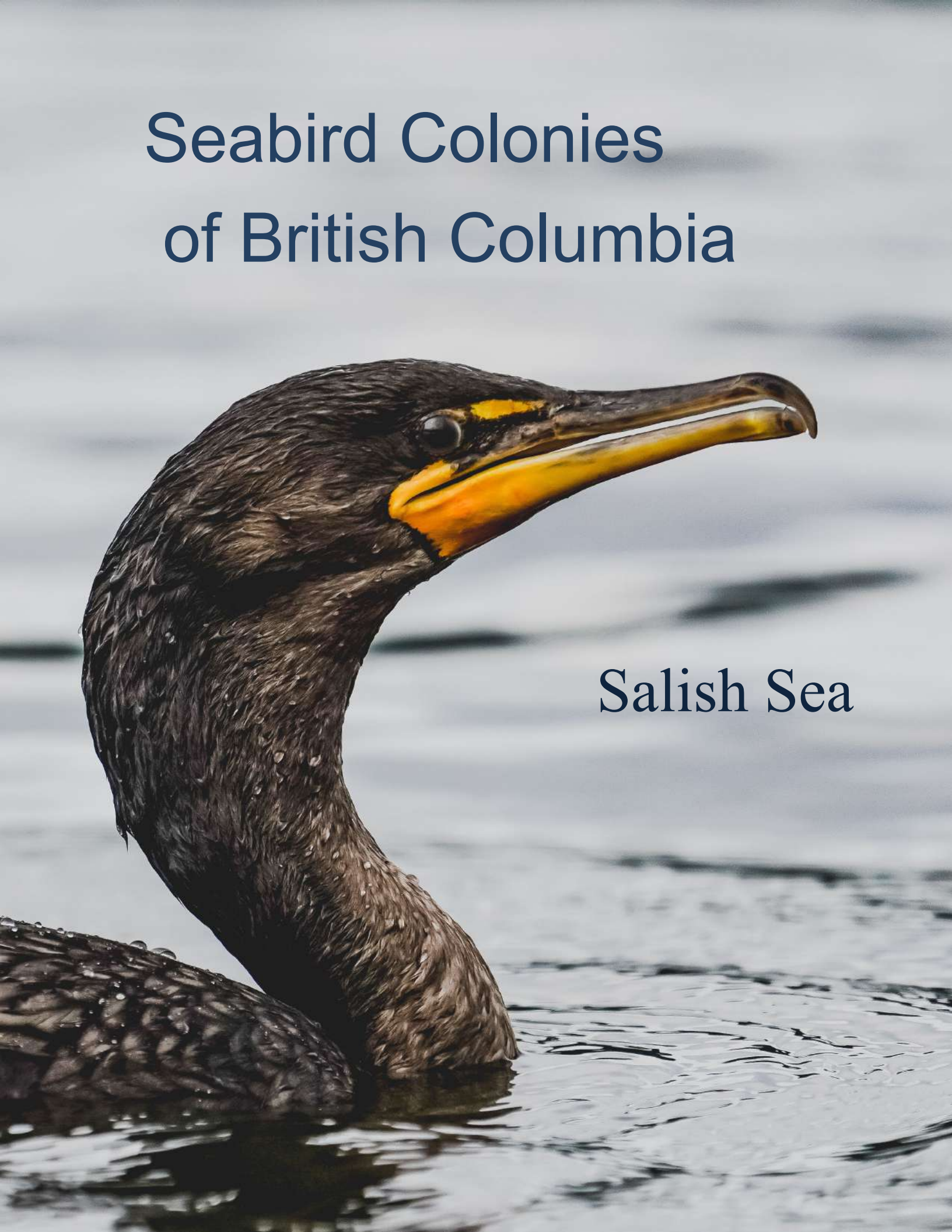
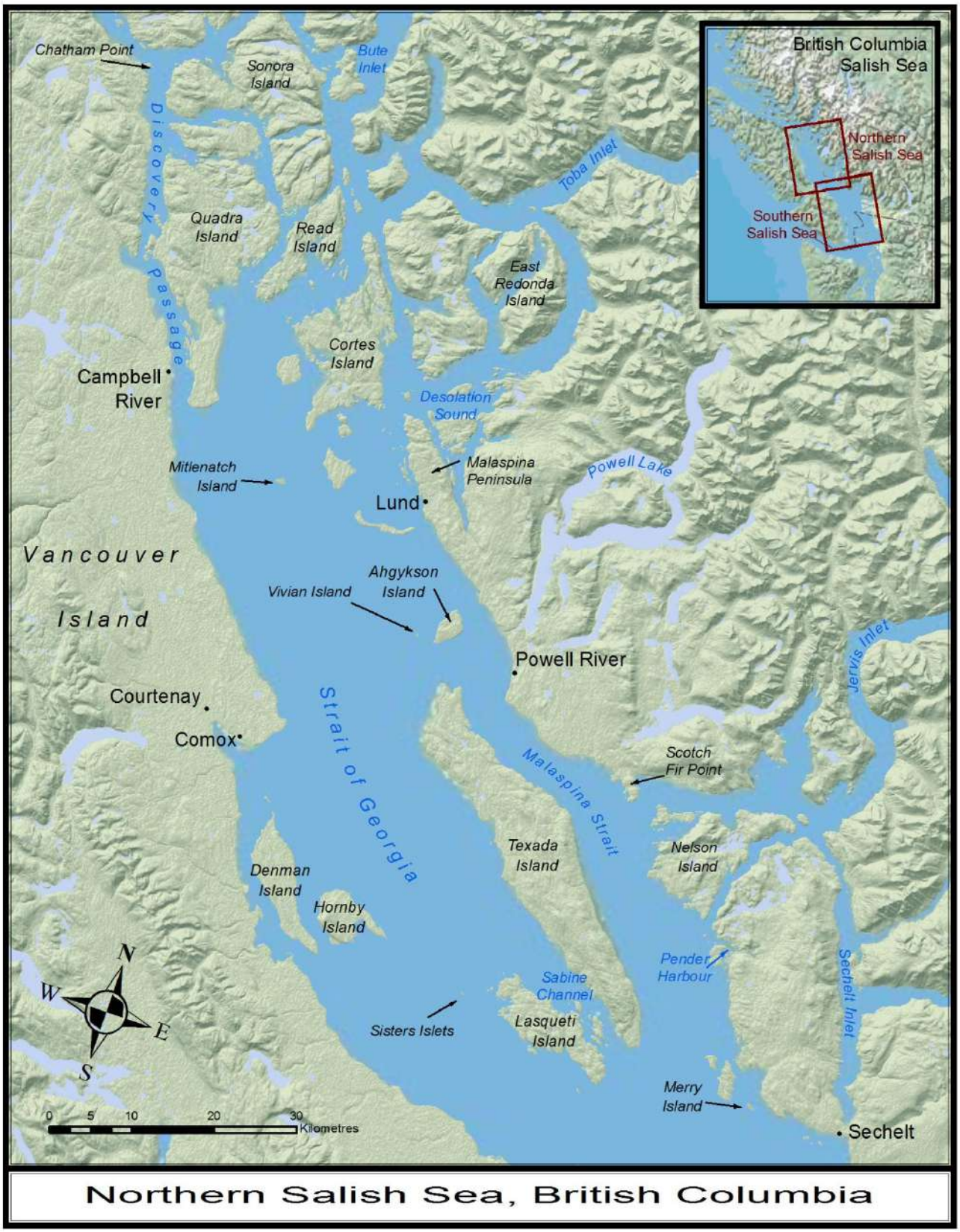
Seabird Colonies of British Columbia



Salish Sea



Northern Salish Sea, British Columbia

Seabird Colonies of British Columbia
Salish Sea

Michael S. Rodway
R. Wayne Campbell
Moira J.F. Lemon

PREAMBLE TO THE FINAL EDITION

A preliminary edition of this volume, *Seabird Colonies of British Columbia: Salish Sea* was released in May 2023 with data current through 2022. That edition lacked full input from its second author, Wayne Campbell, due to health issues. Over the interim, in spite of persistent health problems and other obligations, Wayne, with great help from his wife Eileen, was able to extract pertinent photos from his archived photo collection so that we could add them to this volume. The other two authors assumed the task of selecting, scanning, and inserting a portion of those photos into the finished manuscript. We have thus been able to illustrate the entire volume, especially adding photos to sections and colony accounts that lacked photos in the preliminary edition. These photos provide historical visual records of colonies, habitats, and scientists conducting the inventory work reported on here. The final layout was completed by the senior author. The senior author also has continued to request and compile seabird nesting records from all known sources and has now completed data collection through summer 2023. We have thus, contrary to our previous intentions, decided to update colony accounts for the Salish Sea and population estimates for all colonies in British Columbia (BC) to include data through 2023. This final edition thus details seabird breeding populations at colonies in the BC Salish Sea and provides a synopsis of breeding populations at all colonies in BC, current to 2023. New colony sites first documented in 2023 have been added, and two nesting species that were absent in 2022, Caspian Tern (*Hydroprogne caspia*) and Arctic Tern (*Sterna paradisaea*), were confirmed breeding at new sites in the BC Salish Sea in 2023.

The compilation of historical data for this volume was exhaustive. Sources searched included: records in the BC seabird colony inventory files, the BC Nest Record Scheme, published papers, unpublished in-house reports from various government departments, naturalist's reports, student theses, consultant reports, and all records from eBird, the BC Breeding Bird Atlas project, and from all other sources listed in this volume. We acknowledge that some records likely exist that were unavailable or unknown to us at this time, as is always the case in a project of this magnitude; however, such records are unlikely to affect in any substantial way the colony histories presented in this volume.

We include here a short tribute to Bristol Foster. We had anticipated including a more comprehensive tribute to Bristol, but found that we wanted to expand it to a longer account than was suitable for this volume. We therefore decided to present that elsewhere in a separate upcoming volume of *Wildlife Afield*.

We had also intended to include in this final edition a special recognition for Mark Nyhof who was responsible for preparing the first three volumes of this series for publication. He has made a tremendous contribution to the work and set a difficult-to-emulate example for the layout of this final volume. Because he has been responsible for producing many *Wildlife Afield* documents other than the first three volumes of this series on the seabird colonies of BC, it was decided to provide a more detailed account of all his efforts and accomplishments in a separate forthcoming issue of *Wildlife Afield*.

Although this is the final edition of Volume 4 of this series, the senior author will continue to request and compile seabird nesting records for the foreseeable future so that the BC breeding seabird database is kept up to date. Currently no additional editions of this work are planned, though it is possible that updates may occur in future.

A TRIBUTE

J. Bristol Foster – a Vision for the Future

Many people have shared the vision of protecting the rich ecological heritage of British Columbia (BC). J. Bristol Foster is one of the pioneers of that group. He has campaigned for the conservation of the natural environment for most of his life, which has now spanned over nine decades. His contributions to the study and conservation of breeding seabirds in BC have been tremendous. As the first Coordinator of the Ecological Reserves Program in BC, and building on the efforts of those like UBC professor Vladimir J. Krajina who worked to establish the program, Bristol made major strides in providing protection for seabird breeding colonies. Designated Ecological Reserves now protect 70% of the seabird breeding populations in BC. Bristol was also instrumental in helping to launch the first comprehensive seabird colony survey of the BC coast conducted by Wayne Campbell out of the British Columbia Provincial Museum (BCPM; now Royal British Columbia Museum) in 1974-1977. Bristol recognized the value of those surveys in providing the knowledge needed to direct future conservation initiatives.

Bristol developed a passion for the natural world as a young boy growing up in Toronto. He shared that passion with his life-long friend and renowned wildlife artist Robert M. Bateman. They met at a young naturalists' club that gathered monthly at the Royal Ontario Museum and together became ardent bird watchers. The two friends shared many

adventures and still live close to each other on Saltspring Island in the BC Gulf Islands. One great adventure when they were young men was most memorable.

After completing a Master's degree on mammals at the University of Toronto, Bristol needed a respite from the academic world. He phoned his good friend Robert Bateman and asked if he wanted to drive around the world. With a high school atlas they planned their trip through equatorial Africa, northern India, Nepal, Burma, Thailand, Malaya, and across to Australia. The 1957-1958 trip took 14 months and cost them a total of $2,000 each, including shipping costs for their Land Rover. Before they left, Bristol took a course where students learned to dismantle and reconstruct a Land Rover so that he could make repairs en route. That hands-on approach to challenges served Bristol well throughout his life.

Bristol subsequently moved to BC where in 1960 and 1961 he conducted research for his doctoral dissertation at UBC on the evolution of mammals in Haida Gwaii. After comparing 116 island species to their mainland varieties, Bristol found that many island species had evolved body sizes that differ from their mainland counterparts. He proposed the simple explanation that smaller creatures on islands get larger due to the absence of predators and larger creatures become smaller because islands provide more limited food resources. This explanation has become known as Foster's rule.

After finishing his Ph.D. studies, Bristol obtained Canadian government funding for studies in Kenya. He became Head of the Wildlife Ecology Graduate Studies program at the University of Nairobi, personally conducted studies on giraffes, and directed other students conducting studies of other African mammals. Canadian funding expired after five years and Bristol returned to BC in 1968.

On his return to BC, Bristol accepted a position as assistant director of the BCPM. He then became director of the museum from 1970 to 1974. The bureaucratic work of being a director was challenging and fun but Bristol had a preference for field studies and spent time in the field whenever possible. In 1969, he managed to make three short visits to Haida Gwaii to pursue seabird and small mammal studies, to visit falcon nesting areas on Langara Island, and to examine potential ecological reserve sites. This was early on in the development of the ecological reserves program in BC and reflected Bristol's long-standing commitment to the protection of natural areas, including seabird colonies.

The Ecological Reserves Program in BC grew out of Canada's participation in the International Biological Program, a worldwide endeavor running from 1964 to 1974 and involving 58 nations, with the goal of identifying and protecting representative terrestrial and aquatic ecosystems around the world. In 1968, the BC government was persuaded by Vladimir Krajina and other scientists, to form an Ecological Reserves Committee that would advise on the selection of potential reserve sites. A year later, the government began setting aside ecological reserves under the *Land Act*, and in 1971, the *Ecological Reserves Act* was passed, which made BC the first province in Canada to formalize and give permanent protected status to ecological reserves. However, it was not until 1974 that a government department was formed to administer the new act. In 1974, the Ecological Reserves Unit was formed and Bristol left his job as Director of the BCPM to become a one-person department as Coordinator of the Ecological Reserves Program. He was a one-man show until funding became available to hire assistants, including Jim Pojar in 1976, Trudy Carson (now Chatwin) in 1977, Hans Roemer in 1979, and Lynne Milnes in 1980.

Bristol served as head of the Ecological Reserves Program until 1984 and has continued as an ardent conservationist ever since. In 2020, he became a Board member of the non-profit society Friends of Ecological Reserves, which currently manages the volunteer warden program designed to protect the natural ecosystems on Ecological Reserves from human and other impacts.

On The Covers

Front: Double-crested Cormorant. *Photo by Macus Ong.*
Back: Ironworkers Memorial Bridge. *Photo by Macus Ong.*
Inside covers: Maps prepared by HR GISolutions Inc., Victoria, B.C.
Title page: Glaucous-winged Gull chick. *Photo by Michael S. Rodway.*
Page 2: Glaucous-winged Gull. *Photo by Alan D. Wilson.*
Page 3: Bristol Foster. *Photo by R. Wayne Campbell.*

(Note: superscript numbers in the text refer to entries in the Literature Cited and Other Sources of Information that begin on page 584)

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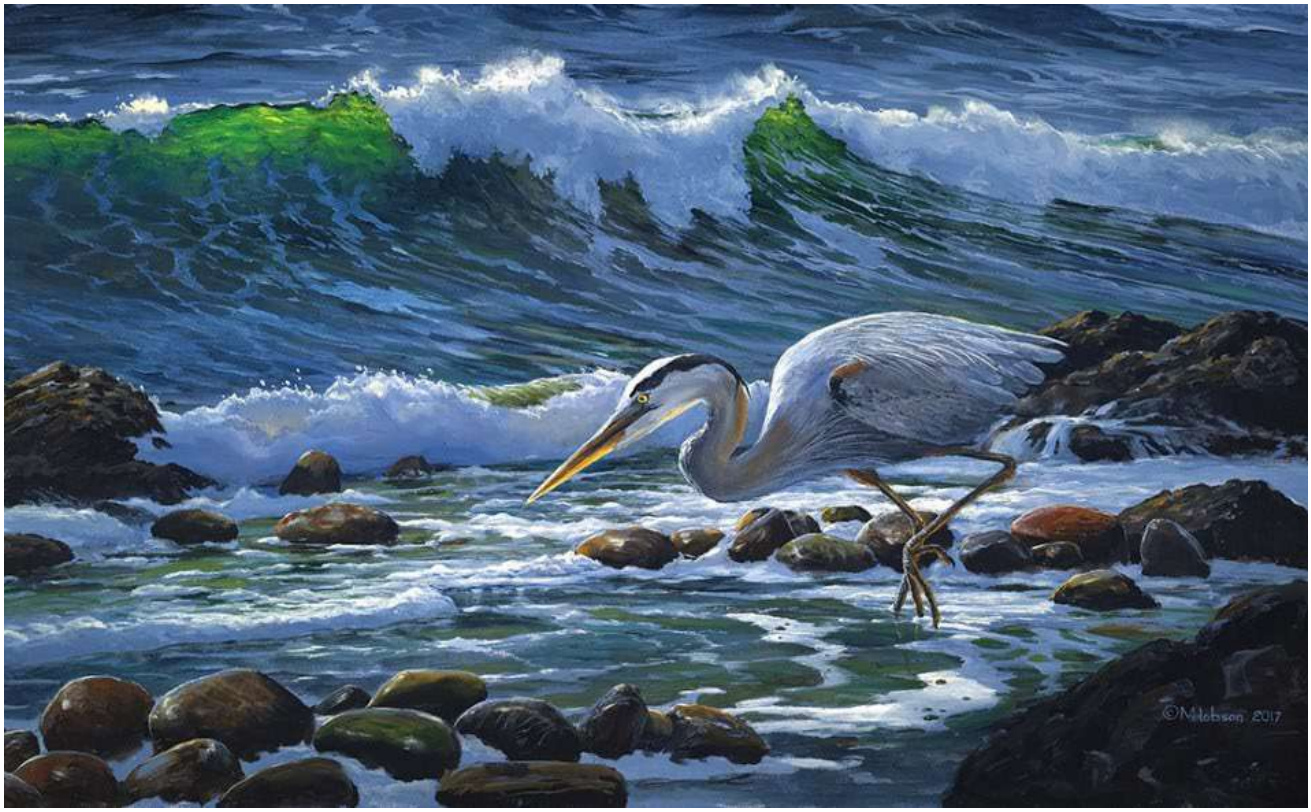
An estimated 478 Black Oystercatchers and 21,630 Glaucous-winged Gulls nest at 114 and 127, respectively, of the 221 currently-used seabird nesting sites in the BC Salish Sea. [Paintings "Oystercatchers: Stepping Cautiously" (top) and "Chesterman Beach: The Golden Hour" *courtesy Mark Hobson, Coastline Art Inc.*]

Nesting seabirds share coastal habitats with many other marine-dependant species. [Paintings "Common Mergansers: Fixing Feathers" (top) and "Orca Whale and Coho Salmon: The Getaway" *courtesy Mark Hobson, Coastline Art Inc.*]

Nesting seabirds compete for food with many other species, including humans. The collapse of fish stocks such as sand lance, capelin, or herring due to human overfishing results in seabird breeding failures and mortality. [Painting "Troller: Herring Season" *courtesy Mark Hobson, Coastline Art Inc.*]

Seabirds suffer numerous impacts from human activities. Many die as by-catch in commercial and sports fisheries, and even innococous-sounding activities like scuba diving around islands to view octopi and other underwater denizens can cause disturbance to seabirds nesting on the islands. [Paintings “Octopus: Into The Open” (top) and “Tiger Rockfish” *courtesy Mark Hobson, Coastline Art Inc.*]



Nesting seabirds as well as other marine-associated species like Great Blue Herons are threatened by burgeoning human populations in the Salish Sea. If suitable habitats can be protected, then conservation efforts can restore impacted wildlife populations, as evidenced by Sea Otters, which have recently become re-established in the Salish Sea. [Paintings "Great Blue Heron: The Risk Taker" (top) and "Sea Otters: Breakfast On The High Seas" *courtesy Mark Hobson, Coastline Art Inc.*]

Declines over recent decades in breeding populations of Double-crested and Pelagic cormorants and Glaucous-winged Gulls in the BC Salish Sea have been mainly attributed to disturbance by increasing numbers of humans and Bald Eagles. [Painting "Bald Eagles: Waiting For Salmon In Kynoch Inlet" *courtesy Mark Hobson, Coastline Art Inc.*]

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SEABIRD COLONIES OF BRITISH COLUMBIA

PART 4: SALISH SEA: A HISTORY TO 2023
- including Northern Strait of Georgia and Gulf Islands
(with appended data and totals for the entire BC coast to 2023)

Michael S. Rodway[1], *R. Wayne Campbell*[2], *and Moira J.F. Lemon*[3]

[1]*Wildwing Environmental Research, Box 47, Gold Bridge, British Columbia, Canada V0K 1P0, (wildwing@xplornet.ca)*

[2]*2511 Kilgary Place, Victoria, British Columbia, Canada V8N 1J6*

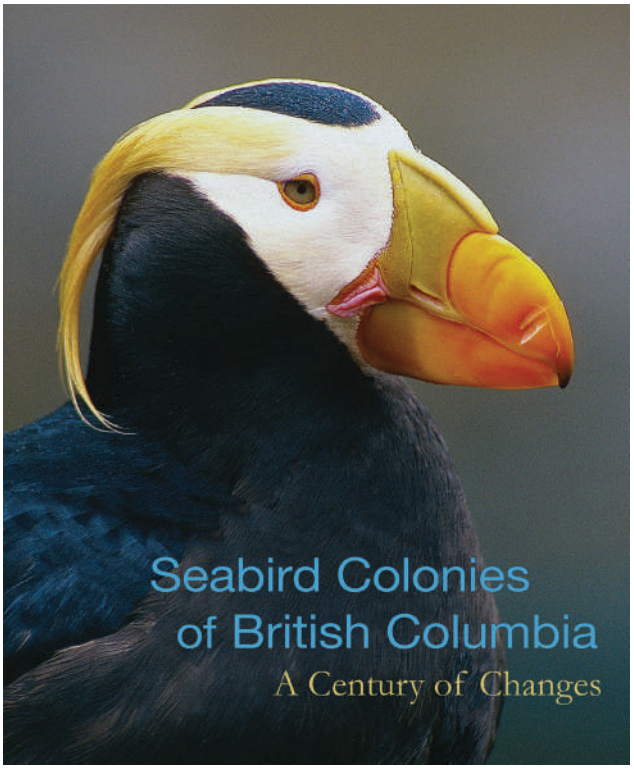
[3]*4997 57th Street, Delta, British Columbia, Canada V4K 3E7*

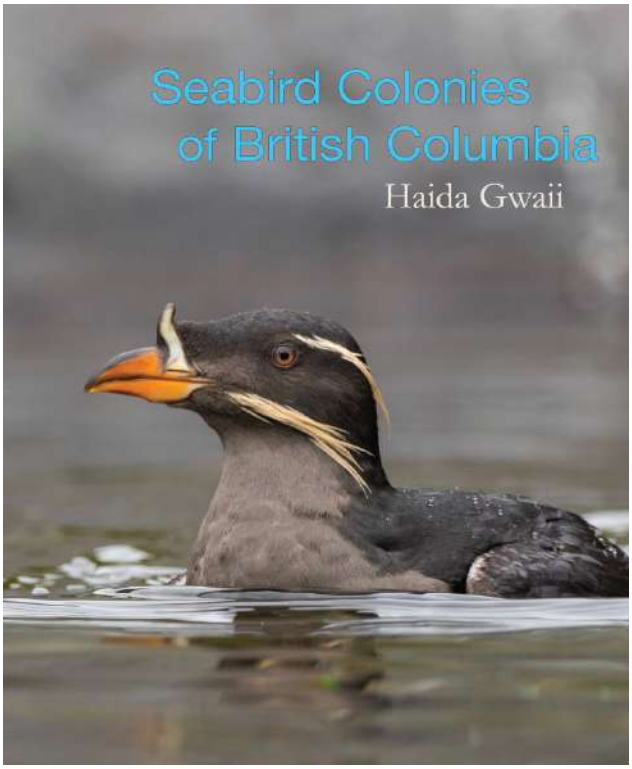
PREFACE

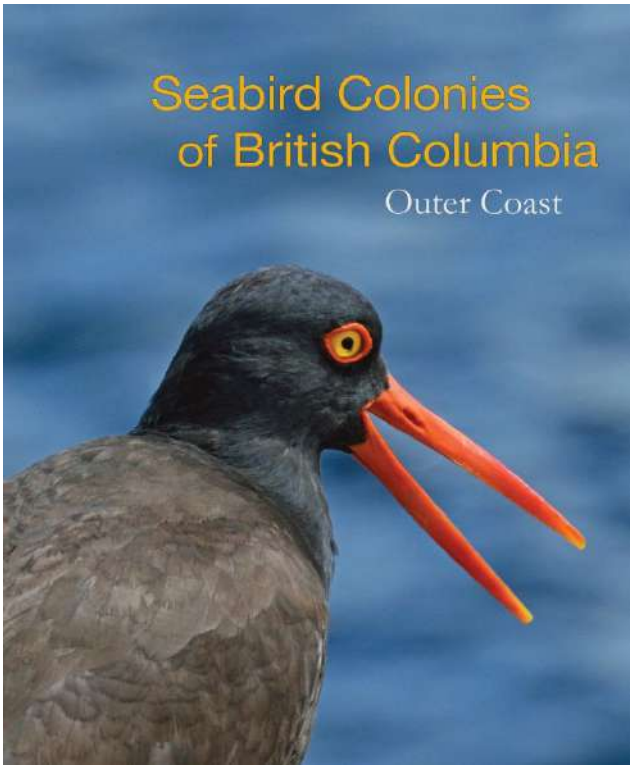
This is Part 4 in the series of publications presenting the history of British Columbia (BC) seabird colonies (Figure 1). It is the final volume in the series and completes the colony accounts for the province. In Part 1, we presented background and introduction to the histories and a review of provincial populations and trends.[335] Parts 2 and 3 presented colony accounts for Haida Gwaii [336] and the Outer Coast,[337] respectively. In the present volume, we consider all known seabird colonies in the BC portion of the Salish Sea, from the north end of the Strait of Georgia to Victoria at the south end of Vancouver Island. This area is heavily urbanized, with some of the most rapidly expanding human populations in Canada exerting tremendous and increasing pressure on the environment.[161] This volume is intended as an aid to the conservation and management of nesting seabirds and the marine ecosystems they depend on in this intensely developed region.

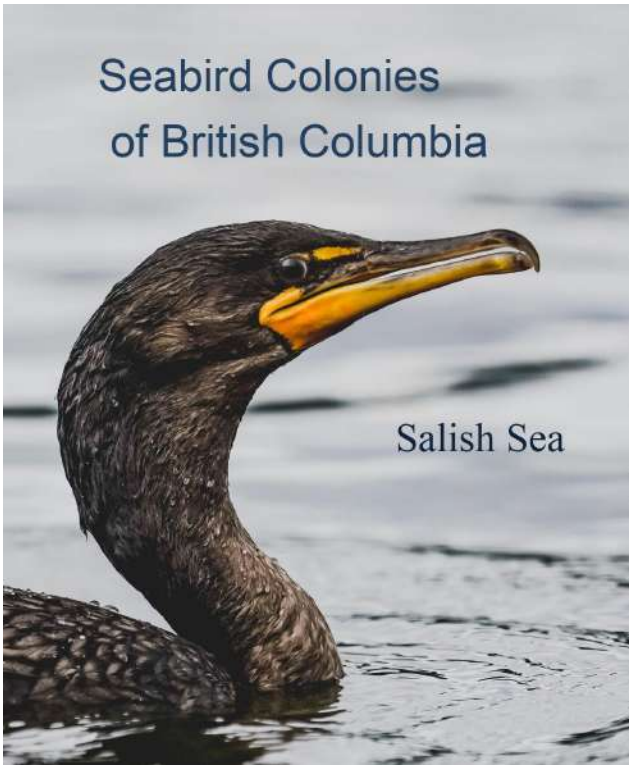
Several region-wide surveys have been conducted in the BC Salish Sea since 1990 [33, 101, 114] causing us to modify our presentation in this fourth volume compared to previous volumes. In the Haida Gwaii [336] and Outer Coast [337] volumes, information as of 1990 was considered current and, in the main colony accounts, no attempt was made to include data collected since. We discussed the reasons for

Figure 1 (next page)**.** Seabirds are one of the most fascinating groups of species on earth. There is a sense of mystique about them, as they often live lives remote from human populations, nesting in dense colonies on isolated, windswept islands, and wandering the open oceans in search of food. Unfortunately, though they have captured the imagination of people throughout history, they have become one of the most threatened groups of animals on the planet due to direct and indirect human impacts on their breeding and foraging habitats. Effective conservation action to protect this imperiled group depends on detailed knowledge for each species of their life history, habitat requirements, historical distribution and abundance, population trends, impacts, and threats at local and global scales. This four-volume series on *Seabird Colonies of British Columbia* provides that knowledge for species breeding on the Pacific Coast of Canada. Volume 1, published in 2018, provides an overview of nesting seabirds in BC, including survey history and methods, detailed species accounts, and regional and provincial population summaries and trends. It also provides an exhaustive summary of impacts, threats, protective measures, and conservation recommendations for seabirds in BC. Three subsequent volumes present comprehensive accounts of population trends and conservation concerns for seabirds nesting in three sections of the BC coast, including Haida Gwaii, published in 2020, Outer Coast, published in 2022, and this volume on the Salish Sea, published in 2024. Together, the three volumes provide detailed histories of every known current or historical seabird colony in the province. The rapidly expanding human population and ensuing environmental concerns in the Salish Sea add to the immediate importance of this final volume.









this in volumes 1 and 2.[335, 336] In the first volume,[335] all post-1990 data that we were aware of at the time of printing were presented in a separate section in each species account. In the Haida Gwaii [336] and Outer Coast [337] volumes, post-1990 data were presented in appendices. By presenting post-1990 data in appendices to those volumes, we were able to insert new data as we received them right up until the final sections of the manuscripts went to layout. Although major changes in seabird breeding populations have been documented since 1990 at some colonies in Haida Gwaii and along the BC outer coast, data to 1990 still provide our best overall baseline population estimates for those areas. This is

not so in the BC Salish Sea because several region-wide surveys have been conducted in this area since 1990. In this fourth volume, we have thus decided to include published and unpublished results of surveys conducted since 1990 in our colony accounts and in our interpretation of regional population trends in the Salish Sea. We have also spent much effort and have recruited the help of many individuals and agencies that have collected data on nesting seabirds in the BC Salish Sea in an attempt to make the colony histories as complete as possible as of 2023. In spite of this effort, there are likely data collected since 1990 that were unavailable or unknown to us.

Surveys in the BC Salish Sea since 1990 have focused on specific species and generally have not considered other species that may have been nesting on specific colonies. Thus, most recent surveys do not provide estimates of total seabird populations at each colony but do provide important updates for individual species.[33, 57, 101, 114]

Legacy from the 1970s and 1980s

The most comprehensive baseline population data for seabirds nesting in BC were collected during surveys by the British Columbia Provincial Museum (BCPM, now Royal British Columbia Museum) in the 1970s and by the Canadian Wildlife Service (CWS) in the 1980s. The objectives of the surveys and the ways they were conducted by BCPM and CWS crews were quite different. The objectives of the BCPM surveys were to explore the entire BC coast for nesting seabirds in about three years. Except for some large colonies, which might take a few days to explore, crews were constantly on the move, often visiting numerous islands in one day. Some BCPM surveys, such as the first survey in 1977 of the west coast of Graham Island in Haida Gwaii and some surveys in the BC Salish Sea were conducted by small, two-person crews using a zodiac and camping along the way. However, most surveys in Haida Gwaii and along the BC outer coast were conducted from a mother ship, the MV Tedmac*. Having a mother ship to transport survey crews was invaluable. Time was not needed for setting up and dismantling camps and offloading supplies, surveyors returned daily to an inviting environment where wet gear could be dried, and the skipper prepared most of the meals! This meant that more time could be spent conducting surveys and more islands could be visited each day. That was all made possible because Dr. Harold Carter Sr., or "Doc" Carter, who was motivated to support the keen interests of his son, Harry Carter, bought the* Tedmac *to serve as a mother ship and also helped with expenses for the expeditions* (Figure 2).

CWS surveys in the 1980s were more intensive. Building on the data collected by the BCPM in the 1970s, the main objective of the CWS surveys in Haida Gwaii and along the BC outer coast in the 1980s was to obtain reliable, statistically-comparable estimates of population sizes for burrow-nesting species at colonies previously identified by BCPM crews. Counts for surface-nesting species were also obtained. It often took many days or weeks to systematically survey a colony of burrow-nesting species with transects and to set up permanent monitoring plots to help detect future population trends. Surveys of all major colonies of burrow-nesting species in BC took a decade to complete. Those surveys were more efficiently conducted from base camps on or near islands to be surveyed. In any case, no benefactor like Doc Carter came forward to support CWS surveys and funds were not available to hire a mother ship. Many CWS surveys were conducted using zodiacs, usually two, to travel between colonies, with rough base camps set up on major colonies to be surveyed. More elaborate camps were established on large colonies where crews might be stationed for several weeks or months (Figure 3)*, which occurred especially when crews were also involved in other research projects being conducted at the same time. Assistance from Coast Guard vessels was sometimes available and charter boats were sometimes hired to transport crews and gear to and from those sites at the beginning and end of a field session.*

By including post-1990 data in our main accounts, we have now updated regional population estimates for the BC Salish Sea (Figure 4) from those summarized in Part 1 of this work.[335] This means that the estimates of total seabird breeding populations in BC presented in Part 1 are now out of date. In Appendix 1 of this volume we thus present revised summary tables of seabird breeding populations in BC, which update Tables 3-6 in the first volume.[335] We first include a list of additional post-1990 data for colonies in Haida Gwaii and the BC Outer Coast that we obtained after those volumes [336, 337] were published. We then provide a complete list of current population estimates at every known current or historical colony site in those areas as of 2023, which updates all regional population tables in the Haida Gwaii and BC Outer Coast volumes. The tables in Appendix 1 thus include the updated estimates to 2023 for the BC Salish Sea, as well as any post-1990 population estimates for colonies in Haida Gwaii and the Outer Coast (summarized in Appendix 1 of previous volumes [336, 337] or obtained since their publication). As an aid to identifying and mapping colony locations, we also provide updated geographical coordinates for all known historical and current seabird colony sites in BC as of 2023 (see Appendix 1).




Figure 2. Most BCPM surveys in the 1970s were conducted from the comfort of a mothership, the MV *Tedmac*. Photos here show (clockwise from top left): the *Tedmac* near an island being surveyed on the northern mainland coast; Marilyn Paul (now Lambert) in the luxury of her own bed on the *Tedmac*; Harry Carter, Michael Rodway, and Marilyn Paul (left to right) in the cozy kitchen on the *Tedmac*, and Doc Carter on deck amidst drying sleeping bags. *Photos by R. Wayne Campbell, 1976 and 1977.*




Figure 3. Surveys by CWS in the 1980s and more recently were generally conducted from base camps set up on or near major colonies to be surveyed. Crews slept in small tents and makeshift shelters were set up for kitchen and work areas. On large colonies where crews might be stationed for months, more elaborate and comfortable field camps were established with heated wall tents where crews could warm up and dry out. Photos here show (clockwise from top left): CWS field camp in a small bay on the west Rankine Island in Haida Gwaii in 1984, with (from left to right) Michael Rodway, Doug Bertram, Mike Biro, Dave Powell, and Tony Robichaud; tarped kitchen area in the camp on Lucy Islands on the northern mainland coast in 2011; and long-term field camps set up on Frederick Island in Haida Gwaii by Moira Lemon and Trudy Carson (now Chatwin) in 1980 and by Laurie Wilson, Moira Lemon, and others in 2014 (Laurie Wilson is visible in the photo). *Photos by Moira J.F. Lemon, 4 June 1984, 15 July 2011, 25 July 1980, and 26 May 2014.*

Figure 4. Numbers of nesting seabirds in an area may fluctuate greatly among years and across decades. Reasons for declines in breeding populations may include loss of habitat, reduced availability of food resources, disturbance, predation, and climate change. Increases in population size and expansion in the range of nesting species also occur. For example, four species (clockwise from top left), Brandt's Cormorant (*Phalacrocorax penicillatus*; now *Urile penicillatus* [222]), Caspian Tern (*Hydroprogne caspia*), Arctic Tern (*Sterna paradisaea*), and Rhinoceros Auklet (*Cerorhinca monocerata*) have expanded their range into the Salish Sea since the first seabird catalogue by Drent and Guiguet was published in 1961.[144] *Photos by R. Wayne Campbell.*

In Part 1 [335] we described the various survey methods used over the years to census seabird colonies in BC, and provided a detailed key to the codes used to qualify data in tables. Brief definitions of the codes used in the tables are provided in Appendix 2 of this volume. Appendix 3 lists sites in the BC portion of the Salish Sea that were explored during seabird surveys, but where no evidence of nesting by seabirds was found. To assist with future survey work, we present a synthesis of methods for conducting surveys of seabird breeding populations in the BC Salish Sea in Appendix 4. The material in Appendix 4 is designed to complement established provincial protocols [322] and other published survey methods. As described in previous volumes and below in the section, *Data Presentation and Organization*, each seabird colony has been labelled with a unique letter and number code.

INTRODUCTION

The BC Salish Sea – Northern Strait of Georgia to Vancouver and Gulf Islands to Victoria

The name "Salish Sea" was proposed by the Chemainus First Nation in 2008 and was approved by the United States (U.S.) in 2009 and by Canada in 2010 to refer to the combined waters of the Strait of Georgia, Juan de Fuca Strait (officially named Strait of Juan de Fuca in the U.S. [186]), and Puget Sound. In BC, in addition to the Strait of Georgia and Juan de Fuca Strait, the Salish Sea also includes Desolation Sound, Discovery Passage, and a number of other channels in the north, and Haro Strait and the many channels around the Gulf Islands in the south. The entire Salish Sea is about 440 km (270 mi) long and has a surface area of about 18,000 km^2 (6,900 sq mi), about 60% of which is in BC. We use BC Salish Sea and Strait of Georgia interchangeably to refer to

the northern portion of the Salish Sea within BC that we deal with in this volume of the seabird colony catalogue (Figure 5). To the north, we have defined Chatham Point at the north end of Discovery Passage as the boundary between the BC Salish Sea and the Outer Coast regions considered in Part 3.[337] To the south, we extend the boundary of the BC Salish Sea to and including William Head, just south of Victoria. That boundary excludes the portion of the BC coast that lies within Juan de Fuca Strait, even though it is officially considered part of the Salish Sea.[186] The area south of Carmanah Point on the west coast of Vancouver Island, which includes seabird colonies from WV-870 "Parkinson" Cliff to WV-930 Race Rocks, are within Juan de Fuca Strait. Those colonies were considered part of the West Coast Vancouver Island region, and histories for those colonies were presented in Part 3.[337] As discussed in Part 3, Juan de Fuca Strait exhibits transitional characteristics between the exposed outer coast and inland waters, but overall, the area between Carmanah Point and Race Rocks is more similar to the outer coast in terms of ocean temperatures, salinity, tidal cycles, fog, and exposure to ocean swells.[389, 390] A glacial sill that runs across the eastern end of Juan de Fuca Strait south of Victoria arrests the penetration of colder, higher-salinity waters from the open ocean. We considered that sill to be a reasonable boundary between the outer coast waters dealt with in Part 3 [337] and the inner waters of the Salish Sea that we deal with here.

Figure 5. The Salish Sea is a marginal sea of the Pacific Ocean encompassing inner waters of southern British Columbia and northern Washington, including the Strait of Georgia, Juan de Fuca Strait, Puget Sound, and adjacent waters. Within the Salish Sea, many small to medium-sized islands dot the landscape (top left). Larger islands are heavily forested (top right). Islands support a high diversity of plant species and the area is used by many resident and migrating animals, including nesting seabirds that utilize the marine environment for foraging (bottom right), staging, and loafing. Large and rapidly increasing human populations in the region exert tremendous pressure on the environment and there are numerous impacts to wildlife, including those caused by high levels of contaminants and human debris in marine waters. Seabirds in the Salish Sea commonly suffer deformities in bills and feet, entanglement and drowning in active and derelict fishing gear, and oiling (bottom left). Observations of contaminated, injured, or dead birds, and birds displaying unusual behaviours, should be reported immediately to Canadian Wildlife Service in Delta, BC. *Photos by R. Wayne Campbell (top and bottom right) and Moira J.F. Lemon.*

The Geological History of the BC Salish Sea

The present shape of the BC coast is a product of ongoing tectonic movements and collisions, volcanic intrusions, glacial and riverine sculpting and sedimentation, and changing ocean and land levels.[177, 216, 389] The parts of the earth's crust that now form most of the BC coast likely originated in what is now northern Europe and Russia. Those terranes travelled across the Arctic to the northwest coast, docking with older terranes that form the BC interior sometime between 175 and 100 million years ago.[92, 177, 250] During that period, a general downfolding of the crust along the Pacific coast created the Georgia-Hecate Depression that runs from Alaska to the Gulf of California. The Salish Sea lies in that trough. Concurrent uplift and folding of adjoining areas began the formation of the Coast Mountains and the Vancouver Island Ranges. A series of uplifts and downfoldings, accompanied by changing ocean levels and erosion patterns, continued to shape the BC coast over the next 100 million years. Between 55 and 40 million years ago, two terranes travelling northward along the Pacific coast collided with the south end of Vancouver Island. The force of those collisions folded and faulted the sedimentary rock within the southern Strait of Georgia, evident in the tilted sedimentary strata now exposed on islands like Mandarte and other islands in the southern Gulf Islands (Figure 6). One period of uplift 5 to 10 million years ago resulted in a full retreat of the ocean from the coastal trough, creating an expansive valley along the east side of Vancouver Island.[389]

Over the last 1-2 million years, intense scouring and gouging by a series of massive glaciers sculpted the coast we see today (Figure 7). Erosion by ice flowing down mainland rivers carved long, steep-sided valleys into the eastern side of the Strait of Georgia. Those became deep fiords such as Jervis

Figure 6. Layers of sedimentary rock are exposed along the headland and beach on Tumbo Islands' south shore (left), and on the broad shelf of conglomerate rock on the east side of Cabbage Island. *Photos by Christopher McNeill, July and August 2009.*

Figure 7. The inexorable flow of a series of massive glaciers over the last 1-2 million years carved the long, steep-sided valleys that penetrate the BC coastline today. *Photo by Heidi M. Regehr, Coast Mountains, BC, 4 September 2018.*

Inlet, which now extends 61 km into the Coast Mountains.[389] Glacial scouring and subsequent flooding also created the complex of islands and passageways of the present-day Salish Sea. The Gulf Islands were formed through carving of the soft sedimentary rock that was originally part of southern Vancouver Island. Erosion in those areas created elegant cliff and rock galleries that famously line the shorelines of many Gulf Islands (Figure 8). More resistant igneous rock in the northern Strait of Georgia formed islands like Mitlenatch Island. About 17,000 years ago, at the peak of the Fraser Glaciation during the most recent Wisconsin Glacial Episode, glacial ice covered all of southern BC to depths up to 2 km. In the Salish Sea area, glacial ice overtopped the mountains of Vancouver Island (Figure 9) and flowed west over the island to the Pacific Ocean.[118] Ice flowed through Juan de Fuca Strait to the edge of the continental shelf, about 80 km off the present south end of Vancouver Island. The weight of that ice depressed land levels 250-300 m and perhaps as much as 400-500 m in areas of maximum glacial loading.[116, 118] The continental ice sheets also removed vast quantities of water from the

Figure 8. Examples of the marvelous and fanciful erosional features along Tumbo Islands' sandstone shores and at Wallace Island (bottom left). Moira Lemon is taking in the sights (top left). *Photos by Christopher McNeill (top left) and Moira J.F. Lemon.*

world's oceans, causing global sea levels to fall about 120 m below their present level.[168]

Subsequent shoreline levels and the evolving shape of the Salish Sea coastline were largely determined by the relative magnitude of crustal rebound, which lowers relative sea levels, and glacial melting, which raises actual sea levels. Glaciers decayed rapidly from coastal areas after the peak of the Fraser Glaciation: [117] what are now Vancouver and Victoria were free of ice and Juan de Fuca Strait was opened to the Pacific Ocean by about 15,700-15,500 years ago; the Strait of Georgia was completely deglaciated shortly thereafter.[118, 195] When the ocean flooded the isostatically depressed lowlands immediately following glacial retreat, sea levels within the Salish Sea were 140-200 m higher than today.[118] Recent studies around Quadra Island revealed relative sea levels of 197 m above present at 14,300 years ago.[168] Relative sea levels fell to only 2-3 m above present by 12,000 years ago, and then fell slowly to near their present level as local uplift ceased. Over the last 100 years, tectonic motion has raised coastal land levels, by about 6 cm at Victoria,[19] but in the area of the Salish Sea this has been offset by rising global sea levels, such that relative sea levels within the BC Salish Sea have risen 3-7 cm over the last century.[46] This trend will likely continue through the near future as global temperatures rise and ice caps continue to melt.

Figure 9. At the peak of the most recent Wisconsin Glacial Episode about 17,000 years ago, glacial ice up to 2 km thick covered all of the Salish Sea and overtopped the mountains of Vancouver Island to flow westward into the Pacific Ocean. *Photo by Heidi M. Regehr, Coast Mountains, BC, 11 September 2018.*

Habitats for Seabirds in the BC Salish Sea

Retreat of the recent Cordilleran Ice Sheet, the associated isostatic rebound of the earth's crust, and the inundation of the Salish Sea by the Pacific Ocean and the melting glaciers formed hundreds of islands in the Salish Sea. Many smaller islands remained bare rock or developed shallow soils supporting lush growths of grasses, shrubs, and herbaceous vegetation. Larger islands developed forest ecosystems.[239] Forest ecosystems that developed in northern portions of the Strait of Georgia are classed as part of the Coastal Western Hemlock Biogeoclimatic Zone, as is the rest of the northern BC coast.[311] The zone is characterized by cool, cloudy summers, mild, high-rainfall winters, and frequent fog and drizzle throughout the year, although the climate in the Strait of Georgia is drier than on the outer coast, with forest communities in the northern Strait of Georgia classed into dry and very dry maritime subzones. Tree species are predominantly western hemlock (*Tsuga heterophylla*; hereafter hemlock), western redcedar (*Thuja plicata*; hereafter redcedar), and Sitka spruce (*Picea sitchensis*; hereafter spruce), with Douglas-fir (*Pseudotsuga menziesii*) occurring in drier habitats (Figure 10). More southern areas, lying within the rain shadow of the Vancouver Island and Olympic mountains, experienced a more Mediterranean-like climate. Forest ecosystems that developed in these drier and warmer areas are classed within the Coastal Douglas-fir Biogeoclimatic Zone, with characteristic stands of Douglas-fir, redcedar, arbutus (*Arbutus menziesii*; Figure 11), and Garry oak (*Quercus garryana*).[283] Areas lying within that zone include: the Gulf Islands and the eastern shore of Vancouver Island from Victoria north as far as Denman and Hornby islands; Lasqueti Island and the western side of Texada Island; narrow coastal strips on the mainland north of Vancouver along the Sunshine Coast from Howe Sound to Desolation Sound; and the area south of Vancouver around Tsawwassen.

The main natural habitats used for nesting by seabirds in the BC Salish Sea are small bare or grassy rocks and cliffs (Figure 12). The elegantly




Figure 10. Two Biogeoclimatic Zones are represented in the Salish Sea region in BC, Coastal Western Hemlock in northern portions and Coastal Douglas-fir in the south. Photos here show (clockwise from top left): a stand of western hemlock and western redcedar, the main tree species in the Coastal Western Hemlock Zone; an example of intense logging that impacts inland nesting habitat for Marbled Murrelets (*Brachyramphus marmoratus*) in these zones; regenerating Douglas-fir; and a majestic Garry Oak, a characteristic tree in the Coastal Douglas-fir Zone. The latter native species, at the northern limit of its range in North America, occurs in BC only down the eastern margin of southern Vancouver Island and in the Gulf Islands. *Photos by R. Wayne Campbell and Moira J.F. Lemon (bottom left).*

eroded sandstone cliffs on many of the Gulf Islands and other islands like Chrome Island have numerous cavities that provide sheltered locations used for nesting by cormorants, Glaucous-winged Gulls (*Larus glaucescens*), and Pigeon Guillemots (*Cepphus columba*). Other than the occasional use of trees by nesting Double-crested Cormorants (*Phalacrocorax auritus*; now *Nannopterum auritum*

[222]), there is little use of forested habitats on islands in the Salish Sea. This is related to the dearth of burrow-nesting seabirds in this area. A few Rhinoceros Auklets and Tufted Puffins (*Fratercula cirrhata*) nest in burrows on unforested Mandarte Island, and Pigeon Guillemots have infrequently been recorded nesting in burrows at the edge of the vegetation on non-forested islands. Most larger, forested islands in the Salish Sea are likely inhabited by mammalian predators like American Mink (*Neovison vison*) that render those habitats unsuitable for burrow-nesting seabirds. The non-colonial Marbled Murrelet nests in coastal forests inland from the Salish Sea, but is not known to nest on any colony islands and is not considered in our colony accounts.

Figure 11. The forest cover at Pirates Cove on De Courcy Island, with a mix of Douglas-fir and arbutus along the shore (top), is within the Coastal Douglas-fir Biogeoclimatic Zone. Arbutus trees growing along the southern shore of Tumbo Island exemplify the graceful beauty of these majestic trees. *Photos by Moira J.F. Lemon, 22 August 2010 (top) and 23 August 2009.*

Urban habitats have become important for nesting seabirds in the Salish Sea (Figure 13). Bridge sites in Greater Vancouver such as the Ironworkers Memorial Bridge, the Granville Bridge, and the Burrard Bridge now support large proportions of the Double-crested and Pelagic (*Phalacrocorax pelagicus*; now *Urile pelagicus* [222]) cormorant breeding populations in the BC Salish Sea. Rooftops and other structures on high-rise towers, industrial and commercial buildings and equipment, private homes, docks, pilings, and ferry terminals are now used by large and increasing numbers of Glaucous-winged Gulls in the urban centres of Greater Vancouver and Greater Victoria as well as in smaller communities. Black Oystercatchers (*Haematopus bachmani*) have also been recorded nesting on rooftops and Pigeon Guillemots have become common nesting birds under waterfront wharves along urban shores.

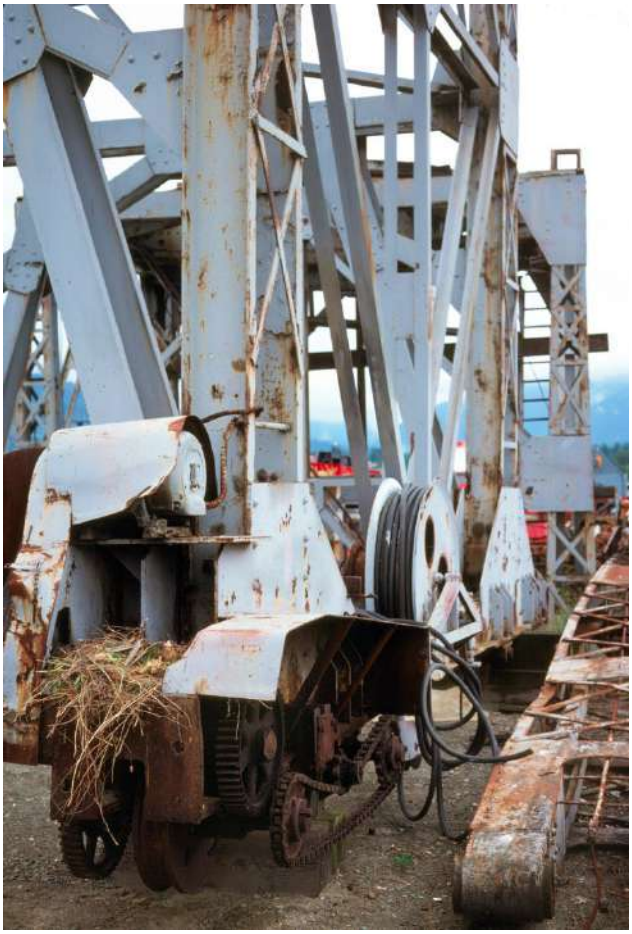
The marine environment of the Strait of Georgia is shaped by freshwater runoff, tidal currents, and wind.[246, 389] Discharge from the Fraser River accounts for 80% of the runoff entering the strait and, especially during spring runoff, creates an estuarine-like environment throughout the southern Strait of Georgia. The sediment-laden plume from the river spreads across much of those southern waters. Lighter, fresh water flows over the denser salt water and creates a thin surface layer of brackish water about 5-15 m deep (Figure 14). The seaward flow of fresh surface water induces a return flow of deeper and cooler salt water that rises towards the surface near the outflow of fresh water, contributing to the dilution of the Fraser River plume. This upwelling of deeper water brings dissolved nutrients towards the surface and is partially responsible for high phytoplankton and zooplankton concentrations that occur in the middle of the strait.[389, 390]

Tides and wind contribute to vertical mixing and dilution of the Fraser River plume and also create localized areas of upwelling that enrich surface waters.[246, 389] Flood tides also carry the fresh-water plume northwards. Tides in the Strait of Georgia are mainly semidiurnal, with two unequal high and low

Figure 12. Natural habitats for nesting seabirds in the BC Salish Sea include (clockwise from top left): isolated bare rocks, small islands with patches of low shrubs, vertical cliffs with supporting ledges, and glacial- and wave-eroded cavities that are used by cormorants, gulls, and guillemots. *Photos by R. Wayne Campbell.*

water levels per day, except near Victoria where tides are diurnal, with a single high and low tide per day. Tidal ranges reach maxima of about 5 m in the northern strait and 4 m in the south. Tide levels are governed not so directly by lunar and solar gravitational effects that predict tidal rhythms in the open ocean but by tidal currents propagated from the open Pacific that enter the Salish Sea through Queen Charlotte Strait and Johnstone Strait in the north and Juan de Fuca Strait in the south. Those tidal currents meet and can create turbulent waters in the northern Strait of Georgia in the area just south of Quadra and Cortes islands.[389] Areas of upwelling and high biological productivity occur where tidal streams flow through constricted channels such as Active Pass in the Gulf Islands.[139, 413, 432]

Figure 13. Over the past 40 years or so, urban habitats have attracted increasing numbers of nesting Double-crested and Pelagic cormorants, Glaucous-winged Gulls, and Pigeon Guillemots, as well as some of their predators such as Peregrine Falcons (*Falco peregrinus*). These photos (this page and clockwise from top left on next page) illustrate the use of urban and other man-made habitats around the shores of the Salish Sea. **1)** The Ironworkers Memorial Bridge across the Second Narrows of Burrard Inlet in Vancouver now supports the largest colony of Double-crested Cormorants in BC. That species has also nested on pilings, dolphins, and logging cranes in the BC Salish Sea. **2)** Although nesting by Double-crested Cormorants on the Ironworkers Memorial Bridge was not documented until 2014 (nesting occurred on the nearby power tower in 2006), adult cormorants were seen on beams under the bridge by bridge painters as early as 1991. The painters reported that cormorants were chased away by Peregrine Falcons (shown in photo) nesting under the bridge. Falcons have not been recorded nesting on the Ironworkers Memorial Bridge in recent years, but they do nest on other bridges in the Vancouver area, including the Burrard Bridge that now supports the largest colony of Pelagic Cormorants in the northern Strait of Georgia. **3)** Glaucous-winged Gulls were first recorded nesting on industrial machinery in Victoria in 1958 [144] and on commercial rooftops in Vancouver in 1962.[284] This photo from 1978 shows one of many nests at the Vancouver Shipyards in North Vancouver; nests were located on a rock jetty, pilings, buildings, metal frameworks, and machinery. By the 1980s, hundreds of pairs were nesting on rooftops in Greater Victoria and Vancouver.[220, 431] Since then, numbers have continued to increase and the distribution of nesting gulls has expanded throughout much of those urban areas. Since Glaucous-winged Gulls and their nests/eggs are protected by federal law, maintenance workers and building managers frequently take measures to discourage nesting attempts. **4)** In rural areas on islands in the Salish Sea, gulls will also nest on rooftops of homes and summer cottages. The roof guy wires visible in this photo of a house on Passage Island were installed to deter gulls but were ineffective. **5)** In recent years, Pigeon Guillemots have frequently been reported nesting under piers, wharves, and other structures along the North Vancouver waterfront. Nesting may have occurred earlier as adults were seen in the area as early as 1970. **6)** Pigeon Guillemots also nest on beams at BC ferry docks, like here at the Tsawwassen terminal. *Photos by Macus Ong, 30 April 2020 (1) and R. Wayne Campbell, March 1979 (2), July 1978 (3), 2 June 1978 (4), 18 June 1970 (5), and August 1990 (6).*



Waters of the Strait of Georgia are highly productive.[389] In addition to supporting nesting seabirds during the summer, the region supports some of the largest overwintering populations of waterbirds in Canada.[163] Despite high zooplankton productivity, there is a lack of planktivorous seabirds nesting in the strait.[249] This contrasts to other areas of the BC coast where predominantly planktivorous species, such as Cassin's Auklets (*Ptychoramphus aleuticus*), Ancient Murrelets (*Synthliboramphus antiquus*), and storm-petrels (*Oceanodroma* spp.), constitute the vast majority of the breeding seabird population.[335] Their absence as breeding species from the Strait of Georgia may relate to the unsuitability of forested habitats for burrow-nesting seabirds discussed above but also may relate to their more pelagic foraging habits. In the Strait of Georgia, nesting seabirds are primarily piscivorous (Figure 15), although bivalves, mostly blue mussels (*Mytilus edulis*), are a major prey item for adult Glaucous-winged Gulls during the nesting season.[423] Pacific Herring that spawn and grow in the strait are the main prey fed to Glaucous-winged Gull chicks. Older age classes of herring migrate out of the Strait

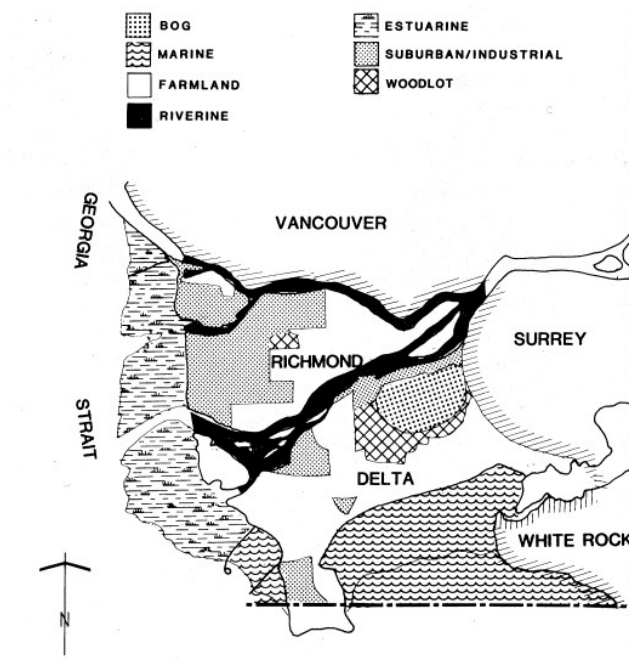


Figure 14. The Fraser River delta is the largest estuary on the Pacific coast of Canada. Studies in the 1980s estimated that over an average year, about 500,000 waterbirds use the estuary and mud flats to feed, stage, and loaf.[56] In some years, as many as 1.4 million birds migrate through the delta, including 300,000 to 750,000 waterfowl, 200,000 to 600,000 shorebirds, and 60,000 gulls. Photos here illustrate various aspects of the delta. **1)** Seven main habitats of the delta have been mapped, including estuarine areas of intertidal mud flats at the mouth of the river (top left).[56] **2)** During winter and migration, the delta supports internationally significant populations of 16 bird species, including Western Sandpiper (*Calidris mauri*; top right), Dunlin (*Calidris alpina*), several waterfowl species, and Glaucous-winged Gull. **3)** During the breeding season, the intertidal mud and sand flats are important foraging and loafing areas for Great Blue Herons (*Ardea herodias*; bottom right), Glaucous-winged Gulls, and Caspian Terns. Fish species moving through the river that are most important to birds are eulachon (*Thaleichthys pacificus*), Pacific herring (*Clupea pallasii*), flounders (Pleuronectidae), and sculpins (Cottidae). **4)** The plume from the Fraser River extends much of the way across the Strait of Georgia and lines of demarcation are evident offshore as lighter, fresh water flows over denser salt water (bottom left). *Map from Butler and Campbell* [56] *(top left); photos by Moira J.F. Lemon, 22 April 2005 (top right) and R. Wayne Campbell; and Fraser River plume image (bottom left) courtesy NASA earth observatory, 6 September 2014*.

of Georgia after spawning in March, and it is the young herring that are probably the most important prey species for seabirds in the Strait of Georgia during other times of the year.[200, 387] Pacific sandlance (*Ammodytes hexapterus*) and a number of benthic fish species are also important in the diet of cormorants and Pigeon Guillemots. Black Oystercatchers feed on intertidal invertebrates and depend on healthy shoreline habitats (Figure 16). Human refuse is also an important food source for Glaucous-winged Gulls in the Salish Sea.

Figure 15. Except for Black Oystercatchers, nesting seabirds in the BC Salish Sea are predominantly piscivorous. Here, adult and immature Glaucous-winged Gulls and California Gulls (*Larus californicus*) are feeding on Pacific herring (top), and washed-up herring spawn collects in heaps along the upper intertidal zone at spawning grounds. Herring is probably the most important prey species for seabirds in the Salish Sea.[200] *Photos by Paula Courteau, Hornby Island, BC, 1 March 2018 (top) and Moira J.F. Lemon, Point Roberts, WA, 15 March 2014.*

Figure 16. Black Oystercatchers have been included as a seabird species in this 4-volume treatise on seabird colonies in BC because they depend on marine habitats throughout the year. They forage exclusively in marine intertidal environments and nest on maritime islands. Although they do not spend large portions of their life at sea, which is typical of more iconic seabirds like puffins and storm-petrels, they are a sentinel species for the health of marine coastal ecosystems. *Photo by Macus Ong, 8 May 2020.*

HISTORY OF SEABIRD COLONY SURVEYS IN THE BC SALISH SEA

Coast Salish people traditionally harvested nesting seabirds and their eggs for food and were likely familiar with the locations of most seabird colonies in the area (Figure 17).[14] The first written records of seabirds nesting in the BC Salish Sea date back only about 160 years. We know of no records confirming breeding by a seabird species in the BC Salish Sea from the numerous exploratory and mapping expeditions that visited the area in the 18th and early 19th centuries. Records of nesting seabirds began to accumulate when egg collectors started visiting colonies in the latter part of the 19th century. It was the bird-banders in the first half of the 20th century that first started to gather quantitative information on nesting populations (Figure 18). Their efforts were focused on major colonies of Glaucous-winged Gulls. More comprehensive surveys of the entire region were not initiated until the latter half of the 20th century and even today new colonies are still being discovered in previously poorly explored areas. The sections below provide background on the sources of the records and observations that have been used to prepare the seabird colony accounts presented in this volume.

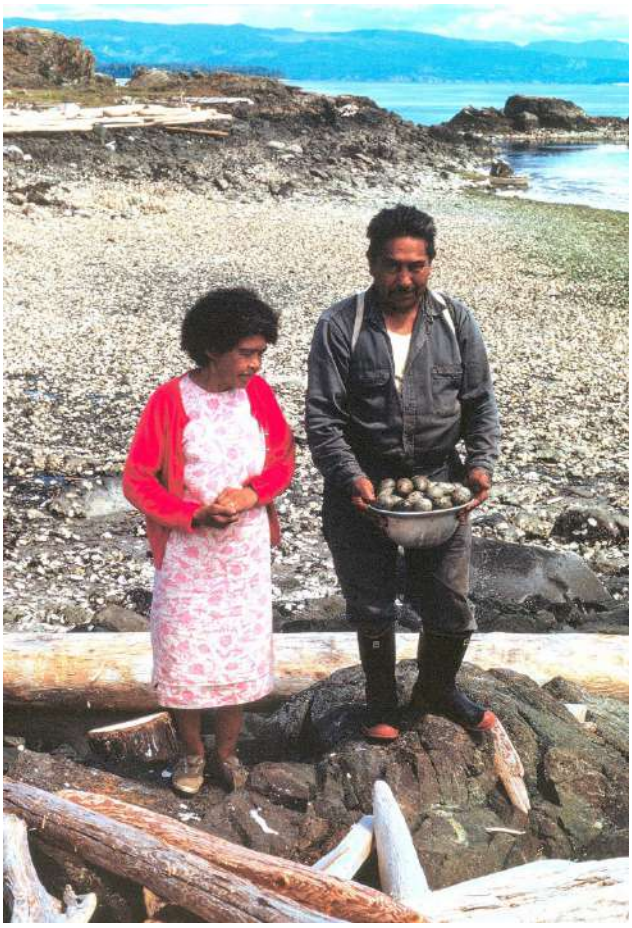


Figure 17. Seabird eggs were traditionally harvested by First Nations people in the Salish Sea. Some Coast Salish people still carry on the activity today. *Photo by R. Wayne Campbell, Mitlenatch Island, BC, June 1968.*

Early Explorers and Naturalists (1792-1858)

During his voyage with Captain Vancouver aboard the HMS *Discovery* in 1792, Archibald Menzies (Figure 19) made a note in his journal for 23 June 1792, "Near the entrance [of Howe Sound] they passed some Rocky Islands on which they shot a few Sea Pies." [281] The "Sea Pies" he was referring to were Black Oystercatchers. It is likely they were breeding. Butler et al.[62] suspected that Menzies was referring to the Grebe Islets.

David Lyall was the surgeon and naturalist aboard the HMS *Plumper* that, under the command of Captain H. Richards, was charting coastal waters for the British Royal Navy in 1857-1860. In 1858, Lyall collected some specimens on Waldron Island in the disputed waters of the northern San Juan Islands, which in 1872 were ceded to the United States.[99, 104] He may have obtained some Tufted Puffin egg specimens from Mandarte Island in 1858,[100] but the precise location for those specimens is uncertain (see Mandarte Island account).

Figure 18. Records of seabirds nesting in the BC Salish Sea first began to accumulate when oologists (egg collectors) started visiting colonies in the latter part of the 19th century. Quantitative information on nesting populations was first gathered by bird-banders in the first half of the 20th century. The top photo (from left to right) shows Wayne Campbell displaying his oological collection to the Kennedy brothers, Ken, Bruce, and Ian in April 1966. The bottom photo shows Ed Sing banding a young Glaucous-winged Gull on Christie Islet in Howe Sound, BC on 18 July 1970. *Photos by Don Trimbell (top) and R. Wayne Campbell.*

Figure 19. Archibald Menzies was a Scottish surgeon who spent many years with the Royal Navy travelling the globe. As a naturalist aboard the HMS *Discovery*, he sailed into Howe Sound on 23 June 1792 and collected a "few" Black Oystercatchers, the earliest record for the province. *Photo courtesy of the Campbell River Mirror newspaper.*

Independent Collectors and Observers (1858-2023)

Earliest specimen records from the Salish Sea require some interpretation. Because of changing border agreements between the United Kingdom and the United States, some early specimens were collected at locations labelled as Vancouver Island (the name of the British colony between 1849 and 1866) or British Columbia (the colony name from 1866-1871 and the Canadian provincial name since 1871) that are now part of the San Juan Islands in Washington.[99, 104] Because those locations were part of BC or Vancouver Island at the time specimens were collected, Carter and Sealy [99] and Carter et al.[104] considered them early, sometimes the earliest, breeding records for the province. They include: three Black Oystercatcher and nine Pigeon Guillemot eggs collected by Lyall on 23 June 1858 on Waldron Island, Vancouver Island; a half-grown Black Oystercatcher chick caught by a dog on 7 July 1862 on San Juan Island, BC; and three Black Oystercatcher eggs collected on 30 May 1867 at White Rock, BC (located southwest of Waldron Island in the San Juan Islands). The present-day border was established in 1872 when these islands were ceded to the United States. Adding further confusion, some records from outside the disputed area in American territory were labelled "Vancouver Island," including three Black Oystercatcher and three Pigeon Guillemot eggs collected on 8 and 28 June 1858 at "Rosario Strait, Vancouver Island" [104] (Rosario Strait runs along the east side of the San Juan Islands in Washington). Even after the final border was established, some records continued to refer to U.S. sites as in BC, including Pelagic Cormorant eggs collected on 10 July 1922,[540a] Glaucous-winged Gull eggs collected on 24 June 1908,[536a] Pigeon Guillemot eggs collected in 1894 [99] and 24-25 June 1908,[536b] and a Tufted Puffin egg [536c] collected on 20 June 1914, all from Skipjack Island, located just north of Waldron Island in Washington. We have not included colony accounts for locations that are now part of Washington as they have logically been included in seabird catalogues for that jurisdiction.[361]

Specimens collected in the 1860s in what are now the San Juan Islands in Washington were obtained by James E. Hepburn. Hepburn was an English naturalist who resided for long periods in San Francisco, California, and later in Victoria, BC, where he died in 1869.[104] He may have collected on Mandarte Island in the 1860s but the precise location for those records is uncertain (see Mandarte Island account).

The Cunninghams were a prominent family of hardware merchants and politicians in New Westminster during the latter part of the 19th century.[251] One of the members of the family, J.A. Cunningham, collected a few egg specimens on Mandarte Island in 1886 and 1903.[100] A decade earlier, in 1876, an egg specimen was collected on Mandarte Island by an I.A. Cunningham. We were unable to determine the relationship between those individuals (see Mandarte Island account).

Charles Frederick Newcombe was a BC resident and one of the founding members of the Natural History Society of British Columbia. A physician, naturalist, and anthropologist, Newcombe collected for several museums, including the American Museum of Natural History and the BC Provincial Museum. He collected seabird specimens at Mandarte Island in 1892 and Chain Islets/Great Chain Island in 1895. Newcombe also collected specimens in Haida Gwaii and along the BC outer coast and has been mentioned in previous volumes of this work.[336, 337]

Walter Francis Burton settled in Victoria in the early 1890s. He was a businessman whose hobbies were hunting, golfing, and birdwatching. Burton also collected bird and egg specimens and eventually donated his collection to the BC Provincial Museum. He collected on Mandarte Island as early as 1892 (Figure 20) and later on Chain Islets/Great Chain Island. He was the first to report Double-crested Cormorants nesting in the BC Salish Sea.[270]

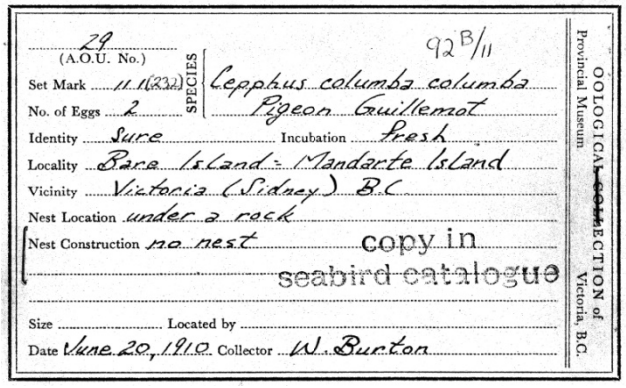


Figure 20. Specimen card for a clutch of Pigeon Guillemot eggs collected by Walter F. Burton on Mandarte Island in 1910 and housed in the oological collections at the British Columbia Provincial Museum (later Royal BC Museum). Burton was still visiting Mandarte Island 18 years later.

Robert A. Cumming was a carpenter from New Westminster. He was a dedicated bird watcher and collector in the Vancouver area and also visited seabird colonies in Haida Gwaii.[336] His published

bird list, based on 22 years of observations between 1909 and 1931 for the Vancouver area, included 243 species.[132] He collected specimens and made observations of nesting seabirds on Christie Islet and Passage Island during that time.

Elton Alexander Anderson contributed records of nesting seabirds around Valdes and Galiano islands in 1920-1923 in response to the questionnaire sent out by Drent in 1960 (Figure 21). Anderson worked as an independent logger and was a dedicated naturalist and conservationist.[8] He served as president of the Federation of BC Naturalists from 1971 to 1973. After he died in 1975, the Federation created the Elton Anderson Award to acknowledge outstanding conservation efforts.

Kenneth Racey (Figure 22) was raised in Quebec and in 1909 moved to BC, where he worked as a purchasing agent in the logging and mining industries. He made his home on the shore of Burrard Inlet near the present City of Port Moody.[83] Racey was an ardent naturalist and collector, a founding member of the Vancouver Natural History Society, and a mentor for Ian McTaggart-Cowan. Racey made observations on Passage Island in 1921 and 1922 [318] and on Ragged Islets in 1923. He was one of the earliest naturalists to publish concerns about fuel oil and its effect on seabirds.[583]

B. C. NEST RECORDS SCHEME--SEA BIRD INQUIRY, 1960

Please do not let this questionnaire die with you; if you yourself have not had the opportunity of visiting sea-bird colonies, pass it on to someone who has. It is only if every individual makes a real effort to record the information known to him, that our results will be worthwhile. Each and every one of you who contributes to the catalogue will receive a copy when it is published. Finally, try to be prompt on returning the attached form to us; compilation of the results will take a long time, and since the main compiler will be leaving in April, all reports should be mailed in by the end of this month (February), to:

B. C. NEST RECORDS SCHEME
DEPARTMENT OF ZOOLOGY
UNIVERSITY OF B. C.
VANCOUVER 8, B. C.

With best thanks for your help,

Rudolf Drent, for the Committee.

Figure 21. Elton Anderson was one of over 70 people who responded to a seabird enquiry from Rudi Drent,[545] sent out when Drent was compiling the first catalogue of BC seabird colonies.[144] In 1960, Drent mailed the request for information on 13 species of nesting seabirds to BCNRS contributors, as well as federal and provincial biologists, naturalists, bird-banders, light-house keepers, and loggers. He explained in detail, in a seven-page mimeographed document (top), the purpose of the request and the specific information he required. The response was very encouraging! Rudi also designed a new colony nest record card [336] for seabirds that could also be used for interior colonial-nesting groups like grebes, pelicans, gulls, terns, swifts, wrens, swallows, and blackbirds. The same card is still being used today.[457]

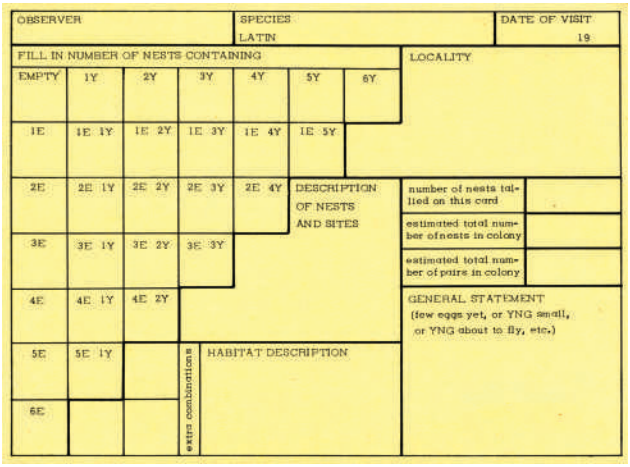


Figure 22. Kenneth Racey published about 40 articles in scientific journals on birds and mammals.[548] Two major papers published in the prestigious ornithological journal *Auk* summarized his collecting activities and observations in the vicinity of Alta Lake near Whistler.[546, 547] Copies of Racey's field notes and publications are housed in the reference collections at the Biodiversity Centre for Wildlife Studies in Victoria, BC. *Photo courtesy of Ann Schau.*[223]

Werner and Hilde Hesse (Figure 23) were German immigrants that came to Canada in 1952. They both had a passion and curiosity about birds. They enrolled in an evening bird course organized by Dr. Miklos Udvardy, a professor at UBC. There they learned about local birding sites and met renowned Canadian ornithologist Anthony (Tony) J. Erskine. They then met Rudi Drent at a post-count gathering of the Ladner Christmas Bird Count, which they had hosted. That chance meeting cemented a long-term relationship with Rudi, who, along with Tony, encouraged the couple to keep records of their birding trips. Werner and Hilde were frequently invited to Mandarte Island to assist Rudi with his research and surveys of nesting seabirds. They also helped read gull bands by telescope. Not long after meeting Rudi, the Hesse's moved to Metchosin on Vancouver Island and upon their death gifted their home and property to UBC for bird study, especially nesting seabirds. Their large library, a trunk load of field notes (15 large volumes; Figure 24), and field equipment were given to Wayne Campbell. That collection is now housed with the Biodiversity Centre for Wildlife Studies in Victoria.

Figure 23. Hilde (left) and Werner Hesse on Mandarte Island, BC. *Photographer unknown.*

Figure 24. At the end of every day, Werner Hesse would play classical music and transcribe his bird observations. *Photo by R. Wayne Campbell, Metchosin, BC, 26 September 2008.*

Alan Best and his son Robin Best (Figure 25) contributed many seabird nesting records from colonies in the Gulf Islands. The Bests were Vancouver residents and had a summer home in

Ganges Harbour on Saltspring Island. Alan made observations on the Chain Islands in Ganges Harbour from about 1920 to 1960 and also on Red Islets.[144] Robin visited a number of colonies in the 1960s, including Ballingall Islets, cliffs on Galiano and Prevost islands, Chain Islands, and Belle Chain Islets. Robin also banded gulls on Ballingall Islets in 1968. Encouraged by his father, who served as director of the Stanley Park Zoo, Robin volunteered at the zoo and at the Vancouver Aquarium in his youth. He went on to study zoology at UBC, conducted post-graduate work on polar bears (*Ursus maritimus*) at Guelph in Ontario, and then dedicated himself to the study and conservation of aquatic mammals and rainforests in the Amazon basin.[359] The Robin Best award is given to students to encourage continued studies in the Amazon. There is a Robin Best Library at the Vancouver Aquarium.

Figure 25. Young members of the Vancouver Natural History Society on a field trip in the Lower Mainland (from left to right): Norm Clarkson, an unidentified young naturalist, Robin C. Best, and Ken Kennedy. All have been involved with studies of nesting seabirds in BC. Norm visited Langara Island; [336] the unidentified naturalist helped band young Glaucous-winged Gulls; Robin surveyed colonies and banded young gulls mainly in the Gulf Islands; and Ken has been involved in seabird surveys and banding programs since the early 1960s. Ken initially worked as a summer naturalist on Mitlenatch Island, [79, 80] and lately as a volunteer setting up camp and helping with maintenance each spring on the island. *Photo by R. Wayne Campbell, April 1965.*

Arthur Lionel Meugens (Figure 26) was born in India and immigrated to Canada around 1900, settling first in the Okanagan, then Victoria in 1915, and later in Burnaby.[83] He worked as an accountant and professional photographer and ran a car rental service. A keen naturalist, he was a co-founder of the Victoria Natural History Society and was an avid egg collector. He reported Pelagic Cormorants nesting on the light beacon on Lewis Reef and on Chain Islets/Great Chain Island in 1924. He visited Imrie and Mandarte islands in 1945 [256] and Christie Islet and Pam Rock in 1956.

Figure 26. This photo shows (from left to right): Arthur L. Meugens, David L. Frost, and John K. Cooper clearing bird eggs collected at Bridge Lake, BC.[549] Meugens published about 10 articles, mostly in the Victoria Naturalist, including articles about seabirds seen during his trips to Chain Islets/Great Chain Island and Bare [Mandarte] Island.[256, 548] His field diaries, egg collection, and library were bequeathed to Wayne Campbell. *Photo by Louise V. Cooper, June 1959.*

John Kennedy Cooper (Figure 27) became a good friend of Meugens. Cooper worked in the real estate business in New Westminster but spent much of his leisure time in the outdoors. Specimen collecting was a major hobby, first butterflies in the 1920s and 1930s, then bird eggs in the 1950s and 1960s after meeting Walter S. Maguire and Meugens,[83, 550] and later BC fossils after meeting Glenn Ryder.[551] Cooper and Meugens collected on Christie Islet and Pam Rock in 1956 and 1957. Cooper's son, John M. Cooper (see Figure 27), accompanied his father on many collecting excursions. Young John went on to study zoology at UBC and accepted a position as a biologist at the RBCM in 1981. He is a co-author of *The Birds of British Columbia* volumes.

Walter S. Maguire was a long-term resident of New Westminster where he served as Director of the YMCA. He was an avid oologist and collected hundreds of egg-sets during the 1940s and 1950s, including many of Glaucous-winged Gulls, Pelagic Cormorants, and Pigeon Guillemots from colonies near Vancouver, including Christie Islet, Pam Rock, and Passage Island. He also visited Mandarte Island in 1940. For a short time he collected eggs commercially. His egg collection includes over 500 clutches of 119 species and is now housed in the Beaty Biodiversity Museum at UBC.[83]

Figure 27. John Cooper Sr. was an avid collector. He was initially attracted to the colour and wing patterns of butterflies (top left). After meeting oologists Walter Maguire and Arthur Meugens, the challenge of finding bird nests became a passion (top right). Searching for fossils became a focus after meeting Glenn Ryder. The bottom right photo shows (left to right) a young John Cooper Jr., with his sister Carrie, Glenn Ryder, and mother Louise, collecting fossils in an embankment. While at the BCPM, John Jr. carried on the family's collecting and observing interests. He spent most of his time on *The Birds of BC* project and completing his M.Sc. thesis on Least Sandpipers (*Calidris minutilla*) in Haida Gwaii.[552] In this photo (bottom left), John Jr. has just discovered a Hermit Thrush nest on the ground.[553] *Photos by R. Wayne Campbell, Parker Lake, BC, 26 June 1996 (top left), H. Shirley Parsons, Blue Lake, Richter Pass, BC, June 1960 (top right), John K. Cooper, near Princeton, BC, 1968 (bottom right); and R. Wayne Campbell, Haines Triangle, BC, 27 May to 4 July 1983.*

Albert R. (Davey) Davidson (Figure 28) visited a number of seabird colonies in the Gulf Islands in the 1950s and early 1960s, including Ballingall Islets, Charles Island, Mandarte Island, and Gordon Head.[122, 135, 136, 137, 138] He was a long-standing member of the Victoria Natural History Society and was often accompanied on his excursions by other members, including J.O. Clay. Residing in Victoria since about 1913, Davidson was an avid birdwatcher and in his centennial year was still publishing papers on birds of the area.[83]

Reverend John Stainer moved to Canada from England in 1938. Over the next several decades, he worked as a teacher, a journalist, and a minister at various locations in BC, including Vancouver Island in the 1950s.[85] He was a devout birdwatcher and contributed many records to the British Columbia Nest Record Scheme (BCNRS) and *The Birds of British Columbia* volumes. He also answered Drent's seabird questionnaire in 1960 with seabird nesting records from St. John Point and Bare Point.

George Allen Poynter immigrated to Canada from England in 1956. He was interested in birds most of his life and developed a special interest in seabirds during four circumnavigations of the world in the 1950s.[83] He promoted conservation actions for birds and for the natural environment generally, was active in the Victoria and Vancouver Natural History societies, and served as a director of the Canadian Nature Federation. He worked as a manager on the

North Vancouver waterfront and, along with David Woolgar, who also was a bird enthusiast and worked as a manager on the Vancouver waterfront, kept notes on rooftop- and machinery-nesting Glaucous-winged Gulls in the area. Poynter also discovered Glaucous-winged Gulls nesting in freshwater on Capilano Lake in North Vancouver.

Figure 28. Albert R. (Davey) Davidson published about 70 articles, all in the Victoria Natural History Society's magazine *Victoria Naturalist*.[548, 554] Unlike many publications that only include lists of birds, Davey's articles often had abundance estimates for species, including nesting seabirds. When Enid Lemon, a long-time VNHS member, alerted Wayne Campbell that the future repository for Davey's field notes was being discussed, Wayne took steps to secure them. The original notes are now preserved in the collections at the Biodiversity Centre for Wildlife Studies. *Courtesy of Oak Bay Star (now Oak Bay News), 17 October 1988.*

Howard Andrew Telosky worked as a mail carrier for many years and, after retirement, became a Care Aid volunteer in Campbell River. Birdwatching was a hobby. He founded the Mitlenatch Field Naturalists and led many excursions to Mitlenatch Island. Howard was a regional editor for *The Birds of British Columbia*.[83] He observed nesting seabirds in the Seymour Narrows area north of Campbell River in the 1970s and prepared an annotated list of birds seen in the vicinity of Campbell River that was never published. The list, and updates, included observations of nesting seabirds locally on Vancouver Island, on nearby Copper Cliffs on Quadra Island, on Mitlenatch Island, and around Texada Island. Howard died on 1 March 2016. His field diaries were willed to Wayne Campbell and are archived with the Biodiversity Centre for Wildlife Studies.

Many other independent bird watchers have contributed records of nesting seabirds in recent years. Numerous new colony sites have been identified by some of those observers, especially in the northern Strait of Georgia. We have tried to mention all contributors in the *Acknowledgements*. Some, such as George Sirk (Figure 29) and Louise Blight, who have had past affiliations with specific organizations or institutions, are described in pertinent sections below. Of special note is a team of volunteers from Lasqueti Island, spearheaded by Connie Haist and Anna Smith, and including Doane Grinnell, Sheila Harrington, Sheila Ray, and Richard Smith (Figure 30). They have spent several years surveying and exploring for seabird nesting sites in that area, motivated by their general concern for the protection of wildlife species and habitats in the environs of Lasqueti Island and elsewhere. Connie Haist worked as a veterinarian on Vancouver Island. Throughout her career, she volunteered her veterinary skills to help orphaned and injured wildlife.[192] After retiring to Lasqueti Island and later to Yellow Point near Nanaimo, she has dedicated much of her time to a number of local conservation initiatives. Anna Smith has degrees in marine and freshwater ecology and conservation. She has studied a wide variety of fish and invertebrates and continues to follow her passion through wildlife rehabilitation. She recently graduated from UBC, where she studied the effects of zinc contamination on olfaction in juvenile coho salmon (*Oncorhynchus kisutch*) for her Master's thesis in the Faculty of Forestry. She has extended her broad fascination and concern for the marine environment to include nesting seabirds. Doane (Dick) Grinnell earned his living as a carpenter and has lived on Lasqueti Island for many years. He has a long-standing interest in nesting seabirds and participated as a volunteer in surveys conducted by CWS in Haida Gwaii and along the outer coast in the 1980s.[336, 337] Sheila Harrington is an educator, designer, and

Figure 29. George Sirk has had a varied career. He has worked seasonally with BC Parks Branch on Mitlenatch Island [357] and at Shuswap Lake Park,[555] as a resource person on world tours, as Mayor of Cortes Island, as *Nature Boy* on the University of Victoria radio station, and as a bus driver in Victoria. Along the way, he has surveyed seabird colonies, monitored Black Oystercatcher nests, and banded Glaucous-winged Gulls. He was the first to report Arctic Terns on Mitlenatch Island [357] and recently has been monitoring a pair of Arctic Terns nesting near his home on Cortes Island (see SG-050 Little Rock). This photo shows George quickly discovering that the sea water at Mitlenatch Island, where the tides meet, was colder than expected! *Photo by R. Wayne Campbell, August 1969.*

administrator and was for 13 years the founding Executive Director of the Land Trust Alliance of BC. She is also the current secretary/treasurer of the Lasqueti Island Nature Conservancy. Sheila Ray has retired from her career as a school teacher and is now involved in many volunteer projects, such as organizing bird counts. She is a past president of the Lasqueti Island Nature Conservancy. Anna Smith's father, Richard Smith, earned his degree in Agricultural Science from UBC in 1978 and went on to work for Health Canada and The Canadian Food Inspection Agency. Since retiring, he has dedicated more time to exploring nature and assisting with projects like tracking larval recruitment in Dungeness crabs (*Metacarcinus magister*) and doing bird surveys.

Other independent observers that have made major contributions to our knowledge of nesting seabirds in recent years include: Ed Jordan, a fisherman and guide from Quadra Island; Paula Courteau, who has worked on the ferries and as a firefighter on Hornby Island for many years; Christian Gronau (Figure 31), an ardent naturalist who has worked in the mining industry and later as a shellfish farmer on Cortes Island; Kenneth G. Wright (Figure 32), a devout bird watcher who has an unquenchable fascination for the natural world, has worked on seabird colonies under contract for CWS, and often collects information on nesting seabirds while kayaking around colonies off West Vancouver; Ronald D. Jakimchuk (now deceased), a biologist, wildlife consultant, and naturalist, who was a prominent supporter of the work conducted by the Biodiversity Centre for Wildlife Studies and participated in several surveys of seabird colonies in the Victoria and Saanich areas (Figure 33); and Jacques Sirois (Figure 34) from Victoria, who is the volunteer co-caretaker and co-warden of Victoria Harbour Migratory Bird Sanctuary (VHMBS), Trial Islands Ecological Reserve (within VHMBS), and Chain Islets and Great Chain Island Important Bird Area (contiguous to VHMBS).






Figure 30. A team of current and former long-term residents of Lasqueti Island in the northern Strait of Georgia, including (clockwise from top left) Connie Haist, Anna Smith, Doane Grinnell, Sheila Harrington, Sheila Ray (seen here at Cathedral Lakes Provincial Park), and Richard Smith, conducted several voluntary surveys and made a tremendous contribution to our knowledge of seabirds nesting at colonies in that area. *Photos by: unknown photographer, 1 November 2022 (Connie); Richard Smith, 27 June 2021 (Anna); Terry Theiss, 21 April 2018 (Doane); Gordon Scott, 11 October 2018 (Sheila Harrington); Chris Whiting, 12 July 2013 (Sheila Ray); and Anna Smith, 24 June 2021(Richard).*

Figure 31. Christian Gronau manages a small oyster lease on Cortes Island. He is an astute observer of nature and has published several of his bird and mammal encounters in Wildlife Afield.[556-560] Recently, Christian, along with his compatriot George Sirk, has been monitoring activities of a pair of Arctic Terns nesting on a small islet near his home on Cortes Island (see SG-050 Little Rock). *Photo by R. Wayne Campbell.*

Figure 32. Here, Kenneth G. Wright uses an elevated perch to view shorebirds on the mud flats at Iona Island during migration. In recent years, he has frequently kayaked around islets like Bird Islet and Grebe Islets off West Vancouver and recorded nesting Black Oystercatchers and Glaucous-winged Gulls. *Photo by R. Wayne Campbell, 20 April 1994.*

Figure 33. Ron Jakimchuk participated in surveys of some seabird colonies around the Saanich Peninsula with Wayne Campbell. Wayne counted nests and Ron was the scribe. This photo finds Ron on Arbutus Island, which was completely surveyed twice in different years for all bird and mammal species by Ron, Ron's son Rick, Xisa Huang, Wayne, and Mark Nyhof. *Photo by R. Wayne Campbell, 2 June 2018.*

BC Provincial Museum (1892-1981)

The BC Provincial Museum was founded in 1886 with John Fannin as Curator/Director (Figure 35). The museum was initially called the Provincial Museum of Natural History and Anthropology, then the British Columbia Provincial Museum (BCPM), and more recently the Royal British Columbia Museum (RBCM). Fannin was an ornithologist who produced the first checklists of BC birds.[166, 167] His checklists included seabird breeding records from Mandarte Island and environs and he collected on the island in 1892 with C.F. Newcombe.[99]

Francis Kermode succeeded Fannin as curator and worked to protect nesting seabirds on Mandarte Island at a time before the Migratory Bird Treaty gave legal protection for nesting birds. Through negotiations with the federal Department of Indian Affairs, Kermode obtained authority for the BCPM to place a guard on the island. He appointed W.B. Anderson to serve as warden on Mandarte Island in

1915 and 1916.[232, 233] Anderson contributed many observations about the nesting birds during the two seasons he was stationed there. Another Anderson, E.M. Anderson, was a major collector for the museum and also worked with Kermode. He collected specimens on Mandarte Island in 1900 and 1908.

Figure 34. Biologist, naturalist, birdwatcher, and lecturer, Jacques Sirois is passionate about the protection of birds and other wildlife. Formerly with the Canadian Wildlife Service, Jacques is the volunteer co-caretaker and co-warden of Victoria Harbour Migratory Bird Sanctuary, Trial Islands Ecological Reserve, and Chain Islets and Great Chain Island Important Bird Area. He is also chair of the Friends of the Victoria Harbour Bird Sanctuary. Photos here show Jacques along Enterprise Channel in front of the Trial Islands in Oak Bay, Victoria (top), and posing with one of his educational projects, a tribute to Canadian wildlife artist J. Fenwick Landsdowne. *Photos by Michel Sirois, February 2023.*

William Arnold Newcombe was the son of C.F. Newcombe. Growing up, William accompanied his father on many expeditions and became a skilled and knowledgeable biologist. He served as an assistant biologist at the BCPM for several years but his employment was terminated abruptly due to conflict with director Kermode.[128] W.A. Newcombe visited Mandarte Island in 1929 and 1933 and made observations in 1934 at a number of colonies, including the west cliffs on Valdes Island, Ballingall Islets, the central and south cliffs on Galiano Island, Hawkins Island, Java Islets, and Imrie Islets.

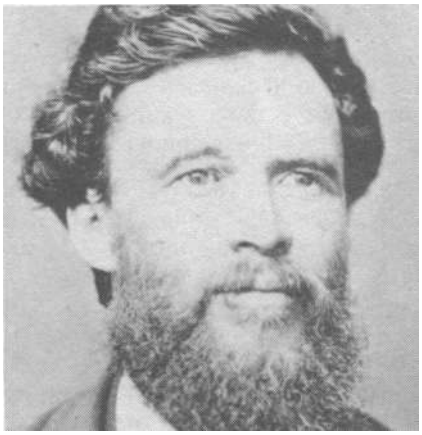


Figure 35. The Provincial Museum was founded in 1886 in response to a petition signed by 30 prominent citizens. It occupied a single room in the Capital buildings and was nicknamed "The Birdcages" in reference to the stuffed animal specimens. The museum's first curator, John Fannin, was born in Ontario in 1837, settled in Hastings in Burrard Inlet, became a shoemaker, and developed a reputation as a taxidermist and outdoorsman.[584] He published four natural history articles in *The Auk* [548] and was the first person to compile a *Check List of British Columbia Birds.*[166] Due to limited knowledge at that time, only five species of seabirds were specifically listed as nesting. *Photo courtesy Archives of British Columbia.*

Ian McTaggart-Cowan (Figure 36) served as biologist at the BCPM from 1935 to 1940. He visited some seabird colonies in the BC Salish Sea during that period, including Ballingall Islets in August 1939 after his trip earlier that season along the mainland coast with Tom and Elinor McCabe.[308, 337] Cowan went on to have a large impact on seabird studies in the Salish Sea and elsewhere in BC after he became a professor at UBC in 1940. Most of that impact was indirect, through his inspiration of others (see *University Undergraduate, Graduate, and Faculty Research* below).

Kermode retired in 1940 after 36 years as director. He was succeeded by G. Clifford Carl (Figure 37) who filled the position for the next 30 years. Carl made a few visits to seabird colonies in the BC Salish Sea: Mandarte Island in 1940 and 1961 and Ballingall Islets in 1941. In 1948, Carl hired Charles J. Guiguet for the position of curator of the Birds and Mammal Division at the BCPM. Guiguet served in that position until he retired in

Figure 36. During his short tenure at the BCPM, and before he went to UBC (where this picture was taken), Ian McTaggart-Cowan initiated an *Occasional Paper* series that encouraged UBC students to publish their theses.[412, 561] The series also included the first seabird catalogue and other compilations,[144, 562] which laid the groundwork for the present catalogue. *Photo courtesy University of British Columbia Archives, Image 1.1 – 19357.*

1980. Between 1948 and 1960, Guiguet made several visits to seabird colonies in the Salish Sea, mostly those close to Victoria, including Bare Point, Chain Islets/Great Chain Island, Trial Islands, and Lewis Reef. Most of his seabird work was conducted elsewhere in BC. He travelled widely and gathered much information on nesting seabirds through outer coastal areas, including Haida Gwaii.[335, 336, 337]

J. Bristol Foster became director of the museum in 1970 but resigned in 1974 to become the first full-time coordinator of the BC Ecological Reserves Unit. Dedicated efforts by Foster led to the protection of many seabird colonies in BC; we pay tribute to his life's work at the beginning of this volume. He was succeeded by Yorke Edwards (see *BC Parks* below), who served as director until 1984. At the BCPM, Foster was responsible for hiring R. Wayne Campbell, co-author of this present work, to join the staff in January 1973 as assistant curator of Birds and Mammals under Guiguet. With the support of Foster, Campbell soon launched the comprehensive survey of the entire BC coast for nesting seabirds.[70, 75] Michael S. Rodway joined those surveys, an experience which sparked a life-long passion and led to the production of this four-volume treatise on seabird colonies in the province. We have described the development of the BCPM survey program in detail in Parts 1 and 2 of this work.[335, 336] BCPM surveys were conducted in the BC Salish Sea from 1974 to 1981. Many BCPM staff participated in those surveys, especially Michael C.E. McNall, Marilyn A. Paul (now Lambert), Michael G. Shepard, and Keith G. Taylor, as well as M. Elizabeth Courtnall, Phil R. Nott, Gary Seedhouse, and Christopher D. Shepard (Figure 38).

Figure 37. Although primarily a marine biologist, Dr. G. Clifford Carl's broad interest in BC's natural history was well respected. His 1951 paper on the Scott Islands, co-authored with museum colleagues, was the first to highlight the significance of those islands to nesting seabirds.[563] As time permitted, he visited some colonies in the Salish Sea. Towards the end of his tenure at the BCPM, Carl encouraged Wayne Campbell to summarize and publish his discoveries on Cleland Island.[564] *Photo courtesy of Royal British Columbia Museum, BC Archives.*

Michael McNall (see Figure 38) joined the BCPM in 1980. Originally from Ontario, he had worked at the Royal Ontario Museum and conducted research in the Canadian arctic before moving to Victoria.[83] He surveyed several seabird colonies in the BC Salish Sea in 1981. McNall was a co-author of *The Birds of British Columbia*.

Marilyn Paul (now Lambert) joined the Bird and

Mammal Division at the BCPM as a stenographer and then seized the opportunity to become a museum technician when a position became available (Figure 39). She participated in the seabird surveys conducted by the BCPM during the 1970s throughout much of the BC coast.[336, 337] She helped survey a number of colonies in the BC Salish Sea in 1976, accompanied by Wayne Campbell and others. She is now a director of the Friends of Ecological Reserves and is the volunteer warden for the Oak Bay Islands Ecological Reserve.

Figure 38. All BCPM crew had to be adaptable and prepared to quickly switch between tasks. In this photo (from left to right), Phil Nott, Michael McNall, and Chris Shepard are taking a break from seabird surveys and other museum work to prepare specimens of small mammals on a field trip to the extreme northwestern part of BC. *Photo by R. Wayne Campbell, Haines Road, BC, August 1980.*

Michael Shepard (Figure 40) worked at the BCPM from 1975 to 1979. During that period, he conducted seabird surveys in the BC Salish Sea, as well as in Haida Gwaii [336] and on the west coast of Vancouver Island.[337] He previously had conducted surveys of seabird colonies near his home in Nanaimo when he was in high school in the mid-1960s, assisted with seabird studies on Cleland Island off the west coast of Vancouver Island in 1970, and worked as a naturalist on Mitlenatch Island in 1974 (see *BC Parks* below).

Keith Taylor (Figure 41) worked for many years as a wildlife illustrator and helped curate the ornithological collections at the BCPM. He participated in the BCPM seabird surveys along the outer mainland coast in 1976 [337] and surveyed a number of colonies in the BC Salish Sea in 1974. Since retiring from the museum, he has worked as a freelance bird illustrator and leads birding trips to various parts of the world. Taylor has self-published several birders guides [566, 567] and recently completed

Figure 39. In the early 1970s, Marilyn Paul was the secretary for the Birds and Mammal Division at the BCPM but wanted a more adventurous life outdoors. When a position became available for a technician, she successfully applied and quickly joined the museum seabird group surveying nesting islands along the BC outer coast and in the BC Salish Sea. She is shown here on the Storm Islands in Queen Charlotte Strait. She also helped survey some islands in Puget Sound, WA. Marilyn was a co-author on articles on tree-nesting Peregrine Falcons on the northern mainland coast [565] and on Brandt's Cormorants nesting on Mandarte Island in the Salish Sea.[103] *Photo by R. Wayne Campbell, 13 June 1976.*

Figure 40. Breeding seabirds have been an integral part of Michael Shepard's life for decades. While at the BCPM, he was an ideal technician because he was very methodical and thorough about how information was compiled, stored, and accessed. *Photo by R. Wayne Campbell, Victoria, BC, circa 1975.*

a 30-year project on the *Birds of Vancouver Island.* This is a comprehensive, 860 page, illustrated guide that Taylor has made freely available to download.

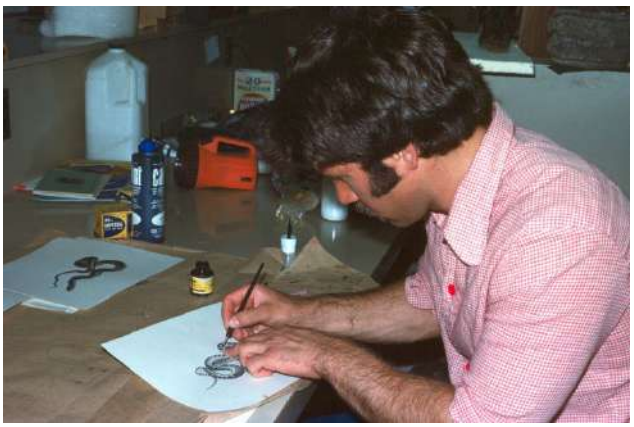


Figure 41. Keith Taylor is a talented bird artist. While at the BC Provincial Museum, he broadened his skills and interests and illustrated two museum handbooks on amphibians and reptiles (which he is working on here).[568, 569] *Photo by R. Wayne Campbell, Victoria, BC, April 1977.*

Expeditions from Outside the Province (1896-1934)

William Leon Dawson was a renowned ornithologist born in Iowa.[380] He attended college in Seattle, Washington and later moved to Santa Barbara, California where in 1916 he founded the Santa Barbara Museum of Comparative Oology which later became the Santa Barbara Museum of Natural History. He was the author of many publications on birds including multi-volume works on the birds of California, Iowa, and Washington. Dawson was a competitive egg collector and built one of the largest collections of bird eggs in the world. He visited Mitlenatch and Mandarte islands in 1896 [140] and Imrie Island in the company of J.M. Edson in 1905.[152]

Percy A. Taverner (Figure 42) was the Curator of Ornithology at the National Museum in Ottawa and published extensively on the birds of Canada.[384, 385] Taverner spent three days (29-31 July) on Mitlenatch Island during a collecting expedition to BC in 1922. He was assisted on that trip by Hamilton Mack Laing, a student from Saskatchewan who later moved to Comox on Vancouver Island. Taverner and Laing made the trip to Mitlenatch Island in the company of Theed Pearse who began his banding program that year (see below).[304]

John B. Semple from Pittsburgh mounted expeditions to various parts of North America to collect for the Carnegie Museum of Natural History. He visited BC in 1934 and collected hundreds of

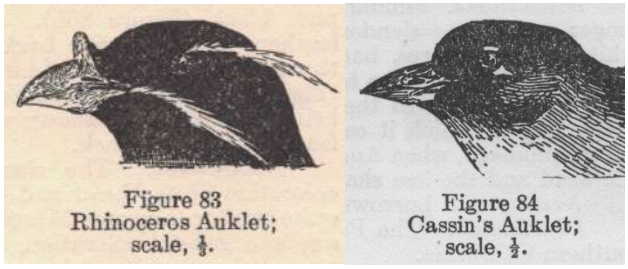


Figure 42. As Curator of Ornithology at the National Museum in Ottawa, Percy Taverner travelled across Canada to obtain specimens for the museum. In May 1922, he was in the Okanagan Valley on a collecting trip with three of the early collectors of bird skins and eggs in BC, including (top, from left to right): Percy, Allan C. Brooks, Theodore L. Thacker, and Charles de Blois Green. Percy wrote about 30 articles and reports on birds in BC.[548, 554] Percy's 1928 book *Birds of Western Canada* [385] covered BC and the Prairie provinces to Ontario. At that time, little was known about nesting seabirds in BC. For example, in 1928, Percy wrote, "we have few actual breeding records [for Rhinoceros Auklets]...There are colonies…about the south end of Vancouver Island and elsewhere in the lonelier spots along the coast…to Alaska" [the auklets reported off southern Vancouver Island may have been feeding flocks from colonies in northern WA]. For Cassin's Auklet, Percy wrote, "this little Diver should be noticed more often…especially on the outer shore of Vancouver Island where breeding colonies will probably be found." We now know that colonies in BC support major proportions of the world populations of both Rhinoceros and Cassin's auklets. A copy of Taverner's published papers and unpublished field diaries are in the Biodiversity Centre for Wildlife Studies' collections in Victoria, BC. *Photographer unknown* (top), drawings from *Birds of Western Canada.*[385]

bird specimens from the areas around Courtenay, Comox, Campbell River, and Port Hardy as well as many others from the BC interior. He and George Miksch Sutton from Cornell University collected on Mitlenatch Island in 1934. They also provided one of

the earliest descriptions of a Marbled Murrelet egg, taken from the oviduct of a bird collected near Mitlenatch Island on 23 May 1934.[379]

The Bird-banders (1920-1974)

Numerous people have assisted in banding programs on seabird colonies in the BC Salish Sea. A few dedicated individuals spearheaded those programs and in addition provided detailed records of nesting species on colonies where banding was conducted.

Theed Pearse (Figure 43) was one of the earliest bird-banders in BC. He immigrated to Canada in 1914 and lived most of his life in Courtenay on the east coast of Vancouver Island. A barrister by profession, he was passionate about birds throughout his life and published extensively on his observations.[83] Most of his seabird-related observations were made in the Strait of Georgia, but he visited colonies on the west coast of Vancouver Island in the 1940s.[337] Between 1920 and 1957, Pearse made many visits to Mitlenatch Island where he did most of his banding. He started banding Glaucous-winged Gulls chicks there in 1922. This was the first seabird banding done in BC.[304]

Figure 43. Theed Pearse was an amateur ornithologist, bird bander, and bird protectionist, and unlike most early bird enthusiasts, was a member of every major ornithological organization in North America, including the British Columbia Ornithologists' Union.[585] In the early 1900s, he became embroiled in a rift that developed between bird collectors and protectionists within the British Columbia Ornithologists' Union that resulted in collapse of that society a few years later.[586] A major contribution to BC ornithology was his self-published book *Birds of the Early Explorers in the Northern Pacific.*[570] Theed's original field notes are in the Biodiversity Centre for Wildlife Studies' library. This photo shows Theed (left) and his wife, Elma, attending an annual, old timer's reunion dinner in Comox, circa 1966. *Photographer unknown*.

The Glaucous-winged Gull banding program initiated by Pearse on Mitlenatch Island continued after the island was purchased by the provincial government in 1959. Under the supervision of David Stirling at BC Parks, banding was conducted in 1960 by Bill Merilees and Raymond Barnes and annually by the seasonal naturalists that were stationed on the island each year from 1963 to 1974 (see Mitlenatch Island account). Those naturalists are described below under *BC Parks*.

Bird banders started to visit Christie Islet in 1926. Kenneth C. Alexander banded on the islet in 1926-1931 and in 1938-1940.[349, 369] A long-term naturalist, Alexander later served as Treasurer of the Victoria Natural History Society in the 1970s. Others, including William Marsden Hughes (Figure 44), Bill Merilees, and Wayne Campbell conducted more intensive banding, starting in 1949 through the 1960s under the auspices of the Vancouver Natural History Society in association with the Pacific International Chapter of the Western Bird Banding Association.[221, 351] Hughes originally hailed from Massachusetts where he resided until 1940. He was a veteran of the First World War. After moving to Vancouver, he joined the Vancouver Natural History Society and was the Ornithology Section leader of the society during the late 1950s and early 1960s. He was a mentor for Bill Merilees.[253] We profile Bill Merilees and Wayne Campbell below under *BC Parks*.

George D. Sprot grew up in Scotland and arrived on Vancouver Island in 1908. As a youth, he developed a fascination with birds and was intrigued by the various methods that had been devised for capturing them.[363] He was a member of the British Columbia Ornithologists' Union in the 1920s and resided in Cobble Hill, north of Victoria. He assisted Pearse on Mitlenatch Island in 1928 [302] and initiated a banding program on Imrie Island and Mandarte Island from 1929 to 1934.[364, 369] Sprot also made observations at Ballingall Islets.[368] Dennis Ashby

from Duncan carried on banding on Imrie Island in 1938-1940 as part of the Pacific Gull Color Banding Project. [169, 348] On Mandarte Island, intensive banding was conducted in the 1950s and early 1960s, primarily under the banding permits of Dr. Miklos Udvardy and graduate student Gerard van Tets,[150] who we describe below under *University Undergraduate, Graduate, and Faculty Research*.

Figure 44. As a member of the Vancouver Natural History Society, Bill Hughes volunteered for many conservation activities, including the Wood Duck (*Aix sponsa*) nest-box project,[587] Christmas Bird Counts, backyard songbird banding, the BC Nest Record Scheme,[277] shorebird surveys, and banding Glaucous-winged Gull chicks on local colonies. Bill was best known for his banding efforts at the Vancouver International Airport, using vertical pole traps to catch, band, and release raptors, especially Short-eared Owls (*Asio flammeus*). *Photo by John G. Sarles, Sea Island, BC, November 1964.*

John G. (Jack) Sarles was a businessman in Vancouver and later moved to White Rock with his wife Rosemond who he had met through the Vancouver Natural History Society. He was a knowledgeable ornithologist and general naturalist and served for a time as chairman of the society's Conservation Committee. He also served as Secretary-Treasurer of the Pacific International Chapter of the Western Bird-Banding Association.[82] In White Rock, he and Rosemond helped to organize the White Rock and Surrey Field Naturalist Club.[253] Jack's banding efforts focused on the Five Finger Island/Hudson Rocks/Snake Island complex near Nanaimo where he banded Glaucous-winged Gulls in 1958-1959 [316, 350] and in 1964-1965.

Thousands of Glaucous-winged Gull chicks were banded on Chain Islets/Great Chain Island in the late 1970s by crews from the BCPM led by Wayne Campbell and Michael Shepard, who we discuss under *BC Parks* and *BC Provincial Museum*.

Canadian Federal Government Ministries (1921-2023)

Attention to nesting seabirds in BC by federal authorities began after the Migratory Birds Treaty between Canada and the United States was ratified in Canada on 7 December 1916 and the *Migratory Birds Convention Act* was passed in Canada in 1917. Evolving bureaucracies have been responsible for the application and enforcement of Migratory Birds Regulations under the Act.

Chief Federal Migratory Bird Officer (1921-1947)

James Alexander Munro (Figure 45) served as the Chief Federal Migratory Birds Officer in BC from 1920 until he retired in 1949. He had major influences on ornithology and wildlife conservation in BC and contributed many records on nesting seabirds in the BC Salish Sea between 1921 and 1947.

Munro developed an interest and expertise in ornithology during his childhood years in the Toronto area. He arrived in BC in 1910 as a young man and settled in the Okanagan, where he built a home and made a living as an orchardist. Known as a talented taxidermist as well as an expert ornithologist, Munro supplemented his income by selling his carefully prepared bird specimens to museums in Canada and the United States.[83] In the summer of 1915, he was hired for four months to collect bird specimens for the BCPM.[223] In 1918, Munro applied unsuccessfully for the newly-formed position of Supervisor of Wild Life Protection in Canada.[50] That position had been created to administer Migratory Birds Regulations following passage of the *Migratory Birds Convention Act* by Canada in 1917. It was placed within the Wildlife Division of what was then the Parks Branch of the Department of the Interior. The position went to a competing candidate, Hoyes Lloyd, who, in 1920 appointed Munro as the Chief Federal Migratory Birds Officer for the provinces west of Ontario and

the Northwest Territories. After 1933, Munro's responsibilities and research focused on birds in British Columbia. His title changed from Chief Migratory Bird Officer to Dominion Wildlife Officer in 1947, when the Government of Canada reorganized the Department of Resources and Development and charged a new agency, the Dominion Wildlife Service, with most of the federal responsibilities for wildlife management in Canada. Three years later, just after Munro retired, the Dominion Wildlife Service was renamed the Canadian Wildlife Service (see below).

Figure 45. James Munro, in his capacity as Chief Federal Migratory Birds Officer for the western provinces, a position that arose out of the *Migratory Birds Convention Act* of 1916, travelled extensively throughout BC and made visits to many seabird colonies in the Salish Sea. Of the hundreds of publications and reports written by Munro, about 20 were specifically on colony visits or conservation topics related to seabirds.[548, 554] Copies of most of Munro's bibliographic material is in the collections of the Biodiversity Centre for Wildlife Studies. *Photographer unknown.*

Munro conducted extensive studies on birds, especially waterfowl, in the province and produced many publications, including the 1947 update, *A Review of the Bird Fauna of British Columbia*, written with his protégé and co-author Ian McTaggart-Cowan.[274] He observed nesting seabirds mainly on Mandarte Island and Ballingall Islets in the 1920s and 1930s, but also recorded nesting seabirds on Mitlenatch, Snake, Imrie, and Discovery islands. He was especially interested in documenting the early nesting records of Double-crested Cormorants on Ballingall Islets and Mandarte Island (Figure 46).[270, 272] He first visited Mandarte Island in 1921.

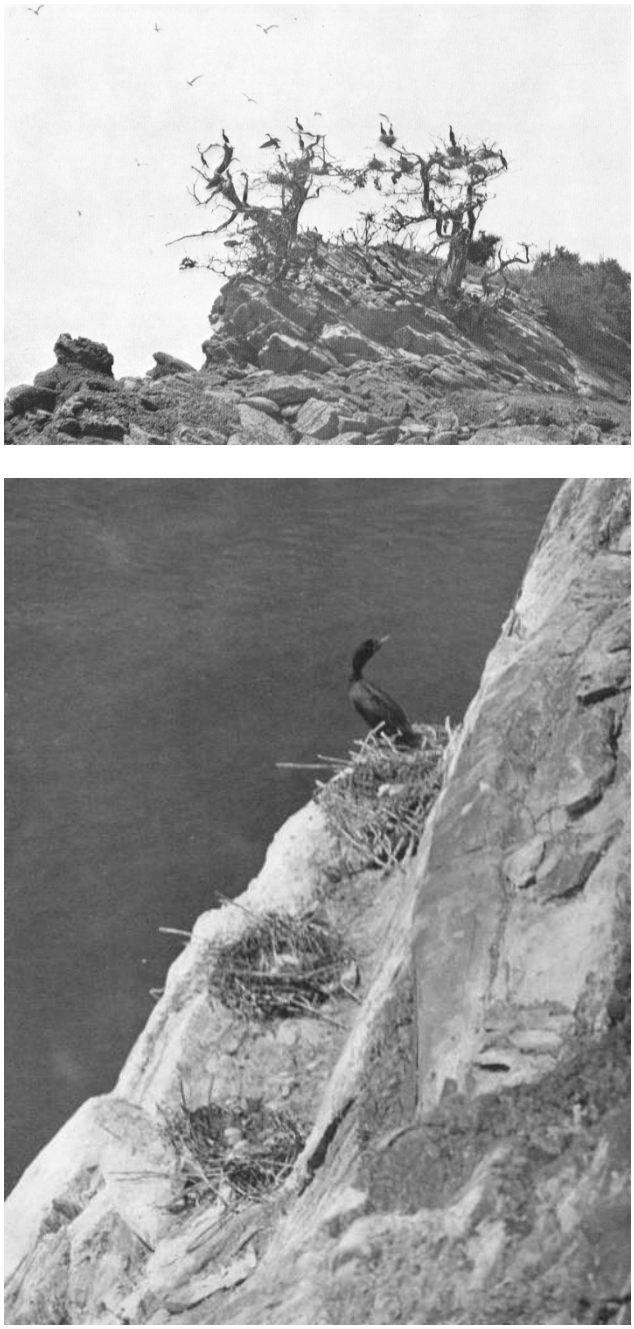


Figure 46. Two of Munro's favourite Double-crested Cormorant colonies to visit were the tree-nesting site on Ballingall Islets (top) and the sloping rock bluffs on Bare [Mandarte] Island. *Photos by James A. Munro, courtesy of National Parks Bureau, Department of Mines and Resources.*

Royal Canadian Mounted Police (1928-1936)

In 1919, the newly-established Supervisor of Wild Life Protection, Hoyes Lloyd, arranged for the

appointment of honorary game officers throughout Canada to assist in the enforcement of migratory bird regulations. They were given authority under the *Migratory Birds Convention Act* of game officers with the powers of a police constable. In addition, all forestry officers of the Department of the Interior, fishery officers of the Department of Marine and Fisheries, and members of the Royal Canadian Mounted Police (RCMP) were appointed game officers under the Act. In his capacity as Chief Federal Migratory Bird Officer for BC (see above), Munro enlisted the services of the RCMP to patrol Mandarte Island for illegal egg harvesting and molestation of nesting birds during the 1920s and 1930s. Observations of nesting seabirds on the island were reported by some of those RCMP officers, including Corporal Thos. C. Brice in 1928,[44] Sergeant J.R. Paton in 1929-1931,[297, 298, 299] and Constable J.S. Brandon in 1935-1936.[41, 42]

Parks Canada (1977-2023)

During the 1970s, Parks Canada was soliciting natural history reviews of much of the BC coast [310, 378, 386] to identify critical marine bird and mammal habitats and areas with high wilderness values that might warrant protection under their mandate. Preliminary analyses identified the Gulf Islands as possessing natural elements, including a diversity of marine bird and mammal species, which warranted the area being designated as a Natural Area of Canadian Significance. In 1977, Parks Canada commissioned a compilation of data on marine birds and mammals and a survey of nesting seabirds to identify priority habitats for these species in the Gulf Islands.[332] University of Victoria student Lynne Milnes (Figure 47) assisted Michael Rodway in conducting the survey. Milnes soon after obtained a position as a botanist at the BCPM and then in 1980 started working with Bristol Foster in the Ecological Reserves Unit (see below).

The Gulf Islands National Park Reserve (GINPR) was established in 2003, and in 2005 Parks Canada began monitoring Black Oystercatcher nesting populations in the park and nearby areas. The genesis of that monitoring program began years earlier through the efforts of Rob Butler while he was at CWS. At that time, concern was mounting about pipelines and oil transport through the southern Salish Sea. Butler suggested to CWS that a baseline study to measure natural variability of oystercatcher populations in the Gulf Islands would be worthwhile. Management agreed and as a first step Butler took on Stephanie Hazlitt to conduct studies on Black Oystercatchers as a M.Sc. student at SFU.[202] After the GINPR was established, park ecologist Todd Golumbia became enthusiastic about an oystercatcher inventory in the GINPR and, in 2005-2006, collaborated with Butler in a survey of nesting populations.[57] After Butler retired from CWS in 2007, he continued to collaborate with Parks Canada to conduct oystercatcher surveys in the GINPR as well as in the northern Strait of Georgia through funding from the Pacific WildLife Foundation (see below).

Figure 47. While a student at the University of Victoria, Lynne Milnes assisted Michael Rodway in conducting surveys of nesting seabirds in the Gulf Islands for a report commissioned by Parks Canada to help identify priority habitats for marine bird and mammal species in that area. *Photo by Michael S. Rodway, June 1977*.

Canadian Wildlife Service, Environment and Climate Change Canada (1983-2023)

Though established in 1947 (as the Dominion Wildlife Service), it was not until 1972 that the Canadian Wildlife Service (CWS) established an office in BC. Seabird studies by CWS in BC began after Kees Vermeer (Figure 48) transferred from the Prairie Region to the newly-established Pacific and Yukon office in 1975. Vermeer made tremendous contributions to seabird studies in BC during the next two decades until he retired in 1994. He initially focused on seabirds breeding at colonies along the BC outer coast and in Haida Gwaii [336, 337] and began dedicated surveys in the Strait of Georgia in 1983.[421] Further comprehensive surveys were conducted in the Strait of Georgia in 1986 and 1987.[420, 427, 428, 431] Kenneth H. Morgan was responsible for conducting the surveys of nesting seabirds in 1987. Morgan carried on at CWS to become the foremost expert on the distribution and abundance of seabird species in BC pelagic waters during different times of year.[257]

Other CWS scientists have also collected information on nesting seabirds in the BC Salish

Sea. Rob Butler (Figure 49), whose early years we describe below under *BC Parks*, joined CWS in 1979. Migrating shorebirds were a major focus of his research at CWS, but he also conducted some surveys of nesting seabirds, including collaborative efforts with Wayne Campbell from the BCPM [56] and Todd Golumbia from Parks Canada.[57] He also collaborated with Vermeer to produce the symposium proceedings on the ecology and status of marine and shoreline birds in the Strait of Georgia.[418]

Figure 48. Kees Vermeer immigrated to Canada from the Netherlands in 1954.[579] By 1956, he was enrolled at UBC studying geology and zoology. He developed an interest in nesting seabirds and studied the breeding biology of Glaucous-winged Gulls on Mandarte Island for his M.Sc. thesis in 1961-1962.[412] Later, as a CWS research scientist, Kees initiated a seabird research program in BC after he transferred to the newly established Pacific and Yukon region of CWS in 1975. He began his seabird studies on Triangle Island on the BC outer coast and afterwards also conducted studies in Haida Gwaii. In the 1980s, he supervised comprehensive surveys of cormorants, Black Oystercatchers, and Glaucous-winged Gulls nesting in the BC Salish Sea.[420, 427, 428, 431] These photos shows Kees, now 92, when he was chosen one of the 75 top Canadian immigrants for 2022 (top), and at a ceremony held in February 2023 at his home in North Saanich, BC where he received a Lifetime Achievement Award from the Pacific Seabird Group. In the latter photo, Kees and his wife Rebecca are centre front, surrounded by (from left to right), Iain Duncan, Alan Burger, Louise Blight, Wally du Temple, Patrick O'Hara, Ron Ydenberg, Doug Bertram, Rob Butler, and Sandi Bertram. *Photos by Nick Bowlin, 29 March 2022 (top) and Lora Morandin, 4 February 2023.*

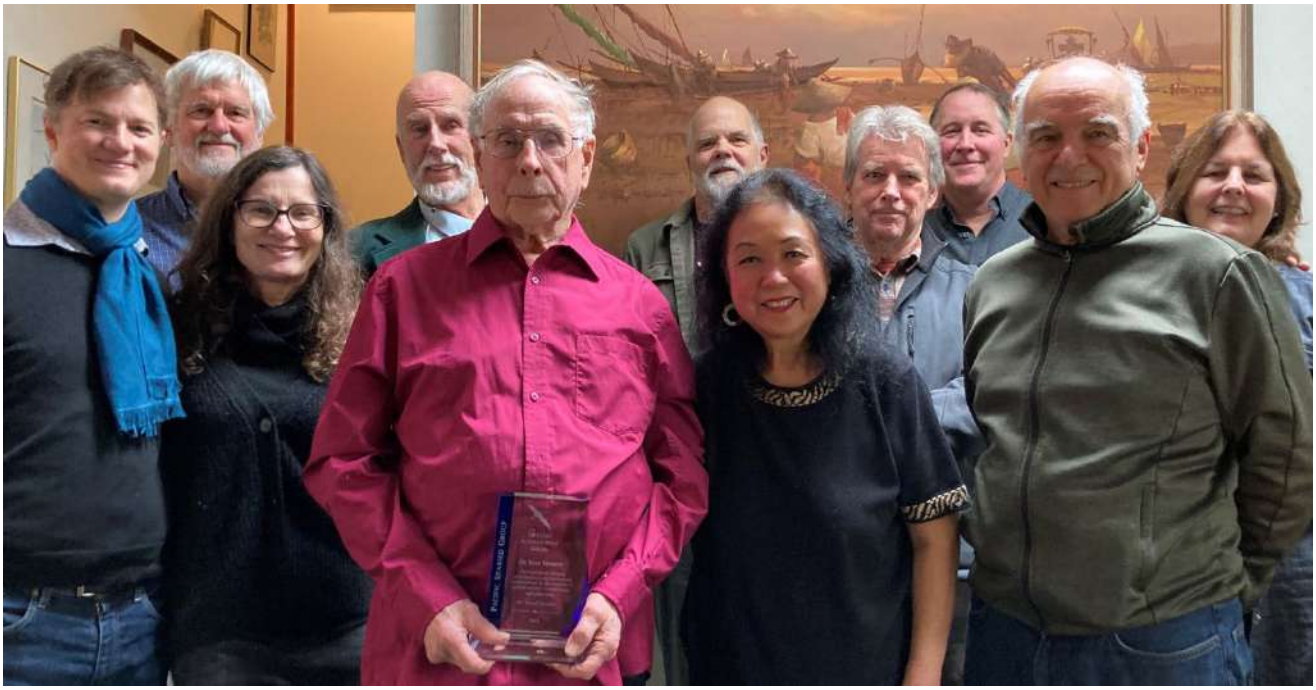


Figure 49. Rob Butler is a seasoned naturalist and scientist with major research interests in nesting seabirds, Northwestern Crows (*Corvus caurinus*), Great Blue Herons, and migrating and wintering shorebirds in the Salish Sea. Images here illustrate some of Rob's main interests. Rob was attracted to the aura of Triangle Island and in 1984 assisted with seabird inventories there (top left). Estimating populations and determining food resources for migrant and wintering shorebirds in the Fraser River delta has been a long-term research project. During migration, hundreds of thousands of Western Sandpipers, possibly the entire Flyway population, use the mud flats of Boundary Bay, Sturgeon Bank, and Roberts Bank in the Fraser River Delta (top and bottom right). In 2005, Rob initiated a collaborative program with Parks Canada to monitor Black Oystercatcher nesting populations in the BC Salish Sea. *Photos by Michael S. Rodway (top left*), *Moira J.F. Lemon (top right), and R. Wayne Campbell.*

Butler continued to gather information on nesting seabirds after he retired from CWS in 2007 (see below under *Pacific WildLife Foundation*).

Andre Breault (Figure 50) worked mostly on waterfowl at CWS. However, in 1990, early in his long career at CWS, he conducted surveys of Double-crested and Pelagic cormorants nesting at certain colonies in the Strait of Georgia as part of toxicology studies administered by Phil Whitehead and John Elliot.[43] In August 1990, Andre, Wayne Campbell, and volunteers from the BCPM banded Double-crested Cormorant young on Great Chain Island. Ian E. Moul also made counts of cormorant nests while collecting eggs for the CWS toxic chemical monitoring program from 1991 to 1995.[260, 261, 262, 263, 264]

Moira J.F. Lemon, third author of this work, has spent most of her seabird career at colonies on the BC outer coast and in Haida Gwaii,[336, 337] but in 1997 and 1999 assisted Terry Sullivan and Stephanie Hazlitt to conduct surveys of a number of Glaucous-winged Gull and Black Oystercatcher colonies in the BC Salish Sea.[377] During much of her tenure at CWS, Lemon was also responsible for conducting annual monitoring of migrating shorebird populations in the Fraser Delta and on Sidney Island. Since retiring from CWS, Moira and her partner Christopher McNeill (Figure 51) have searched colony sites near their home in Ladner for nesting seabirds and often gather records on nesting seabirds during their annual sailing trips around the Gulf Islands and the Strait of Georgia.

Figure 50. Andre Breault was keenly interested in factors affecting coloniality in birds. In the late 1980s, he conducted surveys to determine the distribution and abundance of Eared (now Black-necked) Grebes (*Podiceps nigricollis*; top photo) in interior wetlands in BC, [571] and then studied habitat selection and coloniality in Eared Grebes for his M.Sc. thesis out of UBC. In the early 1990s, he censused select cormorant colonies in the Salish Sea. In the bottom photo, Robert Byers from the BCPM (left) and Andre are banding nestling Double-crested Cormorants on Great Chain Island in 1990. *Photos by R. Wayne Campbell*.

Recently, research scientist Mark Drever (Figure 52) has assisted with cormorant surveys in the area in collaboration with Harry Carter [98] and Trudy Chatwin.[112] Douglas (Doug) Bertram, who has been director of the Triangle Island Research Station and head of the Marbled Murrelet Recovery Team, recently collaborated with Louise Blight to conduct drone surveys of nesting Glaucous-winged Gulls in the urban centre of Victoria and elsewhere.[32, 453] In his student years, Bertram conducted some surveys in the Salish Sea in 1981 with Michael McNall at the BCPM and, from 1983 to 1985, was part of the CWS team conducting surveys at colonies in Haida Gwaii.[336]

Figure 51. Since Moira Lemon retired from CWS, she and her long-time partner Christopher McNeill spend much of their time hiking, skiing, and sailing. They often get a chance to view seabird colonies while sailing through the Gulf Islands and the northern Strait of Georgia. They are shown here on a gravel bar of the Lord River during a canoe trip through the Taseko Lakes. *Photo by Heidi M. Regehr, 14 September 2014.*

Figure 52. CWS research scientist Mark Drever's studies focus on the conservation of marine and shoreline birds, especially in the Salish Sea. He has assisted with seabird surveys in various regions of the BC coast and has participated in cormorant surveys in the Salish Sea. He is shown here surveying one of the Rhinoceros Auklet permanent monitoring plots on Pine Island in Queen Charlotte Strait in 2011. *Photo by Moira J.F. Lemon, 9 July 2011.*

BC Provincial Government Ministries (1923-2023)

Surveys of breeding seabirds in the BC Salish Sea have been conducted by employees of a variety BC provincial government departments over the last 100 years. Jurisdiction, responsibilities, and goals for

wildlife management at a provincial level in BC have changed considerably over that time.[126, 276] Ordinances providing for the "protection of game" were first created on the Colony of Vancouver Island in 1859. Further ordinances to prevent the "wanton destruction of game" were implemented in the United Colony of British Columbia and later the province of British Columbia after BC joined confederation in 1871. Those ordinances were consolidated as the *Game Protection Act* in 1898. The provincial Department for the Protection of Game and Forests was established in 1905. In 1914, the *Game Protection Act* was repealed and replaced with the *Game Act*, which would remain in force (with many amendments) until 1966 when it was replaced by both the *Wildlife Act* and the *Firearms Act*. At that time the Fish and Game Branch responsible for administering those Acts was renamed the Fish and Wildlife Branch to reflect a broadening concern for wildlife conservation and protection generally and not simply the protection of game for hunting (Figure 53). The Branch was initially housed within the Ministry of Recreation and Conservation but was transferred in 1978 into the Ministry of Environment (MOE) that had been established in 1975.

Figure 53. In Canada, most birds are protected by the *Migratory Birds Convention Act* (MBCA) of 1917 which enforces the 1916 treaty between USA and Canada. The MBCA was updated in 1994 with stronger penalties for infractions. Not protected by the MBCA are 20 families of birds occurring in Canada, including the three species of cormorants breeding in BC and most avian predators of seabirds in BC. The BC *Wildlife Act* provides protective legislation for all birds and other vertebrates. Provincially protected avian predators of seabirds and, in parentheses, some of their known seabird prey, include (this page, clockwise from top left): **1)** Bald Eagle *Haliaeetus leucocephalus* (gulls, kittiwakes, alcids); [523, 573] **2)** Peregrine Falcon (storm-petrels, gulls, alcids); [573, 574, 575] **3)** Northwestern Crow (cormorant and gull eggs and nestlings); [51, 144, 335, 407] **4)** Snowy Owl *B. scandiacus* (gulls and alcids in winter in BC and storm-petrels and alcids in summer in Alaska). [576, 577, 578] and (next page, top left) **5)** Great Horned Owl *Bubo virginianus* (incubating and roosting gulls at some seabird colonies close to the mainland); [523] and **6)** Common Raven *Corvus corax* (cormorant and gull eggs and nestlings); [335] *Photos by R. Wayne Campbell (1, 2, 3, 6), Moira J.F. Lemon (4), and Ervio Sian (5).*

The Ecological Reserves program was initially administered under the *Land Act* after an Ecological Reserves Committee was formed in 1968. The program was more formally established after the *Ecological Reserves Act* was passed in 1971 under the administration of what was then the Department of Lands, Forests, and Water Resources. In 1985, the Ecological Reserves Committee was dissolved and jurisdiction for Ecological Reserves was moved to the Parks Branch.

Further changes in ministry designations and in the organization of responsibilities for wildlife management and habitat protection in BC have occurred since MOE was created in 1975. New designations included: the Ministry of Lands, Parks and Housing in 1978; the Ministry of Environment and Parks in 1986; the Ministry of Environment, Lands and Parks in 1991; the Ministry of Water, Land and Air Protection and the Ministry of Sustainable Resource Management in 2001; the Ministry of Environment (again) in 2005; the Ministry of Natural Resource Operations in 2010; the Ministry of Forests, Lands and Natural Resource Operations in 2013; and the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) and the Ministry of Environment & Climate Change Strategy (MOECC) in 2017. Until February 2022, FLNRORD was responsible for the stewardship of provincial Crown land to ensure the sustainable management of forest, wildlife, water, and other land-based resources. However, BC Parks, the Conservation Officer Service responsible for the enforcement of environmental regulations, and the Environmental Assessment Office, which coordinates and assesses the environmental impact of major development proposals in the province, are currently managed within MOECC. In February 2022, FLNRORD was reconfigured into two new ministries: 1) Forests; and 2) Lands, Water and Resource Stewardship. Regional Fish and Wildlife operations remained with the Ministry of Forests, while the Ecosystems Branch, including the Conservation Data Centre, and responsibilities for species at risk are now in the Lands, Water and Resource Stewardship Ministry.

Game Conservation Board (1923)

Seabird nesting records were contributed by one early game warden hired by the BC Game Branch under the auspices of the Game Conservation Board

that had been appointed in 1918. Ronald MacDonald Stewart (Figure 54) immigrated to Canada in 1907 and lived in Comox on Vancouver Island from 1907 to 1926.[83] After the First World War, Stewart worked in the BC Forest Service and later as a game warden in the Game Branch. He was one of two wardens stationed on Mitlenatch Island for 10 days at the beginning of June 1923. Estimates of seabird nesting populations made by Stewart were included in publications by Theed Pearse.[301] Stewart spent his later years in Haida Gwaii.[336]

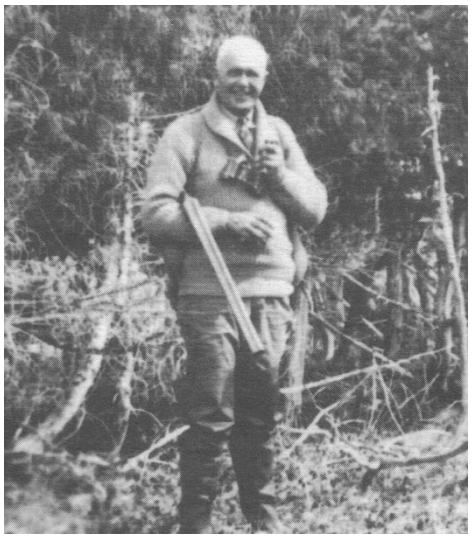


Figure 54. Ronald Stewart had a variety of jobs after he moved to BC in 1907. He was employed with the BC Forest Service and later the Game Branch as a game warden. He was transferred to Chilliwack and then, in 1936, to Masset in the Queen Charlotte Islands (Haida Gwaii). He loved the Queen Charlotte Islands and collected many bird specimens there. His collection of 1,500 specimens was donated to the BCPM. Ronald died on 3 May 1958 when he was 77 years old. *Photographer unknown*.

BC Parks - Mitlenatch Island Nature Park and Area (1959-2023)

Several major contributors to our knowledge of breeding seabirds in the BC Salish Sea worked early in their careers as seasonal naturalists on Mitlenatch Island. The island was bought by the province in 1959 and established as a provincial park in 1961. The naturalist program on the island began in 1963 under the supervision of David Stirling. Stirling was first hired by R. Yorke Edwards (Figure 55) in 1958 to work as a naturalist at Miracle Beach Provincial Park.[73] Edwards was a student who during his formative years had been inspired by Ian McTaggart-Cowan. After hearing Cowan lecture in 1947, Edwards moved from his native Ontario to study under Cowan at UBC, where he graduated in 1949.[254] Edwards became the wildlife biologist for BC Parks in 1951. He and Stirling visited Mitlenatch Island briefly in 1960. Edwards also made observations on Ballingall Islets in 1964 after those islets were designated as a BC Nature Park in November 1963. Alan Cecil Brooks, son of Alan Cyril Brooks who we have described in previous volumes,[336] accompanied Edwards on that trip. Edwards moved to Ottawa to join the Canadian Wildlife Service in 1967 and returned to BC in 1972 to become assistant director and then director in early 1975 of the BCPM until his retirement in 1984.[91]

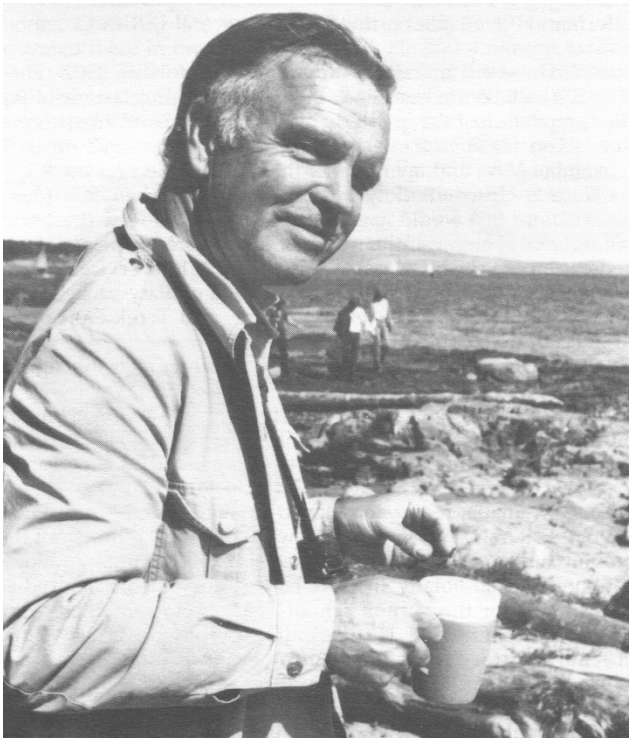


Figure 55. Although administrative duties took most of his time at BC Parks, Yorke Edwards still managed to visit some seabird colonies in the BC Salish Sea and was instrumental in promoting nature interpretive programs at BC Parks, including at Mitlenatch Island Provincial Nature Park. *Photo by Gywnnath Hansen, Wilson Beach, BC, August 1982*.

Edwards had promoted the idea of establishing nature interpretive programs first as a research officer in the BC Forest Service and then in the Parks Branch after management of parks had been transferred to the Department of Recreation and Conservation in 1957.[254] He was given approval for an interpretive program in 1957. Stirling was one of the first to work as a naturalist under that program (Figure 56). Stirling was given permanent status in

Figure 56. While in charge of the nature house at Miracle Beach Park (as well as Mitlenatch Island), Dave Stirling gave morning talks and led walks for park visitors.[73] *Photo by R. Wayne Campbell, August 1965.*

the Parks Branch in 1960 and took on a supervisory role for the increasingly popular summer interpretive programs at BC Parks.

The first summer naturalist hired for Mitlenatch Island was Gerard van Tets in 1963.[404] At that time, van Tets was just finishing his Ph.D. studies at UBC (see below). Robert Wayne Campbell (Figure 57) and William James (Bill) Merilees were hired for the position in 1964.[64] Campbell was recommended for the job by Rudi Drent, whom Campbell had met while Drent was a student at UBC, and by professors Dean Fisher and Ian McTaggart-Cowan at UBC. Campbell had already been surveying seabird colonies and banding young gulls in the Greater Vancouver area; the naturalist position at Mitlenatch Island allowed him to continue that passion.[82] Campbell worked as the summer naturalist on Mitlenatch Island for three years, after which he moved to work at Wickaninnish Park on the west coast of Vancouver Island. We have described in previous volumes [335, 336] his subsequent career as one of the most renowned ornithologists in Canada (also see *About the Authors* at the end of this volume).

Merilees was just completing his Bachelor's Degree majoring in Zoology and Botany at UBC, where he was encouraged by Ian McTaggart-Cowan. He was a friend of Cowan's son Garry and spent time with the Cowan family during his high school and university years.[308] Merilees had been hired earlier as the naturalist at Miracle Beach Park in 1960. That year, he and Raymond Barnes, another student naturalist, made observations and banded Glaucous-winged Gulls on Mitlenatch Island. As a high school student, Barnes had worked at E. C. Manning Park during the first year of BC Park's Nature Interpretive Program in 1957. Years later, Merilees accepted a permanent position as Regional Interpretation Officer for Vancouver Island with BC Parks, where he worked from 1978 to 1997. He has continued to be an active naturalist since his retirement.[255]

Ken Kennedy (Figure 58) also worked as a naturalist on Mitlenatch Island for three years, in 1965 and 1966 with Wayne Campbell [78, 79, 80] and in 1967 with Robert (Bob) George Footit.[228] Kennedy conducted surveys of many seabird colonies in the BC Salish Sea during the 1960s and 1970s, often in the company of Campbell. The friendship that developed between Kennedy and Campbell led to Kennedy standing as best man at Campbell's

Figure 57. Wayne Campbell was hired as a summer naturalist at Mitlenatch Island Provincial Nature Park in 1964. A passionate bird watcher since he was a young lad, Campbell went on to become one of the foremost ornithologists in Canada. He is shown here at Wickaninnish Park on the west coast of Vancouver Island where he transferred after working three summers at Mitlenatch Island. *Photo by William M. Verbruggue, June 1967*.

wedding. Kennedy later worked at the Stanley Park Zoo and he currently lectures internationally. Robert (Bob) George Foottit (Figure 59) was born and raised in Vancouver, BC. He was a naturalist at Mitlenatch Island Nature Park from 1967-1970.[171, 172, 173, 228] In the 1970s, he conducted surveys of a number of seabird colonies in the northern Strait of Georgia in the company of fellow naturalists Rob Butler and Bill Merilees.[174, 175] Foottit then went on to study insects for his M.Sc. and Ph.D. work at SFU. He was hired as a research scientist at the Canadian National Collection of insects in Ottawa in 1986 before completing his doctorate in 1988.

George P. Sirk (Figure 60) developed an early obsession with birds and nature during his childhood in Vancouver. He got his first job as a naturalist when Stirling hired him to work at Mitlenatch Island with Foottit in 1969. Sirk returned as a newlywed with his bride Lauren as the summer naturalists in 1971.[357] Sirk has been interpreting nature around the globe ever since and is still an avid birdwatcher around his home on Cortes Island where he shares his passion with other birdwatchers like Christian Gronau.

Robert (Rob) W. Butler was first hired to work on Mitlenatch Island in 1970 with Foottit. He returned with his wife Sharon in 1973 [55] and 1976 (Figure 61), and with John Kirbyson in 1977. John Kirbyson returned in 1978 with Jerry McFetridge.[542] In the intervening years, the naturalist post was filled by G. and J. Erasmus (whom we were unable to find

Figure 58. Ken Kennedy was a summer naturalist on Mitlenatch Island for four years. In this photo, he has gathered visitors to teach them about some of the flora and fauna on the island. *Photo by R. Wayne Campbell, 11 June 1967.*

Figure 59. Returning from his post as a summer naturalist on Mitlenatch Island, Bob Foottit (right), accompanied here by Errol Anderson, a junior naturalist with the Vancouver Natural History Society, is waiting at the ferry terminal at Departure Bay. *Photo by R. Wayne Campbell, early September 1968.*

Figure 60. George Sirk has always possessed an insatiable curiosity about the natural world. Whenever an opportunity arose to see new birds, he usually participated. In this photo, he was returning home from a pelagic birding trip off Tofino and fell asleep on the ferry. *Photo by R. Wayne Campbell, Swartz Bay, BC, 26 September 1970.*

further biographical information for) in 1972 [162] and by Michael and Teresa Shepard in 1974. Butler was a young student when he first worked on Mitlenatch Island. He completed his B.Sc. in 1976 and his M.Sc. in 1980 [52] at SFU (see *University Undergraduate, Graduate, and Faculty Research* below). John Kirbyson was an SFU assistant hired by Nico Verbeek to assist Butler in the field. Butler subsequently finished a Ph.D. studying Great Blue Herons at UBC in 1991 (Figure 62) [53] during his tenure at CWS (see *Canadian Wildlife Service* above). Michael Shepard was a dedicated birdwatcher from a young age; he conducted seabird surveys on the Five Finger Island/Hudson Rocks/Snake Island complex as a high-school student in 1966. After working as a naturalist on Mitlenatch Island, he took a position at the BCPM (see *BC Provincial Museum* above).

Figure 61. Rob Butler was a young student when he first worked as a naturalist on Mitlenatch Island in 1970. Young love led to him getting married not long after. He returned to Mitlenatch Island with his wife Sharon in 1973 and 1976. They are shown here at Lighthouse Park in West Vancouver on their wedding day. They recently celebrated their 50th wedding anniversary and still have fond memories of their time as naturalists on Mitlenatch Island. *Photo by Richard T. Wright, 27 September 1972.*

The Mitlenatch Experience

Seabirds are among the best known of birds – think penguin and puffin – and British Columbia is home to several million breeding individuals. The hundreds of seabird colonies described in this and companion volumes is testament to how widespread and numerous seabirds are in the province. Despite this popularity and abundance, the number of places where the public can safely step ashore to watch nesting seabirds without impacting their breeding success can be counted on one hand. Mitlenatch Island in the northern Strait of Georgia has a long history of being one of those rare places.

Visitors and nesting seabirds are not always a good mix, so prudence is needed to allow for co-existence. With this foresight in mind, BC Parks extended the Park Naturalist program to Mitlenatch in 1963, two years after the island had been established as a provincial park. The program had been promoted and launched under the visionary direction of Yorke Edwards in 1957. David Stirling was given the job of supervising the program on

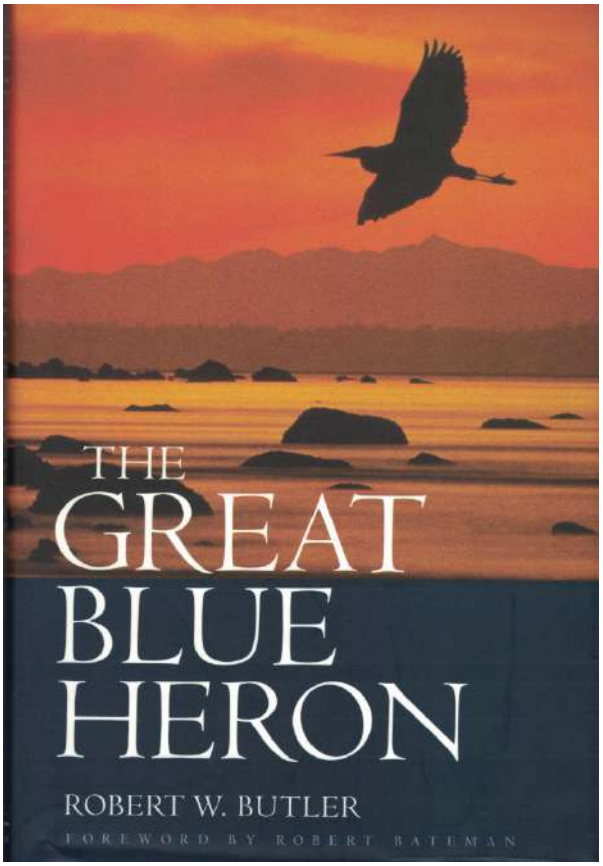


Figure 62. While working with the Canadian Wildlife Service, Rob Butler completed a Ph.D. on habitat selection and breeding chronology of Great Blue Herons (top) at colonies in the Salish Sea. Following his graduate studies, he also published a popular book on the species.[580] *Photo by R. Wayne Campbell*.

Mitlenatch. The first naturalists stationed on Mitlenatch were Gerard van Tets in 1963, and in 1964, renowned local naturalist Bill Merliees and famed ornithologist Wayne Campbell. Three years later, and just after my 17th birthday, I got my chance to follow in their footsteps.

I had been working as a field assistant of student Dave Mossop on UBC professor Jim Bendell's study of grouse movements in the mountains west of Campbell River. After several weeks of traipsing about hill and dale in search of grouse we were ready for a break. Dave contacted the Park Naturalists stationed on Mitlenatch about paying a visit.

We hired a boat and arrived on a July morning to the squeal of seabirds ringing out around the island. Park Naturalists on the island that year were Robert Foottit and Ken Kennedy, from whom I learned a great deal about island life and their role as nature interpreters. I was smitten by the island and the job. Three years later in

1970, I was hired as a Park Naturalist along with Bob Foottit. I developed a fascination with seabirds and also became interested in crows, which were present on the island and were constantly interacting with the nesting seabirds. I voraciously read all I could on the natural history of seabirds, including my colleague and good friend Kees Vermeer's citation classic on the breeding ecology of the Glaucous-winged Gull.[412] *I learned about the variety of calls and displays of nesting gulls from Niko Tinbergen's* Herring Gull's World *that was instrumental in him sharing a Nobel Prize in 1973 with Karl Von Frisch and Konrad Lorenz. Bob Foottit recognized my interest in crows and encouraged me to study their diet. Three more years passed, and in 1973, Sharon and I, as newlyweds, returned to the island and it was then that I decided to work toward a graduate degree on crows.*

The opportunity to study crows arose in 1976 when Nico Verbeek joined the faculty at Simon Fraser University (Nico would go on to study seabirds and crows on the island from 1980 to 1999). Nico had been a post-graduate student of Niko Tinbergen, and shared with me an interest in the social behaviour of crows. I became his first student. In 1976, with the generous support of Kerry Joy and David Stirling at BC Parks, Sharon and I were again hired as Park Naturalists on Mitlenatch, where I was allowed the latitude to gather data on the crows toward my thesis (Figure 63). I returned to the island in 1977 and 1978 to complete my crow studies (the full story will appear in my upcoming book Society of Crows *published by On Point Press).*

My experience on the island was unforgettable. Even just approaching the island was magical - the light in the northern Strait of Georgia seemed to play tricks on the eye creating an illusion that the island moved away as you drew near. Others have shared that illusion - to the Kwagiulth people, the name of the island, "mah-kwee-lay-lah," meant "it looks close, but seems to move away as you approach it." As a Park Naturalist, I remember that by the time boaters arrived, many were ready to stretch their legs. The island offered the respite they sought and a unique opportunity to come close to seabirds with minimal disturbance. The park's two beaches where visitors made landfall were connected by a meadow far from nesting seabirds on the high ground. The visitor could stroll along beaches, cross the meadow on foot, or climb East Hill to a bird blind where they could watch the gulls go about their nesting duties undisturbed. This rare opportunity is a special feature of Mitlenatch that continues today and, when accompanied by a Park Naturalist who can explain the behaviours of the birds, visitors leave with unforgettable experiences. Many visitors, once smitten by the island's charms, longed to stay for several days and for some lucky people, that opportunity is now real.

The BC Park Naturalist program terminated many years ago and on Mitlenatch has been replaced with the voluntary Mitlenatch Island Stewardship Team who coordinate stationing of volunteer wardens on the island through spring and summer. The Mitlenatch experience profoundly changed my world view and set me on a path to become a professional ornithologist. Those that have followed and had an opportunity to spend a week on the island among the birds often come away with a similar fondness for Mitlenatch and its seabirds and often a new sense of purpose.

(contributed by Rob Butler)

Figure 63. On Mitlenatch Island, Northwestern Crows have breeding territories that are usually adjacent to the beach. Some nests are built on the ground near shrubs and saplings (top). Crows obtain food (like this Pacific Littleneck Clam, *Protothaca staminea*) from nearby intertidal beaches, especially when feeding nestlings.[52] *Photos by R. Wayne Campbell, May 1968*.

BC Parks hired summer naturalists David Thomson in 1980-1981 and Alison Watt (Figure 64) in 1982. Both Thomson and Watt had worked as naturalists at other parks, including Manning Park, and have continued to volunteer as summer wardens and help conduct seabird surveys on Mitlenatch Island. Watt has now worked as a volunteer warden for a week every summer for 25 years. Thomson

generally volunteers in the company of his wife Peggy Sowden (see below). Together, they also conduct regular winter bird surveys around their wilderness home in Port Neville. Watt is a biologist, science communicator, landscape artist, and author, who gave us the delightful account of her time on Triangle Island off the west coast of Vancouver Island with Anne Vallée who tragically died there in 1982.[436]

Figure 64. Alison Watt is an award-winning author and poet who lives on Protection Island near Nanaimo. She graduated from Simon Fraser University with a B.Sc. in Biological Sciences. Alison enrolled in Masters of Arts program in Botany at UBC and later transferred to complete a Masters of Fine Art degree in Creative Writing. She has been a tour leader in Central and South America and a naturalist aboard many vessels along the BC coast. She has also accompanied Trudy Chatwin on cormorant surveys in the Salish Sea. Alison is self-employed, teaches art, and offers courses on-line through her business *Artwork Artplay*. *Photo by Dirk Heydemann, Protection Island, BC, 4 November 2021.*

Between 1989 and 2009, paid naturalists were replaced with volunteers coordinated by BC Parks. Over the years, volunteers included many exceptional wildlife observers and naturalists such as Betty Brooks (née Elizabeth Hatfield; married Alan Cecil Brooks - see above), who was the first female park naturalist to work for BC Parks,[282] Bill Merilees (see above), and biologist Tom Sterling (Figure 65) among many others. After 2009, BC Parks decided to close the volunteer naturalist program. A group of concerned volunteers, who formed the Mitlenatch Island Stewardship Team (MIST), assumed responsibility for carrying on the program. An agreement was signed between BC Parks and Peggy Sowden (on behalf of the MIST volunteers) with the assurance that they would carry on the program at almost no cost to parks (see more details under colony account SG-090 Mitlenatch Island).

Figure 65. Since 1989, many skilled naturalists, like Ducks Unlimited Canada biologist Tom Sterling, have acted as volunteer wardens on Mitlenatch Island to help protect nesting seabirds and manage park visitors. *Photographer unknown*.

Margaret (Peggy) J. Sowden has had a long association with Mitlenatch Island. She first visited the island in 1971, conducted surveys of nesting seabirds on the island with Michael Rodway in 1978, and has been passionate about its protection ever since. A leading member of MIST, she has regularly volunteered her time to serve as a summer warden on the island. Her husband David Thomson shares her passion and commitment to protecting the island (Figure 66). As well as being a keen naturalist, Sowden is a renowned artist and member of the international Artists for Conservation organization. She was also a practicing veterinarian for many years.

MIST has continued to place volunteer wardens on the island and conducts regular surveys of nesting seabirds and other ecosystem components there. In 2010, MIST volunteers Mikaela Davis, Tella Osler, Peggy Sowden, and David Thomson, as well as Trudy Chatwin from MOE, assisted in the Glaucous-winged Gull nest count conducted by Louise Blight as part of her Ph.D. thesis (see *University Undergraduate, Graduate, and Faculty Research* below). At that time, MIST began a monitoring program to repeat gull nest counts every five years. In 2015, the count was completed by Trudy Chatwin, David Thomson, Peggy Sowden, Heidi Tonn, Rod

Mitchell, and Connie Haist. MIST also conducts annual monitoring of nesting cormorants. Peggy Sowden was the lead for that program until 2020. The scheduled 2020 gull survey was postponed until 2022 due to the COVID-19 epidemic. In 2022, the gull nest survey was led by the new MIST volunteer coordinator, Susan Rybar. Participants included Erica McClaren, Susan Rybar, Tony Rybar, Kje Rybar, Rod Mitchell, Heidi Tonn, Connie Miller-Retzer, Wendy Okopski, and Avery Okopski. Nancy Baron and Alison Watt have conducted many of the recent cormorant surveys.

Figure 66. Long-time partners and lovers of wilderness, Peggy Sowden and David Thomson have regularly served as volunteer wardens on Mitlenatch Island and share a commitment to the conservation of nesting seabirds on the island. *Photo by Marlene Graham, 12 May 2012.*

BC Ecological Reserves (1968-1985) and Friends of Ecological Reserves (1983-2023)

The Ecological Reserves Committee was formed in 1968 largely due to the vision and persistent efforts of Vladimir Krajina.[142] Although the committee was formed in 1968, and the *Ecological Reserves Act* was passed in 1971, there was no Ecological Reserves (ER) Unit until Bristol Foster was hired in 1974 to become the first full-time coordinator. He was a one-man show until he was able to hire Jim Pojar in 1976 and Trudy Carson (now Chatwin) in 1977. Lynne Milnes was hired after Carson left in 1980 and was responsible for managing the new volunteer warden program. With Carson and others, Milne helped found the Friends of Ecological Reserves society in 1982-1983. Observations of nesting seabirds at reserves have been made by various wardens and other society members over the years, including: Al Gaensbauer, warden of Lasqueti Island ER; Bill Merilees, warden of Hudson Rocks ER; Roger Allen, warden of Rose Islands, Canoe Islet, and Ballingall Islets ERs; Marilyn Lambert warden of Oak Bay Islands ER; and Jacques Sirois, Warden of Trial Islands ER (Figure 67).

Figure 67. Volunteer Ecological Reserve wardens play a valuable role in monitoring the health of their respective reserves. Although wardens generally visit reserves only periodically, their observations can provide important insights into the status of nesting birds. For example, wardens can count nests and note signs of human disturbance and associated impacts to nesting birds, like this depredated Pelagic Cormorant egg seen on Great Chain Island in 1978. *Photo by R. Wayne Campbell, July 1978.*

BC Ministry of Environment (1999-2023)

Of the many people who have conducted studies on breeding seabirds in the BC Salish Sea, one employee of the provincial government stands out. Trudy Chatwin (née Carson; Figure 68) has made tremendous contributions to our knowledge and conservation of nesting seabirds, especially cormorants. She has had a passion for nature since she was a young girl growing up on Mount Tolmie in Victoria. As an adult she has worked tirelessly to protect natural places. She started working with Bristol Foster in the provincial Ecological Reserves Unit in 1977 and for many years she served as as an Endangered Species Biologist for MOE

(subsequently FLNRORD) in Nanaimo. She has conducted repeated surveys of cormorants in the BC Salish Sea, beginning in 2000.[114] Those surveys were conducted with the assistance of others, including Monica Mather, Tanya Giesbrecht, Terry Sullivan, Alison Watt, Marilyn Lambert, Harry Carter, and Mark Drever. Chatwin's work identified major declines in cormorant breeding populations and helped increase efforts to protect nesting sites. She also researched how nesting and roosting seabirds respond to approaching boats and kayaks, and recommended set-back distances of 50-70 m to protect nesting cormorants and other seabirds from disturbance.[108, 113] Chatwin continues to be involved in conservation initiatives and is still conducting surveys of seabird colonies in the Salish Sea and elsewhere in BC since retiring from the provincial government.

Figure 68. Trudy Chatwin's passion and concern for the natural world and its living creatures has been paramount throughout her life and career. She gained valuable experience with plants and animals while working with the BC Ecological Reserves Unit in the 1970s, and her subsequent career as an Endangered Species Biologist (ESB) with the BC Ministry of Environment (MOE) meshed well with her dedication to protect wilderness and wild creatures. She was driven by a thirst for knowledge and has worked productively with federal and provincial biologists, city officials, naturalists, university professors, students, and wildlife consultants. Trudy has played a major role in the protection of wildlife habitats in BC. With the Ecological Reserves Unit, she was involved in identifying, assessing, and designating representative ecosystem units for protection as Ecological Reserves. With MOE, Trudy supervised major inventory and research programs for Marbled Murrelets,[588, 589] and was partly responsible for the difficult job of identifying, prioritizing, and designating important Wildlife Habitat Areas to protect that threatened species as well as other endangered species and ecosystems. She was also involved in assessing critical habitat for bats.[590] The photo **(1)** on this page shows Trudy, in standard west coast attire, checking an Ancient Murrelet burrow on Frederick Island in Haida Gwaii in 1980. Other photos (next page, clockwise from upper right; numbered 2 to 6) illustrate some of the other species and issues Trudy has been involved with. For the last two decades, Trudy has conducted surveys and helped develop a monitoring program for Double-crested **(2)** and Pelagic **(3)** cormorant nesting populations in the BC Salish Sea.[112, 114] **4)** Locating, determining nest contents, and monitoring threatened Great Blue Heron colonies on Vancouver Island has also been one Trudy's responsibilities. **5)** All species at risk fall under the purview of an ESB like Trudy, including Northern Goshawk (*Accipiter gentilis langi*).[581] **6)** During her time at MOE, Trudy also participated in co-operative nearshore surveys (map shows survey route) by Parks Canada and MOE to provide data on abundance and distributional changes for species like Heermann's Gull (*Larus heermanni*), Black-legged Kittiwakes (*Rissa tridactyla*), Marbled Murrelets, and Brown Pelicans (*Pelecanus occidentalis*).[582] *Photos by Moira J.F. Lemon (1) and R. Wayne Campbell (2, 3, 4, 5); map courtesy of Parks Canada and BC Ministry of Environment.*[582]

Ian Moul, who had previously been involved in surveys and studies of cormorants at some colonies in the BC Salish Sea while working at CWS (see *Canadian Wildlife Service* above), conducted some cormorant surveys in 1999 [265] after moving to the BC Ministry of Environment, Lands and Parks. Moul, in association with Martin B. Gebauer, also produced a status report on Double-crested Cormorants in 2002,[266] which incorporated 2000 survey data collected by Chatwin and others (at that

time the ministry was called Water, Land and Air Protection). Other provincial government biologists, including Jenna Cragg and Connie Miller-Retzer at FLNRORD and Erica McClaren and Bryan Vroom at MOECC, have conducted some seabird colony surveys in recent years. Louise Blight, who until recently also worked at MOECC, has previously conducted major studies on Glaucous-winged Gull breeding populations in the BC Salish Sea (see *University Undergraduate, Graduate, and Faculty Research* below).

Lighthouse Keepers (1940-2010)

Several lighthouse keepers in the Strait of Georgia have been keen birdwatchers and have contributed extensive records of nesting seabirds on the islands where they were stationed. Many of the earlier records were solicited by Drent during preparation of his seabird catalogue [144] and later during surveys he conducted in 1968.[523] Others were contributed directly to the BCNRS or were conveyed to other surveyors like Wayne Campbell and Louise Blight when they visited the colonies.

Oswald Stanley Dean made observations while he was stationed at the Sisters Islets and the Cape Mudge lighthouses in 1940-1943 and 1943-1961, respectively. Mary Waldern kept records of nesting birds when she was stationed with her husband Arthur on Sisters Islets in 1951 and on Ballenas Islands from 1952-1957. Also on Sisters Islets, William (Bill) Milne contributed observations made between 1968 and 1981 during his stint at the lighthouse. George H. Potts kept track of nesting gulls on Franklin and Merry islands while he was keeper from 1951 to 1966. After Potts, Ethel Kippin made frequent observations and conducted many surveys on Franklin and Merry islands during the years from 1966 to 1978 that she was stationed at the Merry Island lighthouse with her husband Jim. Douglas Howard Franklin was the lightkeeper on Trial Islands from 1957 to 1962. He kept records of nesting seabirds during that period and his daughters June and Rae monitored the hatching success of gulls in 1960 and 1961. Meredith Dickman has been the lightkeeper on Trial Islands since 2007 and has contributed records of nesting gulls, including an estimate of the nesting population in 2010.[453]

University Undergraduate, Graduate, and Faculty Research (1957-2023)

Students and faculty at the University of British Columbia (UBC) and Simon Fraser University (SFU) have made major contributions to our knowledge of breeding seabirds in the BC Salish Sea. Most notable was Rudolph (Rudi) H. Drent who we profiled in the second volume of this work.[336] Drent studied Pigeon Guillemots nesting on Mandarte Island in 1959 and 1960 as a Master's student at UBC under the supervision of Miklos D. F. Udvardy. At the same time, Drent compiled all available information on seabirds nesting in BC, including many data from Guiguet at the BCPM (see above), who was co-author on Drent's seminal publication, *A Catalogue of British Columbia Seabird Colonies*.[144] That publication and Drent's subsequent efforts motivated future surveys on the distribution and abundance of nesting seabirds in BC and was a direct inspiration for this present four-volume treatise.

Drent returned as an Assistant Professor in the Department of Zoology at UBC from 1967 to 1972.[336] During that period, he supervised five graduate students, four of whom also conducted work on seabirds breeding on Mandarte Island: Ian Robertson (reproductive success in cormorants [324]), Anthony F. Koelink (growth in Pigeon Guillemots [236]), Bryan A. Henderson (parental feeding in Glaucous-winged Gulls [209]), and John G. Ward (reproductive success and food supply in Glaucous-winged Gulls [435]). Drent also supervised undergraduate students: Michael Easton, who examined banding records to determine movements and mortality of Glaucous-winged Gulls from colonies on Mitlenatch, Christie, and Mandarte islands; [150] and Norman W. Aitchison, who studied breeding ecology and brood-size in Pigeon Guillemots on Mandarte Island in 1971.[4] As well as supervising students, Drent personally collected many data on nesting seabirds at colonies throughout the BC Salish Sea, especially in 1968 when he conducted many of the first complete nest counts and thus provided the first reliable quantitative data for nesting populations at numerous colonies. He conducted many of those surveys with the assistance of his wife Nora. Data from those surveys and lobbying by Drent were instrumental in the establishment in 1971 of some of the earliest Ecological Reserves on Rose Islets and Canoe Islet.

Drent began his seabird career under the tutelage of Miklos Udvardy, who also motivated and mentored two other students to study breeding seabirds on Mandarte Island. Gerard Frederick van Tets studied cormorant behaviour on Mandarte Island during the summers of 1957-1960 and 1962 for his M.Sc. and Ph.D. theses at UBC under the supervision of both Udvardy and Cowan. [402, 403, 405] Kees Vermeer studied the breeding biology of Glaucous-winged Gull for his M.Sc. thesis in 1961-

1962.[412] Vermeer went on to play a major role in seabird studies in the BC Salish Sea during his tenure as a research scientist with the Canadian Wildlife Service (see *Canadian Wildlife Service* above).

Ian McTaggart-Cowan was also a major contributor to our knowledge of breeding seabirds in the BC Salish Sea. He made some visits to seabird colonies, including Ballingall Islets in 1957 and Elliot Bluff in 1959, but his most important contributions to seabird studies were indirect through his inspiring influence on many students of ornithology, including Rudi Drent and Wayne Campbell. As noted above, during his early years, Cowan had been mentored by Racey and Munro. In his turn, Cowan went on to become one of the most influential biologists in Canada.[223, 308]

Udvardy also announced the launch of the British Columbia Nest Record Scheme (BCNRS) at UBC,[399] developed in association with Cowan and M. Timothy Myres.[277] We have described the development of the BCNRS in a previous volume.[336] The scheme was managed in turn by Tim Myres (1955-1958), Rudi Drent (1959-1960), Bill Merilees (1961-1962), George M. McKay (1963-1965), and Wayne Campbell (1966-present). Many seabird nesting records were contributed to the scheme, especially under Drent's and later Campbell's influence. McKay also added seabird records to the scheme, following his visits to Christie Islet and Pam Rock with Merilees in 1958 and 1959 and his surveys of some colonies in the Gulf Islands in 1963.

Udvardy also supervised Frank S. Tompa who studied population dynamics of Song Sparrows (*Melospiza melodia*) on Mandarte Island for his doctoral thesis.[392] That study set the stage for one of the longest-term studies of a wild bird population in the world, carried on by: Jamie N.M. Smith, who moved to Canada to accept a faculty position at UBC in 1973; his student Peter Arcese, who completed both Master's [12] and Ph.D. [13] degrees on Song Sparrows and subsequently also became a professor at UBC; and many other graduate students.[358] Both Smith and Arcese have contributed incidental records of nesting seabirds on Mandarte Island and nearby colonies. Pirmin Nietlisbach, who conducted studies on Song Sparrows on Mandarte Island for his doctoral thesis and was subsequently a postdoctoral fellow at UBC from 2017-2020, has also submitted seabird records from Mandarte Island.[524]

Louise K. Blight (Figure 69) conducted a major study on population trends of Glaucous-winged Gulls in the BC Salish Sea for her Ph.D. dissertation under the supervision of Arcese.[30] Surveys conducted by Blight in 2009 and 2010 provided the most comprehensive population estimates for the region since the 1986 surveys by Vermeer and Devito,[420] although data originally presented by Blight [30, 33] were incomplete and comparisons with previous data were flawed (see section *Identifying and Addressing Issues with the Historical Data* below). Blight had previously conducted studies on Rhinoceros Auklets nesting on Triangle Island for her Master's thesis out of SFU.[28] Recently, she has successfully used drones to census Glaucous-winged Gull nesting populations in the urban centre of Victoria.[32] She was employed as a Resource Objectives Biologist with the BC Ministry of Environment and Climate Change Strategy until 2021. She now works independently from her home on Saltspring Island.

Figure 69. Louise Blight conducted comprehensive surveys of Glaucous-winged Gull populations in the BC Salish Sea as part of her Ph.D. research out of the University of British Columbia.[30] Her research interests are broad and she has carried out research on alcids and gulls elsewhere in BC and for many years participated in studies on penguins in Antarctica. *Photo by Grant Ballard, Cape Crozier, Ross Island, Antarctica, 9 December 2007.*

Edward Kroc (Figure 70) became an Assistant Professor in Measurement, Evaluation, and Research Methodology in the Faculty of Education at UBC in 2018. He has a passionate interest in the ecology of urban-nesting gulls and has conducted detailed studies on the behaviour and habitat use of Glaucous-winged Gulls in Vancouver.[240, 241] He has recently used a predictive modelling approach to generate estimates of gull breeding populations in the City of Vancouver, which includes our designated colonies SG-600, SG-660, SG-661, and SG-667, in collaboration with Louise Blight and UBC student Wilson Cao.[242]

Figure 70. Edward Kroc became an Assistant Professor in the Faculty of Education at UBC in 2018 following a term as a Postdoctoral Research Fellow in the department and after completing a Ph.D. in Mathematics at UBC. One of his research interests is urban ecology, especially related to the life cycle of Glaucous-winged Gulls in the urban environment. *Photographer unknown.*

Terrance (Terry) M. Sullivan studied timing of breeding in Double-crested Cormorants at several colonies in 1993-1994 for his M.Sc. thesis at UBC.[376] He was supervised by Professor Kim Cheng. Sullivan also conducted seabird work under contract with CWS both before [374, 375] and after [377] his Master's studies (Figure 71).

Figure 71. Terry Sullivan worked under contract with CWS for many years on a variety of projects. In this picture, he is banding a Western Sandpiper on Sidney Island during the birds' southward migration. *Photo by Moira J.F. Lemon, July 1997.*

Frederick A. Gornall was a professor in UBC's Faculty of Educational Science specializing in the teaching of botany. Though not directly related to his UBC studies, Gornall made detailed observations of nesting seabirds on Chain Islets/Great Chain Island near Victoria in 1960 and on Passage Island near Vancouver in 1964.

Seabird studies began later at SFU than at UBC. That university was not established until 1965; seabird work began following the appointment of Nicolaas (Nico) A.M. Verbeek to the faculty in 1976. Verbeek conducted his seabird research on Mandarte and Mitlenatch islands. He was a frequent visitor to Mitlenatch Island over the years 1980 to 1999 (Figure 72). His main research focus was on the breeding ecology of Glaucous-winged Gulls and egg predation by Northwestern Crows [406, 407, 408, 409] (note that the American Ornithological Society has recently lumped Northwestern Crow with American Crow as *Corvus brachyrhynchos*,[115] but the change has been contested, with a recommendation to re-split the two species; [54] we continue to refer to Northwestern Crow throughout this work).

Figure 72. SFU professor Nicolaas Verbeek (right) conducted research and supervised student research on Mandarte and Mitlenatch islands from the 1970s to the 1990s. He is shown here on Mitlenatch Island examining wing molt in Glaucous-winged Gulls with assistant John Kirbyson in 1977 or 1978. *Photo by Robert W. Butler.*

Verbeek supervised Rob Butler during his M.Sc. studies on the breeding ecology of Northwestern Crows on Mitlenatch Island in 1976-1978 [52] and Simon K. Emms, who studied nest distribution of Pigeon Guillemots on Mitlenatch Island in 1984-1985 for his M.Sc. thesis.[157] Under the co-supervision of Rob Butler when he was at CWS (see *Canadian Wildlife Service* above) and Ronald C. Ydenberg at SFU, Stephanie L. Hazlitt studied nesting behaviour of Black Oystercatchers at several colonies in the Gulf Islands in 1996-1997 for her M.Sc. thesis.[202] Under the supervision of Ruth Joy at SFU, Macus Ong (Figure 73) investigated the use of

photogrammetric methods to monitor cormorant breeding populations and behaviour at Vancouver bridges and on Gabriola Island in 2020 for his M.Sc. thesis.[285] Rachel Stapleton, also under the supervision of Ruth Joy, continued photographic monitoring of Double-crested Cormorants nesting on Mitlenatch and Gabriola islands in 2022 for her M.Sc. studies.

Figure 73. While he was a M.Sc. student under the supervision of Ruth Joy at SFU, Macus Ong monitored Double-crested and Pelagic cormorants nesting on urban bridges and offshore islets using combined photogrammetric and traditional in-person survey methods. He is an award-winning photographer and many of his wonderful photographs are included in this book. This photo shows Macus on the Stanley Park seawall with the Lions Gate Bridge in the background. *Photo by Nattipat Vesvarute, 2020.*

An important seabird-related thesis has come out of Royal Roads University in Victoria. For her M.Sc. thesis under the supervision of Alan E. Burger at Royal Roads, Trudy Chatwin determined set-back distances required to protect nesting and roosting seabirds from boat disturbance.[108] The study was conducted in 2006 and 2009 at a number of colonies in the BC Salish Sea as well as at some colonies on the west coast of Vancouver Island. Chatwin pursued her Master's degree while she was employed at MOE (see *BC Ministry of Environment* above).

Pacific WildLife Foundation (2003-2023)

In 2003, Rob Butler (Figure 74) became president of West Coast Whale Research Foundation that had been founded by Jim Darling in 1981. Butler helped restructure and expand the scope of the organization and the name was changed to the Pacific WildLife Foundation. Records of nesting seabirds have frequently been collected as part of their ongoing efforts in support of wildlife conservation in the Salish Sea. Much of their work has been done in collaboration with others, including Black Oystercatcher surveys in the GINPR in partnership with Parks Canada (see above),[57] the BC Breeding Bird Atlas project in conjunction with Birds Canada and others (see below),[45] and more recent studies on the status and distribution of marine birds and mammals in the Greater Vancouver and Howe Sound areas with Birds Canada.[58, 59, 61, 62]

Figure 74. Rob Butler has been immersed in the study and conservation of the natural world throughout his adult life. After an inspired career with the Canadian Wildlife Service, Rob continued his commitment to the study and protection of wildlife through his involvement as president and now director of the Pacific Wildlife Foundation, a non-profit foundation whose slogan is "objective science for conservation." The foundation is now based out of Port Moody, BC and is affiliated with Simon Fraser University and Reed Point Marina. *Photo by Ruth Foster, Port Moody, BC, 17 November 2017.*

Biodiversity Centre for Wildlife Studies (2004-2023)

The Biodiversity Centre for Wildlife Studies (BCFWS) in Victoria was established in 2004 by Wayne Campbell and his wife Eileen (Figure 75). The centre is the current home of the BCNRS that has been managed and funded by the Campbells since 1966, with support since 2004 by members of the Biodiversity Centre for Wildlife Studies and the Ron Jakimchuk Wildlife Heritage Foundation. It is thus the repository for most of the historical data on nesting seabirds in BC and continues to receive and archive additional seabird nesting records. Members of the BCFWS have also been conducting surveys of nesting seabirds at some colonies in the southern Strait of Georgia and Haro Strait since 2004. This four-volume treatise on seabird colonies in BC has been produced as part of their journal publication *Wildlife Afield*.

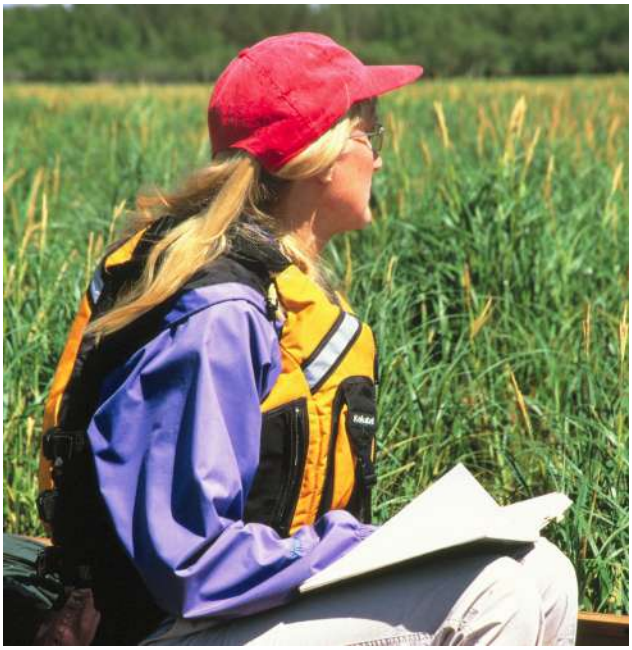



Figure 75. The Biodiversity Centre for Wildlife Studies (BCFWS) is a non-profit society registered under the *BC Societies Act* and plays a unique and vital role in wildlife conservation in BC. Preliminary research conducted before the BCFWS was created found that there was no registered society or government agency in the province that was soliciting, compiling, and archiving historical information on all wildlife in BC. In fact, many extremely valuable historical data contained in unpublished reports and notebooks were routinely being lost as many organizations and institutions were divesting themselves of such records. Since the BCFWS was established in 2004, initially funded by Wayne (left) and Eileen Campbell, original or copies of field diaries and often entire libraries have been donated, collected, and catalogued from about 250 living and deceased wildlife observers. Compilation of data from archived sources is ongoing. The BCFWS publishes a peer-reviewed, bi-annual, natural history journal *Wildlife Afield*, annual BC Nest Record reports, and books. The four volumes of this seabird catalogue have been published as part of the *Wildlife Afield* journal series. BCFWS members also conduct research and surveys to gather data on numerous wildlife species. For example, special projects of the BCFWS currently include comprehensive, "in-marsh" surveys of interior wetlands [591] and providing nesting platforms and monitoring populations of Black Terns (*Chlidonias niger*) at colonies throughout BC.[592] *Photos by Eileen C. Campbell (left) and R. Wayne Campbell, Cecil Lake, BC, 20 June 2008.*

BC Breeding Bird Atlas Project (2008-2012)

Records of nesting seabirds in the BC Salish Sea were collected during field surveys for the *Atlas of the Breeding Birds of British Columbia* conducted in 2008-2012.[45] The atlas project was part of a national conservation program led by Birds Canada (formerly Bird Studies Canada) and Environment Canada in partnership with provincial governments, natural history organizations, and the private sector. Partners in BC included Birds Canada, Canadian Wildlife Service, BC Ministry of Environment, BC Nature, BC Field Ornithologists, Biodiversity Centre for Wildlife Studies, Louisiana Pacific, and the Pacific Wildlife Foundation. The project teamed a small group of professionals with an army of volunteer birdwatchers and many generous donors from public and private sectors. Coordinated by the staff of Birds Canada, the project was guided by a steering committee composed of representatives of the major partners in the project. More than 1,300 citizen-scientists were organised by a group of 45 volunteer regional coordinators who spent five years (2008-2012) logging over 56,000 hours of field data collection.

Carter Biological Consulting (2009-2015)

Harry R. Carter was a native son of Victoria who was a major participant in the BCPM seabird surveys in the 1970s (Figure 76). In the first volume of this treatise,[335] we presented a tribute to Harry, who died in 2017. In 2003, Harry returned to BC after a 20-year stint in California working with the U.S. Fish and Wildlife Service and Humboldt State University. His passion for seabirds never waned and he conducted a number of surveys of seabird colonies in the Strait of Georgia between 2009 and 2015, under the banner of his own consulting company in Victoria. Much of his focus during those years was

on nesting cormorants and he collaborated with others, including Trudy Chatwin at MOE and Mark Drever at CWS, to conduct regular surveys to monitor cormorant breeding populations in the area. Chatwin and Drever carried on those surveys after Harry died.[112]

Figure 76. Harry Carter was passionate about seabirds his entire life. He participated in most of the seabird surveys conducted by BCPM in the 1970s. After an illustrious career working on seabirds in California, Harry returned to BC in 2003 and continued his seabird work here and abroad until his untimely death in 2017.[335] Inspired in his early years by Wayne Campbell and Charles Guiguet at the BCPM, Harry in turn was an inspiration to many seabird students throughout his productive career. Harry is shown here captivated by an adult Cassin's Auklet he extracted from a burrow on the Harvey Islands in 1976 (left) and during surveys by zodiac in 2007. *Photos by R. Wayne Campbell, 24 June 1976 (left) and 15 August 2007.*

The Race Is On

Special dynamics develop among people who spend extended periods together in isolated field camps or expeditions. In those situations, people are dependent on each other for their well-being and survival, need each other to accomplish the work, and have only each other to interact with. Working and living for weeks or months together away from larger society is an immersive and unique experience. And every group develops its own dynamics. Individuals sometimes develop an intense enmity for another member of the field crew and loathe having to work with them on a daily basis, but most times, people develop special bonds of friendship. Established friendships can be lasting, or they may be particularly associated with the field camp environment and not persist outside that environment. People that you build an intense connection with during a field season, you may never see again after the field season is over. But that's ok and is somehow part of the specialness of such relationships.

During the BCPM seabird surveys in the 1970s, one of the people I (Michael) worked with extensively was Harry Carter. I developed a brotherly connection with Harry during those surveys, and although we spent little time together in subsequent years, the bond persisted, probably because we both maintained a passion for seabird work and conservation throughout our lives. Harry was always the most ardent supporter of my work on this four-volume treatise of seabird colonies in BC. Sadly, Harry died before the first volume was published

(see our tribute to Harry in volume 1 [335]). Though he's gone, I still feel a connection with Harry and I fondly remember our experiences together as young adults during the 1970s field work. As often occurs with real brothers, our relationship at that time was tinged with a healthy competitive edge. I especially remember our races to find Black Oystercatcher nests (Figure 77).

On the BCPM surveys, we explored many rocks and islets where oystercatchers might have been nesting. Oystercatcher nests are notoriously difficult to find and Harry and I had an unspoken challenge to be the first to find a nest on each islet we landed on. Just a look was all that was needed to start the race. As we were approaching a suitable islet, we both would scan ahead for an adult oystercatcher that might react to our approach and thus give away a nest location. When we landed, the race was on! Of course we had to be careful - you need to watch where you walk to make sure you don't step on cryptic eggs or chicks. Over the course of our surveys in the 1970s, I found 472 nests and Harry found 473 nests - just kidding, we didn't keep track, but our competition added a little extra excitement to what was already a thrilling job.

Figure 77. Black Oystercatcher nests and chicks are often well concealed and it is always an enticing challenge to find them during seabird surveys. *Photos by Moira J.F. Lemon.*

Wildwing Environmental Research (2018-2023)

Michael S. Rodway and Heidi M. Regehr (Figure 78) formed their own consulting company, Wildwing Environmental Research, in 2004. In 2021 and 2022, they conducted surveys for nesting seabirds in the Greater Vancouver area to obtain data for this publication. Between 2018 and 2023, Rodway also sent out requests for seabird nesting records to numerous birdwatchers, naturalists, government biologists, city officials, institutional employees, and university professors and students. Enthusiastic responses to those requests added much data to the colony accounts in this book.

Figure 78. Production of this four-volume treatise on seabird colonies in BC fulfills a decades-long vision of Michael Rodway. Throughout the many years of this volunteer work, he has been encouraged by his long-term partner Heidi Regehr, who has provided unlimited editorial, financial, and moral support for the project. They are shown here at Rathtrevor Beach on the shores of the Salish Sea. *Photo by Anna Coombs, 12 September 2012.*

SEABIRD BREEDING POPULATIONS IN THE BC SALISH SEA

Identifying and Addressing Issues with the Historical Data

Before interpreting the status and trends for seabird breeding populations in the BC Salish Sea, we needed to address errors and/or omissions, or lack of comparability in survey or analysis methods, among data sources. Since the earlier compilations by Drent and Guiguet (Figure 79) [144] and Campbell,[70] much effort has been spent attempting to determine changes in the abundance and distribution of breeding populations in the Strait of Georgia, especially for cormorants [1, 114, 421, 428] and Glaucous-winged Gulls.[30, 33, 101, 377, 420] Trend information from those studies has been extremely important to management and conservation efforts related to marine wildlife in the rapidly developing Salish Sea area. We in no way mean to detract from the value of those studies, but in some cases, to evaluate population status and changes over time, we had to correct errors or inconsistencies and/or reinterpret data that had been previously summarized and analyzed. We have also incorporated data that were previously unavailable or not considered by other authors. Required modifications to previous summaries and interpretations were often minor (e.g., small changes in numbers of breeding pairs at a colony) but in some cases, substantially changed our understanding of population trends in the BC Salish Sea.

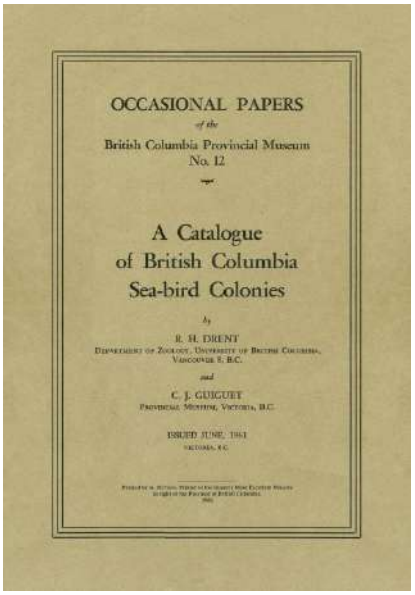


Figure 79. Many changes have occurred in the distribution and abundance of seabirds nesting in the BC Salish Sea since Rudi Drent published the first catalogue of seabird colonies in 1961.[144]

Minor errors have been made by many authors and compilers, including ourselves in previous publications. For example, in the previous two volumes of this treatise [336, 337] we found and corrected errors we had made in the first volume.[335] Inevitably, some errors will persist in this fourth volume even though we have spent much effort and time reviewing and comparing data sources in an attempt to present data as accurately as possible. As best as we were able, we have identified and corrected past errors through comparisons with original data sources. Identified errors help explain many of the discrepancies in data presented by different authors. However, not all discrepancies are due to errors; some are simply due to different choices made by authors about how to interpret data or which data to include. We use footnotes in colony tables to identify where errors have been corrected, and we sometimes mention errors in the text that discusses specific records. We also discuss historical differences in the interpretation or inclusion of specific records. In the sections below we outline errors, omissions, and lack of comparability among datasets due to inconsistencies in survey, reporting, and analysis methods that affect estimates of historical population sizes and interpretation of population changes. We describe below how we dealt with problems and uncertainties when compiling data for population estimates and when comparing across areas and years. Even when consequences of the changes relative to previous studies and data summaries are minor, it is important to clearly track and report on data interpretation and use to prevent confusion and the propagation of errors or misinterpretations into the future. We discuss some identified errors and previous misinterpretations of data in greater detail in the individual colony accounts.

Pelagic Cormorant Data

Errors in Compiling Data. During data compilation for Pelagic Cormorants, we identified errors in previous summaries that affect historical estimates of breeding populations. Campbell [70] summarized counts made in the Strait of Georgia in 1974, as well as in Queen Charlotte Strait, the Scott Islands, and on the west coast of Vancouver Island in 1975 and earlier (see Outer Coast volume [337]). In that summary, the total Pelagic Cormorant population estimated for the Strait of Georgia was given as 2,038 pairs. Three errors that have come to light since require that we revise that figure. First, number of nests counted at Gordon Head was 12, not 20 as

listed by Campbell.[70] Second, 19 nests counted at Augustus Point and 12 nests counted on Fiddle Reef were accidentally omitted. The revised total for the 1974 survey of the Strait of Georgia is thus 2,060 pairs at 26 sites (see section below on trends for Pelagic Cormorants). Third, although it did not change the total estimate, Campbell [70] mistakenly listed 91 nests on Five Finger Island that were actually counted on the adjacent Hudson Rocks (Figure 80). That error has propagated through all subsequent compilations.

Figure 80. Despite our best efforts, errors are inevitably made in almost all compilations that involve large datasets. This Pelagic Cormorant nest and 90 others that were found on Hudson Rocks in 1974 have been incorrectly listed as being on nearby Five Finger Island.[70] The four main Hudson Rocks and the one Five Finger Island have often been misconstrued as the "five fingers" of Five Finger Island, which is likely what led to this historical error in data compilation. *Photo by R. Wayne Campbell, 5 July 1974.*

Other errors have been made in subsequent compilations for Pelagic Cormorants. Vermeer and Rankin [421] omitted the count (47 pairs) for Christie Islet (Figure 81) listed in Campbell [70] and quoted the count for Chain Islets/Great Chain Island as 183 instead of the correct 185 pairs. Their total estimate was thus 49 pairs short of that cited in Campbell.[70] They also missed the omitted counts for Augustus Point and Fiddle Reef (described above) that they were likely unaware of. Those errors propagated through the more recent compilations of Vermeer et al.[428] and Chatwin et al.[114] In addition, Race Rocks was included in the Strait of Georgia comparisons in those three publications, as well as in the most recent by Carter et al.,[101] although Drent and Guiguet [144] and Campbell [70] considered that colony as part of the west coast Vancouver Island region, as do we and as did Vermeer in his later compilation for west coast Vancouver Island.[426] Vermeer and Rankin [421] and Vermeer et al.[428] added the 160 nests for Race Rocks given in Campbell [70] to the total they presented for 1974 (2,149 nests). Chatwin et al.[114] also added Race Rocks but omitted 91 nests on Five Finger Island (actually on Hudson Rocks – see above) in their comparison table and quoted the 1974 total as 2,058 nests. Many of these errors were corrected by Carter et al.,[101] but those authors introduced two other minor errors in their compilation of 1974 data: for Bare Point they used an estimate of 125 pairs made by John Comer on 9 June 1974 rather than the actual count of 118 nests made by Wayne Campbell on 13 July 1974; and for Mitlenatch Island they erroneously listed 293 nests instead of the correct count of 286 nests. See section below on trends for Pelagic Cormorants for a corrected comparison of those data.

Figure 81. The record of 47 Pelagic Cormorant nests counted on Christie Islet in 1974 was inadvertently omitted in several subsequent assessments of trends in breeding populations in the Strait of Georgia. *Photo by R. Wayne Campbell, 6 July 1974.*

Misidentification of Historical Breeding Sites. We have identified three problems in the most recent compilation by Carter et al.[101] regarding the identification of historical breeding sites for Pelagic Cormorants. In two cases, records from Christie Islet were incorrectly assigned to other sites. First, Carter et al.[101] list Anvil Island (a relatively large, forested island and not a known seabird colony) as a historical nesting site, citing one breeding record from 1956. The record (a set of eggs collected on 1 June 1956 [536d]) does give Anvil Island as the location but describes the site as "rock off Anvil Island," which undoubtedly refers to Christie Islet (Figure 82). Drent and Guiguet [144] would have been aware of egg specimens in the RBCM collection when they made their compilation and would have listed Anvil Island as a breeding site if eggs had been collected there. They give counts for both Christie Islet and

Pam Rock from 1956 but make no mention of nesting on Anvil Island. There are three Pelagic Cormorant, 10 Glaucous-winged Gull, and six Pigeon Guillemot egg specimens from 1949 held in other museums that are also described as "off Anvil Island." There is little doubt that they originated on Christie Islet (see Christie Islet account). Thus, we think it is safe to assume that the Anvil Island record considered by Carter et al.[101] referred to Christie Islet.

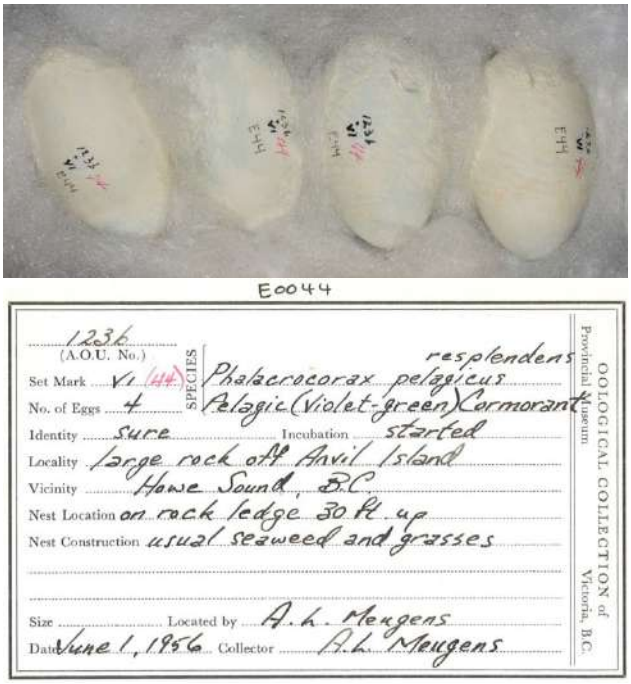


Figure 82. This Pelagic Cormorant egg specimen collected by Arthur Meugens in 1956 and now housed in the Royal British Columbia Museum was almost certainly obtained on Christie Islet, which is located south of Anvil Island. *Images courtesy of Royal BC Museum collections.*

Second, Carter et al.[101] also list Gull Island, Horseshoe Bay as a historical nesting site for Pelagic Cormorants, citing one nest found in 1957. Drent and Guiguet [144] report an isolated pair of Glaucous-winged Gulls nesting in 1957 on cliffs just north of Horseshoe Bay but we know of no historical records of Pelagic Cormorants nesting in the area except to the south of Horseshoe Bay on Passage Island or further away to the north on Pam Rock or Christie Islet. The mapped location for this site in Carter et al.[101] corresponds to Whyte Islet, to the south of Horseshoe Bay, but as far as we know only Black Oystercatchers and Glaucous-winged Gulls have been found nesting there, in 1978 and 1981. The record most likely refers to four Pelagic Cormorant eggs collected by John K. Cooper on 30 May 1957. The location was given as "Gull Island, Howe Sound" in the vicinity of Horseshoe Bay. Gull Island was an alternate name for Christie Islet and Cooper was undoubtedly referring to Christie Islet. Cooper gave the same location for Glaucous-winged Gull and Pigeon Guillemot eggs collected on the same date in 1957 and for specimens of all three species previously collected there on 10 June 1956. Drent and Guiguet [144] described the visit by Cooper accompanied by Meugens to Christie Islet on that date in 1956 and we are confident that Cooper was referring to Christie Islet for all those specimens.

Third, we think the listing of Link Island as a historical nesting site for Pelagic Cormorants is not warranted. The one nesting record cited by Carter et al.[101] refers to one old, unattended nest seen by us (MSR) in 1978. Such a nest may represent a past breeding attempt by adult birds, but young and courting cormorants will also build trial nests prior to breeding, especially in peripheral areas.[356, 402] In either case, an old, unattended nest provides no actual evidence of historical breeding and we do not think it constitutes a breeding record for this site. We made similar observations at Lyall Harbour in 1977 and at the Little Group in 1978 but again did not consider them breeding records for those sites. Carter et al.[101] made a different decision about the Link Island record but, inconsistently, did not identify Lyall Harbour or the Little Group as historical breeding sites, even though they had similar records. Although we did not consider old, unattended nests to be breeding records, we describe all such records in the relevant colony accounts. Places where nests have been built in the past remain potential breeding sites and are worth monitoring for possible future colonization, such as occurred at the Little Group site in 1989.

Varying Survey Coverage. Comprehensive cormorant surveys have been conducted since Drent and Guiguet [144] but some known nesting sites have been missed on every survey and undoubtedly other active sites have remained undiscovered even though surveys have been more complete and repeated more often in the Strait of Georgia than in other regions of BC. This problem is difficult to overcome with limited resources. Pelagic Cormorants are fickle in their use of nesting sites and are quickly responsive to disturbance and other impacts at nesting colonies. Site use changes from year to year and often within a season. More than any other seabird species nesting in BC, reliable population estimates at regional and provincial scales for Pelagic Cormorants depend on concurrent surveys of all nesting sites.

The most comprehensive surveys for cormorants were conducted in 1974,[70, 523] 1983,[421] 1987,[428] 2000,[114] and 2014.[101] Drent and Guiguet [144] compiled estimates from a variety of sources and years with the most quantitative data from 1959 and 1960. Actual nests counts were obtained for three colonies in 1959 and four colonies in 1960. Estimates based on numbers of birds seen were obtained for two additional colonies in 1959 and one additional colony in 1960 (Figure 83). We prefer to make inter-annual comparisons only for actual nest counts conducted in one season, but because there are so few data from that time period available, we have combined records from 1959 and 1960 and included estimates based on numbers of birds seen. This confounds comparisons because of the year-to-year differences that occur in cormorant numbers at a particular colony and the inaccuracy of estimating numbers of nests from numbers of birds present. These problems should be kept in mind when interpreting results.

Figure 83. The Pelagic Cormorant colony on Mitlenatch Island was one of 21 known colony sites and one of only seven colonies for which Drent had reliable nest count data when he produced his summary of nesting seabirds in BC in 1961.[144] At present, we know of 58 colony sites where Pelagic Cormorants have nested in the BC Salish Sea. *Photos by R. Wayne Campbell, Mitlenatch Island, BC, 1965 (left) and 1969.*

The most thorough Pelagic Cormorant survey in the 1970s was conducted by the BCPM in 1974.[70] Still, three colonies with past nesting were not visited by BCPM crews in 1974 (see section below on trends for Pelagic Cormorants), though they were visited in 1976 or 1977. In 1983, no data were reported [421] for 12 previously-used colonies. The most recent, previous counts at those 12 sites totaled 183 nests, 117 of which were counted only two years earlier in 1981. In addition, the Second Narrows Bridge colony was not included by Vermeer and Rankin [421] in their list of nesting sites in 1983; it was first discovered that year by Hobson and Wilson.[215] Similarly, 11 historical nesting sites were not included in the table of Pelagic Cormorant colonies surveyed in 1987,[428] and 12 and 11 known nesting sites were not visited during the 2000 and 2014 surveys, respectively.[101, 114, 459] Three of the 11 sites not surveyed in 2014 were visited in 2013 or 2015

and counts from those years were included in the 2014 population summary.[101]

In most survey years, we are confident that sites without reported data on nesting Pelagic Cormorants were simply not visited. However, in 1987, other published data exist [158, 427, 428] which indicate that many sites without reported data were surveyed. The best data from which we can infer absence of nesting Pelagic Cormorants are for sites where other species were reported nesting in 1987. Surveys in 1987 were conducted by Ken Morgan, who concurrently surveyed cormorant,[428] Black Oystercatcher,[427] and Pigeon Guillemot [158] nesting populations. Double-crested Cormorants were reported nesting at Rose Islets,[428] and Black Oystercatchers and/or Pigeon Guillemots were reported on Galiano Island - North Cliffs, Prevost Island - South Cliffs, and Little Group/Dock Island.[158, 427] Thus, it was clear that those sites were visited in 1987 and it seems safe to conclude that no Pelagic Cormorants were seen nesting at those colonies that year. Nesting by Pelagic Cormorants at the Little Group/Dock Island colony was not confirmed until 1989 (though unattended nests were seen there in 1978), so it is uncertain whether that colony was in existence in 1987 and we did not consider it a historical colony at that time.

Although no specific data survive to confirm visits to other colonies in 1987, the described methods for those surveys indicate that many other sites were likely surveyed and no Pelagic Cormorant nests were seen. From the published papers, we inferred that all islands in the Gulf Islands were boated around, but only known nesting sites in the northern Strait of Georgia were visited. Emms and Morgan [158] were explicit in the Pigeon Guillemot paper: "all islands, islets, and rocks from Five Finger Island south were surveyed between 5 and 23 June. North of Five Finger Island, only previously known [Pigeon Guillemot] colonies and cormorant colonies were surveyed on 8 and 9 July." Similarly, in the Black Oystercatcher paper,[427] it says, "We surveyed the Gulf Islands from Hudson Rocks near Nanaimo to Chain Islands near Victoria for nesting oystercatchers between 5 and 23 June. We circled all islands (n = 284) by motor boat and landed on any island on which we observed oystercatchers. We searched these islands on foot to obtain evidence of nesting, such as presence of nests or young; in their absence we tried to determine if the birds' behaviour indicated nesting. We also censused 30 islands north of the Gulf Islands for nesting oystercatchers on 8 and 9 July." The cormorant paper [428] does not specify whether all shoreline areas in the Gulf Islands were searched for cormorant nests, but it does say that all islands were circled by boat (again n = 284) to collect habitat data.

Given that all islands were circled in the Gulf Islands in 1987, we assumed that in that year no Pelagic Cormorants were seen nesting at sites in the Gulf Islands that were not listed in the table of colonies in the cormorant paper.[428] We also assumed that no Black Oystercatchers or Pigeon Guillemots were seen at sites in the Gulf Islands not listed in the papers for those species by Vermeer et al.[427] and Emms and Morgan,[158] respectively. For colonies north of Nanaimo, there are different sets of colonies listed in the cormorant,[428] Black Oystercatcher,[427] and Pigeon Guillemot [158] papers. We assumed that there were no cormorants nesting at colonies that were listed in the Black Oystercatcher or Pigeon Guillemot papers but not in the cormorant paper. We further assumed that there were no Black Oystercatchers seen at sites listed in the cormorant or Pigeon Guillemot papers but not in the Black Oystercatcher paper (see below). Similar assumptions were made for Pigeon Guillemots. We have some concerns about the assumptions for Pelagic Cormorants because, as noted above, 11 previously-known colonies were not listed by Vermeer et al.[428] in their table of Pelagic Cormorant colonies in the Strait of Georgia. They were likely unaware of those colonies at that time and may not have targeted them in their surveys. Assuming that there were no cormorants nesting at those 11 sites in 1987 makes a difference in the interpretation of population trends, and it should be kept in mind that no data exist to confirm this assumption. In a personal communication in 2021, Ken Morgan,[490] who conducted the 1987 surveys, corroborated all our assumptions, but cautioned that the greatest focus was placed on previously reported colonies that they were aware of at the time. If we accept the above assumptions, then there were only three previously-known Pelagic Cormorant colonies (Brothers Islands near Victoria and Rabbit and Bertha islands in the northern Strait of Georgia) that were not surveyed in 1987.

Assigning inactive status when no data exist. A major concern with the recent compilation by Carter et al.[101] is that they assigned inactive status (zero nests) to Pelagic and Double-crested cormorant colonies in years when there were no survey data available (see Tables 1 and 2 in that publication [101]). All surveys in the Strait of Georgia have missed some sites where Pelagic Cormorants had previously been recorded nesting. This complicates the

interpretation of overall trends because Pelagic Cormorants are notorious for using sites intermittently and show tremendous variation in the numbers of pairs nesting at any particular site. [102, 341] Assigning inactive status to unsurveyed sites introduces biases into comparisons across years and compromises the interpretation of population changes. It also distorts the findings of previous workers, especially Drent and Guiguet,[144] which Carter et al.[101] use as their historical baseline, and Chatwin et al.,[114] who explicitly identified previously used sites that were not surveyed in a particular year and explained how such missing data limited comparisons across years. Dedicated surveys were not conducted in 1959-1960 and data in Drent and Guiguet [144] were gathered opportunistically from a variety of sources, mostly by correspondence. Most areas had not been surveyed and they cautioned (page 4) that "…it should be clear by now that our knowledge is scanty, and most apparent gaps indicate nothing but unknown areas." It is misleading to assign data where none exist (Figure 84). A further problem with those early records is that many of the quantitative data presented represent approximate estimates by various observers based on numbers of birds seen and were not actual nest counts. To be fair to Carter et al.,[101]

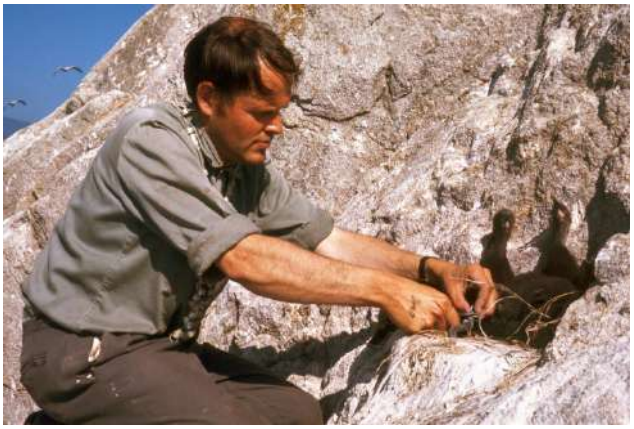


Figure 84. While he was a graduate student at UBC in 1960, Rudi Drent compiled all data that he could find on nesting seabirds at colonies in BC. Available data were very limited and many seabird nesting sites were unknown, even in the busy waters of the Salish Sea. In his published catalogue,[144] Rudi cautioned that "our knowledge is scanty, and most apparent gaps indicate nothing but unknown areas." Lack of data for sites that were later known to be breeding colonies thus cannot be interpreted to mean that nesting seabirds were absent from those sites at that time. Rudi is shown here banding nestling Pelagic Cormorants on Christie Islet in 1970. *Photo by R. Wayne Campbell, 18 July 1970.*

the misinterpretation of the data from Drent and Guiguet [144] began with earlier studies.[421, 428] The data have been considered to represent a total population count for the Strait of Georgia in 1959-1960 and have been used as a baseline from which to infer population changes since. This compromises our understanding of historical changes.

Lumping of Data for Multiple Colonies. Another problem complicating the interpretation of changes is the tendency for recent authors to combine sites in their data presentation. Most recent compilations for Pelagic Cormorants combine records for five pairs of adjacent sites: Vivian Island and Rebecca Rock, Franklin and Merry islands, Christie Islet and Pam Rock, Prospect Point and Siwash Rock, and Harris Island and Lewis Reef (plus Fiddle Reef in Carter et al.[101]). This is confusing and makes identification of nesting sites and tracking of population changes difficult. For example, there are no definitive records of Pelagic Cormorants nesting on Rebecca Rock, as far as we know (Figure 85). Also, by combining sites, we lose information on movements between those sites. For example, following disturbance on Christie Islet in the mid-1970s, cormorant numbers decreased there and increased on the adjacent Pam Rock. We recommend that all historical nesting sites be visited on future surveys and that data are reported separately for those different sites.

Vermeer and Rankin [421] and Vermeer et al.[428] presented Pelagic Cormorant records for 33 and 34 sites (excluding Race Rocks) surveyed in 1983 and 1987, respectively. In 1983, 21 sites with nests and 12 sites without nests were reported. Three of the active sites and one unused site listed lumped data for pairs of islands (Vivian Island and Rebecca Rock, Franklin and Merry islands, Christie Islet and Pam Rock, and Harris Island and Lewis Reef). For the active sites, we could not tell which of the two colonies in each pair had nests. Similarly in 1987, there were 25 sites listed with birds nesting and nine without, with five of the sites lumping data for paired islands (with the addition of Siwash Rock lumped with Prospect Point). Data for those paired islands were also combined from the more recent surveys in 2000 and 2014, [101, 114] but unpublished data provided by Trudy Chatwin [459] allowed us to separate counts for all island pairs except Christie Islet and Pam Rock in 2000. In dealing with these paired islands, we have assumed that there were no nests on Rebecca Rock as there are no specific records of Pelagic Cormorants ever nesting there. Thus, we have not listed Rebecca Rock as a historical nesting site for Pelagic Cormorants and

assign the count data given for Vivian Island and Rebecca Rock together only to Vivian Island. This assumption may be wrong. No nests were reported on Harris Island and Lewis Reef in either 1983, 1987, or since and so the combined data were not an issue in that case.

Figure 85. Several compilations of seabird nesting records in the BC Salish Sea have lumped data for pairs of adjacent colony sites. This practice compromises our understanding and interpretation of the status and trends of seabird breeding populations on these colonies. For example, although they are 4 km apart, Rebecca Rock (left) and Vivian Island in the northern Strait of Georgia have often been lumped together in summaries of seabird colony data. Pelagic Cormorants have been listed as nesting on this pair of colonies in several publications, but, as far as we know, that species has never been recorded nesting on Rebecca Rock. Further, unlike Vivian Island that has cliffs along the shore (right), Rebecca Rock is a low-lying rock without much suitable nesting habitat for Pelagic Cormorants. Listing Rebecca Island along with Vivian Island as a nesting site for Pelagic Cormorants is misleading. *Photos by R. Wayne Campbell, 2 July 1974.*

Inconsistent Survey Methods. A final problem confounding comparisons for cormorants is that different survey methods have been used in different years. Most early surveys by the BCPM and others were conducted on land by walking through the colonies and inspecting all nests if possible. Since 1983, cormorant colonies have mostly been surveyed from the water. In 1987, cormorant nests on Great Chain Island, Five Finger Island, and Hudson Rocks were counted on land; all other colonies were counted from the water.[428] Surveys from the water are preferable if they minimize disturbance to nesting birds, but in many cases they underestimate nesting populations. For example, on Chain Islets/Great Chain Island in 1983, cormorant nests were counted from the water by Vermeer and Rankin [421] in May-June and from land by the BCPM party in August; [72] the survey from the water tallied 71% of the Double-crested Cormorant and only 53% of the Pelagic Cormorant nests seen from land. Such differences are not universal and in some cases more nests are visible from the water than from land. Also, many Pelagic Cormorant colonies on cliffs cannot be easily surveyed from land. Survey methods are best tailored to fit characteristics of individual colonies and need to consider the impacts of disturbance and the objectives of the survey. Surveys from the water provide less information on breeding chronology and success (Figure 86). Comparisons across years are most robust if consistent methods are used, at least on each colony. Survey timing also affects nest counts and data are most comparable if timing of surveys is similar across years.

Double-crested Cormorant Data

Errors in Compiling Data. Some data and comparability issues were also found for Double-crested Cormorants. We have identified six compilation errors that have affected summaries of historical population sizes and changes. First, a 1959 record [350] of a good-sized colony on Five Finger Island (or the adjacent Hudson Rocks – see Five Finger Island account) was omitted in all subsequent compilations, including Drent and Guiguet.[144] Second, Drent and Guiguet [144] listed four nests on Chain Islands in 1960 but the number of nests counted was 14.[523] That mistake was carried through subsequent compilations,[266] although most summary statistics for 1959/1960 used the nine nests counted in 1959.[101] Mistakes in summation in original records accounted for three errors: 89 nests were counted on Rose Islets in 1974 but reported as 80 nests by Campbell [70] and all subsequent authors; 582 nests were counted on Mandarte Island in 1974 but reported as 482 nests by all authors; and 98 nests

Figure 86. On some cormorant colonies, depending on the distribution of nests, more accurate counts can be obtained by counting nests from land than from the water. The opposite can also be true, and sometimes surveys from both land and water are needed to obtain accurate results. Counting nests from land has the added advantage that nest contents can be determined, providing data on breeding chronology and success. However, surveys from land can cause greater disturbance to nesting birds. Here (clockwise from top left): clutch sizes could be recorded in these Pelagic and Double-crested cormorant nests on Greater Chain Island counted in 1981; Wayne Campbell and son, Sean, are counting and recording contents of cormorant nests on Chain Islets in 1974; flushing adults off their nests can result in predation of exposed eggs and small chicks; and heat stress to small chicks, like these naked Double-crested Cormorant chicks (one with inflated neck) exposed on Rose Islets, is also a concern. Visibility of nests from land or water and potential impacts of disturbance are important to consider in determining the most appropriate survey methods for each colony. *Photos by R. Wayne Campbell, 12 July 1981, June 1974, 19 July 1973, and 13 July 1974.*

were counted on Christie Islet in 1978 but reported as 108 nests.[523] Finally, total nests counted on Chain Islets/Great Chain Island in 1990 by Breault [43] has previously been reported by us [335] and others [114, 266] as 686 but should have been 702. Breault counted 686 nests during his survey late in the season on 8 August to determine productivity (see his Appendix 10), but he counted 702 nests during his initial nest survey on 25 June (see his Table 9).

Assigning inactive status when no data exist. As was the case for Pelagic Cormorants, some authors [101, 266] have assigned inactive status to Double-crested Cormorant colonies in years when no survey data were available, especially for the period 1959/1960 summarized by Drent and Guiguet.[144] It is tempting to assume that unreported colonies were not in existence before they were discovered, but the pitfalls of that assumption are obvious. For example, at the very conspicuous and picturesque Ballingall Islets, nesting by Double-crested Cormorants was likely occurring undetected for more than a decade before it was first reported (see Ballingall Islets account).[144, 272] Similarly, it is unknown when the Double-crested Cormorant colonies at Canoe Islet and Rose Islets were established and Drent and Guiguet [144] had no information on those colonies. An estimated 65 pairs of Double-crested Cormorants, as well as Pelagic Cormorants, Glaucous-winged Gulls, and Pigeon Guillemots were found nesting on Rose

Islets when they were first visited in 1963 and most likely that colony was in existence at the time Drent and Guiguet made their summary (Figure 87). This is simply further evidence of the incomplete nature of the seabird data available to Drent and Guiguet and of the limitations on tracking population trends from that period, which Drent and Guiguet clearly acknowledge.

Figure 87. The Double-crested Cormorant colony on Rose Islets was unknown when Drent and Guiguet published their seabird catalogue in 1961.[144] However, it was most likely active at that time as it was well established when it was first documented in 1963. *Photo by R. Wayne Campbell, 13 July 1974.*

Inconsistent Survey Methods. As mentioned above in relation to Pelagic Cormorant data, survey methods have been inconsistent. Comparisons across years are most robust if consistent methods are used for each colony.

Black Oystercatcher Data

Varying Survey Coverage. Data for Black Oystercatchers are difficult to interpret and comparisons across years and between areas are compromised due to varying survey and reporting methods. The Gulf Islands were more thoroughly surveyed than the northern Strait of Georgia during the major surveys for nesting Black Oystercatchers in 1987 [427] and 2005/2006.[57] In 1987, all islands in the Gulf Islands between Hudson Rocks near Nanaimo and Chain Islets/Great Chain Island near Victoria were circled by boat and observers landed on any islands where oystercatchers were seen. A total of 284 islands in the Gulf Islands were checked. Only 30 islands were visited in the northern Strait of Georgia.[427] Vermeer et al.[427] listed only 10 sites in the northern Strait of Georgia where they found nesting oystercatchers and did not list the other 20 surveyed sites where no oystercatchers were found nesting. They stated that the 30 islands visited in the northern Strait of Georgia were checked during surveys for other species on 8-9 July 1987. Emms and Morgan [158] surveyed previously known Pigeon Guillemot and Pelagic Cormorant colonies in this area on 8-9 July 1987, and we assumed that the islands surveyed for oystercatchers in the northern Strait of Georgia in 1987 by Vermeer et al.[427] were the same as the ones surveyed by Emms and Morgan.[158] We thus gave a count of zero for Black Oystercatchers for 1987 on islands (e.g., Vivian Island) surveyed by Emms and Morgan [158] but not listed as having nesting oystercatchers by Vermeer et al.[427]

Inconsistent Survey Methods. In 2005 and 2006, Butler and Golumbia [57] visited all sites where Vermeer et al.[427] had found oystercatchers nesting plus all other small, bare rocky islands that were considered potentially good nesting sites. They landed on all islands surveyed in the Gulf Islands to search for Black Oystercatcher nests in 2005, but islands in the northern Strait of Georgia were surveyed from the elevated deck of their boat in 2006. Surveys within Gulf Islands National Park Reserve were conducted in cooperation with Parks Canada in 2005. Since 2005, Parks Canada [529] has monitored Black Oystercatcher nesting populations at 20 colony areas, most of which are located within Gulf Islands National Park Reserve. During most Parks Canada surveys up to 2018, islands were searched on foot, unless weather conditions prevented landing. Since 2018, Parks Canada surveyors have less frequently landed on islands, and as of 2022, conducted surveys of all monitored colonies from the water (Figure 88). In their tallies of numbers of nesting pairs, Vermeer et al.,[427] Butler and Golumbia,[57] and Parks Canada [529] included nests counted and nests suspected, based on the behaviour of birds seen. For data from Vermeer et al.[427] and Butler and Golumbia,[57] we could not tell whether nests were found or just suspected on specific colonies, nor what the contents were of nests that were found. Unpublished data from Parks Canada [529] provided detailed information on specific records from Butler and Golumbia [57] for colonies within Gulf Islands National Park Reserve and on subsequent records from the Parks Canada monitoring program. For other colonies in the Gulf Islands surveyed by Butler and Golumbia [57] in 2005, we had no additional information that allowed us to determine whether nests were found or not. Because Vermeer et al.[427] and Butler and Golumbia [57] landed on all islands surveyed in the Gulf Islands, we have

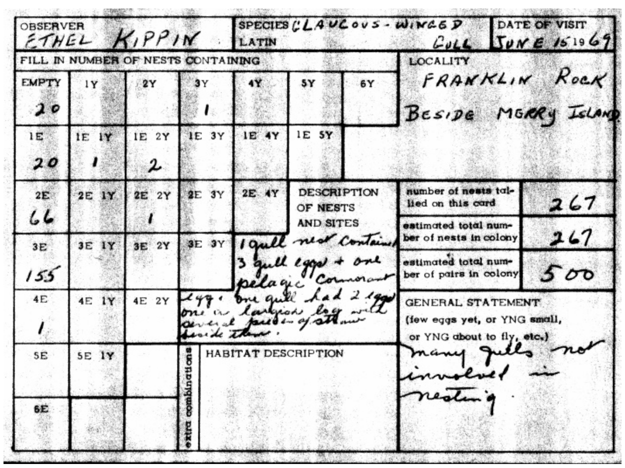
listed all counts for those colonies given by those authors as if they were actual nest counts (unless we had specific information to the contrary), but it should be kept in mind that this was not always the case. For colonies in the northern Strait of Georgia surveyed by Butler and Golumbia [57] in 2006, we assumed that few nests could be seen to confirm nesting during surveys from the boat, and thus considered all records from that area as suspected nesting. Carter [94] counted oystercatchers from the water at a few colonies visited in 2014, but except on Christie Islet provided no information on whether birds may have been nesting; we treated those counts as incidental observations and not breeding records.

Figure 88. Inconsistent survey methodology compromises the comparability of historical survey data for Black Oystercatchers. During surveys conducted before 2005, observers generally landed on islands and searched for nests on foot. Since 2005, it has become more common to survey colonies from the water, and since 2022, all surveys by Parks Canada in the Gulf Islands National Park Reserve have been conducted only from the water.[529] Nests can sometimes be seen from the water, but most often no information is obtained on the presence, numbers, or contents of nests. During water surveys, estimates of breeding populations are based on counts of apparently nesting birds visible on likely nesting territories. *Photo by Mark Nyhof.*

Glaucous-winged Gull Data

Errors in Compiling Data. Some errors were made in the compilation of historical records for Glaucous-winged Gulls that affected recent trend analyses by Blight.[30, 33] Early records for "Yellow Island" by Sprot [369] and Munro and Cowan [274] were mistakenly listed for Chrome Island in the northern Strait of Georgia [30] when in fact they referred to Imrie Island in the Gulf Islands. This mistake was due to confusion about the historical names of those islands: Chrome Island used to be called "Yellow Rock" or "Yellow Island" and Imrie Island was called "Yellow Island" (see island accounts). The error resulted in a historical estimate of 150 pairs nesting on Chrome Island that was used in trend analyses,[30] when in fact no more than three pairs have ever been recorded nesting on that colony. With similar implications for analyses, Blight [30] listed a count of 1,754 pairs nesting on Chain Islets/Great Chain Island in 1968, when in fact only 814 nests (754 on Great Chain Island and 60 on Chain Islets) were counted during the thorough survey conducted by Drent that year.[523] Blight [30] only had the data for Great Chain Island from that year, and the total of 1,754 nests listed was simply

due to a typing error.[453] An estimate of 20 pairs nesting on Ballenas Islands in 1969 by Campbell and Foottit [74] was mistakenly listed as 120 pairs by Blight.[30] On Franklin and Merry islands, Ethel Kippin reported total numbers of nests and total numbers of gulls present on the islands during the years she was stationed there. In her counts of individuals she included many non-breeding birds that she explicitly stated were not involved in nesting (Figure 89).[523] Kippin's estimates of total birds at the colony created some confusion in later compilations of her records. Blight [30] in some cases gave combined estimates of the nesting population on Franklin and Merry islands in 1974-1976 based on the numbers of birds present rather than the number of nests counted (Figure 90). For 1974, 1975, and 1976, Blight [30] listed estimates of 1,005, 622, and 779 pairs nesting on Franklin and Merry islands combined, whereas total nests counted in those years were 639, 583, and 590, respectively.[523]


OBSERVER ETHEL KIPPIN
SPECIES GLAUCOUS-WINGED GULL
LATIN
DATE OF VISIT JUNE 15 1969
FILL IN NUMBER OF NESTS CONTAINING
LOCALITY FRANKLIN ROCK BESIDE MERRY ISLAND

EMPTY	1Y	2Y	3Y	4Y	5Y	6Y
20			1			

1E	1E 1Y	1E 2Y	1E 3Y	1E 4Y	1E 5Y
20	1	2			

2E	2E 1Y	2E 2Y	2E 3Y	2E 4Y
66		1		

3E	3E 1Y	3E 2Y	3E 3Y
155			

4E	4E 1Y	4E 2Y
1		

5E	5E 1Y

6E

DESCRIPTION OF NESTS AND SITES: 1 gull nest contained 3 gull eggs + one pelagic Cormorant egg. one gull had 2 eggs one in larger log with several pieces of straw beside them.

number of nests tallied on this card: 267
estimated total number of nests in colony: 267
estimated total number of pairs in colony: 500

GENERAL STATEMENT (few eggs yet, or YNG small, or YNG about to fly, etc.): many gulls not involved in nesting.

extra combinations
HABITAT DESCRIPTION

Figure 89. Difficulties in interpreting some nesting records have contributed to errors in the analyses of historical trends in breeding population size for some seabird species. Ethel Kippin conducted thorough surveys of nesting seabirds and contributed many seabird nesting records during the years she was stationed at the Merry Island lighthouse. On nest record cards submitted for Glaucous-winged Gulls, she reported total numbers of nests and total numbers of gulls present on the islands.[523] She specified that total numbers of gulls present included many that were not involved in breeding. Her records of total numbers of gulls present rather than the number of nests she counted have sometimes been used to estimate breeding populations, creating inflated estimates of breeding population size. *Card from BC Nest Record Scheme.*

Four other minor errors affected summary statistics in other years and have propagated through later compilations. Two of those were summation errors on original data forms. First, a count of 10 nests at Augustus Point in 1974 was omitted by Campbell.[70] Second, a total of 722 nests counted on Christie Islet in 1978 were erroneously summed and reported as 718.[523] Third, for Five Finger Island in 1980, the sum was reported as 364 nests instead of the correct total of 380.[523] Fourth, in 1999, an error in calculating an estimate for the number of gull nests on Christie Islet affected overall population summaries from that survey. Based on numbers of nests counted and coverage of the colony, Sullivan et al.[377] presented an estimate of 232 nests on Christie Islet. However, original data collected by Moira Lemon showed that 221 nests were counted, coverage of the colony was estimated at 90%, and the total estimate should have been 246 nests.[484]

Varying Survey Coverage. The most comprehensive surveys for Glaucous-winged Gulls were conducted in 1974,[70, 523] 1977,[332, 523] 1978 (Figure 91),[523] 1981,[523] 1986,[420] and 2009/2010.[30, 453] Coverage varied among surveys and some known colonies were not surveyed in all years (see section below on trends for Glaucous-winged Gulls). In 2009/2010, Blight [30] surveyed about 60% of the colonies that had been surveyed by Vermeer and Devito [420] in 1986. Most known colonies that were not surveyed in 2009/2010 were small and in 1986 supported only about 4% of the total numbers counted. Populations nesting on urban rooftops have increased since the 1970s but were not included by Vermeer and Devito [420] or Blight.[30]

Inconsistent Survey Methods. Most Glaucous-winged Gull surveys since the 1960s have been conducted on land by walking through colony areas and counting all nests, with a variety of techniques used on large colonies to ensure that all areas are explored and to avoid recounting (Figure 92). Data from such nest counts are readily comparable across years and among areas. Earlier population estimates were often based on the numbers of adults present on a colony or just a rough guess and are less comparable across years. In 1986, nests were counted on foot in all areas except in proximity to nesting cormorants and on inaccessible sites such as cliffs, bridges, and beacons, where nests were counted by binoculars from a distance or from a boat.[420] In 2009 and 2010, nests were counted by walking through colonies, except in colony areas close to nesting cormorants which were counted with

Figure 90. A survey by Anna Smith on Sea Egg Rocks in 2011 demonstrated how biased counts of adults present in colony areas can be for estimating actual breeding populations. She tallied 939 adults standing in breeding habitat at the time of her survey; only about 50 pairs were nesting. A few large young are visible in this photo. *Photo by Anna Smith, July 2011.*

Figure 91. Harry Carter joined Michael Rodway to conduct a survey of seabird colonies in the Strait of Georgia in 1978. *Photo by Michael S. Rodway, 18 June 1978.*

binoculars to avoid disturbing cormorants, and on four small colonies of 1-5 pairs, where gulls were also counted using binoculars.[30] Estimates on those four small colonies where nests were not counted in 2010,[30, 453] for all colonies surveyed by Carter [94] in 2014, and for some colonies visited recently by contributors to eBird [524] were based on numbers of adults in nesting areas counted from the water.

Lack of Comparability in Data Reporting and Analysis. Lack of comparability in Glaucous-winged Gull data across years was encountered due to differences in reporting and analysis for a recent important dataset presented by Blight.[30, 33] In contrast to all previous survey data to which comparisons were made, Blight omitted empty nests from her counts in 2009 and 2010. This omission had a major effect on her estimates of population sizes (i.e., number of nesting pairs) and corrupted her analyses

Figure 92. Most historical Glaucous-winged Gull surveys have been conducted by walking through colony areas and counting all nests. This photo shows Tessa Campbell assisting with gull surveys on Great Chain Island in 1981. She has her umbrella to protect herself from dive-bombing and feces-splattering gulls. *Photo by R. Wayne Campbell, 12 July 1981.*

of population trends. Due to the importance of the trend analyses from Blight's study, we discuss the problem in detail.

Blight reported only nests with eggs (or with evidence of depredated eggs) from her surveys in 2009/2010 [30, 33] because she was informed by Vermeer [513] that empty nests were not counted during the previous comprehensive survey conducted in 1986 by Vermeer and Devito.[420] Blight [453] reports that Vermeer's emailed response to her enquiry about the survey methods used in 1986 read, "regarding your query, we counted only the nests with eggs or young." Michael Rodway corresponded with Vermeer in June 2022 and received a different answer: "as far as I remember, my associates and I always included empty nests in Glaucous-winged Gull count data when censusing gulls in the Strait of Georgia and on the west coast of Vancouver Island. Not having done so, would have led to an underestimate of nesting pairs." [513] Vermeer was more definite in subsequent correspondence with Blight and Rodway in October 2022, stating,

> *"I am certain that Kevin Devito and assistants, who conducted Glaucous-winged Gull surveys under my supervision in the Strait of Georgia in 1986, counted all empty nests (although not mentioned in the methods section of the publication) as the census was conducted during the hatching or chick-rearing period. When surveyors enter a colony during that period, many of the older chicks leave their nests and hide, leaving many empty nests behind [Figure 93]. Therefore not counting [those] nests would lead to a considerable underestimate of nesting pairs. My [previous] hasty and online reply immediately after my exciting trip to Europe on June 14, 2010, suggests I "disremembered" at that time."* [513]

In addition to Vermeer's affirmation in June and October 2022, there is overwhelming other evidence to support the assumption that empty nests were included in the 1986 data presented by Vermeer and Devito.[420] Most notably, Vermeer and Devito [420] explicitly stated that on some colonies most or sometimes all nests counted and reported were empty. Also, Ken Morgan,[490] who conducted many other surveys for Vermeer, stated that empty nests were counted and included in totals. For surveys on the west coast of Vancouver Island, Vermeer was more explicit about counting methods and stated, "All nests were counted, whether empty or containing eggs." [426] Further, Vermeer made extensive comparisons of counts made in 1986 in the Strait of Georgia [420] and in 1989 on the west coast of Vancouver Island [426] with data collected by the BCPM in the mid-1970s,[70] which included empty nests. We know that Vermeer included empty nests in his counts for the west coast of Vancouver Island [426] and it is unlikely that he used a different method for 1986 counts in the Strait of Georgia [420] as it would have made that data not comparable to previous data from the 1970s. A subsequent comparison to the 1986 data performed by Sullivan et al.[377] included empty nests in the count data from the 1997 and 1999 surveys, with the assumption that empty nests were also included in the 1986 data.[484, 511] We are certain that Sullivan et al.[377] were correct, and have made the same assumption for our data comparisons in this volume.

No original records survive from the 1986 survey to demonstrate unequivocally that empty nests were included,[420] but, given the above considerations, we are confident that empty nests were included in 1986 counts, and, with rare exceptions, in all previous survey data, to which Blight compared her 2009/2010 data. Analyses by Blight [30, 33] used all available historical data covering a 111-year time series of counts at breeding colonies. Other than the 1986 survey, we three authors of this seabird colony catalogue were personally involved in data collection and/or have in our files copies of the original records from virtually all other surveys that have been conducted in the BC Salish Sea. We can thus confirm that count data used in the analyses by Blight [30] from years other than 1986 included empty nests. Although Glaucous-winged Gulls may start several nest scrapes,[412] only one nest is completed,[410] and empty nests are typically counted to include in population estimates pairs that, at the time of the survey, have not yet laid eggs, whose eggs have been preyed on or harvested and who have not yet laid replacement clutches, whose chicks have hatched and wandered away from the nest, or who have failed.[322, 335] The 2009/2010 data used by Blight was thus not comparable to previous survey data. This corrupted Blight's trend analyses.

It was unfortunate that Blight [30, 33] was misled into reporting only nests with eggs in her publications from her thesis work which resulted in biased comparisons to previous data, but fortunately she and her field crew also tallied empty nests during their surveys and she has generously contributed those data to this publication. We are thus able to present valid comparisons (i.e., including empty nests in counts) across all years that gull nests were counted. The effect on comparisons was substantial,

as 35% of nests counted in 2009/2010 were empty (see section below on trends for Glaucous-winged Gulls).

Nest contents were not reported from the region-wide survey in 1986,[420] but in most other years nest contents were reported and allow comparisons of breeding chronology and the proportions of empty nests among colonies. Such data contribute to the assessment of breeding success and impacts to nesting populations.

Figure 93. Standard protocol for censusing Glaucous-winged Gull nesting populations is to count all nests, including empty nests. Nests may be empty for several reasons and it is important to count them to include breeding pairs that have not yet laid eggs (top left), whose eggs have been preyed on or harvested and who have not yet laid replacement clutches, whose chicks have hatched and wandered away from the nest, which they will do within days after hatch (bottom two), or who have failed. Top right photo shows a newly-hatched chick in the nest. In the bottom right photo, note the butts of small chicks hiding under the rock crevice at the top of the photo. The disheveled, empty nest is at the bottom of the photo. *Photos by R. Wayne Campbell.*

Some comparability issues among studies simply resulted from choices made by various authors about how to group data. As a result of different grouping choices (as well as compilation errors noted above), our total nest counts for specific years (see Glaucous-winged Gull trends below) often differ from totals previously presented by other authors. Differences occurred because previous summaries included different sets of colonies, included data from surveys conducted in years other than the year in question, or intentionally omitted data from sites (e.g., urban sites) that had been surveyed in that particular year. As a specific example, Race Rocks was included in the 2009/2010 surveys and summary statistics for the Strait of Georgia [30] but was not included in previous compilations for the area [70, 420] and is not included here. We included Race Rocks as part of the west coast of Vancouver Island region in Part 3 of this work.[337] Campbell [70] and Vermeer et al.[426] also included Race Rocks in their summary of gull nesting populations on the west coast of Vancouver Island. Vermeer and Devito [420] chose not to include urban populations in their summary statistics for nesting populations in 1986, even though they had data for urban sites in that year.[431] We have included counts for urban sites made in 1986 in our total population estimates for that year.

Pigeon Guillemot Data

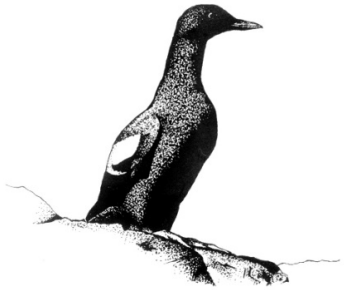
As with elsewhere in BC, data for Pigeon Guillemots are inadequate to determine breeding population sizes or to infer trends (Figure 94).[335] Nests are difficult to find and often inaccessible and total nest counts are not feasible during regular surveys. Numbers of birds present around colonies are tallied during surveys but such tallies provide little information on breeding population sizes. Birds have been counted more thoroughly in the Gulf Islands than in the northern Strait of Georgia during the most recent surveys for this species.[158]

Figure 94. Numbers of Pigeon Guillemots present around colonies are regularly recorded during seabird colony surveys, but those records provide little information on breeding population sizes. This is because attendance of guillemots around colonies is extremely variable and only an unknown proportion of birds seen during a survey are breeding birds. Surveyors often search for Pigeon Guillemot nests to confirm nesting but, except for two detailed studies on Mandarte [143] and Mitlenatch [159] islands, there are no accurate counts of total numbers nesting at colonies in the BC Salish Sea. These nests were found on Chain Islets (left) and Five Finger Island. *Photos by R. Wayne Campbell, 29 June 1973 (left) and 5 July 1974.*

All Species – Producing Current Nesting Population Estimates with Multiple and Varied Data Sources

A final issue that needs to be clarified before discussing population status and trends for seabirds breeding in the BC Salish Sea concerns the methods we have used to derive current nesting population estimates on colonies. As mentioned above, recent surveys in the Salish Sea have tended to focus on single species, and thus population data for all species nesting at a particular colony may come from various sources and years, sometimes decades apart. This means that "current" nesting population estimates may include recent data as well as decades-old data. Also, we have made subjective judgements about which records constitute the best "current" estimate of numbers nesting at a particular colony. Although we have listed records from eBird [524] in colony tables, most of those records are incidental and do not represent complete colony surveys. Thus, in most cases we have used the most recent data derived from a dedicated colony survey as the "current" estimate rather than more recent but incidental eBird records. However, in some cases, eBird records provided the best and sometimes only "current" data for a colony, and sometimes confirmed breeding at colonies where breeding had not been confirmed during previous surveys.

There were many records in eBird of counts of Pigeon Guillemots around colonies. When there were several counts of Pigeon Guillemots around a colony from the same year, we listed the maximum. If there were counts from several proximate years, we considered the maximum count from those years as most representative of the numbers of guillemots using a colony and used that count as the "current" estimate. We also made those kinds of judgments in some other cases when Pigeon Guillemots had been counted in proximate years. We previously used the same approach to obtain current estimates of Pigeon Guillemot numbers at colonies on the west coast of Vancouver Island [337] as well as at some colonies in Haida Gwaii [336] (see page 60 in Part 1 [335] for a fuller discussion of the advantages and potential biases in this approach).



Status of Seabird Breeding Populations as of 2023

Ten seabird species have historically nested at colonies in the sheltered waters of the BC Salish Sea (Figure 95). One species, Tufted Puffin, was not nesting as of the most recent surveys. As of 2023, an estimated 29,629 individuals of the other nine species breed at 221 sites: 13,476 at 116 sites in the northern Strait of Georgia, and 16,153 at 105 sites in the Gulf Islands (Table 1). Five species predominate. Glaucous-winged Gull is the most abundant nesting species, comprising 73% of the total seabird nesting population in the BC Salish Sea. Double-crested and Pelagic cormorants, Pigeon Guillemots, and Black Oystercatchers constitute most of the rest of the breeding population. Four species, Brandt's Cormorant, Caspian Tern, Arctic Tern, and Rhinoceros Auklet, currently nest at only one colony site each. The majority of the total seabird breeding population in the BC Salish Sea nests on a few large colonies; almost half (48%) nests at three colonies on Mitlenatch Island, Mandarte Island, and Chain Islets/Great Chain Island.

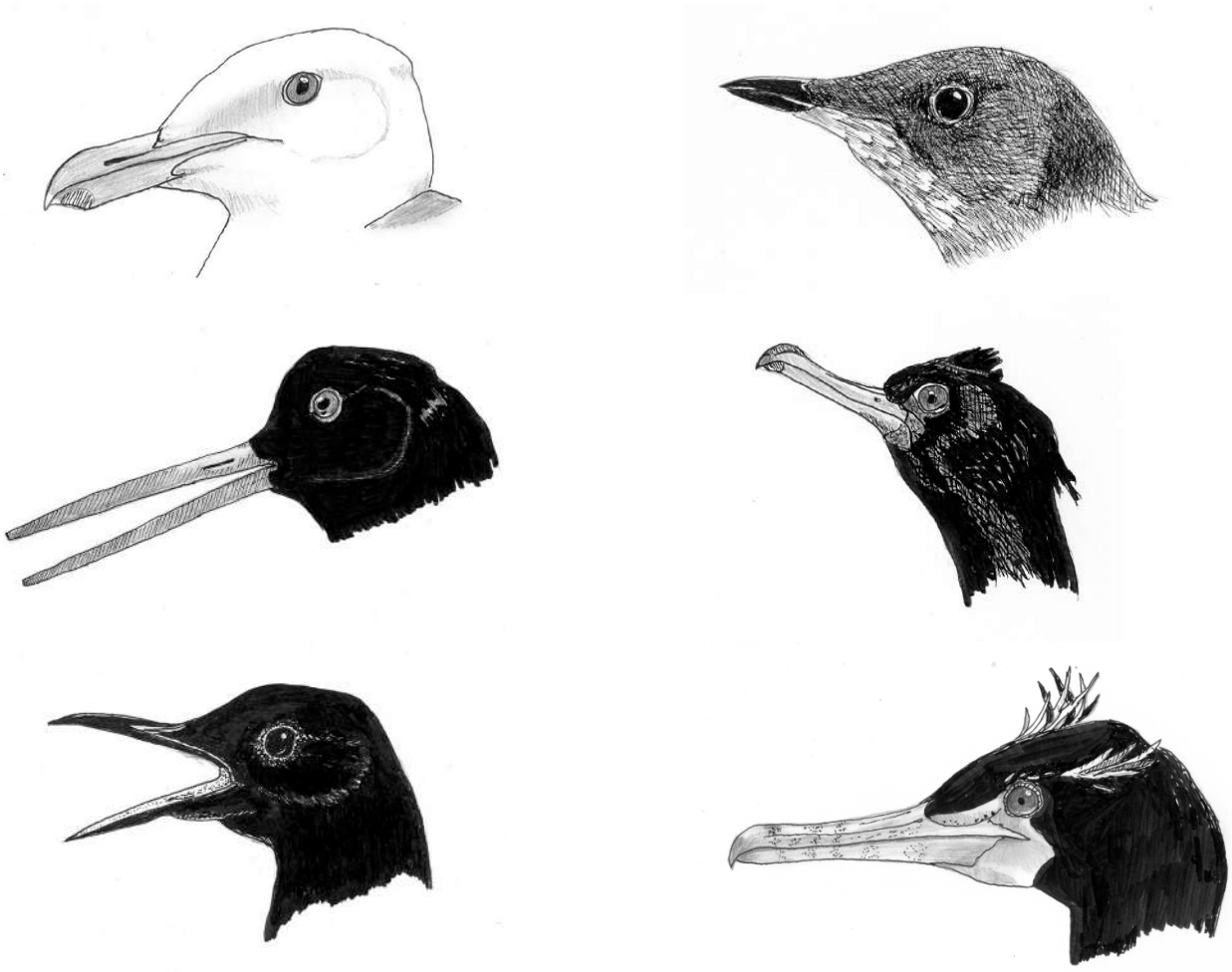
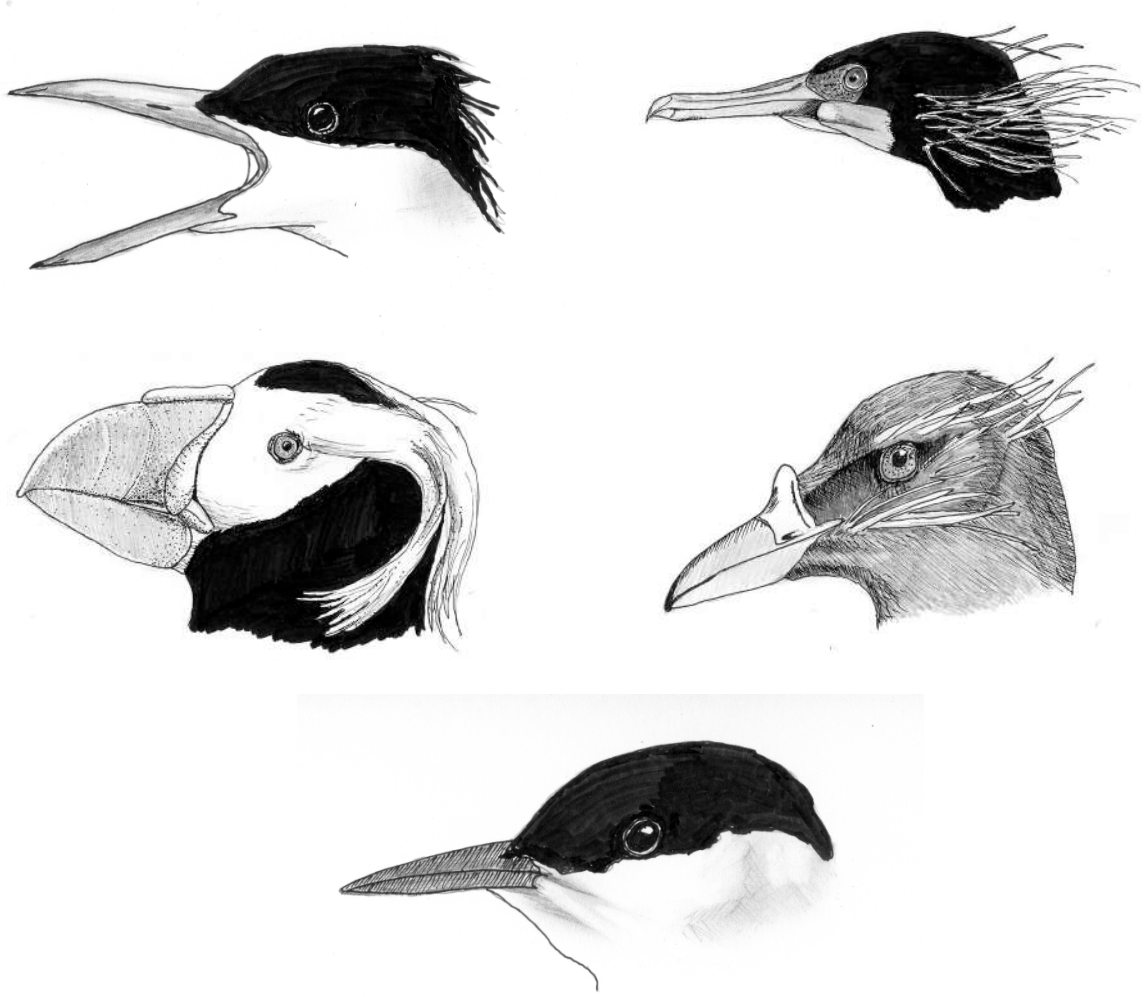


Figure 95. Nine colonial-nesting seabird species were breeding at 221 sites in the BC Salish Sea as of 2023. The non-colonial Marbled Murrelet has a dispersed nesting distribution through adjacent coastal forests. Clockwise from top left (this page, then next page), the most numerous nesting species is Glaucous-winged Gull, followed by Marbled Murrelet, Pelagic Cormorant, Double-crested Cormorant, Pigeon Guillemot, Black Oystercatcher, Caspian Tern, Brandt's Cormorant, Rhinoceros Auklet, and Arctic Tern (see Table 1 and text for numbers). Tufted Puffin, have nested in the BC Salish Sea but were absent during the most recent surveys. *Artwork by Rob Butler.*



In BC coastal waters, Double-crested Cormorants nest only in the Salish Sea except for a small colony on the northern mainland coast just reported in 2023 (see below). The BC Salish Sea also supports major proportions of total provincial breeding populations of Pelagic Cormorant (45%), Glaucous-winged Gull (45%), Black Oystercatcher (16%), and Pigeon Guillemot (15%) (updated from Part 1; [335] see Appendix 1). Burrow-nesting species are a minor component of the breeding seabird community in the BC Salish Sea, in contrast to the outer portions of the BC coast where burrow-nesting species predominate.[336, 337] Pigeon Guillemots occasionally nest in burrows at a few colonies, but Rhinoceros Auklets and Tufted Puffins are the only predominantly-burrow-nesting species known to have nested in the Salish Sea. The latter two species have been confirmed nesting in small numbers only on Mandarte Island in the Gulf Islands, although puffins have been absent there since 1996.[31, 449] A few Rhinoceros Auklets have been suspected nesting on Mitlenatch Island in the northern Strait of Georgia. Brandt's Cormorants (*Phalacrocorax penicillatus*; now *Urile penicillatus* [222]) also have been confirmed nesting in small numbers only on Mandarte Island in the BC Salish Sea. Caspian and Arctic terns were absent from previous nesting sites in 2022, but were discovered nesting in 2023 at new sites on Centre Islet and Sisters Islets, respectively, in the northern Strait of Georgia.

Urban habitats have become more important for Double-crested Cormorants, Pelagic Cormorants, and Glaucous-winged Gulls (Figure 96), currently supporting 45, 19, and 31%, respectively, of their estimated nesting populations in the BC Salish Sea. Accurate estimates of population sizes are available for Double-crested and Pelagic cormorants nesting at urban sites but not for Glaucous-winged Gulls. Dispersed rooftop nesting by gulls now occurs over large areas of Greater Vancouver and Victoria and is likely frequent in smaller coastal communities as well. There are some survey data for portions of the urban environment but total nesting populations have not been accurately determined. For some urban

Table 1. Summary of seabird breeding populations in the two designated regions of the BC Salish Sea as of 2023.[a]

	DCCO[b]	BRCO[c]	PECO[d]	BLOY[e]	GWGU[f]	CATE[g]	ARTE[h]	PIGU[i,l]	RHAU[j]	TUPU[k]	ALL SPECIES
TOTAL NESTING PAIRS											
Northern Strait of Georgia	550		599	140	4,862	28	1	n/a	2		n/a
Gulf Islands	554	12	811	99	5,953			n/a	15	0	n/a
BC Salish Sea Total	**1,104**	**12**	**1,410**	**239**	**10,815**	**28**	**1**	**n/a**	**17**	**0**	**n/a**
TOTAL BREEDING BIRDS											
Northern Strait of Georgia	1,100		1,198	280	9,724	56	2	1,112[l]	4		13,476
Gulf Islands	1,108	24	1,622	198	11,906			1,265[l]	30	0	16,153
BC Salish Sea Total	**2,208**	**24**	**2,820**	**478**	**21,630**	**56**	**2**	**2,377[l]**	**34**	**0**	**29,629**
Percent of all nesting seabirds in the BC Salish Sea	**7**	**0**	**10**	**2**	**73**	**0**	**0**	**8**	**0**	**0**	**100**
Percent of the total BC Salish Sea population of each species breeding in each geographic region of the BC Salish Sea as of 2023											
Northern Strait of Georgia	50	0	42	59	45	100	100	47	12	-	45
Gulf Islands	50	100	58	41	55	0	0	53	88	-	55
TOTAL CURRENT SITES											
Northern Strait of Georgia	3		14	60	65	1	1	46	1		116
Gulf Islands	3	1	12	54	62			51	1	0	105
BC Salish Sea Total	**6**	**1**	**26**	**114**	**127**	**1**	**1**	**97**	**2**	**0**	**221**
Confirmed on last survey											
Northern Strait of Georgia	3		14	41	56	1	1	23	0		94
Gulf Islands	3	1	12	28	52			17	1	0	78
BC Salish Sea Total	**6**	**1**	**26**	**69**	**108**	**1**	**1**	**40**	**1**	**0**	**172**
Confirmed on any survey											
Northern Strait of Georgia	3		14	50	63	1	1	37	0		109
Gulf Islands	3	1	12	51	56			47	1	0	104
BC Salish Sea Total	**6**	**1**	**26**	**101**	**119**	**1**	**1**	**84**	**1**	**0**	**213**
Unconfirmed											
Northern Strait of Georgia	0		0	10	2	0	0	9	1	0	7
Gulf Islands	0	0	0	2	6			4	0	0	1
BC Salish Sea Total	**0**	**0**	**0**	**12**	**8**	**0**	**0**	**13**	**1**	**0**	**8**
TOTAL HISTORICAL SITES											
Northern Strait of Georgia	12	0	25	64	86	3	2	52	1	0	133
Gulf Islands	18	1	33	75	81	0	0	65	1	1	128
BC Salish Sea Total	**30**	**1**	**58**	**139**	**167**	**3**	**2**	**117**	**2**	**1**	**261**
Confirmed											
Northern Strait of Georgia	12		25	54	83	3	2	42	0		126
Gulf Islands	17	1	33	71	74			57	1	1	127
BC Salish Sea Total	**29**	**1**	**58**	**125**	**157**	**3**	**2**	**99**	**1**	**1**	**253**
Unconfirmed											
Northern Strait of Georgia	0		0	10	3	0	0	10	1		7
Gulf Islands	1	0	0	3	7			8	0	0	1
BC Salish Sea Total	**1**	**0**	**0**	**13**	**10**	**0**	**0**	**18**	**1**	**0**	**8**
CURRENTLY ABANDONED SITES											
Northern Strait of Georgia	9		11	4	21	2	1	6	0		17
Gulf Islands	15	0	21	21	19			14	0	1	23
BC Salish Sea Total	**24**	**0**	**32**	**25**	**40**	**2**	**1**	**20**	**0**	**1**	**40**
Previously confirmed											
Northern Strait of Georgia	9		11	4	20	2	1	5			17
Gulf Islands	14		21	20	18			10		1	23
BC Salish Sea Total	**23**		**32**	**24**	**38**	**2**	**1**	**15**		**1**	**40**
Previously unconfirmed											
Northern Strait of Georgia	0		0	0	1	0	0	1			0
Gulf Islands	1		0	1	1			4		0	0
BC Salish Sea Total	**1**		**0**	**1**	**2**	**0**	**0**	**5**		**0**	**0**

[a] Excluding Marbled Murrelet.
[b-i] Species acronyms as follows: [b]DCCO-Double-crested Cormorant, [c]BRCO-Brandt's Cormorant, [d]PECO–Pelagic Cormorant, [e]BLOY–Black Oystercatcher, [f]GWGU–Glaucous-winged Gull, [g]CATE – Caspian Tern, [h]ARTE – Arctic Tern, [i]PIGU–Pigeon Guillemot, [j]RHAU–Rhinoceros Auklet, and [k]TUPU–Tufted Puffin.
[l] Note that estimated totals for Pigeon Guillemots refer to the numbers of birds counted around colonies and are not estimates of actual breeding populations (see text).
[m] Number of breeding sites indicates the number of colonies where a particular species has been found nesting.

colonies, we have treated available survey data as partial colony counts and have estimated total current population sizes by extrapolation. Those estimates have large margins of error. Accurate determination of population size and overall trends for Glaucous-winged Gulls in the BC Salish Sea will require comprehensive surveys of urban habitats, perhaps using a stratified sampling method to cover the extensive areas now used for nesting in the large urban centres. Blight et al.[32] recently demonstrated

that unmanned drones with mounted cameras were an effective method of counting rooftop nests in a portion of downtown Victoria. Another promising approach was used by Kroc et al.,[242] who developed a predictive model to generate an estimate of the number of Glaucous-winged Gulls nesting on rooftop structures within the City of Vancouver (see *Trends in Seabird Breeding Populations* below).

Figure 96. Many species have shared urban habitats with us humans ever since we first built cities. Some seabird species have relatively recently also colonized urban habitats and are now regular city denizens. Shown here are two young Glaucous-winged Gull chicks obviously at home in the city and strolling along a Vancouver rooftop in step with human citizens below. We should be delighted to share our cities with these "marine" species, especially since our activities have compromised natural nesting habitats and disrupted natural food supplies for this imperiled group of animals. *Photo by Edward Kroc, 21 July 2015.*

Three inland breeding sites for Glaucous-winged Gulls have been recorded in the BC Salish Sea area. We were previously unaware of these records.[335] Poynter [313] reported one pair nesting on a raft in Capilano Lake in North Vancouver from 1972 to 1974; Vermeer and Devito [419] discovered one pair nesting on top of a piling in Cowichan Lake during surveys of Mew Gulls (*Larus canus*; now Short-billed Gull *Larus brachyrhynchus* [222]) in 1984 and 1985; and Mike Chutter [523] found one pair nesting in a bucket on a platform in Long Lake near Nanaimo in 1986.

The non-colonial Marbled Murrelet (Figure 97) is not addressed in our seabird colony accounts. However, the Salish Sea area dealt with in this volume of the seabird colony catalogue encompasses important marine habitat for a substantial proportion of their population in BC, especially in winter,[338] and is adjacent to coastal forest habitat used for nesting by this threatened species. An estimated 5,000-7,000 Marbled Murrelets nest in inland forested habitats in this area of the southern mainland and eastern Vancouver Island.[124]

Figure 97. Marbled Murrelets in breeding (top) and winter plumage. The BC Salish Sea provides important marine habitat for this threatened species in both summer and winter. *Photos by Paula Courteau, Hornby Island, BC, 21 June 2015 (top) and 5 October 2015.*

Secrets at Dawn in the Coastal Forests

We often think that the most dramatic leaps forward in scientific knowledge come with technological advancements. For instance, the development of small satellite transmitters and GPS loggers that record exact locations of individual birds have provided detailed understanding of migration routes and important feeding areas. But sometimes important discoveries are made by simply looking at the world in a different way. So it was with the discovery of Marbled Murrelet nesting habitat - Marbled Murrelets had always been flying into the forest and calling, it was just that no one in the scientific community had listened or looked at the right time of day.

For most of the twentieth century, not much was known about the Marbled Murrelet's nesting habits or

requirements. Tantalizing clues would surface from time to time, and it was generally understood that this small cousin of the burrow-nesting Ancient Murrelet was not a colonial nester, nor was it nesting on remote offshore islands with its fellow seabirds, but was somehow linked to the coastal old-growth forests (Figure 98).

It was not until the late 1980's when researchers in California and Oregon, who were conducting auditory surveys of forest dwelling birds, realized that they were also detecting the calls of Marbled Murrelets flying in from nearby coastal waters. I can still vividly recall the reverential hush in the audience at a Pacific Seabird Group conference when Oregon Wildlife Biologist Kim Nelson showed a video clip of a Marbled Murrelet flying in to land at its nest on a mossy limb of an immense tree. Adapting protocols used to survey songbirds, an inventory methodology was soon developed based on visual and auditory detections of Marbled Murrelets flying and vocalizing above and through forest areas and up flight corridors along streams. The methodology was designed to identify which forested areas were critical to this secretive bird.

Realizing the importance of determining nesting habitats for the Marbled Murrelet along the BC coast, CWS research scientist Jean-Pierre Savard recruited me (Moira) to initiate some preliminary surveys in forest stands around the Vancouver area in 1989. There were good historical records of Marbled Murrelets on the waters of the Salish Sea, but indications were that sightings had declined over the years.[327] *As a starting point, our objectives were to determine if the murrelets were using the forested watersheds of the North Shore mountains on the north side of Burrard Inlet.*

Since inland flight activity of Marbled Murrelets is greatest in the early morning hours, one has to arrive at chosen survey locations well before dawn. To conduct surveys in the forested watersheds on the North Shore, meant that I had to leave my home in Ladner at about two o'clock each morning. I did hear some birds in the Seymour, Capilano, and Coquitlam watersheds, but Marbled Murrelet activity was infrequent. We decided that we really needed to go to an area where there was lots of activity so we could become more familiar with the repertoire of Marbled Murrelet calls and behaviours.

At that time, trails had been built in the Carmanah valley on the west coast of Vancouver Island as a way to bring attention to this pristine area, and to promote the creation of a park to protect the intact stands of old-growth forest from logging. That had to be a great place to find Marbled Murrelets, I thought, and also a great opportunity to see this most magnificent valley. I was not disappointed. Marbled Murrelet activity was abundant, with almost constant calls of birds during the two or three early morning hours when they flew in from the coast. Standing on the gravel bars of the creek, with the surrounding old-growth forest often shrouded in mist, hearing the keer-keer calls of this furtive bird and seeing their ghost-like forms flying swiftly above and below the forest canopy, was like being witness to a secret world (Figure 99). *What might the forests bordering the Salish Sea have sounded like in the early morning hours before widespread logging had reduced the ancient forests there to a few remnant stands?*

It was an exciting privilege for me to have been involved in the initial investigations into the inland habitat requirements of Marbled Murrelets in BC. Research into Marbled Murrelet use of inland nesting and marine foraging habitats became a focus in BC through the 1990's and on into the 2000's with Simon Fraser University, University of Victoria, the Canadian Wildlife Service, and the BC Ministry of Environment developing many and varied programs that have increased our knowledge of this bird that eluded biologists for such a long time.[49, 124]

Figure 98. Studies since the 1970s have demonstrated an intimate link between the status of Marbled Murrelet breeding populations and the abundance of old-growth forest habitat. *Photo by Moira J.F. Lemon.*

There is unconfirmed evidence of historical nesting by murres (*Uria* spp.) in the BC Salish Sea. An egg specimen currently housed at the Humboldt State University Museum is identified as Thick-billed Murre (*U. lomvia*), collected by M. Merring

on 9 July 1896 at "Texada Island, Straits of Georgia." [533a] We are skeptical that the species identity is correct for this record because the first accepted sight record for Thick-billed Murre in BC was in 1970 at Langara Island in Haida Gwaii and the species has never been confirmed present in the Strait of Georgia.[84] Bird specimens previously identified as Thick-billed Murre that were collected in the Strait of Georgia have been re-examined and identified as Common Murre (*U. aalge*). Common Murre occur year round in the Strait of Georgia (Figure 100) but have never been documented breeding there,[84, 335] so this egg specimen remains intriguing as a possible record of historical breeding in the region by one of the *Uria* species.

Figure 99. Inland surveys of Marbled Murrelet activity are conducted in the early morning hours by recording birds seen or heard as they fly over and call on their way to and from nesting sites. Survey stations are placed in openings in the forest with good visibility of the sky. Openings along creeks can be suitable if creek noise is low and does not compromise the ability of surveyors to hear calls. Conducting surveys in old-growth stands as dawn is breaking is always a magical experience. Here, in the lower reaches of Carmanah Creek, mist is flowing up the valley from the coast. *Photo by Moira J.F. Lemon, May 1989.*

Figure 100. Common Murres are common in the inner waters of the BC Salish Sea, especially in winter, but they have not been recorded breeding in the area. The two birds in the foreground are in winter basic plumage; the rear bird is likely in transition to Alternate I or Definitive Alternate plumage, which southern birds can obtain as early in the season as January.[3] *Photo by Paula Courteau, 15 December 2017.*

Trends in Seabird Breeding Populations to 2023

Despite being close to the major centres of human settlement in BC, information on the status of nesting seabirds in the BC Salish Sea is sparse before the latter half of the 20th century. However, repeated visits during the first half of the 20th century to a few major colonies, including Mitlenatch Island, Christie Islet, Ballingall Islets, Java Islets, Imrie Islet, and Mandarte Island, provide some trend data for cormorants and Glaucous-winged Gulls at that time. Those visits were made mainly by bird-banders. Drent and Guiguet [144] gathered available information on nesting seabirds as of 1960 and were able to discern changes at major colonies at that time. An overview of nesting populations throughout the area was not obtained until the 1970s. Comprehensive surveys since then have documented major changes in the distribution and abundance of breeding cormorants and Glaucous-winged Gulls throughout the BC Salish Sea. Data for Black Oystercatchers and Pigeon Guillemots are inadequate to confirm overall trends, although many new nesting sites found in recent years for Black Oystercatchers suggest an expanding population for that species. Tables portraying trends for individual species that are presented below include data from years that have the most complete survey data.

Double-crested Cormorant

Double-crested Cormorants (Figure 101) have been recorded nesting in the BC Salish Sea for a century. However, archaeological evidence indicates

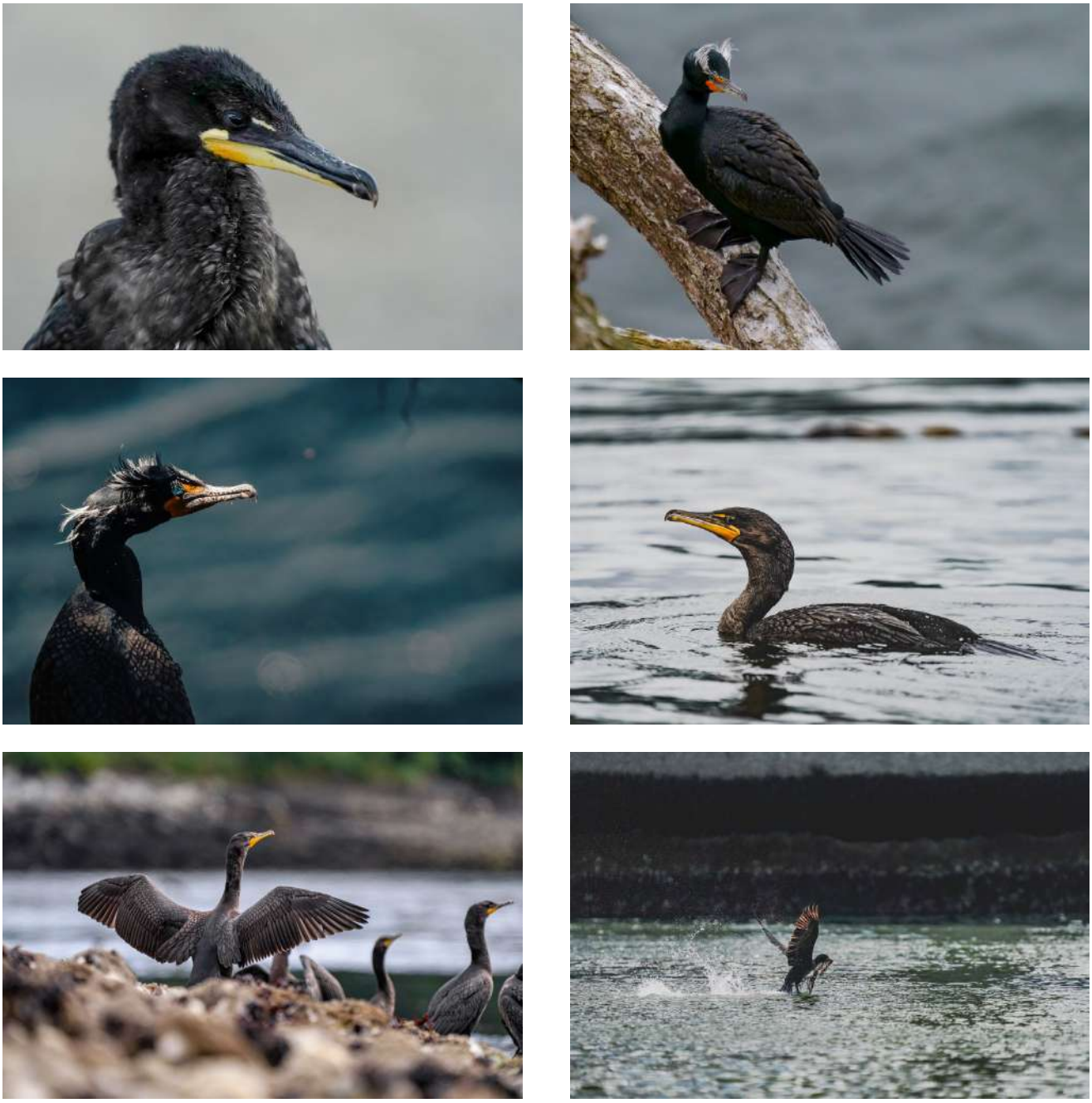


Figure 101. Portrait of the Double-crested Cormorant (clockwise from top left): **1)** stately-looking juvenile; **2)** breeding adult displaying the two tufts on the side of the head that give them their name; **3)** with their wettable plumage, cormorants ride low in the water; **4)** picking up seaweeds for nesting material; **5)** drying wings after a foraging bout; and **6)** an adult sporting the carefree, unkempt look. *Photos by Macus Ong.*

they have been present in the area for over 5,000 years and their relatively recent colonization of the BC Salish Sea may in fact represent re-colonization after having been extirpated.[214] They have been colonizing northward in the Strait of Georgia and now nest as far north as Mitlenatch Island in the BC Salish Sea. Evidence has just surfaced (as of February 2023) of a small colony seen on Gull Rocks near Prince Rupert on the northern mainland coast in 2014,[544] which is the first record of coastal breeding in BC outside the Salish Sea (see Appendix 1).

In recent decades, Double-crested Cormorants also have established colonies on three interior lakes in BC: at Stum Lake in the Chilcotin in 1993,[509] at Leach Lake in the Creston valley in 2003,[400] and most recently on Ootsa Lake in the Nechako Reservoir in the centre of the province.[321] Nests were absent at the Ootsa Lake site in 1996 and were first seen in 2004 when two nests were reported. There is

also a record from 1997 of adults feeding two young on the Cheslatta River,[400] which is a tributary of the Nechako River with its headwaters in Skins Lake located only about 7 km northeast of the colony site on Ootsa Lake documented in 2022. Thus it seems likely that Double-crested Cormorants have been nesting in that general area for some time. A total of eight nests were counted on 1 June 2022, located at *53°44'30"N 126°03'09"W* in snags on the south side of Ootsa Lake about 5 km southwest of the Skins Lake Spillway. Adults were sitting in nests. The nests were revisited on 26 July; five nests contained small to large young (Figure 102). In the same vicinity, Regehr and Kurtz also confirmed a new colony of Herring Gulls (*Larus argentatus*) on Knox Island and on nearby rocky islands in the lake.[321]

Figure 102. A new interior nesting site for Double-crested Cormorants in BC was documented on Ootsa Lake recently.[321] Eight nests with attending adults were seen on 1 June and near-fledging young were seen on 26 July 2022. Cormorants were first seen nesting at this site in 2004. *Photos by Heidi M. Regehr, 26 July 2022.*

Underwater Hearing in Cormorants

Marine mammals are well known for their acoustic abilities underwater.[164, 176] *Whales and dolphins use sound to navigate, to locate and sometimes stun prey, and to communicate with each other. Sound travels more efficiently through water than through air and, from a sensory perspective, the underwater world is dominated by sound, especially at depths where light penetration is attenuated. Hearing is thus an effective sense underwater and many marine animals have evolved auditory adaptations. Only recently, however, have biologists asked the question, "Do marine birds that dive for food also have adaptations related to auditory perception underwater?"*

A research team out of Denmark and Sweden were one of the first to address this question,[227] *although over 50 years earlier, Poulter* [312] *postulated that penguins use cavitation "clicks," generated by their movements through the water, as a source of passive sonar to aid in locating prey underwater. The Scandinavian team conducted experimental studies of Great Cormorants* (Phalacrocorax carbo sinensis) *in a laboratory setting.*[227] *Their conclusions were: "the results clearly show that even though cormorants do not seem to have very sensitive hearing either in air or in water, their underwater hearing is better than what would be expected from a purely in-air adapted ear. Hearing in water may be used by the cormorant to pinpoint the direction to prey, to avoid predators, and to orient underwater. More work is obviously needed to obtain more accurate hearing data on this species and to better understand the importance of underwater sounds for this and other marine birds. Such information can also be used to better understand how marine birds are vulnerable to man-made noise and if underwater sounds can efficiently be used to deter cormorants and other birds from fishing operations."*

More recent studies have demonstrated several adaptations in the middle ear related to underwater hearing in multiple different lineages of diving birds, including alcids and diving ducks.[448] *Greatest differences from terrestrial birds in middle ear morphology were found in species with underwater pursuit behaviour and deep-diving capabilities. Some of the changes in the middle ear could also be adaptations to protect the ear from the higher pressures that are found at increasing water depth. Studies have also found evidence that several species of penguins use underwater vocalizations during feeding dives to help locate and capture prey.*[388] *This suggests that penguins use active sonar underwater, perhaps somewhat like echolocation used by toothed whales, in contrast to Poulter's* [312] *idea that penguins employ a type of passive sonar using sounds generated by their diving actions.*

Adaptations for underwater hearing in diving birds is currently a popular research topic and greater insights

into how birds use sound underwater are likely forthcoming. Studies to date suggest that adaptations that facilitate underwater hearing potentially constrain the sensitivity of aerial hearing.[448] Because marine birds also rely on hearing in air for many important aspects of their lives, including courtship and recognition of mates and offspring, trade-offs between underwater and in-air hearing will also be important to understand.

The BC coastal population of Double-crested Cormorants in the Salish Sea represents the northernmost extent of the *P.a. albociliatus* subspecies. The other Pacific coast subspecies, *P.a. cincinatus*, nests at about 90 colonies in Alaska, but, except for one or two pairs recorded nesting at Hazy Islands in southeastern Alaska (920 km away), and the new record of nesting on Gull Rocks on the northern mainland coast in BC, there is a gap of 1,660 km between the northernmost colony of *P.a. albociliatus* in the northern Strait of Georgia and the closest colony of *P.a. cincinatus* in south-central Alaska.[105] Double-crested Cormorants have also been present in Alaska for thousands of years and it seems likely that their distribution was more continuous in the past. Why there is such a hiatus in their current breeding distribution along the Pacific Coast is unclear but may suggest past extirpation of coastal populations as has occurred in a number of other areas in North America.[197]

Double-crested Cormorants were first reported nesting in the BC Salish Sea in 1927 when Walter Burton detected at least one pair nesting amongst Pelagic Cormorants on Mandarte Island. Later that season, Burton, accompanied by James Munro, confirmed three nests.[270] The colony on Ballingall Islets was discovered several years later in 1933, but based on the condition of the colony when first described, Munro [272] thought that the colony on Ballingall Islets may have been established earlier than on Mandarte Island, perhaps around 1920 [144] (see Carter [96] for additional discussion of these early records). As mentioned above, we have no early records for some sites and we do not know when colonies were established at sites such as Rose or Canoe islets. The Rose Islets colony was well established when it was first visited in 1963 and may have been in existence for many years before that (see section above on *Identifying and Addressing Issues with the Historical Data*). A fairly large colony of Double-crested Cormorants was reported on Five Finger Island or possibly on one of the adjacent Hudson Rocks (see Five Finger Island account) in 1959,[350] a nesting record that apparently was missed by Drent and Guiguet [144] and all subsequent authors.

Carter [97] speculated that two sets of eggs identified as Double-crested Cormorant collected in 1896 south of Comox (which likely referred to St. John Point on Hornby Island) and in 1900 at Sidney Island (which likely referred to Mandarte Island) constitute earlier records for nesting by that species in BC. We were unwilling to accept those records as confirmation of breeding by Double-crested Cormorants and still consider the records by Munro [270, 272] as the earliest confirmation of breeding in BC. We further discuss those records considered by Carter [97] under the accounts for St. John Point and Mandarte Island.

The status of Double-crested Cormorants in BC has been reviewed more frequently than any other seabird species nesting in the province, except perhaps Marbled Murrelet. This is likely because of its wide geographic distribution and resultant management concerns that occur at local, regional, and continental scales, especially in relation to perceived competition with human commercial and sports fisheries and aquaculture.[442] It was one of the first species assessed by COSWIC after the Committee was created in 1977,[123] even though the species is not protected federally in Canada as part of the Migratory Bird Treaty with the United States (although it is protected federally in the U.S. since a 1972 amendment to their convention with Mexico [442]). Most reviews have addressed BC populations as part of larger metapopulations,[1, 2, 105, 287, 421, 441, 442] but some have focused more specifically on BC populations.[101, 114, 266, 428]

Double-crested Cormorants increased in numbers in the decades after they became established on Mandarte Island and Ballingall Islets in the Gulf Islands in the 1920s. By 1960, over 200 pairs were nesting at five colonies in the Gulf Islands (Table 2). Nesting was first recorded in the northern Strait of Georgia on Christie Islet in 1941, but birds nested only intermittently there for the next 30 years and did not become well established in the northern Strait of Georgia until the 1970s. Overall population size and numbers of nesting sites continued to increase in both the Gulf Islands and the northern Strait of Georgia into the 1980s, but trends varied on different colonies. Maximum numbers were recorded at Ballingall Islets in 1957, at Rose Islets in 1968, at Franklin Island in 1978, at Christie Islet in 1981, at Bare Point in 1983, and at Chain Islets/Great Chain Island in 1990. Five formerly-confirmed nesting sites in the Gulf Islands were abandoned in 1987, including the major colonies at Ballingall Islets and Bare Point.

Table 2. Trends in Double-crested Cormorant breeding populations (number of nests counted) in the BC Salish Sea to 2022 (the most recent year with adequate data). All known historical nesting sites are listed. A dash indicates colonies for which there are no survey data in a particular year. An "x" indicates that nesting was confirmed but numbers of nests were not counted (see Appendix 2).

SITE CODE	SITE NAME	Earliest nesting record		Survey year[a]								
		Count	Year	1959/60	1974	1983	1987	2000	2009	2014	2019	2022
Northern Strait of Georgia												
SG-090	Mitlenatch Island	10	1993	0	0	0	0	70	20	25	55	25
SG-130	McRae Islet	1	2000	-	-	-	0	1	-	0	-	-
SG-302	Rabbit Island	10	2010	-	-	-	-	-	-	-	0	-
SG-310	Sea Egg Rocks	4	2020	-	-	-	-	-	-	-	0	-
SG-360	Franklin Island	x	1967	-	56	21[b]	5[b]	0	-	0	-	-
SG-430	Christie Islet	x	1941	0	25	164	119[c]	42[c]	0	0	-	-
SG-440	Pam Rock	29	1974	-	29	[d]	[c]	[c]	4	0	-	-
SG-580	Second Narrows	63	2009	-	-	0[e]	0[e]	0[e]	63	158	383	520
SG-670	Queen's Reach to North Arm	1	1983	-	-	1	-	-	-	-	-	-
SG-678	Iona Island	1999	x	-	-	-	-	x	-	-	-	0
SG-690	Sand Heads	100e	1985	-	-	-	86	35	0	-	-	-
SG-700	Roberts Bank - Superport	30e	1986	-	-	-	42	11	0	-	-	0
Gulf Islands												
GI-050	Five Finger Island	large colony[f]	1959	x[f]	0	0	138	15	0	0	-	-
GI-060	Hudson Rocks	17[f]	1987[f]	[f]	0	0	17	0	0	0	0	-
GI-090	Gabriola Island - West Cliffs	27	2006	-	0	0	0[e]	0[e]	39[g]	64	111	205
GI-195	Ladysmith Harbour	x	2004	-	-	-	-	-	0	0	0	-
GI-210	Rose Islets	x	1958	-	89	12	2	15	0	0	0	-
GI-220	Canoe Islet	30e	1968	-	12	0	0	0	0	0	2+	-
GI-280	Bare Point	30-35e	1971	-	0	198	0	0	0	0	0	-
GI-290	Shoal Islands	65	1987	-	-	-	65	104	159	48	0	-
GI-320	Ballingall Islets	x	1933	59	14	20	25	0	0	0	0	-
GI-330	Galiano Island - Central Cliffs	14	2000	-	0	-	0	14	51[h]	8	0	-
GI-350	Charles Island	x	1954	-	-	-	0	-	-	-	-	-
GI-420	Chain Islands (Second Sister)	8-9	1956	14[i]	-	0	0	0	0	-	-	-
GI-430	Annette Inlet	25e	1988	-	-	-	0	-	0	-	-	-
GI-440	Red Islets	S	1960	S	-	-	0	-	0	-	-	-
GI-460	Channel Islands	24e	1950	16	-	0	0	0	0	0	-	-
GI-630	Arbutus Island	1	2012	-	-	0	0	0	-	0	-	-
GI-750	Mandarte Island	3	1927	135-150	582	1,100	972	215	137[j]	307	328	398
GI-890	Chain Islets/Great Chain Island	2	1976	0	0	190	510	95	16	0	-	0
Colonies surveyed in 1959/1960 (see text), 1974, 1983, 1987, 2000, and 2014 (5 colonies)												
	Colonies with nests			2	3	4	4	4	3	2	n/a	n/a
	Total nests			194-209	621	1,474	1,626[k]	422	173	332	n/a	n/a
Colonies surveyed in 1974, 1983, 1987, 2000, and 2014 (12 colonies)												
Northern Strait of Georgia												
	Colonies with nests			n/a	2	1-2	1-2	2-3	2	1	n/a	n/a

Table 2 cont'd	1959/60	1974	1983	1987	2000	2009	2014	2019	2022
Total nests	n/a	54	164	119	112	24	25	n/a	n/a
Gulf Islands									
Colonies with nests	n/a	4	5	6	4	3	2	n/a	n/a
Total nests	n/a	697	1,520	1,664	340	192	371	n/a	n/a
Total BC Salish Sea									
Colonies with nests	n/a	6	6-7	7-8	6-7	5	3	n/a	n/a
Total nests	n/a	751	1,684	1,783	452	216	396	n/a	n/a
All surveyed colonies[l]									
Northern Strait of Georgia									
Colonies surveyed	2	4	6	8	8	6	6	4	4
Colonies with nests	0	3	3-4	4-5	6	3	2	2	2
Total nests	0	110	186	252	159+[m]	87	183	438	545
Gulf Islands									
Colonies surveyed	7	10	12	17	14	16	14	10	3
Colonies with nests	5-6	4	5	7	6	5	4	3	2
Total nests	239+[n]	697	1,520	1,729	458+[m]	402	427	441	603
Total BC Salish Sea									
Colonies surveyed	9	14	18	25	22	22	20	14	7
Colonies with nests	5-6	7	8-9	11-12	12	8	6	5	4
Total nests	239+[n]	807	1,706[o]	1,981	617+[m,p]	489[q]	610	879	1,148
NUMBER OF PREVIOUSLY-CONFIRMED NESTING SITES THAT WERE KNOWN TO BE ABANDONED									
Northern Strait of Georgia	1	0	0	0	1	3	4	2	2
Gulf Islands	0	2	4	5	6	11	10	7	1
Total BC Salish Sea	1	2	4	5	7	14	14	9	3

[a] Data for 1959/60, 1974, 1983, 1987, 2000, 2009, and 2014 from Drent and Guiguet,[144] Campbell,[70] Vermeer and Rankin,[421] Vermeer et al.,[428] Chatwin et al.,[114] Adkins and Roby [1] and Lambert,[244] and Carter et al.,[101] respectively, with added data from the BCNRS and with errors and omissions amended (see text). Trudy Chatwin [459] provided additional data from the 2000 and 2014 surveys. For other sources see individual colony accounts.

[b] Nesting was reported for Franklin and Merry islands combined but nesting by Double-crested Cormorants has never been confirmed on Merry Island and we listed these records only for Franklin Island.

[c] Estimates given included both Christie Islet and Pam Rock.[114, 428]

[d] Vermeer and Rankin [421] listed an estimate of 120 nests for Christie Islet and Pam Rock combined in June 1983, but we do know whether nests were actually found on Pam Rock. More nests were counted on Christie Islet later that year.

[e] No data were reported for Double-crested Cormorants but complete counts of Pelagic Cormorants were conducted at these sites so we assumed that no Double-crested Cormorants were seen nesting.

[f] A fairly large colony reported by Sarles [350] in 1959 may have been on Five Finger Island or on Hudson Rocks.

[g] Adkins and Roby [1] list 43 nests for 2009.

[h] Adkins and Roby [1] list 47 nests for 2009.

[i] Drent and Guiguet [144] listed 4 nests in 1960 but that number has been corrected.[523]

[j] Adkins and Roby [1] list 143 nests for 2009.

[k] May have included some nests on Pam Rock.

[l] Number of sites differ from those given in previous compilations [101, 114, 421, 428] because we separated sites that had been lumped together and because data provided by Trudy Chatwin [459] allowed us to better identify which sites had been surveyed in a particular year.

[m] Plus an unknown number of nests for Iona Island.

[n] Plus an unknown number of nests for Five Finger Island and Red Islets. Nesting was not confirmed on Red Islets.

[o] This total differs from that in Vermeer and Rankin [421] because we had additional counts for some colonies.[523]

[p] This total differs from that in Chatwin et al. [114] due to a summation error in that publication. It was corrected in Carter et al.[101]

[q] This total differs from that in Carter et al. [101] because we included 16 nests reported on Great Chain Island by Lambert.[244]

Total populations declined dramatically during the last part of the 20th century and the first decade of the 21st century. By 2000, numbers nesting were less than a third of what they were in 1987 and by 2009 overall population size was reduced to only 25% of the 1987 maximum. Some signs of recovery were seen in 2014 and further increases have occurred since then at the urban bridge site at Second Narrows and at Gabriola Island - West Cliffs. Recently, the Second Narrows site has become the largest colony in BC. New colonies were recently established in the northern Strait of Georgia: a small colony was briefly established on Rabbit Island in 2010 and four nests were found on Sea Egg Rocks in 2020. The total breeding population in the BC Salish Sea is currently estimated to be 1,104 pairs (Table 1), just over half (56%) the maximum numbers seen in 1987. Twenty-four (80%) of the 30 known historical nesting sites for Double-crested Cormorants in the BC Salish Sea were abandoned during the most recent surveys.

Until recently, the majority of the Double-crested Cormorant population nested at sites in the Gulf Islands. At the maximum population size in 1987, seven sites in the Gulf Islands supported 87% of the total BC Salish Sea population. The recent dramatic increase in numbers nesting on the Ironworkers Memorial Bridge at Second Narrows has reversed that pattern. Currently, 50% of the population nests at three sites in the northern Strait of Georgia and 50% nests at three sites in the Gulf Islands. Most of the population is now concentrated at the Second Narrows site (47%) in the northern Strait of Georgia and on Mandarte Island (36%) and Gabriola Island - West Cliffs (14%) in the Gulf Islands.

Double-crested Cormorants nest on the ground on most island colonies. They have also nested in trees on several colonies, including Gabriola Island - West Cliffs (Figure 103), Rose Islets, Bare Point, Shoal Islands, Ballingall Islets, Charles Island, Annette Inlet, Channel Islands, Chain Islands (Second Sister), and Mandarte Island. Use of trees for nesting has been ephemeral at many of those sites. This may be because trees are destroyed by the nesting activities of the birds but, in many cases, appears to result from nesting birds simply moving to alternate habitats within a colony.

Figure 103. Double-crested Cormorant tree nests on the west cliffs of Gabriola Island in 2020. *Photos by Macus Ong, 23 May 2020.*

Double-crested Cormorants also frequently use trees for roosting, sometimes before using them as nest sites (e.g., at Annette Inlet). Monitoring of roosting sites is thus warranted to detect possible new nesting sites. One such site is in Winter Cove at the north end of Saturna Island. Bev Ramey,[495] who has a cabin there, has watched the antics of roosting Double-crested Cormorants over the years. Since about 2006, from late August through to late spring, as many as 110 Double-crested Cormorants have

been observed roosting in Douglas-fir trees in the cove. Bev has never seen birds carrying nesting materials, but she reports that in recent years, birds are spending longer in the trees during the daytime and return to perch in the trees sometimes through the day. Perhaps this is a possible site for future nesting.

Brandt's Cormorant

Brandt's Cormorants (Figure 104) were discovered nesting on Mandarte Island purportedly for the first time in 2013.[103] However, we have recently uncovered an egg specimen [539a] that confirmed breeding by Brandt's Cormorant on Mandarte Island on 11 June 1931. The collector of that specimen is not recorded. This record predates by over three decades the previous earliest record of breeding in BC reported in 1965 on Sea Lion Rocks on the west coast of Vancouver Island,[372] but the timing is similar to the earliest record in the Washington portion of the Salish Sea from 1928.[361] Incidental breeding occurred at three sites in the Washington Salish Sea between 1928 and 1953 but

Figure 104. Brandt's Cormorant nested intermittently in the BC and Washington portions of the Salish Sea during the first half of the 20th century. After a long absence, they were found nesting again on Mandarte Island in 2013.[103] *Photo by Paula Courteau.*

has not been recorded there since.[97, 361] Drent and Guiguet [144] anticipated nesting by Brandt's Cormorants on Mandarte Island based on large numbers of birds regularly observed in the area during summer, but it was not until 2013 that nesting was observed there again.[103] The 1931 record on Mandarte Island and the records from 1928 to 1953 in Washington indicate that intermittent breeding, similar to what has been observed at west coast Vancouver Island colonies, occurred in the Salish Sea during the first half of the 20th century. The recent records of nesting on Mandarte Island suggest that Brandt's Cormorants are again expanding their breeding range into the Salish Sea. Numbers on Mandarte Island increased from four nests in 2013 to 21 nests in 2019; there were 12 nests on the most recent count in 2023.

Pelagic Cormorant

Historical records are adequate to demonstrate tremendous population increases for Pelagic Cormorants (Figure 105) at major colonies during the first half of the 20th century.[144, 303] Increases are best documented at the Mandarte Island colony, where numbers increased over tenfold from an estimated 25 pairs in 1915 to 370-380 pairs (357 nests were counted) in 1959. By 1960, more than 856 pairs were recorded nesting at 14 sites (Table 3), although two colonies had been abandoned and problems with human disturbance were already apparent at several colonies.[144] The total breeding population in 1960 was likely substantially larger than 856 pairs because population estimates were not available for some known or suspected nesting sites and other nesting sites were undoubtedly unknown.

Figure 105. Pelagic Cormorants have historically been recorded nesting at 58 colony sites in the BC Salish Sea. *Photo by Paula Courteau.*

Many presently known nesting sites were unexplored in 1959/1960, but data for 11 colonies that were repeatedly surveyed over the years suggest that total populations in the Strait of Georgia continued to increase through 1974, may have reached a peak around 1983, and then declined dramatically between 1987 and 2000, with some recovery by 2014. As with Double-crested Cormorants, there were contrary trends at different

Table 3. Trends in Pelagic Cormorant breeding populations (number of nests counted) in the BC Salish Sea to 2019. All known historical nesting sites are listed. A dash indicates colonies for which there are no survey data in a particular year. An "x" indicates that nesting was confirmed but numbers of nests were not counted (see Appendix 2).

SITE CODE	SITE NAME	Earliest nesting record		Survey year[a]						
		Count	Year	1959/60	1974	1983	1987	2000	2014	2019
Northern Strait of Georgia										
SG-020	Copper Cliffs	many	1959	many	-	0	0	-	-	5+
SG-022	"Quathiaski" Cliffs	20e	2021	-	-	-	-	-	-	-
SG-090	Mitlenatch Island	24	1949	155 (1960)	286	318	315	234	225	176
SG-110	Vivian Island	27	1970	-	25	15	3	0	0	-
SG-130	McRae Islet	15	1987	-	-	-	15	7	38	-
SG-180	Mouat Islands	17	2014	-	-	-	-	-	17	-
SG-220	St. John Point	50e	1955	x	9	127	101	0	0	0
SG-240	Chrome Island	54	1974	-	54	78	141	57	17	-
SG-250	Sisters Islets	14	1968	-	41	51	0	0	0	-
SG-302	Rabbit Island	1	1981	-	-	-	-	-	-[b]	15
SG-310	Sea Egg Rocks	63	2011	-	-	-	-	-	-	40
SG-350	Bertha Island	12	1981	-	0	-	-	-	-	-
SG-360	Franklin Island	123	1968	-	92	18[c]	22[c]	0	0	-
SG-370	Merry Island	6+	1968	-	38	[c]	[c]	0	0	-
SG-390	Trail Islands	10e	1973	-	2	15	14	0	0	-
SG-400	White Islets	3	1968	-	4	38	13	2	1	-
SG-430	Christie Islet	x	1924	8 (1959)	47	80[c]	44[c]	19[c]	17	-
SG-440	Pam Rock	x	1948	0 (1959)	3	[c]	[c]	[c]	0	-
SG-530	Passage Island	2	1968	-	48	72	16	21	0	0
SG-580	Second Narrows	10e	1983	-	-[d]	10e	90	201	120	111
SG-620	Prospect Point	1	1981	-	0	64	93[c]	12	0	-
SG-630	Siwash Rock	2	1970	-	0	-	[c]	0	0	-
SG-640	Burrard Bridge	many	1997	-	-	-	-	39	91	63
SG-650	Granville Bridge	47	2000	-	-	-	-	47	80	306
SG-710	Tsawwassen - Ferry Terminal	4	2022	-	-	-	-	-	-	-
Gulf Islands										
GI-010	Ballenas Islands	x	1956	-	24	0	0	-	0	-
GI-050	Five Finger Island	7	1977	-	0	115	17	2	0	-
GI-060	Hudson Rocks	30-35	1959	38 (1960)	91	30	142	3	0	0
GI-070	Snake Island	x	1958	15e (1959)	22	60	74	41	0	-
GI-090	Gabriola Island - West Cliffs	25e	1960	25e (1960)	367	0	0	62	67	79
GI-150	Decourcy Island	23	1977	-	-	-	0[e]	-	-	-
GI-160	Valdes Island - West Cliffs	x	1920	-	0	6	0	0	0	1+
GI-210	Rose Islets	6e	1963	-	0	0	0[e]	0	0	0
GI-230	Galiano Island - North Cliffs	44	1976	-	-	-	0[e]	0	0	-
GI-250	Augustus Point	20e	1972	-	19	-	0[e]	-	18	8
GI-270	Tent Island	4e	1972	-	0	-	74	0	5	14
GI-280	Bare Point	x	1952	50e (1959)	118	373	142	0	0	0
GI-320	Ballingall Islets	9-12	1936	11 (1959)	0	0	2	0	0	0
GI-330	Galiano Island - Central Cliffs	x	1957	-	0	-	72	11	2	6
GI-350	Charles Island	x	1954	-	-	-	0[e]	-	-	-
GI-400	Galiano Island - Active Pass Cliffs	1	1975	-	-	0	0	0	0	-
GI-420	Chain Islands	x	1945	0	-	0	0[e]	-	-	-
GI-450	Prevost Island - South Cliffs	17	1977	-	-	-	0[e]	-	-	-
GI-510	East Point - Cliffs	x	1958	-	54	53	12	0	-[f]	-
GI-530	Elliot Bluff	10e	1974	-	10e	0	0	0	-[f]	-
GI-570	Oaks Bluff	8	1987	-	-	-	8	17	11	-
GI-630	Arbutus Island	17	1978	-	-	16	18	2	71	-
GI-656	Swartz Bay - Ferry Terminal	S	2017	-	-	-	-	-	-	-

Table 3 cont'd

SITE CODE	SITE NAME	Earliest nesting record Count	Year	Survey year[a] 1959/60	1974	1983	1987	2000	2014	2019
GI-710	Little Group	55	1989[g]	-	-	-	0[e, h]	-	-	-
GI-740	Sidney	3	2023	-	-	-	-	-	-	-
GI-750	Mandarte Island	x	1891	375 (1959)	443	550	536	270	645	586
GI-790	Gordon Head	x	1927	x	12	13	24	0	0	-
GI-840	Fiddle Reef	3-4	1970	-	12	-	0[e]	-	0	-
GI-870	Lewis Reef	x	1948	x	24	0	0	0	0	-
GI-880	Harris Island	22	1971	-	30	0	0	0	0	-
GI-890	Chain Islets/Great Chain Island	x	1924	72-74 (1960)	185	203	248	41	0	-
GI-900	Trial Islands	x	1956	107 (1960)	0	0	0	0	0	-
GI-940	Brothers Islands	7	1981	-	-	-	-	-	-	-
Colonies surveyed in 1959/1960 (see text), 1974, 1983, 1987, 2000, and 2014 (11 colonies)										
	Colonies with nests			10	9	7-8[c]	8-9[c]	7-8[c]	4	n/a
	Nests			856	1,562	1,614	1,503	670	954	n/a
Colonies surveyed in 1974, 1983, 1987, 2000, and 2014 (29 colonies)										
Northern Strait of Georgia										
	Colonies with nests			n/a	12	11-13[c]	10-12[c]	6-7[c]	4	n/a
	Nests			n/a	649	876	762	345	260	n/a
Gulf Islands										
	Colonies with nests			n/a	10	8	8	6	2	n/a
	Nests			n/a	1,316	1,350	1,185	419	712	n/a
Total BC Salish Sea										
	Colonies with nests			n/a	22	19-21[c]	18-20[c]	12-13[c]	6	n/a
	Nests			n/a	1,965	2,226	1,947	764	972	n/a
All surveyed colonies[i]										
Northern Strait of Georgia										
	Colonies surveyed			5	15	15	17	18	19(20)[j]	9
	Colonies with nests			4	12	12-14[c]	12-15[c]	10-11[c]	9(10)[j]	7
	Nests			163+	649	886	867	553	606(626)[j]	716
Gulf Islands										
	Colonies surveyed			11	21	20	30	22	23(25)[j]	10
	Colonies with nests			10	14	10	13	9	7(8)[j]	6
	Nests			693+	1,411	1,419	1,369	535	819(820)[j]	694
Total BC Salish Sea										
	Colonies surveyed			16	36	35	47	40	42(45)[j]	19
	Colonies with nests			14	26	22-24[c]	25-28[c]	19-20[c]	16(18)[j]	13
	Nests			856+	2,060	2,305	2,236	1,088	1,425(1,446)[j]	1,410
Number of historical sites surveyed that were abandoned										
Northern Strait of Georgia				1	1	1-3[c]	2-5[c]	7-8[c]	10	2
Gulf Islands				1	6	10	16[h]	13	16	4
Total BC Salish Sea				2	7	11-13[c]	18-21[c]	20-21[c]	26	6

[a] Data for 1959/60, 1974, 1983, 1987, 2000, and 2014 from Drent and Guiguet,[144] Campbell,[70] Vermeer and Rankin,[421] Vermeer et al.,[428] Chatwin et al.,[114] and Carter et al.,[101] respectively, with errors and omissions amended (see text). Trudy Chatwin [459] provided additional data from the 2000 and 2014 surveys. For other sources see individual colony accounts.

[b] Not surveyed in 2014. Twenty nests were counted in 2015.[101]

[c] Numbers were reported together for pairs of colonies, Franklin and Merry islands, Christie Island and Pam Rock, and Prospect Point and Siwash Rock [114, 421, 428] and we do not know whether nesting occurred on both colonies of each pair.

[d] There are no records from 1974 but Martin Lee found gull nests in 1975 and 1978 and made no mention of cormorants nesting.[523]

[e] Not listed in the table of Pelagic Cormorant colonies in Vermeer et al.[428] but based on their reported survey methods we assumed the site was surveyed and no nests were seen.

[f] Not surveyed in 2014. In 2013, there was one nest at East Point and no nests at Elliot Bluff.[101]

[g] Five unattended nests were seen in 1978 but we did not consider that a breeding record for this colony.

[h] Although there were no nests in 1987, we did not consider the Little Group as an abandoned colony in 1987 because only old, unattended nests had been observed previously at that colony.

[i] Number of sites differ from those given in previous compilations [101, 114, 421, 428] because we separated sites that had been lumped together and because data provided by Trudy Chatwin [459] allowed us to better identify which sites had been surveyed in a particular year.

[j] Totals in parentheses include 20 nests counted on Rabbit Island in 2015 and 1 nest at East Point and 0 nests at Elliot Bluff in 2013.

colonies over this period: the large colony on Trial Islands and the Ballingall Islets colony were abandoned by 1974; the Gordon Head colony decreased from 75 pairs in 1955 to 12 pairs in 1974; the large numbers suspected nesting on Copper Cliffs on Quadra Island in 1959 were gone by 1976;

and Elliot Bluff, Lewis Reef, and Harris Island were abandoned by 1983. The large colony on the Gabriola Island cliffs had highest numbers in 1968, declined by over a third by 1977, and was abandoned between 1978 and 1987 (Figure 106). Smaller numbers were again nesting there in 2000, with around 60 to 90 pairs nesting there in most years since. Small numbers were also nesting again at Copper Cliffs in 2019. Passage Island was first colonized in 1968, increased to a maximum of 180 nests in 1981, and was abandoned after 2000 (Figure 107). At Mitlenatch Island, numbers reached a maximum of 504 nests in 1966 and have fluctuated but generally declined since to a low of 93 nests in 2021 (see Mitlenatch Island account).

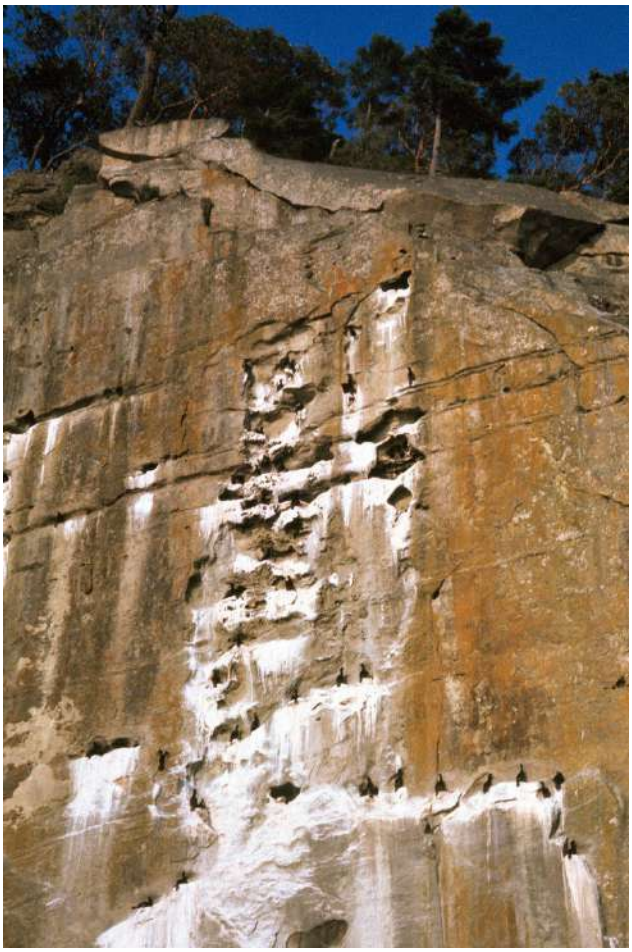


Figure 106. Pelagic Cormorants were first recorded nesting on the western cliffs of Gabriola Island in 1960. The colony increased rapidly to a maximum of 390 nests by 1968 and then decreased just as rapidly and was abandoned by 1978. Colonized again by 2000, Pelagic Cormorants have nested successfully on the cliffs for the last two decades. *Photo by R. Wayne Campbell, 5 July 1974.*

Figure 107. Passage Island near Vancouver was one of the largest Pelagic Cormorant colonies in the BC Salish Sea for a brief period in the late 1970s and early 1980s. It was also one the most important Glaucous-winged Gull colonies at that time. The Pelagic Cormorant colony was at its peak size when this photo was taken in 1981. Subsequently, the colony was a victim of real estate development and intolerant human residents. *Photo by R. Wayne Campbell, 7 June 1981.*

Surveys in the 1970s more than doubled the number of known Pelagic Cormorant nesting sites in the Strait of Georgia compared to Drent and Guiguet.[144] Cormorants may have colonized some of those sites in the interim, but many new sites identified were likely simply a result of more dedicated surveys. Counts at 29 colonies where surveys were repeated in 1974, 1983, 1987, 2000, and 2014 showed the same trends as the 11 colonies that had been regularly surveyed since 1960 (Table 3). Total numbers of nests were similar from 1974 through 1987, again peaking in 1983. Major declines were detected after 1987 and overall numbers counted in 2000 were only about a third of what they were in 1983.[114] Again, some recovery in the regional population was indicated by 2014 [101] but numbers at the 29 surveyed colonies were still less than half of what they were in 1983. The trend at the largest colony on Mandarte Island was slightly different. Numbers reached a peak of 603 nests in 1981, declined to only 37 nests in 1999, then rebounded to 645 nests in 2014 and an all-time maximum of 740 nests in 2015. The most recent complete survey of Mandarte Island in 2022 (see the Mandarte Island account regarding the 2023 survey conducted late in the season) documented 598 nests, only slightly less than the peak seen in 1981.

The use of sites for nesting by Pelagic Cormorants has changed dramatically over the years. Many historical nesting sites have been abandoned and much of the regional population now nests at

sites colonized since the 1970s. The number of abandoned nesting sites has increased steadily over the last five decades. Even in 1983 when the regional population was at its peak, there were at least 11 historical nesting sites surveyed where Pelagic Cormorants were not nesting. At the 29 colonies that were consistently surveyed since 1974, only six were still used in 2014 (Table 3). New nesting sites have been colonized over the same 40-year period, but total number of nesting sites has still decreased. Considering all of the 58 sites where Pelagic Cormorants have been recorded nesting in the BC Salish Sea, almost half (26) were known to be unused in 2014. Seven other sites that were not surveyed in 2014 were abandoned when they were previously visited and were likely not used in 2014 as well. One abandoned site, Valdes Island - West Cliffs, was re-colonized in 2015. In total, no cormorants were nesting at 55% of known historical nesting sites when they were most recently surveyed (Table 1).

Available data indicate that 16 sites were colonized by Pelagic Cormorants since the 1970s (Table 3). Vermeer et al.[428] stated that they had documented five new colonies in 1987, although only four sites (McRae Islet, North Pender Island cliffs, Tent Island, and Galiano Island - Central Cliffs) had no previous records listed in their summary table. In fact, only two sites, McRae Islet and North Pender Island cliffs (Oaks Bluff), were new sites in 1987. Birds were first recorded nesting on Tent Island in 1972 and on Galiano Island - Central Cliffs in 1957 (Figure 108). Eleven of the 16 sites colonized by Pelagic Cormorants since the 1970s were located in the northern Strait of Georgia; five were in the Gulf Islands.

Figure 108. Galiano Island - Central Cliffs was listed as a new Pelagic Cormorant colony in 1987 [428] but in fact had been established since at least 1957 according to local residents. Wayne Campbell and Marilyn Paul counted 32 nests in 1976. *Photo by R. Wayne Campbell, 27 July 1976.*

Pinpointing when sites were colonized is problematic because of the time gaps between surveys and because surveyors have tended to concentrate on previously known nesting sites and spend less time searching other areas. In the Gulf Islands/Victoria area, three new sites, Oaks Bluff, Little Group, and Brothers Islands, were identified in the 1980s. The Brothers Islands colony was identified in 1981, but we have no previous records for that colony and so are uncertain when it was first used for nesting by Pelagic Cormorants. There were no cormorants nesting at Oaks Bluff in 1977 or 1978 [523] and the site was apparently colonized between then and 1987.[428] Successful nesting at the Little

Group was first recorded in 1989; five old abandoned nests were seen in 1978 and none were nesting in 1987. The fourth and fifth new colonies in the Gulf Islands at the Swartz Bay ferry terminal and on the Sidney waterfront were first noted in 2017 and 2023, respectively. Two of the colonies established in the 1980s, Little Group and Brothers Islands, were subsequently abandoned.

In the northern Strait of Georgia, three new Pelagic Cormorant nesting sites were identified in 1981: Rabbit Island, Bertha Island, and Prospect Point. There were no previous survey data for Rabbit Island, but Bertha Island was likely colonized after 1975 and Prospect Point was apparently first used after 1977. Next, a new colony was identified in 1983 on the Second Narrows Bridge.[215] That site may have been first used that year. Martin Lee reported gull nests there in 1975 and 1978 and made no mention of cormorants nesting,[523] and Doug Wilson [518] saw no cormorant nests there in 1982. The new site on McRae Islet found by Vermeer et al.[428] was colonized between 1981 and 1987. The first record of nesting on Burrard Bridge in Vancouver is from 1997.[524] Granville Bridge may have been colonized in 2000; nesting birds were not recorded before that.[114] New colonies were discovered on Sea Egg Rocks in 2011 [506] and on Mouat Islands in 2014 [101] that were likely established sometime after 1981. Nesting was reported on "Quathiaski" Cliffs for the first time in 2021 and at the Tsawwassen ferry terminal in 2022. All new sites identified in the northern Strait of Georgia since the 1970s, except Prospect Point, were still in use when they were last surveyed.

The proportion of the regional population of Pelagic Cormorants nesting at new locations has steadily increased, especially on Vancouver bridges. One quarter of the estimated regional population in the BC Salish Sea in 2014 was nesting at new sites established since the 1970s. The discovery of new colonies even when total populations are declining highlights the need for thorough surveys of past and potential nesting locations to obtain confident estimates of overall breeding populations. With the concurrent abandonment of many historical sites, populations have become more concentrated, especially at the major colonies on Mitlenatch and Mandarte islands, which in 2014 accounted for 60% of the total population nesting in the BC Salish Sea.[101]

There have been no region-wide surveys for Pelagic Cormorants since 2014. However, there are data from 2019 for most of the main colonies, including the large colonies on Mitlenatch Island, the three Vancouver bridge sites, the west cliffs on Gabriola Island, and Mandarte Island. At 16 colonies that were surveyed in 2014 and then again in 2019, numbers of nests increased slightly from 1,253 to 1,350. Cormorants were nesting at the same nine of the 16 sites in both years plus at one additional site in 2019 on Valdes Island – West Cliffs where they had been absent in 2014. No cormorants nested on the Burrard Bridge from 2016 to 2018 because exclusion netting was installed under the central span of the bridge in those years, but numbers rebounded in 2019-2022, with the maximum number of nests (147) ever recorded tallied in 2021. On the Granville Bridge, there was a large decrease in the number of nests, from 306 nests in 2019 to about 80 nests in 2020, again due to the installation of exclusion netting to facilitate construction and maintenance activities. Numbers increased slightly to 95 nests in 2021 and 108 nests in 2022, when the exclusion netting was removed from the southern half of the bridge. A redistribution of nests between the two bridges occurred in 2023, with a decrease to 55 nests on the Burrard Bridge and an increase to 182 nests on the Granville Bridges. Numbers of nests decreased on Mitlenatch Island and at Second Narrows since 2019. As of 2023, for the entire BC Salish Sea, a total of 1,410 pairs were estimated nesting at 26 sites: 599 pairs at 14 sites in the northern Strait of Georgia and 811 pairs nesting at 12 sites in the Gulf Islands (Table 1). The current population estimate is 61% of the peak numbers counted in 1983 (Table 3).

Black Oystercatcher

Historical data for Black Oystercatchers in the BC Salish Sea suggest that nesting populations have increased and expanded over the last century but it is difficult to ascertain how much increased numbers are a result of population growth or greater survey effort. Comparisons across years are also confounded by differences in survey methods (see *Identifying and Addressing Issues with the Historical Data* above).

There are few nesting records prior to the 1960s. The species was not considered by Drent and Guiguet [144] and was generally not recorded by early bird banders. Most early records of nesting oystercatchers were from egg collectors (Figure 109). Eggs were first collected in 1892 on Mandarte Island and in 1895 on Chain Islets/Great Chain Island.

Records from Mandarte and Mitlenatch islands indicate that Black Oystercatchers were absent during several decades of the early 20th century and

Figure 109. The first confirmed records of Black Oystercatchers nesting in the BC Salish Sea came from egg collectors. The earliest record is from Mandarte Island in 1892. *Photo by R. Wayne Campbell, Mitlenatch Island, BC, June 1968.*

may have colonized, or in the case of Mandarte Island, re-colonized the islands around mid-century. On Mandarte Island, oystercatchers were confirmed nesting several times between 1892 and 1914. In 1915, W.B. Anderson noted that Black Oystercatchers used to be plentiful but had disappeared.[232] They were not reported nesting again until 1945. Numbers nesting after 1945 varied with a maximum of seven nests found during the thorough study by Hazlitt in 1996.[202] On Mitlenatch Island during the early 1920s, Pearse [301] searched for nesting oystercatchers but found none. They were first suspected nesting on the island in 1959 and 1960 and were confirmed nesting in 1963. A maximum of eight nests were reported in 1978, although seven of the nests found that year were empty. Four is the most nests with eggs or young reported on Mitlenatch Island (in 1976 and 1991).

The most complete counts for Black Oystercatchers nesting in the Strait of Georgia were conducted in 1978, 1987, and 2005/2006 when 78, 70, and 106 nests were counted or estimated at 44, 45, and 48 colony sites, respectively (Table 4). However, several known nest sites were not surveyed each year. As discussed above in the section *Identifying and Addressing Issues with the Historical Data*, surveys in 1987 and 2005/2006 were more complete in the Gulf Islands than in the northern Strait of Georgia. Also, surveys in the northern Strait of Georgia in 2005/2006 were conducted from the water only. The best comparison of data from surveys conducted in 1978, 1987, and 2005/2006 is for colonies in the Gulf Islands, where 51, 51, and 49 nests were counted at 30, 31, and 25 sites, respectively. Those data indicate a relatively stable nesting population over those years (Figure 110).

Compiled data as of 1990 and 2023 provide a further comparison of estimated population sizes. Available data as of 1990 indicated a total population in the BC Salish Sea of 99 pairs nesting at 73 sites: 29 pairs at 25 sites in the northern Strait of Georgia and 70 pairs at 48 sites in the Gulf Islands (Table 3, page 63 in Part 1 [335]). Our current estimate as of 2023 is 239 pairs nesting at 114 sites: 140 pairs at 60 sites in the northern Strait of Georgia and 99 pairs at 54 sites in the Gulf Islands (Table 1). Although they suggest an increasing population, these data are inadequate to accurately determine trends. Most of the apparent increase has occurred in the northern Strait of Georgia, where, for example, 15 new sites were identified in 2019-2023 (Table 4), mostly through the efforts of volunteer birdwatchers and naturalists in response to inquiries sent out by Michael Rodway. Most of those newly identified nesting sites were previously unexplored during oystercatcher surveys and it is not possible to distinguish population change from the effects of greater survey effort. At some sites, the most recent data are from surveys conducted from the water,[57, 94] which cannot reliably be compared to previous nest counts conducted on land. In the Gulf Islands, increased numbers are likely due to the dedicated and repeated surveys that have been conducted on many colonies in recent years by Parks Canada.[529] Largest numbers of nests found during Parks Canada surveys have been on Belle Chain Islets, Java Islets,

Figure 110. At least one pair of Black Oystercatchers has consistently nested on Norris Rocks in the northern Strait of Georgia during every survey in which observers have searched for oystercatcher nests on that colony since records began there in 1968. Two or three pairs have been seen nesting in recent years. *Photo by R. Wayne Campbell, 4 July 1974.*

Table 4. Survey effort, number of colony sites identified, and number of nests counted or estimated during major surveys conducted in 1974, 1978, 1987, and 2005/2006, and during the periods 1959-1968, 2010-2018, and 2019-2023 for Black Oystercatchers in the BC Salish Sea.[a]

	1959-1968	1974	1978	1987	2005/2006[b]	2010-2018	2019-2023
Number of colony sites known at this time (where past or present nesting had been documented)							
Northern Strait of Georgia	6	13	18	28	36	49	64
Gulf Islands	11	15	37	54	63	73	75
Total BC Salish Sea	17	28	55	82	99	122	139
Number of colony sites known at this time that were surveyed							
Northern Strait of Georgia	6	13	17	17	25	33	40
Gulf Islands	10	13	31	50	39	44	33
Total BC Salish Sea	16	26	48	67	64	77	73
Surveyed colony sites where oystercatchers were found nesting							
Northern Strait of Georgia	6	9	14	14	23	31	39
Gulf Islands	10	13	30	31	25	39	30
Total BC Salish Sea	16	22	44	45	48	70	69
Nests/nesting pairs counted at surveyed sites							
Northern Strait of Georgia	8[c]	12	27	19	47	47[c]	106[c]
Gulf Islands	18[c]	25	51	51	49	82[c]	64[c]
Total BC Salish Sea	26[c]	37	78	70[d]	106	129[c]	170[c]
Previously known colony sites surveyed where oystercatchers were not found nesting							
Northern Strait of Georgia	0	4	3	3	2	2[e]	1[f]
Gulf Islands	0	0	1	19	14	5[e]	3[f]
Total BC Salish Sea	0	4	4	22	16	7[e]	4[f]
Number of colony sites known as of 2023 that were surveyed							
Northern Strait of Georgia	7	22	27	18	25	33	40
Gulf Islands	10	19	41	60	39	44	33
Total BC Salish Sea	17	41	68	78	64	77	73
New colony sites identified during survey; in parentheses are the number of new sites identified during all surveys conducted since the previous survey shown in this table							
Northern Strait of Georgia	6	5 (7)	4 (5)	2 (10)	5 (8)	9 (13)	15
Gulf Islands	7	4 (4)	12 (22)[g]	14 (17)	5 (9)	10 (10)	2
Total BC Salish Sea	13	9 (11)	26 (27)[g]	16 (27)	10 (17)	19 (23)	17
New colony sites identified during survey where nesting oystercatchers were previously known to be absent; in parentheses are the number of such sites identified during all surveys conducted since the previous survey shown in this table							
Northern Strait of Georgia	1	2 (2)	3 (4)	2 (7)	4 (4)	4 (5)	5
Gulf Islands	2	2 (2)	6 (7)	8 (9)	4 (6)	4 (4)	0
Total BC Salish Sea	3	4 (4)	10 (11)	9 (14)	8 (10)	8 (9)	5

[a] Main data sources include Butler and Golumbia,[57] Vermeer et al.,[427] BCNRS,[523] eBird,[524] Parks Canada,[529] and contributions by many volunteers in response to inquiries from Michael Rodway. See colony accounts for specific data sources.
[b] Butler and Golumbia [57] conducted surveys in the Gulf Islands in 2005 and in the northern Strait of Georgia in 2006. Totals differ from those presented in Butler and Golumbia [57] because additional survey data were provided by Parks Canada,[529] Todd Golumbia,[472] and others.
[c] For the 1959-1968, 2010-2018, and 2019-2023 periods, we used the maximum number of nests counted at a colony during those periods to calculate a total.
[d] Vermeer et al.[427] presented a tally of 67 nests for 1987 that included three nests on Race Rocks. We have not included Race Rocks but had additional data on other colonies.
[e] Oystercatchers nested intermittently (i.e., they were not nesting in some years during the 2010-2018 period) at an additional one site in the northern Strait of Georgia and eight sites in the Gulf Islands.
[f] Oystercatchers nested intermittently (i.e., they were not nesting in some years during the 2019-2023 period) at an additional one site in the northern Strait of Georgia and 10 sites in the Gulf Islands.
[g] Two new sites were identified in 1976 and eight were identified in 1977 in the Gulf Islands.

Imrie Island, the Little Group, Sallas Rocks, and Little D'Arcy Island (Table 5). Although changes in survey effort confound the interpretation of population trends, the greater number of nests and the numerous new nesting sites discovered in recent years suggest, at the least, a robust and stable, if not increasing and perhaps expanding, nesting population of Black Oystercatchers in the BC Salish Sea.

Historical data are adequate to demonstrate considerable variation in site use by Black Oystercatchers over the years.[57] Many new colony sites have been identified during every major survey (Table 4). Some newly identified sites were likely a result of greater exploration, but in a large proportion of cases (41%), previous surveys had found no nesting oystercatchers. Overall, from 1959 to 2023, oystercatchers were found nesting at 57 new sites where they were previously known to be

Table 5. Black Oystercatcher surveys conducted by Parks Canada at colonies within Gulf Islands National Park Reserve in 2005-2023. Counts from 1987 for those sites have been included for comparison. See colony accounts for sources and survey dates. Sites not surveyed are indicated by a dash. When more than one nest was found and the contents of all nests were determined, the number of nests that contained eggs or young is indicated in square brackets. Since 2018, Parks Canada surveyors have less frequently landed on islands, and as of 2022, conducted surveys of all monitored colonies from the water. An "e" indicates that total numbers were estimated, and an "S" indicates that breeding was not confirmed (see Appendix 2).

Colony	1987	2005	2006	2007	2008	2009	2010	2011	2012	2014	2015	2016	2018	2019	2020	2021	2022	2023
GI-440 Red Islets	0	0	-	1	1S	1	1	1	1	1	1eS	1	1S	0	0	1S	0(0)	1eS(2)
GI-460 Channel Islands - southeast island	0	0	-	1	1	1	1	3eS	-	2S	0	2[2]	2eS	2S	1S	1S	2S(5)	1S(3)
- west island	0	-	-	-	-	1	1	1	0	0	2[2]	0	0	1S	0	0	0(0)	0(0)
GI-470 Belle Chain Islets - islet #1 (north)	[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- islet #2 (mid-north)	[a]	-	-	2[2]	1	2[2]	2[2]	2[2]	3[2]	3eS	1eS	2[2]	0	0	0	0	0(0)	2eS(4)
- islet #3 (mid- south)	[a]	2[2]	3e	1	1	5e	3e	4e	2[1]	3[3]	2eS	1	5e	5e	4eS	3[2]	5eS(10)	2eS(5)
- islet #4 (Anniversary)	3[a]	1	3[2]	3[2]	3[3]	5[3]	5e	5[4]	5[1]	4e	4eS	1	5eS	4e	3eS	3e	4eS(9)	4eS(8)
GI-480 "Minx" Rocks	1	1eS	1eS	-	-	-	1	1	-	1	0	1	0	1S	0	1S	1eS(2)	1eS(2)
GI-490 Pine Islet	2	1	-	1	-	1	1[b]	1S	-	1	0	1	1	0	1S	1S	1(2)	0(1)
GI-500 Cabbage Island	1	0	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0(0)	0(0)
GI-550 Java Islets - west islet	4[a]	1	3e	2[2]	4eS	5[4]	4e	5[5]	6[6]	4S	4[4]	4[4]	2S	7e	3eS	4e	3eS(7)	3eS(9)
- east islet	[a]	-	1	1S	1eS	1eS	2[2]	2[2]	2[2]	2[2]	1	3[3]	5[4]	4e	2[1]	3eS	3eS(6)	3eS(5)
GI-580 "Peter" Rock	2	0	-	-	-	-	-	-	-	0	0	1	1S	1eS	1	1S	1eS(1)	0(0)
GI-590 Jackson Rock	0	1	1	0	1	1	1	1S	1S	1	1	1eS	1S	0	1S	1	1eS(2)	1eS(2)
GI-600 Isabella Island	0	1S	-	-	-	-	-	0	-	0	1	1	1S	1S	1S	2eS	1eS(2)	0(0)
GI-610 Pellow Islets	0	0	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0(0)	0(0)
GI-620 Tortoise Islets	1	1	1eS	-	-	-	-	-	-	1	0	0	0	0	1eS	1	1eS(2)	1(2)
GI-670 Imrie Island	2	1	3[3]	4eS	3[3]	5[4]	4[3]	4[3]	4e	3[3]	4e	4[4]	2eS	5[5]	5e	5[5]	6e(13)	6eS(13)
GI-680 Reay Island	0	0	-	0	-	-	-	-	1S	-	1	0	1S	0	1	0	2eS(4)	0(0)
GI-690 Greig Island	0	2[1]	2[1]	1	1	1	1	0	1	0	1	2[2]	1S	1	1	1S	1S(1)	1eS(1)
GI-710 Little Group - Dock Island	1	4e	1S	2eS	2S	1S	-	2eS	1	2eS	1eS	0	1S	1	0	1S	1S(2)	1eS(2)
- islet south of Dock I.	0	1	-	1	1	-	1S	0	-	1	0	0	-	-	-	-	-	-
- islet west of Dock I.	1	1	-	-	1eS	0	1	1	1S	1S	0	-	0	0	0	0	1S(3)	1eS(3)
- rocks southeast of Ker I.	0	-	1S	-	-	-	-	-	-	0	0	1	1S	1eS	0	1S	0(0)	1eS(1)
GI-750 Mandarte Island - north rock	3[c]	2eS[c]	-	1S	1	1	1	1	1	1S	1eS	1	1S	1eS	1eS	1eS	1eS(2)	1eS(2)
GI-770 Sallas Rocks – rock southeast of treed islet	1[a]	-	-	-	-	1	1	1	1S	1eS	0	0	1S	2eS	1	1	1S(2)	2eS(3)[d]
- southwest rock	[a]	1S	-	-	-	1	1	0	0	1eS	1	1	1S	1S	0	1S	1S(1)	1eS(2)
- southeast rock	[a]	-	-	-	-	1	1	1S	2eS	1eS	2[2]	1	1eS	-	-	1	1S(2)	[d]
GI-780 Little D'Arcy Island - north rock	1	4[4]	2[2]	3[3]	4[4]	5[3]	5e	5[1]	4[4]	3[3]	3[3]	1	2[2]	1eS	2S	2S	2eS(5)	3eS(5)
GI-782 Unit Rocks	0	1	1eS	1	1	1	1S	1S	1eS	2eS	0	0	0	1	1	1	1eS(3)	1S(1)
Number of colony sites (locations) surveyed	20 (30)	20 (23)	10 (13)	13 (17)	11 (16)	13 (20)	14 (21)	15 (23)	13 (19)	19 (28)	20 (29)	20 (28)	20 (28)	20 (27)	20 (27)	20 (28)	20 (28)	20 (28)
Number of nests counted or estimated at all surveyed sites (number of adults counted)	**23**	**26**	**23**	**25**	**27**	**40**	**39**	**42**	**37**	**39**	**31**	**30**	**36**	**40**	**30**	**37**	**41 (86)**	**37 (76)**

[a] Locations of nests found in 1987 were not specified.
[b] Eggs had been depredated and nest was abandoned.
[c] Includes nests on the main island as well.
[d] Counts for the two southeast Sallas Rocks were combined in 2023.

absent. Those data suggest an expanding population since the 1950s. However, the opposite trend has also occurred at many historically used sites. On average, almost a quarter (23%) of the previously known nesting sites that were surveyed were not used during major surveys conducted in 1978, 1987, and 2005/2006 (Table 4). Similarly, 18% of the 139 known colony sites in the BC Salish Sea were not used when they were last surveyed (Table 1). Some of those records may indicate intermittent use of colony sites rather than colonization of new sites or abandonment of historically used sites. Records from 1959 to 2018 are adequate to demonstrate intermittent nesting (i.e., oystercatchers were nesting, then were absent, and then were nesting again) at 29 colonies. Surveys may not have been conducted frequently enough to detect intermittent use at many other colonies. Most colonies where intermittent use has been documented have had one or two pairs of oystercatchers nesting prior to the time when birds were absent (numbers nesting on Mandarte Island may have been greater than two pairs prior to their absence after 1914). Subsequent numbers nesting at those colonies have ranged from one to five pairs (except 7 pairs have nested on Mandarte Island).

Continued discovery of new Black Oystercatcher colony sites and documented intermittent use of colony sites have important implications for conducting surveys and monitoring breeding populations. First, all suitable nesting areas need to be surveyed to obtain reliable estimates of total nesting populations. Thorough surveys conducted in the Gulf Islands in 1987 and 2005 provide a good example: Vermeer et al.[427] noted many apparently suitable colony sites that were not occupied in 1987; Butler and Golumbia [57] found oystercatchers nesting at 21 of those sites in 2005. Contrary to Vermeer et al.,[427] Hazlitt [202] suggested that suitable breeding habitat in the Gulf Islands was saturated and limited breeding population size. Her conclusions were based on the greater and consistent number of nests found during the repeated surveys she conducted in 1996 and 1997 compared to those found during the single survey by Vermeer et al.[427] in 1987. However, Hazlitt also found that 12% (4 of 34) of nesting territories used in 1996 were not used in 1997, and the same proportion (12%) was newly established in 1997.[202] Longer-term data over larger areas reveal that a high proportion of known colony sites as well as other sites with suitable nesting habitat are unused in any particular year.

Single surveys of all potential nesting habitats are generally not sufficient to provide accurate estimates of total breeding populations. Multiple surveys during the early incubation period are needed. This assumes that the methods used on most recent surveys [57, 202, 427] are followed. During those surveys, potential nesting sites were circled by boat and observers landed on any islands where oystercatchers were seen. Hazlitt found that the probability of detecting a nesting pair from the water was 68% with one survey, 90% with two surveys, and 100% with three surveys.[202] She also suspected that single surveys such as the one in 1987 [427] likely missed nesting pairs that failed early in incubation before the survey was conducted. In total, Hazlitt found over twice as many nesting pairs in her study area in 1996 and 1997 as had Vermeer et al. in 1987. Her findings can likely be extrapolated to other areas where breeding population estimates have been estimated based on single visits to colony sites. Detection probabilities would be much higher, likely close to 100% for detecting nesting birds present on one survey, if all suitable colony sites were explored from land regardless of whether oystercatchers were visible from the water.

Interpretation of trends would be assisted if future surveys use consistent methods, count nests from land, and if information on empty nests was consistently recorded, including whether those nests are likely associated with hidden young (Figure 111) and whether multiple nests are close together and likely represent one nesting territory.

As noted above, in 2022 Parks Canada decided to conduct all surveys of monitored colonies within Gulf Islands National Park Reserve only from the water. In 2023, a decision was made to conduct surveys every two years.

Figure 111. Black Oystercatchers chicks will hide away from the nest soon after hatching. They are often difficult to find. Many empty nests found by surveyors have hidden young nearby. *Photo by R. Wayne Campbell, Chain Islets, BC, 22 June 1973.*

It's in the Eyes

Black Oystercatchers, like other members of the order Charadriiformes, are monomorphic in plumage but somewhat dimorphic in size.[9] *Both sexes have the same solid dark plumage, but females tend to be larger and have longer and thinner bills than males.*[9] *Bills of females also may be slightly more orange than males* [5] *and females are more likely to show pale tips on the belly feathers.*[201]

Unfortunately for researchers studying Black Oystercatchers, visual assessment of morphological differences cannot be used to reliably separate sexes in the field because differences are slight and there is overlap in size distribution between the sexes. Until recently, this has meant that researchers must capture birds to sex them. Discriminant analysis using body measurements from captured birds can be used to sex individuals from the same area with reasonably high levels of accuracy (86-88%).[190] *Such analyses are less reliable if birds from different areas are studied because morphological measurements vary among populations, which results in greater overlap between the sexes in the range of body measurements. Molecular markers from DNA analyses can be used to accurately sex birds but also requires capturing and handling birds to obtain blood samples. Molecular sexing also has the drawbacks of high cost and having to wait for laboratory analyses to determine the sex.*

In 2004, Guzzetti et al.,[190] *conducting studies of Black Oystercatchers at Middleton Island and in Prince William Sound in Alaska, noticed that some breeding adults had darkened regions within the yellow iris of their eyes, which they called "eye flecks." That characteristic appeared to be linked to sex and Guzzetti et al.*[190] *wondered if it could possibly provide a reliable means to sex Black Oystercatchers in the field without having to capture them. Eye colour had long been used to age Black Oystercatchers - chicks initially have dark eye rings and dark irises and develop the orange eye ring and bright yellow iris characteristic of adults by their third year.*[9] *Although the cause of eye flecks is unknown,*[190] *they look like parts of the iris that remained dark and unpigmented as the bird aged.*[342]

To test their hypothesis that eye flecks could be used to sex Black Oystercatchers, Guzzetti et al.[190] *categorized their captured birds as having full eye flecks, slight eye flecks, or no eye flecks. Eye flecks were defined as full if at least part of the fleck was completely black; otherwise it was defined as a slight eye fleck. Birds were sexed using molecular markers and the presence of eye specks was compared between males and females. Of 70 females and 55 males sampled, they found that all females had eye flecks (94% had full eye flecks and 6% had slight eye flecks), whereas among males, 64% had no eye flecks, 29% had slight eye flecks, and 7% had full eye flecks. Guzzetti et al.*[190] *found that if they assumed that all females have full eye flecks and all males have slight or no eye flecks then sex could be assigned correctly 93.6% of the time* (Figure 112)*. Thus, eye-fleck categorization was more accurate than discriminant analysis using body measurements. This finding was a great boon for researchers and meant that birds could be sexed with a high degree of accuracy without having to capture them.*

Guzzetti et al.[190] *issued a caution with their findings. Their study examined Black Oystercatchers during the breeding season from a local area in Alaska. Whether their results applied to other locations and to birds during other times of the year was unknown. They were also uncertain whether their findings might apply to other oystercatcher species. They made some observations of Eurasian Oystercatchers* (Haematopus ostralegus) *and found that females had larger eye flecks than males but almost all birds had eye flecks, making eye flecks less useful for distinguishing sex in that species.*

Subsequent researchers have investigated eye flecks in other oystercatcher species. Kohler et al.[237] *found that eye flecks can serve as a reliable indicator of sex for African Black Oystercatchers* (Haematopus moquini)*. For American Oystercatchers* (H. palliatus)*, Munters* [275] *found significant differences between the sexes, with females having a greater proportion of eye flecks than males, but concluded that it was not feasible to quantify the amount of eye flecks in the field. Eye fleck pattern was not a reliable predictor of sex in the Pied Oystercatcher* (H. longirostris) *in Australia, although a bird with no eye flecks was most likely to be an adult male.*[342] *Eye fleck pattern was not related to sex in the Kamchatka Oystercatcher* (H. ostralegus osculans)*.*[279]

Overall, studies indicate that categorization of eye flecks can be used to sex some oystercatcher species (Black Oystercatchers and African Black Oystercatchers, so far), but the technique is not broadly applicable across the genus. Still, the technique is welcome news for researchers and birdwatchers on the Pacific coast of North America. Next time you are watching Black Oystercatcher on our shores, don't forget – sex is in their eyes!

Figure 112. The presence of eye flecks in adult Black Oystercatchers has proven to be a reliable predictor of sex. Females (left; male out of focus on right of photo) almost always have full eye flecks, while males (right) have no or only slight eye flecks. *Photos by Paula Courteau, 8 March 2015.*

Glaucous-winged Gull

Determining trends in total population size for Glaucous-winged Gulls nesting in the BC Salish Sea is complicated by their extensive and increasing use of urban habitats over the last 60 years and the lack of accurate population estimates for those areas. In recent decades, populations have clearly increased in urban habitats and decreased at many historically important island colonies but how those trends offset each other is undetermined. As noted above (see *Status of Seabird Breeding Populations as of 2022*), we have made rough estimates of current population sizes at urban colonies. Using those estimates, we have attempted to evaluate overall trends in gull populations throughout the BC Salish Sea. In the sections below we first interpret population trends for historically-used island colonies, then consider urban colonies, and finally evaluate overall trends in Glaucous-winged Gull populations throughout the BC Salish Sea (Figure 113).

Island Colonies – Trends to 2010. Changes in Glaucous-winged Gull breeding populations on island colonies are apparent during the first part of the 20th century and are best documented after 1966 through 2010 (Table 6). Few total nest counts were conducted before the 1960s; abundance data prior to the 1960s are mostly rough estimates of population size. Prior data suggest generally increasing trends in population size during the first half of the 20th century at major colonies, although increases may not have begun until after about 1915, given that Anderson noted a substantial reduction in numbers nesting on Mandarte Island in 1915 compared to 20 years earlier.[232] Estimated numbers since 1915 have been used to infer dramatic population increases from the early 20th century to 1960 at the largest colonies on Mitlenatch and Mandarte islands.[420] However, population changes are difficult to quantify during that period and increases may not be as large as previously suggested.

Figure 113. Although common, noisy, querulous, and smelly, there is a beauty and elegance about Glaucous-winged Gulls that makes them lovely to observe and fascinating to study. Watching undisturbed individuals going about their daily lives on Mitlenatch Island is a treat for naturalists and tourists alike. *Photos by Marlene Graham, 2005 to 2011 and David Thomson (chick behind parent), 2009.*

On Mitlenatch Island, Pearse initially estimated about 250 pairs nesting in 1922.[301] That estimate was quoted by Drent and Guiguet [144] and was used by Vermeer and Devito [420] in their interpretation of population changes since 1922. In the same paper, Pearse quoted an estimate of 1,500 adults and 600 nests made by R.M. Stewart in June 1923 when Stewart was stationed for 10 days as a warden on the island.[301] Curiously, that estimate was not presented by Drent and Guiguet [144] or Vermeer and Devito.[420] Pearse later revised his estimates and retrospectively estimated a consistent nesting population of about 1,500 birds (i.e., 750 pairs) throughout the years from 1922 to 1957.[304, 305] Several estimates made after 1959 suggested population increases in the order of 400-500% over the next few years to a maximum of 3,500 pairs estimated nesting in 1967. However, the first total count of 1,632 gull nests conducted in 1974 [70] tallied just over half the estimated number of nests from the year before and

Table 6. Trends in Glaucous-winged Gull breeding populations (number of nests counted) in the BC Salish Sea between 1959 and 2010. All known historical nesting sites are listed. Rough estimates of population size are listed in the body of the table but are not included in the totals tallied at the bottom of the table. A dash indicates colonies for which there are no survey data in a particular year. See Appendix 2 on pages 504-505 for an explanation of the letter codes used to qualify population estimates.

SITE CODE	SITE NAME	Earliest nesting record		Survey Year[a]							
		Count	Year	1959/1960	1974	1977	1978	1981	1986	1999	2009/2010[b]
Northern Strait of Georgia											
SG-014	Hoskyn Rock	x	2012	-	-	-	-	-	-	-	-
SG-017	Centre Islet	1S	2018	-	-	-	-	-	-	-	-
SG-020	Copper Cliffs	1+eS	1976	-	-	-	0	-	-	-	-
SG-030	Three Islets	1	1974	-	1	1eS	2eS	1	-	-	-
SG-050	Little Rock	1	1974	-	1	0	0	1	1	-	-
SG-055	Ray Rock	10e	2009	-	-	-	-	-	-	-	10e
SG-060	Powell Islets	1	1970	-	0	0	1S	0	-	-	-
SG-070	Major Islet	1S	1970	-	3[3]	0	1S	1	-	-	-
SG-080	Keefer Rock	7	1970	-	-	20[20]	14[1]	28[26]	28	-	-
SG-090	Mitlenatch Island	x	1896	600-1,200e	1,632[1,578]	987[811]	2,558[2,326]	1,922[986]	2,100	-	2,493[1,152]
SG-100	Powell River	6	1986	-	-	-	-	-	6	-	-
SG-110	Vivian Island	59+	1966	-	218[191]	-	240[90]	229[178]	208	-	-
SG-130	McRae Islet	97	1969	-	-	-	150[36]	164[73]	262	-	-
SG-135	Deserted Bay - Dock	1	2021	-	-	-	-	-	-	-	-
SG-140	"Blind" Islets	2	1986	-	-	-	0	0	2	-	-
SG-145	“Cockburn” Islets	150e	2014	-	-	-	0	0	-	-	-
SG-148	“Trafalgar” Rock	1	1986	-	-	-	-	0	1	-	-
SG-150	Hodgson Islands	1	1986	-	-	-	0	0	1	-	-
SG-180	Mouat Islands	16	1981	-	-	-	0	16[11]	35	-	-
SG-190	"Davie" Islet	3	1986	-	-	-	-	0	3	-	-
SG-200	Denman West Dock	1	1986	-	-	-	-	-	1	-	-
SG-210	Denman East Dock	1	1986	-	-	-	-	-	1	-	1eS
SG-212	Hornby Island - West Dock	1	before 2000	-	-	-	-	-	-	-	-
SG-220	St. John Point	25e	1936	S	5	2[2]	-	3-7e	6	-	-
SG-230	Norris Rocks	17	1968	-	85[81]	104[27]	58[22]	111[48]	287	-	185[111]
SG-240	Chrome Island	1	1974	-	1	-	1eS	3eS	3eS	-	1S
SG-250	Sisters Islets	100e	1940	-	108[108]	-	85[65]	151[141]	25	-	-
SG-260	Finnerty Islands	10eS	1974	-	10eS	-	0	6[4]	4	-	-
SG-270	Fegan Islets	2S	1974	-	2S	-	0	1	1	-	-
SG-278	“Sabine” Islets	1	1986	-	-	-	-	0	1	-	-
SG-290	"Upwood" Islet	3	1981	-	-	-	-	3[3]	-	-	-
SG-300	Sheer Island	7	1981	-	-	-	-	7[7]	50	-	-
SG-302	Rabbit Island	22	1986	-	-	-	-	0	22	-	-
SG-305	“Windy” Rock	1	1986	-	-	-	-	0	1	-	-
SG-310	Sea Egg Rocks	5	1986	-	-	-	0	0	5	-	-
SG-330	"Priestland" Rocks	1	1981	-	-	-	-	1	-	-	-
SG-340	"Jeddah" Rocks	2	1981	-	-	-	-	2[1]	-	-	-
SG-360	Franklin Island	700-800eS[c]	1950	500e	387[354]	287[242]	478[404]	443[306]	216	-	47[43]

Table 6. cont'd

SITE CODE	SITE NAME	Earliest nesting record		Survey Year[a]							
		Count	Year	1959/1960	1974	1977	1978	1981	1986	1999	2009/2010[b]
SG-370	Merry Island	x[c]	1924	100e	252[201]	310[255]	362[d]	158[13]	6	-	3eS
SG-380	Porpoise Bay	1	1978	-	-	-	1	1	-	-	-
SG-390	Trail Islands	2	1973	-	3[3]	-	4eS	5[4]	-	-	-
SG-400	White Islets	x	1923	-	279[278]	-	458[410]	314[185]	490	-	328[253]
SG-430	Christie Islet	x	c1914	299[299]	477[430]	x	722[655]	558[518]	454	246e	255[198]
SG-440	Pam Rock	x	1941	-	121[113]	x	151[115]	131[103]	109	25[7]	11[7]
SG-444	Squamish Harbour	1	2008	-	-	-	-	-	-	-	1
SG-450	Bowyer Island	11S	1978	-	0	-	11S	12	-	-	-
SG-460	"Sunset Beach" Cliffs	1	1956	-	-	-	-	-	-	-	-
SG-470	"Bay" Rock	5	1980	-	-	-	-	-	-	-	-
SG-490	Whyte Islet	6	1978	-	-	-	6[4]	22[19]	0	0	0
SG-500	Bird Islet	3	1974	-	3[3]	-	-	-	38	35[33]	45[15]
SG-505	Kettle Point	2S	1981	-	-	-	-	2S	-	-	-
SG-520	"Eagle" Rocks	2	1974	-	2[2]	-	-	17[5]	10	1	-
SG-530	Passage Island	x	1940	50e	496[456]	-	798[701]	709[451]	384	-	25[11]
SG-540	Grebe Islets	7	1974	-	7[7]	-	12[7]	22[2]	108	257[217]	58[33]
SG-550	Point Atkinson	4	1968	-	-	-	-	-	-	-	-
SG-555	Capilano Lake	1	1972	-	1	-	-	-	-	-	-
SG-560	Wigwam Inn	1	1940s	-	-	-	-	-	-	-	-
SG-568	Port Moody	1	2013	-	-	-	-	-	-	-	-
SG-570	Barnet	2	1977	-	-	2[2]	-	-	-	-	-
SG-580	Second Narrows	2	1975	-	-	-	4	-	40	-	-
SG-590	North Vancouver	1	1967	-	72[57]	25[20]	28[5]	21[10]	158e	-	-
SG-595	West Vancouver	18e	2021	-	-	-	-	-	-	-	-
SG-600	Vancouver Harbour	1	1962	-	-	-	-	-	112e	-	-
SG-610	Lions Gate Bridge	1	1958	-	1	-	-	4	12	-	2
SG-620	Prospect Point	2	1959	2	5	4	1	9	4	-	0
SG-630	Siwash Rock	3-4e	1958	-	6[6]	4	-	5[5]	8	-	0
SG-640	Burrard Bridge	9	1986	-	-	-	-	-	9	-	1
SG-650	Granville Bridge	10	1986	-	-	-	-	-	10	-	-
SG-660	False Creek	172e	1986	-	-	-	-	-	172e	-	-
SG-661	Point Grey	20e	2021	-	-	-	-	-	-	-	-
SG-664	Oak Street Bridge	1	2021	-	-	-	-	-	-	-	-
SG-665	Mitchell Island	2eS	2021	-	-	-	-	-	-	-	-
SG-666	Knight Street Bridge	1	2021	-	-	-	-	-	-	-	-
SG-667	South Vancouver	2	2021	-	-	-	-	-	-	-	-
SG-670	Queens Reach to North Arm	4	2012	-	-	-	-	-	-	-	-
SG-672	Pattullo Bridges	2S	2013	-	-	-	-	-	-	-	-
SG-674	Annacis Island	3eS	2021	-	-	-	-	-	-	-	-
SG-675	Lulu Island - North	1	2008	-	-	-	-	-	-	-	-

Table 6. cont'd

SITE CODE	SITE NAME	Earliest nesting record		Survey Year[a]							
		Count	Year	1959/1960	1974	1977	1978	1981	1986	1999	2009/2010[b]
SG-677	Sea Island	9	2018	-	-	-	-	-	-	-	-
SG-679	Lulu Island - South	2	2008	-	-	-	-	-	-	-	-
SG-680	Westham Island	3	1972	-	-	-	-	-	-	-	-
SG-700	Roberts Bank Superport	3	1988	-	-	-	-	0	-	-	-
SG-710	Tsawwassen Ferry Terminal	3+	~1961	-	9[7]	3eS	4S	7[3]	-	-	4
SG-720	Tsawwassen Breakwater	10e	1970	-	115[102]	160[147]	150[103]	223[106]	238	-	250e[e]
SG-730	White Rock	1S	2010	-	-	-	-	-	-	-	1S
Gulf Islands											
GI-010	Ballenas Islands	50e	1952	-	0	-	-	2eS	0	-	-
GI-015	Yeo Islands	1S	1978	-	-	-	1S	-	-	-	-
GI-020	Ada Islands	75+	1961	-	171e	-	154[127]	155[108]	124	-	73[69]
GI-040	Maude Island	2	1986	-	0	-	-	-	2	-	0
GI-045	Long Lake	1	1986	-	-	-	-	-	1	-	-
GI-050	Five Finger Island	x	1958	-	311[288]	459[422]	473[454]	599[559]	671	288e	9[2]
GI-060	Hudson Rocks	x	1958	75e	248[242]	259[252]	236[225]	308[291]	247	122[74]	10eS
GI-070	Snake Island	x	1947	300-500e	558[432]	400e[f]	615[582]	719[631]	673	204[44]	23e
GI-076	Brandon Islands	3S	1999	-	-	-	-	-	-	3S	-
GI-085	Nanaimo Harbour	10e+	2005	-	-	-	-	-	-	-	-
GI-090	Gabriola Island - West Cliffs	2	1968	-	4	5	3	-	-	-	4
GI-095	Harmac - Mill	100e+	2005	-	-	-	-	-	-	-	-
GI-100	Gabriola Island - East Cliffs	1	1977	-	-	1	-	-	-	-	-
GI-110	Carlos Island	1	1978	-	0	-	1	-	-	-	-
GI-112	Breakwater Island	1S+	2012	-	-	-	-	-	-	-	-
GI-130	Round Island	5	1977	-	-	5[2]	3[2]	3[2]	-	-	-
GI-150	Decourcy Island	3	1977	-	-	3	2	-	2	-	0
GI-160	Valdes Island - West Cliffs	1	1977	-	0	1	1	0	-	-	-
GI-170	Ruxton Island	2	1977	-	-	2	2	-	2	-	-
GI-171	Whaleboat Island	1	1986	-	-	0	0	-	1	-	-
GI-180	Tree Island	1	1977	-	-	1	2[2]	-	-	-	-
GI-190	Miami Islet	22	1968	-	52[47]	43[39]	32[25]	26[16]	38	-	5eS
GI-200	Ragged Islets	10-20e	1961	-	103[75]	126[117]	130[111]	89[29]	69	-	28[18]
GI-210	Rose Islets	x	1963	-	208[113]	167[160]	167[135]	211[183]	116	-	21[12]
GI-220	Canoe Islet	x	1963	-	67[60]	57[21]	50[30]	62[23]	56	-	-
GI-230	Galiano Island - North Cliffs	4	1976	-	-	2	1	-	6	-	-
GI-240	"Preedy" Rock	2	1978	-	-	-	2[1]	-	-	-	-
GI-250	Augustus Point	4e	1972	-	10	6	3	6+	8	-	-

Table 6. cont'd

SITE CODE	SITE NAME	Earliest nesting record		Survey Year[a]							
		Count	Year	1959/1960	1974	1977	1978	1981	1986	1999	2009/2010[b]
GI-260	Wallace Island	3	1974	-	3[3]	12[8]	10[6]	7[1]	3	-	-
GI-270	Tent Island	1	1972	-	3[3]	16	7	15e	12	-	-
GI-280	Bare Point	1	1968	-	11	8	4e	16e	5	-	-
GI-280	Chemainus - Harbour	3	2010	-	-	-	-	-	-	-	3
GI-290	Shoal Islands	1	1974	-	1	-	1	-	-	-	-
GI-290	Crofton - Mill	20e	2016	-	-	-	-	-	-	-	-
GI-300	Cowichan Lake	1	1985	-	-	-	-	-	-	-	-
GI-310	Vesuvius Bay	4	1986	-	-	-	-	-	4	-	-
GI-320	Ballingall Islets	40	1934	57	96[96]	118[116]	106[105]	63[30]	145	-	22[6]
GI-330	Galiano Island - Central Cliffs	3-4eS	1976	-	-	1	1	-	-	-	-
GI-340	"Wise" Rock	1S	1977	-	-	1S	0	-	-	-	-
GI-370	Galiano Island - South Cliffs	1	1977	-	-	1	0	-	-	-	-
GI-380	Lion Islets	2	1977	-	-	2[2]	2[1]	-	1	-	-
GI-390	"Gossip" Rock	1	1986	-	-	0	0	-	1	-	-
GI-410	"Long Harbour" Islet	3	1974	-	3[3]	1	1	-	~1[g]	-	-
GI-420	Chain Islands	4	1977	-	-	4	16[4]	-	~5[g]	-	-
GI-424	Hawkins Island	3	1934	-	-	0	0	-	-	-	-
GI-440	Red Islets	1S	1977	-	-	1S	1S	-	-	-	-
GI-450	Prevost Island - South Cliffs	2	1977	-	-	2	3	-	-	-	-
GI-460	Channel Islands	1	1977	-	-	1	1	-	-	-	-
GI-470	Belle Chain Islets	15	1966	-	6[6]	29[23]	50[43]	78[46]	56	-	18
GI-490	Pine Islet	4	1977	-	-	4[1]	1	-	-	-	-
GI-510	East Point - Cliffs	7	1977	-	0	7	6	3	7	-	-
GI-520	Lyall Harbour - Cliffs	1	1986	-	-	0	-	-	1	-	-
GI-540	"Croker" Rock	2	1955	-	-	0	0	-	-	-	-
GI-550	Java Islets	x	1900	372[372]	372[358]	374[348]	499[481]	384[315]	298	-	25[15][h]
GI-560	Blunden Islet	1-2	c1960	-	-	0	0	-	-	-	-
GI-590	Jackson Rock	1	1978	-	-	0	1	-	-	-	-
GI-595	Fulford Harbour	1	2022	-	-	-	-	-	-	-	-
GI-620	Tortoise Islets	1S	1977	-	-	1S	1S	-	-	-	-
GI-630	Arbutus Island	39	1976	-	-	-	69[55]	89[83]	150	55[7]	68[53]
GI-640	Hatch Point - Wharf	2	1981	-	-	-	-	2[1]	-	-	-
GI-656	Swartz Bay - Ferry Terminal	1	2020	-	-	-	-	-	-	-	-
GI-660	"Swartz Head" Rocks	1	1978	-	-	-	1	-	-	-	-
GI-670	Imrie Island	x	1927	270[245][i]	298[298]	315[299]	355[287]	279[247]	216	41[2]	-
GI-680	Reay Island	5	1974	-	5[5]	6[6]	1	-	-	0	0
GI-690	Greig Island	20e	1963	-	40[39]	-	44[38]	53[46]	52	14[2]	17[14]

Table 6. cont'd

SITE CODE	SITE NAME	Earliest nesting record Count	Earliest nesting record Year	Survey Year[a] 1959/1960	1974	1977	1978	1981	1986	1999	2009/2010[b]
GI-710	Little Group	35	1977	-	-	35	2[1]	-	6	1S	0
GI-720	Rubly Island	x	1977	-	-	x	0	-	-	-	-
GI-740	Sidney	2	1981	-	-	-	-	2	4	-	-
GI-750	Mandarte Island	x	1892	1,800-2,000e	1,047[1,037]	1,666[j]	544[505]+[k]	1,386[1,112]	2,363	-	2,432[1,920]
GI-770	Sallas Rocks	29	1986	-	-	-	-	-	29	-	9[1]
GI-800	Ten Mile Point	1	1960	1	-	-	-	-	-	-	-
GI-820	Jemmy Jones Island	1S	1978	-	-	-	1S	-	-	-	-
GI-850	Mary Tod Island	1	1986	-	-	-	-	-	1	-	2S
GI-880	Harris Island	41	1971	-	-	28[28]	47[38]	19[6]	22	-	-
GI-890	Chain Islets/Great Chain Island	x	1924	700-1,000e	1,764[1,659]	1,838[1,789]	1,956[1,765]	1,880[1,508]	2,432	-	2,066[1,410]
GI-900	Trial Islands	x	1948	50e	0	-	2S	-	-	-	100e
GI-905	Ogden Point - Port	x	2008	-	-	-	-	-	-	-	-
GI-910	Harrison Island	1	1980	-	-	-	-	-	-	-	-
GI-930	Victoria	1	1958	-	-	-	-	-	110	-	-
GI-940	Brothers Islands	143	1981	-	-	-	-	143[133]	-	-	-
Colonies surveyed in 1974, 1978, 1981, 1986, and 2009/2010 (24 colonies)											
Northern Strait of Georgia											
Colonies with nests				n/a	11	n/a	11	11	11	n/a	10
Nests				n/a	3,742	n/a	5,599	4,380	4,161	n/a	3,406
Gulf Islands											
Colonies with nests				n/a	13	n/a	13	13	13	n/a	13
Nests				n/a	4,976	n/a	6,128[l]	5,951	7,284	n/a	4,749
Total BC Salish Sea											
Colonies with nests				n/a	24	n/a	24	24	24	n/a	23
Nests				n/a	8,718	n/a	11,727[l]	10,331	11,445	n/a	8,155
All surveyed colonies[m]											
Northern Strait of Georgia											
Number of colonies known				14	36	39	42	49	63	64	70
Number of known colonies that were accurately surveyed				1[n]	29	16	30	38	44	6	18[e]
Surveyed colonies that had nests				1[n]	28	13	26	37	43	5	15[e]
Total nests				299[n,o]	4,302	1,909	6,300	5,313	5,632	564	3,459[e]
Nests with known contents				299[o]	4,285	1,897	6,265	5,279	n/a	527	3,447
Percent of known nests that were empty				0[o]	7	20	17	39	n/a	22	47
Gulf Islands											
Number of colonies known				15	31	52	58	62	71	72	76

Table 6. cont'd

SITE CODE	SITE NAME	Earliest nesting record Count	Year	Survey Year[a] 1959/1960	1974	1977	1978	1981	1986	1999	2009/2010[b]
	Number of known colonies that were accurately surveyed			3[n]	25	42[f]	53[k]	28	40	9	22
	Surveyed colonies that had nests			3[n]	23	39[f]	47[k]	27	39	8	18
	Total nests			699[n,o]	5,381	5,608[f]	5,067[k]	6,599	7,940	728	4,932
	Nests with known contents			642[o]	5,185	5,214	5,035	6,555	n/a	667	4,781
	Percent of known nests that were empty			4[o]	8	5	10	18	n/a	59	26
Total BC Salish Sea											
	Number of colonies known			29	67	91	100	111	134	136	146
	Number of known colonies that were accurately surveyed			4[n]	54	58[f]	83[k]	66	84	15	40[e]
	Surveyed colonies that had nests			4[n]	51	52[f]	73[k]	64	82	13	33[e]
	Total nests			998[n,o]	9,683	7,517[f]	11,367[k]	11,912	13,572	1,292	8,391[e]
	Nests with known contents			941[o]	9,470	7,111	11,300	11,834	n/a	1,194	8,228
	Percent of known nests that were empty			3[o]	8	9	14	27	n/a	43	35
Number of historical sites surveyed that were abandoned											
Northern Strait of Georgia				0	1	3	4	1	1	1	3
Gulf Islands				0	2	3	6	1	1	1	4
Total BC Salish Sea				0	3	6	10	2	2	2	7

[a] See colony accounts for data sources.
[b] Most colonies were surveyed in 2010; Belle Chain Islets, Java Islets, Greig Island, Mandarte Island (main island), Sallas Rocks, Mary Tod Island, and Chain Islets/Great Chain Island were surveyed in 2009.
[c] Estimate of 700-800 pairs listed for Franklin Island included both Franklin and Merry islands.
[d] Contents of 351 nests were determined: 279 contained eggs; 72 were empty.
[e] An estimate of 250 pairs was made for Tsawwassen Breakwater in 2010 but nests were not counted. This estimate was not included in the totals for 2010.
[f] An estimate of 400 pairs was made for Snake Island in 1977 but nests were not counted. This estimate was not included in the totals for 1977.
[g] See colony accounts.
[h] This may be an incomplete count; see colony account.
[i] A total nest count was conducted on Imrie Island in 1960 but Drent suspected that he may have missed 20-30 nests in tall-grass habitat and made a total estimate of 290-300 nesting pairs.
[j] Contents of 1,366 nests were determined: 1,321 contained eggs or young; 45 were empty.
[k] Only a partial count was conducted on Mandarte Island in 1978. The island was not included in the totals for all surveyed colonies in 1978. Substituting the count from 1977 would give totals of 6,732 nests for the Gulf Islands and 13,032 nests for the entire Strait of Georgia in 1978.
[l] As only a partial count of nests was conducted on Mandarte Island in 1978, we substituted the count made in 1977 in the total for 1978 so that 1978 could be included in the inter-annual comparison. This was similar to how counts on Mandarte Island from 2009 and 2010 were included in the comparison.
[m] Includes only colonies where total nest counts were conducted; excludes rough estimates for several colonies in 1959/1960, Snake Island in 1977, and Ray Rock and Tsawwassen Breakwater in 2009/2010 and the incomplete counts conducted on Mandarte Island in 1978 and in Squamish Harbour and White Rock in 2009/2010. Number of sites also differ from those given in previous compilations [30, 377, 420] because we included urban nest sites [218, 220, 431] and some unpublished records [484, 523, 524] and separated some sites that had been lumped together.[453]
[n] Nest counts were conducted in 1959/1960 on only four colonies (Christie Islet, Ballingall Islets, Java Islets, and Imrie Island). Estimates of numbers nesting at other colonies were not included in the totals for 1959/1960.
[o] Only nests with eggs or young were reported on Christie and Java islets; empty nests may not have been recorded and total numbers of nests may have been larger.

it is likely that previous records of over 3,000 pairs were overestimates. Still it is likely that the nesting population more than doubled between 1957 and 1974. Most of the increase likely occurred after the island was acquired by the province in 1959 (see Mitlenatch Island account; Figure 114).

Figure 114. Mitlenatch Island is one of the largest Glaucous-winged Gull colonies in BC. The nesting population increased substantially after the island was protected as a Provincial Park in 1961 and naturalists were regularly stationed on the island during the summer breeding season. From the late 1970s through 2010, the island supported a relatively stable nesting population of around 2,000 to 2,800 pairs. However, surveys over the last decade indicate alarming declines in the breeding population. Photos here show (clockwise from top left): nesting habitat in 1991; a territorial dispute between two adults; a typical clutch of three eggs; and two young gulls away from the nest. *Photos by R. Wayne Campbell, 4 August 1991, June 1964, 18 June 1964, and August 1966.*

On Mandarte Island, Anderson counted 352 nests and estimated a total of 450 pairs nesting in 1915.[232] He reported a doubling of the population the next year,[233] suggesting a population of about 900 pairs. Population estimates from the 1920s ranged from 350 to 1,000 pairs. Because other estimates during that period were lower, Drent and Guiguet [144] wondered whether Munro's [271] estimate of 1,000 pairs in 1927 may have been too high. However, Munro made most of the other estimates from the 1920s [269] and the variability in Munro's estimates may simply reflect the difficulty of estimating nesting populations on large colonies. Given Munro's [269] description of the abundance of nesting gulls in 1923 (see Mandarte Island account), we suspect that his later estimate of 1,000 pairs was reasonable. That estimate was similar to the approximately 900 pairs that Anderson suggested were nesting in 1916. Estimated numbers varied over the next several decades. Drent et al.[146] estimated about 1,800-2,000 pairs nesting in 1957-1961. In 1962, an estimate of 2,100 pairs nesting on the main island was derived by extrapolation from the 479 nests found in Vermeer's study area; [412] in addition, 100 pairs were estimated nesting on the south islet, for an overall total of 2,200 pairs.[146] A maximum of 2,500 pairs was estimated by Robertson in 1970.[332] However, the first total nest count conducted in 1974 tallied 1,047 nests, less than half the number of nests estimated by Robertson in 1970 and not greatly

different than the estimates of 900 and 1,000 pairs from 1916 and 1927. Available estimates thus indicate population increases on Mandarte Island between 1915 and 1974, but much of the increase may have occurred at the beginning of that period following the posting of a warden on the island in 1915 to protect nesting birds.

Available survey data suggest substantial population growth between 1959/1960 and 1974, especially after 1966. Nest counts were conducted in 1959/1960 at only four colonies: Christie Islet, Ballingall Islets, Java Islets, and Imrie Island (Table 6). Counts gave a total of 998 nests on those four colonies in 1959/1960, but numbers may have been somewhat larger. All nests reported on Christie and Java islets held eggs or young; thus it is possible that empty nests were not recorded, which would have biased estimates downward. On Imrie Island, Drent suspected that he may have missed 20-30 nests in tall-grass habitat (see colony account). In 1974, a total of 1,243 nests were counted on those same colonies, suggesting an increase of about 25%. Trends varied among the four colonies: greater numbers in 1974 were found only on Christie Islet and Ballingall Islets; and numbers of nests were similar in 1959/1960 and 1974 on Java Islets and Imrie Island. On Christie Islet, counts conducted between 1955 and 1959 varied from 219 to 419 nests, which was only slightly less than the 477 nests counted in 1974. Count data from those four colonies thus provide only weak evidence for increasing trends generally in the Strait of Georgia between 1959/1960 and 1974. However, survey data at other colonies indicate dramatically increasing populations during this period. In addition to the apparent increase on Mitlenatch Island mentioned above, available estimates also suggest a large increase on Passage Island from an estimated 50 pairs in 1959 to 496 nests in 1974, when the first complete nest count was conducted. The colony complex of Five Finger Island, Hudson Rocks, and Snake Island off Nanaimo was surveyed in 1966 and 1974. Numbers on those three colonies quadrupled from 264 nests in 1966 to 1,117 nests in 1974. In 1968, counts were made at six colonies: Norris Rocks, Sisters Islets, White Islets, Pam Rock, Miami Islet, and Chain Islets/Great Chain Island (Figure 115). Total nests on those six colonies increased almost threefold from 1,381 in 1968 to 3,815 in 1974. Increases were seen on five of the six colonies; numbers decreased on White Islets from 345 nests in 1968 to 279 nests in 1974 (greater numbers were counted there in 1978). Numbers also increased on Franklin Island, from 267 nests in 1969 to 387 nests in 1974, and on Vivian Island, from 75 nests in 1970 to 218 nests in 1974. In sum, these data suggest that overall population size at island colonies more than doubled between 1960 and 1974.

After 1974, overall population size of Glaucous-winged Gulls nesting on island colonies in the BC Salish Sea continued to increase at least up to 1978, after which it briefly stabilized then decreased again (Table 6). Compared to 1978, overall numbers were lower in 1981 but were similar in 1986; the total breeding population thus may have been relatively stable between 1978 and 1986. Total population size decreased sometime after 1986 but the decline was not detected until the survey of a few colonies was conducted in 1997/1999 [377] followed by the more comprehensive surveys conducted in 2009/2010.[30, 453] These overall trends mask marked variation among colonies and between the two regions of the BC Salish Sea, and changes in nesting populations over this time period are complex.

Various comparisons can be made of population changes between 1974 and 2009/2010. The best long-term trend data comes from 24 colonies (11 in the northern Strait of Georgia; 13 in the Gulf Islands) that were repeatedly surveyed during this period (Table 6). This subset of colonies includes all the main colonies surveyed and 97% of the nests counted by Blight [30] in 2009/2010. Different colonies were surveyed in 2009 and 2010, and we thus combined counts from those two years to compare with previous surveys. We also used a 1977 count at Mandarte Island in the 1978 total because that island was only partially surveyed in 1978. Total nest counts at those 24 colonies increased 35% between 1974 and 1978. The increase was greater in the northern Strait of Georgia (50%) than in the Gulf Islands (23%). In 1986, total numbers were similar to 1978 but major changes in distribution were occurring. Opposite trends were seen in the northern Strait of Georgia and the Gulf Islands between 1978 and 1986. Numbers began to decline in the northern Strait of Georgia after 1978 and had decreased 26% by 1986. In contrast, nests counted at colonies in the Gulf Islands increased by 19% between 1978 and 1986 (although fewer nests were found in 1981). Thus peak numbers and subsequent decline occurred earlier in the northern Strait of Georgia than in the Gulf Islands. Comparing changes at the 24 colonies between 1974 and 1986, showed a net increase of 11% in the northern Strait of Georgia compared to a 46% increase in the Gulf Islands. Between 1986 and 2009/2010, declines were greater in the Gulf Islands (35%) than in the northern Strait of Georgia (18%). The net result of the increases and decreases in

Figure 115. Numbers of Glaucous-winged Gulls nesting on the Chain Islets/Great Chain Island colony increased through the 1970s and likely peaked around 1986. Large numbers still nest (over 2,000 pairs when last surveyed in 2009), and, due to the recent decline on Mitlenatch Island, the Chain Islets/Great Chain Island colony is currently the second largest gull colony in the BC Salish Sea. *Photos by R. Wayne Campbell, 19 June (top) and 23 July 1973.*

population sizes over this time period was that numbers nesting at those 24 colonies in 2009/2010 were only slightly less (6%) than had been found in 1974.

Other comparisons between specific years show trends consistent with those found at the 24 colonies discussed above. We present additional comparisons because they include larger numbers of surveyed colonies and provide greater insight into population changes that occurred between 1974 and 2009/2010. At 50 colonies (23 in the northern Strait of Georgia; 27 in the Gulf Islands) surveyed in 1974 and 1978 (using the 1977 count for Mandarte Island), total nests counted increased 32% from 9,593 in 1974 to 12,670 in 1978. The rate of increase at this sample of colonies was again greater in the northern Strait of Georgia (44%) than in the Gulf Islands (22%). Although increases occurred at the majority (62%) of colonies, numbers of nests decreased at 18 of the 50 colonies and the distribution of the nesting population was changing. Increased numbers were seen on all larger colonies; all decreases were found on smaller colonies of less than 250 nesting pairs. The nesting population on the four largest colonies on Mitlenatch Island, Chain Islets/Great Chain Island, Mandarte Island, and Passage Island increased 41% between 1974 and 1978, compared to a 22% increase on all other colonies.

At 55 island colonies (24 in the northern Strait of Georgia; 31 in the Gulf Islands) surveyed in 1978 (using the 1977 count for Mandarte Island) and 1986, total nests counted were almost identical: 12,949 in 1978 and 12,759 in 1986. However, opposite trends were seen in the two regions. At colonies in the northern Strait of Georgia, numbers decreased by 20% from 6,244 nests in 1978 to 4,971 nests in 1986. In the Gulf Islands numbers increased by 16% from 6,705 nests in 1978 to 7,788 nests in 1986. Trends also varied among colonies in each region. In the northern Strait of Georgia, numbers decreased on the two largest colonies on Mitlenatch Island and Passage Island. Large decreases were also found on Sisters Islets, Franklin Island, Merry Island, Christie Islet, and Pam Rock. Concurrently, numbers increased markedly on McRae Islet, Norris Rocks, and the Tsawwassen Breakwater. In the Gulf Islands, major increases were seen on Five Finger Island, Ballingall Islets, Arbutus Island, Mandarte Island, and Chain Islets/Great Chain Island, while substantial declines occurred on Ragged Islets, Rose Islets, Java Islets, and Imrie Island.

Blight et al.[33] reported a decline of 57% at island colonies between 1986 and 2009/2010 but, as discussed above in the section *Identifying and Addressing Issues with the Historical Data*, nest count data used by Blight et al.[33] excluded empty nests and were thus not comparable to counts from previous years. Our revised comparison including all nests counted (i.e., including data contributed by Blight [453] on numbers of empty nests counted in 2009/2010) at 36 colonies surveyed in 1986 and again in 2009/2010 found a decline of 29% from 11,703 nests in 1986 to 8,283 nests in 2009/2010. Declines occurred mostly on smaller colonies. Numbers increased at the two largest colonies on Mitlenatch and Mandarte islands and decreased by only 15% at the third largest colony on Chain Islets/Great Chain Island (Figure 116). At all other colonies surveyed, overall numbers decreased by an alarming 73% from 4,808 nests in 1986 to 1,292 nests in 2009/2010. Declines were documented at all those other colonies except Bird Islet, where nests counted increased from 38 to 45. Declines at those colonies were again greater in the Gulf Islands: numbers decreased by 55% (from 2,129 to 962 nests) at 16 colonies in the northern Strait of Georgia and by 88% (from 2,679 to 330 nests) at 17 colonies in the Gulf Islands.

Surveys conducted in 1997/1999 [377] provided an indication of the rate of decline in gull populations after numbers peaked between 1978 and 1986. Sullivan et al.[377] documented a 31% decline since 1986 at 14 colonies surveyed in 1997 and 1999. This comparison included the large nesting population on Mandarte Island, which was surveyed in 1997 and showed little change since 1986. Relatively stable populations on Mandarte Island buffered more extreme declines on smaller colonies. At 13 colonies surveyed in 1986 and 1999 (Table 6), which excluded Mandarte Island, numbers of nests decreased from 2,734 to 1,289, a decline of 53%. The greatest decreases were seen at colonies in the Gulf Islands: numbers decreased 26% (from 719 to 564 nests) at six colonies surveyed in the northern Strait of Georgia compared to a decline of 64% (from 2,015 to 725 nests) at seven colonies surveyed in the Gulf Islands.

The rate of decline between 1999 and 2010 can be estimated from eleven colonies that were surveyed in both 1999 and 2010. At those 11 colonies during this time period, numbers decreased from 1,233 to 479 nests. Again, declines were greater in the Gulf Islands: 34% (from 563 to 369 nests) at five colonies surveyed in the northern Strait of Georgia compared to 84% (from 670 to 110 nests) at six colonies surveyed in the Gulf Islands.

A comparison between 1974 and 2009/2010 reveals the net changes in Glaucous-winged Gull

Figure 116. Mitlenatch Island, Mandarte Island, and Chain Islets/Great Chain Island are the three largest Glaucous-winged Gull colonies in BC. Their size order has varied (see Table 6). During the last comprehensive survey in 2009/2010,[30] Mitlenatch and Mandarte islands were the first and second largest colonies, respectively. Although the gull colonies on Mandarte Island and Chain Islets/Great Chain Island have not been surveyed since, the recent declines in gull numbers detected on Mitlenatch Island has left Mandarte Island and Chain Islets/Great Chain Island as the first and second largest colonies. These photos from 7 July 1947 show the thriving colony on Mandarte Island. *Photographer unknown.*

nesting populations at island colonies in the BC Salish Sea over that time period. At 32 colonies (15 in the northern Strait of Georgia; 17 in the Gulf Islands) surveyed in 1974 and 2009/2010, total numbers of nests decreased slightly (5%) from 8,746 (3,761 in the northern Strait of Georgia and 4,985 in the Gulf Islands) in 1974 to 8,310 (3,457 in the northern Strait of Georgia and 4,853 in the Gulf Islands) in 2009/2010. However, the similarity in total numbers masks major changes among colonies. On the three largest colonies on Mitlenatch Island, Mandarte Island, and Chain Islets/Great Chain Island, numbers increased by 57% from 4,443 nests in 1974 to 6,991 in 2009/2010. On all other colonies, numbers decreased by 69% from 4,303 nests in 1974 to 1,319 nests in 2009/2010. The most serious declines were seen on Franklin and Merry islands, Passage Island, the Five Finger Island-Hudson Rocks-Snake Island complex (Figure 117), and Java Islets.

Figure 117. The island complex of Five Finger Island, Hudson Rocks, and Snake Island near Nanaimo was historically a major nesting site for Glaucous-winged Gulls, supporting 1,626 breeding pairs at its peak in 1981. Drastic declines in the numbers nesting occurred soon after that and only about 42 pairs were still nesting on the entire complex during the last comprehensive survey in 2010. Similar population declines have been seen at all but the three largest colonies in the BC Salish Sea. On all island colonies other than the largest three, the total nesting population decreased by 73% between 1986 and 2010. Human disturbance has likely played a large role in these declines, especially at colonies like the Five Finger Island-Hudson Rocks-Snake Island complex that are close to urban centres. *Photo by R. Wayne Campbell, Five Finger Island, BC, 5 July 1974.*

To summarize, the abundance and distribution of Glaucous-winged Gulls nesting at island colonies in the BC Salish Sea have shown marked changes over the last 125 years. Early records suggest population declines during the end of the 19th century and early 20th century at the major colony on Mandarte Island. Numbers nesting there then approximately doubled following the posting of a warden on the island in 1915 and may have increased only slightly more between 1916 and 1974. On Mitlenatch Island, numbers likely also more than doubled between the early part of the 20th century and 1974, but much of the increase on that island may have occurred after 1959 when the island was acquired by the province to be protected as a park. Populations nesting at

other colonies known at that time also likely more than doubled between 1959/1960 and 1974. Numbers continued to increase after 1974 and there was sufficient data to demonstrate differing trends between the northern Strait of Georgia and the Gulf Islands regions and among large and small colonies. Total population sizes peaked around 1978 in the northern Strait of Georgia and around 1986 in the Gulf Islands. After 1986, the total nesting population at island colonies decreased throughout the BC Salish Sea and by 2009/2010 was similar in size to what was counted in 1974. Comparing changes in the two regions showed that: between 1974 and 1978 increases were greater in the northern Strait of Georgia than in the Gulf Islands; between 1978 and 1986 numbers decreased in the northern Strait of Georgia but continued to increase in the Gulf Islands; and between 1986 and 2009/2010 greater decreases occurred in the Gulf Islands than in the northern Strait of Georgia, such that by 2009/2010 numbers nesting in both regions were similar to what was counted in 1974. Although total population sizes were similar in 1974 and 2009/2010, major changes had occurred in the distribution of nesting birds. Many smaller colonies decreased in size while numbers nesting on the largest colonies increased, making breeding populations more aggregated. The proportion of the total island-nesting population in the BC Salish Sea that was nesting on the three largest colonies on Mitlenatch Island, Mandarte Island, and Chain Islets/Great Chain Island was less than 50% in 1974 and more than 80% in 2009/2010. Populations nesting on all other island colonies decreased 73% between 1986 and 2010.

Absolute changes in numbers of Glaucous-winged Gulls nesting on island colonies in the BC Salish Sea cannot be determined precisely because surveys in all years have been incomplete. However, we can derive a reasonably accurate approximation of how numbers have changed, especially since 1974. Our best estimates of total numbers nesting come from 1974, 1978 (if we include the 1977 count for Mandarte Island), and 1986. Counts at island colonies tallied 9,610 pairs in 1974, 13,000 pairs in 1978, and 12,948 pairs in 1986. At extant colonies that were not surveyed, we estimated that there were about 250 pairs nesting in 1974, about 170 pairs nesting in 1978, and about 200 pairs nesting in 1986, giving overall totals on island colonies of about 9,860 pairs in 1974, about 13,170 pairs in 1978, and about 13,150 pairs in 1986. In 2009/2010, counts at surveyed island colonies tallied 8,388 pairs (as noted above, this estimate was based on the complete data set provided by Blight [453] that included empty nests, and differs from previously presented estimates [30, 33]). In addition, Blight [30] estimated 250 pairs nesting on the Tsawwassen Breakwater. Numbers nesting at colonies that were not surveyed in 2009/2010 are difficult to estimate, but may have been around 500-800 pairs. Total population size at island colonies in 2009/2010 was likely around 9,000-9,500 pairs. Counts in 1974 and 2009/2010 thus indicate that numbers likely increased by over 3,000 pairs between 1974 and 1978 and decreased by about 3,500-4,000 pairs between 1986 and 2009/2010.

Limited data from few colonies (discussed above) suggest that nesting populations approximately doubled between 1915 and 1959/1960 and again between 1959/1960 and 1974. If we consider those data representative of the entire population, then, back-calculating from a total nesting population of about 10,000 pairs in 1974, total numbers increased from a population of about 2,500 pairs in 1915 to 5,000 pairs in 1959/1960. These crude estimates for 1915 and 1959/1960 undoubtedly have wide margins of error. Vermeer and Devito [420] made a somewhat larger estimate of 5,654-6,654 nesting pairs for the total population size in 1959/1960 based on data in Drent and Guiguet.[144] That estimate may also be a reasonable approximation of population size at that time but it was based mostly on rough estimates of numbers nesting on major colonies that were not comparable to later nest counts. Thus, overall, based on all available data, we estimate island colony numbers to have been: 2,500 pairs in 1915; 5,000 pairs in 1959/1960; 9,860 pairs in 1974; 13,170 pairs in 1978; 13,150 pairs in 1986; and 9,000-9,500 pairs in 2009/2010.

Urban Colonies. Nesting was first recorded in urban areas of Vancouver and Victoria in 1958.[144] Since then the urban nesting population has increased dramatically (Figure 118). Large numbers were nesting in both Vancouver and Victoria by the late 1980s.[220, 431] Urban sites were thus first colonized and urban nesting populations were expanding during the same period that island-nesting populations were increasing. Since the 1980s, urban populations have continued to increase while overall island-nesting populations have declined.

Presently, as of 2023, gulls in Victoria have been found nesting in urban habitats as far as 2 km inland from the nearest marine shores. In the City of Vancouver, gulls have been found nesting over 4.5 km from the nearest marine shores, and in Greater Vancouver, they have expanded their range along the shores of the Fraser River to areas in Coquitlam

almost 30 km inland from the mouth of the river and about 7 km inland from the nearest salt water at the head of Burrard Inlet. Recent surveys along the Fraser River in Vancouver found evidence of nesting on buildings along the North Arm and around several of the islands in the river, including Lulu, Sea, Annacis, and Mitchell islands, on some of the bridges crossing the river, including the Oak Street, Knight Street, and Pattullo bridges (Figure 119; see respective colony accounts), and in Surrey to the south of the south arm of the river. Nesting has not yet been reported along the southern shore of the Fraser River in South Westminster (which is part of Surrey) and North Delta, nor on the Port Mann, Queensborough, or Alex Fraser bridges (see Appendix 3).[501]

Many urban areas have not been well explored for nesting gulls, and we have no accurate estimates of total population sizes in urban areas. However, some studies have provided nest counts in small sections of urban habitat in Vancouver [241, 417, 431] and Victoria.[32, 218, 219, 220] Most recently, predictive modelling by Kroc et al.[242] has generated an overall estimate of the numbers of gulls nesting within the City of Vancouver (which includes four designated colonies: SG-600 Vancouver Harbour; SG-660 False Creek; SG-661 Point Grey; and SG-667 South Vancouver). For that study, Kroc conducted surveys in 2017 of nesting gulls at 20 study areas distributed throughout the City of Vancouver. Data from those surveys, and from GIS data sets from the City of Vancouver providing zoning information and characterizing the structure of individual buildings, were used to develop a predictive model to estimate probabilities of gull nests occurring on different types of rooftop structures across the city.[242] To test his predictive model, Kroc counted nests in 10 small areas across the city. Numbers of nests counted in test areas agreed closely with predictions. The derived model generated an estimate of approximately 1,690 pairs, which we have rounded to 1,700 pairs, for the total breeding population in the City of Vancouver. We considered that figure to be the best estimate of the current nesting population of Glaucous-winged Gulls in the entire City of Vancouver. To derive estimates for each of the four designated colonies within the City of Vancouver, we initially made a best guess using available data and made estimates of 1,100, 400, 100 and 100 pairs in the Vancouver Harbour, False Creek, Point Grey, and South Vancouver colonies, respectively (see colony accounts). Subsequently, Ed Kroc generously collaborated in our efforts and went back to his original dataset and ran the predictive counts for each of the four colony areas to compare with our estimates. His model predictions generated estimates of 973, 486, 124, and 97 nests in the same four colony areas, respectively, which, at an appropriate

Figure 118. Glaucous-winged Gulls have successfully colonized urban habitats in the BC Salish Sea over the last half century. Rapid population growth in urban environments may be related to reduced risks of predation by Bald Eagles in urban habitats and to less intra-specific aggression among a dispersed nesting population, and thus less chick mortality caused by con-specifics, than in a typical island colony.[240, 417] High post-hatch survival of chicks may also be related to the availability of human refuse for food, although natural foods, including forage fish and marine invertebrates (as seen being fed to chicks in these photos), may be more important to successful fledging and subsequent survival of urban-reared young.[415, 435] *Photos by Edward Kroc.*

Figure 119. Glaucous-winged Gulls were first confirmed nesting on the Pattullo bridges in 2021. *Photo by Heidi M. Regehr, 5 June 2021.*

level of precision, rounded to 1,000, 500, 100, and 100 nests, respectively. We used the estimates from the predictive model as the current estimates for the Glaucous-winged Gull nesting populations in those four colonies. Repeat surveys by Kroc et al.[242] of a subset of study sites in 2023, indicated that nesting populations in those urban areas were increasing at a rate of about 4% per annum, so breeding populations are likely already larger than the above estimates.

In other designated colonies in Greater Vancouver, we made rough estimates of population sizes based on observations in each colony. For several colonies, we had too few records to meaningfully estimate total numbers and our estimates simply equal the number of confirmed or suspected nests reported and undoubtedly underestimate total nesting populations. In Victoria, we treated the results of the studies by Hooper [218, 219, 220] and Blight et al.[32] as partial counts and made rough estimates of total population sizes partially by extrapolation. As of 2023, we estimated a total population of about 2,200 pairs in the Greater Vancouver area and about 760 pairs in Greater Victoria, including the port at Ogden Point. Gulls have also been reported nesting on rooftops and other structures in Powell River (9 pairs), Nanaimo (about 100 pairs), Harmac (about 100 pairs), Chemainus (3 pairs), Crofton (about 20 pairs), Fulford Harbour (1 nest), and Sidney (10 pairs), and small numbers likely nest in other communities. Combining all these estimates gives an estimate of approximately 3,200 pairs for the total population of Glaucous-winged Gulls nesting in urban habitats in the BC Salish Sea. That is likely a conservative estimate, but, given the wide margin of error in the component estimates, we suspect that the actual population size nesting in urban habitats around the shores of the BC Salish Sea as of 2023 is in the order of 3,000 to 4,000 pairs.

Overall Trends in the BC Salish Sea to 2023. If we accept the estimate of about 3,200 pairs currently nesting in urban habitats, then the increase in urban-nesting gulls has not quite offset the decline of about 3,500-4,000 pairs in the island-nesting population between 1986 and 2009/2010. Further declines in island-nesting populations have occurred since 2010 (see below), and our current estimate as of 2023 of 10,815 pairs for the total breeding population in the BC Salish Sea (Table 1) indicates an overall decline of about 20% since 1986. Estimates also indicate that over 30% of the total BC Salish Sea population now nests in urban environments.

The number of known island and urban colony sites for Glaucous-winged Gulls increased tremendously from 29 sites known to Drent and Guiguet [144] in 1961 to 167 sites that were known as of 2023 (Tables 1 and 6). Many of those sites,

including many urban sites, were likely colonized by gulls as nesting populations were increasing generally in the BC Salish Sea. However, as with Black Oystercatchers, differences in survey effort confound the interpretation of changes in site use. Often, the discovery of new nesting sites can be attributed to more complete exploration. Of the 138 "new" colony sites that were recorded between 1961 and 2023, only 26 had records of being previously explored for nesting gulls. As noted above, numbers of nesting gulls decreased on many small colonies, but most historical nesting sites were still being used when they were last surveyed: 23 of the 24 colonies that were surveyed in 1974, 1978, 1981, 1986, and 2009/2010 were still occupied in 2009/2010; and 127 (76%) of the 167 known historical colonies were occupied by nesting gulls when they were last visited (Table 1).

No region-wide surveys have been conducted since 2010. However, since then, unpublished records contributed by many volunteers have identified 20 new colony sites, most (80%) located in the northern Strait of Georgia. Twelve of the newly identified colony sites since 2010 were in the urban areas of Greater Vancouver, three were on islands at the northern end of the Strait of Georgia, one was on a remote dock in Deserted Bay in Jervis Inlet, three were on made-made habitats in the Gulf Islands at Crofton, Fulford Harbour, and the Swartz Bay ferry terminal, and one unconfirmed site was on Breakwater Island on the eastern edge of the Gulf Islands. In addition, between 2000 and 2010, volunteer birdwatchers identified other previously undocumented nesting sites on islands at the north end of the Strait of Georgia (Ray Rock) and in urban areas, including Squamish, Greater Vancouver (3 sites), Nanaimo Harbour, Harmac, Chemainus, and the port at Ogden Point in Victoria.

Available data indicate that breeding populations have been consistently increasing at all urban sites. There is also evidence of recent increases since 2010 in nesting populations on some island colonies in the northern Strait of Georgia, including Powell Islets, Major Islet, Sisters Islets, Fegen Islets, and Sea Egg Rocks (Figure 120). In the Gulf Islands region, a drone survey of Great Chain Island in 2019 suggested stable or slightly increasing populations at that colony since 2009 (see GI-890 Chain Islets/Great Chain Island colony account); otherwise increasing trends are evident only at urban colonies. Continued declines since 2010 have been documented on a few island colonies, including Bird Islet and Grebe Islets close to Vancouver in the northern Strait of Georgia, and Rose Islets, Canoe Islet, Ballingall Islets, and Arbutus Island in the Gulf Islands. The most dramatic decline has been reported on the major colony on Mitlenatch Island in the northern Strait of Georgia. Numbers of nests counted on Mitlenatch Island during the most recent compete survey in 2022 indicated a decrease in the nesting population of over 60% since 2010. This trend contrasts with increases seen at smaller colonies in the northern Strait of Georgia and is difficult to interpret. It also contrasts with the apparently stable or increasing trend at the large colony on Chain Islets/Great Chain Island, which suggested continued aggregation of the island-nesting Glaucous-winged Gull population on the three largest colonies in the BC Salish Sea, at least to 2019. The MIST volunteers who conducted the survey discussed several reasons why the numbers may have been low on Mitlenatch Island in 2022,[343] but those reasons were unlikely to account for the scale of the decline. Interannual changes of a similar magnitude as the difference between the 2010 and 2022 counts have been documented on Mitlenatch Island in the past (see Mitlenatch Island account), and the 2022 results may possibly reflect a poor year when fewer birds initiated breeding rather than a change in the actual size of the breeding population. Some support for this proposition comes from the fact that gulls that did breed in 2022 experienced poor reproductive success and very few chicks were seen later in the season by MIST volunteers.[343, 524] In 2023, results of a drone survey [601] suggested some recovery of the population since 2022 (see Mitlenatch Island account), but total numbers of nests were still much reduced compared to 2010. Future surveys will reveal the longer-term status of the gull breeding population on Mitlenatch Island but, at present, results of the 2022 and 2023 surveys are cause for concern at this most important colony.

Figure 120. Contrary to the declining trend in recent decades at most smaller, island colonies, nesting populations of Glaucous-winged Gulls have increased on some colonies in the northern Strait of Georgia, including this colony on Sea Egg Rocks. *Photo by Anna Smith, July 2011.*

The limited data gathered since 2010 are inadequate to define overall population trends over the last decade but they do suggest some patterns of population change. Continued declines have been detected at island colonies close to the city of Vancouver and in the Gulf Islands, areas that receive high volumes of human recreational traffic. New nesting sites and increasing nesting populations have been documented at island colonies located in the less-intensely-visited northern portion of the northern Strait of Georgia and at virtually all urban colonies. These data suggest a continuing shift of nesting populations to urban sites as well as a movement to more northern and remote island sites, although that movement pattern has been offset by the contrary trend seen at the major colony on Mitlenatch Island in 2022 and 2023. Data also emphasize the pressing, ongoing need to institute measures to protect the majority of island Glaucous-winged Gull (as well as cormorant) colonies in the BC Salish Sea from human incursion, especially in the Gulf Islands and other areas that receive ever increasing human traffic. Further insights into population trends on island colonies may be forthcoming following planned, wide-scale surveys in the BC Salish Sea scheduled for summer 2024.[613]

A Busy Time in the City

City life runs on schedules and the timing of human activities in urban environments is predictable. We get up, we go to school, we go to work. We catch a bus at eight o'clock, lunch at twelve, punch out at five. Tuesday is trash day, Sunday we go to the park. Using schedules to structure our lives is efficient – no point going shopping at seven if the store doesn't open until nine or standing at the bus stop for an hour because we don't know when the next bus goes by. Other species living in urban environments also schedule their lives.

Gull species have become successful inhabitants of urban environments around the world. A recent study out of Bristol in the United Kingdom has shown that Lesser Black-backed Gulls (Larus fuscus) *adapt their foraging patterns to urban schedules.*[362] *This makes them more efficient foragers and has likely contributed in part to their successful colonization of cities. The Bristol study monitored gull activity at three habitats within the city: a park, a school, and a waste centre. GPS tags were also placed on individuals to track their movements and the amount of time they spent at those three habitat types. Results of the study showed that gull foraging patterns closely corresponded to the timing of school breaks and to the opening and closing times of the waste centre. Observations clearly showed that gulls had knowledge of human schedules and anticipated when food would be available - gulls would wait on surrounding rooftops before school breaks and before waste was unloaded. At parks, foraging activity of gulls was not related to human activity, but rather corresponded to the availability of earthworms or arthropods early in the day. Studies from the other side of the world in Japan have also found spatial and temporal foraging patterns in gulls, in this case Black-tailed Gulls* (Larus crassirostris)*, that correlate with the availability of human-generated food resources.*[447]

It is reassuring when our cities run on time and somehow comforting to know that other city denizens also benefit from our clockwork existence. We of course need our time-pieces to keep us on schedule; gulls and other animals seem to manage fine without.

Caspian Tern

An adult Caspian Tern with flightless young was sighted on a sandy beach at Roberts Bank in 1984,[84] and a colony was established on a warehouse roof on the north side of Lulu Island in 2012.[40, 317] The colony was not successful and we have no subsequent records of breeding in the Greater Vancouver area, although other breeding attempts seem likely. Many observations of courting birds and fledged young have been reported, especially from Iona Island and the Tsawwassen Ferry terminal.[524] In 2023, Caspian Terns were confirmed nesting at a new site on Centre Islet at the northern end of the Strait of Georgia (Figure 121). That site is currently the only nesting site for Caspian Terns on the BC coast.

Arctic Tern

A pair of Arctic Terns was seen and suspected nesting on Little Rock near Cortes Island from 2014 to 2019.[446, 473, 504] Parents with one fledged young confirmed breeding at this colony in 2015. The terns were absent in 2020.[473] One adult was seen again flying around Little Rock in June and early July 2021 but was not seen after that and probably did not nest that year. On Mitlenatch Island, one or two Arctic Terns were seen for several days on a rocky knoll in 2021, although evidence of nesting was not obtained.[489, 504, 524] Arctic Terns were not reported on Little Rock or on Mitlenatch Island in 2022. An adult with a juvenile photographed at Campbell River on 12 September 2022 [524] may have bred locally but also could have been migrating.[84]

In 2023, a pair of Arctic Terns was seen on Little Rock in May, but not after that. However, one pair was confirmed nesting at a new site to the south on Sisters Islets (Figure 122).[524, 603] This is currently the only known nesting site on the BC coast.

Figure 121. Caspian Terns were confirmed nesting in 2023 for the first time on Centre Islet, located at the northern end of the Strait of Georgia. *Photo by Ed Jordan, 6 August 2023.*

Figure 122. Arctic Terns were confirmed nesting on Sisters Islets in the northern Strait of Georgia in 2023. This is the second known breeding site for Arctic Terns on the BC coast. *Photo by Cathy Carlson, 4 August 2023.*

Pigeon Guillemot

As in most regions of the BC coast except Skidegate Inlet in Haida Gwaii,[336, 429] Pigeon Guillemots (Figure 123) have never been well surveyed in the BC Salish Sea. Counts of guillemots present around colonies have been made in concert with surveys of other species, and evidence of nesting has been obtained at many colonies, but dedicated surveys designed to reliably estimate numbers attending colonies have not been conducted. Graduate studies conducted on Mandarte Island in 1957-1960 [143, 146] and Mitlenatch Island in 1984-1986 [157, 158] provided estimates of numbers nesting on those two important colonies at those times. Current population sizes on those two colonies and overall breeding population size in the BC Salish Sea are unknown.

The most thorough counts of Pigeon Guillemots present around colonies were conducted in 1974, 1978, 1981, and 1987. We have tabulated numbers of sites surveyed, total numbers of birds counted, and numbers of confirmed nests reported during those surveys, but those data are not comparable and cannot be used to infer trends (Table 7). We have also included estimates of numbers nesting at a few colonies in 1959/1960 compiled by Drent and Guiguet.[144] Those estimates were derived from a number of sources and were mostly based on numbers of birds seen by various observers, except for the almost-complete nest count made on Mandarte Island during Drent's student research.[143, 146] We estimated the number of birds seen in 1959/1960 by doubling the estimates of numbers of pairs nesting given by Drent and Guiguet.[144]

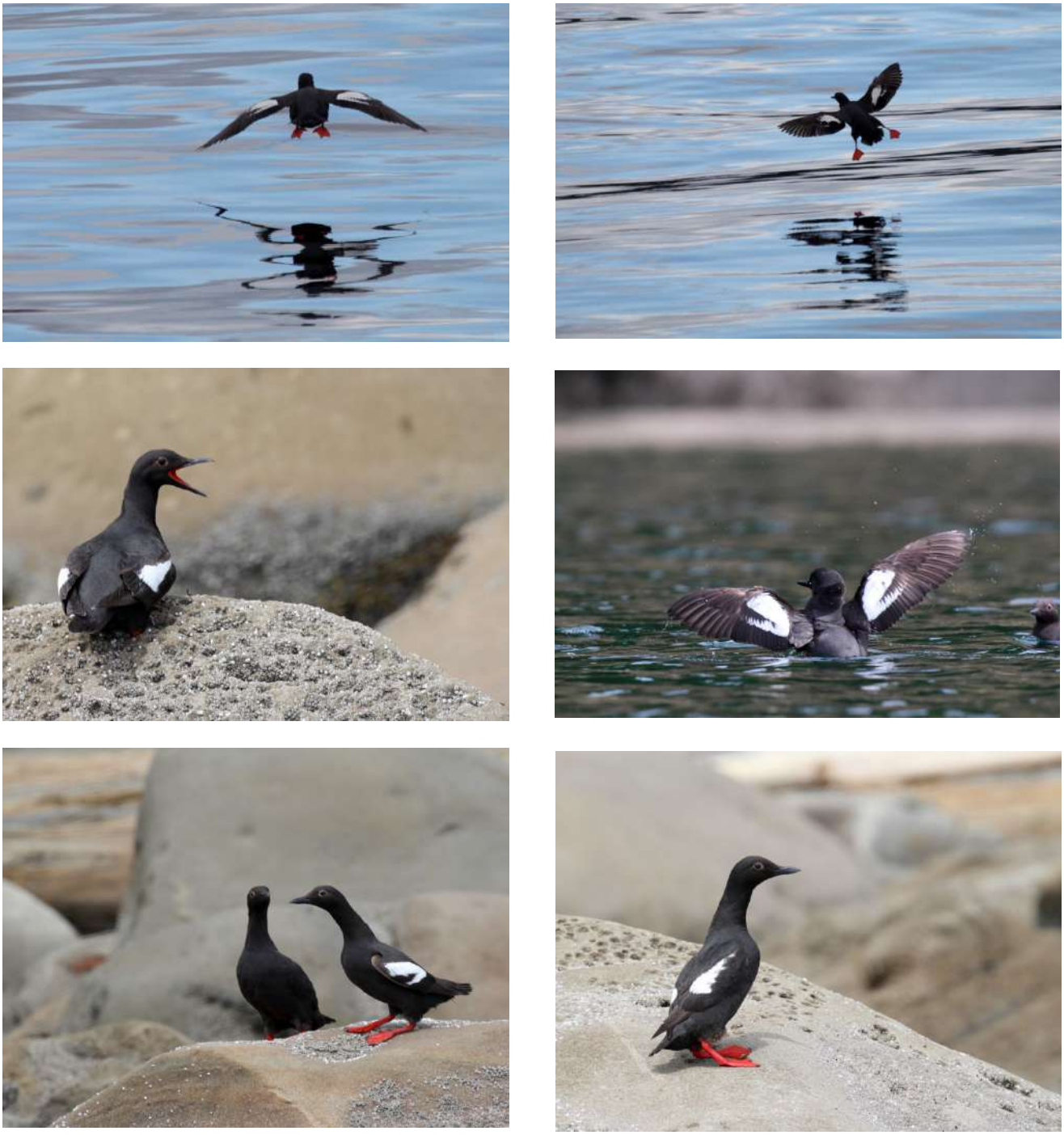


Figure 123. Pigeon Guillemots are common along the shorelines of most seabird colonies in BC. When exploring the BC coast for nesting seabirds, BCPM curator Charles Guiguet considered the presence of Pigeon Guillemots a good indicator of a potential seabird colony. *Photos by Paula Courteau.*

During the years up to 1987, the greatest number of guillemots was counted in 1981, when 1,143 were tallied around 43 colonies, and guillemots were present at the most (55) colony sites in 1978. Over all years, Pigeon Guillemots have been recorded around 117 colonies: 52 in the northern Strait of Georgia and 65 in the Gulf Islands (Table 1). Compiling all recent records gave the current estimate of 2,377 individuals present at 97 colony sites. During the most recent surveys at each colony, no guillemots were seen at 20 of the historical sites where birds had previously been recorded. Recent absence of birds at those sites may simply be due to the timing of surveys and cannot be used to infer changes in site use.

Table 7. Number of Pigeon Guillemots counted and nests confirmed during surveys conducted in 1959/1960, 1974, 1978, 1981, and 1987 in the BC Salish Sea.[144, 158, 523]

	1959-1960[a]	1974	1978	1981	1987
Number of colony sites surveyed where Pigeon Guillemots have ever been reported					
Northern Strait of Georgia	7	20	18	28	20
Gulf Islands	8	23	44	22	55
Total BC Salish Sea	15	43	62	50	75
Number of colony sites surveyed with Pigeon Guillemots present					
Northern Strait of Georgia	7	14	14	23	11
Gulf Islands	7	19	41	20	26
Total BC Salish Sea	14	33	55	43	37[b]
Number of Pigeon Guillemots counted around colonies					
Northern Strait of Georgia	~535[a]	488	452	521	257
Gulf Islands	~334[a]	514	449	622	596[b]
Total BC Salish Sea	~869[a]	1,002	901	1,143	853[b]
Number of confirmed nests reported					
Northern Strait of Georgia	7	34	9	39	0
Gulf Islands	123	38	60	9	0
Total BC Salish Sea	130	72	69	48	0

[a] Approximate totals for the number of birds observed around colonies in 1959/1960 were based on estimates of the numbers of pairs nesting presented by Drent and Guiguet.[144] Actual counts of birds present were not provided in most cases (see text).
[b] Tallies in 1987 differ from those presented by Emms and Morgan [158] because we did not include Race Rocks in our summary.

Rhinoceros Auklet

Rhinoceros Auklets (Figure 124) likely nest at two sites in the BC Salish Sea but have been confirmed nesting only on Mandarte Island. They were found nesting on Mandarte Island in 1876 and 1886 but then were apparently absent for the next 100 years (see colony account). Nesting was discovered again in the mid-1980s. Numbers have been highly variable since: in the 1980s a maximum of about 10 pairs were estimated nesting in 1988; about 120 burrows were found in the early 2000s; and about 20 burrows were seen most recently in 2020.[449] Small numbers have been suspected nesting on Mitlenatch Island since 1970 and 2-3 pairs were suspected nesting there in 1991. Mapped records from the BC Breeding Bird Atlas [45] and from eBird [524] that indicate breeding at other sites in the BC Salish Sea were based on observations of birds on the water in the area (Oak Bay) that were carrying fish and on the suspected smell of Rhinoceros

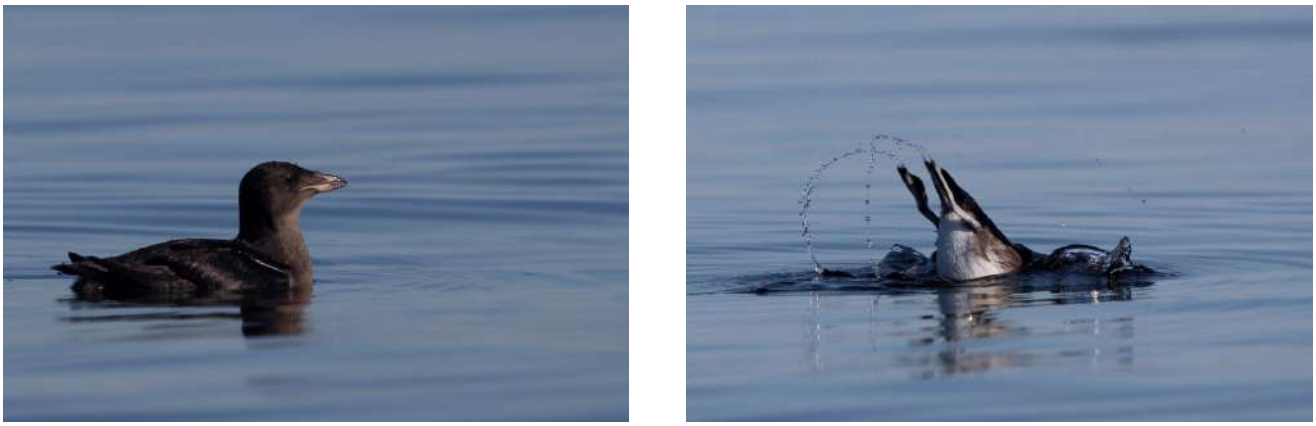


Figure 124. An immature Rhinoceros Auklet diving near Flora Islet in the northern Strait of Georgia. Although few Rhinoceros Auklets nest in the BC portion of the Salish Sea, many thousands nest just south in Washington on Protection and Smith islands, located in the eastern Strait of Juan de Fuca. Recent surveys on Protection Island indicated a breeding population there of almost 36,000 pairs,[306] making it about the eighth largest colony in the world, after Teuri Island in Japan, Forrester Island in southeast Alaska, and Moore Islands, Byers Islands, Storm Islands, Pine Island, and Triangle Island on the BC outer coast.[179, 335] Many foraging adults seen in the southern Gulf Islands during the breeding season likely originate from colonies in Washington (see Mandarte Island account). *Photos by Paula Courteau, 20 September 2014.*

Auklets on the colony (Trial Islands), respectively. In no cases was evidence of breeding obtained at colonies in those locations.

Tufted Puffin

As with Rhinoceros Auklets, Tufted Puffins (Figure 125) have been confirmed nesting only on Mandarte Island in the BC Salish Sea. They may have been found nesting on the island as early as 1858,[100] but the first definite record of breeding is from 1908. Since then, there was a small but relatively consistent population of around two or three pairs nesting throughout most of the 20th century, although only one bird was seen when they were last reported around the island in 1995. The head of a bird preyed on by a Northern River Otter (*Lontra canadensis*) was found on the island in spring 1996 and puffins have not been seen nesting since.[449] At Mitlenatch Island, one or two Tufted Puffins were seen around the island in 1963 and 1973, and Van Tets [404] speculated that they may colonize the island in the future. There is no evidence that they have as yet done so.

Puffins are Fluorescent – Who Knew?

Our world is full of colour. About 10 million colours. Our vision is trichromatic, meaning that photoreceptor cones in our eyes discriminate three different colours – red, blue, and green.[307] *We also have rods in our eyes which are more sensitive to incoming light but do not discriminate colour. Varying stimulation of these receptors by light allows our brains to create the 10 million colours that paint our picture of the world. Compared to most other mammals our world is rich in colour. We see a tremendous variety of colours not visible to cats and dogs, which have only two types of colour receptors, blue and green (it's a myth that cats and dogs see only shades of black and white), and to whales and sea lions, which have only one type of colour receptor, tuned to greenish or yellowish wavelengths. However, compared to many other vertebrates, our world is dull.*

Ancestral vertebrate lineages, including teleost fish, reptiles, and birds, mostly have at least four types of colour receptor cones.[39] *Their tetrachromatic colour vision system paints the world in colours we can barely imagine. Genetic changes responsible for the different cone types occurred by about 350 million years ago, prior to the divergence all major present-day classes of vertebrates. Mammals, which are predominantly dichromatic, lost much of the capability to detect colour early in their evolution, likely because they were primarily nocturnal at that time. Trichromacy "re-evolved" in primates about 35 million years ago.*

Another adaptation that greatly refines spectral sensitivity and improves colour vision also appeared early in vertebrate evolution but was lost by most mammals, including humans and all other placental mammals.[393] *Many fish, some frogs, reptiles, and all birds have variously-coloured oil droplets within their photoreceptor cones. Incoming light passes through the oil droplet before reaching the cone's photosensitive outer layer. Recent studies indicate that oil droplets have two main functions: they act as microlenses that enhance light delivery to the photosensitive layer of the cone, and they filter the spectrum of light that passes, thereby improving color discrimination and color constancy. Oil droplets range in colour from transparent to bright red according to the concentration of carotenoid pigments within the oil droplet. Greater concentrations of carotenoids filter more light and thus reduce the total amount of light reaching the photosensitive layer. This is a disadvantage for species that live in low light conditions and such species have evolved very pale or colourless oil droplets. For example, owls and deep-diving penguins that forage in dim light both have colourless oil droplets. The same is likely true for deep-diving alcids like murres and puffins. The lack of oil droplets in human eyes further separates our visual perception of the world from that of birds and many other vertebrates.*

Birds are some of the most colourful creatures on earth. However, though we may delight in their brilliance, in many cases we see only relatively drab versions of their true selves. Most birds see colours into the ultraviolet (UV) portion of the light spectrum and many have evolved plumage patterns that reflect UV light.[151, 267] *Thus, many of their plumage colours that they display to each other are invisible to us. UV reflectance is often associated with other plumage colours that are visible to humans and, as with many other plumage patterns, has been shown to be important in inter- and intra-sexual communication and mate choice. In some cases, species that appear sexually monomorphic to humans have been found to be sexually dimorphic in the UV spectrum. Such differences have major implications for the study and understanding of avian behaviour and mate choice decisions. The ability to see UV light has also been shown to be important for foraging, navigation, egg recognition, feeding of young, and regulating circadian rhythms.*[319, 394]

Vision has not been studied in detail for most seabird species.[433] *However, recent exciting discoveries of ornamental bill plates and head plumes that are fluorescent under UV light hint at the importance of UV sensitivity for at least some species. Fluorescent bill plates were first reported in Crested Auklets* (Aethia cristatella)*.*[434] *Soon after, they were reported in Atlantic Puffins* (Fratercula arctica)*,*[149] *Rhinoceros Auklets,*[438] *and Tufted and Horned puffins.*[165] *The head plumes of Tufted Puffins were also shown to be fluorescent. These findings conjure up incredible images for us seabird biologists – imagine an entire slope of puffins with fluorescent glowing bills!*

Figure 125. A small enclave of Tufted Puffins nested on Mandarte Island in the Gulf Islands for over 100 years. That is the only site in the BC Salish Sea where puffins have nested. They likely last tried to nest in 1996 and have been absent ever since. *Photo by Michael S. Rodway.*

Impacts and Threats to Seabird Breeding Populations

Like elsewhere, most factors that have had major impacts on seabird breeding populations in the BC Salish Sea over the last century are due directly or indirectly to human activities. The relative importance of different factors has changed over time. Human persecution, especially intense egg harvesting, was likely most responsible for depressed population levels at the beginning of the 20th century.[144] Breeding populations rebounded following the decline in that practice. Humans also generated an abundant food supply in the form of garbage that likely helped facilitate population growth by Glaucous-winged Gulls during the mid-20th century.[33, 420] Depressed populations of Bald Eagles (*Haliaeetus leucocephalus*) due to human persecution and pesticide contamination also likely reduced predation pressure on breeding seabirds, especially gulls, and helped facilitate population growth at that time.[154, 212] Predation and, probably more importantly, disturbance of nesting seabirds by Bald Eagles, increased as eagle populations recovered during the latter part of the 20th century.[154, 425] Disturbance from rapidly expanding human populations also became a serious problem [144] and at many colonies may have been the most important factor impacting nesting seabirds over the last 50-60 years. Reduction in the availability and quality (i.e., size-at-age) of forage-fish prey like herring has likely impacted the survival and reproductive success of seabirds over that same time period.[29, 33, 34, 35, 387] Intensive herring fishing (Figure 126) during years of poor recruitment has led to fishery collapses and closures, such as occurred in the 1960s.[226] Collapse of larger fish stocks may also have affected seabirds indirectly through reduction of prey for Bald Eagles, resulting in greater predation on alternate prey like seabirds.[154]

Figure 126. Several mammal species, including humans, gather at spawning locations to harvest Pacific herring. Intensive fishing during years of poor recruitment has led to the collapse of spawning stocks and fisheries closures in the past.[226] In this photo, humans and sea lions are gathered near spawning sites on Hornby Island. *Photo by Paula Courteau, 17 March 2017.*

Currently, increased disturbance from expanded human and Bald Eagle populations and changes in the availability of forage-fish prey (Figure 127) are considered the most serious threats to nesting seabirds in the BC Salish Sea.[33, 101, 114] Disturbances by humans and eagles have major impacts because

of the opportunistic predation on eggs and small chicks by Northwestern Crows and Glaucous-winged Gulls that occurs when seabirds are flushed from their nests. Bycatch in the commercial, tribal, and sports fisheries, oil and plastic pollution, loss of habitat due to real estate development, and extreme weather conditions exacerbated by climate change have also impacted nesting seabirds in the BC Salish Sea. Positive impacts from human activities have also occurred, including continued increased food supplies from human refuse and fisheries discards, and the creation of nesting habitat on buildings, bridges, and other structures.

Responses of nesting seabirds to impacts have differed in the Salish Sea compared to Haida Gwaii [336] and along outer coastal areas of the BC mainland and Vancouver Island.[337] Differences are due to the composition of breeding seabird communities and to the availability of alternate nesting habitat for nesting species in the different areas. Breeding

Figure 127. A boil of small fish, perhaps herring, attracts a frenzied feeding flock of gulls near Hornby Island. Changes in the availability of forage-fish prey throughout the year and in the distribution of herring spawning sites in the spring likely impact nesting seabirds and other waterbirds in the BC Salish Sea. *Photo by Paula Courteau, 10 September 2014.*

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seabird communities in outer coastal areas are dominated by burrow-nesting species. Their distribution is limited by the availability of undisturbed forested and grassy island habitats and the presence of introduced and native mammalian predators. In Haida Gwaii, the spread of introduced rats (*Rattus* spp.) and Northern Raccoons (*Procyon lotor*) has reduced the availability of suitable nesting habitat for seabirds and eliminated breeding populations from many former colony islands. There are no other suitable habitats available for burrow-nesting seabirds in those areas. The situation is different for the surface-nesting species that dominate the breeding seabird community in the Salish Sea. Human incursion has eliminated nesting seabirds from formerly suitable island habitats, but impacted species have found alternate nesting habitats in urban environments. For Glaucous-winged Gulls, high reproductive success of urban-nesting relative to non-urban-nesting pairs led Kroc [241] to suggest that the rate of colonization and the relative use of urban habitats could be quite high in the Salish Sea (Figure 128). Double-crested (Figure 129) and Pelagic (Figure 130) cormorants have also

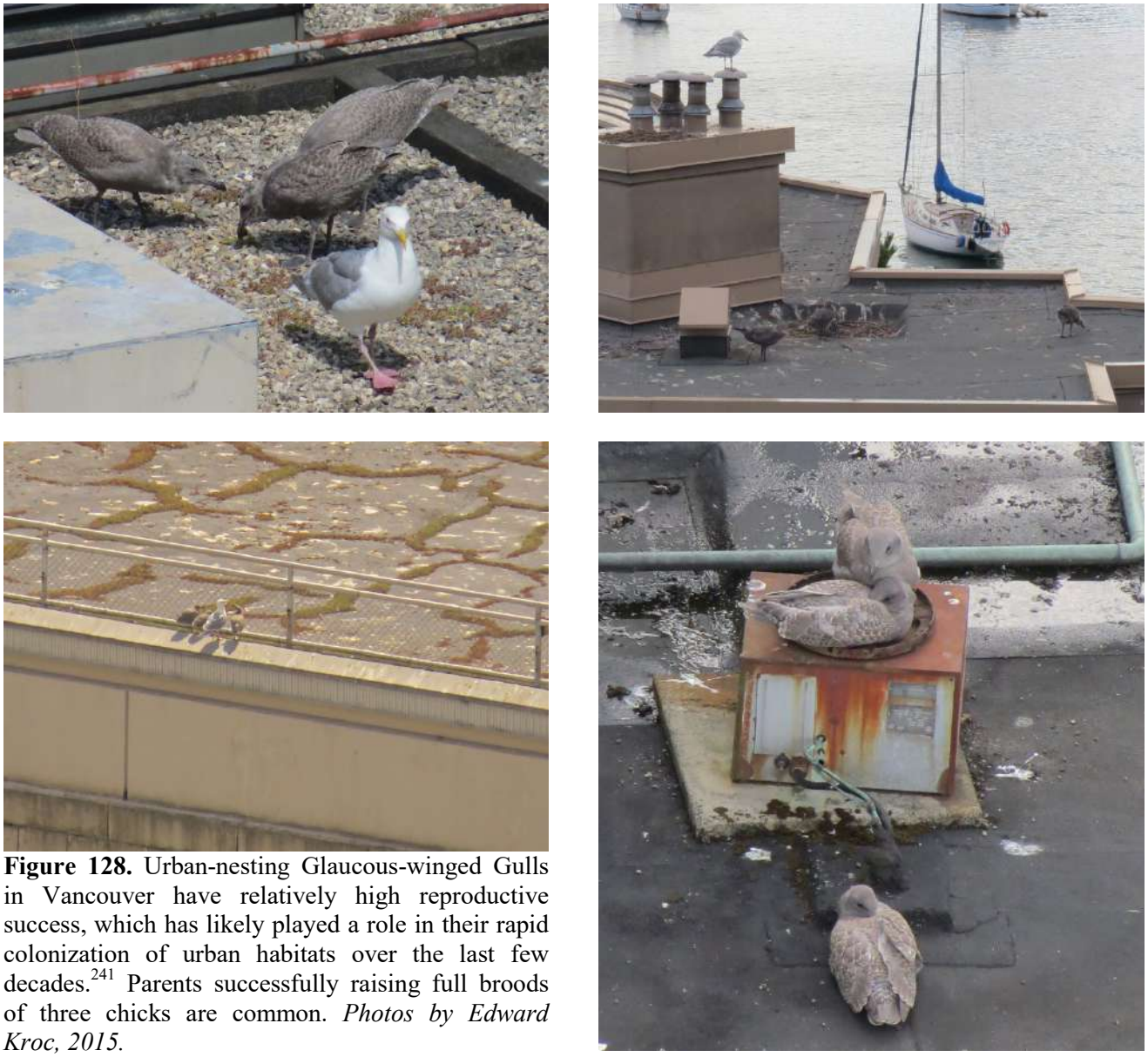


Figure 128. Urban-nesting Glaucous-winged Gulls in Vancouver have relatively high reproductive success, which has likely played a role in their rapid colonization of urban habitats over the last few decades.[241] Parents successfully raising full broods of three chicks are common. *Photos by Edward Kroc, 2015.*

rapidly and successfully colonized urban habitats on bridges in the Vancouver area.

Threats and impacts to nesting seabirds in BC were discussed in detail in Part 1 of this work.[335] In the following sections, we elaborate on some of these threats specific to seabirds nesting in the BC Salish Sea.

Impacts from introduced mammals

There has been little impact from introduced mammals on nesting seabirds in the BC Salish Sea. European Rabbits (*Oryctolagus cuniculus*) were introduced on Mandarte Island prior to 1915.[232] Anderson suspected they were displacing Tufted Puffins and Pigeon Guillemots from nesting holes and crevices. Munro [269] also noted that many burrows had been usurped by rabbits in 1921. The rabbits persisted for many years but died out around 1955, leaving many burrows that were then used by guillemots and puffins.[402]

Other impacts to breeding seabirds from introduced mammalian predators have not been reported, although pets of lighthouse keepers and other human visitors to colony islands may have affected breeding seabirds on some islands (see below). Introduced Black (*Rattus rattus*) and Norway (*R. norvegicus*) rats are present in the lower mainland area around Vancouver and on Vancouver Island [278] and have reached several of the larger islands in the BC Salish Sea, including Quadra and Saltspring islands. One Black and one Norway rat was seen on Passage Island near Vancouver in 1981 and 2023, respectively, but otherwise, rats have not been recorded on the many smaller seabird islands in

Figure 129. Double-crested Cormorants first colonized the Ironworkers Memorial Bridge at Second Narrows in Vancouver in 2014, although they were nesting on the nearby power tower as early as 2006. In less than a decade, the colony on the bridge has grown to become the largest Double-crested Cormorant colony in BC. *Photo by Edward Kroc, 2017.*

Figure 130. Pelagic Cormorants were first recorded nesting on the Burrard Street Bridge in Vancouver in 1997. The bridge currently supports the second largest Pelagic Cormorant colony in the BC Salish Sea. *Photo by Macus Ong, 20 July 2021.*

the BC Salish Sea, despite abundant marine traffic that could facilitate their dispersal.

Impacts from native mammals

Northern River Otters (Figure 131) have some impact on nesting seabirds in the BC Salish Sea.[174, 411] On Mitlenatch Island, they have been seen preying on adult Glaucous-winged Gulls,[20] but they more frequently take gull chicks. Predation on gull chicks was particularly heavy in 1973, when a family of otters was living on the island for the summer,[55] and in 1977.[523] River otters may have been responsible for numerous dead birds (mostly gull chicks) found on Five Finger Island in 1974,

1978, and 1980, and severe predation on gull chicks was reported on nearby Snake Island in 1977.[523] Obvious predation by river otters on Glaucous-winged Gulls was seen on Ragged Islets in 1978, and river otters may have been responsible for the reproductive failure of gulls observed on Imrie Island in 1985.[420] River otter predation on gull chicks was especially severe on Mandarte Island in 1977.[411] Predation on Rhinoceros Auklets and Tufted Puffins has also been reported on Mandarte Island.[449] River otters are common around seabird colony islands and, although they can have major impacts on nesting birds in some years, river otters generally have minor impacts on nesting populations. For example, on Snake Island, following a season of severe predation by river otters in 1977, signs of river otter but no evidence of predation on seabirds were seen in 1978.

Figure 131. Northern River Otters are common on seabird colony islands and occasionally become serious predators of nesting seabirds. *Photo by Paula Courteau, Hornby Island, BC, 15 November 2015.*

American Mink (Figure 132) are common throughout the BC Salish Sea [198] but have rarely been reported on seabird colony islands. During the breeding season, mink or signs of mink have been seen: on Rebecca Rock in 1981, around the docks on Hornby Island in recent years, on the south islet off Rabbit Island in 2021, on Sea Egg Rocks in 2021, on Merry Island in 1974, on Chain Islands in 1948, on the largest of the Chatham Islands in 1975, and on islet #3 of the Chain Islets (see Figure 581 on page 543) in 1973. Mink were sighted on Mandarte Island once in December 1960, were never recorded during the seabird breeding season during the period of intensive research on the island in the 1950s and 1960s,[146] and have been seen on the island only once in 40 years of research by Peter Arcese.[449] They have not been reported on Mitlenatch Island by the many naturalists that have spent time there during the breeding season. Mink are considered common on Ruxton Island and in Wallace Island Marine Provincial Park but have not been recorded on those islands during seabird surveys. Impacts to nesting seabirds have been observed only on Chain Islets #3 where carcasses of Pelagic Cormorant, Black Oystercatcher, and Glaucous-winged Gull were found at a feeding platform on 23 June 1973. Mink also may have been responsible for many eviscerated young gulls that were found on islet #18 of the Chain Islets on 25 July 1973. Observations of mink in the Chain Islands in 1948 coincided with the demise of the small Pelagic Cormorant colony established there a few years earlier,[144] but direct impacts by mink were not observed.

Figure 132. American Mink are common throughout the BC Salish Sea and, with other predators like Northern Raccoons, likely limit the distribution of nesting seabirds to small islets and rocks or inaccessible cliffs. Mink have been reported infrequently on the small islets that support seabird colonies and have only occasionally been known to prey on nesting seabirds in the BC Salish Sea. Much of their diet is fish. *Photos by Paula Courteau, Hornby Island, BC, 18 June (top) and 18 May 2018.*

Other potential mammalian predators are also notably absent from most seabird colony islands in the BC Salish Sea. Northern Raccoons are common on large islands, including Newcastle Island, where small numbers of the rare and locally famous "blonde raccoon" occur.[134] We know of four records of raccoons or signs of raccoons seen on small colony islands, all in the Gulf Islands: raccoons were sighted on Cabbage Island in 2005 and 2018, one was reported on nearby Pine Islet in 2014; and single individuals were seen on Pellow Islets and on the western of the Tortoise Islets in 2019. Raccoons are common in urban areas [198] but are unlikely to pose a threat to urban-nesting cormorants and gulls that primarily use inaccessible habitats such as bridges and rooftops.

Impacts from native birds

Northwestern Crows, Bald Eagles, and Glaucous-winged Gulls are the main avian predators impacting nesting seabirds in the BC Salish Sea. We discuss them in detail below, especially Bald Eagles. The link between Bald Eagle and seabird population trends has received much attention in the literature; [33, 101, 114] however, as discussed in the paragraphs below, the relationship is complex, and evidence for a direct cause-and-effect relationship is lacking. Other avian predators recorded at seabird colonies in the area include Peregrine Falcons (*Falco peregrinus*), Common Ravens (*Corvus corax*), and Great Horned Owls (*Bubo virginianus*). Those three species have had small and ephemeral impacts to nesting seabirds at few colonies in the BC Salish Sea.

Northwestern Crows are opportunistic predators of seabird eggs and small young and have had a major impact on nesting seabirds in the BC Salish Sea. The scale of their impact is largely a consequence of human and Bald Eagle disturbances that flush seabirds, especially cormorants and Glaucous-winged Gulls, off their nests.[144] Crows are common and often nest on seabird colonies and are quick to take advantage of disturbances. Bald Eagles were the main source of disturbance before humans became a problem. In the absence of disturbance, crows sometimes succeed in snatching eggs or small young from cormorant nests when cormorant parents are switching incubation or brooding duties. They also occasionally succeed by mobbing a sitting bird so that it exposes eggs or chicks to predation in its attempts to fend off the attackers.[51, 144, 407] Crows will also steal gull eggs and chicks, but this behaviour is more dangerous and thieving crows are regularly killed by gulls during the attempt.[409] Otherwise, crows foraging in colony areas primarily scavenge for regurgitated fish from nesting cormorants and Glaucous-winged Gulls and for small gull chicks that may have been killed on the colony.[51] Though less so than crows, Glaucous-winged Gulls also capitalize on prolonged disturbance events to prey on cormorant eggs (Figure 133) and cannibalize nests of other gulls.[144]

Figure 133. Glaucous-winged Gulls as well as Northwestern Crows are quick to take advantage of disturbances that flush cormorants off their nests. Here a gull has grabbed a Double-crested Cormorant egg from an exposed nest on Mandarte Island. *Photo by R. Wayne Campbell, 10 July 1981.*

Recovery of Bald Eagle populations in North America has been associated with increased impacts to nesting seabirds (Figure 134).[212] Impacts include direct predation, behavioural responses to eagle presence that may be costly to nesting birds, and, probably most important, disturbance that facilitates predation of eggs and chicks by crows and gulls (Figure 135). Recovery of eagle populations began in the 1970s following the enactment of protective legislation and the banning of pesticides like DDT. Breeding populations in the Gulf Islands increased by about 30% between 1974 and 1987.[395, 425] Elliot et al.[154] reported four-fold increases in wintering and breeding eagle populations in the BC Salish Sea area between the early 1980s and the late 1990s. Numbers have been relatively stable since.[154, 163] The frequency of Bald Eagle disturbance to nesting seabirds in the Salish Sea increased in step with eagle population recovery [377] and has been considered a major threat to breeding seabirds only since about 1990.[129]

The relationship between Bald Eagle abundance and seabird population trends is not clear. Vermeer et al.[425] suggested that from 1974 to 1987, increases in Bald Eagle numbers in the BC Salish Sea

reflected increases in that of their main prey, Glaucous-winged Gulls. Since then, several authors have suggested the opposite relationship with causal links between increases in eagle numbers and decreases in seabird breeding populations.[33, 101, 210, 377] However, for seabird wintering populations, Elliot et al.[154] found no declines in population size over the period of rapid eagle increase for those species where declines had been previously attributed to eagles.

Figure 134. The recovery of Bald Eagle populations in North America is a conservation success story. The restoration of apex predators to perturbed ecosystems has consequences for prey species and the restoration of Bald Eagles in the BC Salish Sea has likely resulted in greater predation and disturbance of nesting seabirds. *Photo by Paula Courteau, Hornby Island, BC, 2 December 2015.*

There is evidence of Bald Eagle impacts on nesting seabirds in the BC Salish Sea, but the degree of impact varies by seabird species and according to several factors, particularly the proximity of seabird colonies to Bald Eagle nests. Glaucous-winged Gull was the most frequent (35%) prey item found at eagle nests in the Gulf Islands in 1987.[425] Predation on gulls was more frequent by eagles nesting closer to gull colonies than those nesting farther away. In contrast, gulls were not a prey item fed to eagle chicks in the study by Elliot et al.,[153] but the eagle nests monitored in that study were not close to any major gull colonies. Eagles will also prey on gull eggs and chicks.[129] Eagle predation on Double-crested and Pelagic cormorants has been reported [101, 181] but is less common.[425] However, nesting cormorants suffer indirectly from Bald Eagle predation on Glaucous-winged Gulls because the cormorants are flushed off their nests when eagles approach, providing opportunities for opportunistic nest predation by crows and gulls. Predation on nesting seabirds by immature eagles has not been quantified, but predation and disturbance by non-breeding eagles can be intense,[376] and may be worse in the absence of resident breeding eagles that defend their territories.[343]

The immediate impacts of eagle disturbance and predation are obvious; however, it is difficult to determine the relative importance of eagle disturbance and other factors, including human disturbance, in affecting seabird population trajectories. This is because the effects and consequences of human and eagle disturbance are similar and difficult to separate: Bald Eagle numbers have been recovering throughout a time of ever increasing impacts on nesting seabirds from human disturbance and habitat loss (discussed in detail in the section below). Human disturbance can also exacerbate impacts from eagles by flushing eagles from their perches, thereby increasing the frequency that eagles disturb nesting seabirds.

Eagles have been implicated in the declines of Double-crested and Pelagic cormorant and Glaucous-winged Gull breeding populations in the BC Salish Sea due to correlations between increasing eagle numbers and decreasing seabird numbers. However, detailed examination of population trends of these three seabird species provides little support for this conclusion. All three species had initially increasing population trends, followed by decreasing trends, over the years 1974 to 1999 when numbers of eagles were increasing [33, 101, 154, 377, 420, 425, 428] (see also *Trends in Seabird Breeding Populations to 2023* above). Also, seabird population trends were complex through this period with contrasting trends at different colonies. Many cormorant and gull colonies declined or were abandoned before eagle numbers increased, while other colonies increased or remained stable in the face of growing eagle populations.

The best evidence showing increasing disturbance to nesting seabirds in the BC Salish Sea due to Bald Eagles is from studies conducted on Mandarte Island; [376, 377] however, even here there are inconsistencies in the trends between eagle and seabird numbers that make interpretation of cause-and-effect relationships difficult. Large numbers of Double-crested (Figure 136) and Pelagic cormorants were nesting on that colony through the 1970s and 1980s but numbers then decreased dramatically through the 1990s. Lowest numbers in 1999 coincided with the peak of eagle population growth. However, while eagle numbers remained high, populations of both cormorant species recovered

and, for Pelagic Cormorants, reached the highest numbers ever recorded in 2015. For Glaucous-winged Gulls, the nesting population remained high on this colony throughout those decades, with the highest numbers of nests ever counted in 2009/2010. During the study by Blight on Mandarte Island in 2008-2010, only "low levels of eagle predation" on gulls was observed.[35] Blight et al.[35] concluded that there was little evidence for an impact of eagles on the reproductive success of gulls on the island. For cormorants, the role of eagles in the decline of cormorant nesting populations in the 1990s is uncertain. Sullivan [376] found generally high productivity by Double-crested Cormorants in spite of frequent disturbance by Bald Eagles, except on Mandarte Island in 1994 when disturbance was especially persistent throughout the nesting period. However, breeding was delayed by frequent disturbance by eagles and associated egg predation by crows and gulls early in the season. Sullivan [376] suggested that although cormorant chick productivity was high, delayed breeding may have reduced chick survival after fledging and contributed to declining populations through the 1990s.

Figure 135. Bald Eagles likely have their greatest impact on nesting seabirds in the BC Salish Sea through disturbance, although direct predation is also important. Bald Eagles flying over or perching in the vicinity of cormorant or gull nests will flush breeding birds from their nests, exposing eggs or young chicks to predation by Northwestern Crows and Glaucous-winged Gulls. *Photo by Paula Courteau, Hornby Island, BC, 2 December 2015.*

A study by Henson et al.[210] on the major Glaucous-winged Gull colony on Protection Island in the Washington portion of the Salish Sea showed a strong relationship between decreasing numbers of gulls nesting on the island and increasing numbers of Bald Eagles in Washington State, although here too evidence for a direct cause-and-effect relationship is lacking. Similar to the pattern seen in the BC portion of the Salish Sea, gull numbers initially increased during the period of increasing eagle numbers. Numbers of occupied eagle territories in Washington State increased almost five-fold from 1980 to 1993. Numbers of gull nests on the island increased 37% from 3,796 to a maximum of 5,189 over the same interval. A subsequent decline in the gull population over the next decade to about half the maximum

numbers was attributed to changes in vegetation cover that displaced gulls from preferred nesting habitat, combined with the effects of increasing predation by Bald Eagles that began after 1990.[129] However, gull numbers were relatively stable after 2002, with similar numbers of nests found in 2016 and 2002, while eagle numbers continued to increase at least through 2005.[210]

Figure 136. Double-crested Cormorants were nesting in large numbers on Mandarte Island in the 1980s. Numbers declined after that through the 1990s but then increased again after about 2010. Bald Eagles may have impacted nesting populations on Mandarte Island but the relationship between eagle disturbance and cormorant abundance is not clear. Increasing numbers of Double-crested Cormorants nesting on Mandarte Island through the 1970s and into the early 1980s coincided with a period of recovering eagle populations in the Strait of Georgia. More recently, cormorant numbers have increased again in spite of elevated eagle populations. *Photo by R. Wayne Campbell, 10 July 1981.*

Human intervention to control Bald Eagle populations has been proposed as a possible management strategy to protect seabird populations if the impacts of eagles on nesting seabirds intensify.[212] First Nations also propose reviving the hunting of eagles for ceremonial purposes, citing as justification the perceived threat that eagles pose to at-risk bird species.[154, 187] There are reasons to recommend against both those proposals, especially because, as discussed above, inferences that eagles are a threat to at-risk species have not been well supported.[154] In the past, real and perceived impacts on commercial fish populations, fur-bearing mammals, and livestock were previous justifications for the persecution of eagles that contributed to their decline.[47] The protection from such persecution and the recovery of Bald Eagles populations in North America is a conservation success story. It would be a shame to tarnish that story with regressive management practices aimed once again at controlling eagle populations. Impacts that their recovery may have on seabird or other wildlife populations are a consequence of restoring an apex predator to ecological communities that have been perturbed by human actions.[212] It is thus human populations and behaviours that must be managed to insure a future for nesting seabirds. Eagle populations in the BC Salish Sea likely reached carrying capacity and stabilized after about 2000. However, the future health and stability of eagle

populations are not guaranteed as there are several stressors presently impacting eagle populations, including shortages of prey species like salmon,[154] illegal killing and trafficking of up to 1,000 eagles per year for the black market in animal parts,[187] poor nesting success in recent years, and impacts of the highly pathogenic H5N1 avian influenza that has been responsible for numerous deaths of eagles in 2022.[238, 519] We thus agree with Elliot et al.[154] that "there is no need to cull eagles to prevent negative impacts on prey populations associated with continued eagle population growth." We also suggest, with respect, that hunting of eagles for ceremonial purposes is a tradition that is best left in the past, along with other traditions that have been intentionally abandoned, such as harvesting Ancient Murrelets by lighting large beach fires that disoriented birds would fly or walk into,[155] collecting puffins for bill ornaments, hunting whales and sea otters (*Enhydra lutris*), and many past ceremonial traditions that were associated with warfare, slavery, human sacrifice, and cannibalism.[148, 225] Eagle feathers can be acquired from birds that die naturally or accidentally. In BC, the government has an existing agreement with First Nations that when eagle carcasses are turned in there is a priority to make them available to First Nations for ceremonial purposes.

Highly Pathogenic H5N1 Avian Influenza

The recent, global spread of the highly pathogenic H5N1 avian influenza (HPAI) has become a major emerging threat to seabirds and many other avian species around the world.[373] *The H5N1 virus first emerged in China in domestic waterfowl in 1996 and then in poultry farms in 1997.*[107] *It is thus a consequence of human activities, as are most other threats to seabirds. To quote European scientists, "This is a human-made problem that has arisen in south-east Asia because the H5N1 avian flu virus was not controlled properly."* [235] *The virus initially spread to wild birds, mainly waterfowl, as a low pathogenic strain. During their migrations, those birds spread the virus globally. In 2005, wild birds spread H5N1 to poultry in Africa, the Middle East, and Europe. Subsequent gene-swapping by H5 viruses from poultry and wild birds led to the emergence of the highly pathogenic H5N1 strain, which became predominant in Asia, Africa, Europe, and the Middle East by the end of 2021. The virus was first detected in Canada and U.S. in wild birds in late 2021. In February 2022, the virus began causing outbreaks in U.S. commercial and backyard poultry. Worldwide, the virus has resulted in the culling of many millions of domestic fowl. There has been great public concern about the impacts of HPAI on many thousands of wild birds,*[133] *and moral outrage about the often inhumane killing, in an ineffective attempt to stop the spread of the virus, of over 140 million chickens* (Gallus gallus domesticus) *and other poultry as of December 2022.*[235]

Seabirds are especially vulnerable to the virus because they aggregate at nesting colonies where the virus is easily spread. The virus was first detected in Scottish seabird colonies in 2021, and, through the 2022 breeding season, many seabird species, especially Northern Gannets (Morus bassanus) *and Great Skuas* (Stercorarius skua)*, suffered mass mortalities affecting major proportions of their world populations.*[133] *In December 2021, the virus was found in domestic birds in St. John's in Newfoundland and Labrador, likely transmitted by infected seabirds that flew over through Iceland, Greenland, and the Canadian high Arctic.*[189] *Thousands of gannets, puffins, and murres died from the virus during summer 2022 in Newfoundland and Labrador.*[259] *The virus has now spread across the United States up to Alaska's western coast and south to South America. Late in November 2022, roughly 14,000 seabirds, mostly pelicans* (Pelecanus spp.) *and Blue-footed Boobies* (Sula nebouxii)*, were found dead along the coast of Peru.*[323] *Total mortality is likely much greater.*

Mass mortalities of seabirds have yet to be reported in BC, but there is major concern about the spread of the disease during upcoming breeding seasons. As of January 2023, many waterfowl species, especially Canada Geese (Branta canadensis)*, some American White Pelicans* (Pelecanus erythrorhynchos) *and Great Blue Herons, five raptor species, including many Bald Eagles, two owl species, mostly Great Horned Owls, and several crows and Common Ravens have been victims of the virus in BC.*[90] *Most detections have been in the Lower Mainland area. On the BC coast, infected birds, in this case a Bald Eagle, have been detected as far north as Powell River in the Salish Sea.*

Symptoms of the HPAI infection in birds include listlessness, walking in circles as if intoxicated, dragging limp wings at their sides, swollen heads and necks, trouble breathing, and sudden death. Mortality rate of infected birds is high - up to 90% to 100% in chickens, often within 48 hours.[107] *Avian influenza spreads by direct contact or exposure to body fluids and feces, both of which can be airborne. The virus can also persist in the environment for extended periods of time and can therefore be transmitted indirectly, for example by water or food sources, footwear and clothing, or fieldworker equipment. Biosecurity measures are essential to prevent human-mediated transmission of HPAI within and between sites, whether they are seabird colonies or where birds are kept domestically. Anyone who finds a sick or dead wild bird in Canada should contact the Canadian Wildlife Health Cooperative (in BC contact: 1-866-431-2473).*

Direct impacts from human activities

Nesting seabirds were traditionally harvested by Coast Salish people.[14] Individual bands "owned" specific colonies where they would harvest the birds and eggs during the breeding season. Seabird eggs were also increasingly harvested by non-native fishermen during the early decades of the 20th century. Intense egg harvesting was likely responsible for poor breeding success and depressed population levels of Glaucous-winged Gulls nesting on Mitlenatch and Mandarte islands at that time.[144] On Mitlenatch Island, Pearse [301] noted that quite a few gull eggs were taken by fishermen and First Nations people; in some years, the "…the place was cleaned of eggs." On Mandarte Island in 1915, Anderson [232] reported that declines and abandonments [of nesting seabirds] were caused by the harvest of eggs and young by "whites, Indians, and Japanese." On Merry Island, lighthouse keepers reported that First Nations people from the Sechelt band used to gather eggs up until 1967. Their practice was to smash all eggs and then return a few days later to harvest all the fresh-laid replacement eggs. Evidence of egging was reported through the 1970s and 1980s on islands like Mitlenatch, Vivian, Ragged, and Mandarte and likely still occasionally occurs on some colonies. Specimen collectors took some eggs during the late 1800s and the first half of the 20th century, and harvesting of a few eggs for scientific reasons, especially for contaminant analyses, has been conducted in recent decades.

Seabird nesting habitat has been usurped by humans for residential development (e.g., Passage Island; Figure 137) and for the installation of lighthouse structures (several islands) and communications towers (Trial Islands). Residential development has also occurred immediately above many cormorant nesting cliffs, especially in the Gulf Islands. Conflicts have often ensued following human settlement near nesting seabirds and direct persecution of seabirds has occurred to discourage nesting. Following residential development on Passage Island, new residents began shooting gulls and destroying or covering nests. What used to be the fourth largest Glaucous-winged Gull colony in the BC Salish Sea was reduced to a small remnant of its former population size. Dead cormorants have been hung over cliffs located below human residences in attempts to discourage nesting birds (e.g., at Elliot Bluff). Lighthouse keepers in most cases have been protective of nesting seabirds, but lightkeepers on Sisters Islets in 1981 destroyed all gull nests as soon as they were built because they were concerned about flies, foul odours, and feces contaminating their water. Similarly on Chrome Island in the early 1960s, lighthouse children used to throw rocks at nesting cormorants to deter them (Figure 138). Pets of lightkeepers have also had impacts on nesting seabirds, either intentionally or unintentionally on the part of their owners.

Figure 137. In the 1970s, Passage Island supported the fourth largest Glaucous-winged Gull colony in the BC Salish Sea and was a major Pelagic Cormorant colony. When this photo was taken in 1981, residential developments were usurping nesting habitat and residents were shooting birds and destroying nests. A few gulls still nest but cormorants last nested on the island in 2000. *Photo by R. Wayne Campbell, 7 June 1981.*

Human disturbance on colonies has likely had the greatest impact on nesting seabirds and is probably the most important factor responsible for population declines on many colonies. As noted above, the effects of human and Bald Eagle disturbance are confounded. However, declines at many colonies occurred in association with increasing levels of human disturbance before eagle populations began to increase. The rapid growth of the human population in the BC Salish Sea and the ever-increasing recreational boating and kayaking traffic around colony islands has immensely intensified the problem since Drent emphasized it over 60 years ago.[144] It is difficult to prove that human disturbance has caused seabird population declines, but immediate impacts associated with disturbance are obvious and there are many indications that long-term declines are linked to increasing levels of human disturbance. In 1960, Drent showed contrary trends at cormorant colonies that were heavily disturbed by people compared to those that were not.[144] The picturesque cormorant colony on Ballingall Islets was one of the early victims of human disturbance described by Drent. Disturbance at that colony was blamed for

reproductive failures as early as 1957, repeatedly caused breeding failures in the early 1960s,[403] and was considered the reason for declines in cormorant numbers in the 1970s and 1980s.[421] The colony has been abandoned since the 1980s.

Figure 138. Lighthouses and other structures built on offshore islands may destroy seabird nesting habitat. Disturbance from lighthouse residents also may impact nesting birds, although, in our experience, most lightkeepers are protective of nesting birds. On Chrome Island (shown here) there were reports from the 1960s that the lighthouse keeper's children used to throw stones at the cormorants to discourage them from nesting. *Photos by R. Wayne Campbell, 4 July 1974.*

Some of the best examples linking human disturbance to seabird population declines come from colonies that have been monitored by resident lighthouse keepers. In 1960, lightkeeper Douglas Franklin was monitoring Pelagic Cormorant nests on Trial Islands near Victoria. He reported breeding failure of the colony likely due to gull predation on cormorant eggs during disturbances from many visitors to the island. Recreational traffic has continued to increase and cormorants have not nested there since. On nearby Chain Islets/Great Chain Island, visitor disturbance followed by severe egg predation was blamed for the large number of empty Pelagic Cormorant nests in 1960, 1968, and 1980. Nesting numbers also declined at that colony and it was later abandoned. On Franklin and Merry islands, Double-crested and Pelagic cormorant and Glaucous-winged Gull populations declined after about 1978 and cormorants have not been recorded nesting there since the 1980s. Ethel and Jim Kippin monitored seabird nesting populations while they were lightkeepers on Merry Island from 1966 to 1978. They reported very little human disturbance in the area in 1968 but rapidly increasing disturbance through the 1970s, with visitors spending hours on the colony and boats present around the colony all day. Many broken cormorant eggs were found following disturbances. In 1979, Chris Shepard and Elizabeth Courtnall from the BCPM noted an "awful lot of people and crows in the area" that were likely responsible for the total failure of Double-crested Cormorants that year. Predation and disturbance by Bald Eagles and associated predation by crows also impacted nesting seabirds on Franklin and Merry islands but greatest levels of predation were reported in 1968-1976 before major declines in seabird populations occurred.

Large seabird populations that used to nest on the Five Finger-Hudson Rocks-Snake Island complex may also have been severely impacted by human disturbance. Those colonies are located close to the urban centre of Nanaimo and suffer high levels of human disturbance from boaters who land to picnic and party on the island. Survey crews in 1974 saw many people camping and picnicking on Snake Island.[523] In 1980, the survey crew met a fisherman and his two children wandering around the gull colony for an afternoon break from their boat, which was anchored offshore. Fisherman's wives and children were also dropped off on the island to sunbath and swim. Disturbance by Bald Eagles may also have contributed to the decline of those colonies,[181] but prolonged visits by humans on the islands likely had greater overall impacts on seabird nesting populations.

The loss of many small colonies and the aggregation of Double-crested and Pelagic cormorant and Glaucous-winged Gull nesting populations at a few large colonies that has occurred in the BC Salish Sea over the last 60 years may be a response to increasing disturbance, mainly by humans. Drent identified this trend in response to increasing levels of human disturbance as early as 1960.[144] In 1985 and 1986, Vermeer and Devito [420] found that fledging rate of Glaucous-winged Gulls

was about five times higher on the large colony on Mandarte Island than on smaller colonies surveyed in the Gulf Islands, with many smaller colonies producing no young. On several smaller colonies, Vermeer and Devito [420] witnessed severe predation on gull eggs by crows after gulls flushed from their nests as the survey team approached the island. Disturbance by recreational boaters would have similar consequences and may have been responsible for reproductive failures at smaller colonies, although disturbance and predation by Bald Eagles and river otters likely also played a role on some colonies.[420] In larger colonies, greater vigilance by larger numbers of birds, predator swamping, and mobbing can provide protection against avian predators like eagles.[443] Those behaviours may also deter human visitors as attacks by hundreds of aggressive gulls can be quite intimidating. Perhaps more importantly, however, the two largest colonies on Mitlenatch and Mandarte islands have greater protection from human disturbance than most other colonies in the BC Salish Sea due to the constant presence during the seabird breeding season of volunteer wardens on Mitlenatch Island and researchers on Mandarte Island who discourage uncontrolled visits by people (Figure 139). The presence of wardens and researchers would not limit disturbance by Bald Eagles, which frequently flush seabirds from their nests.[377] This suggests that restriction of human disturbance is most relevant to the success of those colonies.

Figure 139. Seasonal naturalists on Mitlenatch Island help to control and educate island visitors and limit their disturbance to nesting seabirds. However, they cannot control all access and can do little to deter recreational boaters and fishers from approaching too closely to the cliffs where cormorants are nesting. Those cliffs are out of sight of the naturalist's cabin and other areas that the naturalists frequent. *Photo by R. Wayne Campbell, 2 August 1991.*

A Plea for Protection – by Rudi Drent – a quote from 1961 [144]

"I have said that part of the cause for increase in gulls and cormorants over the past 50 years has been the gradual abandonment of "egging." A new form of disturbance is now making itself felt, however, and has already reversed the trend of increase at several colonies. This threat is "misguided tourism." The postwar craze for small motor boats, especially ever speedier outboard models, has filled south coast waters with swarms of whining "sharks" that penetrate every channel. Formerly small boating was confined to relatively slow inboards, and fishing was the primary objective. Now, however, a new class of boat enthusiasts is involved, with often no goal in mind other than to cover distance at speed; landing on islets here or there breaks monotony of travel. The result has been an ever-increasing disturbance of the more accessible colonies. Those with definitely malicious intent are few; the damage is caused by curious but well-meaning folk.

"The evidence is clear: if the south-cost colonies are to continue, human disturbance must be curbed. All the nesting sea birds on our coast are already protected by law: it is unlawful to kill, hunt, capture, injure, take, or molest auks, auklets, guillemots, murres, puffins, gulls and petrels (among others), or to destroy, take or molest nests or eggs of these birds (see Migratory Birds Convention Act and Migratory Bird Regulations, 1960 ed., administered by Canadian Wildlife Service). The only species not covered by this federal law, the cormorants, are protected on our coast by the British Columbia Game Act.

"The regulations are there; the problem is primarily one of public education. Once the over-enthusiastic visitors can be made to realize the damage they are inflicting, the great majority desist of their own accord. In the meantime, practical measures would be desirable for the three presently threatened colonies, viz., Ballingall Islets (our oldest and most picturesque double-crested cormorant colony), Christie Islet (the closest sizeable sea-bird colony to Vancouver, main site for the scientific gull-banding programme of the Western bird Banders' Association [Vancouver chapter], and for guided educational tours by the Vancouver Natural History Society), and finally Trial Island (largest pelagic cormorant colony in near vicinity of Victoria). If landing on these islands without special permission (for banding, census, etc.), or otherwise frightening birds from the nests were prohibited from May 15 to August 15 each season, the colonies would be given a chance for survival."

Seabirds in the Salish Sea suffer substantial mortality as by-catch in the commercial and aboriginal salmon and herring fisheries.[170, 194] They are also caught inadvertently by sports fishermen.[66]

Diving species like Common Murres and Rhinoceros Auklets are the most frequently killed species in net fisheries; Glaucous-winged Gulls are commonly snared by recreational fishers. Marbled Murrelets, Pigeon Guillemots, cormorants, and Tufted Puffins are also caught in both commercial and sports fisheries. Derelict fishing gear in nearshore waters also catches many seabirds. In a study by Good et al.,[185] cormorants, especially Brandt's and Pelagic cormorants, were the species that were most frequently caught in hundreds of derelict gillnets, fishing lines, crab pots, and prawn traps that were recovered from the waters of the Salish Sea.

Oil pollution is a serious threat to seabirds throughout coastal waters.[422] Many birds die annually in the Salish Sea from chronic oil pollution (Figure 140).[48] Chronic pollution will likely worsen and risks of catastrophic oil spills increase due to the greater container ship traffic that will be associated with the recently approved Terminal 2 expansion of the Roberts Bank Superport and with the more frequent oil tanker traffic that will result from the twinning of the Trans Mountain pipeline that brings crude and semi-refined oils from Alberta to the port in Vancouver harbour.

Figure 140. This Pigeon Guillemot has become oiled along the back of its neck while foraging for fish to deliver to its chicks on Mitlenatch Island. It likely encountered a small blob of oil from one of the many sources of chronic oil pollution that contaminate marine waters in the BC Salish Sea and worldwide. The fate of this guillemot is uncertain – the small patch of oiled feathers has lost its insulative properties and is enough to cause hyperthermia in cold weather and in cold, marine waters. *Photo by Marlene Graham, 18 August 2008.*

Environment for Sale

In a world addicted to economic growth, development and economic gain take precedence over environmental protection and wildlife conservation. It is virtually unheard of for environmental concerns to halt major development projects. Mitigation measures intended to offset environmental damage are usually instituted following an environmental assessment of the anticipated impacts of a project. However such measures generally cannot fully compensate for the many and varied environmental impacts, and fail to arrest the cumulative, ongoing erosion of habitat quality for wildlife species, including seabirds. Further, the environmental assessment process itself is being compromised and in many cases appears to be for sale. The Trans Mountain pipeline and the Roberts Bank Superport Terminal 2 expansion projects in BC are good examples.

Expansion of the Trans Mountain pipeline was approved on 18 June 2019 by the Government of Canada, not surprisingly, as the federal government bought Trans Mountain from Kinder Morgan Inc. for $4.5 billion in 2018 after the company threatened to scrap the line's

expansion amid fierce environmental opposition. Though there was still opposition to the pipeline, construction was well underway in 2020 and most affected communities were negotiating for benefits. As of February 2021, more than $1.4 billion in contracts had been awarded to First Nations communities and the federal government was negotiating with representatives of 75 indigenous communities from Alberta and BC to sell the pipeline to First Nations groups once it was completed.[18, 398] *Costs for the pipeline expansion ballooned from an estimated $7.4 billion when the government purchased the pipeline in 2018 to $21.4 billion in June 2022* [391] *and $34 billion by March 2024.*[606] *The project will likely be a financial loss for the Canadian government and taxpayers. The pipeline finally began operations on 1 May 2024.*

The Terminal 2 expansion at Roberts Bank was given federal approval on 20 April 2023 [593] *despite unanimous contrary recommendations from environmental groups and the federal government's own agency responsible for the protection of migratory birds.*[594] *On the same date, the Government of Canada announced over $45 million in funding for First Nations groups, who have lent support for the project. Agreements for such funding date back almost two decades to when the Vancouver Port Authority (VPA) signed a memorandum with the local Tsawwassen First Nation (TFN) that promised millions of dollars in compensation once the third berth at Deltaport expansion was approved (which occurred in 2006) and the current expansion at Terminal 2 was approved.*[595] *Specifically, the agreement, signed in November 2004, stated:*

1) *VPA will pay $4,500,000.00 to TFN, with such Payment to be paid on and for the following: a) $2,000,000.00 to be paid to TFN on the Ratification Date in respect of its claim of past infringements of TFN Aboriginal Interests by VPA; and b) A further $2,500,000.00 to be paid to TFN in respect of any claim of future infringements of TFN Aboriginal Interests caused by or connected with the Roberts Bank Port Facility Expansion, with $1,000,000.00 to be paid on Environmental approval being granted in respect of the expansion of the third berth at Deltaport and $1,500,000.00 to be paid on Environmental approval being granted in respect of Terminal 2.*

2) *VPA will undertake to ensure that TFN Entities receive a minimum of $4,000,000.00 in contracts to undertake construction or construction related work, or supply goods and services in support of construction of the Roberts Bank Facility Expansion. TFN will receive such contracts by the following schedule: a) $1,500,000.00 by the completion of the third berth at Deltaport; and b) $2,500,000.00 by the completion of Terminal 2.*

*The VPA also agreed to provide a million-dollar development fund, a $10 million joint venture investment fund, jobs, and other benefits to TFN. The VPA and the BC Ministry of Water, Land and Air Protection also agreed to support "efforts in removing or excluding the water lot [fronting the TFN community] from the jurisdiction of the Ministry of Water, Land and Air Protection and/or any designation of these water lots as a '*Wildlife Management Reserve *.' In turn, the TFN agreed "that, with respect to the Environmental Assessments relating to the Roberts Bank Port Facility Expansion, the TFN will not raise any Environmental concerns, issues or objections nor make any Environmental comments or submissions that are based on, result from or are in any way attributable to aboriginal status, rights or title."* [594] *Obtaining such First Nations' support for a project is a vital step as they have major influence on the success of a development proposal.*

A further pecuniary problem compromising the environmental assessment and protection process, at least in BC, is the inherent conflict of interest for environmental consulting firms and their registered professional biologists who are responsible for conducting impact assessments for proposed projects. Those firms and biologists are hired by the development companies and depend on those companies for their livelihood. An environmental consulting firm that recommended against development projects because of environmental concerns would find itself short of work. Rather, there is an inevitable incentive for consulting biologists to find mitigating measures that meet the approval of government regulatory agencies and allow projects to go ahead.

Risks of spills of other toxic chemicals, plastics, styrofoam, and other hazardous wastes are also increasing along the inner and outer coastlines of BC with increased container traffic into Vancouver ports,[335] as exemplified by the recent MV *Zim Kingston* incident off the west coast of Vancouver Island in October 2021.[248]

Protective Status for Seabird Colonies in the BC Salish Sea

A few island seabird colonies in the BC Salish Sea have protection as BC Ecological Reserves which prohibit public access without permission. Many scattered colonies have protective status as part of provincial and federal parks. Access to many seabird nesting sites within parks is also restricted, but parks attract tourist traffic and, unless wardens are present, likely offer minimal real protection to

nesting seabirds in the busy waters of the BC Salish Sea. Unfortunately, the same is true for most colonies designated as Ecological Reserves.

Colonies in urban habitats, that now support large proportions of the Double-crested and Pelagic cormorant and Glaucous-winged Gull populations breeding in the BC Salish Sea, have no protective status beyond general federal and provincial legislations that protect nesting birds. At present, urban areas provide only tentative habitats for nesting seabirds. Conflicts with human interests in urban areas result in management of nesting seabirds as pest species in many areas. Measures to deter, exclude, and destroy nesting attempts are common [26, 141, 184, 205, 354, 396, 454] (Figure 141). The successful establishment of nesting cormorants and gulls in urban areas should thus not distract concern for the major declines in breeding populations that have occurred on more traditional island colonies and the need to protect those areas from human impacts.

Figure 141. Glaucous-winged Gulls nesting in urban environments are often considered pests and many deterrent measures have been attempted to discourage nesting. Measures are often ineffective. Shown here (clockwise from top left), gulls are nesting directly under bird-repellent spinners, adjacent to a dilapidated plastic owl, inside rows of spikes lining the roof edge, and beside an intact plastic owl. *Photos by Edward Kroc.*

Going forward, urban residents are often delighted to witness nesting seabirds nearby, and there is growing public awareness of the risks to seabirds nesting in the city and the need to provide measures to protect nesting birds and their young (Figure 142). Management officials responsible for maintaining the structural integrity of urban bridges or rooftops are often receptive to possible measures that could also accommodate nesting birds. Compromises are currently being made to allow cormorants to nest on portions of Vancouver bridges and to prevent disturbance to nesting birds during maintenance activities.[184, 205] Additional modifications to bridge and rooftop structures and to maintenance schedules could perhaps provide stable, long-term nesting habitats in urban environments while at the same time protecting structures from damaging effects of nesting and roosting birds and minimizing the harassment of maintenance personnel by territorial birds (Figure 143).

Wildlife Rescue ASSOCIATION

Gull Rooftop Nesting Season

Frequently Asked Questions

Figure 142. The Wildlife Rescue Association of BC was established in 1979 to rehabilitate wildlife affected by human activity and provide education to the public on co-existing with urban wildlife. Since their formation they have treated more than 135,000 animals. The association has produced a pamphlet to provide information specifically related to Glaucous-winged Gulls nesting in the urban areas of Vancouver. They have kindly allowed us to reproduce that pamphlet here (following pages). More information can be found on their website at https://www.wildliferescue.ca/. Several other Wildlife Rescue and Rehabilitation centres operate within the Salish Sea area, including the BCSPCA's Wild ARC centre in Victoria (https://spca.bc.ca/locations/wild-arc/). A list of rehabilitation centres in BC and their contact information can be found on the Wildlife Rehabilitator's Network (https://www.wrnbc.org/contact/find-a-local-rehabilitator/).

There are Gulls nesting on our rooftop! What should I do?

Leave them alone! It is a federal offense to tamper with a gull nest.

Every July and August, "Gull Season" occurs in the Lower Mainland of British Columbia. Gulls like to nest on flat rooftops in Vancouver. To stay close to their main food source of fish, gulls will nest in areas near water. These rooftop sites are typically safe from predators - humans included!

Gull parents will only leave their babies to gather food for them. Gull nestlings are *semi-precocial*, they hatch with downy feathers, eyes open, and can walk around shortly after hatching. However, they do not feed on their own like fully precocial babies (goslings and ducklings), rather they rely on their parents for food and remain in the nest for a number of days.

Ideally, if the nest site is on a rooftop, the young gull only leaves the nest/rooftop once they can fly and find food on their own. Often, the young gulls glide down from their nesting site to ground level where the parents continue to provide food for them until they can fly.

What are some common reasons a young gull would be admitted to Wildlife Rescue?

1. **Orphaned**
   The most common reason juvenile gulls need help is when they are orphaned, which can lead to dehydration and starvation as the parents are not around to provide important nutrients.

2. **Hit by Car**
   Once on the ground, young gulls face urban challenges including busy streets full of people, cars and bikes, all potentially harmful for these animals. If the animal has been hit by a car or bike, they often suffer broken bones and other internal traumas.

3. **Nest Disturbance**
   As gulls often nest in urban areas, they are frequently confronted by humans. This is particularly apparent on construction sites where their nests can be in the way of work, and are unknowingly disturbed.

When is intervention needed?

Intervention is required when:

- If a **nestling** (all downy/fluff/spotted) is found on ground.
- If an **older nestling** (spots on head/fully feathered on body) is found in an unsafe area or shows signs of injury or distress.
- If a **fledgling** (Grey/brown in color, short tail) is found with injuries (blood, bone, drooping wings etc.).
- If a **fledgling** is showing signs of lethargy or dehydration (sunken eyes, slow moving, wobbly, not bright alert and responsive).

Nestling

Covered in fluffy down feathers, spotted all over.

Older Nestling

Fluffy spotted down on head, body is covered with smooth grey feathers.

Fledgling

Fully feathered, smooth grey and brown, shorter tail then adult.

Caution: Gulls are an imprintable species!

Since it is possible for gulls to imprint and habituate on humans, avoiding interacting with the young gulls is necessary. Please **do not** feed, pick up, pet, or interact in any way with young gulls.

In care, highly trained staff and volunteers wear extensive "imprinting gear" to avoid them from associating humans with food or worse, not having a natural fear of "predators" such as humans.

Need more help?

Call your local wildlife rehabilitator for assistance.

Wildlife Rescue Association of British Columbia
5216 Glencarin Drive, Burnaby, BC V5B 3C1
Support Centre: (604) 526-7275
wildlife@wildliferescue.ca

If you are not located in the Lower Mainland, please contact your nearest wildlife rehabilitator.

Gull in care at Wildlife Rescue.

Follow along on social media:

wildliferescue wildliferescuebc WRAofBC

Figure 143. Rooftop-nesting Glaucous-winged Gulls are the bane of maintenance personnel, who often suffer repeated blows to the head before they either refuse to work on rooftop machinery when gulls are nesting or ensure that they have assistants to fend off dive-bombing gulls while they are working.[498] *Photo by Edward Kroc, 2 July 2015.*

BC Parks and Ecological Reserves

Seabird colonies designated as Ecological Reserves include (from north to south): "Jenkins" Cliffs within the Lasqueti Island Ecological Reserve, Hudson Rocks, Rose Islets, Canoe Islet, Ballingall Islets, and parts of the Trial Islands. Jemmy Jones Island, some small islets in the Chatham Islands, and Chain Islets/Great Chain Island are part of the Oak Bay Islands Ecological Reserve. Most of these sites were historically large seabird colonies. Many, including Hudson Rocks, Rose Islets, Canoe Islet, and Ballingall Islets (Figure 144) have been abandoned by most previously nesting seabirds in spite of their protected status. Chain Islets/Great Chain Island still support a large nesting population of Glaucous-winged Gulls but the hundreds of pairs of Double-crested and Pelagic cormorants that used to nest on the islets are gone.

Figure 144. Double-crested Cormorants were last reported nesting on Ballingall Islets in 1987 but still frequently roost on the islets, as seen here in 2006. *Photo by Moira J.F. Lemon, 14 Aug 2006.*

From a conservation perspective, Mitlenatch Island Nature Park is one of the most successful parks and protects one of the most important seabird colonies in the Strait of Georgia. The conservation success of that park is likely due to the volunteer warden program maintained by the Mitlenatch Island Stewardship Team that helps control human disturbance to the nesting birds (Figure 145). Many smaller seabird colonies are encompassed by provincial parks, including (from north to south): Gorges Islands within the protected area adjacent to Walsh Cove Provincial Park, Ray Rock and "Tenedos" Rock in Desolation Sound Marine Provincial Park; Copeland Islands in Copeland Islands Marine Park; St. John Point and Flora Islet in Helliwell Park; Boyle Point in Boyle Point Provincial Park; Finnerty Islands, Fegen Islets, and Jervis Island in Sabine Channel Marine Provincial Park; "Upwood" Islet in South Texada Island Provincial Park; Bertha Island in Simson Provincial Park; Wigwam Inn, Croker Cliffs, and "Buntzen" Cliffs in Say Nuth Khaw Yum Provincial Park [aka Indian Arm Park]; Newcastle East Dock in Newcastle Island Marine Provincial Park (Figure 146); Whaleboat Island in Whaleboat Island Marine Provincial Park; Wallace Island in Wallace Island Marine Provincial Park (Figure 147); and the southern portion of Discovery Island in Discovery Island Marine Provincial Park.

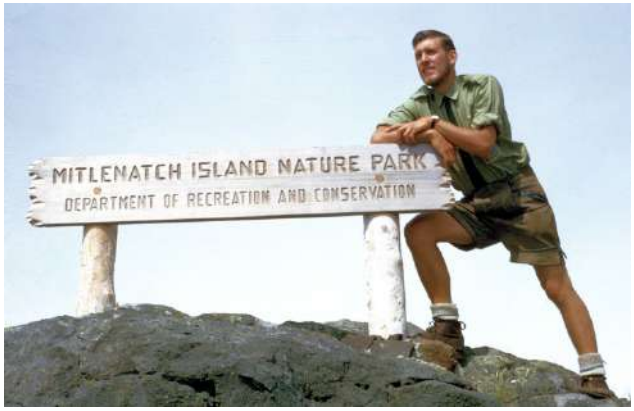


Figure 145. Park naturalists on Mitlenatch Island have been protecting nesting seabirds and the rest of the island biota for over 60 years. This photo shows Bill Merilees at a newly erected park sign in 1964. *Photo by R. Wayne Campbell, July 1964.*

Figure 146. Newcastle Island Marine Provincial Park is a popular tourist destination. The island has an extensive sandstone shelf on its eastern shore. *Photo by Moira J.F. Lemon, 28 Aug 2022.*

Gulf Islands National Park Reserve

Gulf Islands National Park Reserve is a disjunct patchwork of protected lands in the southern Gulf Islands, some which were former provincial parks. Seabird colonies within the park include (from north to south): Hawkins Island, Portlock Point, Red Islets, Channel Islands, Belle Chain Islets, part of "Minx" Rocks, Pine Islet, Cabbage Island, East Point Cliffs, Java Islets, "Peter" Rock, Jackson Rock, Isabella Island, Pellow Islets, Tortoise Islets, Imrie Island, Reay Island, Greig Island, Dock Island and adjacent rocks in the Little Group, Rum Island, Sidney Spit, Sallas Rocks, the rock north of Little D'Arcy Island, and the reefs east of Unit Rocks. Declines and extirpations of nesting seabirds have occurred at many colonies within the park, including: the major historical Glaucous-winged Gull colonies on Java Islets and Imrie Island; smaller gull colonies on Belle Chain Islets, Reay Island, Greig Island, Dock Island in the Little Group, and Sallas Rocks; and cormorant colonies on Channel Islands, East Point Cliffs, and the Little Group. Most declines occurred before the park was formed but there are no indications that nesting seabirds are faring any better since the park was established. Parks Canada has restricted visitor access to most of the seabird colony sites within the park.

Figure 147. A string of small, rocky reefs are protected within the Wallace Island Marine Provincial Park. They provide nesting habitat for Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots. *Photo by Moira J.F. Lemon, 28 Aug 2021.*

Other Federally Protected Areas

Most colonies in the Victoria area between GI-810 Flower Island and GI-930 Victoria lie within the Victoria Harbour Migratory Bird Sanctuary (VHMBS), except Chatham Islands, Discovery Island, Lewis Reef, and Chain Islets/Great Chain Island, which are outside the sanctuary boundaries. The VHMBS was the first Migratory Bird Sanctuary established on the Pacific Coast of Canada. Christie Islet and Reifel Island, which is part of the Westham Island colony, are also within federal Migratory Bird Sanctuaries. Reifel Island is also designated as part of the Alaksen National Wildlife Area, the Fraser River Delta Ramsar site, and the Boundary Bay - Roberts Bank - Sturgeon Bank (Fraser River Estuary) Important Bird Area (see below).

Lighthouses and surrounding structures on Merry Island and Entrance Island have been protected as a Federal Heritage site by Parks Canada.

City and Regional Parks

A few seabird colony sites are within well-used city parks and are no longer used by most seabird species that historically nested there. Prospect Point

and Siwash Rock lie within Vancouver's renowned Stanley Park. Point Atkinson is within the City of West Vancouver's popular Lighthouse Park.

Local Conservancy Areas and Nature Sanctuaries

On Galiano Island, part of the Galiano Island - Central Cliffs colony has been protected as the Trincomali Nature Sanctuary (Figure 148).

Figure 148. Part of the central cliffs on Galiano Island where Pelagic Cormorants have nested since 1957 have been protected as part of the Trincomali Nature Sanctuary established in 2001. *Photo by R. Wayne Campbell, 8 June 1976.*

Important Bird and Key Biodiversity Areas

The Salish Sea supports large summer, winter, and migratory bird populations and many sites have been designated Important Bird Areas (IBAs) or, more recently, Key Biodiversity Areas (KBAs). The designation of IBAs and KBAs in BC is an international conservation initiative led in Canada by Birds Canada and other coalition partners.[612] IBAs and KBAs provide no legal protection.

Seabird colonies in the BC Salish Sea within IBAs or KBAs include (from north to south): Ray Rock within the *Desolation Sound IBA/KBA*; Mitlenatch Island within the *Mitlenatch Island IBA/KBA*; McRae Islet and "Blind" Islets within the *Jervis Inlet/McRae Islet IBA*; Denman West Dock, Denman East Dock, Hornby West Dock, St. John Point, Flora Islet, Norris Rocks, Boyle Point, and Chrome Island within the *K'ómoks IBA/KBA*; White Islets within the *White Islets and Wilson Creek IBA/KBA*; most island colonies and shoreline areas of urban colonies located in Howe Sound, Burrard Inlet, Indian Arm, and False Creek as part of the *English Bay, Burrard Inlet & Howe Sound IBA/KBA*; Squamish Harbour within the *Squamish River Area IBA/KBA*; Capilano Lake within the *Greater Vancouver Watershed IBA*; portions of colony sites between SG-661 Point Grey to SG-730 White Rock as part of the *Boundary Bay - Roberts Bank - Sturgeon Bank (Fraser River Estuary) IBA/KBA*; Snake Island within the *Snake Island IBA*; Canoe Islet within *Porlier Pass IBA/KBA*; Galiano Island - Active Pass Cliffs within the *Active Pass IBA/KBA*; "Killer Whale" Rocks, Little Group, Sidney Spit, Sidney, James West Dock, and Sallas Rocks within the *Sidney Channel IBA/KBA*; Mandarte Island within the *Mandarte Island IBA/KBA*; and Chain Islets/Great Chain Island within the *Chain Islets & Great Chain Island IBA/KBA*.

COLONY ACCOUNTS AND REGIONAL SUMMARIES

Data Presentation and Organization

We have divided the BC Salish Sea into two geographic regions (Figure 149; also see Figure 58 on page 58 in Part 1 [335]). Summary information on the status, trends, and conservation issues for breeding seabirds throughout the inner waters of the BC Salish Sea have been presented above. Individual colony accounts are presented below for each region. Colony accounts are presented in north-to-south order following our previous numbering scheme.[328] Geographically-ordered colony identity numbers were assigned at intervals of 10 to allow future insertion of newly discovered colonies in geographic sequence. Many new identity numbers have been inserted where historical data have become available or been reinterpreted since initial reports were published and where more recent surveys have identified new seabird nesting sites. Location names are from BC Geographical Names,[186] except for names in quotations, which we have assigned when no gazetteered names exist to avoid confusing lists of unnamed colonies.

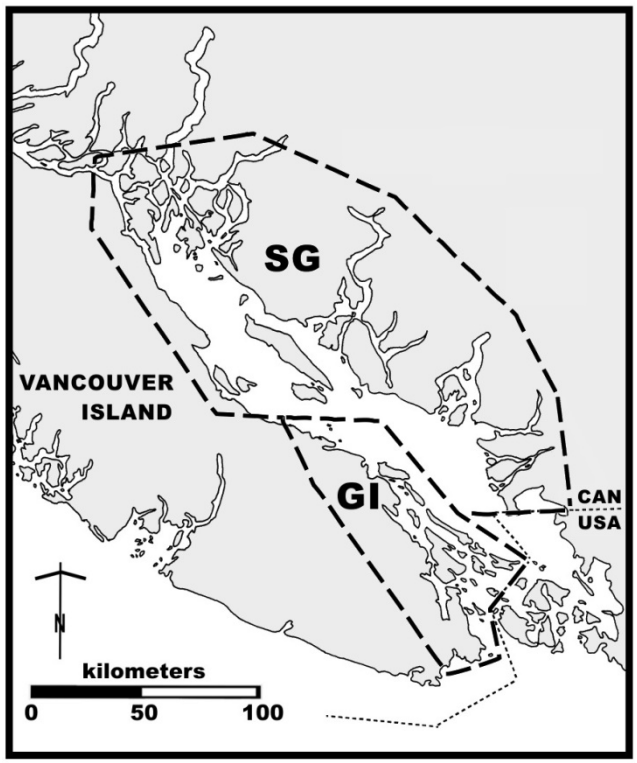


Figure 149. We have divided the Salish Sea into two geographic regions used to summarize seabird breeding populations. From north to south, these are: Northern Strait of Georgia (SG) and Gulf Islands (GI).

Throughout this work we use the terms "colony" and "breeding site" interchangeably. Number of current breeding sites listed on tables thus indicates the number of colonies where a particular species has been found nesting. We use "locations" rather than "sites" to describe different places within colonies where birds have been found nesting.

Each colony account is divided into three or four sections: *Location*, *Description*, and *Historical Summary*, plus a *Remarks* section if pertinent. *Location* includes latitude and longitude, National Topographic System (NTS) map grid number, a verbal description of the colony location, and previous or alternate names for the site if applicable. Designated colonies generally correspond to gazetteered [186] locations, and may encompass a single island or an island group. However, many islands or island groups with gazetteered names have unnamed islets or rocks nearby that we have associated with the named colony. We verbally describe the location relative to the named site of any such nearby, unnamed islets that we have included as part of the colony. For sites without gazetteered names, and for which we assigned names in quotations, we decided which island or group of islands would be included in the colony. Urban areas that have been colonized by nesting seabirds presented an additional complication for designating colonies in the BC Salish Sea. For urban communities other than Greater Vancouver, we assigned colony names and boundaries that, by and large, correspond to those of the city or community. Breeding records for Greater Vancouver were too complex to deal with as one colony. We thus arbitrarily divided up the Greater Vancouver area and assigned colony names to portions of the urban habitat where we had clusters of nesting records, such as a bridge site or a stretch of harbour and associated nearshore structures. Although at present nesting records do not extend throughout the Greater Vancouver area, we placed the boundaries of the assigned colonies to encompass the entire urban habitat of Greater Vancouver as far east as the City of Coquitlam so that future records can be easily accommodated. Latitude and longitude are based on the NAD83 datum and were determined using the Toporama feature of the Atlas of Canada provided by Natural Resources of Canada.[280] Latitude and longitude are generally given for only one, specified main island for colonies that include multiple islands. For urban colonies, we provide either approximately central coordinates or coordinates that correspond to a known or main location of nesting birds within the colony area.

Under *Description* we provide: total area and maximum elevation of island colonies, and maximum elevation of cliffs for cliff colonies, if available; a dominant habitat category (e.g., Forested, Grassy rock, Bare rock, Cliffs); and a brief description of the site. Areas were measured on Google Earth Pro using their polygon tool. Maximum elevations were taken from nautical charts published by the Canadian Hydrographic Service where available or were determined using Toporama.[280] Habitat categories overlap and only indicate the most prevalent habitat types. Multiple habitat categories may be listed, especially for colonies that include groups of islands. Forested islands almost always have rocky shorelines, often with areas of grassy or herbaceous vegetation, and may have some cliff habitat. The "Forested" habitat category thus indicates islands that often also have habitats similar to the categories of "Grassy rock" and "Bare rock" and perhaps "Cliffs." The "Grassy rock" category includes any rocky island with substantial areas of grass or other herbaceous vegetation; shrubs may also be common and there may be a couple of scattered trees. "Bare rock" refers to a habitat type that has no vegetation or sparse vegetation and virtually no soil accumulation. The "Forested," "Grassy rock," and "Bare rock" categories are thus somewhat nested; grassy rocks lack forested habitat, and bare rocks lack forested and grassy habitats. "Cliffs" are near vertical rock faces with variable amounts of vegetation. We also use other habitat categories that are self-explanatory, including "Bridge," "Rooftops," "Wharf," and "Pilings." We provide details about the variety of habitats and vegetation composition in the brief description of the site. Under *Description* we also note the protected status, if any, of each colony.

The *Historical Summary* section presents a table summarizing all historical records on seabird nesting populations through summer 2023, and a discussion of the historical records, including specific nesting locations and an interpretation of population trends and changes in nesting distributions for each species. Unsubstantiated records or records with uncertain locations may be mentioned in the text but are not included in colony tables. Sources for historical records are given in the table and, unless there is ambiguity, are not repeated in the text that discusses those records.

Under *Remarks* we provide information on predation and the presence of avian and mammalian predators, as well as any other recorded impacts that may have affected population estimates and trends, including human disturbance, research, and banding activities on the colony. We summarize all records of Bald Eagles, Peregrine Falcons, and mammalian predators on a colony but we present records for other species such as Common Ravens (Figure 150) and Northwestern Crows, which are common on many BC seabird colonies, mainly when there is evidence that they have preyed on nesting seabirds at that colony.

Figure 150. Common Ravens are common around islands in the BC Salish Sea and occasionally have been suspected of preying on nesting seabirds or their eggs. Their overall impact on nesting seabirds is likely minor. *Photo by Paula Courteau, Hornby Island, BC, 26 March 2015.*

Summary tables for each colony are identified by their colony number. Other tables and figures are numbered in sequence.

How to Interpret Data in Colony Tables

Population estimates in each colony table are number of breeding pairs. Numbers in parentheses are numbers of individual birds seen around colonies, which may include non-breeding birds, and are used only for Pigeon Guillemots and Tufted Puffins, for which breeding population estimates are often difficult to obtain (see Part 1 [335]). Population estimates and other historical data presented in colony tables have been derived from various types of observations and survey methods and are not always comparable. To tabulate historical records, we have used a number of codes to indicate and qualify the kinds of data presented. Those were described in detail in Part 1 [335] and are summarized in Appendix 2 of this volume. Codes are not defined in each table and Appendix 2 should be referred to for an explanation of the symbols that code the data in colony tables. A list of species acronyms used in the tables is also given in Appendix 2. Data sources

are listed by source number in all colony tables; source numbers refer to entries in *Literature Cited* and *Other Sources of Information*.

We have reviewed original data sources in preparing the colony histories presented here and have found mistakes in previous publications. Where differences in specific data occur between this release and past publications, the data here should be considered correct.

NORTHERN STRAIT OF GEORGIA

The Northern Strait of Georgia is the first of the two geographic regions we have used to organize colony accounts for the BC Salish Sea (see Figure 149 on page 160; also see Figure 58 on page 58 in Part 1 [335]). Current estimates as of 2023 of seabird breeding populations at each colony in the northern Strait of Georgia are listed in Table 8. Summary information for this region is presented together with that for the Gulf Islands region in the sections above titled *Seabird Breeding Populations in the BC Salish Sea* (see Table 1 on page 92). This approach provided a more coherent account of the status, trends, and conservation issues for breeding seabirds throughout the inner waters of the BC Salish Sea. Here we begin the colony accounts for the areas in the northern Strait of Georgia from Chatham Point at the north end of Discovery Passage to Tsawwassen south of Vancouver (Figures 151 to 154).

Table 8. Current estimates of seabird breeding populations at colonies in the northern Strait of Georgia as of 2023. Estimates are numbers of breeding pairs except for numbers in parentheses and totals in the "All species" column, which are numbers of individuals. Numbers in parentheses, given mainly for Pigeon Guillemots, are numbers of birds counted around colonies, likely include non-breeding birds, and thus are not reliable estimates of actual breeding populations. See Appendix 2 on pages 655-656 for an explanation of the letter codes used to qualify population estimates.

SITE CODE	SITE NAME	DCCO	PECO	BLOY	GWGU	CATE	ARTE	PIGU	RHAU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
SG-003	Gorges Islands			2				(1)		5	2019
SG-005	Sheer Point							S(100)		100	2021
SG-008	"Deepwater" Bluffs							x(6)		6	2009
SG-010	"Brown" Bluffs							x(10)		10	2009
SG-012	"Steamer" Island			1						2	2023
SG-014	Hoskyn Rock			1eS	24e					50	2016, 2021
SG-015	Breton Islands			1eS						2	2021
SG-017	Centre Islet			4e	30e	28e		S(2)		126	2021, 2022, 2023
SG-018	"Plunger" Rock			1						2	2021
SG-020	Copper Cliffs		5+		0			S(8)		18	1978, 2019, 2022
SG-022	"Quathiaski" Cliffs		20e							40	2021
SG-024	"Whaletown" Rock			1						2	2021
SG-026	"Fast" Rock			1						2	2021
SG-030	Guide Islets			1						2	2021
SG-034	"Mansons" Rock			1						2	2021
SG-038	"Frabjious" Rock			1eS						2	2006
SG-040	Three Islets			4e	1			x		12	1981, 2020, 2021
SG-044	Twin Islands			0						0	1981
SG-048	"Sirk" Beach			1						2	2021
SG-050	Little Rock			3e	1		0	(6)		14	1986, 2019, 2022
SG-055	Ray Rock				21e					42	2020
SG-056	"Tenedos" Rock			2e				(1)		5	2019
SG-060	Powell Islets			2e	40e			(8)		92	2006, 2011, 2019
SG-068	Copeland Islands			2eS				(4)		8	2006, 2017
SG-070	Major Islet			2e	70e			x(48)		192	2006, 2021, 2022
SG-080	Keefer Rock			1	0					2	1981, 2006
SG-090	Mitlenatch Island	23	131	6eS	952			x(500)	2eS	2,728	1991, 2006, 2018, 2022, 2023
SG-100	Powell River				9e					18	1986, 2020, 2021, 2022
SG-110	Vivian Island		0	3eS	0			S(17)		23	2011, 2014
SG-120	Rebecca Rock			1eS				(0)		2	2006, 2014
SG-130	McRae Islet	0	38	3e	55e			S(2)		194	2014, 2021

Table 8. cont'd

SITE CODE	SITE NAME	DCCO	PECO	BLOY	GWGU	CATE	ARTE	PIGU	RHAU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
SG-135	Deserted Bay - Dock				1					2	2021
SG-140	"Blind" Islets				1S					2	2011
SG-145	"Cockburn" Islets				30eS			S(7)		67	2014, 2019
SG-148	"Trafalgar" Rock				1					2	1986
SG-150	Fearney Point							x(106)		106	2022
SG-160	Hodgson Islands			1eS	4S					10	2011, 2014
SG-170	Daniel Point							(0)		0	1987
SG-175	Whitestone Islands			1eS						2	2006
SG-180	Mouat Islands		13	3eS	45S					122	2006, 2015
SG-190	"Davie" Islet				3					6	1986
SG-200	Denman Island - West Dock				0					0	2021
SG-210	Denman Island - East Dock				1			1		4	2014, 2021
SG-212	Hornby Island - West Dock				0			1		2	2020
SG-220	St. John Point		0	2eS	0			x(30)		34	2021, 2022
SG-221	Flora Islet			2e						4	2022
SG-230	Norris Rocks			3	185					376	2010, 2021
SG-239	Boyle Point							1		2	2019
SG-240	Chrome Island		0		1S			S(2)		4	2010, 2014, 2022
SG-250	Sisters Islets		0	9	61		1			142	2021, 2023
SG-260	Finnerty Islands			7	0			x(5)		19	2021
SG-270	Fegen Islets			4	14					36	2021
SG-276	"Heron" Rock			0						0	2021
SG-278	"Sabine" Islets			11eS	0					22	2021
SG-280	Jervis Island			4eS				2(2)		12	1981, 2021
SG-284	Boho Island							x(35)		35	2011
SG-286	"Connie" Rock			4						8	2021
SG-290	"Upwood" Islet				1					2	2019
SG-300	Sheer Island			1	16			S(2)		36	2021
SG-301	Bull Island			1eS						2	2021
SG-302	Rabbit Island	0	19	6	6					62	2021
SG-305	"Windy" Rock				1					2	1986
SG-308	"Jenkins" Cliffs							x15(67)		67	2021
SG-310	Sea Egg Rocks	7	44	8	112e			x(9)		351	2019, 2021
SG-320	Sangster Island							1(1)		2	1981
SG-330	"Priestland" Rocks			1	1					4	1981, 2021
SG-340	"Jeddah" Rocks			1	2					6	1981
SG-350	Bertha Island		2					(6)		10	2011, 2015
SG-360	Franklin Island	0	0	1	47			x(11)		107	2010, 2014, 2019
SG-370	Merry Island		0	1eS	0			S(9)		11	2010, 2014
SG-380	Porpoise Bay				1					2	2018
SG-390	Trail Islands		0	3eS	0			S(3)		9	2006, 2014
SG-400	White Islets		1	0	328			S(12)		670	2010, 2014, 2023
SG-410	Popham Island							1(2)		2	1981
SG-414	Pasley Island			1S						2	2015
SG-416	"Onion" Rock			1						2	2022
SG-420	Ragged Island			1eS						2	2015
SG-424	"Galbraith" Rock			1						2	2015
SG-426	Grace Islands			1						2	2009
SG-428	Mariners' Rest			1						2	2009
SG-430	Christie Islet	0	12	2e	255			S(20)		558	2010, 2014, 2015
SG-440	Pam Rock	0	0	1S	11			S(4)		28	2010, 2014, 2017, 2021
SG-444	Squamish Harbour				0					0	2021
SG-446	"Britannia" Rock			1						2	2008
SG-450	Bowyer Island				12			(0)		24	1981
SG-460	"Sunset Beach" Cliffs				1					2	1957
SG-470	"Bay" Rock				0					0	2021
SG-475	Horseshoe Bay – Ferry Terminal							(0)		0	2021
SG-480	Lookout Point							2e(3)		4	1981
SG-490	Whyte Islet			0	0					0	2021

Table 8. cont'd

SITE CODE	SITE NAME	DCCO	PECO	BLOY	GWGU	CATE	ARTE	PIGU	RHAU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
SG-500	Bird Islet			1	5					12	2016, 2023
SG-505	Kettle Point				0					0	2023
SG-510	Batchelor Point							(0)		0	2023
SG-520	"Eagle" Rocks			1	x					4	2018, 2023
SG-530	Passage Island		0	3	25			S(1)		57	2010, 2014, 2021, 2022
SG-540	Grebe Islets			2	0			(2)		6	2015, 2022
SG-550	Point Atkinson				0					0	2021
SG-555	Capilano Lake				0					0	2021
SG-560	Wigwam Inn				0					0	2013
SG-562	Croker Island - Cliffs							x(4)		4	2013
SG-565	"Buntzen" Cliffs							x(1)		2	2015
SG-568	Port Moody				2eS					4	2021
SG-570	Barnet				7e					14	2021
SG-580	Second Narrows	520	73		21			1		1,230	2013, 2022
SG-590	North Vancouver			1	200e [c]			x(22)		424	1975, 1981, 1983, 1986, 2009, 2013, 2014, 2018-2021
SG-595	West Vancouver				19e					38	2021, 2023
SG-600	Vancouver Harbour				1,000e [c]					2,000	2015-2020
SG-610	Lions Gate Bridge				2					4	2023
SG-620	Prospect Point		0		0			(10)		10	2014, 2016
SG-630	Siwash Rock		0		0			(0)		0	2014
SG-640	Burrard Bridge		55		3					116	2017, 2023
SG-650	Granville Bridge		182		3					370	2017, 2023
SG-660	False Creek				500e [c]					1,000	2015-2019
SG-661	Point Grey				100e [c]					200	2017-2018
SG-664	Oak Street Bridge				1					2	2021
SG-665	Mitchell Island				2eS					4	2021
SG-666	Knight Street Bridge				1					2	2021
SG-667	South Vancouver				100e [c]					200	2017, 2019
SG-670	Queens Reach to North Arm	0			12eS					24	2021
SG-672	Pattullo Bridges				11					22	2021
SG-674	Annacis Island				3eS					6	2021
SG-675	Lulu Island - North				220e	0				440	2017, 2021
SG-677	Sea Island				7					14	2023
SG-678	Iona Island	0								0	2022
SG-679	Lulu Island - South				3					6	2008, 2019
SG-680	Westham Island				0					0	1988
SG-685	Surrey - North				1					2	2023
SG-690	Sand Heads	0								0	2009
SG-700	Roberts Bank - Superport	0			3					6	1988, 2022
SG-705	Roberts Bank - Foreshore			1		0				2	1986, 2017
SG-710	Tsawwassen - Ferry Terminal		4	2	8			(8)		36	2020, 2022, 2023
SG-720	Tsawwassen - Breakwater				250e					500	2010
SG-730	White Rock				8e [c]					16	2010-2020

[a] Number of individuals.
[b] For sources see individual colony accounts.
[c] See colony account for the derivation of this estimate.

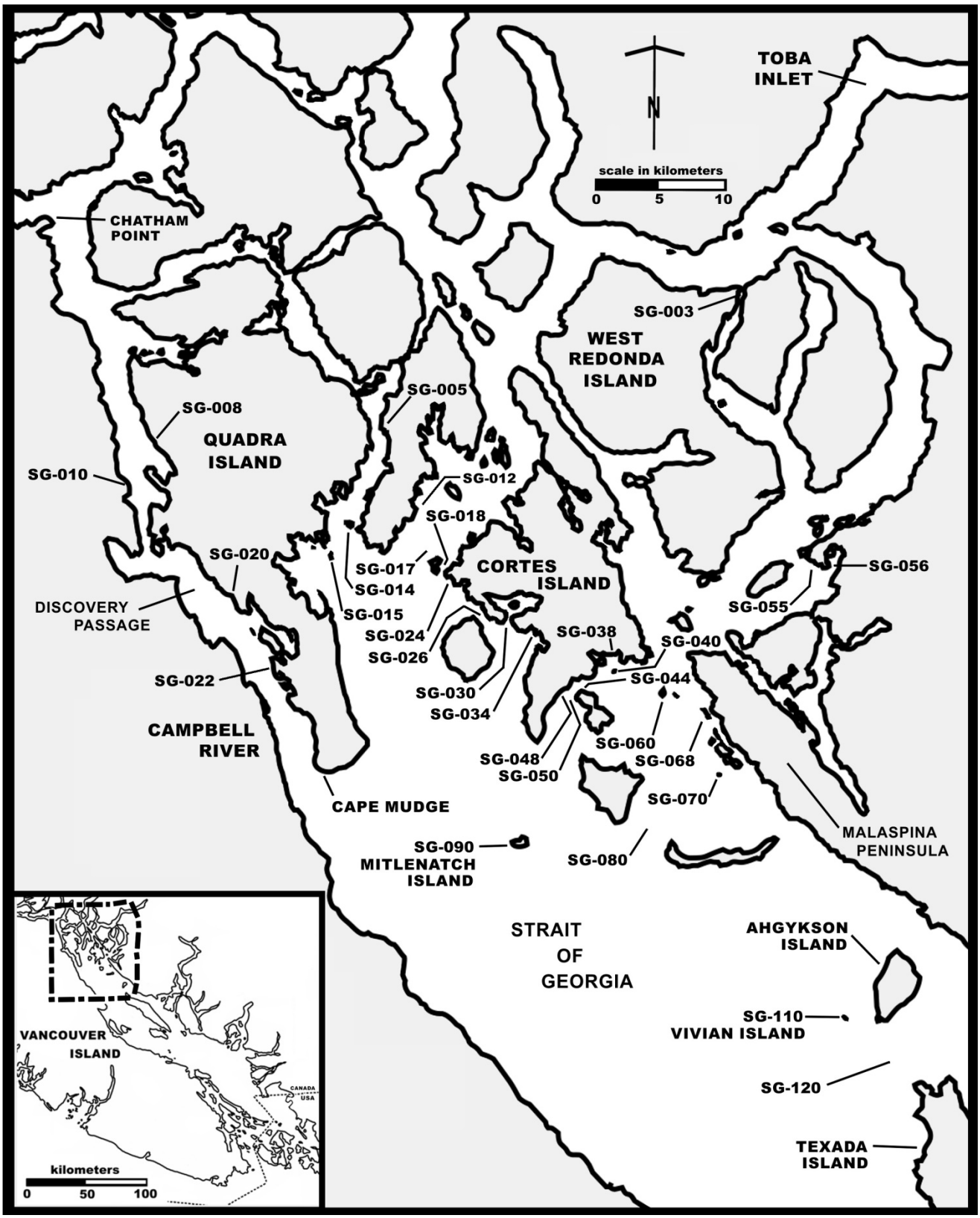


Figure 151. Locations of seabird colonies in the northern Strait of Georgia - northern section (colonies SG-003 to SG-090 and SG-110 to SG-120).

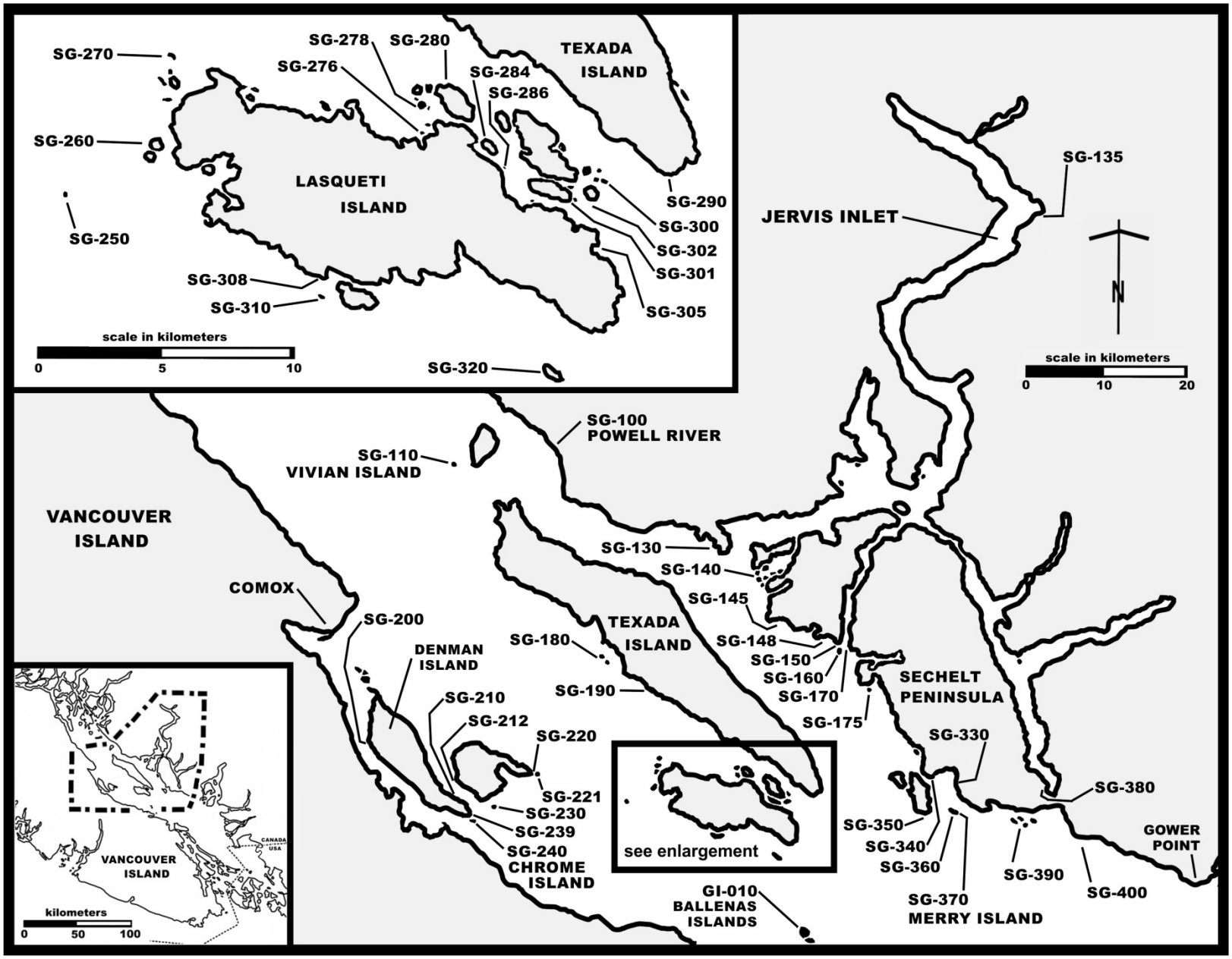


Figure 152. Locations of seabird colonies in the northern Strait of Georgia – middle section (colonies SG-100 to SG-400).

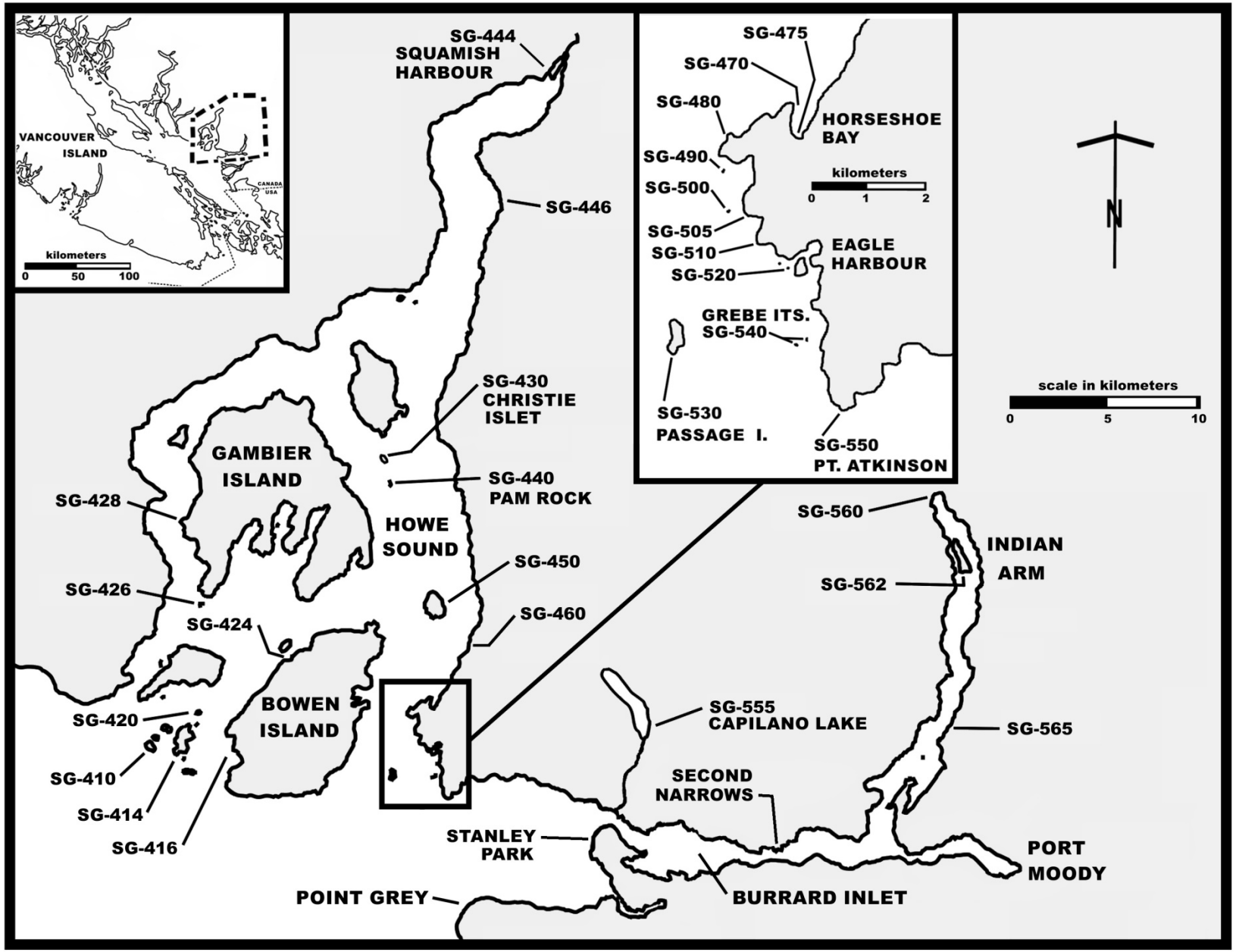


Figure 153. Locations of seabird colonies in the northern Strait of Georgia – Howe Sound area (colonies SG-410 to SG-565).

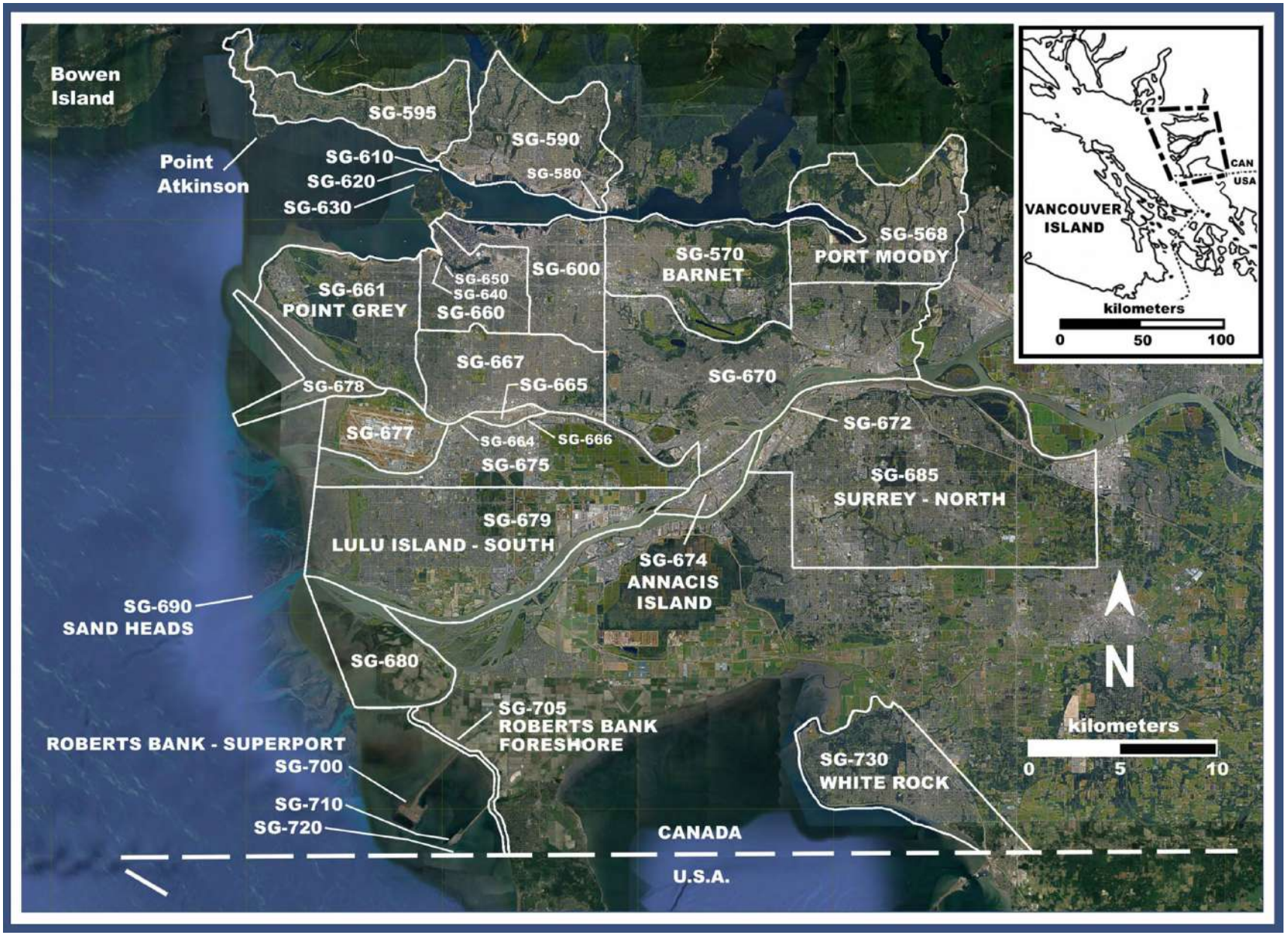


Figure 154. Locations of seabird colonies in the northern Strait of Georgia - Greater Vancouver area (colonies SG-568 to SG-730). Base map image from Google Earth.

SG-003 GORGES ISLANDS

Location: *50°16'02"N 124°47'55"W; 92 K/7.*
West side of West Redonda Island, at the north end of Waddington Channel.

Description: *2.6 ha; 14 m high; Forested; Bare rock.*
Gorges Islands are composed of two larger, partially forested islands with rocky shorelines, and three smaller, tidally-connected rocks that are mostly bare. Bluff Point is at the west end of the largest island. The islands lie within the protected area adjacent to Walsh Cove Provincial Park, established in 1989.

Historical summary: Frequent eBird contributors Nancy and Camille Bock reported two Black Oystercatcher nests with eggs at this location in 2019 (Table SG-003). Four Glaucous-winged Gulls and a Pigeon Guillemot (Figure 155) were also recorded. We have no other records for this site.

Figure 155. One Pigeon Guillemot was seen around Gorges Island in 2019, but no evidence of nesting was reported. *Photo by Marlene Graham.*

Table SG-003. Seabird nesting records for Gorges Islands. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
30 May 2019	2[2]	(1)	524

Remarks: Four Bald Eagles were reported in the area in 2019.

SG-005 SHEER POINT

Location: *50°11'56"N 125°07'45"W; 92 K/3.*
West side of Read Island in Hoskyn Channel.

Description: *Cliffs.*

Historical summary: Pigeon Guillemots were first reported breeding here in 2013 by Ed Jordan from Quadra Island (Table SG-005). Adults were flying up to the crevices where nests were located. They were reported at this nesting site in most years since.

Table SG-005. Seabird nesting records for Sheer Point. See Appendix 2 for codes.

DATE	PIGU	SOURCE
21 May 2013	x(122)	524
5 Jun 2014	x(150)	524
6 Apr 2015	(10)	524
1 Jun 2016	S(65)	524
19 Jul 2017	S(75)	524
28 Apr 2019	S(80)	524
16 May 2021	S(100)	524
11 Aug 2022	(60)	524

SG-008 "DEEPWATER" BLUFFS

Location: *50°11'34"N 125°20'33"W; 92 K/3.*
Quadra Island shore north of Deepwater Bay at the north end of Seymour Narrows.

Description: *Cliffs.*

Historical summary: Several Pigeon Guillemots (Figure 156) were seen standing on a rocky ledge at the base of these cliffs on 20 June 2009 (Table SG-008). Later that season, on 28 July, one adult carrying fish was seen flying into a crevice located about 5-6 m high on the cliff face.

Table SG-008. Seabird nesting records for "Deepwater" Bluffs. See Appendix 2 for codes.

DATE	PIGU	SOURCE
20 Jun, 28 Jul 2009	x(6)[a]	45

[a] The record noted "several" birds; we tabulated it as "six."

Figure 156. Pigeon Guillemots have been detected nesting at several new sites in the northern Strait of Georgia in recent years. They were first confirmed nesting at "Deepwater" Bluffs in 2009. *Photo by Paula Courteau.*

SG-010 "BROWN" BLUFFS

Location: *50°10'13"N 125°22'13"W; 92 K/3.*
Vancouver Island shore north of Brown Bay at the north end of Seymour Narrows.

Description: *Cliffs.*

Historical summary: Howard Telosky observed Pigeon Guillemots carrying food into nest sites in 1972 and 1975 (Table SG-010). Nests were located in crevices 6-9 m above the water on a sheer rock face. In 2009, one adult was seen entering and leaving a crevice on the sheer cliff and about 7-10 birds were present on the water below. Observers noted that guillemots had been seen in that area in years before.

Table SG-010. Seabird nesting records for "Brown" Bluffs. See Appendix 2 for codes.

DATE	PIGU	SOURCE
5 Aug 1972	1(1)	523
2 Aug 1975	1(2)	523
20 Jun 2009	x(10)	45

SG-012 "STEAMER" ISLAND

Location: *50°09'30"N 125°05'41"W; 92 K/3.*
In Burdwood Bay on the east side of Read Island, south of Evans Bay, west of Hill Island. Steamer Island is the local name for the island.

Description: *Forested.*

The island is mostly forested, with a rocky shoreline and a bare rocky point at the south end. Steamboats used to dock on the island at a time over a century ago when there was a hotel and store in Burdwood Bay.

Historical summary: Victoria birder and Camosun College professor Daniel Dönnecke reported one pair of Black Oystercatchers nesting on the southern rocky point in 2022 (Table SG-012). Nest contents were not checked but one of the two adults present was observed in incubating posture for several days running (Figure 157). In 2021, Dönnecke observed intense territorial displays by oystercatchers against Bald Eagles at this site and it is likely that the oystercatchers were nesting then as well. Breeding was confirmed in 2023 when Dönnecke observed two large, but still flightless young being fed by two parents on 17 July.[524]

Figure 157. An adult Black Oystercatcher sitting tightly on a nest for extended periods is almost certainly incubating eggs. However, we require direct observation of eggs or chicks to confirm a breeding record. *Photo by R. Wayne Campbell.*

Table SG-012. Seabird nesting records for "Steamer" Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
7 Jul 2022	1S	465, 524
17 Jul 2023	1	524

Remarks: A pair of Bald Eagles was nesting on the island in 2022 and eagles were frequently seen in the area in 2021.

SG-014 HOSKYN ROCK

Location: *50°08'20"N 125°09'33"W; 92 K/3.*
Between Quadra and Read islands, at the south end of Hoskyn Channel, south of Dunsterville Islet.

Description: *0.3 ha; 5 m high; Bare rock.*

Historical summary: We suspect this rock was inspected by BCPM crews on 2 July 1974 and 3 June 1978 and no birds were seen but we have no definite records. Ed Jordan from Quadra Island has viewed the rock many times from the water and has regularly seen Black Oystercatchers and Glaucous-winged Gulls on the rock since 2012. He has confirmed nesting by gulls since 2012 (Table SG-014). Juvenile gulls of many age classes were seen in August 2012. In 2013, a total of 160 gulls, with many apparently paired up on territories, were seen on 21 May, about 50 newly-hatched chicks (Figure 158) were seen on 31 July, and one late-hatched chick was noted on 5 September. In 2014, Jordan counted 66 adults on 24 March and 175 on 10 June; he noted that gulls appeared to be on territories in March and at least half were on nests in June. Young were recorded by the end of June and many young were seen in late August. Many gull counts were conducted during the summers of 2015-2021 (except 2017); most frequent tallies ranged from 100-150 birds, with a maximum of 200 gulls recorded on 7 June 2015 (including immature and roosting birds as well as adults on territories). Jordan recorded 100 gulls on 22 May 2021 and in 2022. In 2016, first chicks were recorded on 5 July. In 2022, Jordan saw many birds sitting on nests but no sign of chicks on 17 July.

Figure 158. Observations on Hoskyn Rock suggest that the timing of breeding for Glaucous-winged Gulls is later for birds nesting at the northern end of the Strait of Georgia than for those nesting at more southern colonies in the BC Salish Sea. At southern colonies, most chicks are hatching by late June; on Hoskyn Rock in 2013, many newly-hatched chicks were recorded at the end of July. *Photo by R. Wayne Campbell.*

We did not estimate numbers of gulls nesting between 2012 and 2020 or in 2022 because counts from those years did not distinguish numbers of birds on territories from roosting birds. In July 2021, Ed Jordan circumnavigated the rock to specifically look for nests. He estimated about two dozen nests in total. Sabina Mense from Cortes Island has also regularly observed gulls nesting on this rock. In June 2021, she sailed past the east side of the rock and saw 12 nests; she estimated similar numbers of nests on the west side plus more nests on the top of the rock. This would give a total estimate similar to that by Jordan in July.

Oystercatchers were frequently seen over the years 2012-2020; specific records of one pair suspected nesting were made in 2014 and 2016. Two or three oystercatchers were recorded in May 2020, but none were seen by Jordan when he circumnavigated the rock in July 2021.

Table SG-014. Seabird nesting records for Hoskyn Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
2012-2020[a]		x	524
7 Jul 2014	1eS	x	524
9 Jun 2016	1eS	x	524
Jun 2021		12+	486
6 Jul 2021		24e	477
17 Jul 2022		x	524

[a] Except 2017.

SG-015 BRETON ISLANDS

Location: *50°07'44"N 125°10'37"W* (eastern rock)*; 92 K/3.*
South entrance to Hoskyn Channel, east of Hyacinthe Point on Quadra Island.

Description: *6.4 ha; 59 m high; Forested; Grassy rock.*
The main Breton Island is forested. Most of the shoreline is rocky, with a small beach on the west side and piles of accumulated driftwood along the south and east sides. There are three small rocks off the north side of the main island. The larger, 8 m-high eastern rock is mostly bare, with small bits of vegetation.

Historical summary: Ed Jordan suspected one pair of Black Oystercatchers was nesting on the eastern rock in 2021 (Table SG-015). We have no other records for this site.

Table SG-015. Seabird nesting records for Breton Islands. See Appendix 2 for codes.

DATE	BLOY	SOURCE
6 Jul 2021	1eS	477

SG-017 CENTRE ISLET

Location: *50°07'30"N 125°05'28"W; 92 K/3.*
Northwest of Subtle Islands, off the west side of Cortes Island, north of Whaletown Bay.

Description: *0.5 ha; 8 m high; Grassy rock.*

Historical summary: We suspect this rock was inspected by BCPM crews on 2 July 1974 and 3 June 1978 and no birds were seen but we have no definite records. Christian Gronau from Cortes Island has been boating by this islet for decades and reported an average of three pairs of Black Oystercatcher nesting in the years 1985-2010 and 2016-2021 (Table SG-017). Sabina Mense also reported annual nesting since about 2003. Ed Jordan from Quadra Island observed oystercatcher chicks on the islet in 2014: three young and nine adults were seen on 30 June, and two young and four adults were seen on 7 July. A pair with two large young was photographed by Daniel Dönnecke in 2018. In 2021, Gronau noted numerous active and old scrapes, Jordan counted at least eight adults that he suspected were nesting on 12 July, and Gillian and Gary Fast thought that there could have been as many as 15 pairs nesting, based on the number of adults seen flying back to the islet with food on 17 July. Adults appeared to be feeding on the southwest side of nearby Subtle Islands. In 2022, Jordan reported at least six young with adults and a total of 20 birds. He also noted 20 oystercatchers present on 4 August 2023; some were nesting. We considered four pairs estimated nesting in 2021 as the best current estimate for the breeding population.

Glaucous-winged Gulls likely nested on the islet in 2018; four adults and one fledged juvenile were seen by Dönnecke in August. The juvenile most likely fledged on Centre Islet but could have been raised elsewhere. In 2021, Ed Jordan saw at least four gulls on nests on 12 July and Gillian and Gary Fast estimated 25-35 pairs nesting on 17 July. On 17 July, there were also about 75-100 non-breeding adults and immatures roosting on low rocks on the south side. In 2022, Jordan reported 120 gulls on the islet including at least 20 young on 21 July, and in 2023, he noted at least 150 birds with young on the islet on 4 August (Figure 159).[110]. We have used the 2021 estimate of about 30 pairs as the current estimate for the breeding population of gulls on the islet.

In 2023, Centre Islet was confirmed as a new nesting site for Caspian Terns in BC and the only current nesting site on the BC coast. Unfortunately, nesting attempts may have been unsuccessful. Both Gary Fast and Ed Jordan reported nesting in 2023. Fast noted that, "over the past three years the number of Caspian Terns visiting Centre Islet has greatly increased. This year [2023] there were eggs laid but no chicks were seen (Figure 160). It seems that by the time eggs are laid the gulls have hatched their young and both the eggs and, I assume, the chicks are taken by the adult gulls or the young gulls. It was rather sad to see." Jordan boated by the islet on 4 August 2023 and saw a large group of Caspian Terns; some appeared to be sitting on nests and one was seen feeding another bird that may have been a fledged juvenile. Jordan counted 56 Caspian Terns on 5 August and took several photos on 6 August. Other observers also reported Caspian Terns on the islet. Christian Gronau photographed eight adults roosting in the intertidal zone on the islet on 30 May

Table SG-017. Seabird nesting records for Centre Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	CATE	PIGU	SOURCE
1985-2010	3e				473
2003-2021	x				486
30 Jun 2014	2e				524
7 Jul 2014	2e				524
2016-2021	3e				473
6 Aug 2018	1	1S			524
12 Jul 2021	4eS	4eS+			477
17 Jul 2021	many	30eS		S(2)	467
21 Jul 2022	3e+	x			524
Jul-Aug 2023	x	x	28e	S(2)	467, 473, 477, 524

Figure 159. At least 150 Glaucous-winged Gulls, including many young were seen on Centre Islet in early August 2023. *Photos by Ed Jordan, 6 August 2023.*

Figure 160. Caspian Terns were confirmed nesting on Centre Islet in 2023. A small group was sighted roosting in intertidal areas on 30 May (this page) and nests with eggs were seen on 7 July (next page, top). Nesting appeared to be unsuccessful. Larger numbers were seen in August. Some birds in August appeared to be sitting on nests. *Photos by Christian Gronau, 30 May 2023 (this page), Gary Fast, 7 July 2023 (next page, top) and Ed Jordan, 6 August 2023.*

2023. On 27 July 2023, Brian Ross counted 89 present. The number of nesting pairs in 2023 was not determined; we used the lesser count of 56 adults on 5 August to estimate a breeding population of 28 pairs.

In 2021, 2023, and other years, Gillian and Gary Fast have seen at least one pair of Pigeon Guillemots that they suspect nest on the islet.

Remarks: In 2002, Sabina Mense posted signs to alert kayakers and other boaters about nesting oystercatchers on the islets.

SG-018 "PLUNGER" ROCK

Location: *50°07'10"N 125°04'09"W; 92 K/3.*
East of Subtle Islands in Plunger Passage, off the west side of Cortes Island, north of Whaletown Bay.

Description: *0.2 ha; 3 m high; Bare rock.*

Historical summary: Sabina Mense from Cortes Island reported annual nesting by Black Oystercatchers since about 2003 (Table SG-018). We have no other records for this site.

Table SG-018. Seabird nesting records (nests) for "Plunger" Rock.

DATE	BLOY	SOURCE
2003-2021	1	486

Remarks: In 2002, Mense posted signs to alert kayakers and other boaters about nesting oystercatchers on the islets.

SG-020 COPPER CLIFFS

Location: *50°05'58"N 125°16'16"W; 92 K/3.*
West side of Quadra Island, north of Gowlland Harbour.

Description: *Cliffs* (Figure 161).

Figure 161. Pelagic Cormorants were reported nesting on Copper Cliffs in 1959 but then not seen nesting again for 60 years. Though cormorants were absent when the site was surveyed in 1976, large numbers of Pigeon Guillemots were confirmed nesting. *Photo by R. Wayne Campbell, 10 June 1976.*

Historical summary: Large numbers of Pelagic Cormorants were reported nesting in 1959 by Oswald Dean, lightkeeper at Cape Mudge on Quadra Island (Table SG-020). Drent [144] noted that confirmation of nesting was desirable for this site and we have thus considered that record an unconfirmed nesting record. We have no other records for cormorants nesting at this site until 2019. That year, Gord Smith from Calgary confirmed nesting, counted 40 birds in total, and submitted photographs to eBird [524] of adults in attendance at five nests. Fourteen adults are visible in the photos of the five nests and it is likely that there were more than five nests in total. In 2022, eBird contributor Vibeke Pedersen recorded six birds and noted some were by nests.

In 1976, four adult Glaucous-winged Gulls were seen on the cliff and 36 adults were below the cliff. Nesting was suspected but no nests were visible. No gulls were nesting in 1978 and none have been reported since, although two gulls were seen near the cliffs in 2022.

Pigeon Guillemots were gathered on the water at the base of the cliff (Figure 162) and several were seen flying into crevices in 1976. In 1978, there were guillemots but no gulls present. This colony was not listed by Emms and Morgan [158] as a previously-known nesting site for Pigeon Guillemots but we assumed that they surveyed these cliffs in 1987 and saw no guillemots (see section *Identifying and Addressing Issues with the Historical Data*). A small flock of guillemots was present in 2022.

Figure 162. Pigeon Guillemots regularly gather on the water or on lower rocks around their nesting sites where they engage in courtship displays and other interactions. *Photo by Paula Courteau.*

Table SG-020. Seabird nesting records for Copper Cliffs. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
1959	S			144
10 Jun 1976	0	1+eS	x(62)	523
3 Jun 1978	0	0	S(15)	523
29 May-13 Jun 1983	0			421
8-9 Jul 1987	0		(0)[a]	158, 428
17 Jun 2019	5+			524
2 Jul 2022	S		S(8)	524

[a] See text.

SG-022 "QUATHIASKI" CLIFFS

Location: *50°03'12"N 125°13'58"W; 92 K/3.*
West side of Quadra Island, between Gowlland Harbour and Quathiaski Cove, south of April Point.

Description: *Cliffs.*

Historical summary: A new Pelagic Cormorant nesting site was reported here in 2021. Comox Valley resident Gordon Stewart viewed the site from Tyee Spit across Discovery Channel and reported about 20 cormorants occupying nests on these cliffs in early June (Table SG-022).

Table SG-022. Seabird nesting records for "Quathiaski" Cliffs. See Appendix 2 for codes.

DATE	PECO	SOURCE
8 Jun 2021	20e	524

SG-024 "WHALETOWN" ROCK

Location: *50°06'15"N 125°03'13"W; 92 K/3.*
Along the west shore of Cortes Island, just south of Whaletown Bay, north of Marina Island.

Description: *0.1 ha; Bare rock.*
This rock is connected at low tide to the main shore of Cortes Island.

Historical summary: In 2021, Gillian and Gary Fast saw a female Black Oystercatcher sitting on a nest with a male nearby on 7 July and two small chicks with the female on 21 July (Table SG-024).

Table SG-024. Seabird nesting records (nests) for "Whaletown" Rock.

DATE	BLOY	SOURCE
7, 21 Jul 2021	1	467

SG-026 "FAST" ROCK

Location: *50°05'30"N 125°02'04"W; 92 K/3.*
Along the west shore of Cortes Island, west of Gorge Harbour, east of Shark Spit on Marina Island.

Description: *0.02 ha; Bare rock.*
This small rock is tidally connected to the main shore of Cortes Island.

Historical summary: Gillian and Gary Fast reported one Black Oystercatcher nest on this rock in 2021 (Table SG-026).

Table SG-026. Seabird nesting records (nests) for "Fast" Rock.

DATE	BLOY	SOURCE
7 Jul 2021	1	467

SG-030 GUIDE ISLETS

Location: *50°04'51"N 125°01'04"W* (west islet)*; 92 K/3.*
Off the mouth of Gorge Harbour on the southwest side of Cortes Island, east of Marina Island.

Description: *0.4 ha; 10 m high; Grassy rock; Bare rock.*
The higher, western islet is grassy on top; the east islet is bare rock.

Historical summary: Christian Gronau reported up to two pairs of Black Oystercatchers nesting on these rocks in the years 1980 to 2010 (Table SG-030). Occasional nests with three young were observed in those years. At least one pair has nested in most years on the smaller east rock. In 2021, Sabina Mense also reported one pair nesting on the smaller rock every year since about 2001.

Table SG-030. Seabird nesting records (nests) for Guide Islets.

DATE	BLOY	SOURCE
1980-2010	2	473
2001-2021	1	486

Remarks: Gronau noted variable success by oystercatchers, as the site is regularly visited by Bald Eagles.

SG-034 "MANSONS" ROCK

Location: *50°04'34"N 124°59'23"W; 92 K/2.*
West of Manson Bay and Mansons Landing on the west side of Cortes Island, south of Gorge Harbour.

Description: *0.2 ha; 3 m high; Bare rock.*

Historical summary: In 2021, Sabina Mense from Cortes Island reported annual nesting by Black Oystercatchers (Figure 163) since about 2001 (Table SG-034). We have no other records for this site.

Table SG-034. Seabird nesting records (nests) for "Mansons" Rock.

DATE	BLOY	SOURCE
2001-2021	1	486

Figure 163. Many new nesting sites for Black Oystercatchers have been reported in recent years by local naturalists living on islands at the northern end of the Strait of Georgia. *Photo by R. Wayne Campbell.*

SG-038 "FRABJIOUS" ROCK

Location: *50°03'46"N 124°54'43"W; 92 K/2.*
South end of Cortes Island, east of Cortes Bay, north of Three Islets. The cove where the rock is located is locally known as Frabjious Bay.

Description: *0.2 ha; 8 m high; Grassy rock.*

Historical summary: The survey in 2006 was conducted from the water and one pair of Black Oystercatchers was reported nesting (Table SG-038). We suspect this rock was inspected by BCPM crews on 2 July 1974 and 3 June 1978 and no birds were seen but we have no records to confirm those observations. Butler and Golumbia [57] list zero nests for this site in 1987, but this rock was probably not surveyed in 1987 as only 30 islands north of the Gulf Islands were surveyed that year.[427]

Table SG-038. Seabird nesting records for "Frabjious" Rock. See Appendix 2 for codes.

DATE	BLOY	SOURCE
12-16 Jun 2006	1eS	57

SG-040 THREE ISLETS

Location: *50°03'14"N 124°54'47"W; 92 K/2.*
Southeast of Cortes Bay, off the south side of Cortes Island. Locally known as Cod Rocks.

Description: *0.9 ha; 14 m high; Grassy rock.*
These three rocky islets are separated only at high tide (Figure 164).

Figure 164. Views of Three Islets (top to bottom): the connected chain of rocks from the west; habitat on the north rock; and habitat on the highest, south rock. *Photos by R. Wayne Campbell, 9 June 1981.*

Historical summary: Foottit et al. inspected all three islets and saw no sign of nesting or roosting birds in 1970 (Table SG-040). They did note that the islets offered suitable nesting habitat for gulls and guillemots. A Black Oystercatcher nest with eggs was found on the north rock and one Glaucous-winged Gull nest with eggs was found on the south rock in both 1974 and 1981. For gulls, we have no records since 1981; Vermeer and Devito [420] may have surveyed these islets in 1986 and found no gulls nesting but they made no mention of it.

Vermeer et al. found a pair of oystercatchers nesting in 1987, and in 2021, Sabina Mense from Cortes Island reported annual nesting since about 2002. Oystercatchers were observed from the water in 2006. In 2021, an oystercatcher nest with three young was photographed (Figure 165) and four pairs were estimated nesting.

Figure 165. Black Oystercatchers have been recorded nesting on Three Islets since 1974. A nest with three young was found in 2021. *Photo by George P. Sirk, 4 June 2021.*

In 1974, four Pigeon Guillemots were present and one nest with one egg was found on the north side of the north rock. A nest found in 1980 was in a well-hidden crevice on an east-facing cliff face. In 1981, a guillemot nest was found in a crevice on the southeast side of the north islet. Christian Gronau reported guillemots nesting on the larger rock in 2020.

Table SG-040. Seabird nesting records for Three Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
3 Aug 1970	0	0	(0)	175
2 Jul 1974	1	1	2e(4)	70, 523
28 Jun 1977	1eS	1eS	1eS	523
2 Jun 1978	1	2eS		523
17 Jun 1980	1	0	1	523
19 Jun 1981	1	1	1(2)	523
8-9 Jul 1987	1		S(4)	158, 427
2002-2021	x			486
12-16 Jun 2006	2eS			57
13 Jun 2009			x	45
2020			x	473
4 Jun 2021	4e			504

Remarks: One dead Pigeon Guillemot with a minor scrape on the head was found floating on the water just off the rocks in 1980. In 2001, Sabina Mense posted signs to alert kayakers and other boaters about nesting oystercatchers on the islets.

SG-044 TWIN ISLANDS

Location: *50°02'34"N 124°56'50"W* (north islets)*; 92 K/2.*
Along the southeast side of Cortes Island, south of Cortes Bay, north of Hernando Island. Twin Islands officially include the two large islands and the small islets off the north end.[186] Also named the Ulloa Islands between 1945 and 1962. The northern islets are locally known as Little Twin.

Description: *290 ha; 157 m high; Forested; Grassy rock.*
The main two islands are mostly forested and have rocky shorelines and some beaches. They are connected by a narrow isthmus and tidal flats. Development has occurred on the south island: the Twin Islands Lodge was built in 1938 and much of the forest was logged in the late 1990s. The two northern islets have a combined area of 0.9 ha and rise to 19 m elevation. They are mostly rocky, with some grassy patches; the larger northwest islet has a sparse stand of trees.

Historical summary: One Black Oystercatcher nest with three eggs was found on the northern islets in 1978 (Table SG-044). No seabirds were seen on other visits but we have no records since 1981.

Table SG-044. Seabird nesting records (nests) for Twin Islands.

DATE	BLOY	SOURCE
2 Jul 1974	0	523
2 Jun 1978	1	523
19 Jun 1981	0	523

Remarks: There are aquaculture pens along the shore of the main northern island, just south of the northern islets. The area is popular for recreational boaters and the Twin Islands Lodge is a major tourist attraction, with visits by royalty and other celebrities.

SG-048 "SIRK" BEACH

Location: *50°02'21"N 124°58'04"W; 92 K/2.*
On the east side of the south end of Cortes Island, north of Sutil Point between the Hollyhock Retreat Centre and Hank's Beach, west of Twin Islands.

Description: *Beach; Rocky shore.*
This colony extends about 2 km along the shore of Cortes Island. Rocky outcrops alternate with pockets of sandy and gravel beaches.

Historical summary: George Sirk found a Black Oystercatcher nest with eggs along this stretch of beach in 2021 (Table SG-048). Flocks of up to 40 oystercatchers have been observed along this stretch of shoreline.[473]

Table SG-048. Seabird nesting records (nests) for "Sirk" Beach.

DATE	BLOY	SOURCE
Jun 2021	1	504

Remarks: The eggs of the oystercatcher nest found in 2021 were stepped on and crushed by a member of a tour group visiting the area.

SG-050 LITTLE ROCK

Location: *50°02'10"N 124°57'27"W; 92 K/2.*
Off the east side of the south tip of Cortes Island, between Cortes and Twin islands. Note that the location was erroneously mapped as off Read Island in Vermeer and Devito [420] but was correctly mapped as off Cortes Island in Vermeer et al.[427] Locally known as Long Tom.

Description: *0.2 ha; 4 m high; Grassy rock* (Figure 166).

Historical summary: Foottit et al. saw no seabirds in 1970 or 1973 (Table SG-050), though they noted that the habitat looked suitable. The rock was used intermittently for nesting by isolated pairs of Glaucous-winged Gulls between 1974 and 1986. A gull nest with three eggs was found in 1974 and a nest with two eggs was recorded in 1981. We have no nesting records for gulls since 1986, but Ed Jordan from Quadra Island and Keith Matthieu from Campbell River recorded one or two gulls present in June 2016, 2017, and 2019.

Black Oystercatchers were first found nesting in 1987. In 2021, Sabina Mense from Cortes Island reported annual nesting since about 2002. Two pairs were seen from the water in 2006 and Christian Gronau reported several pairs nesting since at least 2010. Adults feeding young were seen by Russ Petersen on 7 July 2019.

A pair of Arctic Terns has been seen and was likely nesting on this rock in most years between 2012 and 2019 (Figure 167). They were absent in 2020 and have not nested since. Ed Jordan from Quadra Island observed and photographed a pair with a recently fledged young on 11 July 2014 and noted that 2014 may have been the third year that they had nested. He and others also observed a pair present in 2015 and 2019. Mike Yip first photographed the pair in 2014. Bill Ophoff, the naturalist at Hollyhock Retreat Centre on Cortes Island, saw one fledged young flying with the

Figure 166. Little Rock is a long, rocky islet off the east side of Cortes Island, locally known as "Long Tom." It is the first site in coastal BC where Arctic Terns were recorded nesting. The bottom photo catches "Long Tom" bathed in a winter light. *Photos by R. Wayne Campbell, 2 July 1974 (top) and Christian Gronau, 23 January 2018.*

Figure 167. One pair of Arctic Terns likely nested on Little Rock in most years between 2012 and 2019. Here, in 2019, they are dive-bombing a pair of Glaucous-winged Gulls that may also have been nesting on the island. Black Oystercatchers also nest on the rock. *Photo by Christian Gronau, 17 June 2019.*

Table SG-050. Seabird nesting records for Little Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	ARTE	PIGU	SOURCE
3 Aug 1970	0	0		(0)	175
6 Aug 1973	0	0		(0)	175
2 Jul 1974	0	1		(0)	70, 523
28 Jun 1977	0	0		(0)	523
3 Jun 1978	0	0		(0)	523
17 Jun 1980	0	0		(2)	523
19 Jun 1981	0	1		(0)	523
Jun 1986		1			420
8-9 Jul 1987	1			(0)[a]	158, 427
2002-2021	x				486
12-16 Jun 2006	2eS				57
2010-2021	~3e				473
11 Jul 2014			1		524
2014-2019			1		446, 473, 504
19 Aug 2015			1S		524
24 Jul 2016				(2)	524
25 Jun 2017				(1)	524
10 Jun, 7 Jul 2019	1		1S	(6)	524
2020			0		473
26 Jun 2021			0		504
2022			0		504
2023			0		473, 504

[a] No record was listed [158] but we assumed the site was surveyed and no birds were seen (see section *Identifying and Addressing Issues with the Historical Data*).

parents at the end of the nesting season in 2015.[504] George Sirk searched the site after the breeding season that year and found what he was quite sure was the nest scrape. It was situated half under a boulder the size of a coffee table amongst a group of erratics. He did not find egg shell fragments amidst the scrape but did find three adult feathers that he was able to identify as Arctic Tern feathers. In 2020, Christian Gronau boated by the rock at least a dozen times over the summer and saw no sign of the terns. In 2021, one adult was seen circling the island on 26 June and a pair was present on 1 July, but birds were not seen after that. In 2022, George Sirk viewed the rock numerous times over the summer but never saw any terns. Arctic Terns were seen but did not appear to be nesting in 2023. Gronau photographed one pair on the rock on 30 May 2023 (Figure 168) and saw a pair briefly flying over the rock on 27 July 2023. Terns were absent on many other days that the rock was observed by Gronau and by Sirk in 2023.

Figure 168. One pair of Arctic Terns was again seen on Little Rock in spring 2023. *Photo by Christian Gronau, 30 May 2023.*

Pigeon Guillemots have not been confirmed breeding but have been seen around the rock in some years: a pair was rafting by the rock in 1980 but exhibited no nest defense or alarm behavior; a maximum of six were recorded on 10 June 2019.

Remarks: An incident occurred on 24 May 2017 that likely disturbed nesting birds, including the recently established Arctic Terns. Canadian Military personnel from the Comox base used the rock as a site to dispose of explosive flares. They exploded the flares in the intertidal zone on the southeast side of the rock. George Sirk heard the explosion and felt a minor shock wave from Twin Islands over a kilometre away and Christian Gronau took some photos of the event (Figure 169). Apparently, the authorities apologized, and nothing like this has happened since.

Figure 169. Little Rock was used as a disposal site for explosive flares in May 2017, an event that likely disturbed nesting birds as well as local residents of the area. The flares were exploded in the intertidal zone on the southeast side of the rock by Canadian Military personnel from the Comox base. The event has not been repeated. *Photos by Christian Gronau, 24 May 2017.*

The site receives high levels of disturbance from kayakers and other boaters. In 2002, Sabina Mense posted signs to alert boaters about oystercatchers nesting on the islets.

SG-055 RAY ROCK

Location: *50°06'39"N 124°43'22"W; 92 K/2.*
East of Mink Island, southwest of Bold Head at the mouth of Tenedos Bay.

Description: *0.3 ha; 5 m high; Grassy rock.*
Ray Rock (Figure 170) lies within Desolation Sound Marine Provincial Park established in 1973.

Figure 170. Ray Rock sits in the open waters of Desolation Sound. It is mostly bare rock with patches of grasses in cracks and crevices. *Photo by Moira J.F. Lemon, 6 August 2012.*

Historical summary: About 20 adult Glaucous-winged Gulls with many recently fledged young and dilapidated nests were reported on the rocky islet in 2009 (Table SG-055). Moira Lemon photographed adults and large young on the rock in 2012. There is also a photo on Google Earth by Jim Nieland showing a portion of the rock (Figure 171). Visible in the photo are 42 adult gulls spread over the rock and 28 large young. We estimated 21 pairs nesting from that photo but were unable to determine the date of the photo. We estimated that it was taken in 2020.

Table SG-055. Seabird nesting records for Ray Rock. See Appendix 2 for codes.

DATE	GWGU	SOURCE
15 Sep 2009	10e	45
6 Aug 2012	x	484
~2020	21e	526

Figure 171. Photo of Ray Rock posted on Google Earth showing 42 adult and 28 large young Glaucous-winged Gulls spread over the rock. Photo was likely taken in about 2020. *Photo by Jim Nieland (from Google Earth)*.

SG-056 "TENEDOS" ROCK

Location: *50°07'05"N 124°42'34"W; 92 K/2.*
On the west side of Tenedos Bay, north of Bold Head (Figure 172).

Figure 172. The imposing face of Bold Head marks the entrance to Tenedos Bay in Desolation Sound. *Photo by Moira J.F. Lemon, 5 August 2018.*

Description: *0.2 ha; 5 m high; Bare rock.*

This rock lies within Desolation Sound Marine Provincial Park established in 1973.

Historical summary: Nancy and Camille Bock reported four Black Oystercatchers and found a nest with eggs at this location in 2019 (Table SG-056). Two Glaucous-winged Gulls and a Pigeon Guillemot were also recorded.

Table SG-056. Seabird nesting records for "Tenedos" Rock. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
28 May 2019	2e	(1)	524

Remarks: A Canada Goose (*Branta canadensis*) nest with eggs was seen in 2019.

SG-060 POWELL ISLETS

Location: *50°02'30"N 124°51'11"W* (northeast rock)*; 92 K/2.*
West of Bliss Landing, off the northern end of Malaspina Peninsula.

Description: *14 ha; 38 m high; Forested; Grassy rock.*

Two of the three islets in this group are forested and have rocky shorelines. The small, 0.2 ha, 5 m-high islet off the north end of the eastern forested islet is mostly rock with some grassy patches and a few shrubs (Figure 173).

Figure 173. Many Glaucous-winged Gulls were seen on the small rocky islet of the Powell Islets in August 2018 and 2019. The eastern forested islet of the group can be seen on the left side of the picture. *Photo by Moira J.F. Lemon, 7 August 2018.*

Historical summary: Nesting has been recorded only on the northeast rock. Numbers of Glaucous-winged Gulls nesting have increased in recent years. One gull nest in 1970 held one half-grown chick, and one empty nest was found in 1978 (Table SG-060). Nests were not counted in 2011 but at least 18 chicks and 58 birds in total were seen by Pierre Geoffray from Powell River. In 2012, Geoffray noted at least 25 active nests. While sailing by, Moira Lemon counted at least 80 adult and five large young gulls on the rock in 2019. Fifty adults and juveniles were reported by eBirder Robert Van der Zalm in 2021, and Dana Gullison observed young of the year and estimated 300 Glaucous-winged Gulls present on 30 July 2023. We used the count of adults by Lemon in 2019 to estimate the current nesting population.

Four adult Black Oystercatchers were present in 1977 but observers thought only one pair was nesting. No seabirds were seen in 1981 but two pairs of oystercatchers were found nesting in 1987. Sabina Mense from Cortes Island reported annual nesting since 2002. Oystercatchers were observed from the water in 2006. A pair with large young was seen in 2011. We assumed that the 2011 observation was incidental and considered the survey data from 2006 a better indication of the numbers of oystercatchers nesting. The 2021 observation confirmed recent nesting.

Foottit et al. reported Pigeon Guillemots in the vicinity but no evidence of them nesting in 1970. Several were seen around the islet in 2011 and 2012.

Table SG-060. Seabird nesting records for Powell Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
3 Aug 1970		1		175
2 Jul 1974	1	0		523
28 Jul 1977	1	0		523
2 Jun 1978	1	1S		523
19 Jun 1981	0	0		523
8-9 Jul 1987	2			427
2002-2021	x			486
12-16 Jun 2006	2eS			57
17 Jul 2011	1	20e	(8)	524
27 May 2012		25e+	(7)	524
7 Aug 2018		x		484
10 Aug 2019		40e		484
22 Jul 2021	x	x		486, 524
30 Jul 2023		x		524

Remarks: In 2001, Sabina Mense posted signs to alert kayakers and other boaters about nesting oystercatchers on the islets.

SG-068 COPELAND ISLANDS

Location: *50°01'25"N 124°49'29"W* (northern rock)*; 92 F/15.*
North of Lund along the west side of Malaspina Peninsula. Colony includes all islands along Thulin Passage north to Turner Bay and east of Townley Islands. Locally known as the Ragged Islands.

Description: *180 ha; 87 m high; Forested; Bare rock.*
Most of this island chain is forested (Figure 174). Shorelines are rocky, with some small bare rocks off the main islands. The islands were designated a Marine Provincial Park in 1971.

Figure 174. Most of the Copeland Islands are forested. *Photo by R. Wayne Campbell, 19 June 1981.*

Historical summary: One Black Oystercatcher was present on the small rocks at the north end but no evidence of nesting was seen in 1978 (Table SG-068). Locations of the two pairs observed in 2006 were not specified. Surveys were conducted from the water in 1981 and 2006.

Pigeon Guillemots were seen feeding young in 2011 and 2-4 birds were seen and were possibly nesting in 2016-2018.

Table SG-068. Seabird nesting records for Copeland Islands. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
2 Jun 1978	0		523
19 Jun 1981	0		523
12-16 Jun 2006	2eS		57
12 Jul 2011		x	524
10 Aug 2016		(2)	524
16 Aug 2017		(4)	524
16 Aug 2018		(2)	524

Remarks: The islands are subject to considerable human disturbance. There are two designated campsites in the Copeland Islands Marine Park and the area is a popular kayaking and boating destination.

SG-070 MAJOR ISLET

Location: *49°59'22"N 124°48'58"W; 92 F/15.*
Northwest of Lund and southwest of the Copeland Islands.

Description: *2.3 ha; 26 m high; Grassy rock.*
There are pockets of grasses, forbs, and shrubs, but the islet is mostly bare rock (Figure 175). There is a light beacon on the rock.

Historical summary: Prior to about 2014, only small numbers of birds nested on this islet despite adequate habitat for many more (Table SG-070). There has been a major increase in Glaucous-winged Gull and Pigeon Guillemot numbers in recent years. A maximum of three pairs of gulls were found nesting in 1974, otherwise, up to 1981, only single pairs had been recorded. One empty gull nest was found in 1970. No nest was found in 1973 but two fledgling gulls were present on the water. In 1974, three nests with eggs were found on the south end of the islet. Two pairs of gulls were present but no nests could be found in 1977, one empty nest was attended by a pair of gulls in 1978, and the single gull nest held one egg in 1980. In 1981, six adults were present but only one nest with two eggs could be found. It was located on the high point of the rock. No gulls appeared to be nesting in 2006, but in 2014 Pierre Geoffray counted 242 gulls present, including 22 juveniles on 29 July. On 23 July 2016, Janice Bragg counted 90 adults and 10 juveniles from the water. Several counts of gulls were made in 2021: a maximum of 240 on 23 May; and 50-80, including large young, on 18-24 July. In 2022, ornithologist Ken Wright from Lillooet, BC estimated 75 gulls present on 9 April, and Nanaimo birder Dana Gullison reported 145 gulls, including young, on 8 July and a total of 220 gulls on 23 August. Gullison also observed young of the year and counted 369 gulls present on 30 July 2023. As we had no recent nest counts, we used the numbers of adults present during the main breeding season to estimate the current nesting population. We suspect that large numbers of gulls counted later in the season in recent years have included non-breeding birds; we thus used the count by Gullison on 8 July 2022 to derive a current estimate.

Figure 175. Major Islet has smooth granitic shores. Large numbers of Glaucous-winged Gulls have been reported on the islet in recent years but few are visible in this photo taken in August 2018 (top left). Many horizontal cracks in the shore cliffs (top and bottom right) provide attractive nesting habitat for Pigeon Guillemots, which have also been seen in greater numbers in recent years. There are pockets of grasses and shrubs on the island. Here (bottom left), a dwarf saskatoon berry shrub puts on an early displays of fall colours. *Photos by Moira J.F. Lemon, 8 August 2018 (top left) and R. Wayne Campbell, 19 June 1981 and 2 July 1974 (bottom two).*

Only single pairs of Black Oystercatchers have been found nesting except in 2006 when two pairs seen from the water were suspected nesting. No nest was found but a pair of excited adults and two young hiding in the rocks were seen at the north end of the islet in 1974, one empty oystercatcher nest was found but no oystercatchers were present in 1977, and one pair of quiet and not defensive oystercatchers was encountered near two empty scrapes in 1978. The oystercatcher nest in 1981 held three eggs and was located on the east side of the islet (Figure 176). In 2011, a pair with three large young was seen in July and a total of 17 oystercatchers were present on 15 July. In 2022, Gullison observed adults with young and reported 12 oystercatchers present on 8 July. We assumed that the 2011 and 2022 observations of adults with young were incidental and considered the survey data from 2006 a better indication of the numbers of oystercatchers nesting. The 2022 observation confirmed recent nesting.

Small numbers of Pigeon Guillemots have been seen on most visits; more have been seen recently. A nest with two eggs was found in a horizontal crevice in the rock in 1981. Birds at nests were reported by Pierre Geoffray on 7 July 2011 and by young ornithologist Joshua Brown on 18 July 2021.

Figure 176. One Black Oystercatcher nest with three eggs was found on Major Islet in 1981. *Photo by R. Wayne Campbell, 19 June 1981.*

Remarks: One adult Bald Eagle was perched on top of the islet in 1981.

Table SG-070. Seabird nesting records for Major Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
3 Aug 1970		1S	S(few)	175
17 Aug 1973		1	S(few)	175
2 Jul 1974	1	3[3]	(0)[a]	70, 523
28 Jun 1977	0	0	S(6)	523
31 May 1978	1S	1S	(0)	523
17 Jun 1980	0	1	S(2)	523
19 Jun 1981	1	1	1(2)	523
8-9 Jul 1987	1		S(9)	158, 427
12-16 Jun 2006	2eS	0		30, 57, 456
7-15 Jul 2011	1		x(15)	524
27 May 2012			(17)	524
29 Jul 2014		110e	(2)	524
14 May 2016			(20)	524
23 Jul 2016		45e		524
16 Aug 2017			(30)	524
2 Apr 2018			(22)	524
8 Aug 2018		S		484
May-Jul 2021		120e	x(48)	524
8 Jul 2022	x	70e	S(47)	524
30 Jul 2023		x	(9)	524

[a] Campbell [70] reported two pairs of Pigeon Guillemots in 1974 but no birds were seen that year.

SG-080 KEEFER ROCK

Location: *49°58'05"N 124°52'38"W; 92 F/15.*
Off the east side of Hernando Island, north of Manson Passage.

Description: *0.1 ha; 3 m high; Bare rock.*
Keefer Rock is composed of one main rock and a series of smaller pinnacles (Figure 177).

Historical summary: Glaucous-winged Gull nests were found on the main rock in 1970 and 1973 and likely in other years as well (Table SG-080). Most gull nests were empty on 1 August 1970; one nest held two young about 2-3 days old. Michael and Teresa Shepard found mostly empty gull nests in early June 1978 but noted that egg-laying had just begun. Numbers of nesting gulls increased over the 1970s (Figure 178) and declined sometime after 1986. None were seen in 2006.

Rob and Sharon Butler confirmed Black Oystercatchers nesting in 1973. The oystercatcher nest found in 1981 was located at the south tip of the rock away from nesting gulls (Figure 179).

One Pelagic Cormorant egg was found in a gull nest in 1981 (Figure 180), but there was no other evidence of cormorants nesting; 73 Pelagic, 27 Brandt's, and six Double-crested cormorants were roosting on the rock.

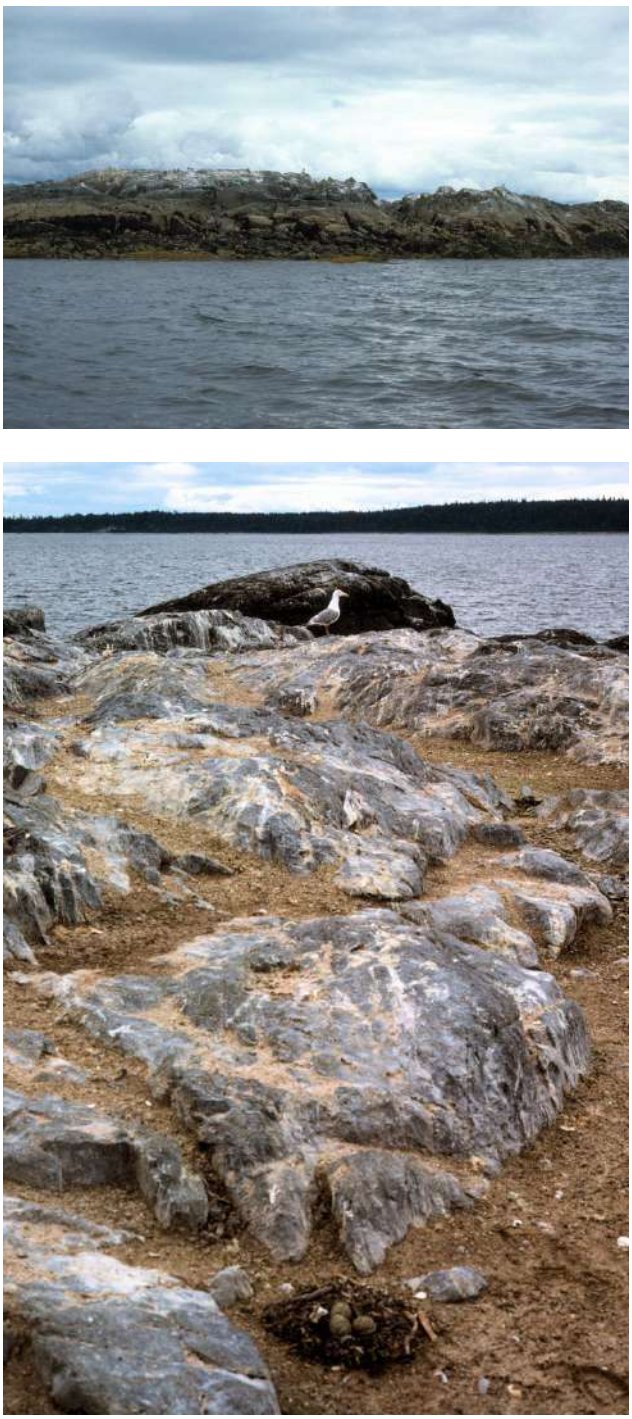


Figure 177. Rocky habitat on Keefer Rock provides suitable nesting habitat for Glaucous-winged Gulls and Black Oystercatchers. A gull nest with three eggs is visible at the bottom of the bottom photo. *Photos by R. Wayne Campbell, 19 June 1981.*

Figure 178. Numbers of Glaucous-winged Gulls nesting on Keefer Rock reached a maximum of 28 nests in 1981. Without much vegetation on the rock, gulls had built their nests mostly of seaweeds. *Photo by R. Wayne Campbell, 19 June 1981.*

Figure 179. A pair of Black Oystercatchers nesting on Keefer Rock in 1981 had placed their nest away from where Glaucous-winged Gulls were nesting. *Photo by R. Wayne Campbell, 19 June 1981.*

Figure 180. One Glaucous-winged Gull nest found on Keefer Rock in 1981 had an intact Pelagic Cormorant egg at the side of the nest. No other signs of cormorants nesting at this site were seen. *Photo by R. Wayne Campbell, 19 June 1981.*

Table SG-080. Seabird nesting records for Keefer Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
1 Aug 1970		7[1]	175
9 Jul 1973	1	7[7]	175, 523
30 Jun 1977	1S	20[20]	523
2 Jun 1978	1	14[1]	523
17 Jun 1980	1	19[18]	523
19 Jun 1981	1	28[26]	523
Jun 1986		28	420
12-16 Jun 2006		0	30, 456

Remarks: Mostly empty gull nests and the two small chicks found in August 1970 suggest that eggs had been lost earlier in the season. The one empty gull nest in 1980 had been depredated.

SG-090 MITLENATCH ISLAND

Location: *49°57'00"N 125°00'15"W; 92 F/14.*
In the middle of the northern end of the Strait of Georgia, southwest of Hernando Island, 12.5 km east of Shelter Point on Vancouver Island.

Description: *36 ha; 53 m high; Grassy rock; Cliffs.*
Mitlenatch Island has been described by several authors.[51, 78, 370, 404, 541] Igneous bedrock forms three main hills, colloquially called West Hill, East Hill, and F Island (Figure 181). West Hill forms the larger portion of the island, East Hill lies northeast of West Hill across a grassy isthmus (Notch Meadow), and F Island is a smaller rocky knob off the east end of West Hill, connected by a boulder ridge and gently sloping beach. There are beaches on either side of the isthmus, and the area between East Hill and F Island forms a protected bay (Camp Bay) with an extensive tidal flat. The igneous rock is

Figure 181. Mitlenatch Island is the most important seabird colony in the northern Strait of Georgia. It is mostly bare rock, with large and small pockets of grasses, forbs, shrubs, and trees, and is composed of three main sections, locally known as West Hill, East Hill, and F Island. Photos from 1968 (this page, top two) and from 2005-2009 (this page, bottom two) reveal major changes in vegetation cover, with marked increases in tree and shrub cover over time: **1)** top left photo shows an aerial view from 1968, with West Hill, the largest section of the island on the left, connected to East Hill to the right by the grassy isthmus known as Notch Meadow, and F Island in the middle foreground; **2)** top right is an aerial view from 1970 showing East Hill in the foreground, connected across Notch Meadow with the east side of West Hill, and with F Island in the top left; **3)** bottom left is an aerial view from 2009, with West Hill in the foreground, connected to East Hill to the left across Notch Meadow, and, at low tide, to F Island, visible on the top right of the photo; and **4)** is an aerial view from 2009 showing the east side of West Hill (left) and East Hill (right) connected by Notch Meadow, with the extensive, tidally-flooded flats of Camp Bay between (the naturalist's cabin is visible between the two pocket bays at the head of Camp Bay). Next page photos (top to bottom) show: **5)** Camp Bay at low tide, with F Island on the right; **6)** view of West Hill from Notch Meadow; and **7)** vegetated areas on East Hill, including a small stand of red alder, a few cascara (*Rhamnus purshiana*), and some domestic apple (*Malus domestica*) trees, with F Island in the background. *Photos by R. Wayne Campbell, July 1968 (1) and 18 June 1970 (2), Marlene Graham, 18 July 2009 (1, 2, 3) and 15 August 2007 (4), and Peggy Sowden, 6 July 2005 (5, 6).*

cut by many fissures and is generally steep sided with more vertical cliffs on the west end and south side of West Hill. Some fissures are more than 15 m deep. Large granitic glacial erratics lie scattered over the island. A small bay at the east end of East Hill has been named Harlequin Bay, and a bay at the east end of West Hill is known as Echo Bay.

Most of the area of the island is bare rock but thick growths of shrubs, grasses, and forbs grow in cracks and hollows and on Notch Meadow between West and East hills. Prickly-pear cactus (*Opuntia fragilis*; Figure 182) is common in exposed areas. In 1963, van Tets [404] described two small clumps of lodgepole pine (*Pinus contorta*) in Notch Meadow and a lone Douglas-fir growing in the cliff-sided gully on the west end of West Hill. Campbell and Kennedy [78] and Stirling [370] noted that these were the only tree species on the island in 1965. Pearse [304] noted a major fire in 1956 and David Stirling [510] in 1959 also noted a recent fire on the island that had killed some of the lodgepole pines. There were a few groves of small trembling aspen (*Populus tremuloides*) and bitter cherry (*Prunus emarginata*) growing in sheltered spots in 1966 (Figure 183).[80] By 1973, Butler [51] described a fairly extensive deciduous forest of trembling aspen, willow (*Salix* spp.), and bitter cherry, suggesting substantial changes in vegetation communities over the previous decade. Other tree species such as arbutus and red alder (*Alnus rubra*) were also present. Vegetation changes may be related to changes in the fire regime on the island. The large stand of aspen that currently grows on the upland area of West Hill (Figure 184) is more typical of interior landscapes in BC and is unusual for these coastal regions. Presently, the

Figure 182. Prickly-pear cactus is abundant in open areas on Mitlenatch Island. Small Glaucous-winged Gulls chicks frequently become snared on the cactus. *Photo by Paula Courteau, 15 June 2018.*

Figure 183. Some groves of small trembling aspen and bitter cherry were growing in sheltered spots on Mitlenatch Island in 1966. *Photo by R. Wayne Campbell, August 1966.*

pines are expanding in Notch Meadow (Figure 185), and the invasive Himalayan blackberry (*Rubus armeniacus*) has become well established on West Hill (Figure 186).

Historically, a fish packing plant was reportedly located on east side of the island.[404] Pacific Oysters (*Crassostrea gigas*) were introduced in the late 1950s and today cover an area of about 1,000 m^2 of a mud-gravel and sand-gravel substrate in the protected east bay (Camp Bay). Today they are greatly depleted from what they were in the 1960s and early 1970s.[456] The island was pre-empted by the Manson family of Cortes Island, who lived on the island for a year in 1892 in order to obtain title. They raised cattle until about 1910 and sheep grazed on the island until the 1950s.[404] The Manson's reported that the vegetation increased spectacularly after the sheep were removed.[510] Military plans to use the island as a bombing site and gunnery range were fortunately thwarted.[304] With the intent to use it for that purpose, the Canadian government offered the Manson's $2,000 for the island in 1949-1950 but their offer was not accepted. It was bought for $5,000 by the province in 1959 and designated as the Mitlenatch Island Nature Provincial Park in 1961. The Manson's had a small cabin on Notch Meadow and were still living there in 1898,[543] but it was destroyed by fires and no trace of it remains.[404] A small cabin nestled into the rocks on the east side was built by early naturalists, and an improved version still houses wardens and researchers when they stay on the island (Figure 187).

Historical summary: Mitlenatch Island has attracted ornithologists for well over 100 years. Dawson collected Glaucous-winged Gull eggs in 1896, and Semple and Sutton collected gull eggs in 1934 (Table SG-090). Most early information comes from Theed Pearse who made frequent observations and banded large numbers of nestling Glaucous-winged Gulls during several decades after he first visited the island in 1920. Pearse kept detailed notes and published many of his observations, providing a reliable baseline from which to interpret changes over the last century. Changes in cormorant and gull numbers have been especially dramatic.

Figure 184. The small pockets of short trembling aspen growing on Mitlenatch Island in the 1960s have since expanded and there is now a large stand of aspen on West Hill (top and bottom). Trembling aspen is an abundant species in the BC interior but is uncommon on the BC coast. *Photos by Connie Miller-Retzer, 19 June 2022.*

Much subsequent historical data come from BC Parks staff, and later volunteers, that visited the island after it was acquired by the province and were stationed on the island as seasonal naturalists after it was designated as a nature park. Brief visits were made by David Stirling in 1959 and with Yorke Edwards in 1960 and C.D. Fowle in 1961. Bill Merilees and Raymond Barnes also made a brief

visit in 1960. A sequence of naturalists spent summers on the island starting in 1963: Gerard van Tets in 1963; Wayne Campbell and Bill Merilees in 1964; Wayne Campbell and Ken Kennedy in 1965 and 1966; Ken Kennedy and Robert Foottit in 1967; Robert Foottit in 1968; Robert Foottit and George Sirk in 1969; Robert Foottit and Rob Butler in 1970; George and Lauren Sirk in 1971; G. and J. Erasmus in 1972; Rob and Sharon Butler in 1973; Michael and Teresa Shepard in 1974; Rob and Sharon Butler again in 1976; Rob Butler and John Kirbyson in 1977; Jerry McFetridge and John Kirbyson in 1978; David Thomson in 1980-1981; and Alison Watt in 1982 (Figure 188). Between 1989 and 2009, paid naturalists were replaced with volunteers. Over the years, volunteers have included many exceptional wildlife observers such as Betty Brooks and Bill Merilees (Figure 189) among many others.

Figure 185. Notch Meadow on Mitlenatch Island showing the extent of lodgepole pine trees, saskatoon berry (*Amelanchier alnifolia*), invasive Himalayan blackberry, and other shrubs in 2022. This was an open, grassy meadow in the 1960s (see Figure 181). *Photos by Connie Miller-Retzer, 19 June 2022.*

Figure 186. Himalayan blackberry has become well established on West Hill on Mitlenatch Island, forming an impenetrable swath in one of the wide ravines on the west end of West Hill (top) and spreading through smaller ravines between rocky areas (across bottom of middle photo and on the right side of bottom photo). *Photos by Tony Rybar, 20 June 2022.*

In 2009, BC Parks was prepared to close the volunteer program. Volunteers arranged to cover that summer and in 2010 an agreement was signed with BC Parks and Peggy Sowden (on behalf of the volunteers) with the assurance that they would carry on the program at almost no cost to parks. This volunteer group, the Mitlenatch Island Stewardship Team (MIST), took over transport of the volunteers and all infrastructure improvements, including all new signs, new bird blind, and a new roof and wall replacement on the cabin. MIST continues to station wardens and observers on the island, recently from

Figure 187. The naturalist's cabin on Mitlenatch Island is nestled into the shore rocks at the head of Camp Bay on the east side of the island. Photos here (top to bottom) show the cabin seen from the shore of Camp Bay in 2007, in the evening light in 2009, and getting a new roof, thanks to David Thomson and other MIST volunteers, in 2013. *Photos by Marlene Graham, 16 August 2007 and 24 July 2009 and Peggy Sowden, 17 May 2013.*

early April to mid-September, to help protect nesting seabirds and the rest of the sensitive island ecosystem (Figure 190). They manage and guide tourists that visit the island, conduct regular surveys to monitor seabird nesting populations, and collect a variety of other data on an annual basis. MIST volunteers keep journal records on a range of natural history observations. Journals are held by the lead of the MIST program, currently Susan Rybar who took over from Jan Obrien in January 2022.

In 2010, Trudy Chatwin, Mikaela Davis, Tella Osler, Peggy Sowden, and David Thomson assisted in the Glaucous-winged Gull nest count conducted by Louise Blight as part of her Ph.D. thesis.[30] At that time, MIST began a monitoring program that involved repeating gull nest counts every five years. In 2015, the count was completed by Trudy Chatwin, David Thomson, Peggy Sowden, Heidi Tonn, Rod Mitchell, and Connie Haist. The 2020 gull nest count was postponed due to the COVID-19 epidemic.

Figure 188. After Mitlenatch Island was established as a provincial nature park in 1961, BC Parks hired a series of park naturalists to monitor visitor access and run interpretive programs on the island. Naturalists generally kept detailed records of wildlife sightings and produced annual reports summarizing each season's observations and activities. Photos here show some of the naturalists and their activities during the mid-1960s: (this page) **1)** left to right, Bill Merilees, Yorke Edwards, Dave Stirling, and Allister Muir bringing in the new sign in 1964; (next page, clockwise from top left): **2)** Bill Merilees with a small Black Oystercatcher chick in 1964; **3)** Wayne Campbell (left) and Ken Kennedy sorting out the camp in 1965; **4)** the crew in the dining room in 1965; **5)** Ken Kennedy (centre) and Wayne Campbell (far left) with island visitors in 1965; **6)** building the cabin in 1966; **7)** Ken Kennedy (left) holding a gull with a broken wing and Wayne Campbell near the new cabin in 1966; and (following page, top left) **8)** Ken Kennedy, Barry Edwards, and Errol Anderson having some fun in 1966; *Photos by R. Wayne Campbell, 18 June 1964 (1), 29 June 1964 (2), July 1965 (3, 4, 5), June 1966 (6), 21 July 1966 (7), and August 1966 (8).*


PARK NATURALIST
PARKS

Figure 188 (cont'd).

Figure 189. Bill Merilees was an undergrad at UBC when he first worked on Mitlenatch Island as a summer naturalist in 1960. Half a century later, Bill still visits Mitlenatch Island as a volunteer naturalist. *Photo by Marlene Graham, 13 May 2012.*

Figure 190. The Mitlenatch Island Stewardship Team (MIST) maintains a volunteer program to station wardens and naturalists on the island. MIST volunteers conduct many activities designed to protect and monitor nesting seabirds and other sensitive components of the island ecosystem, such as erecting signs to direct tourist traffic away from seabird nesting areas. *Photo by David Thomson, 20 June 2010.*

MIST also conducts annual monitoring of nesting cormorants. Peggy Sowden was the MIST volunteer coordinator and lead for the seabird monitoring program until 2020. Susan Rybar next assumed that role and coordinated the gull survey conducted in 2022 by Erica McClaren, Susan Rybar, Tony Rybar, Kje Rybar, Rod Mitchell, Heidi Tonn, Connie Miller-Retzer, Wendy Okopski, and Avery Okopski.

Mitlenatch Island Stewardship Team - the Role of the Volunteer

Mitlenatch Island is the second largest seabird colony in the Salish Sea. The rich marine life that surrounds the island is in part due the tide meeting here from the north and south. This in turn creates ideal foraging conditions for seabirds (Figure 191) *and marine mammals.*

Mitlenatch Island volunteers have provided a protective presence since 1989. Volunteers arrive on the island in the spring coinciding with the seabirds establishing their nesting territories. The volunteers are passionate about the protective role they play and happily endure some of the challenges of living on an island with hundreds of nesting seabirds. Most volunteers find it generally takes a day or so to adjust to the almost continuous cries of the Glaucous-winged Gulls. Their shrieking intensifies whenever a predator, such as a Bald Eagle, flies over the colony; they fly up en masse to harass the predator.

When birds, including gulls, lift into the air they defecate. One morning I had the misfortune of having gull feces land in the middle of my breakfast as I was about to take my next mouthful...fortunately I paused in time.

On the flip side is of course the privilege of watching the gull chicks grow up. From the bird blind we can view their activity without disturbing them. As they get close to fledging the chicks practise for future flights by jumping into the air, vigorously flapping their wings. They look very pleased when their efforts result in a short lift off.

By late August many are flying and it is a delight to watch them in a northwest wind soar over the waves perfecting their flying skills.

The MIST (Mitlenatch Island Stewardship Team) program runs to mid-September. The volunteers play a vital role in the ongoing management of the island and its inhabitants. Their activities include annual counts of Pelagic and Double-crested cormorant nests, a complete census of Glaucous-winged Gull nests and eggs every five years, recording bird sightings on a daily basis (over 130 species recorded so far), and guiding and supervising visitors to protect nesting birds and island habitats.

(contributed by Peggy Sowden)

Figure 191. Mixing of tidal currents around Mitlenatch Island creates productive marine environments, including rich intertidal zones, which provide attractive foraging habitats for seabirds. Here (clockwise from top left), long-time MIST volunteer, Marlene Graham, photographed a Glaucous-winged Gull capturing and consuming a sea star in the intertidal zone on Mitlenatch Island. *Photos by Marlene Graham, 10 July 2010.*

Glaucous-winged Gull Trends. Pearse, who provided information on nesting gulls between 1920 and 1966, made various estimates of the gull population over the years, although he never conducted a methodical count of gull nests (Figure 192). Initially, he estimated that about 250 pairs were nesting in 1922.[301] He later revised this estimate to 500 pairs but felt that that estimate was still probably too low.[305] This is consistent with the higher estimate of 1,500 adults and 600 nests made in June 1923 by R.M. Stewart when he was stationed for 10 days as a warden on the island.[301] On his first visit in 1927, which was on 16-18 July, Pearse [302] found 150 gull nests containing eggs or chicks and estimated at least as many empty nests, giving a total estimate of about 300 nests. When he returned on 14 August, he found that many nests had never produced young. Retrospectively, Pearse [304, 305] estimated a consistent nesting population of about 1,500 birds (i.e., 750 pairs) through the years from 1922 to 1957, with variable breeding efforts from year to year.

Estimated numbers of gulls suggested increases of 400-500% in only four years after the island was bought by the province in 1959. Estimates peaked at 3,500 pairs in 1967, although estimates sometimes varied considerably within one season (1,200 pairs were estimated by David Stirling on 6-7 July 1960 and 900 pairs were estimated three weeks later by Bill Merilees). The estimate of 3,000 pairs in 1963 was arrived at by extrapolation from firstly, the number of nests found, and secondly, the number of young banded on F Island. Van Tets [404] marked all the nests on F Island for his study. From the 311 nests found there, he calculated a total of 3,321 nests for the whole island assuming a similar density of nests throughout the areas used for nesting. From the proportion of young banded in different areas, a total of 2,630 nests was calculated. The 3,000-nest estimate was a mid-point between these two extrapolations. The latter procedure was also used in 1969, when 361 nests were counted on F Island and the proportion of young banded there compared to the total number banded generated an estimate of 3,300 pairs, which Foottit [172] adjusted to 3,000 pairs based on estimates of the number of young fledged per nest. The estimate of 3,500 pairs in 1967 was made by Rob Butler,[523] but that estimate was considered high and Kennedy and Foottit,[228] who were stationed on the island at that time, actually thought that numbers may have declined from the previous year. In 1970, Foottit counted nests on F Island (345 nests), East Hill (351 nests), and the southwestern portion of West Hill (679 nests) on 25-29 June.[173] Of those nests counted, 883 held eggs or small young and 492 were empty. Total number of nests on the island was not estimated. In 1973, Butler [55] counted nests on F Island (286 nests), East Hill (319 nests), and the northwestern portion of West Hill (297 nests) on 26-30 June, and estimated a total of 3,000 nests for the island. Of the 902 nests counted in 1973, 613 held eggs or young.

Table SG-090. Seabird nesting records for Mitlenatch Island. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	RHAU	SOURCE
18 Jun 1896				x			127
1 Jul 1920		0	0	x	x		493, 523
29-30 Jul 1922		0	0	500e	x(~500)		301, 303, 304, 305, 493
Jun 1923				600e			301
25-26 Jul 1925		0	0	x	x5		302, 493
15 Jul 1927				x	x		274
16-18 Jul 1927				300e[150]			302
13 Aug 1928				400e			302
1929-1931				x			305
31 May 1934				x			532a
1938-1941				750e			305
15 Aug 1938				x			169, 345, 348
7 Aug 1939				x			346, 347, 348
1940				x	x(~500)		303, 348, 349
1941				x	(numerous)		303, 305
1943		0					303
27 July 1946		0		x			303, 305
18 Aug 1949		24		x	(few)		303, 304, 305
1955		dozens					303
5 Aug 1957		100+	0	750e	S(60+)		304
20 Jul 1959	0	135		600e	100+(200)		144, 510
10 Aug 1959			1S				510
6-7 Jul 1960		150e	1S	1,200e	175e(350)		144, 510
28 Jul 1960		155		900e	170e		144, 523
May-Aug 1963	0	359[a]	1	3,000e	250e(446)		404
Jun-Aug 1964	0	283[181][a]	2-3e	2,500e	100e(315)		64, 81
Jun-Aug 1965	0	412[a]	1	2,500-3,000e	x18(150)		78, 79, 81, 523
Jun-Aug 1966	0	504[221]	1	2,500e	x28(200-300)		80, 81
12 Jul 1967	0	500-600e	1	3,500e	1000e		228, 523
Jun-Aug 1968	0	423[a]	1	x	x15		171, 523
Jun-Aug 1969	0	457	1	3,000-3,300e	x13(406)		172
Jun-Aug 1970	0	437	1	1,375[883]+	x4(433)	S	173
Jun-Aug 1971	0	392	4e	x			357
Jun-Aug 1972		400e	2[2]	x	(numerous)		162
Jun-Aug 1973	0	357	3[3]	3,000e	200e	S	55, 523
2 Jul 1974	0	286[252]	3[3]	1,632[1,578]	200e(283)		70, 523
May-Jul 1976		x	4[4]	x	x		523
29-30 Jun 1977	0	233	5	987[811]	S(43)		523
13-14 Jun 1978	0	321	8[1]	2,558[2,326]	x(281)		523
Jul 1979		280					523
16-17 Jun 1980			7	1,999[1,998]			523
30 May-1 Jun 1981	0	249	2[1]	1,922[986]	x(361)		523
5 Aug 1981	0	243[232]					523
14 Jul 1982		600e					523
29 May-13 Jun 1983	0	318					421
Apr-Aug 1984				2,200e	200e		159, 409
Apr-Aug 1985				2,200e	200e		159, 409
Jun 1986				2,100	175-200e		158, 420
8-9 Jul 1987	0	315	2		175-200e(134)		158, 427, 428
May-Jul 1989		329					375
30 Aug 1990	0	334					43
7-9 Jun 1991			4[4]	2,830[b]			252, 524
4-5 Aug 1991		345[b]				2-3eS	252, 457
1991	0	330					114
1992	0	332					114
1993	10	311					376, 114
1994	33	337					376, 114
1995	43	338					114, 266
2 Jun 1998	16	229					456
1998	46	222					114, 266

Table SG-090. cont'd

DATE	DCCO	PECO	BLOY	GWGU	PIGU	RHAU	SOURCE
1999	47	311					114, 266
Jul-Sep 2000	70	234					114
2002	80						528
12-16 Jun 2006			6eS				57
7 Jul 2007	S	299					456
2007	34	327					1, 522
13 Jun 2009					x		45
2009	20	179					1, 522
11 Jun 2010			2[2]				524
13-14 Jun 2010				2,493[1,152][c]	x		30, 453
10 Oct 2010		x					524
2010	26	173					522
25 May 2011					(241)		524
22 Jul 2011					(299)		524
24 May 2012					(166)		524
14 Jun 2013					(380)		524
2013	27	150					528
20 Jun 2014					(176)		524
2014	25	225					101
9 May 2015	x	x			(130)		524
2015	31	280					522
8-14 Jun 2015				1,595[1,425][d]			360
15 May 2016					(200)		524
2016	48						528
21 May 2017					(124)		524
1 Jul 2017					(164)		524
2017	52	267					112
21 Apr 2018		S			S(500)		524
31 May 2019			x				524
3-5 Jul 2019	33	176	4[4]		S(212)		524, 528
25 Jul 2019	55						478
13-18 Jul 2020	32	152	x				524, 528
2-3 Aug 2021	38	93	2[2]		x(17)		524, 528
19-20 Jun 2022				952[645]			343
26-27 Jul 2022	25	108	x		S(151)		524, 528
28 Jul 2022	23	135					524, 528
17 Jun 2023				786-878+			601
31 Jul-5 Aug 2023	23	131	x		S(127)		524

[a] We have listed total numbers of Pelagic Cormorant nests counted by observers in 1963, 1964, 1965, and 1968 to keep them comparable to full counts from other years. However, observers in those four years suspected that some nests might have been missed and total nesting populations may be slightly larger than their counts (see text). Observers in other years have not considered nests that may not have been visible.

[b] Total extracted from graph in Merilees.[252]

[c] Total includes 118 pairs estimated nesting in areas on West Hill that were not accessed to count nests during the 2010 survey. This included 72 pairs estimated nesting in areas that were not disturbed because they were too close to nesting cormorants and 46 pairs in an area surrounded by Himalayan blackberry. Those areas were inspected by binocular and incubating birds could be seen on some nests. All estimated nests were assumed to contain three eggs. There were thus 1,034 nests with eggs and 1,341 empty nests that were counted, and 118 estimated nests with unknown contents but assumed to contain three eggs each.

[d] Numbers of empty nests may have been underestimated in 2015 (see text). Total includes 50 pairs estimated nesting in areas on West Hill that were not accessed to count nests during the 2015 survey. This included 30 pairs estimated nesting in areas that were not disturbed because they were too close to nesting cormorants and 20 pairs in an area surrounded by Himalayan blackberry. There were thus 1,375 nests with eggs and 170 empty nests that were counted, and 50 estimated nests with unknown contents but assumed to contain eggs.[360] In five nests with eggs, the eggs had been depredated and only broken eggshells were present.

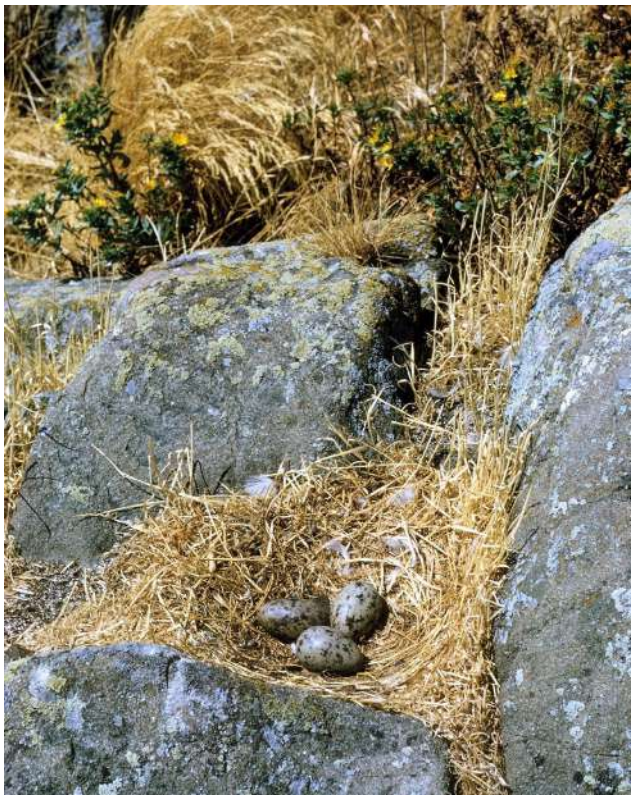
Figure 192. Glaucous-winged Gulls nest in a variety of vegetated (top) and bare rocky habitats on Mitlenatch Island. *Photos by Marlene Graham, 22 August 2008 (top) and 9 July 2010, and R. Wayne Campbell, 11 July 1964 (bottom).*

The first total count of gull nests was conducted in 1974. That survey tallied just over half the estimated number of nests from the year before, and it is likely that previous records of over 3,000 pairs were overestimates. If we accept the revised estimate by Pearse of about 750 pairs nesting up to 1957, then numbers more than doubled between then and 1974. Nine complete counts have been conducted since 1974. Numbers have varied tremendously. A low count of 987 nests was obtained in 1977, followed by a high count of 2,558 nests in 1978. Numbers were somewhat lower through the 1980s but then reached a maximum of about 2,830 nests in 1991. The next survey conducted two decades later suggested a relatively stable nesting population; numbers of nests counted by Blight [30, 453] in 2010 were only slightly less than the numbers counted by the BCPM in 1978. Surveys since 2010 suggest recent, dramatic declines in the nesting population, but counts show similar variation to those from the 1970s and 1980s and are difficult to interpret.

Fewer total nests but more nests with eggs were recorded by MIST volunteers in 2015 than had been counted in 2010. There may have been a bias in recording empty nests in 2015 [507] because volunteers that assisted with the surveys in 2010 had the impression that only nests with eggs were important to count (see the section on *Identifying and Addressing Issues with the Historical Data* above). That problem was resolved for the 2022 survey when volunteers were instructed to count all nests.[502] Results of the 2022 survey indicated a major decline in the nesting population since 2010: only 952 nests, including 307 empty nests, were counted in 2022, a decrease of over 60% since 2010. However, observers reported several factors that may have contributed to a low count in 2022.[343] Firstly, the nesting season appeared delayed and many nests were empty or still being built: a large proportion (32%) of nests were empty in 2022 compared to other years like 1974 (3%) and 1978 (9%); and 173 (18%) of the 952 nests counted in 2022 were classed as only partially constructed (most [85%] of those had no eggs). Surveyors also recorded 143 nest scrapes where it looked like birds were just starting to build nests; those were not included in the nest count. Secondly, not all areas of the colony were surveyed; the spread of Himalayan blackberry blocked access to some areas on West Hill. Finally, increases in dense vegetation on the island made it harder to search for and find nests (Figure 193), although it may also have reduced available nesting habitat for the gulls. Observers also speculated that gulls may be nesting deeper into thick vegetation in response to impacts from eagles and river otters, thus exacerbating the problem of finding nests.

Although the above factors may have affected counts in 2022, they are unlikely to account for the drastic reduction in numbers of nests counted compared to 2010 for a couple of reasons. First, although the season appeared delayed in 2022, it was likely more delayed in 2010. A larger proportion of gull nests were empty in 2010 (54%) than in 2022

Figure 193. Tall grasses and other dense vegetation are more abundant on Mitlenatch Island now than in the past, likely due to a changing fire regime on the island. Many Glaucous-winged Gull nests are now located deep into thick vegetation (this page) and are often difficult to find. Nests located in more open areas (next page) are much easier to detect. *Photos by David Thomson, 24 June 2008 (this page, top left), R. Wayne Campbell, July 1965 (next page, top right), and Tony Rybar, 20 June 2022.*



(32%), and similar proportions (18%) of nests were classed as partially built in both years. [343, 453] Clutch sizes in nests that contained eggs also indicated a greater delay in laying in 2010; comparing the proportions of one-egg, two-egg, and three-egg clutches in 2010, 2015, and 2022 showed that there were fewer nests with full clutches in 2010 (44% of 1,034 nests counted with eggs) than in 2015 (60% of 1,375 nests counted with eggs) and 2022 (60% of 645 nests counted with eggs). Thus, the late breeding season in 2022 cannot explain the drastic difference in nest counts between 2010 and 2022. Second, nests that may have been missed also are unlikely to account for the scale of the decrease seen in 2022. Although most volunteer surveyors in 2022 had no previous experience counting nests on Mitlenatch Island, they made a concerted effort to find nests and likely missed only a small proportion of nests.[343] Areas that were inaccessible also likely held only a small proportion of the total nests on the island. We can thus conclude that there were many fewer gulls nesting in 2022 than in 2010. However, such differences may reflect changes in breeding effort rather than changes in population size. Similar interannual differences in nest counts have been seen in the past that were likely due to differences in breeding effort. For example, changes in breeding effort likely accounted for the low count of 987 in 1977 followed by a high count of 2,558 nests in 1978. It is possible that fewer birds initiated

breeding in 2022 than 2010 due to poor environmental conditions. Productivity appeared to be poor in 2022 and very few chicks were seen later in the season by MIST volunteers.[343, 524] Subsequent surveys should reveal whether the breeding population has been reduced or if the 2022 results were due to a year with poor breeding effort. At any rate, results of the 2022 survey are cause for concern.

The gull colony was surveyed by remote drone on 17 June 2023.[601] Imagery analysis yielded counts of 786 incubating adults and 92 likely incubating adults (i.e., a total of 786-878 nests). Uncertainty about the 92 likely incubating adults was due to small areas of motion blur or overexposure in the images. It was unknown how many nests might have been hidden under dense vegetation and not visible on drone imagery. Empty nests, as well as nests with eggs but without incubating adults, would also not have been visible in drone imagery.[602] Thus, the drone count of incubating adults in 2023 best compares to numbers of nests with eggs or young counted during previous ground surveys. This comparison indicates greater numbers nesting in 2023 than in 2022, although still substantially less than in 2015 and 2010. A recent study using data from Chain Islets/Great Chain Island, estimated that, due to the variability in proportions of empty nests seen on that colony, numbers of incubating adults visible on drone imagery likely represented between 63 and 84% of the total number of breeding pairs present.[602] Similar considerations on Mitlenatch Island (with proportions of empty nests as high as 54% in 2010), would suggest a total nesting population of between about 900 to 2,000 pairs in 2023. Unless 2023 was also a poor reproductive year for gulls, results from 2022 and 2023 suggest that breeding populations have declined on Mitlenatch Island since 2010.

There have been major changes in the distribution of gull nests on Mitlenatch Island over the last 60 years, especially on F Island. No nests were found in 2022 on F Island where van Tets marked 311 nests in 1963,[404] Foottit counted 361 nests in 1969 [172] and 345 nests in 1970,[173] and Butler counted 286 nests in 1973.[55] Declines on F Island occurred in the 1970s, between 1970 and 1978, and then again after 2010. Numbers on F Island appeared relatively stable between 1978 and 2010. Possible reasons for the declines on F Island are discussed below under *Remarks*. From years when all nests were counted and recorded for each area, total nests (including numbers estimated in 2010 and 2015 – see footnotes to Table SG-090) on West Hill, East Hill, and F Island, respectively, were: 1,315, 180, and 137 in 1974; [523] 2,320, 163, and 75 in 1978; [523] 1,806, 119, and 74 in 1980; [523] 1,692, 153, and 77 in 1981; [523] 1,762, 639, and 92 in 2010; [453] 1,208, 380, and 7 in 2015,[360] and 813, 139, and 0 in 2022.[343] Proportions of the population nesting in the three areas, respectively, were: 81, 11, and 8% in 1974; 91, 6, and 3% in 1978; 90, 6, and 4% in 1980; 88, 8, and 4% in 1981; 71, 26, and 4% in 2010; 76, 24, and <1% in 2015, and 85, 15, and 0% in 2022. These data indicate that, in addition to changes on F Island, the proportions of nests on West and East hills have varied, with greater proportions of nests on East Hill in recent years.

In 2010, 2015, and 2022, observers estimated the numbers of gulls nesting in areas near the cormorant cliffs and in an area surrounded by Himalayan blackberry on West Hill that were not accessed to count nests. Differences across years seen in those areas also indicate changes in abundance and distribution of nesting gulls. In 2010, a total of 118 pairs were estimated nesting in those areas, including 72 pairs nesting along the cormorant cliffs and 46 pairs in the area surrounded by Himalayan blackberry.[453] Those areas were inspected by binocular and incubating birds could be seen on some nests. In 2015, 30 pairs were estimated near the cormorants and 20 pairs in the area surrounded by Himalayan blackberry.[360] In 2022, no gulls were seen in either area.[343]

Pelagic Cormorant Trends. Pelagic Cormorants were first observed nesting on the cliffs on the west side of the island (Figure 194) by Ralph Fryer in 1949. Pearse [303] initially reported 18 nests (in two clusters of eight and ten nests each) found by Fryer, but later, based on further communication with Fryer, stated that there were 24 nests that year.[305] Pearse had not seen evidence of nesting prior to that and was confident that Pelagic Cormorants had not nested before at least 1946. Numbers increased dramatically over the next few decades, especially after farming activities ceased and the island was given protection as a provincial park. A maximum of 504 nests were counted from land on 14 June 1966, although more were estimated in 1967 and 1982. Since 1966, numbers have fluctuated but generally declined. MIST volunteers Nancy Baron and Alison Watt counted 152 nests in 2020, including 13 nests at a new location on the northeast cliffs below the bird blind, and a low of only 93 nests in 2021. In 2022, Baron counted 108 nests with birds on them on 27 July and Baron and Watt counted 135 nests on 28 July. A total of 131 nests were counted on the most recent survey in 2023.

Figure 194. Pelagic Cormorants nest mainly on the steep cliffs on the south side of West Hill on Mitlenatch Island. *Photos by R. Wayne Campbell, 25 August 1969 (top and next page) and Paula Courteau, 29 July 2018.*

Surveys for Pelagic Cormorants have been conducted from land or from the water and methods have varied from year to year. In some years, surveys have been conducted from both land and water, allowing comparisons to be made of the effectiveness of the different methods. Results of those comparisons have been inconsistent. In some years, observers conducting surveys from land were able to provide additional data on nest contents. Cormorant nests were counted from land in 1959, 1960, and 1966, but other full counts have been conducted from the water or from both land and water. In 1963, van Tets counted 359 nests from the water along the south side of West Hill and noted that a few more nests may not have been visible from the boat. Campbell [64] counted 283 nests from land on 16 July and 273 nests from a boat on 27 July 1964. He noted that a few nests may have been missed and the breeding population could be as high as 300 pairs. A rough count of about 422 nests on 13 July and a more precise count of 412 nests on 12 August were made from a boat in 1965.[79] Considering possibly missed nests, observers suspected a 1965 nesting population of close to 500 pairs. In 1968, 247 nests held eggs of 313 nests inspected from above the cliffs on 7 July by Rudi and Nora Drent and Robert Foottit.[523] A number of nests were not visible from above and a count from the water of the same area of cliff on the same day tallied 377 nests. An additional 46 nests were counted from the water in an area towards the west end of the cliffs that was not surveyed from above. This gave a total count from the water of 423 nests and an estimated total of 425-450 nests for the colony in 1968, assuming that some nests were still missed. Robert Foottit conducted a census from land on 7 July 1969 and observed 140 empty nests, 265 nests with eggs, and 15 nests with birds sitting on them, for a total of 420 nests. The next day he surveyed the colony from the water and counted 457 nests. Similarly on 7 July 1970, 126 empty nests, 296 nests with eggs, and 15 nests with birds sitting on them, for a total of 437 nests, were counted from land, and 421 nests were counted from a boat. A recount from land on 8 Aug yielded 79 empty nests, 326 nests with eggs or young, and 13 nests with birds sitting on them, for a total of 418 nests. Several counts were made in 1973 with a maximum count of 357 nests from the water on 8 July.[55] On 2 July 1974, counts from the land by Wayne Campbell and from the water by Keith Taylor and Michael Shepard tallied 286 and 233 nests, respectively. After 1974, all counts except in August 1981 were made from the water. An additional count from land was begun in 1978 but was curtailed because crows were ransacking the colony.

In summary, comparisons of survey methods for Pelagic Cormorants across all years when both land and water surveys were conducted found that more nests were counted from land than from the water in 1964, 1970, and 1974; the reverse was the case in the other three years, 1968, 1969, and 1973, when both land and water counts were made. Counting nests from the water can be recommended as the best survey method for Pelagic Cormorants on Mitlenatch Island, given the inconsistency in which type of survey detected the most nests and the risks of disturbance impacts during surveys from land.

Observations of nesting Pelagic Cormorants were made early and late in the season in some years. Nests still contained some young on 10 October 2010,[524] and about 400 Pelagic Cormorants were paired up on the nesting cliffs on 21 April 2018.

Double-crested Cormorant Trends. Double-crested Cormorants were infrequent summer visitors in 1963, and van Tets predicted that they would likely start breeding on the island within the next 50 years. Only 30 years later, the first Double-crested Cormorant nests were found along the tops of the southern cliffs on West Hill (Figure 195).[266] Numbers increased from 10 nests in 1993 to a peak of 80 nests in 2002. Fewer have nested since. On 7 July 2007, all nests were empty (nests were not

Figure 195. Double-crested Cormorants were first recorded nesting on Mitlenatch Island in 1993. They build their bulky stick nests on the rounded shoulder of the southern cliffs on West Hill. Numbers nesting have varied since 1993, with a maximum of 80 nests counted in 2002. *Photos by Paula Courteau, 29 July 2018.*

counted) with about 50-70 adults nearby. Two counts were made in 2019: volunteer wardens on the island counted 33 nests; Mason King analyzed a digital photo taken from the water and tallied 55 nests. Nancy Baron and Alison Watt made three counts of nests in 2022, tallying 25, 23, and 23 nests on 26, 27, and 28 July, respectively. Twenty-three nests were counted on the most recent survey in 2023.

Brandt's Cormorant Trends. Brandt's Cormorants have been frequently noted around the island and seen on the colony with other cormorant species, but no definite evidence of nesting has been reported (Figure 196). There is an eBird [524] record of Brandt's Cormorants nesting on Mitlenatch Island on 28 August 2011, but that record was considered unsubstantiated and was withdrawn by its contributor, Powell River birder Pierre Geoffray.[471]

Figure 196. In the BC Salish Sea, Brandt's Cormorants, including many adults in breeding plumage, are often seen roosting on colony islands but have been confirmed breeding only on Mandarte Island in the Gulf Islands. *Photo by Paula Courteau, 19 March 2017.*

Black Oystercatcher Trends. Black Oystercatchers were first recorded on the island by David Stirling who noted a pair in 1959 and 1960. Pearse [301] had searched in vain for oystercatchers before that. The pair in 1960 was aggressive and likely defending a nest. The establishment of oystercatchers on the island also coincides with the purchase of the island by the provincial government from the Manson family. Since then, oystercatchers have nested at several locations around the island. Data are not adequate to accurately determine trends in numbers after 1960, but the greatest numbers of nests were reported in 1978 (8 nests), 1980 (7 nests), and 2006 (6 nests estimated), suggesting that numbers increased initially after 1960 and may have been relatively stable since the 1970s. The main known nesting area in the 1960s was on the beach at the west end of F Island near the old breakwater. In 1963, one pair nested there unsuccessfully, although the pair may have re-nested elsewhere on the island after their eggs were taken by crows. A pair successfully hatched chicks on F Island in 1964,

1965, 1967, and 1970,[64,79, 173, 228] but in 1966 birds were unsuccessful and did not attempt to renest there that season after their eggs were taken by crows.[80] In 1968, three eggs were laid in the nest, but their fate was unknown,[171] and in 1969 nesting again appeared unsuccessful. As many as six oystercatchers were seen flying around in 1970, but no other nests were found. Nesting at locations other than F Island was first reported in 1964, when two empty nests were found near the cliffs on West Hill. Three nests with eggs were found in 1971, located on F Island, in Harlequin Bay at the east end of East Hill, and in Echo Bay at the east end of West Hill. A fourth nest was suspected in 1971 in a cove at the east end of the cormorant cliffs on West Hill. Nests were again found on F Island and Harlequin Bay in 1972. The F Island nest was successful, but the pair in Harlequin Bay lost their clutch to crows. The next year, 1973, was the first year that a nest was not located on F Island since 1963. Three nests were found in 1973 at the three other locations where nests were found or suspected in 1971. Two of the nests in 1973 produced young; the Harlequin Bay pair was again unsuccessful.[55] F Island was again used in 1974, as well as Harlequin Bay and Echo Bay. Michael and Teresa Shepard saw chicks at the latter two territories. No information was given about the five nests reported in 1977. In 1978, one nest with one chick was found on F Island, and five and two empty scrapes were found on West Hill and East Hill, respectively. Naturalist David Thomson reported seven nests in 1980 (Figure 197). Only one nest was found by the survey crew (that included David) on 16-17 June that year. That nest with one egg was found in a unique location at the top of a rock bluff at the westernmost tip of the island. One pair was present near two close-together, empty nests in this area on 31 May 1981. A second pair was nesting on East Hill in 1981. There are few more recent nesting records for oystercatchers and no thorough surveys of the island to determine the nesting population for over 40 years (Figure 198). Vermeer et al. reported two pairs nesting in 1987, four nests with eggs were found by Leah Ramsay and Bill Merilees in 1991, Butler and Golumbia suspected six pairs nesting during their boat survey in 2006, and two pairs with adults on nests were reported in 2010. Adults with chicks were sighted by MIST volunteers in 2019-2023 (4 different broods in 2019). We have used the estimate by Butler and Golumbia [57] as the most recent estimate of the nesting population on the island.

Figure 197. One of seven Black Oystercatcher nests found on Mitlenatch Island by park naturalist David Thomson in 1980. An adult (left) was incubating three eggs laid on a bed of clam shells. *Photos by David Thomson, June 1980.*

Pigeon Guillemot Trends. Pearse noted a decline in Pigeon Guillemot numbers from high counts of about 500 birds in the 1920s and 1930s to "very few" birds in 1955.[303, 304] He recorded them as numerous in 1941, but only a fraction as many were present in 1946 and 1949. Pearse noted "good numbers again in 1957" and had no explanation for the low numbers seen previously.[304] Higher numbers were observed through the 1960s and 1970s. Separate estimates of 175 and 170 pairs were made by David Stirling and Bill Merilees, respectively in 1960.[523] Rob Butler [523] made an estimate of 1,000 pairs in 1967, but that estimate was considered too high, and Kennedy and Foottit thought that numbers were similar to previous years. Emms and Verbeek estimated about 200 pairs nesting in 1984-1985, and Emms and Morgan estimated 175-200 pairs nesting in 1987. Counts over the last decade have varied, with a high estimate of 500 birds on and around the colony made by eBird contributor Russ Petersen

Figure 198. Black Oystercatchers have been regular denizens of Mitlenatch Island since 1959 when the island was purchased by the provincial government to be set aside as a park. They are commonly recorded around the island, but thorough surveys to determine the size of the nesting population have not been conducted for decades. They can be seen foraging along intertidal habitats and even feeding on oysters on Mitlenatch Island. *Photo by Paula Courteau, 29 July 2018.*

Figure 199. Over 100 pairs of Pigeon Guillemots regularly nest on Mitlenatch Island, and they are commonly seen around the island on the water, flying, and sometimes carrying fish to feed their chicks. *Photos by Paula Courteau, 29 July 2018.*

after circumnavigating the island in 2018. Nancy Baron counted 151 birds, some holding fish, when she kayaked around the island in 2022 (Figure 199).

There is insufficient information to determine whether guillemot numbers were reduced in the 1940s and early 1950s or whether low counts may have been related to the timing of visits in those years. Pearse found nests under driftwood, under rocks, and in crevices in 1925.[493] Stirling observed many birds delivering fish to nests located in crevices and Merilees found four nests in crevices and under boulders in 1960. Of 20 nests found by van Tets in 1963, nine were on rocky beaches and 11 were on higher hillsides; 13 were under boulders, five in rock fissures, and two under driftwood. Seven nests were found in 1964: four under boulders, two in crevices, and one under a log. Nests have been found in similar locations in other years. During his

graduate studies in 1984 and 1985, Emms [157] found the majority of the population nesting in boulder tumbles at the base of cliffs along the eastern and southern shores of the island. He located and monitored 91, 106, and 78 nests during his studies in 1984, 1985, and 1986, respectively.[158]

Rhinoceros Auklet Trends. Nesting by Rhinoceros Auklets has not been confirmed but has been suspected for decades. In 1960, a pair was seen close to shore on each of three days observers were on the island and was seen once on shore.[510] Van Tets reported four sightings in 1963 of Rhinoceros Auklets on the water just east of East Hill, including a pair courting on 13 June, single adults on 17 and 20 June, and two adults on 2 July. Small numbers of Rhinoceros Auklets were seen around the island in other years that naturalists were stationed there (Figure 200). In 1970, Foottit saw a maximum of nine just off the east end of West Hill on 2 July. Two of those birds flew to the top of West Hill in the evening and only one returned, which made Foottit suspect they may be nesting. In 1973, a maximum of 15 Rhinoceros Auklets in breeding plumage were seen in the evening and nesting was again suspected: one flew off the cormorant cliffs on 17 July, and one carrying food flew over West Hill on 8 August.[55] Michael Rodway and Peggy Sowden recorded 16 birds in 1978. In August 1991, Merilees reported at least four burrows found by Eileen and Wayne Campbell; breeding was not confirmed, but Wayne Campbell [457] suspected two or three pairs nesting. One to five birds were frequently sighted around the island in 1992, 2002, and each year from 2012 to 2023, with occasional larger groups of 10-19 birds and high counts of 47 birds recorded at 21:30 hr on 17 July 2017 and 33 birds at 21:15 hr on 25 June 2019.[524]

Figure 200. Small numbers of Rhinoceros Auklets have regularly been seen around Mitlenatch Island during the breeding season. Nesting has been suspected for many years but never confirmed. *Photo by Paula Courteau.*

Tufted Puffin Trends. Two Tufted Puffins were seen on shore and in the water at the east end of F Island in June 1963, and one adult was observed off the southwest tip of the island on 20 and 21 June 1973 (Figure 201).[55] Van Tets suspected that Rhinoceros Auklets, Tufted Puffins, and Common Murres, which were frequently observed off the island in 1963 and other years, may colonize the island in the future. None of those species have yet been confirmed breeding on Mitlenatch Island, but, as noted above, 2-3 pairs of Rhinoceros Auklets have been suspected breeding since 1991. [457, 504]

Figure 201. No evidence of nesting by Tufted Puffins has been observed on Mitlenatch Island, but pairs and individuals in breeding plumage have been seen around the island and they could potentially nest in the future. *Photo by Carita Bergman.*

Caspian and Arctic tern Trends. Caspian and Arctic terns are also potential breeders on the island. Small numbers of Caspian Terns have been regularly seen around the island every summer since 2010.[524] In 2021, a single Arctic Tern was seen for several days in late June and early July at the same location on a rocky knoll on the south end of East Hill,[489, 504] (Figure 202) and a pair was sighted in that area by Catherine McEwen on 11 July.[524]

Remarks: Pearse [301] noted that quite a few gull eggs were taken by "fishermen and Indians." In some years, "…the place was cleaned of eggs." Following protests from Pearse, the BC Game Conservation Board stationed two game wardens on the island for 10 days at the beginning of June in 1923, but nests were raided afterwards and it was quickly evident that to protect the nesting efforts of the gulls, wardens needed to be present for a much longer period.[301] The human harvest of eggs had eased off but was still occurring in the 1960s.[305]

Figure 202. One or two Arctic Terns were repeatedly seen in the same spot on East Hill on Mitlenatch Island in 2021 and perhaps will nest there in the future. Since 2012, one pair of Arctic Terns has been confirmed or suspected nesting in most years on Little Rock, located off the east side of Cortes Island about 10 km to the northwest of Mitlenatch Island. The terns seen on Mitlenatch Island in 2021 may have been the pair from Little Rock, as they did not appear to nest successfully at that site that year.[473] *Photo by George P. Sirk, 3 July 2021.*

Sprot suspected that sheep grazing on the island were responsible for numerous broken gull eggs found in 1928 and other years.[302] Pearse [305] noted that the sheep were gone in 1963; apparently they were removed around 1953.[404]

Pearse noted that there had been fires on the island sometime after 1929, including a major one in 1956, but that they did not seem to have affected the nesting gulls.[304, 305]

Crows were preying on gull eggs (Figure 203) and a flock of 200-300 was seen but did not stay long in 1922.[493] Well over 100 crows were present in 1925 and 1927, 40-50 were seen in 1957,[302, 493] and a flock of 100 was recorded in 1959.[510] Pearse stated that few, if any, crows nested on Mitlenatch, most coming over from nearby islands.[304] Stirling [510] suspected nesting by crows in 1959, and he noted heavy predation of cormorant eggs by crows in 1960 and 1961. Many cormorant, gull, and guillemot eggs and the eggs in the single oystercatcher nest were destroyed by crows in 1963.[404] In one instance, a crow was seen to kleptoparasitize a Pigeon Guillemot trying to deliver a fish to its nest. Kleptoparasitism of Pigeon Guillemots by crows and sometimes gulls was more frequently observed in 1964.[64] Van Tets [404] found 18 crow nests and estimated a breeding population of about 30 pairs in 1963. Crows harvested early-laid eggs and delayed cormorant breeding by about two weeks in 1964 [64] and preyed heavily on Pigeon Guillemot eggs in 1965.[79] Butler estimated the summer population of crows in 1973 to be 35 adults plus offspring for a total of 135 birds.[51] Crows commonly scavenged in seabird colony areas for food dropped by parent cormorants and gulls. Seabird eggs, mainly

Figure 203. Northwestern Crows have been documented preying on Glaucous-winged Gull eggs on Mitlenatch Island since 1922. They also prey heavily on cormorant eggs and sometimes on Pigeon Guillemot and Black Oystercatcher eggs. *Photos by R. Wayne Campbell, 11 July 1964 and 18 June 1970.*

those of cormorants, were also considered a major source of food for the crows. Crows quickly took advantage of any disturbance that flushed nesting birds but also would incessantly swoop at incubating cormorants and sometimes gulls to dislodge them from their nests. Butler observed only one instance of crows eating a Pigeon Guillemot egg.[51] Crow predation on cormorant and gull eggs was again severe in 1977.[523] Butler et al.[63] estimated about 60 pairs of crows nesting on the island in 1976-1983, and James and Verbeek [224] estimated 65 breeding pairs in 1979-1980. Predation by crows has continued to the present; Nancy Baron saw crows take four Double-crested Cormorant eggs following disturbances on 31 July 2023.[524] Crows commonly roost in the aspen grove on West Hill.[456]

Verbeek reported that Glaucous-winged Gulls frequently cannibalize gull eggs.[409] Gulls killed some young Pigeon Guillemots that had left the nest but were unable to fly in 1963.[404] Predation on cormorant eggs or young by gulls has not been reported but likely occurs.

Predation and disturbance by Bald Eagles has impacted nesting seabirds in some years. Naturalists throughout the 1960s and early 1970s regularly reported one or two eagles flying over the island, but the eagles rarely landed and were often chased off by mobbing gulls or crows (Figure 204). Visiting eagles occasionally captured nesting birds. An adult Bald Eagle carried off a large young gull in 1960.[510] One or two adult or immature Bald Eagles regularly visited the island and caused panic flights of gulls whenever they flew over in 1963.[404] They were seen to prey on recently fledged crows and young and adult gulls. Visits by eagles were less frequent in 1965 than 1964 and no sign of eagle predation was seen in 1965.[79] Foottit [172] saw eagles capture a crow or Pigeon Guillemot and a young gull in 1969 and evidence of eagle predation on a few gulls was seen in 1972.[162] The first major impacts due to eagles were reported by Peggy Sowden and Michael Rodway who surveyed the colony on 13-14 June 1978. An immature Bald Eagle flew over the cormorant colony several times each day, upsetting all nesting birds and causing heavy losses of cormorant eggs to crows. Impacts from an expanded eagle population have likely continued.[33, 101, 114] In recent decades, a pair of eagles regularly nested on the island but had been absent for a few years after the main branch that the nest was built on broke off. In 2022, a new eagle nest had been built in the same tree, but nesting was not successful (Figure 205).[343] Transient eagles have also been present and may have been more abundant and had greater impact on

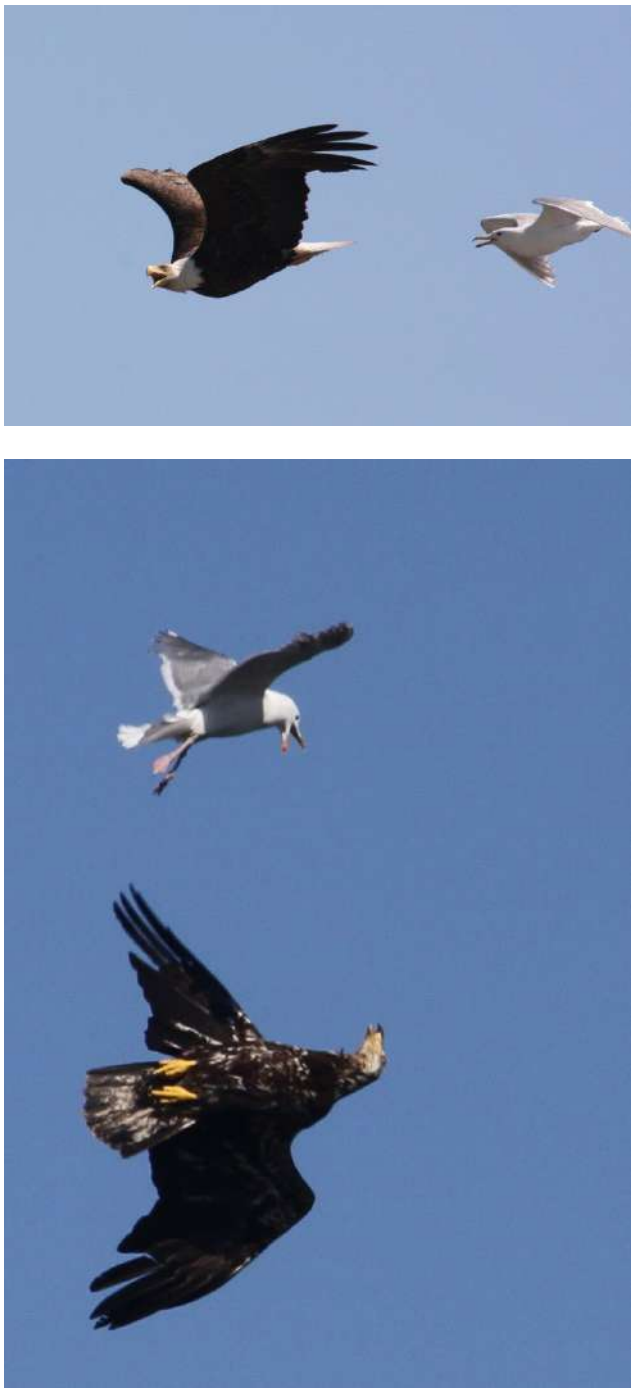


Figure 204. Bald Eagles visiting Mitlenatch Island are often successfully chased off by Glaucous-winged Gulls or Northwestern Crows. Here gulls are harassing passing subadult (top) and immature eagles. *Photos by Marlene Graham, 22 July 2009 (top) and 7 July 2010.*

nesting seabirds during years when the resident pair did not nest. In 2022, three adults and three juveniles were present at F Island when the Glaucous-winged Gull survey party arrived on 19 June. The juvenile eagles were frequently seen bombing the gulls on West Hill and the eagles were active on F Island

throughout the week. Remains of about eight adult and young gulls were noted during the 2022 gull survey. Broken or depredated eggs were also recorded: 18 and 47 broken eggs were found in and outside nests, respectively. Eagles may have been primarily responsible for breeding failures of many if not all Double-crested Cormorants in 2022 [508] (see below). Heavy daily predation on gulls by four Bald Eagles as well as by river otters was reported by Nancy Baron on 4 August 2023.[524]

Figure 205. A lone Douglas-fir tree has been growing in the cliff-sided gully on the west end of West Hill since the 1960s. Bald Eagles regularly nested in the tree in recent decades, but had been absent for a few years after the main branch that the nest was built on broke off. A new eagle nest had been built in the tree in 2022. *Photo by Rod Mitchell, 21 June 2022.*

Other predators that have been recorded on the island include Great Horned Owl, Peregrine Falcon, Common Raven (Figure 206), Wandering Garter Snake (*Thamnophis elegans vagrans*), and river otter. Great Horned Owls, probably a pair, were seen on the island in 1927 and 1928 and were likely preying on adult gulls. One owl was shot on the island in 1927.[302] Pearse recorded a Peregrine Falcon that stayed briefly and a pair of ravens around in 1957.[304] Campbell [64] also noted an immature falcon present on 18 August 1964 and other individuals have been occasionally sighted since. Ravens were also seen in 1963 [404] and have been noted in other years since. A pair has recently taken up residence and nests in the pines on Notch Meadow (Figure 207). Wandering Garter Snakes (Figure 208) are common on the island and have been documented preying on nestlings of Pelagic Cormorant, Glaucous-winged Gull, and Pigeon Guillemot.[68] They likely take nestling Black Oystercatchers as well. In their study of Pigeon Guillemots, Emms and Verbeek [159] found that crows were responsible for virtually all egg predation but almost all chicks were taken by garter snakes.

Figure 206. These Pigeon Guillemot feet and other prey remains were found on Mitlenatch Island at what David Thomson called a "raven's table" in 2013. It's not uncommon for Common Ravens to leave a large variety of prey remains at a feeding site, which is often located close to a nest. *Photo by David Thomson, 17 May 2013.*

Figure 207. Common Ravens frequently visit Mitlenatch Island. In recent years, a pair has nested in the Lodgepole Pines on Notch Meadow, and typically fledges several young, such as these three seen in 2008. *Photo by Marlene Graham, 21 August 2008.*

River otters were seen on two occasions in July 1963 [404] and were observed preying on gulls chicks and were suspected of preying on adults in 1967, 1970, 1973, and 1977.[174, 523] Predation on adult gulls was confirmed in 2020, when river otters were seen dashing into the colony to prey on flightless gull chicks as well as adults that stood their ground trying to protect their young.[20] A river otter was seen

around F Island in June 1969.[172] Losses of gull chicks due to river otter predation were particularly heavy in 1973, when a family of otters (Figure 209) was living on the island for the summer,[55] and in 1977.[523] The greatest mortality of gull chicks on the island in 1973 was seen on F Island and East Hill. There were river otter runs over the entire island but few signs of predation were seen in 1980 and 1981. River otters have been regularly observed on the island in recent years.[528] As noted above, heavy daily predation on gulls by five river otters as well as by Bald Eagles was reported by Nancy Baron on 4 August 2023.[524]

A few young gulls are regularly snared on prickly-pear cactus.[335, 510]

Disturbance from increasing numbers of recreational boaters (Figure 210) and island visitors has been a concern for many years,[144] and Mitlenatch Island is a popular destination (Figure 211). Severe predation of Pelagic Cormorant eggs by crows due to disturbance of the cormorant colony by boaters was noted as early as 1968.[171] At present, the continual presence of MIST volunteers through the nesting season helps control visitor access to colony areas and minimize human impacts. However, it is difficult for volunteer wardens to prevent boats from approaching too closely to cormorant nesting cliffs.

Figure 208. Wandering Garter Snakes are common on Mitlenatch Island, where they are known predators of nestling Pelagic Cormorants, Glaucous-winged Gulls, and Pigeon Guillemots, and likely also prey on nestling Black Oystercatchers. *Photo by David Thomson, 6 July 2005.*

Figure 209. In 1973, a family of Northern River Otters was living on Mitlenatch Island during the Glaucous-winged Gull breeding season. Predation on gull chicks by river otters was particularly heavy that year. *Photo by Paula Courteau, 20 September 2014.*

Figure 210. The semi-sheltered beach on the north side of Notch Meadow on Mitlenatch Island provides an easy landing and is an inviting stop for recreational boaters (top). Camp Bay (bottom) provides a reasonable anchorage in fair weather. *Photos by Connie Miller-Retzer, 19 June 2022 (top) and R. Wayne Campbell, 17 August 1968.*

Human disturbance may have been responsible for the decrease in the Glaucous-winged Gull nesting population on F Island in the early 1970s. In 1972, a comparative survey was begun relating gull chick survival to visitor use of the island.[162] Visitors were excluded from West Hill and colony areas on East Hill away from the bird blind but were permitted on F Island. F Island was also frequently visited in 1972 by Hydrographic Survey crews, who had a marker on the top of F Island. The study did not provide meaningful results because a bout of bad weather during the main two weeks of hatching caused tremendously high chick mortality throughout the island. We do not know if visitors were permitted on F Island in subsequent years, but disturbance from humans may have been responsible for the decrease in the numbers of gull nests on F Island by 60% between 1970 and 1974 and almost 80% between 1970 and 1978, in contrast to trends elsewhere on the island. Intense predation on gull chicks by river otters observed on F Island in 1973 may also have contributed to the declines. Additional disturbance by Bald Eagles may have contributed to more recent declines on F Island and the extirpation of nesting gulls there by 2022.

Figure 211. The meeting of tidal currents from the north and south in the area around Mitlenatch Island creates a productive marine environment that provides rich foraging habitat for many marine species. The thrill of seeing nesting seabirds on the island as well as less common marine species, like Humpback Whales (*Megaptera novaeangliae*), in the surrounding waters attracts many tourists to Mitlenatch Island. *Photo by Paula Courteau, 29 July 2018.*

A number of studies have been conducted on the island. Banding of nestling Glaucous-winged Gulls has been conducted periodically since 1922.[301, 302, 305] Banding was conducted by Theed Pearse from 1922 to 1949. A total of 104 young were banded by Pearse in 1922 when he visited the island with Taverner and Laing.[304] In 1938-1940, Pearse banded 760 young gulls as part of the Pacific Gull Color Banding Project. [169, 345, 346, 347, 348, 349, 445] Bill Merilees and Raymond Barnes banded 299 young gulls in 1960.[510] Banding of gull chicks occurred annually from 1963-1974: 1,295 in 1963; [404] 3,223 in 1964 and 1965; [82] 2,000 in 1966; [80] 1,900 in 1967; [228] 2,000 in 1968, 1969, and 1970,[171, 172, 173] 1,648 in 1971,[357] 1,500 in 1972,[162] 300 in 1973,[55] and 318 in 1974.[523] In total, over 20,000 gull chicks have been banded since 1922 (Figure 212). Aspects of the breeding biology and foraging ecology of Northwestern Crows have been investigated by several authors.[51, 63, 224] Vermeer [415] collected regurgitated pellets from gulls as part of a comparative study of adult and chick diets on the east and west coasts of Vancouver Island

in 1980. Emms [157, 159, 160] studied nest distribution and food provisioning in the Pigeon Guillemot in 1984-1985. Verbeek [409] investigated differential predation of Glaucous-winged Gull eggs by conspecifics and Northwestern Crows in 1984-1986. Breault collected nine Pelagic Cormorant eggs from the southwest end of the colony on 29 May 1990 for a CWS study on dioxins.[43] Other colony areas were not disturbed. Environment and Climate Change Canada collected 18 Glaucous-winged Gull eggs on 16 June 2022 for toxicity studies.[343] Rachel Stapleton conducted photographic monitoring of 10 Double-crested Cormorant nests for her M.Sc. studies out of SFU in 2022.[508] At all monitored nests she saw adult cormorants flushed off their nests on a daily basis and all nests failed. Bald Eagles, crows, and gulls were frequently detected in the camera images after cormorants had flushed off their nests, and eagles were the suspected cause of most disturbances. Eagles sometimes landed at the nests, and they and the crows and gulls may have been preying on

Figure 212. Over 20,000 Glaucous-winged Gull chicks have been banded on Mitlenatch Island since Theed Pearse first starting banding in 1922. *Photos by Marlene Graham, 2007-2010.*

cormorant eggs. The fate of the other 15 Double-crested Cormorant nests on the colony that were not monitored was unknown but, because they were in close proximity to the monitored nests, it is likely that those nests failed as well in 2022.

SG-100 POWELL RIVER

Location: *49°52'00"N 124°33'10"W* (northern shoreline adjacent to boat hulks)*; 92 F/15.*
City of Powell River on the mainland coast, north of Grief Point. At present, nesting has been recorded only on or near the shoreline but, for future consideration, we have included the entire City of Powell River in this colony.

Description: *Boat hulks; Wharves; Buildings.*

Historical summary: Glaucous-winged Gulls were nesting on old derelict boat hulks anchored north of city centre in 1986 (Table SG-100). In 2020, from the South Harbour Seawalk south of Fairmont Street, local birdwatchers K. and K. Pritchard saw a nest

with one young still in the nest on 13 August. In 2021, newly converted birdwatcher Alex Marchi from North Vancouver reported adults feeding three chicks at Westview Harbour in the city centre. In 2022, the Pritchards photographed two adults with a small chick at a nest on a horizontal beam at the Westview ferry dock on 24 July. Because we had no overall survey data for this colony, we considered the records from 1986, 2020, 2021, and 2022 cumulative to generate an estimate of nine pairs nesting in Powell River as of 2022. It is likely an underestimate.

Table SG-100. Seabird nesting records for Powell River. See Appendix 2 for codes.

DATE	GWGU[a]	SOURCE
Jun 1986	6	420
13 Aug 2020	x	524
12 Jul 2021	x	524
24 Jul 2022	x	524

[a] See text for derived total estimate of nine pairs for the current breeding population.

SG-110 VIVIAN ISLAND

Location: *49°50'26"N 124°42'05"W; 92 F/15.*
West of the south tip of Ahgykson Island (previously Harwood Island) in Shearwater Passage. Formerly known as Bare Island; name officially changed to Vivian Island in 1945.

Description: *3.2 ha; 17 m high; Grassy rock; Cliffs.*
This rocky island is covered with grasses, forbs, cactus, a number of shrub species, and some patches of Pacific crabapple (*Malus fusca*). There are cliffs along the southwest side and a small, pebble beach on the northeast side (Figure 213). Vegetation was getting taller and encroaching more into gull nesting areas in 1981.

Historical summary: Partial counts of gull nests were undertaken in 1966 and June 1974 (Table SG-110). Observations were made from the water in 2006 and 2014.

Figure 213. The rugged cliffs and the grassy and rocky top of Vivian Island were nesting habitats for Pelagic Cormorants and a large colony of Glaucous-winged Gulls through the 1970's. Pictures here show (clockwise from top left): the south-side cliffs where cormorants were nesting in 1974; Mike Shepard surveying the grassy top of the island in 1974; the small pebble beach on the northeastern side of the island in 2018; and a section of cliffs in 2018. *Photos by R. Wayne Campbell, 2 July 1974 and Moira J.F. Lemon, 2 August 2018.*

Pelagic Cormorants and Glaucous-winged Gulls were nesting consistently on Vivian Island through the 1970s but have since been extirpated. Pelagic Cormorants regularly nested on the cliffs along the southwest side through the 1970s (Figure 214). In 1981, there were 19 nests in crevices on the southwest side and four nests in crevices on the east side of the southeast tip of the island. Numbers declined in the 1980s and they have not been seen nesting since 1987. Maximum numbers were estimated by Ken Kennedy in 1975. All birds were incubating at the time of his visit.

Figure 214. Pelagic Cormorant nesting habitat on the cliffs of Vivian Island in 1974 (top left and right) and 1981. *Photos by R. Wayne Campbell, 2 July 1974 and 13 June 1981.*

Glaucous-winged Gull numbers increased from 75 nests in 1970, when the first complete nest count was conducted, to a maximum of 240 nests in 1978. In 1973, gulls were nesting over much of the island except the central area inland and south of the pebble beach. On 2 July 1974, nests were tallied separately for the southeast end (58 nests) and northwest side (160 nests) of the island (Figure 215). In 1975, Ken Kennedy estimated 50 and 195 pairs nesting in those same two areas, respectively. In 1981, most nests were on the rocky areas at the north end but nests were scattered all over the island and many were found deep within the tall grass and were difficult to find. Large numbers of gulls were still nesting in 1986. There are few survey data since. Gulls apparently failed to nest in 2006 and 2014. No adults were seen by Rob Butler in 2006. In 2014, Harry Carter counted about 40 gulls roosting on the north point but saw none on territories.

A pair of Black Oystercatchers was seen on the south tip of the island but no nest was located on 19 June 1974. A nest found on 2 July 1974 was at the north end (Figure 216), as was one found in 1981. Three empty oystercatcher nests were found in 1978; adults were not around at the time the nests were checked although they had been seen earlier. Six adults were seen from the water in 2011; one was sitting on a nest and two other nests were suspected. In 2014, four adults were seen on Vivian Island and/or Rebecca Rock.

No Pigeon Guillemot nests were found in 1970 or 1973 but some birds were seen carrying fish. Pigeon Guillemots were present but no estimate of numbers was made on 19 June 1974. Five nests with

eggs were found on 2 July 1974, four under boulders and one in a crevice (Figure 217). Three nests were found in 1981 located under a rock, in a crevice, and under piled driftwood.

Figure 215. Glaucous-winged Gull chicks were beginning to hatch on Vivian Island when the island was surveyed in 1974. The nest in the bottom left photo contains a cockle shell. *Photos by R. Wayne Campbell, 2 July 1974.*

Figure 216. Black Oystercatcher nest found on Vivian Island in 1974. *Photo by R. Wayne Campbell, 2 July 1974.*

A pair of Rhinoceros Auklets was seen near the island in 1970. Though no evidence of nesting was found, their presence and behaviour was considered "suspicious." [175] One Rhinoceros Auklet was observed just offshore in 1981. Adult Common Murres were recorded in 1975 (five present, one perched on the island; Figure 218) and 1978 (two recorded), but no sign of nesting has been seen.

Figure 217. Pigeon Guillemots on Vivian Island nest under driftwood piles (this page), in crevices in the cliffs (next page, left), and under boulders. One egg is visible in a nest in the right photo on the next page. *Photos by R. Wayne Campbell, 2 July 1974 (next page, left) and 13 June 1981.*

Table SG-110. Seabird nesting records for Vivian Island. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
20 Jul 1966			59+		175, 523
16 Jul 1970			75[27]	S(30-35)	175
26 Aug 1970	27[3]			S(30-35)	175
18 Aug 1973	26[10]	1S		S(30-35)	55, 175[a]
19 Jun 1974	14[12]	1S	84+	S	523
2 Jul 1974	25[24]	1	218[191]	35e(64)	70, 523
30 Jun 1975	35e	1	245e	30e(35)	523
27 Jul 1976	x		x		523
2 Jun 1978	26[0]	3S	240[90]	S(40)	523
17 Jun 1980			119[119]		523
13 Jun 1981	23[4]	1	229[178]	6-10(12)	523
29 May-13 Jun 1983	15				421
Jun 1986			208		420
8-9 Jul 1987	3	0[b]		S(48)	158, 427, 428
May-Jul 1989	0				375
2000	0				114
12-16 Jun 2006		3eS	0		30, 57, 456
2009	0				522
9 Jun 2011		3eS			456
14 Jul 2014	0	[c]	0	S(17)	94

[a] Blight [30] listed a record by these authors for 240 gull nests in 1972 but they only made visits in 1970 and 1973 and only counted gull nests in 1970.
[b] No record was listed,[427] but we assumed the site was surveyed and no birds were seen (see section *Identifying and Addressing Issues with the Historical Data*).
[c] Four oystercatchers were present on Vivian Island and/or Rebecca Rock.

Remarks: Foottit et al.[175] noted a well-used path around the periphery of the island which suggested high levels of human disturbance that may have accounted for the many empty cormorant and gull nests seen in 1970. They also speculated that First Nations people from the nearby Indian Reservation on Harwood Island (now Ahgykson Island) may visit the island to harvest eggs. Egging was reported in 1981.

Two adult Bald Eagles were roosting on the island in 2014. Signs of river otter were seen in 1970, 1974, 1978, 1980, and 1981, and one river

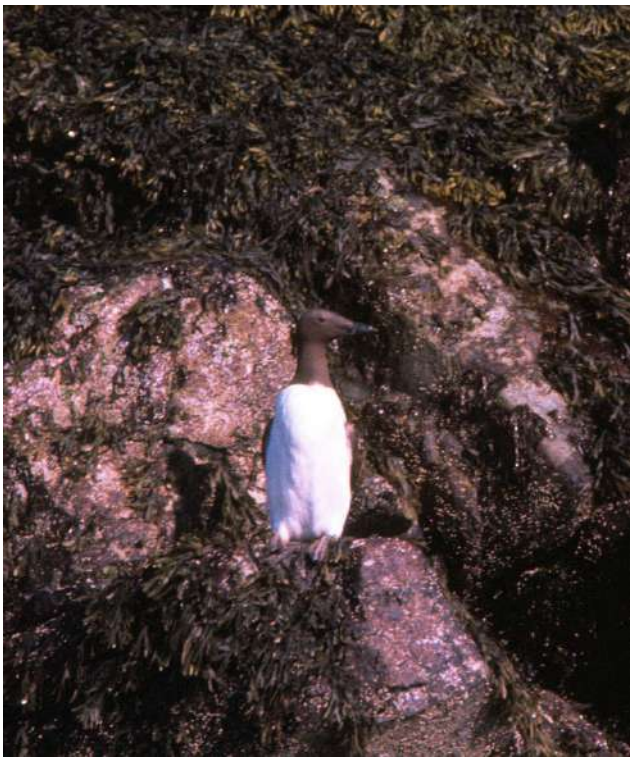


Figure 218. Common Murres have been sighted around Vivian Island during the breeding season, including this one perched on the island in 1974. No evidence of nesting has been seen. *Photo by R. Wayne Campbell, 2 July 1974.*

otter was seen in the water in 1981, but no evidence of predation on seabirds by river otters has been reported. A party of crows was present in both 1970 and 1973. Clyde Burton, who frequently visited the island from his home in Powell River, reported an increase of about 65% in crow numbers from 1974 (Figure 219) to 1975 and stated that crow numbers had tripled in 1976. In 1975, he found crows nesting within 10 feet of gull nests. Young crows appeared to be in poor shape and several dead young were found in 1976. Wayne Campbell also noted increasing numbers of crows in 1981 and speculated that crows may have been responsible for the many empty cormorant nests, although egg laying was still in progress. In addition to an increased nesting population, crows from off-island had started using the island as an evening roost, bringing more predation risk to nesting cormorants and gulls. Campbell observed crows regularly patrolling the cormorant cliffs and trying to steal eggs. Disturbance by boaters approaching too close and flushing cormorants likely exacerbated crow predation. The early survey date was thought to account for large numbers of empty cormorant and gull nests seen in 1978 (laying was just commencing and only 20 gull nests held full clutches), although some predation of eggs in gull nests was noted. One depredated gull egg was found in 1980 and six were seen in 1981 that had been taken by crows.

Figure 219. Large and increasing numbers of Northwestern Crows were reported frequenting Vivian Island from 1970 to 1981. Crows were observed trying to steal Pelagic Cormorant eggs in 1981. *Photo by R. Wayne Campbell, 2 July 1974.*

SG-120 REBECCA ROCK

Location: *49°48'49"N 124°39'35"W; 92 F/15.*
In Algerine Passage, northwest of Texada Island.

Description: *0.2 ha; 4 m high; Bare rock.*
This rock is bare except for a few traces of vegetation. Piles of driftwood were noted on the top of the rock in 1981. There is a light beacon on the summit (Figure 220).

Historical summary: Although this site has been listed with Vivian Island as a nesting site for Pelagic Cormorants,[101, 114, 421, 428] as far as we know Pelagic Cormorants have never been recorded nesting here.
Single pairs of Black Oystercatchers have been found nesting during several surveys (Table SG-120). Oystercatchers were nesting among driftlogs in 1974 (Figure 221). Observers estimated 6-8 pairs of Pigeon Guillemots nesting in 1978 but did not note how many birds were seen. A guillemot nest was found under driftlogs in 1981. Three adult Glaucous-winged Gulls were present in 1981 but none were recorded in other years and no evidence of nesting by gulls has ever been reported.

Remarks: A mink was on the rock in 1981. Two adult Bald Eagles were roosting on the rock in 2014.


Figure 220. Rebecca Rock is a low-lying, bare rock with piles of driftwood scattered about and a light beacon on top. *Photos by R. Wayne Campbell, 13 June 1981 (left) and 2 July 1974.*


Figure 221. Black Oystercatchers were nesting on Rebecca Rock amongst massive piles of driftwood in 1974. The nest with one egg is just visible at the bottom left of the left photo. The right photo is a close-up of the same nest. *Photos by R. Wayne Campbell, 2 July 1974.*

Table SG-120. Seabird nesting records for Rebecca Rock. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
2 Jul 1974	1	1eS(2)	70, 523
2 Jun 1978	1	6-8eS	523
13 Jun 1981	1	2e(4)	523
8-9 Jul 1987	0[a]	(0)	158, 427
12-16 Jun 2006	1eS		57
14 Jul 2014	[b]	(0)	94

[a] No record was listed [427] but we assumed the site was surveyed and no birds were seen (see section *Identifying and Addressing Issues with the Historical Data*).

[b] Four oystercatchers were present on Vivian Island and/or Rebecca Rock.

SG-130 MCRAE ISLET

Location: *49°44'37"N 124°17'33"W; 92 F/9.*
Northwest of Scotch Fir Point, north of the entrance to Jervis Inlet.

Description: *0.4 ha; 14 m high; Grassy rock.*
This granitic island is mostly bare rock, with a few small grassy patches (Figure 222).

Figure 222. McRae Islet is a long granitic rock with some patches of grass on higher sections. *Photos by R. Wayne Campbell, 13 June 1981.*

Historical summary: Rudi Drent confirmed Glaucous-winged Gulls nesting and noted no other seabirds nesting in 1969 (Table SG-130). Most gull chicks were large or already flying. Most gull nests were empty in 1978 but egg laying was just underway. Egg laying was also still in progress in 1981, but many nests were empty because eggs had been depredated. From the water in 2011, Butler counted 25 adults on nests and a total of about 110 adults present. While surveying cormorants from the water, Harry Carter noted about 200 adult Glaucous-winged Gulls and saw a few downy chicks on the islet in 2014. The few chicks visible and few adults apparently incubating suggested that many gulls had failed that year.[94] In 2021, Guy Monty from Parksville reported occupied nests and 42 gulls on 7 July, and Vancouver birder Bridget Spencer counted 110 gulls and noted recently fledged young on 22 July. Because we had no other nest counts for gulls since 1986, we used the most recent count of birds present in 2021 to estimate recent population size.

Pigeon Guillemots were first present and confirmed nesting in 1981. One nest with one egg was found in a rock crevice at the south end of the islet. Monty saw two guillemots and suspected nesting on 7 July 2021.

Pelagic Cormorants colonized the islet around 1987 and Double-crested Cormorants were first seen nesting in 2000. Pelagic Cormorant numbers generally increased from 1987 through 2014, but Double-crested Cormorants were found nesting only in 2000 and 2010 and had abandoned the colony in 2014. There were no eggs in Pelagic Cormorant nests counted in May 1990, but Breault found eggs on 5 and 24 June and observed a number of nests with eggs and young on 29 August. Butler saw four adults sitting on nests and 22 other adults in 2011. A maximum of 38 nests was counted in 2014. In 2021, Monty counted 44 Pelagic Cormorants present and reported birds on nests on 7 July, and Spencer counted 35 Pelagic Cormorants present and photographed birds on nests on 22 July. Spencer also saw four Double-crested Cormorants in 2021 but no evidence of nesting was reported.

Two Black Oystercatchers were seen flying by in 1978, one was present in 1981, and seven were seen from the water in 2014,[94] but no evidence of nesting was reported in any of those years (Figure 223). Monty saw six birds and confirmed nesting on 7 July 2021.

Figure 223. Flocks of non-breeding Black Oystercatchers often fly about and raise a ruckus around colony islands. *Photo by Paula Courteau, 23 June 2017.*

Table SG-130. Seabird nesting records for McRae Islet. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
30 Jul 1969	0	0		97	(0)	70, 523
31 May 1978		0	0	150[36]	(0)	523
13 Jun 1981		0	0	164[73]	2e(4)	523
Jun 1986				262		420
8-9 Jul 1987	0	15			(0)[a]	158, 428
26 May 1990		30				43
1991		30				517
1995	0					266
Jul-Sep 2000	1	7				114
2010	6	22				94, 522
10 Jun 2011		4+		25S+		456
14 Jul 2014	0	38		x	(0)	94, 101, 522
7 Jul 2021		x	3e	x	S(2)	524
22 Jul 2021		x		55e		524

[a] No record was listed [158] but we assumed the site was surveyed and no birds were seen (see section *Identifying and Addressing Issues with the Historical Data*).

Remarks: Crows or ravens were suspected of preying on gull eggs in 1981; 32 freshly broken eggs were found outside nests. A record wet spring that year may also have delayed nesting. Four Pelagic Cormorant eggs were found outside nests and were collected on 5 June, and 10 eggs were collected on 24 June 1990.[43] Eggs were sent to CWS for dioxin analysis. In August 1991, Clyde Burton observed a man and his son walking among the Pelagic Cormorant nests.[266] Cormorant chicks were scared from their nests and clustered in cracks and crevices near the nesting area.

SG-135 DESERTED BAY - DOCK

Location: *50°05'13"N 123°44'39"W; 92 J/4.*
On the east side of Jervis Inlet at the northeast end of Princess Royal Reach, east across the inlet from Patrick Point.

Description: *Dock.*
This is the site of a historical settlement (ts'unay) of the shíshálh people.

Historical summary: Ornithologists Bernard Schroeder, Guy Monty, and David Baird observed one pair of Glaucous-winged Gulls nesting on the dock in 2021 (Table SG-135).

Table SG-135. Seabird nesting records (nests) for Deserted Bay - Dock.

DATE	GWGU	SOURCE
14 Jun 2021	1	524

SG-140 "BLIND" ISLETS

Location: *49°42'53"N 124°13'03"W* (north islet)*; 92 F/9.*
At the mouth of Blind Bay between Hardy and Nelson islands, north of Kelly Island.

Description: *1.9 ha; 26 m high; Forested; Bare rock.*
The two larger islets of this group are forested on top and have extensive bare rocky areas on their west and south sides (Figure 224). Between the two main islets is a pair of low, bare rocks.

Figure 224. "Blind" Islets have smooth granitic bedrock shores. The two larger islets in this small group have forested tops. *Photo by Moira J.F. Lemon, 21 August 2022.*

Historical summary: Michael and Teresa Shepard in 1978 and Wayne Campbell in 1981 saw no birds and found no nests (Table SG-140). Single

Glaucous-winged Gull nests were found on two of the islets in 1986. One adult sitting on a nest was seen from the water in 2011.

Table SG-140. Seabird nesting records for "Blind" Islets. See Appendix 2 for codes.

DATE	GWGU	SOURCE
1 Jun 1978	0	523
13 Jun 1981	0	523
Jun 1986	2	420
10 Jun 2011	1S	456

SG-145 "COCKBURN" ISLETS

Location: *49°40'05"N 124°11'05"W* (south islet)*; 92 F/9.*
Southeast of Cape Cockburn on the west side of Nelson Island.

Description: *0.8 ha; 12 m high; Grassy rock.*
These two islets are predominantly bare rock, with some grassy patches in crevices where soil gathers on the larger, southwest islet (Figure 225).

Figure 225. Surveyors from the BCPM were surprised to find no seabirds nesting on "Cockburn" Islets in 1978 or 1981, as the islets are mostly bare rock with some grassy patches and seemed to be ideal nesting habitat for Glaucous-winged Gulls, Black Oystercatchers, and likely Pigeon Guillemots. Gulls and probably guillemots had colonized these rocks by 2011. *Photo by R. Wayne Campbell, 12 June 1981.*

Historical summary: This was a new nesting site discovered independently by Rob Butler in 2011 and Harry Carter in 2014 (Table SG-145). Michael and Teresa Shepard saw no birds in 1978 and Wayne Campbell searched the islets on foot and saw no evidence of nesting in 1981, although there were three Glaucous-winged Gulls on the island and 25 Glaucous-winged Gulls and two Pigeon Guillemots offshore. From the water in 2011, Butler saw 34 gulls on nests and counted a total of 132 adults present. Carter also surveyed the islets from the water in 2014. Carter noted about 300 adult Glaucous-winged Gulls on the island; five visible adults appeared to be incubating and several chicks were seen, but most adults were standing and did not appear to be successfully nesting. Fewer gulls were recorded in 2019; at least 60 adults standing on the rocks were seen from a distance. In 2022, eBirder John Field reported 180 gulls in the area, most of which were on the rocks, including numerous newly fledged young. Because we had no reliable nest counts for this gull colony, we used the most recent count of adults in 2019 to estimate the nesting population.

In 2014, Carter counted 16 Black Oystercatchers, seven on land and nine flying, but no evidence of nesting was seen. Pigeon Guillemots were also present in 2014 but no positive evidence of nesting was seen; one was roosting in the intertidal, five were on the water, and one was flying.

Table SG-145. Seabird nesting records for "Cockburn" Islets. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
1 Jun 1978	0	(0)	523
12 Jun 1981	0	(0)	523
10 Jun 2011	34+S		456
14 Jul 2014	5+	S(7)	94
7 Aug 2019	30eS		484
14 Aug 2022	x	(2)	524

SG-148 "TRAFALGAR" ROCK

Location: *49°39'05"N 124°06'59"W; 92 F/9.*
West of Fearney Point at the south end of Nelson Island, north of Nelson Rock. Called "unnamed island #9" by Vermeer and Devito.[420]

Description: *0.4 ha; 9 m high; Grassy rock.*
This islet is predominantly bare rock, with some grassy patches in crevices and a few pine trees on the highest portion along the north side.

Historical summary: Two adult Glaucous-winged Gulls were roosting and no evidence of nesting was found in 1981 (Table SG-148). One nest was found in 1986.

Table SG-148. Seabird nesting records (nests) for "Trafalgar" Rock.

DATE	GWGU	SOURCE
12 Jun 1981	0	523
Jun 1986	1	420

SG-150 FEARNEY POINT

Location: *49°38'53"N 124°05'22"W; 92 F/9.*
On the east side of Fearney Point at the southeast tip of Nelson Island.

Description: *Cliffs* (Figure 226).

Figure 226. The cliffs on the east side of Fearney Point at the southeast tip of Nelson Island are an important nesting site for Pigeon Guillemots. *Photo by R. Wayne Campbell, 12 June 1981.*

Historical summary: Three Pigeon Guillemots flew from crevices and another 13 were gathered on the water below the cliffs in 1981 (Table SG-150). One guillemot carrying a fish flew into a crevice on the bluffs in 2014. Liam Ragan from Victoria counted 60 Pigeon Guillemots and saw some entering crevices in the cliff face on 5 July 2020 (note that the location for this record on eBird [524] is entered as "Sakinaw Outflow"). On 12 July 2020, 42 birds were present and young could be heard calling from nests on the cliffs. In 2022, John Field counted birds on the water below the cliffs in May and could hear numerous young calling from nests in June and August. Field also made several counts in 2023, with a maximum of 102 birds seen on 26 April at 10:35 hr. He noted that no birds were visible when he returned 1.5 hr later. Maximum numbers seen in 2023 were similar to the maximum of 106 birds recorded in 2022. Adults were seen flying to and from nesting locations in 2023.

In 2022, Field also observed a Pelagic Cormorant sitting on a ledge about 5 meters above high water at the base of the cliffs. He could not see a nest but wondered if the bird might have been nesting.

Table SG-150. Seabird nesting records for Fearney Point. See Appendix 2 for codes.

DATE	PIGU	SOURCE
12 Jun 1981	8-10e(16)	523
19 Jul 2014	x(85)	524
5, 12 Jul 2020	x(60)	494, 524
8 May, 12 Jun, 14 Aug 2022	x(106)	524
26 Apr 2023	x(102)	524

Remarks: Two adult Bald Eagles were perched in a tree above the cliffs in 1981 and a Peregrine Falcon landed on a ledge high on the cliffs in 2022.

SG-160 HODGSON ISLANDS

Location: *49°38'15"N 124°05'29"W; 92 F/9.*
South of Fearney Point at the southeast tip of Nelson Island, at the mouth of Agamemnon Channel.

Description: *2.7 ha; 21 m high; Grassy rock.*
There are four islands in this group. The highest northern island has some lodgepole pines growing but most areas are bare rock with a few grassy patches (Figure 227).

Historical summary: No evidence of nesting was found on any of the islands in 1978 or 1981 (Table SG-160). One Black Oystercatcher was seen on a tidal reef and four Pigeon Guillemots were in the vicinity of the islands in 1978. A single Glaucous-winged Gull nest was found on one of the islands in 1986 and four adults sitting on nests were seen from the water in 2011. No gulls were seen on the islands when Moira Lemon sailed past late in the season in 2019. We considered the count from 2011 the most current estimate of the nesting population.

Black Oystercatchers were suspected nesting when the islands (listed as Hodgson Rock in Butler and Golumbia [57]) were surveyed from the water in 2006. An agitated oystercatcher was seen from the water and was suspected nesting in 2011 and 2014. In 2014, the oystercatcher was seen on the west island.

Figure 227. Hodgson Islands have extensive rocky and grassy areas that provide apparently ample nesting habitat for Glaucous-winged Gulls and Black Oystercatchers. However, few seabirds have been recorded nesting on the islands. A few trees grow on the top of the largest island. *Photo by Moira J.F. Lemon, 10 August 2018.*

Table SG-160. Seabird nesting records for Hodgson Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
1 Jun 1978	0	0	523
12 Jun 1981	0	0	523
Jun 1986		1	420
12-16 Jun 2006	3eS	0	30, 57, 456
10 Jun 2011	1S	4S	456
19 Jul 2014	1eS		524
7 Aug 2019		0[a]	484

[a] See text.

Remarks: A Bald Eagle was sitting on the west island disturbing the oystercatcher in 2014 and one eagle was recorded in 2019.

SG-170 DANIEL POINT

Location: *49°38'15"N 124°04'20"W; 92 F/9.*
North of Pender Harbour at mouth of Agamemnon Channel.

Description: *Cliffs.*

Historical summary: About 20 pairs of Pigeon Guillemots were reported nesting on the cliffs in 1959 (Table SG-170). Wayne Campbell saw two guillemots fly from crevices and another 14 on the water off the point in 1981. None were seen in 1987.

Table SG-170. Seabird nesting records for Daniel Point. See Appendix 2 for codes.

DATE	PIGU	SOURCE
1959	20e	144
12 Jun 1981	10-20e(16)	523
8-9 Jul 1987	(0)	158

SG-175 WHITESTONE ISLANDS

Location: *49°35'46"N 124°02'41"W; 92 F/9.*
South of the Francis Peninsula off Pender Harbour.

Description: *3.1 ha; 64 m high; Forested; Grassy rock.*
The two larger of these three islands are forested; the smaller northeast island is a low rock with some grassy patches (Figure 228).

Figure 228. Whitestone Islands are mostly forested. The northeast island is a small grassy rock. *Photo by R. Wayne Campbell, 12 June 1981.*

Historical summary: Three Glaucous-winged Gulls were present but there was no evidence of nesting by any species in 1981 (Table SG-175). The survey was conducted from the water in 2006 and one pair of Black Oystercatchers was reported nesting; the location of the pair was not specified but we suspect it was on the northeast rock.

Table SG-175. Seabird nesting records for Whitestone Islands. See Appendix 2 for codes.

DATE	BLOY	SOURCE
12 Jun 1981	0	523
12-16 Jun 2006	1eS	57

Remarks: One adult Bald Eagle was perched in a tree in 1981. There is a dwelling on the largest island.

SG-180 MOUAT ISLANDS

Location: *49°37'59"N 124°27'45"W; 92 F/9.*
Off the mid-west side of Texada Island, south of Harwood Point.

Description: *11 m high; Grassy rock.*
This chain of rocky islands stretches southeast to northwest over a distance of about 1.2 km. There is a larger south island with a rock off its southeast end, and a cluster of three rocky knobs plus a separated rock at the northwest end of the chain. Most areas are bare rock, with some patches of grass and low rose (*Rosa* spp.) and juniper (*Juniperus* spp.) bushes on higher sections.

Historical summary: No sign of nesting activity was seen in 1978 (Table SG-180); a few gulls were present in intertidal areas. In 1981, Black Oystercatcher nests with young were found on the large south island and on the cluster of three rocky knobs at the northwest end of the chain. Glaucous-winged Gulls were also nesting on the three rocky knobs. In 2006, Butler counted 45 adults sitting on nests; the count was made from the water. Also from the water in 2014, Carter counted 16 oystercatchers around the islands, 11 on land and five roosting in the intertidal. About 133 Glaucous-winged Gulls were present, 33 on the northwestern rocks, 23 of which were just roosting, and about 100 on the south island where several downy chicks were visible. We considered the nest count from 2006 the best recent estimate of population size for Glaucous-winged Gulls.

Pelagic Cormorants were first reported nesting in 2006 when Butler counted 14 nests with adults sitting on them. In 2009, there were two nests with young close to fledging on the northwestern rocks and five nests with young on the south island. About 10 other unoccupied nests presumably in use earlier in the year were present. Similar numbers of nests were seen in 2014 and 2015.

Table SG-180. Seabird nesting records for Mouat Islands. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	SOURCE
3 Jun 1978	0	0	0	523
23 Jun 1981	0	2[2]	16[11]	523
Jun 1986			35	420
12-16 Jun 2006	14	3eS	45S	57, 456
21 Sep 2009	17[7]			45
14 Jul 2014	17	[a]	x	94, 101
2015	13			522

[a] Sixteen oystercatchers were present.

Remarks: A crow's nest was found in a rose bush in 1981. Observers in 1981 also noted river otter runways through the rose bushes and saw a river otter on the islands (Figure 229). No sign of predation on nesting birds was seen.

Figure 229. A Northern River Otter was seen on Mouat Islands in 1981. There was no evidence of predation on nesting seabirds. *Photo by Paula Courteau.*

SG-190 "DAVIE" ISLET

Location: *49°36'01"N 124°23'47"W; 92 F/9.*
Mid-west side of Texada Island off Davie Bay.

Description: *3.3 ha; 42 m high; Grassy rock.*
This rocky islet has pockets of grasses and shrubs growing in hollows and crevices.

Historical summary: Wayne Campbell saw no nesting birds here in 1973 or 1981 (Table SG-190). Three pairs of Glaucous-winged Gulls were found nesting in 1986.

Table SG-190. Seabird nesting records (nests) for "Davie" Islet.

DATE	GWGU	SOURCE
23 Jun 1973	0	523
22 Jun 1981	0	523
Jun 1986	3	420

SG-200 DENMAN ISLAND - WEST DOCK

Location: *49°32'05"N 124°49'25"W; 92 F/10.*
Ferry dock on the mid-west side of Denman Island.

Description: *Pilings; Wharf.*

Historical summary: One Glaucous-winged Gull nest was seen on a piling in 1986 (Table SG-200). Mike Morrell from Denman Island remembers a single nest at the ferry dock sometime between 1987 and 1995, but does not recall seeing any sign of nesting birds there recently. No other birdwatchers have reported nesting at this well-visited site, which may also suggest an absence of nesting birds in recent years.

Table SG-200. Seabird nesting records (nests) for Denman Island - West Dock.

DATE	GWGU	SOURCE
Jun 1986	1	420
~1987-1995	1	491
~2021	0	491

Remarks: The ferry dock was rebuilt in October-November 2011.

SG-210 DENMAN ISLAND - EAST DOCK

Location: *49°29'38"N 124°42'32"W; 92 F/10.*
Ferry dock in Gravelley Bay on the east side of Denman Island.

Description: *Pilings; Wharf.*

Historical summary: One pair of Glaucous-winged Gulls was reported nesting on a piling in 1986 (Table SG-210). One pair was also suspected nesting on a piling in 2010, although a nest was not visible. Paula Courteau from Hornby Island worked on the ferry from 1999 to 2015 and in most years recorded a nest located above the starboard wing-wall of the ferry dock. Her most recent observations were in 2014 (Figure 230). That year she identified the female of the pair as a hybrid Glaucous-winged x Western Gull (*Larus glaucescens x occidentalis*); the male showed some signs of hybridization as well.

Figure 230. One pair of Glaucous-winged Gulls nested on the ferry dock in Gravelley Bay on the east side of Denman Island in most years between 1999 and 2015. In 2014, Paula Courteau identified the female of the pair as a hybrid Glaucous-winged x Western Gull. An adult was sitting on the nest on 9 July (top), and two partially feathered young were seen on 3 August 2014. *Photos by Paula Courteau.*

One pair of Pigeon Guillemots has been a constant presence around this dock in summer and has been suspected nesting under the dock over the years 2017-2021. A nest has not been seen but the guillemots have been heard whistling from the likely nest location. Dennis Forsyth from Denman Island reported pairing and territorial behaviour around the dock on 25 April 2021.

Table SG-210. Seabird nesting records for Denman Island - East Dock. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
Jun 1986	1		420
13-20 Jun 2010	1eS		30, 453
1999-2013	1		461
3 Aug 2014	1		461
2017-2021		1	461

Remarks: The ferry dock was completely rebuilt in October-November 2011. One pair of gulls resumed nesting in the same spot above the starboard wing-wall of the ferry dock after the dock was rebuilt.[461] The nesting pair of gulls hatched two or three chicks each year from 1999 to 2014, but nestlings frequently fell from the nest into the water and chick survival was low. During those years, Courteau and other ferry workers frequently rescued fallen chicks and placed them back in the nest.

SG-212 HORNBY ISLAND - WEST DOCK

Location: *49°30'42"N 124°42'16"W; 92 F/10.*
Ferry dock just south of Shingle Spit on the west side of Hornby Island.

Description: *Pilings; Wharf; Buildings.*

Historical summary: According to Hornby resident and ferry worker Paula Courteau, one pair of Glaucous-winged Gulls used to nest atop the ferry gantry (Table SG-212). She last observed gulls nesting around the year 2000 and noted that they definitely have not been nesting there since the dock was replaced in 2011.

A pair of Pigeon Guillemots (Figure 231) has nested under the storage building that is on the ferry dock each year since at least 1999. They made the switch to the new dock after the dock was rebuilt in 2011 and were still courting and flying in and out of the site as of 2020. A pair was present on 25 July 2021, but nesting was not confirmed that year.

Table SG-212. Seabird nesting records for Hornby Island - West Dock. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
1999-2020		1	461
2000	1		461
2012-2020	0		461
25 Jul 2021		S(2)	461

Figure 231. A pair of Pigeon Guillemots has regularly nested on the ferry dock on the west side of Hornby Island since at least 1999. They can frequently be seen on the water nearby in the spring (top) or delivering fish to chicks in the nest later in the season. *Photos by Paula Courteau, 12 May (pair) and 18 July 2012.*

Remarks: Mink prey on Rock Dove (*Columba livia*) nests located near the Pigeon Guillemot nest and may prey on guillemot chicks as well.[461] The ferry dock was rebuilt in October-November 2011.

A Biological Extravaganza

The biological equivalent of Mardi Gras, spawning by Pacific herring is the most spectacular annual wildlife event in the Salish Sea. And like New Orleans for Mardi Gras, in recent decades, the greatest spawning spectacle occurs around Hornby and Denman islands in the Baynes Sound area. Spawning is usually a conspicuous event: the water turns milky white from milt and the frenzied activity may attract thousands of marine mammals and seabirds to feed on both spawning fish and spawned eggs (Figure 232)*. Individuals of many species gather from near and far to join the feasting. Aggregations of 50,000 – 300,000 waterbirds, mostly gulls (Larus spp.), sea ducks, and other diving species, have been observed at annual herring spawning events in BC.*[83, 191]*The consumption of herring and herring eggs is intense, and the high energy content of eggs may provide substantial benefits by increasing survival rates and fuelling migration and reproduction for many species,*[22, 273, 414] *although nutrients from feeding on spawn did not appear to be directly utilized for migration or reproduction in some recent studies on sea ducks.*[6, 36, 37] *One thing that is certain is that a large proportion of the wintering population of several waterbird species aggregate at spawning sites in the Strait of Georgia and many individuals travel considerable distances to get there. For Harlequin Ducks* (Histrionicus histrionicus)*, for which use of herring spawn has been studied in detail, 55–87% of the midwinter population in the northern Strait of Georgia aggregated at spawning sites and some individuals travelled as far as 150 km to get there.*[340] *The event is obviously important to these birds.*

The consequences for marine birds and mammals of the spatial and temporal contraction of spawning and the periodic fisheries-related collapse of herring stocks that have occurred in the Strait of Georgia [199] *are unknown but likely include greater movement costs or a loss of access to this important resource for many individuals.*[439] *For Harlequin Ducks, the proportion of birds that moved to Hornby Island for spawn from other locations was strongly related to the distance birds had to travel.*[340] *Few birds travelled more than 80 km. Why only some birds came and how they knew to go to Hornby Island was not known, although birds which moulted on Hornby Island and then moved to other wintering areas were more likely to return there during spawning. The decline in proportions moving with increasing distance may also have resulted from differences in information among local populations. Birds from different foraging areas move to and from nocturnal roosts several kilometres offshore.*[333] *This may facilitate information transfer among adjacent populations, but the effectiveness of such information transfer likely decreases with increasing distance. Alternatively, the trade-off between the costs of moving and the benefits of being at spawning events may vary among individuals.*[340]

The direct nutritional benefits of feeding on spawn have received much attention.[6, 36, 37] *Possible indirect benefits have received less attention but may also be important and may help explain different decisions made by individuals about whether or not to move to herring spawning events. Just as there is more than feasting that attracts visitors to Mardi Gras, there is evidence that social festivities may be part of the attraction for wildlife species at herring spawn.*

Indirect benefits of feeding on herring spawn have been investigated mainly in Harlequin Ducks. During the short period of about three to four weeks that herring spawn is available to predators like Harlequin Ducks, it provides a superabundant food that individuals can feed on with little effort (Figure 233)*. The influx of herring spawn relaxes constraints on foraging time, and Harlequin Ducks spend less than a third as much time foraging when spawn is available than during the months before and after or at the same time in locations where spawn is not available.*[331] *Surf* (Melanitta perspicillata) *and White-winged Scoters* (M. fusca) *also reduce their foraging time by about 50% when they are feeding on spawn.*[247] *That gives individuals time to allocate to other activities, like courtship and pairing.*

Harlequin Ducks form monogamous, long-term pair bonds, invest a considerable amount of time into choosing a mate, and, like many other waterfowl, form pair bonds during winter.[330, 331] *Harlequin Ducks typically have a dispersed wintering distribution and the costs of mate sampling can be high because of the distances between unpaired birds* (Figure 234)*, especially because most birds are already paired. Studies of time budgets, spacing behaviour, and movement patterns in Harlequin Ducks suggested that unpaired birds in particular derive important indirect benefits from feeding on herring spawn.*[329, 331] *Aggregations of thousands of Harlequin Ducks around Hornby Island during herring spawn reduce the sampling costs for individuals searching for mates. Unpaired birds at herring spawn allocated much of their spare time to courtship and moving, likely in search of potential mates, and were more likely to come to herring spawning sites than paired birds* (Figure 235)*. Proportion of females that were unpaired was higher at herring spawning sites than elsewhere during the first but not the second two-week interval that spawn was available, and male bias in the sex ratio was higher at spawning sites throughout the time spawn was available. These patterns would be expected if unpaired birds were preferentially moving to spawning sites at the start of the spawning period and then forming pair bonds while they were there. The greater proportions of unpaired than paired birds moving to spawn suggests that unpaired birds were willing to incur higher movement costs to gain indirect benefits associated with pairing activities. One telling observation is that the farthest known travel distance of 150 km by a Harlequin Duck moving to a spawning site* [340]

Figure 232. The spawning of Pacific herring that occurs in most years around Hornby and Denman islands is a spectacular annual wildlife event that attracts thousands of marine mammals and seabirds to feed on both spawning fish and spawned eggs. Hornby Island resident Paula Courteau has eloquently captured the intensity of the spectacle on camera. Photos here (previous page and this page, top to bottom) show: **1)** the waters of Hornby Island turn milky as herring spawn along the shore; **2)** a feeding frenzy of Glaucous-winged and California gulls over a school of spawning herring; **3)** gulls diving on a boil of herring; **4)** Bald Eagles gathering in the hundreds near the spawning grounds; **5)** Bald Eagles harvesting herring; and **6)** large rafts of Surf Scoters and other waterfowl aggregated during herring spawn. *Photos by Paula Courteau.*

was performed by a divorcing, >6-year-old female, that had been paired for at least two years prior to moving, and that left her previous mate behind in a small wintering population of <100 birds where there would have been few alternate mate choices.[329]

Although most Harlequin Duck females already have established pair bonds, 50% of second-year females forming their first pair bonds and a small proportion of older, re-pairing females formed pair bonds during or after the herring spawning period.[329] *Because pair bonds are long-term, herring spawn may thus provide important indirect benefits that increase the fitness of over 50% of the breeding population through its effects on individual mate choice opportunities and decisions. Loss of access to herring spawn due to changes in the distribution of spawning sites* [199] *may thus impact both the nutritional state and reproductive performance of affected individuals.*

Figure 233. Herring spawn on *Fucus* spp. in the intertidal zone along the shore of Hornby Island. *Photo by Paula Courteau, 16 March 2017.*

Figure 234. Harlequin Ducks are dispersed in small groups during winter and most females in those groups have established long-term pair bonds. Unpaired males thus may have difficulty locating and courting potential partners and may remain unpaired for several years. *Photo by Paula Courteau, 8 February 2020.*

Figure 235. Flocks of up to 5,000 Harlequin Ducks aggregate at Hornby Island when Pacific herring spawn in March. Unpaired birds are more likely than paired birds to come to spawning sites and allocate much of their spare time to courtship and searching for potential mates. *Photos by Paula Courteau, 20 March 2019 (left) and 6 March 2016.*

SG-220 ST. JOHN POINT

Location: *49°31'00"N 124°35'10"W; 92 F/10.*
East end of Hornby Island. Colony includes all of Helliwell Park and the bluffs extending west into Tribune Bay. The colony also includes the gravelly and rocky reefs that are tidally connected to the eastern shore of Hornby Island, northwest of Flora Islet.

Description: *Cliffs; Bare rock.*
Cliffs of sandstone and conglomerate rock extend west from St. John Point into Tribune Bay (Figure 236). Erosion on the cliff faces has created ledges, pockets, and crevices where birds nest. The area was donated to the province by John Helliwell and established as Helliwell Provincial Park in 1966.

Historical summary: Pigeon Guillemots have been recorded nesting here for 100 years. Glaucous-winged Gulls and Pelagic Cormorants colonized this site likely during the 1930s and 1950s, respectively. Recently, breeding populations of all nesting species have declined or disappeared.

Pearse first visited the island in 1922 and estimated 100 pairs of Pigeon Guillemots nesting on the cliffs on the Tribune Bay side of St. John Point (Table SG-220). Reverend John Stainer reported few guillemots nesting in 1952, 1953, and 1957, and Pearse noted a decline in guillemot numbers between 1922 and 1955, similar to what he observed on Mitlenatch Island. Larger numbers were seen in 1974. Four nests with eggs were located in 1974: one in a crevice on the rock face at St. John Point; and three under boulders along the base of the cliffs running into Tribune Bay where 53 of the 54 birds seen were counted. Dianna Thompson in 1977 saw four guillemots carry fish into nest sites located at

Figure 236. At St. John Point on Hornby Island, conglomerate bluffs extend to the east around the point (top). Pelagic Cormorants and Glaucous-winged Gulls have historically nested on bluffs in those areas but none have been seen nesting in recent years. Sandstone bluffs on the west side of the point (bottom) provide nesting habitat for Pigeon Guillemots. *Photos by Paula Courteau, 6 May 2014 (top) and R. Wayne Campbell, 4 July 1974.*

the tops of the cliff between the roots of arbutus trees. Only two birds were present on the region-wide surveys in the 1980s. Greater numbers of guillemots have been recorded recently; Courteau has regularly seen 20-30 birds along the Tribune Bay cliffs most summers since 2013 (Figure 237). She has seen nesting activity at two main locations in this area: one approximately 300 m from Big Tribune beach; and a second, larger one, near the southeast end of that cliff face towards St. John Point. Birds were recorded flying into crevices in those two areas in 2016. In 2017, adults were seen delivering food to nests on the cliffs nearer to Tribune Bay. In 2021, Courteau counted 18-20 guillemots around the cliffs close to St. John Point on 2 June and saw four birds carrying fish, two of which flew into crevices there, on 6 July. Courteau saw no birds along the cliffs closer to Tribune Bay and that area appeared inactive on 6 July.

Figure 237. Pigeon Guillemots have been recorded nesting at the St. John Point colony for 100 years. They are commonly seen on the water or roosting on the rocks along the base of the cliffs in Tribune Bay on the east side of the point. *Photos by Paula Courteau, 25 March 2016 (top) and 2 June 2021.*

Glaucous-winged Gulls were first recorded nesting in 1936. Pearse did not remember them nesting in the 1920s.[493] G.E. Seon from Hornby Island reported gulls nesting in 1940-1946. Pearse witnessed a decline in gull numbers from about 30 pairs in the 1930s to only one pair in 1955.[303] He speculated that gulls may have been displaced by Pelagic Cormorants; gulls nested on the cliffs in the 1930s before Pelagic Cormorants were present, but only one gull nest located on the exposed flat ground at the top of the cliffs was found in 1955. Later observations did not support this idea – gull nests were situated on cliff ledges amongst the cormorants in 1974 (Figure 238), 1977, 1980, and 1981 – although numbers have never again approached the 25-30 pairs observed nesting in the 1930s. In 1960, Seon counted 70 gulls on the cliffs but could not see any nests from the water. Contents were determined in three nests in 1974 from a cliff-top vantage: one empty, one with three eggs, and one with two young. Six pairs were suspected nesting during the survey for gulls in 1986. Courteau reports that no gulls have nested in the years 2013-2020.

Figure 238. In 1974, a few pairs of Glaucous-winged Gulls were nesting in cliff cavities in the same areas that Pelagic Cormorants were nesting at St. John Point. In this photo, gulls are visible on the upper portion of the cliffs. *Photo by R. Wayne Campbell, 4 July 1974.*

Table SG-220. Seabird nesting records for St. John Point. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
1922				100e	303
Aug 1929				plenty	303
8 Jul 1936			25e	x	303, 493, 523
25 Jun 1937			25+		493, 523
1938	0		30e		303
1940-46			x		144
1952-53				x	144
7 Sep 1954	S				303
10 May 1955				(0)	303
7 Jun 1955	50e		1	(<10)	303, 144
23 Aug 1957	30+			x	144
10 Jul 1960	x		S		144
21 May 1961	25				523
4 Jul 1974	9		5	25e(54)	70, 523
Jul 1977	14-20e		2[2]	4e(17)	444, 523
4 Jun 1978	36				523
28 Jul 1979	59+		4+	7+	523
18 Jun 1980	103		2		523
1 Jun 1981	99		3-7e	S(2)	523
22 May 1983	100e				523
29 May-13 Jun 1983	127				421
Jun 1986			6		420
8-9 Jul 1987	101			S(2)	158, 428
May-Jul 1989	177				375
31 Jul 1990	124				43
2000	0				114
2007	0				522
2008	0				522
2013	0	1			461, 522
2013-2022	0	1-2	0	x(20-30)	461
2014	0				522
29 Jun 2014		2eS			524
2015	0				522
31 May 2016	0		0	x(20)	461
28 Jun 2016	0		0	x2	461
21 May 2017		2eS			524
15 Jul 2017				x(4)	524
14, 27 Jul 2020	0	1	0		461
2 Jun, 6 Jul 2021	0	2eS	0	x2(18-20)	461
16 Jul 2022		2eS			461
19 Jun 2023		1			524

Pearse first reported nesting by Pelagic Cormorants in 1954 when he saw juvenile birds on the sea below the cliffs on the Tribune Bay side of St. John Point. He had seen none nesting in 1938. About 50 pairs were estimated nesting in 1955. Reverend John Stainer inspected a portion of the colony and observed adults feeding young in about 30 nests located on ledges in 1957. About 400-500 Pelagic Cormorants on the cliff face were counted from the water by Seon and others on 10 July 1960. Nests could not be seen but birds were visible in cavities in the cliffs. Numbers actually nesting were not estimated. Three nests with eggs were inspected later from above on 21 July 1960. Few cormorants were nesting in 1974, but numbers increased again after that. In 1974, nests were again located in cavities and could not be inspected, but Ken Kennedy and Wayne Campbell thought that they

could see all nest sites and felt that nine was an accurate count. One or two adults were present at all nest sites. Michael Wolfe and Deanna Thompson managed to determine the contents of nine nests located on cliff ledges in 1977. All nine nests held eggs or young on 9, 10, 23, and 25 July. Wolfe estimated a total of 14 nests but Thompson estimated 20 nests for that year. Thompson estimated nests again in 1979 and could see young in five nests. In 1978 and since 1979, all nest counts have been made from the water. Peak numbers of Pelagic Cormorants occurred during the 1980s to 1990 and then by 2000 the colony was abandoned and apparently has not been used since. Chatwin et al. [114] speculated that cormorants may have moved to Mitlenatch Island but populations on Mitlenatch Island were in decline during this period. Local resident Paula Courteau has seen no cormorants nesting at St. John Point since she started observations in 2012. However, the site is an important night roost: at dusk, much of the year, Courteau has seen dozens, up to a few hundreds of cormorants, mostly Pelagic Cormorants, fly in to these cliffs. Some Brandt's and Double-crested cormorants also use the site (Figure 239). A few cormorants roost there in the daytime too.

The locations of Pelagic Cormorant nests may have changed over the years that they were nesting. The few nests seen in 1974 were scattered in one

Figure 239. All three cormorant species that occur in the BC Salish Sea are commonly seen roosting on the cliffs at St. John Point and elsewhere around the island, such as here on the dock in Ford's Cove. From left to right, in close association, are: individual Pelagic, Brandt's, and Double-crested cormorants. The lovely breeding plumes on the Brandt's Cormorant are well displayed. *Photo by Paula Courteau, 9 April 2018.*

section of the cliffs (Figure 240). In 1989, Sullivan stated that the colony had moved from St. John Point to the southeast portion of Hornby Island, but we were not sure where he meant as St John Point is at the southeast end of Hornby Island. Perhaps he meant that they had moved more to the east side of the point. In 1990, Breault noted that nests were clustered in five areas in Helliwell Park, which covers the St. John Point area. Photos from 1981 show nests located in at least seven locations along the cliffs on the east and south sides of the point (Figure 241).

Figure 240. This photo shows the location of Pelagic Cormorant nests on St. John Point in 1974. This area was also used in 1981 (see Figure 241). *Photo by R. Wayne Campbell, 4 July 1974.*

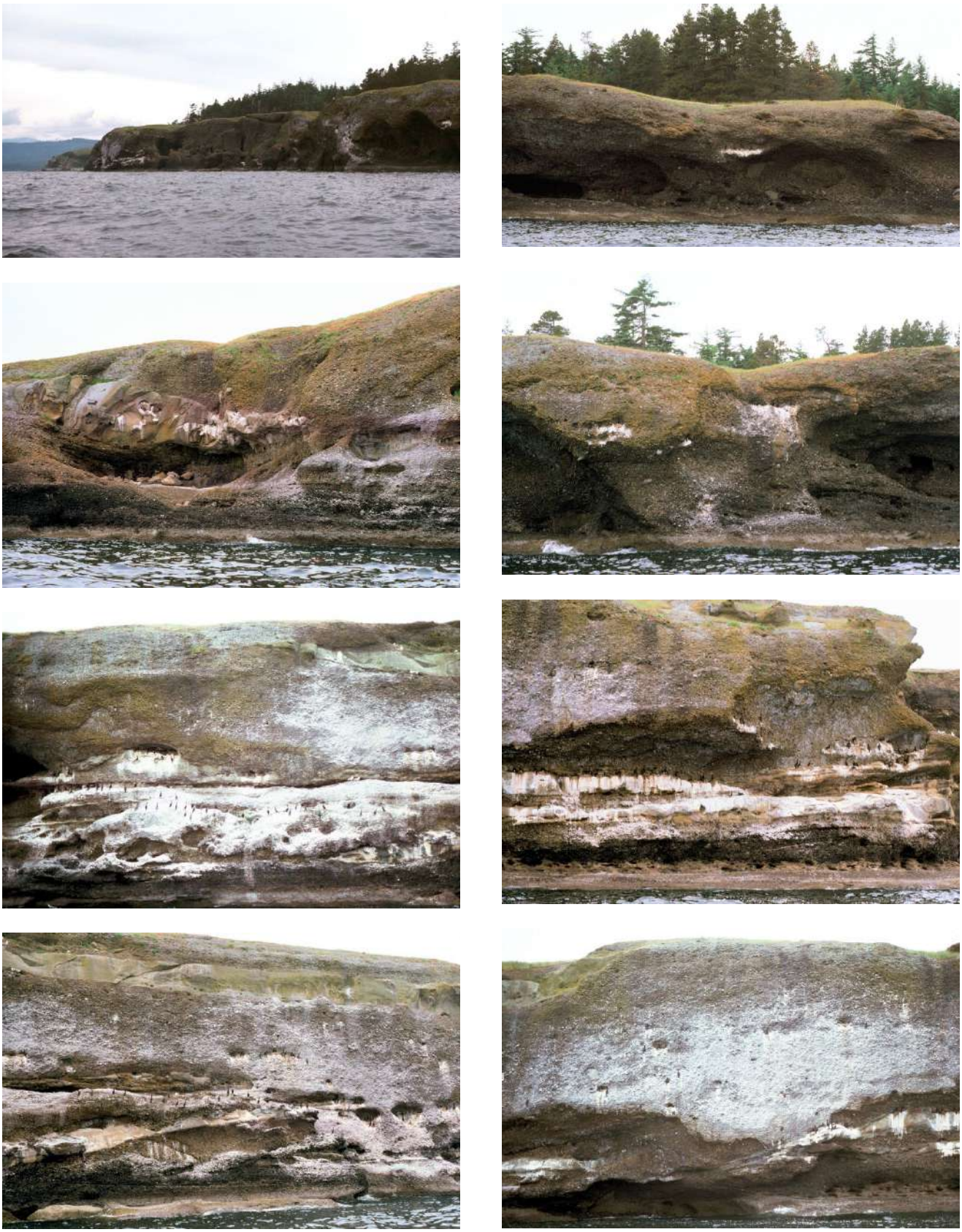


Figure 241. This series of photos show the locations of Pelagic Cormorant nests on the cliffs around St. John Point in 1981. The photos (clockwise from top left) are ordered east to west, with the first photo showing an overview of the cliffs seen from the east. *Photos by R. Wayne Campbell, 1 June 1981.*

Carter [97] speculated that a set of eggs [538a] identified as Double-crested Cormorant and collected on a cliff "south of Comox" on 18 June 1896 for Fannin may have originated on Hornby Island. Carter felt that the species identity was correct because egg sizes corresponded with those of Double-crested Cormorants and fell outside the range for Pelagic Cormorant eggs. In fact, only the length of one of the four eggs was greater than the published range for Pelagic Cormorant eggs; the lengths of three eggs and the widths of all eggs were within the range of egg sizes for that species.[213] The nest was described as seaweed on a cliff ledge, which is more typical of Pelagic than Double-crested cormorant nests. Because of the uncertainty surrounding this record, we have not accepted it as a confirmed breeding record for Double-crested Cormorants. There are no definite records of nesting by Double-crested Cormorants at this site. The 1896 record may indicate nesting by Pelagic or possibly even Brandt's cormorants, but again, due to the uncertainty about the record, we have not listed it as a breeding record in Table SG-220.

Courteau has regularly seen Black Oystercatchers nesting on rocks along the eastern shore of Helliwell Park since 2013. We have no evidence that those areas were checked for nests during previous surveys and thus do not know whether this was a new nesting site at that time. Courteau relayed an observation by local fisherman Grant Scott of a nest with eggs located on the north side of the gravelly reef northwest of Flora Islet in 2013. Two very agitated pairs were observed and suspected nesting in 2014 and three birds were seen engaged in courtship in this area in 2017. Downy oystercatcher chicks were seen on the north side of the gravelly reef on 14 and 27 July and also later in August 2020 (Figure 242). Two pairs were present on 6 July 2021 (one bird may have been brooding chicks) and on 16 July 2022. Daniel Dönnecke reported birds sitting on a nest on the east side of the point on 19 June 2023.

Remarks: Pearse had no explanation for the apparent decline in Pigeon Guillemots from 1922 to 1955.[303] Reverend Stainer observed broken guillemot eggshells in 1952, 1953, and 1957.[144] Depredated cormorant eggshells were found in the field above the cliffs in 1960. Crows were present and suspected responsible. Peregrine Falcons have recently been reported nesting on the cliffs (Figure 243) along the north shore of Tribune Bay near the areas used for nesting by Pigeon Guillemots.[461] The eyrie held two downy eyas on 2 June 2021.

Figure 242. Adult and still downy Black Oystercatcher chick feeding on the shore of Hornby Island near St. John Point in late August 2020. *Photo by Paula Courteau, 27 August 2020.*

Figure 243. A Peregrine Falcon eyrie has been located in a cavity in the sandstone cliffs along the north shore of Tribune Bay on the west side of St. John Point in recent years. *Photo by Paula Courteau, 21 June 2015.*

Hornby Island, and Helliwell Park in particular, are popular tourist destinations and receive large numbers of visitors every year (Figure 244). The site is also an attractive boating area. Whether human disturbance has contributed to seabird declines is unknown. Oystercatchers seen in 2014 were disturbed and very alarmed by hikers accessing islets at very low tide. Courteau reports that the area along the Tribune Bay side of St. John Point has seen increasing activity from boaters since 2012. In the summer of 2020, she was distressed to see several overnight boaters using that shore as a toileting area for their dogs. In 2021, she reported many boats anchored near the Tribune Bay cliffs where she had seen Pigeon Guillemots nesting in previous years.

Courteau was intrigued to find Glaucous-winged Gulls harvesting arbutus berries on Hornby Island in the fall of 2018 (Figure 245).

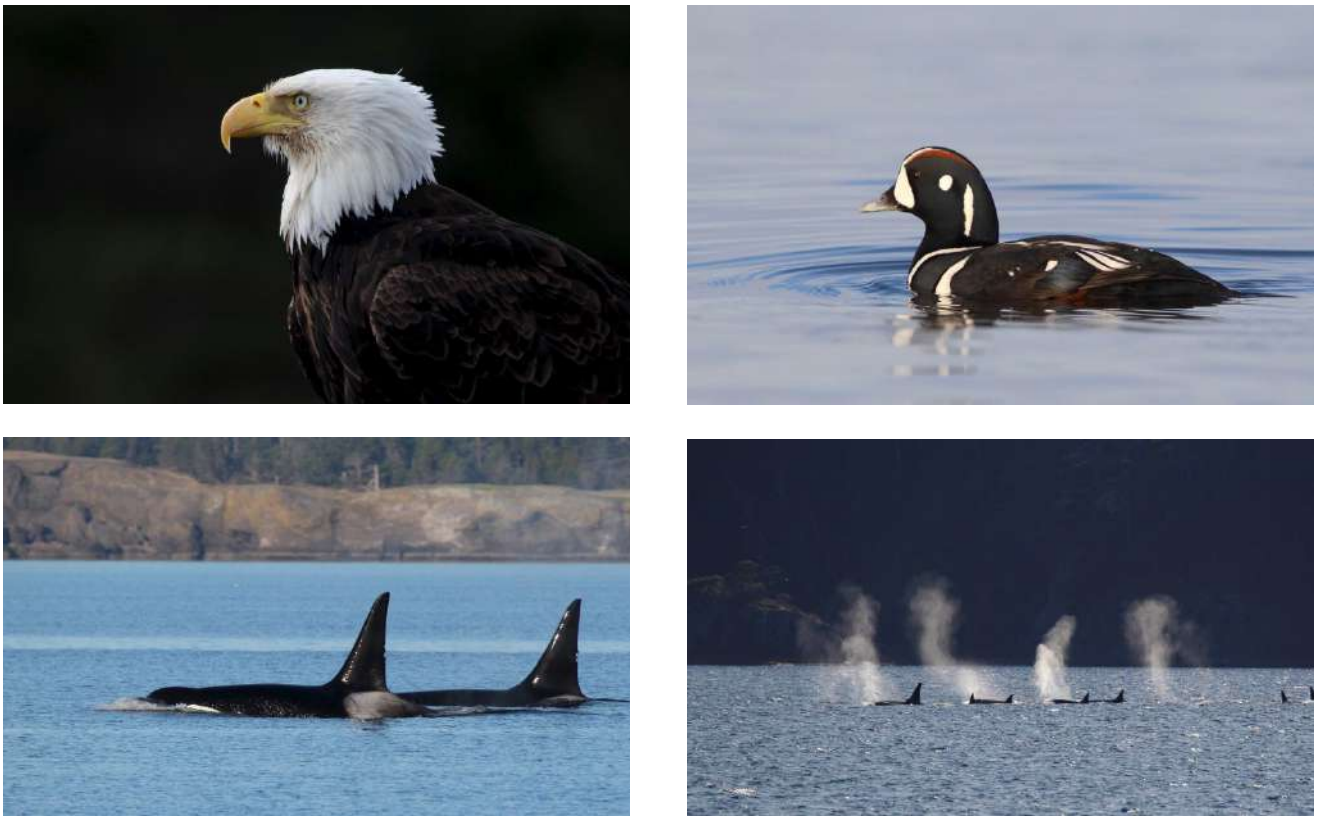


Figure 244. The St. John Point area in Helliwell Park on Hornby Island attracts numerous visitors that enjoy the scenic walks and the potential views of many wildlife species including Bald Eagles and Harlequin Ducks along the shore and Killer Whales (*Orcinus orca*) in the nearby waters. *Photos by Paula Courteau.*

Figure 245. Hornby Island resident Paula Courteau observed Glaucous-winged Gulls harvesting an unusual food item in the fall of 2018. Several gulls were seen eating arbutus berries. *Photo by Paula Courteau, 13 November 2018.*

SG-221 FLORA ISLET

Location: *49°31'03"N 124°34'38"W; 92 F/10.*
Just off St. John Point on the east end of Hornby Island. The separated reef just northwest of Flora Islet is tidally connected to Hornby Island and is considered part of the St. John Point colony.

Description: *3.3 ha; 7 m high; Grassy rock.*
Flora Islet is vegetated with grasses, forbs, and patches of shrubs. There is a navigational beacon on the top of the islet (Figure 246). The islet became part of Helliwell Provincial Park in 1997 when it was acquired through the Pacific Heritage Marine Legacy.

Historical summary: No seabirds were found nesting during several visits by BCPM personnel in the 1970s and 1980s (Table SG-221). Paula Courteau from Hornby Island has been monitoring the islet since fall 2012. She has seen no sign of nesting Glaucous-winged Gulls, but reports that Black Oystercatchers have regularly nested in various areas of the islet since 2013. In 2015, one downy chick was seen on the northwest shore of the islet (Figure 247) and a second nest with an incubating or brooding oystercatcher was observed on the south side of the islet. In 2021, a photo of a nest with one egg was taken by a local fisher on 20 June and a pair was seen there on 6 July. In 2022, from the water, Courteau observed one adult at a

likely nest site on 1 July and saw an adult with three small chicks on the beach near that location on 16 July (Figure 248). A second pair was suspected nesting on the south side of the islet, but no chicks were seen. One adult with a large young was seen on the north side of the islet in 2023.

Figure 246. Flora Island is a low grassy islet with beach and rocky shorelines. It sits off the southeast end of Hornby Island, off St. John Point. Ken Kennedy is scanning the grassy top of the island in the right photo. *Photos by R. Wayne Campbell, 4 July 1974.*

Figure 247. Young Black Oystercatcher chick with adult female (top; note the adult's eye fleck) and hiding after being disturbed on the shore of Flora Island in 2015. *Photos by Paula Courteau, 28 June 2015.*

Table SG-221. Seabird nesting records for Flora Islet. See Appendix 2 for codes.

DATE	BLOY	SOURCE
4 Jul 1974	0	523
4 Jun 1978	0	523
18 Jun 1980	0	523
2013-2022	1-2eS	461
28 Jun 2015	2	461
20 Jun 2021	1	461
1, 16 Jul 2022	2e	461
4 Aug 2023	1	461

Figure 248. Black Oystercatcher sitting on a likely nest located amongst Oregon gumweed (*Grindelia stricta*) on the northwest side of Flora Islet on 1 July (top) and adult seen with three small chicks on the beach near that area on 16 July 2022. *Photos by Paula Courteau.*

Remarks: A river otter was seen on the islet in 1974. The site is a popular dive location that attracts scuba divers and marine biologists from around the world. Canada Geese regularly nest in various areas of Flora Islet (Figure 249).[461] Steller (*Eumetopias jubatus*) and California (*Zalophus californianus*) sea lions commonly haul out on the shore during the winter (Figure 250).

Figure 249. Canada Geese regularly nest on Flora Island. *Photo by Paula Courteau, 10 May 2014.*

Figure 250. Steller Sea Lions hauled out on the shore of Flora Island. Both Steller and California sea lions and occasionally Elephant Seals (*Mirounga angustirostris*) frequent these areas during winter. *Photo by Paula Courteau, 10 November 2012.*

SG-230 NORRIS ROCKS

Location: *49°29'01"N 124°38'51"W; 92 F/7.*
Off the south end of Hornby Island, east of the mouth of Lambert Channel.

Description: *0.5 ha; 2 m high; Bare rock.*
This low flat rock has scant vegetation (Figure 251). Most observers have described piles of driftwood scattered across the island from winter storms.

Historical summary: One pair of Black Oystercatchers has been found nesting in most years (Table SG-230); three pairs nested in 2021. An agitated pair was present in 1968 but no nest was found. Nesting was confirmed in 1974 when a nest with two eggs and a recently hatched chick was found built among a pile of driftwood (Figure 252). Courteau has observed a pair with chicks each year

since 2016 (Figure 253) and suspected a second pair nesting in 2018. In 2021, Courteau observed two pairs with one chick each and a third pair with three chicks on 19 July; the same birds were seen again on 27 July. In 2022, eBird contributors Suzanne Beauchesne, John M. Cooper, and B. Haley reported one adult with two young and a second pair of adults with one young. We used the three pairs observed by Courteau in 2021 as the current estimate for the number of oystercatchers nesting on Norris Rocks.

Figure 251. Norris Rocks is a low, conglomerate rock with little vegetation. Old and recent drift logs are often scattered over the rocks. In the top right photo, the rocks are shrouded in smoke from recent wildfires. *Photos by R. Wayne Campbell, 4 July 1974 (top and bottom left) and Paula Courteau, 5 July 2015 (top right) and 13 August 2019.*

Figure 252. A pair of Black Oystercatchers was nesting amongst the piles of driftwood on Norris Rocks in 1974. Their nest with two eggs and a recently hatched chick, shown in the left photo, is also visible at the bottom left corner of the right photo. *Photos by R. Wayne Campbell, 4 July 1974.*

Numbers of Glaucous-winged Gulls nesting increased dramatically after they were first documented in 1968. Drent estimated 20 pairs of gulls present in 1968 (note that Blight [30] gives a record of 20 gull nests for 1960 by Drent, but Drent's visit was in 1968 and not 1960) but indicated that the 17 nests he found were a complete count of the number of nests in the colony. Nests were located amongst the driftwood. Almost all nests had associated young that were hiding and difficult to find in the driftwood outside the nests. Drent noted two empty nests. Ken Kennedy estimated gull

numbers from the water in 1975. Most gull nests were empty in 1977 and 1978. In 1978, Michael Shepard noted that about 90 pairs were defending territories but only 60% of them had nests, and called the colony a "very strange islet." In contrast, almost all nests held eggs in 1980. Numbers peaked at 297 nests in 1986. Fewer nested in 2010 when the last complete nest count was conducted. While kayaking around the rocks, Courteau has seen nests (Figure 254) and young (Figure 255) each year since 2013. She could see 26 chicks on 27 July 2021 and saw 12 adults on nests in June 2022. Nests with young were observed in August 2022.

Figure 253. At least one pair of Black Oystercatchers regularly nests on Norris Rocks. *Photo by Paula Courteau, 23 June 2017.*

Table SG-230. Seabird nesting records for Norris Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
9 Jul 1968	1eS	17[15]	523
4 Jul 1974	1	85[81]	70, 523
3 Jul 1975		170eS	523
27 Jun 1977	1eS	104[27]	523
4 Jun 1978	1	58[22]	523
18 Jun 1980	1	145[144]	523
1 Jun 1981	1	111[48]	523
Jun 1986		287	420
16 Jun 2010	1	185[111]	30, 453
5 Jul 2015		x	461
26 Jul 2016	1		461
2013-2020		x	461
2016-2017	1		461
23 Jul 2018	2e		461
2019-2020	1		461
19, 27 Jul 2021	3	x	461
7 Jun 2022		x	461
12 Aug 2022	2	x	524

Figure 254. Glaucous-winged Gulls nesting on Norris Rocks and other bare rocks often use seaweeds to construct their nests. The nest in the bottom photo is built of a large pile of seaweeds with a grass lining on top. *Photos by Paula Courteau, 5 July 2015 (top) and 7 June 2022, and R. Wayne Campbell, 4 July 1974 (bottom).*

Figure 255. When colony islands are viewed only from the water, the sighting of chicks, like these Glaucous-winged Gull chicks seen on Norris Rocks in 2018, confirms breeding and provides useful information on breeding chronology. *Photos by Paula Courteau, 23 July (top) and 4 August 2018.*

Caspian Terns have been seen roosting on the island but no sign of nesting has been reported (Figure 256).

Remarks: Gulls were particularly aggressive to surveyors in 1974, more so than at other colonies. Michael Shepard stated that the colony had been "almost certainly egged" to account for a majority of empty but attended nests in 1977. One depredated gull egg was found in 1980.

One adult Bald Eagle was perched on the island in 1974. From her observations since 2012, Courteau noted that eagles are frequent visitors to the rocks (Figure 257); there is an eagle nest at each end of Olsen Farm, across the water to the north on Hornby Island.

Figure 256. A small group of Caspian Terns was roosting on Norris Rocks in 2017. Caspian Terns have frequently been sighted around islands like Norris and Mitlenatch islands, but until 2023, when they were found nesting on Centre Islet (see SG-017), there had been no evidence of coastal nesting in BC except in the Vancouver area. *Photo by Paula Courteau, 23 June 2017.*

Figure 257. Paula Courteau has frequently seen Bald Eagles roosting and sometimes feeding on Norris Rocks in recent years. *Photos by Paula Courteau, 25 February 2018 (top) and 23 May 2020.*

SG-239 BOYLE POINT

Location: *49°28'42"N 124°41'07"W; 92 F/7.*
Southeast end of Denman Island. Colony includes cliffs and rocky shoreline in the vicinity of the point that lie within Boyle Point Provincial Park.

Description: *Cliffs; Rocky shoreline.*
The area is part of Boyle Point Provincial Park, established in 1989.

Historical summary: Mike Morrell saw an adult Pigeon Guillemot carrying fish into a nest located among large boulders and rocky debris below the Eagle Rock viewpoint along the trails through Boyle Point Provincial Park in about 2019 (Table SG-239). The viewpoint is located about 430 m north of Boyle Point. A nestling could be heard calling from the nest.

Table SG-239. Seabird nesting records (nests) for Boyle Point.

DATE	PIGU	SOURCE
~2019	1	491

SG-240 CHROME ISLAND

Location: *49°28'19"N 124°41'04"W; 92 F/7.*
Off Boyle Point at the southeast tip of Denman Island. Formerly known as Yellow Rock and Yellow Island.

Description: *0.7 ha; 15 m high; Cliffs.*
Chrome Island has steep rocky sides. The top of the island has been modified to build the lighthouse and dwellings (Figure 258). Between the buildings is mostly flat lawn, with a few shrubs and small trees on the east side. The first lighthouse was built on the island in 1890 and has since been replaced. The current light was built in 1989 and the station is still manned. The island is a significant and protected archeological site with petroglyphs, human bones, and a shell midden.

Historical summary: Note that there has been some confusion about early records for "Yellow Island" by Sprot [369] and Munro and Cowan.[274] Those records refer to Imrie Island in Haro Strait and not Chrome Island (see GI-670 Imrie Island account). Blight [30] erroneously listed a 1935 record from Munro and Cowan [274] of 150 Glaucous-winged Gull nests for Chrome Island that actually referred to Imrie Island, which was also called Yellow Island at that time. A maximum of 2-3 pairs of gulls have nested on Chrome Island and there has not been a substantial population decline here as reported by Blight.[30] Yellow Rock was renamed Chrome Island around 1940 to lessen confusion with another Yellow Island (still called that today – see Appendix 3) located to the north in Discovery Passage.

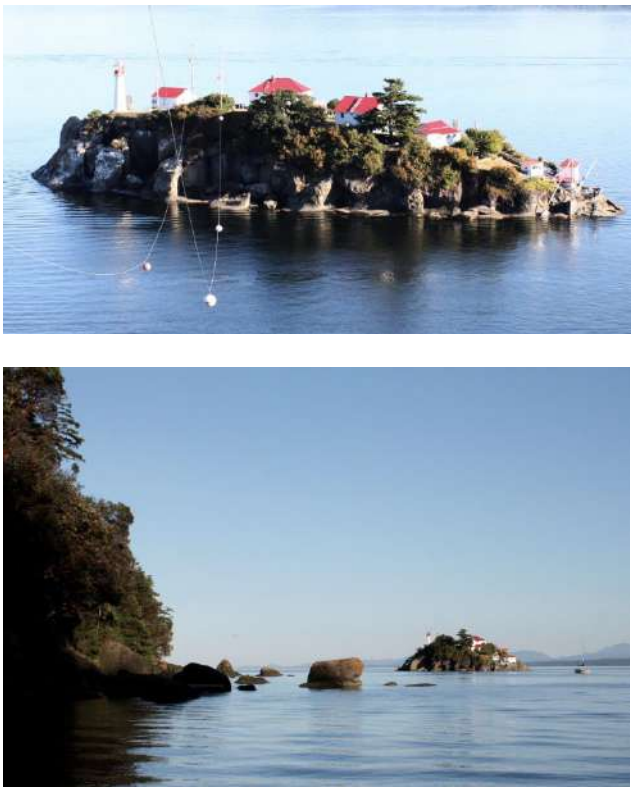


Figure 258. View of Chrome Island and its lighthouse installation from Boyle Point on Denman Island (top). The bottom photo shows the west end of Chrome Island and the passage between Chrome Island and Boyle Point. *Photos by Paula Courteau, 27 July 2014.*

Pelagic Cormorants have been recorded nesting on the cliffs along the east side of Chrome Island since 1966 (Figure 259; Table SG-240). Wayne Campbell and Ken Kennedy first confirmed breeding in 1974 but light keepers informed them that a few pairs began nesting in 1966 and 1967. In 1974, all nests contained eggs or young. Nests were counted from the water in all years since 1974. Numbers have fluctuated considerably with a maximum of 220 nests in 1994. The site was unused for several years after 2000, saw renewed nesting activity by small numbers of birds between 2012 and 2015, and has been unused again in the last couple of years (2021-2022). In 2014, nests contained eggs or small chicks on 27 July and about 25-30 large chicks on 24 August (Figure 260).

Figure 259. Pelagic Cormorant nesting cliffs on the east side of Chrome Island. *Photos by R. Wayne Campbell, 4 July 1974.*

Figure 260. Pelagic Cormorant nests on Chrome Island contained eggs or small young on 4 July 1974 (top left) and 27 July 2014 (right top and middle), and large young on 24 August 2014. *Photos by R. Wayne Campbell (top left) and Paula Courteau.*

One to three pairs of Glaucous-winged Gulls were reported nesting in the 1970s and 1980s, and one pair was seen from the water on the most recent survey in 2010. Lighthouse keepers informed Louise Blight that there was one gull nest on the island in 2010. The gull nest seen in 1974 held eggs and was located on a flat ledge on the cliffs amongst the nesting cormorants (Figure 261). Only one of the two nests seen in 1980 was accessible and could be inspected; it held three eggs.

Figure 261. One Glaucous-winged Gull nest with two eggs (bottom right of photo) was located on a cliff ledge amongst nesting Pelagic Cormorants on Chrome Island in 1974. *Photo by R. Wayne Campbell, 4 July 1974.*

A Pigeon Guillemot nest with eggs was found in a crevice on the cliffs amongst nesting cormorants in 1974. A second pair of Pigeon Guillemots apparently nested under the steps to the lighthouse that year. A pair of Pigeon Guillemots was seen swimming and calling around the cliffs in 2014.

Remarks: When Wayne Campbell and Ken Kennedy were on the island in 1974, they were informed by light keepers Mr. and Mrs. W.E. Gardiner, who had been on the island since 1964, that cormorants had been discouraged from nesting by the previous light keepers' children who used to throw stones at the cormorants. In 1980, one dead Pelagic Cormorant was dangling on the cliffs with its neck tangled in fishing line. According to Rob Zielinski [521] on Hornby Island (information relayed to Michael Rodway by Paula Courteau), the lightkeepers on Chrome Island acquired a dog, disturbance from which Zielinski thought may have discouraged nesting by cormorants in 2021 and 2022.

Two Bald Eagles were seen in 1980. Ten Pelagic Cormorant eggs were collected on 26 June 1990 for CWS toxicity studies.

Table SG-240. Seabird nesting records for Chrome Island. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
1966	4-8e			523
1967	4-8e			523
4 Jul 1974	54[54]	1	2e(5)	70, 523
27 Jun 1977	93		S(25)	523
4 Jun 1978	90	1eS		523
19 Jun 1980	79	2	S(6)	523
1 Jun 1981	59	3eS	S(3)	523
29 May-13 Jun 1983	78			421
Jun 1986		3eS		420
8-9 Jul 1987	141		(0)	158, 428
May-Jul 1989	68			375
25 Jul 1990	80			43
1991	67			114
1992	122			114
1993	171			114
1994	220			114
1995	212			114
1999	134			114
Jul-Sep 2000	57			114
29 May 2003	0			491
2007	0			522
15 May 2008	0			491
2008	0			522
16 Jun 2010		1S		30, 453
2010	0			522
2012	10			522
2013	7			522
27 Jul 2014	20e		S(2)	461
24 Aug 2014	x			461
2014	17			101
2015	26			522
2021-2022	0			521
7-9 Aug 2022	0			461

SG-250 SISTERS ISLETS

Location: *49°29'12"N 124°26'06"W; 92 F/8.*
West of False Bay on Lasqueti Island, on the west side of Stevens Passage.

Description: *3 m high; Grassy rock; Bare rock.*
Sisters Islets are composed of two clusters of low, tidally-connected rocks. There are two rocks in the largest, eastern cluster, with the lighthouse built on the main, southern rock of that cluster (hereafter referred to as main rock). There are patches of grasses and forbs on that rock; the northern of the east rocks (northeast rock) is bare. The smaller, west cluster (west rocks) has three above-tide rocky knobs.

A day beacon was initially placed on the main rock. It was replaced with the first lighthouse built in

1898 and with the present tower in 1967. Much of the surface area of this rock was modified to build the lighthouse, dwellings and other buildings, and a helicopter pad. The station was manned until 1996 after which the buildings were boarded up (Figure 262).

Figure 262. Sisters Islets are a cluster of three, low, mostly barren rocks. Most of the largest rock is taken up by lighthouse facilities that were first established in 1898 and replaced in 1967. The station has been unmanned since 1996 and the buildings are boarded up. There are some grassy patches on the main rock; the northeast and west rocks are bare. Photos show (top to bottom): the main rock with the northeast rock to the right; the northeast rock; and the west rocks. *Photos by R. Wayne Campbell, 4 July 1974.*

Historical summary: Sisters Islets supported good-sized colonies of Pelagic Cormorants and Glaucous-winged Gulls in the early 1980s, but were then virtually abandoned by all nesting birds until recently (Table SG-250). In 2021, Anna and Richard Smith from Lasqueti Island conducted a thorough survey and found larger numbers of Black Oystercatchers than had ever been recorded and an at-least-partially recovered gull population. Cormorants were still absent in 2021.

Various lightkeepers and their wives contributed nesting records over the years they were stationed on the islet. Glaucous-winged Gulls were first reported nesting in 1940-1943 by Oswald Dean and in 1951 by Mary Waldern. Rudi and Nora Drent counted nests in 1968. Gulls have nested on the west rocks and the northeast rock. Separate tallies for the west rocks and the northeast rock (see Figure 262), respectively were kept in 1974 (41 and 67 nests); 1978 (32 and 52 nests, plus one empty nest on the

Table SG-250. Seabird nesting records for Sisters Islets. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	ARTE	SOURCE
1940-43			100e		144
1951			100e		144
1967		1			523
9 Jul 1968	14[13]	0	74[74]		523
1970	6	0	x		523
1971	x				523
14 Jul 1974	41[41]	0	108[108]		70, 523
4 Jun 1978	88[76]	0	85[65]		523
19 Jun 1980	70[70]	0	133[133]		523
24 Jun 1981	69[65]	0	151[141]		523
29 May-13 Jun 1983	51				421
Jun 1986			25		420
8-9 Jul 1987	0	1			427, 428
2000	0				114
12-16 Jun 2006		0			57
14 Jul 2014	0	[a]	0		94
16 Jun 2019		1eS			506
4 Jul 2021	0	9[5]	61[55]		506
28 Jul, 4 Aug 2023				1	524, 603

[a] Five oystercatchers were present.

main rock); 1980 (20 and 113 nests); and 1981 (94 and 57 nests). Vermeer and Devito found only a fraction of that number of nests in 1986 and no sign of nesting by Glaucous-winged Gulls was observed when Harry and Emma Carter boated around the islets in 2014 (four gulls were roosting on the northern knob of the west rocks and none were seen on the main rock). However, large numbers of gulls were again nesting on the northeast rock in 2021; no sign of nesting was seen on the other rocks.

In 1968, the lightkeepers told Drent that one pair of Black Oystercatchers had nested each year up to 1967. They were absent in 1968 because of construction disturbance. According to lightkeeper Bill Milne in 1981, oystercatchers occasionally visit and feed on the islets but had not nested since 1968. One pair was reported nesting in 1987. No oystercatchers were seen from the water in 2006. Five adults were seen from the water in 2014, three on the west rocks and two on the main rock, but no evidence of nesting was obtained. One pair was again suspected nesting in 2019. In 2021, a thorough search by Anna and Richard Smith revealed a substantial nesting population: they found three nests with one (2 nests) or two (1 nest) eggs and one empty nest on the main rock; and two nests with single eggs and three empty nests on the northeast rock. An additional two and three nest scrapes that were considered duplicate nest starts were also seen on those two rocks, respectively.

Pelagic Cormorants were first reported nesting in 1968. Drent found cormorant nests intermingled with gull nests on the flat top of the west rocks. Lightkeeper Bill Milne observed Pelagic Cormorants nesting on the west rocks in 1970. In 1971 they moved to the northeast rock where their numbers subsequently increased. Bill speculated that the cormorants may have moved because of the gulls, although many gulls also nested on the northeast rock. In 1974, most cormorant nests (40) were on the northeast rock (Figure 263) but one pair was apparently using a gull nest (that held four cormorant eggs) on the west rocks. Similarly in 1978, 87 nests were on the northeast rock and one with three eggs was found on the west rocks. All nests were on the northeast rock in 1980 and 1981. Cormorants have not been seen nesting since 1983.

A new nesting site for Arctic Terns was documented on Sisters Islets in 2023. Cathy Carlson photographed a pair of terns with one chick on the northwest end of the main islet with the lighthouse on 28 July (Figure 264) and saw the pair again with one juvenile when she returned on 4 August. Adults were aggressively defending the rock when any gulls flew nearby. During her observations on 4 August, two other adult Arctic Terns flew in from the north, foraged for some time with the pair from Sisters Islets, and then flew off to the north. Perhaps they were the pair seen earlier around Little Rock (see account SG-050 above).

Ken Kennedy noted one Pigeon Guillemot present in 1974 but no evidence of nesting has ever been reported.

Figure 263. On Sisters Islets, Pelagic Cormorants nest on low, rocky areas, in contrast to the more typical cliff habitat that they use on other colonies. Most nests in 1974 were located on the northeast rock. *Photos by R. Wayne Campbell, 4 July 1974.*

Remarks: Reasons for the Pelagic Cormorant and Glaucous-winged Gull population declines and abandonment at this colony in the 1980s are unknown. Human persecution may have contributed. Charles Lundgren had 15 dogs for pets while he was lightkeeper in 1944-1945, which likely would have discouraged nesting birds on the main rock. He returned as keeper in 1947 and may have brought his menagerie back with him. Lightkeepers in 1981 complained of flies, smell, and feces contaminating their water due to the nesting seabirds. They noted that gulls continuously tried to nest on the lightstation rock but nests were destroyed as soon as they were built. A dead sea lion that had been shot in the head was found on the main rock in 2021.

Figure 264. One pair of Arctic Terns was confirmed nesting on Sisters Islets in 2023. This is the second confirmed nesting site for Arctic Terns in coastal BC. Adults with a young chick were first seen by Cathy Carlson on 28 July. Note the one chick at the bottom right of the middle photo. The chick was much larger when she returned on 4 August (bottom). *Photos by Cathy Carlson.*

Drent in 1968 and Campbell in 1981 noted no sign of predation by gulls on cormorants even though they were nesting in close proximity. Ken Kennedy found three dead adult Glaucous-winged Gulls and one dead Pelagic Cormorant tangled in fish net on 14 July 1974. Eggs had been depredated in two cormorant nests in 1980. Observers also found six depredated gull eggs and 16 cold, deserted gull eggs outside of nests. Lightkeepers were collecting some gull eggs in 1981. One dead, partially-hatched gull egg was seen in 2021, possibly a victim of the heat wave that struck the area in late June.

Bald Eagles were present on both east rocks in 2021. Bird bones but no sign of recent predation were seen in multiple locations on the northeast rock. Lightkeepers in 1981 reported that river otters very rarely visit the islets. Old sign of river otter on the main rock was noted in 2021.

Ken Kennedy banded 82 gull chicks and 40 cormorant chicks on 16 August 1974. In 2021, several oystercatcher nests contained sharp fragments of broken glass that they had likely gathered from around the old lighthouse buildings.

SG-260 FINNERTY ISLANDS

Location: *49°29'56"N 124°23'43"W; 92 F/8.*
Off the west side of the north end of Lasqueti Island, northwest of False Bay.

Description: *23 ha; 48 m high; Forested; Grassy rock; Cliffs.*
Most of this group is forested. Shorelines are rocky and there are rocky headlands around larger islands, especially on northwest sides (Figure 265). Smaller islets are bare rock with some grassy patches. The islands are part of Sabine Channel Marine Provincial Park Site 1 established in 2001.

Historical summary: Ken Kennedy boated by the islands in 1974 and observed about 10 pairs of Glaucous-winged Gulls on a rocky headland on the west side of the western-most island (Table SG-260). Two or three birds looked like they were sitting on nests. Michael and Teresa Shepard saw no birds in 1978. Nesting was confirmed in 1980 when Eleanor Perkins and others from the BCPM found one gull nest with three eggs at the top of a rocky ledge. Gull nests were widely scattered on different rocky islands and headlands in 1981. In June 2021 from the water, Sheila Harrington from Lasqueti Island saw six adults that she suspected were nesting on the rock at the southeast corner of the island group (southeast rock). She noted that fewer were present than in previous years. However, Anna and Richard Smith saw no nesting gulls during a complete land survey in July 2021.

Figure 265. The Finnerty Islands are mostly forested but there are many rocky outcrops, headlands, channels, and small islets around the group (this page). In spring, exposed rocky areas are awash in flowers (next page) and succulent forbs like stonecrop (*Sedum* spp.). *Photos by R. Wayne Campbell, 24 June 1981 (this page, top) and Paula Courteau, 17 April 2016.*

One empty Black Oystercatcher nest was found in 1981 (Figure 266). Three adults were present near the nest. Rob Butler recorded two pairs from the water in 2006, and Paula Courteau photographed an adult sitting on a nest in 2018 (Figure 267). Connie Haist reported at least two pairs nesting on rocks around the islands in recent years. In June 2021, Harrington saw two oystercatchers that may have been sitting on nests on the southeast rock. During their thorough exploration in July, Anna and Richard Smith found: a nest with two chicks and an empty nest on the southeast rock (49.4967984°N, 124.3921574°W); two nests with one and two eggs on the small rock (49.503901°N, 124.392725°W) off the northwest corner of the largest island; and two nests with one egg and an empty nest on the rocky rib (49.504873°N, 124.387819°W) on the northeast side of the northeast island. A total of 11 adults were seen in association with those nests. An additional seven empty nests were found that were judged to be duplicate nests within the territories of nesting pairs.

Figure 266. A pair of Black Oystercatchers was suspected nesting on Finnerty Islands in 1981, but only this empty nest was found. *Photo by R. Wayne Campbell, 24 June 1981.*

Figure 267. Black Oystercatcher sitting on a nest of shells on the Finnerty Islands in 2018. *Photo by Paula Courteau, 21 May 2018.*

Pigeon Guillemots were rafting on the water in 1980. In 1981, birds flew from three nest sites located in crevices and under boulders (Figure 268); one nest that could be inspected contained one egg. Five guillemots were seen on a cliff face in 2017. In 2019, Anna Smith saw guillemots emerge from two crevices on a cliff located in the bay on the west side of the largest island (49.502628°N, 124.392886°W). She photographed one bird sitting at the mouth of one crevice (Figure 269). Two other adults were present on the water. Guillemots were present at the same location in July 2021; one adult was seen flying into a crevice.

Figure 268. Pigeon Guillemots were confirmed nesting in crevices and under boulders on these cliffs on Finnerty Islands in 1981. *Photo by R. Wayne Campbell, 24 June 1981.*

Observers in 1980 noted a rock cliff that had seemingly ideal nesting ledges for Pelagic Cormorants. Signs of old guano were seen on the cliff but there was no evidence of nesting. The specific location of this cliff was not noted. In June 2021, Harrington suspected two Pelagic Cormorants were sitting on nests on the southeast rock when she viewed it from the water. However, Smith saw guano from roosting cormorants but no evidence of nesting cormorants during her thorough inspection of the islands in July.

Figure 269. Pigeon Guillemot (centre of photo) sitting at the entrance of a crevice on cliffs on the west side of the Finnerty Islands in 2019. *Photo by Anna Smith, 16 June 2019.*

Table SG-260. Seabird nesting records for Finnerty Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
14 Jul 1974		10eS		70, 523
4 Jun 1978	0	0		523
16 Jun 1980		1	(8)	523
24 Jun 1981	1S	6[4]	x3(6)	523
Jun 1986		4		420
12-16 Jun 2006	2eS			57
28 Jun 2017			x(5)	461
21 May 2018	1S			461
16 Jun 2019			x2(4)	506
25 Jun 2021	1eS	3eS		476
4 Jul 2021	7[5]	0	x(5)	506

Remarks: A river otter den and tunnels were found in 1980. In July 2021, Bald Eagles were present, old evidence of river otter activity was seen, and lots of garbage was noted on the southeast rock. Bald Eagles were also seen in the vicinity of the Pigeon Guillemot nesting area on the largest island.

SG-270 FEGEN ISLETS

Location: *49°31'48"N 124°22'50"W; 92 F/9.*
Off the northwest end of Lasqueti Island. Officially,[186] Fegen Islets consist of the three most northern islets (referred to as the northern rock, middle rock, and southern rock, below) off the northwest end of Lasqueti Island. We have included in this colony the cluster of unnamed islets located south of Fegen Islets and north of Finnerty Islands.

Description: *16 ha; 41 m high; Forested; Grassy rock; Bare rock.*

The three Fegen Islets are mostly bare rock, with some grassy patches and a few trees on the southern rock, which is the largest of the three (Figure 270). They comprise an area of 1.2 ha and reach a maximum elevation of 8 m. There is a marker beacon on the northern rock. The unnamed islets to the south are rocky with forested areas on higher portions of the three largest islets. The entire group of islets (i.e., Fegen Islets and the unnamed islets to the south) is part of Sabine Channel Marine Provincial Park Site 1 established in 2001.

Figure 270. Views of the northern (top) and southern (middle) Fegen Islets and the unnamed forested islets further south, which are included in the Fegen Islets colony. *Photos by R. Wayne Campbell, 24 June 1981.*

Historical summary: Ken Kennedy found two empty Glaucous-winged Gull nests on the middle rock of the three Fegen Islets in 1974 (Table SG-270). No birds were seen in 1978, but a Black Oystercatcher nest with one young and a gull nest with three eggs were found on the northern rock in

1980. One gull nest, again with three eggs, was found on the same rock in 1981. The location of the gull nest was not specified in 1986. The islets were surveyed from the water in 2006 and 2011. Numbers of gulls nesting had increased in 2011; adults were visible on 15 nests. Specific locations of nesting gulls and oystercatchers were not reported.

In 2021, Anna and Richard Smith conducted a complete survey of all islets by boat and explored smaller rocks on foot. Oystercatchers were nesting on the northern rock (3 nests with 1 egg each) and on a small rock (49.523729°N, 124.380822°W) on the northeast side of the largest unnamed islet (1 nest with 1 egg). Gull nests were found on the northern rock (4 nests with eggs and 1 empty nest) and on two rocks (49.525589°N, 124.382803°W and 49.527572°N, 124.383285°W) north of the largest unnamed islet (3 nests with eggs and 1 empty nest; and 4 nests with eggs and 1 empty nest, respectively).

Table SG-270. Seabird nesting records for Fegen Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
14 Jul 1974		2S	70, 523
4 Jun 1978	0	0	523
19 Jun 1980	1	1	523
24 Jun 1981	0	1	523
Jun 1986		1	420
12-16 Jun 2006	4eS		57
8 Jun 2011	2S	15S	456
6 Jul 2021	4[4]	14[11]	506

Remarks: One adult Bald Eagle and one river otter (Figure 271) were recorded in 1981. In 2021, Bald Eagles were seen around the southern unnamed islets and evidence of river otter activity was seen on the northern Fegen Islet with the light beacon.

Figure 271. River otters and signs of river otters are often encountered on seabird colonies in the BC Salish Sea and elsewhere on the BC outer coast. Fish and crabs are their most common food items in the Salish Sea. *Photo by Paula Courteau.*

SG-276 "HERON" ROCK

Location: *49°30'05"N 124°15'08"W; 92 F/9.*
In a small bay, locally known as Heron Bay, on the north side of Lasqueti Island, on the east side of Tucker Bay, west of Jervis Island.

Description: *0.04 ha; 3 m high; Bare rock.*

Historical summary: Sheila Ray saw a pair of Black Oystercatchers nesting on this rock in 2019 (Table SG-276). She could view the site from her house located on the east side of Heron Bay. Eggs were laid in the nest but chicks were never seen and it was assumed that the pair failed. The oystercatchers left the bay by early July 2019 and did not return to nest in 2020 or 2021.

Table SG-276. Seabird nesting records (nests) for "Heron" Rock.

DATE	BLOY	SOURCE
12 Jun-3 Jul 2019	1	524
2020	0	496
2021	0	496

Remarks: In 2019, Sheila Ray saw the nesting oystercatchers trying to chase off Common Ravens. The ravens nested nearby and a raven family of adults with two recently fledged young was seen on 12 June.[524]

SG-278 "SABINE" ISLETS

Location: *49°30'46"N 124°15'34"W* (south islet)*; 92 F/9.*
On the west side of the northern entrance to Sabine Channel, west of Jervis Island, north of Tucker Bay.

Description: *15 ha; 43 m high; Forested; Grassy rock; Bare rock.*
This is a cluster of about seven islets off the west end of Jervis Island. Habitat on larger islets is similar to that on Jervis Island, with forested strips alternating with rocky outcrops. Smaller islets are mostly bare rock, with some grassy sections and scattered trees on the higher rocks. The islets are part of Sabine Channel Marine Provincial Park Site 2 established in 2001.

Historical summary: In 1981, two adult Glaucous-winged Gulls were present but no evidence of nesting was found (Table SG-278). Nesting by one pair was reported in 1986; the location of the nesting

pair was not specified. In 2021, the islets were surveyed by boat by a survey team from Lasqueti Island, including Connie Haist and Anna and Richard Smith. No gulls were seen, but Black Oystercatchers were present (Figure 272) and suspected nesting on four smaller rocky islets in this group, including: the northwestern, 8 m-high (5 pairs) and 5 m-high (1 pair) islets; and the southern, 9 m-high (3 pairs) and 24 m-high (2 pairs) islets.

Figure 272. Black Oystercatchers are conspicuous residents of many shoreline habitats in BC. It is always entertaining to watch their displays and hear their raucous calls around nesting colonies. *Photo by Paula Courteau.*

Table SG-278. Seabird nesting records for "Sabine" Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
24 Jun 1981	0	0	523
Jun 1986		1	420
24 Jun 2021	11eS	0	483

Remarks: An adult Bald Eagle was seen diving at a Glaucous-winged Gull in 1981 (Figure 273). The gull escaped. Three ravens were seen around the southern islets in 2021.

Figure 273. Bald Eagles are common around most islands in the BC Salish Sea and can often be seen hunting Glaucous-winged Gulls. Chases can be prolonged and targeted gulls often manage to outmaneuver the pursuing eagle. *Photo by Paula Courteau.*

SG-280 JERVIS ISLAND

Location: *49°30'45"N 124°14'30"W; 92 F/9.*
Along the north side of Lasqueti Island, east of Tucker Bay. Colony includes the unnamed islets along the east side and the small rock just off the north tip of the main island. Unnamed islets to the west are included in the "Sabine" Islets colony (see above).

Description: *96 ha; 127 m high; Forested; Cliffs; Grassy rock.*
Jervis Island has much exposed rock among strips of forest that tend to run along crevices and hollows between the rocky areas. Shorelines are rocky with some steep cliffs along the east side of the main island. Larger islets off the northwest end are forested but some smaller northwest islets and islets along the east side of the main island are mostly bare rock with some grassy patches. Jervis Island is part of Sabine Channel Marine Provincial Park Site 2 established in 2001.

Historical summary: In 1981, the main island was surveyed by boat and smaller islets were explored on foot. Pigeon Guillemots flew out of two crevices on the cliffs along the east side of the main island in 1981 (Table SG-280). No nesting seabirds were found on the smaller rocks.

In 2021, a crew from Lasqueti Island surveyed the eastern rocky islets by boat. Four pairs of Black Oystercatchers were seen and suspected nesting on

each of four rocky knobs of the southern (*49.510694°N 124.233707°W*) of the group of islets along the east side of the main island.

Table SG-280. Seabird nesting records for Jervis Island. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
24 Jun 1981	0	2(2)	523
24 Jun 2021	4eS		483

SG-284 BOHO ISLAND

Location: *49°30'00"N 124°13'47"W; 92 F/8.*
On the northeast side of Lasqueti Island, southeast of Jervis Island, west of Jedediah Island. Colony includes the tidally-connected rocks off the southeast end of the island.

Description: *16 ha; 61 m high; Forested; Cliffs; Bare rock.*
The main island is mostly forested, but the forest cover is broken by many exposed rocky outcrops across the island. Shorelines are rocky with some cliffs along the east side. Southeastern rocks are mostly bare, with some clumps of trees on higher sections.

Historical summary: Pigeon Guillemots were visiting nests on the cliffs along the east side of the main island in 2011 (Table SG-284). We have no other records for that area. The southeast rocks were inspected by boat on 24 June 2021 and no seabirds were recorded.[483] From a distance, Moira Lemon has heard flocks of oystercatchers around those rocks in several recent years but has never inspected the rocks for signs of nesting.

Table SG-284. Seabird nesting records for Boho Island. See Appendix 2 for codes.

DATE	PIGU	SOURCE
7 Jun 2011	x(35)	456

SG-286 "CONNIE" ROCK

Location: *49°29'30"N 124°13'13"W; 92 F/8.*
Between Lasqueti and Jedediah islands, southeast of Boho Island, northwest of Bull Island.

Description: *0.1 ha; 3 m high; Bare rock.*

Historical summary: A survey team from Lasqueti Island, including Connie Haist and Anna and Richard Smith, found four pairs of Black Oystercatchers nesting in 2021 (Table SG-286). Seven agitated adults were present and four nests with eggs (2 with 1 egg and 2 with 2 eggs) were found; three other empty scrapes found were thought to be associated with the same four pairs. We have no other records for this site.

Table SG-286. Seabird nesting records for "Connie" Rock. See Appendix 2 for codes.

DATE	BLOY	SOURCE
24 Jun 2021	4[4]	483

Remarks: A Canada Goose nest with hatched-out eggshells was found in 2021. The goose family was nearby.

SG-290 "UPWOOD" ISLET

Location: *49°29'19"N 124°08'03"W; 92 F/8.*
Off the south tip of Texada Island, southwest of Upwood Point.

Description: *0.3 ha; 7 m high; Bare rock.*
There are small patches of grass on this otherwise bare rock. The islet is within South Texada Island Provincial Park established in 1997.

Historical summary: Wayne Campbell found three, widely separated Glaucous-winged Gull nests with three eggs each in 1981 and Moira Lemon saw one pair of gulls with one large young in 2019 (Table SG-290). We have no other records for this rock.

Table SG-290. Seabird nesting records for "Upwood" Islet. See Appendix 2 for codes.

DATE	GWGU	SOURCE
24 Jun 1981	3[3]	523
6 Aug 2019	1	484

SG-300 SHEER ISLAND

Location: *49°29'13"N 124°10'17"W; 92 F/8.*
South end of Sabine Channel between Texada and Rabbit islands (Figure 274). Colony includes the islet to the west and the cluster of three small rocks to the north of the island (northern rocks).

Figure 274. Sheer Island sits at the south end of Sabine Channel between Texada and Rabbit islands. This view, looking southeast from the summit of Jedediah Island (foreground) and across Circle Island, shows the northern rocks of the Sheer Island colony in the centre of the photo, the main Sheer Island and the islet west of it on the right side of the photo, and the southern tip of Texada Island in the middle background. In the far distance, the Thormanby Islands sit against the mainland coast. *Photo by Moira J.F. Lemon, 16 August 2020.*

Description: *2.1 ha; 26 m high; Grassy rock; Bare rock.*

The main Sheer Island and the islet just west of it are mostly bare, steep-sided rock, with some grassy areas and a few trees on higher sections. The northern rocks are bare, except for a couple of grassy patches (Figure 275).

Historical summary: Complete counts of Glaucous-winged Gull nests were conducted in 1981, 1986, and 2021. In 1986, Vermeer and Devito reported gull nests on three unnamed islets in this general area (locations #22-24 on their Figure 1 and Table 1 [420]). From their mapped locations, we think the northern of those three islets (#22) refers to the northern rocks of Sheer Island (we have assigned the other two records [islets #23 and 24] to the rock south of Rabbit Island and the rock off Windy Bay ["Windy" Rock], respectively [see below]). Gull nests were not counted between 1986 and 2021, but some observations were made from the water during those years. Rob Butler counted birds on nests on the northern rocks in 2006 and 2011. Moira Lemon made observations while sailing through Sabine Channel on 6 August 2019 and on 22 August 2020. On 9 August 2019, Anna Smith from Lasqueti Island circumnavigated all the rocks and counted all birds seen. A team from Lasqueti Island, including Connie Haist and Anna and Richard Smith, conducted the survey in 2021 (Figure 276).

The number of Glaucous-winged Gulls nesting increased substantially between 1981 and 1986. Fewer were nesting in 2021 than in 1986. Between 1986 and 2021, numbers appear to have varied but counts made from the water are not reliably comparable. In 1981, Wayne Campbell found two gull nests on the top of the rocky area on the main Sheer Island and five nests on the largest of the northern rocks (Table SG-300). Many more nests were found in 1986. In 2006 and 2011, Butler could see adults sitting on 13 and 10 nests, respectively. A total of 19 adults were present in 2011. On 6 August 2019, Lemon counted 10 adult and two juvenile gulls on the largest of the northern rocks, and 49 adults and seven juveniles on the smaller, southeastern of the northern rocks. This was a partial count as only one side of the rocks was visible from the sailboat. Three days later, Smith counted 55 adults on territories and 19 young on the northern rocks (Figure 277). She recorded no gulls on any of the other islets. Fourteen adults with six juvenile gulls were visible on 22 August 2020. In 2021, gull nests (Figure 278) were found on the three northern rocks (12 on the north; 3 on the southwest, and 1 on the southeast rock of that cluster); none were seen on the main island or on the west islet.

Figure 275. The northern rocks of the Sheer Island colony are bare rocks with little vegetation. Many cormorants and gulls roost on the low rocks. The bottom left photo shows the rocky habitat on the top of the largest of the northern rocks, where scattered Glaucous-winged Gull nests were found in 2021, with the main Sheer Island visible in the upper right corner of the photo. *Photos by Anna Smith, 9 August 2019 and 24 June 2021 (bottom left).*

Figure 276. In 2021, a volunteer team from Lasqueti Island, including Connie Haist and Anna and Richard Smith, conducted surveys for nesting seabirds at most islands around Lasqueti Island. Here, Connie Haist and Richard Smith are boating just off the northern rocks (foreground) of the Sheer Island colony. The west tip of Sheer Island is visible on the left, the islet west of Sheer Island lies behind the boat, and Rabbit and Lasqueti islands are in the background. *Photo by Anna Smith, 24 June 2021.*

Figure 277. Adult Glaucous-winged Gull with one chick on the northern rocks off Sheer Island in 2019. *Photo by Anna Smith, 9 August 2019.*

Campbell saw no Black Oystercatchers during his thorough search on foot in 1981. From the water, Smith counted 38 Black Oystercatchers roosting on the northern rocks in 2019 (Figure 279) and Lemon saw two in 2020; no evidence of nesting was seen in those years. Oystercatchers were first reported nesting in 2021: one nest with one egg was found on the western tip of the northern of the northern rocks; three adults were present.

Figure 278. Sixteen Glaucous-winged Gull nests were found on the northern rocks of the Sheer Island colony in 2021. Some eggs were just beginning to pip. Note the contrasting egg colour in the two-egg clutch with the pipping egg. *Photos by Anna Smith, 24 June 2021.*

Table SG-300. Seabird nesting records for Sheer Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
24 Jun 1981	0	7[7]		523
Jun 1986		50		420
16 Jun 2006		13S		456
10 Jun 2011		10S		456
6 Aug 2019		30e+		484
9 Aug 2019		28e		506
22 Aug 2020		7e+		484
24 Jun 2021	1	16[16]	S(2)	483

Pigeon Guillemots were first recorded in 2021: a pair was sighted on land on a steep, deeply-creviced rock face on the south side of the west islet; they appeared to be a mated pair (Figure 280).

Cormorants have not been confirmed nesting on these islands. Double-crested Cormorants apparently attempted to nest in 2019; Smith found four constructed but unattended nests on the northern rocks in 2019. Roosting cormorants have been present: 43 adult and 15 immature Pelagic and five Double-crested cormorants on 9 August 2019 (Figure 281); and 16 Pelagic Cormorants in 2020. A Pelagic Cormorant nest seen in 1981 on the rock south of Rabbit Island was previously mistakenly listed for this colony but is now listed for Rabbit Island (see below).

Figure 279. A total of 38 Black Oystercatchers were roosting on the northern rocks off Sheer Island on 9 August 2019, including a group of 11 preening (top), and three roosting in the company of a Harbour Seal (*Phoca vitulina*). *Photos by Anna Smith.*

Figure 280. This pair of Pigeon Guillemots was likely nesting in a nearby crevice on the cliffs on the south side of the islet west of Sheer Island in 2021. This was the first record of Pigeon Guillemots at the Sheer Island colony. *Photo by Anna Smith, 24 June 2021.*

Remarks: One Bald Eagle was noted at the west islet of the Sheer Island colony in 2021.

Figure 281. Pelagic and Double-crested cormorants have been seen roosting on the rocks around Sheer Island, and Double-crested Cormorants built four nests on the northern rocks in 2019, but neither species has been confirmed breeding at this colony. *Photo by Anna Smith, 9 August 2019.*

SG-301 BULL ISLAND

Location: *49°29'06"N 124°11'49"W; 92 F/8.*
On the north side of Bull Passage, south of Jedediah Island. Colony includes all the rocky islets off the east end of the island (south of Jedediah Island and west of Rabbit Island).

Description: *78 ha; 111 m high; Forested; Cliffs; Bare rock.*
Similar to other islands in the vicinity, Bull Island has a forest cover broken by many exposed rocky outcrops across the island. Shorelines are rocky with some cliffs along the southwest and northeast sides. Eastern rocks are mostly bare (Figure 282).

Figure 282. View from the summit of Jedediah Island looking south down the Strait of Georgia, showing: the southeastern end of Bull Island in Bull Passage (centre right); the small rocks off the east end of Bull Island (centre); the south end of Lasqueti Island beyond Bull Island; and Rabbit Island (centre left), with Hop-a-long Rock just beyond to the south. *Photo by Moira J.F. Lemon, 30 July 2015.*

Historical summary: A survey crew from Lasqueti Island checked the rocky point at the southeast tip of the island by boat in 2021. A pair of agitated Black Oystercatchers was seen on the point; surveyors were confident that they were nesting (Table SG-301). We have no other records for this colony.

Table SG-301. Seabird nesting records for Bull Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
24 Jun 2021	1eS	483

SG-302 RABBIT ISLAND

Location: *49°28'43"N 124°10'30"W* (south rock)*; 92 F/8.*
Southeast of Jedediah Island on the north side of Bull Passage (see Figure 282). Colony includes the rock to the south (colloquially named Hop-a-long Rock) , which is the only location seabirds have been found breeding.

Description: *15 ha; 61 m high; Forested; Grassy rock; Cliffs.*
Rabbit Island is mainly forested except for rocky headlands along the east and north sides. There is a dwelling at the north end. The 0.5 ha south rock (Hop-a-long Rock) is 11 m high and is mostly bare, with some patches of grass, forbs, and shrubs in hollows (Figure 283). There are sheer cliffs on the south side of that rock (Figure 284).

Figure 283. View from Bull Passage of the western end of the colloquially-named Hop-a-long Rock, south of Rabbit Island. The western end of the cliffs that line the south side of the rock are visible on the right. *Photo by Moira J.F. Lemon, 24 July 2018.*

Figure 284. Photos of Hop-a-long Rock, south of Rabbit Island, showing the cliffs on the south side where Pelagic Cormorants nest, and rocky areas with pockets of grass and forbs on the top of the rock where Black Oystercatchers and Glaucous-winged Gulls nest. *Photos by Anna Smith, 9 August 2019 and 24 June 2021.*

Historical summary: Surveys on land were conducted in 1981, 1986, and 2021. Surveys from 2010 to 2020 were conducted from the water. Rob Butler boated around Hop-a-long Rock in 2011. Moira Lemon made counts from a distance while sailing past the south side of the rock on 30 July and 17 August 2019 and past the west end of the rock on 14 August 2020. Anna Smith from Lasqueti Island conducted a more thorough survey from the water on 9 August 2019. In 2021, a survey team from Lasqueti Island, including Connie Haist and Anna and Richard Smith, conducted a complete survey of Hop-a-long Rock on land (oystercatchers and gulls) and from the water (cormorants). Nesting seabirds have been recorded only on Hop-a-long Rock.

In 1981, one Pelagic Cormorant nest containing two eggs was seen on the steep cliffs on the south side of Hop-a-long Rock (Table SG-302). Surveys for cormorants were next conducted in 2010, at which time Pelagic Cormorant numbers had increased and Double-crested cormorants had colonized this rock. In 2011, greater numbers of Pelagic Cormorants were nesting, but Double-crested Cormorants were absent and have not been reported nesting since. Fewer Pelagic Cormorants were nesting when the rock was next visited in 2015; numbers have been relatively stable since then. Paula Courteau confirmed nesting in 2016 but did not estimate numbers (Figure 285). About 20 Pelagic Cormorants were present and birds were seen on nests in 2017, and 40 birds were noted, again with birds on nests in 2018. In 2019, Lemon saw about 15 adult Pelagic Cormorants on the cliffs on 30 July and 14 present on 17 August, at which time she could also see 15 nests on the cliffs that had obviously been used that season. Smith counted 14 nests (3 occupied and 11 empty) during her survey on 9 August 2019. On 14 August 2020, Lemon was not able to count nests but saw 10 Pelagic Cormorants and lots of whitewash on the cliffs. In 2021, the Lasqueti team counted 19 nests (17 with adults sitting or standing; 1 unattended; and 1 still under construction).

Figure 285. Typical guano-covered Pelagic Cormorant nest seen on Hop-a-long Rock off Rabbit Island in 2016. *Photo by Paula Courteau, 9 August 2016.*

Glaucous-winged Gulls were not found nesting in 1981, but 22 nests were counted in 1986. We have assumed that the mapped location #23 in Vermeer and Devito [420] refers to Hop-a-long Rock. Fewer gulls appeared to be nesting in subsequent years. Butler saw only one adult on a nest from the water in 2011. About 12 adults were visible on territories in 2018. In 2019, eight adults were counted on the top of the rock on 30 July, seven adults (Figure 286) and three chicks were seen on 9 August, and six adults were visible on 17 August. None were visible from a distance on 14 August 2020. Six nests were counted on Hop-a-long Rock in 2021 (Figure 287).

Figure 286. Adult Glaucous-winged Gulls on likely nesting territories on Hop-a-long Rock off Rabbit Island were counted from the water in 2019. *Photo by Anna Smith, 9 August 2019.*

Figure 287. Glaucous-winged Gull nest with a full clutch of three eggs on Hop-a-long Rock off Rabbit Island in 2021. The nest was built in the centre of a patch of nodding onion (*Allium cernuum*). *Photo by Anna Smith, 24 June 2021.*

One Black Oystercatcher was seen sitting on a nest on Hop-a-long Rock in 2011 and oystercatchers were confirmed nesting there on 9 August 2019; four adults and one chick were visible from the water. One pair and one single oystercatcher were seen on top of the rock in 2020. Observers in 2021 found six nests that they thought were active, although only a single egg was found in one nest (Figure 288). Ten aggressive adults were present around those nests and there may have been hidden chicks. An additional eight nest scrapes were seen that were judged to be duplicate nest starts.

Figure 288. One Black Oystercatcher nest found on Hop-a-long Rock off Rabbit Island in 2021 contained a single egg (right); five other nests found were empty, but agitated adults were nearby and may have been defending hidden chicks. *Photos by Anna Smith, 24 June 2021.*

Table SG-302. Seabird nesting records for Rabbit Island. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	SOURCE
24 Jun 1981		1[a]	0	0	523
Jun 1986				22	420
2010	10	41			522, 101
7 Jun 2011	0	52	1	1S	456
2015	0	20			101
9 Aug 2016		x			461
21 May 2017		x			524
4 Jul 2018		x			524
24 Jul 2018				6eS	484
30 Jul 2019		S		4eS	484
9 Aug 2019	0	14	2e	4e	506
17 Aug 2019	0	15		3eS	484
14 Aug 2020		S	2eS		484
24 Jun 2021	0	19	6[1]	6[5]	483

[a] The Pelagic Cormorant nest record from 1981 was previously listed with Sheer Island.

Remarks: A river otter den, trails, and scats composed of fish and crab remains were seen on Hop-a-long Rock in 2021 (Figure 289). A Bald Eagle skeleton and a mink skeleton were also found on that rock. Large amounts of garbage that had been washed up on the rock were seen in 2021; Anna Smith removed as much of it as she was able to access.


Figure 289. This large rock in a gully was an ideal denning site for river otters on Hop-a-long Rock in the Rabbit Island colony in 2021. River otter trails and scats composed of fish and crab remains were also seen on Hop-a-long Rock. Observations by Anna Smith indicate that crabs are common in river otter diets in this area.[506]

SG-305 "WINDY" ROCK

Location: *49°27'57"N 124°10'21"W; 92 F/8.*
Off Windy Bay on the east end of Lasqueti Island.

Description: *0.1 ha; 5 m high; Bare rock.*

Historical summary: Wayne Campbell found no birds nesting in 1981 (Table SG-305). We have assumed that the mapped location #24 in Vermeer and Devito [420] refers to this rock. One pair of Glaucous-winged Gulls was found during their survey in 1986.

Table SG-305. Seabird nesting records (nests) for "Windy" Rock.

DATE	GWGU	SOURCE
24 Jun 1981	0	523
Jun 1986	1	420

SG-308 "JENKINS" CLIFFS

Location: *49°27'35"N 124°18'07"W; 92 F/8.*
On the south shore of Lasqueti Island on the east side of Jenkins Cove, north of Jenkins Island.

Description: *Cliffs.*
A series of stepped cliffs extend about 700 m along the Lasqueti Island shoreline on the east side of Jenkins Cove. Vertical bluffs alternate with diagonal ledges and larger benches vegetated with shrubs, grasses, and stands of Douglas-fir and arbutus (Figure 290). The cliffs lie within the Lasqueti Island Ecological Reserve established in 1971.

Historical summary: Pigeon Guillemots have likely nested at this site for many years. Participants of a Friends of Ecological Reserves field trip to the site in 2016, including Garry Fletcher and the reserve warden Al Gaensbauer, noted that guillemots regularly nest in cavities in the fractured rock faces (Table SG-308). Al reported seeing about two dozen guillemots around the cliffs (note that the Friends of Ecological Reserves newsletter [23] misquoted Al as seeing 2,000 instead of two dozen birds [469]). In 2020, Connie Haist, Doane Grinnell, and Trudy Chatwin observed nine Pigeon Guillemots on the water at the base of the cliffs. Three of the birds were holding fish. One other guillemot was seen flying out of a crevice on the cliffs, and there were several other likely nest locations with conspicuous guano on the rock. In 2021, Anna Smith observed birds in May and a party from Lasqueti Island, including Doane

Grinnell, Connie Haist, Sheila Harrington, and Sheila Ray surveyed the cliffs in June. In June, birds were seen entering or leaving 15 likely nesting locations at two areas along the cliffs; 17 other guillemots were on the rocks and 35 were counted on the water.

Figure 290. Stepped cliffs on the south side of Lasqueti Island are part of the Lasqueti Island Ecological Reserve established in 1971. Pigeon Guillemots have likely nested in crevices on these cliffs for many years, although nesting was first reported in 2016. *Photos by Sheila Harrington, 17 June 2021.*

Table SG-308. Seabird nesting records for "Jenkins" Cliffs. See Appendix 2 for codes.

DATE	PIGU	SOURCE
24 May 2016	x	23
9 Jul 2020	x(10)	475
21 May 2021	S(30)	506
17 Jun 2021	x15(67)	482

SG-310 SEA EGG ROCKS

Location: *49°27'08"N 124°18'40"W; 92 F/8.*
West of Jenkins Island off the mid-south side of Lasqueti Island.

Description: *0.6 ha; 8 m high; Grassy rock.*
The main island is a compact chain of tidally-connected rocky knolls with grassy areas and the occasional stunted shrub (Figure 291). A small, low rock lies to the north.

Historical summary: No birds were seen by Michael and Teresa Shepard in 1978 or Wayne Campbell in 1981 (Table SG-310). Observers were surprised at the lack of birds because the habitat looked very suitable for nesting Glaucous-winged Gulls and Black Oystercatchers.

A few gulls had colonized the rocks when Vermeer and Devito conducted their survey in 1986. The next seabird records for this colony were not until 2011: Rob Butler boated around the rocks on 7 June; and marine biologist and Lasqueti Island resident Anna Smith boated around the rocks and took detailed photos from all sides in July (numbers of nesting birds were counted from the photographs). Connie Haist from Lasqueti Island started observations in 2015. That year she saw considerable gull activity on the rocks while hiking along the shore of Lasqueti Island. In subsequent years, Haist circumnavigated the rocks and counted birds from the water: in 2017 with fellow Lasqueti Island resident Doane Grinnell; on 15 July 2019 with Anna Smith; and in 2020 with Trudy Chatwin and Doane Grinnell. In 2019, Anna Smith independently boated around the colony again on 9 August. She also counted numbers of birds and nests from photographs and obtained a better count of birds and nests than from initial observations from the boat. A full survey of the colony was conducted in June 2021 by a party from Lasqueti Island, including Doane Grinnell, Connie Haist, Sheila Harrington, and Sheila Ray.

The Glaucous-winged Gull nesting population has increased since 1986 when five pairs were nesting. In 2011, from the water, Butler could see 27 adults on nests and counted a total of 59 adults present in June. From photographs taken in late July, Smith counted 939 adults in colony areas (many just roosting), four adults still sitting on nests, 104 large, mobile young, and 41 fledglings (Figure 292). From the number of young seen, we estimated a minimum of 50 nesting pairs. In 2017, many gulls were seen on nests; about 300 mature and two first year gulls were present. Photographs taken by Smith in 2019 showed: 21 gulls on nests, 22 others on territories, and 52 roosting on lower rocks on 15 June; 16

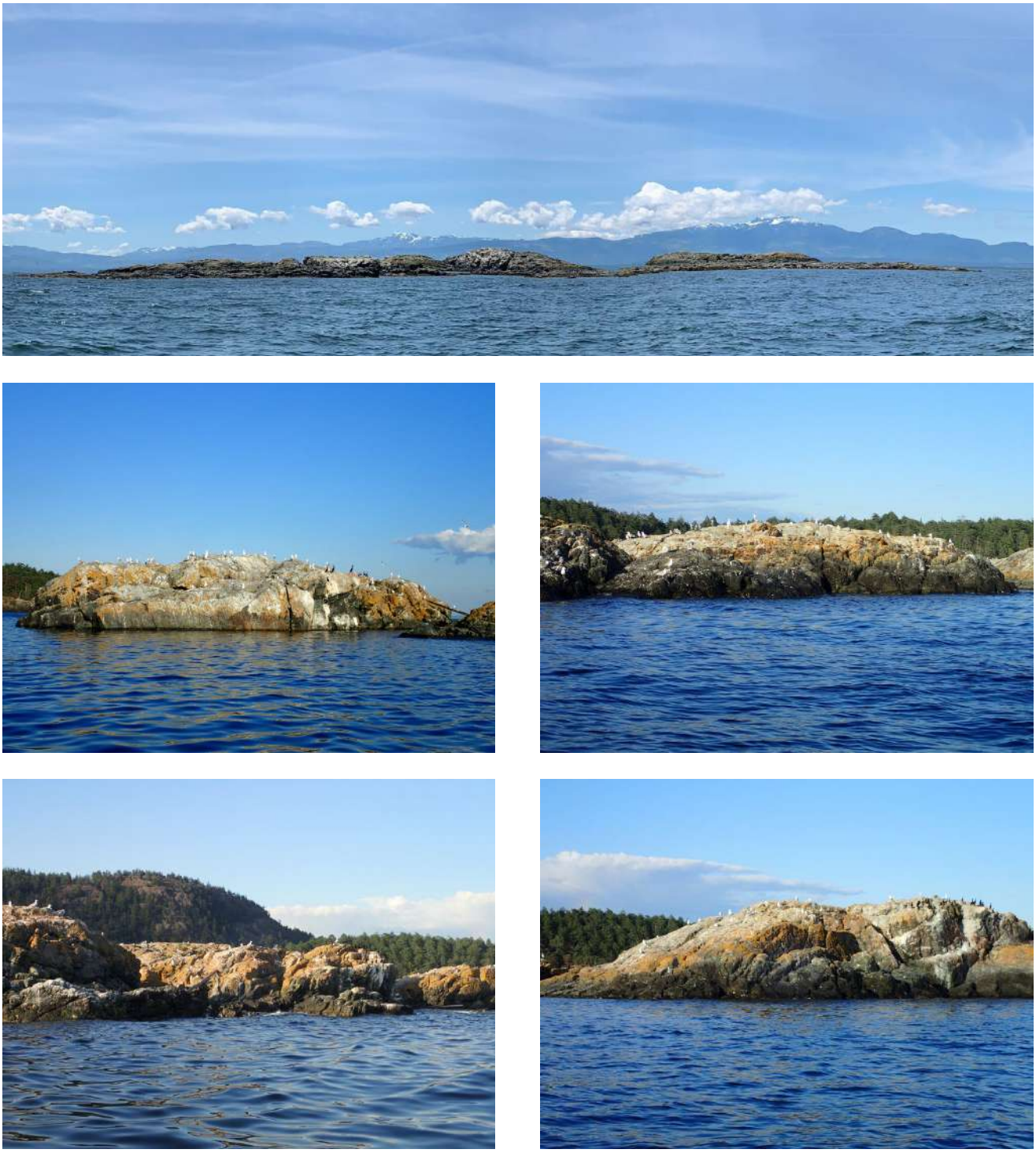


Figure 291. Sea Egg Rocks are mostly bare, with small pockets of grasses and shrubs on higher sections. Photos show a view of the entire chain of rocks from the northeast (top) and the southern sides of some of the rocky knolls that comprise the main island, shown (clockwise from middle left) from west to east. *Photos by Sheila Harrington, 17 June 2021 (top) and Anna Smith, 15 July 2019.*

chicks, four adults on nests, 326 other adults in colony areas, and 58 adults and three yearlings roosting on 15 July; and 245 adults and 89 chicks on 9 August (number of chicks indicated a minimum of 30 nesting pairs). In 2020, observers noted many gulls nesting and counted 103 adults present. Anna Smith made another visit to the island on 21 May 2021. Most gulls were just building nests but she found one nest with a full clutch of three eggs and a second nest with one egg. In June 2021, surveyors accessed most parts of the rocks on foot and counted 102 gull nests, 90 of which held eggs (Figure 293)

or, in three nests, newly hatched young; 12 nests were empty. Twenty adults were seen on territories on a small portion of the rocks that could not be accessed on foot, giving a total estimate of 112 nesting pairs for the colony.

Figure 292. Numbers of Glaucous-winged Gulls present on Sea Egg Rocks in 2011 were counted from photographs taken from the water. Many large young were visible. *Photos by Anna Smith, July 2011.*

Figure 293. Typical Glaucous-winged Gull nests made of grasses, forbs, lichens, mosses, and twigs seen on Sea Egg Rocks in June 2021. Note the carrot pieces dropped in nests to keep track of which nests have been counted. *Photos by Sheila Harrington, 17 June 2021.*

Pelagic Cormorants were confirmed nesting in 2011. Of the 63 nests counted from photographs taken in late July, Smith tallied 16 occupied by adults, 10 with large chicks, and 37 empty (Figure

294). At least 10 Double-crested and three Brandt's cormorants were roosting in colony areas but no sign of nesting was seen. In 2017, Haist recorded both Double-crested and Pelagic cormorants present and suspected nesting by both species; however, numbers of nests were not separated to species and nesting by Double-crested Cormorants was not confirmed. Many hatched young were seen at Pelagic Cormorant nests on ledges. From photographs taken in 2019, a total of 32 (all occupied) and 40 (36 occupied, 4 empty) Pelagic Cormorant nests were counted on 15 June and 15 July, respectively. There was also one partially constructed Double-crested Cormorant nest with an immature standing nearby in June; no Double-crested Cormorant nests were seen in July. A total of 83 adult Pelagic Cormorants were counted in June, and 194 Pelagic, eight Double-crested, and four Brandt's cormorant adults were counted on the colony in July 2019. In 2020, nests of each cormorant species were counted from the water: four Double-crested and 30 Pelagic cormorant nests were counted. This was the first year that nesting by Double-crested Cormorants was confirmed; adults were sitting on nests and both Pelagic and Double-crested cormorants appeared to be incubating. In 2021, Anna Smith observed cormorants building nests on 21 May; no eggs were seen. In June 2021, from the water, the Lasqueti team counted two completed and one partially built Double-crested Cormorant nests, all with adults sitting or standing in the nests (Figure 295), and 44 Pelagic Cormorant nests (31 with sitting adults, 5 of which had a partner standing beside; 10 with a standing adult; and 3 unattended). An adult Double-crested Cormorant was seen bringing a stick to the partially built nest. Smith returned in July and saw seven Double-crested Cormorant nests. Pelagic Cormorants nests were located on several cliffs on the three central rocky knolls; most nests were on two east-facing cliffs protected by adjacent rock masses. The Double-crested Cormorant nests were clustered together on upper ledges of northeast-facing cliffs on the mid-north side of the rocks.

Three pairs of Black Oystercatchers with one or two fledglings each were visible on the rocks in July 2011. Oystercatchers were seen sitting on two nests in 2017. In 2019, two chicks and a total of 35 oystercatchers were seen on 15 July; and 35 adults and 10 young, mainly fledged juveniles with black bill tips, were counted on 9 August. In 2020, at least two pairs were reported nesting. In 2021, Anna Smith found one nest with three eggs on 21 May (Figure 296) and eight nests were counted during the full survey in June (1 of the 8 nests contained 2 eggs and the rest were empty; a total of 16 alarmed adults were encountered around nests and hidden chicks were suspected).

Figure 294. Pelagic Cormorant nests on Sea Egg Rocks in 2011 (this page and next page, top) and one of the crevices used for nesting by Pelagic Cormorants in 2021 (next page, bottom). *Photos by Anna Smith, July 2011 and Sheila Harrington, 17 June 2021.*

Figure 295. Double-crested Cormorants were first confirmed nesting on Sea Egg Rocks in 2020, although they were present on the rocks for several years before that. In June 2021, two completed and one partially built nest were counted, all attended by adults (shown here). Seven nests were seen later that season in July. Note the unfortunate Pelagic Cormorant nesting directly under the central Double-crested Cormorant nest. *Photo by Sheila Harrington, 17 June 2021.*

Figure 296. Black Oystercatcher nest of mussel, limpet, and clam shells with three eggs found on Sea Egg Rocks in May (right) and a nest of rock chips and a few shells with two eggs found in June 2021. *Photos by Anna Smith, 21 May 2021 (right) and Sheila Harrington, 17 June 2021.*

Table SG-310. Seabird nesting records for Sea Egg Rocks. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
4 Jun 1978	0	0	0	0	(0)	523
24 Jun 1981	0	0	0	0	(0)	523
Jun 1986				5		420
7 Jun 2011			1S	27S		456
Jul 2011	0	63	2	50+e	S(6)	506
2015				S		475
22 Jun 2017		x	2e	x	S(6)	475
15 Jun 2019	1S	32	S	21+		506
15 Jul 2019	0	40	x	4+	S(9)	475, 506
9 Aug 2019		x	x	30+	S(4)	506
9 Jul 2020	4	30	2eS+	52e	S(8)	459
21 May 2021	S	S	x	x		506
17 Jun 2021	3	44	8[1]	112e	x(6)	482
4 Jul 2021	7					506

Pigeon Guillemots have been seen on each visit between 2011 and 2021. In 2021, one adult flew out of a 3 m-wide hollow in the rock obscured by grasses, coarse woody debris, and small shrubs. Five other guillemots were present, three on the rocks and two in the water.

Remarks: In May 2021, Anna Smith reported a disturbing amount of garbage, styrofoam, aquaculture gear, and netting washed up on the shores of the island. With funding from the BC government's *Clean Coast, Clean Waters Initiative Fund*, which provides more than $9.5 million for projects to clear BC's shores of marine debris and derelict vessels, Anna and one other person removed 35.5 kg of styrofoam from under one of the cormorant nesting cliffs (Figure 297). Clean-up crews found similar types of marine debris on many islands in the area.

Figure 297. Refuse from human civilization mars and contaminates marine waters and shorelines around the world. In 2021, the BC government established the *Clean Coast, Clean Waters Initiative Fund*, with which people were hired to conduct clean-up operations along BC shorelines. On Sea Egg Rocks, clean-up crews found smaller pieces of styrofoam and other debris littered ankle-deep among the shore rocks under the cormorant nesting cliffs (left). Big pieces of styrofoam, looking like large rocks, were also washed up along the shore (middle). In total, the two-person crew removed 35.5 kg of styrofoam from the shore of Sea Egg Rocks. Similar types of debris were found on many other islands in the area. *Photos by Anna Smith, 21 May 2021.*

In June 2021, observers saw two dry mink scats on one of the rocky knolls. There were several empty gull nests on that rock and two nests contained one whole egg plus broken eggshell fragments (no young). One crow was present when the survey party arrived but it left and did not return during the survey. Two Bald Eagles were seen flying high over the area.

Smith's visit on 4 July 2021 was after the heat wave that hit the area in late June. She reported that most gull chicks had survived the heat wave but there was evidence of eggs that had not, including some that were part-way hatched. She found four dead gull chicks but could not determine the cause of death.

SG-320 SANGSTER ISLAND

Location: *49°25'34"N 124°11'56"W; 92 F/8.*
Off the south end of Lasqueti Island, southwest of Young Point.

Description: *22 ha; 67 m high; Forested; Cliffs.*
Most of this island is heavily forested. There are rocky outcroppings, especially along the east side, and some cliffs along the shore. There is a navigational beacon on the south tip (Figure 298).

Historical summary: One pair of Pigeon Guillemots was found nesting in a crevice in a rock bluff in 1981 (Figure 299; Table SG-320). An adult flew out of the nest site and one egg was visible from the top of the bluff. Six Glaucous-winged Gulls were seen but they were not nesting. We have no recent records for this site.

Table SG-320. Seabird nesting records for Sangster Island. See Appendix 2 for codes.

DATE	PIGU	SOURCE
24 Jun 1981	1(1)	523

Remarks: Two adult Bald Eagles were seen at a nest with young on the northwest side in 1981.

Figure 298. Sangster Island seen from the east. The navigational beacon at the south tip of the island is visible on the left. *Photo by R. Wayne Campbell, 24 June 1981.*

Figure 299. One pair of Pigeon Guillemots was confirmed nesting on the bluffs on Sangster Island in 1981. The island should be surveyed again, preferably in the morning, to check for recent nesting and estimate numbers of guillemots using this site. *Photo by R. Wayne Campbell, 24 June 1981.*

SG-330 "PRIESTLAND" ROCKS

Location: *49°30'28"N 123°54'46"W* (outer rock)*; 92 G/12.*
On the east side of Halfmoon Bay, just south of the government wharf in Priestland Cove.

Description: *0.2 ha; 3 m high; Grassy rock.*

Historical summary: A pair of Glaucous-winged Gulls was nesting on the top of the outer of these two rocks in 1981 (Table SG-330). The nest held three eggs on each visit in June. No Black Oystercatchers were present in 1981; a nest with two eggs was photographed by local birder, Jonathan Pap, in 2021.

Table SG-330. Seabird nesting records (nests) for "Priestland" Rocks.

DATE	BLOY	GWGU	SOURCE
11, 24 Jun 1981	0	1	523
20 Jul 2021	1		524

Remarks: The area is heavily disturbed by boaters and fishermen.

SG-340 "JEDDAH" ROCKS

Location: *49°30'07"N 123°56'48"W* (east rock)*; 92 G/12.*
Off Jeddah Point on the west corner of Halfmoon Bay.

Description: *1.4 ha; 17 m high; Grassy rock.*
The colony consists of a large (0.9 ha) islet south of Jeddah Point and six small rocks to the southeast of the large islet. The large islet has a few trees (Figure 300). The six small rocks are predominantly bare, with some grass growth.

Figure 300. The "Jeddah" Rocks colony includes one larger islet with a few trees (shown here) and half a dozen smaller rocks off Jeddah Point at the west corner of Halfmoon Bay on the mainland coast. *Photo by R. Wayne Campbell, 11 June 1981.*

Historical summary: In 1981, a Black Oystercatcher nest with three pipping eggs was found on the most northern of the small rocks, closest to the large islet (Table SG-340). One Glaucous-winged Gull nest with three eggs was located on the most eastern of the small rocks and one empty gull nest was found on the most southern of the small rocks. A pair of gulls was present at each nest. We have no recent records for this site.

Table SG-340. Seabird nesting records for "Jeddah" Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
11 Jun 1981	1	2[1]	523

Remarks: One adult Bald Eagle was perched in a tree on the large islet in 1981.

SG-350 BERTHA ISLAND

Location: *49°27'54"N 123°57'40"W; 92 G/5.*
Off the south end of South Thormanby Island.

Description: *2.8 ha; 23 m high; Grassy rock; Cliffs.*
This is a steep-sided rock, with grasses and some shrubs growing along crevices and hollows. There is a large, central vegetated area, and there are cliffs at the southeast corner (Figure 301). The island is part of Simson Provincial Park on South Thormanby Island established in 1986.

Figure 301. Bertha Island has ample, open rocky habitat that seems suitable for nesting by Glaucous-winged Gulls and Black Oystercatchers. Surprisingly, those species have never been recorded nesting at this site. *Photo by R. Wayne Campbell, 11 June 1981.*

Historical summary: No birds were seen by the BCPM crew in 1974 (Table SG-350). Pelagic Cormorants were nesting on cliff ledges at the southeast corner of the island in 1981 (Figure 302). The contents of four nests were determined: three held eggs and one was empty. Two cormorants were sitting on nests and 24 birds were present in 2015. Pigeon Guillemots were recorded but no other information was provided in 2011.

Figure 302. A small colony of Pelagic Cormorants was established on the cliffs at the southeast corner of Bertha Island in 1981. Two nests were also seen here in 2015. *Photo by R. Wayne Campbell, 11 June 1981.*

Table SG-350. Seabird nesting records for Bertha Island. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
9 Jul 1974	0		523
11 Jun 1981	12		523
15 Aug 2011		(6)	524
4 Jul 2015	2		524

Remarks: There were no signs of predation on cormorant eggs and no crows were seen in 1981.

SG-360 FRANKLIN ISLAND

Location: *49°28'00"N 123°55'09"W; 92 G/5.*
Off the southwest side of Merry Island. Often called Franklin Rock.

Description: *1.0 ha; 13 m high; Grassy rock; Cliffs.*
This small companion to Merry Island is mostly bare rock, with grass growing in fissures where soil has collected. There are cliffs on the northeast (facing Merry Island) and southwest sides of the island (Figure 303).

Historical summary: Drent and Guiguet [144] summarized earlier records, but the first count and full survey of the island was conducted by Drent in 1968 (Table SG-360). In the following years, Ethel Kippin made many complete surveys during the time she was stationed at the lighthouse on Merry Island. Nest record cards submitted to the BCNRS [523] by Kippin in 1970, 1971, and 1972 gave the locality as Merry Island but it was clear from other information she provided that she was referring to Franklin Island in those years. Records for Franklin or Merry island were more clearly identified in other years (1969, 1975-1977) that she submitted records. Only Double-crested Cormorants were surveyed in 1979.

Figure 303. Franklin Island (centre left), often called "Franklin Rock," sits off the southwest side of Merry Island, which is visible on the right side of the photo. *Photo by R. Wayne Campbell, 25 June 1981.*

We are uncertain about records from 1980. A display crew from the BCPM visited the colony that year. They gave the location as Merry Island but must have been referring to Franklin Island because they counted Double-crested Cormorant nests, which were never reported on Merry Island either before or after 1980. We assumed that they counted all Double-crested Cormorant nests and that the estimate given for that species in 1980 was accurate. However, they reported an anomalously high estimate for Pelagic Cormorants. The observers provided almost no other information other than a rough estimate of numbers, but they did note that there were two different nesting sites for Pelagic Cormorants and indicated that their estimate was approximate. We assumed that they saw birds on both sides of Franklin Island where nesting occurred in other years, but it is also possible that they included birds seen on the adjacent shore of Merry Island. Even so, their estimate seemed grossly inflated compared to contemporary counts from years just before and after 1980. For Glaucous-winged Gulls, we are not sure if a complete count was conducted in 1980; only nests with eggs or young were listed and it is unlikely that there were no empty nests that year. We also assumed that the count referred to Franklin Island but it is possible that the nests inspected were on Merry Island or on both Franklin and Merry islands.

In a number of years, estimates have been given for Franklin and Merry islands combined, compromising the interpretation of trends on each island. However, data are adequate to reveal dramatic declines in the three main nesting species on Franklin Island. Ignoring the estimate from 1980,

Pelagic Cormorants began declining in 1972, from a population of about 120-130 nesting pairs in 1968-1971. Double-crested Cormorant populations increased from 1967 when they were first recorded to a peak in 1978, followed by a subsequent decrease. Both cormorant species had abandoned the colony by 2000. Glaucous-winged Gull numbers have also declined in recent decades and numbers found nesting on the regional survey conducted in 2010 were perhaps only a tenth of the numbers nesting at their peak in the 1970s and early 1980s (Figure 304).

Table SG-360. Seabird nesting records for Franklin Island. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
1950				700-800eS[a]		144
1950-60				x		144
1960				500e		144
20 May 1961				150+e		523
5 Jun 1961				x		523, 536e
1967	x					523
11 Jun 1968	11[3]	123		243e	3S	523
15 Jun 1969	16[10]	127		267[247]		523
6 Jul 1969	29[25]	127		125+		523
28 May 1970	33[3]	60[3]		246[116]		523
15 Jun 1970	33[21]	119[82]		398[347]		523
5 Jul 1970	39[32]	128[100]		352[279]		523
20 May 1971	30[0]	71		272e		523
17 Jun 1971	60[41]	124		480e		523
5 Jul 1971	60[40]	124		480e		523
7 Jul 1972	48[31]	105[63]		173[167]		523
26 May 1974	41	86		366		523
19 Jun 1974	56	63+		359		523
9 Jul 1974	54[41]	92[72]		387[354]	x	523[b,c]
1 Jun 1975	60[18]	42[16]		282[209]		523[c]
20 Jul 1975	60[38]	42[31]		280[135]		523
1 Jun 1976	66[0]	57[0]		277[227]		523
21 Jun 1976	66[11]	61[17]		279[261]		523[c]
15 Jul 1976	66[53]					523
6 Jun 1977	69[48]	32[17]		287[242]		523
9 Jun 1978	91[0]	24[6]	0	478[404]	S(3)	523
29 Jun 1978	35e	20e		150e		523
8 Aug 1979	70[1]				(7)	523
27 Jun 1980	28	~190e[d]		[256][d]		523[d]
11 Jun 1981	47[0]	14[2]		384[259]	2S(3)	523
25 Jun 1981	49[14]	19[0]		443[306]	2e(3)	523
29 May-13 Jun 1983	21	18[a]				421
Jun 1986				216		420
8-9 Jul 1987	5	22[a]	0[e]		(0)[e]	158, 427, 428
2000	0	0				114
12-16 Jun 2006				100e[a]		30, 456
19 Jun 2010			1	47[43]		30, 453
13 Jul 2014	0	0	[f]	x	(0)	94
30 Apr 2019					x(11)	524
29 May 2021				43eS		524

[a] Estimates given included both Franklin and Merry islands.
[b] Note that Campbell [70] combined estimates for Franklin and Merry islands and listed them for Merry Island.
[c] Note that for Glaucous-winged Gulls in 1974-1976, Blight [30] gave combined estimates for Franklin and Merry islands based on numbers of birds present rather than the number of nests counted. Many gulls present were not involved in nesting in those years (see text).
[d] We are uncertain about these data from 1980 (see text).
[e] No records were listed [158, 427] but we assumed the site was surveyed and no birds were seen (see section *Identifying and Addressing Issues with the Historical Data*).
[f] Two oystercatchers were present.

Figure 304. Franklin Island supported a large Glaucous-winged Gull colony until the mid-1980s. Numbers peaked at 478 nests in 1978; only 47 nests were counted on the last complete survey in 2010. Double-crested Cormorant nests are visible on top of the left rocky knoll. *Photo by R. Wayne Campbell, 11 June 1981.*

Glaucous-winged Gulls were the first species recorded nesting on the island. J.A. Brooks, who was a Fisheries Guardian out of Victoria, reported about 700-800 pairs of gulls on territory on the two islands in April 1950 and lightkeeper George Potts noted nesting on both islands throughout the 1950s.[144] Potts gave an estimate of 500 pairs on Franklin Island in 1960 and D. Lorne Frost made a partial estimate in 1961. Drent inspected 203 nests (188 with eggs and 15 empty) on Franklin Island in 1968 but did not count nests near the cliffs so as not to disturb nesting cormorants. Eighty adult gulls were counted in those areas, giving an estimate of another 40 pairs, for a total estimate of 243 pairs. Drent considered that a minimum estimate and said the nesting population could be as high as 300 pairs.

Ethel Kippin first counted gull nests on 15 June 1969, tallying slightly more nests than Drent did the year before. She often conducted multiple surveys during a season, finding different numbers of nests on each survey. On a second visit in 1969 on 6 July she found 125 nests, 102 of which still held eggs or young, counted 96 young outside of nests, and noted that nests that were no longer in use had been demolished. Kippin made three nest counts in 1970. Many nests were still being constructed in May and the maximum number of nests was counted in June and indicated an increase of almost 50% from the same date in 1969. Kippin noted the greater population size and described the colony as "crowded." Fourteen of 252 nests counted on 20 May 1971 held eggs; nest building was still in progress. Kippin estimated another 20 nests for a total of 272 nests on that survey. Later that season she counted 450 nests (416 containing eggs or young) in June, 420 nests (324 with eggs or young) in July, and estimated the total number of nests to be 480 on both those visits. Only 173 nests were found on a single count in July 1972. Kippin conducted two counts in 1974, but maximum numbers of nests were counted by the BCPM crew in July that year. Ethel made several counts in 1975 and 1976 and last submitted survey records for Franklin Island in 1977.

The maximum number of gull nests ever counted was 478 tallied by Wayne Campbell and Heather Garrioch from the BCPM on 9 June 1978, although Kippin estimated slightly more (480) in 1971. Syd Roberts made a cursory estimate from photographs taken later that season, but clearly under-estimated numbers nesting. High numbers of nests were also counted in 1981, especially on 25 June (Figure 305) when 59 more nests were found than on 11 June. Only about half as many nests were found when the colony was next surveyed in 1986 and populations continued to decline through 2010. About 100 gulls were present in 2014. Most were just standing and may have failed nesting, but two downy chicks were also seen. In May 2021, Arnold Skei from Sechelt counted 85 adults spread out on territories over the island. We used that count to estimate 43 pairs nesting in 2021, but we considered the count of 47 nests from 2010 the best recent estimate of population size for Glaucous-winged Gulls (Figure 306).

Drent found 11 Double-crested Cormorant nests amongst Pelagic Cormorant nests on the seaward-facing cliffs on the southwest side of the island in 1968. Ethel Kippin reported that their bulky stick nests were also there the year before. Thus, Double-crested Cormorants nested on Franklin Island at least as early as 1967.

The location of Double-crested Cormorant nests appears to have changed over the years. In 1970, nests were described as sturdy structures of moss and

sticks on rock ledges and cliffs, with Glaucous-winged Gulls and Pelagic Cormorants nesting in the same area. Similarly in 1972, Kippin described the Double-crested Cormorant nests as constructed of sticks and mud on the cliff sides. In 1974, the BCPM crews noted that nests were on the very top and west sides of the island and in 1976 and 1977 Kippin reported that nests were located high on the island. She noted considerable repair and reinforcement of old nests in 1977. All nests were located on the top of the island towards the northwest end in 1981 (Figure 307).

Figure 305. Two complete Glaucous-winged Gull nest counts were conducted on Franklin Island in 1981: 384 nests on 11 June and 443 nests on 25 June. More nests counted on 25 June suggested that nests were still being built and eggs being laid over the interval between the surveys, although some chicks were already hatching by 25 June. *Photo by R. Wayne Campbell, 25 June 1981.*

Figure 306. Many people have assisted with surveys of seabird colonies in BC. Here, Jamie and Helen Stevens from BC Fish & Wildlife Branch are helping Wayne Campbell survey the large Glaucous-winged Gull colony on Franklin Island in 1981. *Photo by R. Wayne Campbell, 25 June 1981.*

Figure 307. In the 1970s and 1980s, Glaucous-winged Gulls were nesting across the top of Franklin Island, Double-crested Cormorants were nesting along the cliff tops on the southwest side of the island, and Pelagic Cormorants were nesting on ledges on the cliff faces. *Photos by R. Wayne Campbell, 9 July 1974 (top) and 11 June 1981.*

Multiple surveys conducted by Kippin revealed some changes in numbers of Double-crested Cormorant nests within and between seasons. On 15 June 1969, Kippin noted that the six empty Double-crested Cormorant nests inspected were still under construction. All nests had been completed when she returned in July. In 1970, nests were under construction and few eggs had yet been laid when Kippin first counted nests in May. She counted seven more nests in July than she had seen in May and June. The nesting population was increasing at that time, and in 1971, 30 new nests were built between 20 May and 17 June. Kippin made counts in May and June 1974. Nest contents were not reported but numbers of nests again increased over those months. Numbers of nests remained fairly stable from 1975 to 1977.

As with Glaucous-winged Gulls, the peak number of Double-crested Cormorant nests was counted in 1978, although all nests were empty at the time of that survey on 9 June. Of about 35 nests

inspected by Syd Roberts on 29 June, only one contained eggs, the rest were again empty. The next year (1979) again appeared to be a complete failure for Double-crested Cormorants, with only one nest containing an egg at the beginning of August. All nests were empty on 11 June 1981 but some nests held eggs by 25 June that year (Figure 308). Two new nests had been started in the time between the two visits that year and were about half finished on 25 June. Double-crested Cormorants were last recorded nesting on the island in 1987, when Vermeer et al. reported five nesting pairs.

Figure 308. Double-crested Cormorants were first recorded nesting on Franklin Island in 1967. Numbers increased over the next few years and most nests inspected in late June or in July in those years held eggs (top). Peak numbers of nests were counted in 1978 but most nests were empty and breeding appeared to be unsuccessful in that and subsequent years. Numbers nesting quickly declined and Double-crested Cormorants were last seen nesting on the island in 1987. *Photos by R. Wayne Campbell, 9 July 1974 (top) and 25 June 1981.*

Pelagic Cormorants were nesting on both seaward-facing cliffs and on the cliffs facing Merry Island in 1968. Contents were determined in most nests and most were empty: Drent tallied 123 nests on Franklin Island and six nests on the adjacent cliffs on Merry Island (see below); of those, 11 held eggs, 102 were empty, and 16 were unknown. Ethel Kippin counted 127 nests on Franklin Island on both her visits in 1969: five nests were inaccessible; of the remaining 122 nests that she inspected on each visit, 108 held eggs and 14 were empty on 15 June, and 118 held eggs or young and four were empty on 6 July. In 1970, first eggs were laid on 10 May and nests were still being built on 15 June. Kippin described them as sturdy mud type nests attached to rock ledges and cliffs. She counted the maximum number of nests in July. There were 53 prepared, empty nests and many more were still being built on 20 May 1971. Including started nests, Kippin estimated the total number of nests to be 71 on that visit. In June and July 1971, 124 nests were counted, 32 of which were located on the underside of the cliff and could not be inspected. Of the 92 nests whose contents could be determined, 62 were empty in June and 66 were empty in July. In 1972, Kippin described nests as made of grass and mud. On 9 July 1974, the BCPM crew reported that the Pelagic Cormorant colony now circled the island. Ethel Kippin also counted nests earlier that year (nest contents were not reported). Kippin found fewer nests in 1976 and even less in 1977. There was much rebuilding and reinforcing of old nests and some new nests built in 1977.

The declining trend continued after 1977 (except for the anomalous estimate given in 1980 – see above) and only 24 Pelagic Cormorant nests were seen on 9 June 1978. Only six nests contained eggs on 9 June and only two of about 20 nests seen on 29 June contained a single egg each; all others were empty. Nests were still being built through June in 1981; seven new nests were constructed on the southwest side cliffs between 11 and 25 June. On 11 June, there were five nests (2 with eggs) on the northeast side cliffs facing Merry Island and nine empty nests on the southwest side cliffs below the Double-crested Cormorant colony. On 25 June, only three nests remained on the northeast side and there were now 16 nests on the southwest side. All were empty. Similar low numbers of nests were reported during the surveys in 1983 and 1987 when Pelagic Cormorants were last seen nesting.

Drent observed Pigeon Guillemots flying past the cormorant cliffs in 1968 but did not search for nests so as not to disturb cormorants. Three were seen off the rock in 1978 and 1981 and seven were recorded in 1979. Nesting was confirmed on 9 July 1974, when one nest with one young was found in a rock crevice, and on 21 June 1981 when a nest with

one egg was found under beach logs piled up on the island. None were recorded during surveys in 1987 and 2014. In 2019, Bernard Schroeder reported guillemots flying up to nest spots on the island.

Black Oystercatchers were first recorded in 2010 when Blight found a nest with one egg and one small chick. Two were seen from the water in 2014. Campbell and Garrioch specifically stated that they saw no oystercatchers in 1978.

Many non-breeding Glaucous-winged Gulls apparently attend this colony during the summer. In all years, Kippin noted many gulls around that she explicitly stated were not involved in nesting. However, she tallied birds as "pairs" and combined breeding and non-breeding birds in counts. Kippen gave her estimates for total number of gulls at the colony as pairs because the nest record cards that she filled out are worded that way. It was clear from her discussion of first-year birds and other information given that she was not referring to the non-breeding birds as “paired” birds, although these estimates included the nesting birds as well. She estimated a total of 500 pairs attending the colony on both visits in 1969 and 800 pairs attending the colony on all three visits in 1970. In 1971, she estimated 1,000 pairs present on each visit and noted many more first-year birds in the area than in previous years. Nine hundred pairs were estimated on the colony in 1972 and in 1975 she estimated 340 and 325 pairs attending the colony in June and July, respectively. Similarly in 1976 and 1977, Kippin estimated 500 pairs of gulls on the colony with many not involved in making nests. Kippin’s estimates of total birds at the colony has created some confusion in later compilations of her records. Blight [30] gave combined estimates for Franklin and Merry islands in 1974-1976 based on the numbers of birds present rather than the numbers of nests counted.

Kippin also included non-breeding cormorants in her estimates of total birds attending the colony. On all three visits in 1970, Kippin estimated 52 pairs of Double-crested Cormorants present. She indicated that all nests were counted, with a maximum of 39 nests counted in July; thus more birds were attending the colony than were nesting. The same was true in 1971, when she estimated 70 pairs present on all three visits and counted a maximum of 60 nests. A total of 48 nests were counted and 58 pairs estimated in the colony in July 1972. In 1975, the estimated number of pairs present was the same as the number of nests, but the following two years there was again a difference with 75 pairs estimated present in both years and 66 and 69 nests counted in 1976 and 1977, respectively. After being disturbed on 11 June 1981, nesting birds gathered on the water offshore where Wayne Campbell counted a total of 114 adults. This was consistent with earlier observations by Ethel Kippin of more birds usually attending the colony than were nesting. For Pelagic Cormorants, Kippin estimated the total number of pairs attending the colony to be 140 in July 1970; 145 on all three surveys in 1971; 125 in 1972; the same as the number of nests in 1975; 67 on both surveys in 1976; and 60 in 1977. Kippin noted that although there were fewer nests in 1977 than 1976, the number of birds present was similar in those two years.

Remarks: Native avian predators and human disturbance have impacted nesting seabirds on Franklin Island. Bald Eagles nested on the adjacent Merry Island in 1967 and 1968. Drent blamed flushing due to eagles followed by crow predation for the few eggs in cormorant nests in 1968. Eggs preyed on by crows were found near nests. Kippin observed four Bald Eagles feeding in the gull colony on 15 June 1970. She found seven dead young gulls on 5 July 1970. Six eagles were seen in the colony in 1971 and Kippin reported that gulls and cormorants were flushed from their nests more frequently than the year before. She noted high mortality among young cormorants and gulls in September 1971, and stated that gull chicks suffered high mortality throughout the summer, with perhaps one quarter achieving fledging size. Bald Eagle (Figure 309) and crow predation occurred daily and they were seen taking up to 20 gull chicks in a single day. Kippin found 26 dead young gulls in July 1972. She noted that the young gulls seemed hungry and adults seemed more aggressive than usual that year. Fourteen dead young were found in July 1975 and five dead young were noted in June 1976. Wayne Campbell recorded one adult Bald Eagle present on 11 June 1981.

Ethel Kippin noted crows continually pilfering eggs from both Double-crested and Pelagic cormorant nests in 1969, 1970, 1971, and 1972. All early Pelagic Cormorant eggs were taken by crows in 1970. Kippin reported that the crow population was larger in 1970 than in the previous year. In 1971, she gathered over 25 broken Double-crested and Pelagic cormorant eggs by 20 May and another 100 between 20 May and 17 June, noting that predation by crows was very heavy that year. About six Double-crested Cormorant eggs had been pushed out of nests and broken on 6 June 1977. Attempts to exterminate the crow population were begun in 1970 (see Merry Island account) but Kippin noted increased numbers again in 1977.

Figure 309. On Franklin Island in 1968 and through the 1970s, Bald Eagles were preying heavily on Glaucous-winged Gull chicks and, through their disturbance that flushed adults off their nests, facilitating high predation of cormorant eggs by Northwestern Crows. *Photo by Paula Courteau.*

Crows were first observed preying on gull eggs in 1971. Crows would roll gull eggs down the cliff until they broke. Kippin found 10 eggs broken in this way on 20 May. She also found two gull nests each containing three freshly broken eggs that were obviously the work of crows just minutes before she arrived on the scene on 17 June. Crows were taking many gulls eggs to feed their young at that time. Four broken gull eggs were found on 1 June 1976, 10 were seen on 6 June 1977, and 18 were freshly depredated on 25 June 1981.

Glaucous-winged Gulls have been responsible for some predation on cormorant eggs and one was seen taking a Double-crested Cormorant egg in 1974. Observers on 9 June 1978 found 33 broken cormorant eggs, at least nine of which were identified as Double-crested Cormorant eggs. Crows and gulls were seen preying on eggs and likely were at least partly responsible for the predominantly empty cormorant nests found during that survey. After briefly disturbing the cormorants on 29 June 1978, Syd Roberts witnessed a gull robbing the last remaining eggs from a Double-crested Cormorant nest before the cormorants could return. A similar situation prevailed in 1981 when both crows and gulls were seen taking cormorant eggs: eight freshly broken Double-crested Cormorant and two freshly broken Pelagic Cormorant eggs were found on 11 June; and 13 freshly depredated Double-crested Cormorant eggs were seen on 25 June. By 25 June, Pelagic Cormorants had failed to keep any eggs in their nests and the 14 Double-crested Cormorant nests with eggs held only one egg each.

Human disturbance has been a problem on the island since at least 1970. Ethel and Jim Kippin reported very little human disturbance in the area in 1968 but that was no longer the case in the 1970s and since. Ethel found about 30 broken Double-crested Cormorant eggs around nests on 21 June 1976 following a day of high human disturbance. The previous day, a charter skin-diving boat was in the area all day and a camera buff and other people from the boat spent about four hours on the island. On 21 June, Ethel also noted that gulls were especially aggressive and territorial, which she felt was a response to the disturbances the previous day. The Kippins also reported high human disturbance during the summer of 1978 from tourists, boaters, and scuba divers who apparently came from Vancouver to collect marine specimens in the area. Gulls were again very aggressive towards surveyors that year. Chris Shepard and Elizabeth Courtnall from the BCPM noted an “awful lot of people and crows in the area” in relation to the apparent total failure of Double-crested Cormorants in 1979. On several occasions in 1981, surveyors were hit on the head by wings, feet, and bills of very aggressive and noisy gulls. A low-flying seaplane and later a closely approaching boat put nesting birds into the air on 25 June 1981. Crows were patrolling the colony during both those disturbances.

Weather has impacted nesting birds in some years. Rain and strong southeast winds caused substantial mortality of gull chicks in July 1974. Eighteen dead and 92 near-dead chicks were found during the survey on 9 July. Ethel Kippin saw no eggs in cormorant nests on 1 June 1976 and suspected that cool weather may have delayed the nesting season.

Ethel Kippin observed several examples of egg dumping over the years. One gull nest contained three gull eggs and one Pelagic Cormorant egg on 15 June 1969, and three gull nests contained the same complement of eggs on 15 June 1970. One Double-crested Cormorant nest inspected on 5 July 1970 contained one Double-crested Cormorant egg and two Glaucous-winged Gull eggs, and one gull nest contained three gull eggs and one Double-crested Cormorant egg on 17 June 1971. The BCPM crew in 1980 reported one gull nest with a cormorant egg in it.

In 1971, Kippin noted that about two thirds of gulls used the same nests as in the previous year. Also, many gulls did very little nest construction, merely selecting a level area to lay their eggs.

A large flock of Herring Gulls (*Larus argentatus*) was present for 2-3 days in early June 1971, which apparently caused some unrest amongst the nesting Glaucous-winged Gulls and may have exacerbated impacts by crows that year.

One Canada Goose nest was found in 2010.

SG-370 MERRY ISLAND

Location: *49°28'09"N 123°55'08"W; 92 G/5.*
South of Halfmoon Bay at the south end of Welcome Passage. Colony includes the rock off the southeast end, locally known as Bambi Islet.

Description: *19 ha; 58 m high; Forested; Grassy rock; Cliffs.*
The majority of this island is forested, with some open areas along the rocky shore, especially along the southwest side and around the southeast end where the lighthouse is situated. There are cliffs on the southwest side, north of Franklin Island, and on the east side of the island. Bambi Islet has some grass and forb growth but is mostly bare rock (Figure 310).

A lighthouse was built on the southeast point of Merry Island in 1903 to guide ships into the entrance of Welcome Pass, which separates Thormanby Island from the Sechelt peninsula. Will Franklin was the first lightkeeper. He and his wife Mary Ann claimed the rest of the island under the *Homestead Act*. They raised sheep, turkeys, chickens, and ducks, and lived on the island until 1954, although Will's term as lighthouse keeper ended in 1932. The original light was replaced with the present tower in 1966. That lighthouse and associated buildings were designated as a Federal Heritage site by Parks Canada in May 2015. The light is still manned and, except for the lighthouse grounds, the island is still privately owned.

Figure 310. View of Merry Island from the south showing the lighthouse and Bambi Islet on the right and Franklin Island in the left foreground. *Photo by R. Wayne Campbell, 11 June 1981.*

Historical summary: The earliest records of seabirds nesting on Merry Island are from 1924, when Donald W. Gillingham relayed reports of nesting by Glaucous-winged Gulls and Pigeon Guillemots, and also of a smaller, unidentified seabird breeding on the lower ledges, which may have referred to Pelagic Cormorants (Table SG-370). Records of Glaucous-winged Gulls nesting in 1950 to 1960 were presented by Drent and Guiguet, and Drent visited the area in 1968. Ethel Kippin made frequent observations and conducted many surveys during the years from 1966 to 1978 that she was stationed at the lighthouse with her husband Jim. Wayne Campbell and other staff from the BCPM conducted several surveys from 1974 to 1981.

In a number of years, estimates have been given for Franklin and Merry islands combined, compromising the interpretation of trends on each island. However, data clearly show major declines in nesting populations of Pelagic Cormorants and Glaucous-winged Gulls. Both species had virtually abandoned Merry Island by the 1980s and none appeared to be nesting when Harry Carter boated by the islands in 2014. Because data were combined for Franklin and Merry islands, we do not know whether Pelagic Cormorants were nesting on Merry Island in 1983 or 1987, nor whether Glaucous-winged Gulls were nesting in 2006.

About 700-800 pairs of Glaucous-winged Gulls were reported on the two islands by J.A. Brooks in April 1950 and lightkeeper George Potts noted nesting on both islands throughout the 1950s. Potts gave an estimate of 100 pairs nesting in two groups on Merry Island in 1960. In 1968, Drent counted 240 adult gulls on the side of Merry Island facing Franklin Island and estimated 120 pairs nesting. He stated that none had nested in that area in 1955 when the property was sold by the Franklins. In 1974, Ethel and Jim Kippin informed Wayne Campbell that only scattered pairs of gulls had nested along the

west side of Merry Island in 1970. This observation seems contrary to the count of 240 adults there by Drent in 1968. In 1974, the BCPM party counted 228 nests on the west side and 24 nests on the east side of the island (Figure 311). Ethel Kippin counted 275 nests on the west side and 17 nests on the east side on 1 June and 281 nests on the west side and 20 nests on the east side on 20 July 1975. On the 1 June survey, she could not determine the contents of 10 nests clinging to the cliffs on the east side of the island; of the 282 nests inspected, 210 contained eggs and the rest were empty. As on Franklin Island, more birds were present than were nesting and Kippin estimated that 320 and 20 pairs were attending the west and east sides, respectively, of the

Figure 311. Glaucous-winged Gulls were reported nesting on Merry Island a hundred years ago. A good-sized colony was present until the early 1980s, after which the breeding population collapsed. *Photo by R. Wayne Campbell, 9 July 1974.*

Table SG-370. Seabird nesting records for Merry Island. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
1924			x	x	182, 523
1950			[a]		144
1950-60			x		144
1960			100e		144
1966		1			523
11 Jun 1968	6	1	120e		523
1 Jun 1970		1			523
1972		2			523
9 Jul 1974	38[35]	2[2]	252[201]	x	523[b,c]
1 Jun 1975	55[11]		292		523
20 Jul 1975	55[32]		301[157]		523[c]
1976		3			523
1 Jun 1976	53[0]		305[237]		523
21 Jun 1976	58[30]	2[2]	311[291]	x5	523[c]
6 Jun 1977	54[9]		310[255]		523
20 Jun 1977				x21	523
9 Jun 1978	76[42]	4e	362	10-15e(17)	523
1979			x		523
11 Jun 1981	0	3[2]	151[30]	10-15e(9)	523
25 Jun 1981	2[0]	3[2]	158[13]	S(8)	523
29 May-13 Jun 1983	[a]				421
Jun 1986			6		420
8-9 Jul 1987	[a]	1		S(3)	158, 427, 428
May-Jul 1989	3				375
2000	0				114
12-16 Jun 2006		1eS	[a]		30, 57, 456
19 Jun 2010		1eS	3eS		30, 453
13 Jul 2014	0	[d]	0	S(9)	94

[a] See Franklin Island. Estimates given included both Franklin and Merry islands.
[b] Note that Campbell [70] combined estimates for Franklin and Merry islands and listed them for Merry Island.
[c] Note that for Glaucous-winged Gulls in 1974-1976, Blight [30] gave combined estimates for Franklin and Merry islands based on numbers of birds present rather than the number of nests counted. Many gulls present were not involved in nesting in those years (see text).
[d] Eight oystercatchers were present.

colony on both visits in 1975. Two counts by Kippin in 1976 gave: 294 and 11 nests on 1 June and 300 and 11 nests on 21 June on the west and east sides, respectively. Again, many gulls present were not nesting and she estimated 500 and 20 pairs of gulls on the west and east sides of the colony, respectively, on both visits that year. In 1977, she counted 293 and 17 nests on the west and east sides, respectively, and estimated totals of 500 and 25 pairs of gulls attending those two areas (but not all nesting). Campbell and Garrioch counted 351 nests (279 contained eggs) on the west side and 11 pairs scattered along the east side (nest contents were not determined) in 1978.

By 1981, Glaucous-winged Gulls had ceased nesting on the east side of the island and numbers nesting on the west side had declined precipitously since 1978. Only six pairs were nesting when the island was next surveyed in 1986. Records for Franklin and Merry islands were combined in 2006 and so the specific locations of nests found that year are uncertain. The island was surveyed from the water and only three pairs were suspected nesting in 2010. That may have been the last year that gulls nested on Merry Island. No Glaucous-winged Gulls were seen from the water in 2014.

In 1968, Drent first recorded Pelagic Cormorants nesting on the southwest-side cliffs opposite Franklin Island. Birds were also nesting in that area in subsequent years (Figure 312). In 1974, the Kippins reported that the colony on Merry Island was recently established and there had been no Pelagic Cormorants nesting on that island in 1971. However, Drent's earlier observation indicates that they have nested on Merry Island since at least 1968. Ethel Kippin reported the same number of pairs present as there were nests in 1975, but in 1976 she estimated 60 pairs present but counted only 58 nests. The maximum number of nests was counted in 1978, but only three years later, in 1981, there were no Pelagic Cormorants present on 11 June and only two newly-built, empty nests were seen on 25 June. Three nests seen in 1989 were the last record of Pelagic Cormorants nesting on Merry Island. No cormorants were found nesting during the two subsequent regional surveys in 2000 and 2014.

Figure 312. Location of Pelagic Cormorant colony on the southwest-side cliffs of Merry Island opposite Franklin Island, as seen in 1974. *Photo by R. Wayne Campbell, 9 July 1974.*

Drent recorded one pair of Black Oystercatchers in 1968. Two pairs of oystercatchers with young were seen on Bambi Islet by the BCPM crew in 1974. According to Ethel and Jim Kippin in 1974, oystercatchers had nested on that rock every year previously that they had been at the lightstation. Ethel submitted nest record cards for one nest monitored there in 1976 (the nest contained 3 eggs on 15 May and 3 young on 15 June) and an additional nest found in a new location on the west side of the main island (that nest contained 3 eggs on 25 May and 3 young on 21 June). Three oystercatcher nests were found in 1978; one on Bambi Islet and two on the main island just west of the lightstation; and one additional pair was seen carrying nesting material (the nest was not located) on the west side of the island near the cormorant colony where Kippin had found a nest in 1976. That year, the Kippins provided additional historical nesting records for oystercatchers to Wayne Campbell: one pair nesting on Bambi Islet in 1966, 1972, and 1976; and one pair in 1972 and two pairs in 1976 nesting near the lighthouse. One nest was again found on Bambi Islet and two nests were located west of the lighthouse in 1981 (Figure 313). A territorial pair was seen from the water on Bambi Islet in 2010 and eight birds were seen on the island in 2014.

Figure 313. One of three Black Oystercatcher nests found on Merry Island in 1981. *Photo by R. Wayne Campbell, 11 June 1981.*

Pigeon Guillemots have been recorded nesting along both the east and west sides of the island. Nesting was first confirmed in 1924 and then again on 9 July 1974, when one nest with two young was found in a rock crevice along the west side within the gull colony. Ethel Kippin reported five nests on cliffs on the east side of the island in 1976 and 21 nests there in 1977. She could not access the cliffs, but we assume she saw birds flying to and from those nest sites. In 1978, three guillemots were seen flying from rock crevices along the east shore and a total of 17 birds were counted around the whole island. Two nests with single eggs each were found in crevices along the west side and two pairs were seen along the east side on 11 June 1981. Birds were seen along the west side on 25 June 1981. Pigeon Guillemots were seen on the water off the east side in 2014.

Double-crested Cormorants have never been confirmed nesting on Merry Island.

Remarks: In 1924, Gillingham reported that, "the lighthouse keeper protects the birds from visitors and will admit no one on the island." The lighthouse keeper Gillingham was referring to must have been Will Franklin. According to the Kippins, First Nations people from the Sechelt band used to gather eggs on the island up until 1967. Their practice was to smash all eggs and then return a few days later to harvest all the fresh-laid replacement eggs.

Bald Eagles were recorded nesting on the island in 1967, 1968, and 1978. Ethel Kippin noted that gulls nesting on the east side of Merry Island were frequently disturbed by eagles in 1975. Thirteen dead young gulls were found on 20 July 1975 and seven dead chicks were seen on 21 June 1976 (Figure 314). One adult Bald Eagle was seen flying off the north end of the island in 2014.

As on Franklin Island, crows and likely gulls were preying on cormorant and gull eggs. Freshly broken gull eggs were found on many surveys: 10 on 1 June 1976, five in 1977, six on 11 June 1981, and 14 on 25 June 1981. Seven broken Pelagic Cormorant eggs, presumably taken by crows, were found under trees along the west side of the island in 1978.

Figure 314. Remains of Bald Eagle predation on an adult Glaucous-winged Gull found on Merry Island in 1981. *Photo by R. Wayne Campbell, 11 June 1981.*

In an effort to protect nesting seabirds on Franklin and Merry islands, the Kippins began an extermination program against the crows in 1970. Crows were generally shot in the spring and fall and nests were destroyed through the summer. Totals of 100+, 120+, 100+, 100+, and 60+ crows were shot in 1970, 1971, 1972, 1973, and 1974, respectively. In 1972, with the help of a local wildlife officer, the Kippins destroyed 110 crow nests. Fifty and 26 nests were pulled down in 1973 and 1974. Some control efforts continued through 1978, but Ethel Kippin noted that crows were on the increase again in 1977.

As on Franklin Island, rain and strong southeast winds caused substantial mortality of gull chicks in July 1974. Eight dead and 33 near-dead chicks were found on the west side of the island during the survey on 9 July (Figure 315). Ethel Kippin noted that a cool spring may have accounted for the lack of eggs in cormorant nests on 1 June 1976.

In 1974, the Kippins reported that they had twice seen mink on the island. They also suspected that river otters bred on the island. Campbell wondered whether predation by mink or river otter may have been the cause of so many empty nests in 1981.

Campbell noted that some gull nests were scanty collections of material in 1981, similar to what Ethel Kippin observed on Franklin Island in 1971, where in some cases eggs were just laid on a level patch of ground with little attempt to build a nest. Such behaviour by nesting gulls complicates survey methodology. Such nests are readily counted if they contain eggs but could easily be missed if eggs have not yet been laid or have been lost.

Figure 315. A major storm with torrential rain and fierce southeast winds in July 1974 caused havoc in the Glaucous-winged Gull colony on Merry Island. Nests were blown asunder (top left) and many small chicks died from hyperthermia. *Photos by R. Wayne Campbell, 9 July 1974.*

As we previously related,[335] Jim Kippin suffered and eventually succumbed to aspergillosis that he likely became infected with during his term on Merry Island. Sadly his efforts, along with his wife Ethel, to monitor and protect the seabirds nesting on the island, ultimately led to his death. The disease may also have impacted the gull population.

SG-380 PORPOISE BAY

Location: *49°29'01"N 123°45'42"W; 92 G/5.*
At the head of Sechelt Inlet on the north side of the town of Sechelt.

Description: *Pilings.*

Historical summary: Wayne Campbell found one pair of Glaucous-winged Gulls nesting on top of a piling at the end of the Tyee Aviation wharf in 1978 (Table SG-380). At that time, he was informed by locals that gulls had nested on that piling for at least the past three years. The nest seen in 1981 was on top of another piling near the float plane wharf. The next records for this site are from 2018: local birder Arnold Skei photographed an adult gull sitting in an abandoned Osprey (*Pandion haliaetus*) nest atop a piling on 20 July; and John Hodges from Roberts Creek saw an adult gull and chick in the nest on 29 July.

Table SG-380. Seabird nesting records (nests) for Porpoise Bay.

DATE	GWGU	SOURCE
20 Jul 1978	1	523
9 Jun 1981	1	523
20, 29 Jul 2018	1	524

SG-390 TRAIL ISLANDS

Location: *49°27'16"N 123°48'54"W* (west island)*; 92 G/5.*
Off the south end of the Sechelt Peninsula between Sargeant and Trail bays, southwest of Sechelt town centre.

Description: *50 ha; 76 m high; Forested; Grassy rock; Cliffs.*

This colony is composed of six islands (Figure 316). Four of these are large, forested islands: from east to west, we refer to these as east island, middle island, larger west island, and smaller west island. There are two small rocks: a 0.5 ha rock (north rock) located north of the larger west island and a 0.1 ha rock (northwest rock) located northwest of the smaller west island. The four larger islands are forested with rocky shorelines. The north rock has some grassy patches. The northwest rock is bare. There are cliffs on the southwest end of the smaller west island. There are dwellings and some clearings on the two largest islands (east island and larger west island).

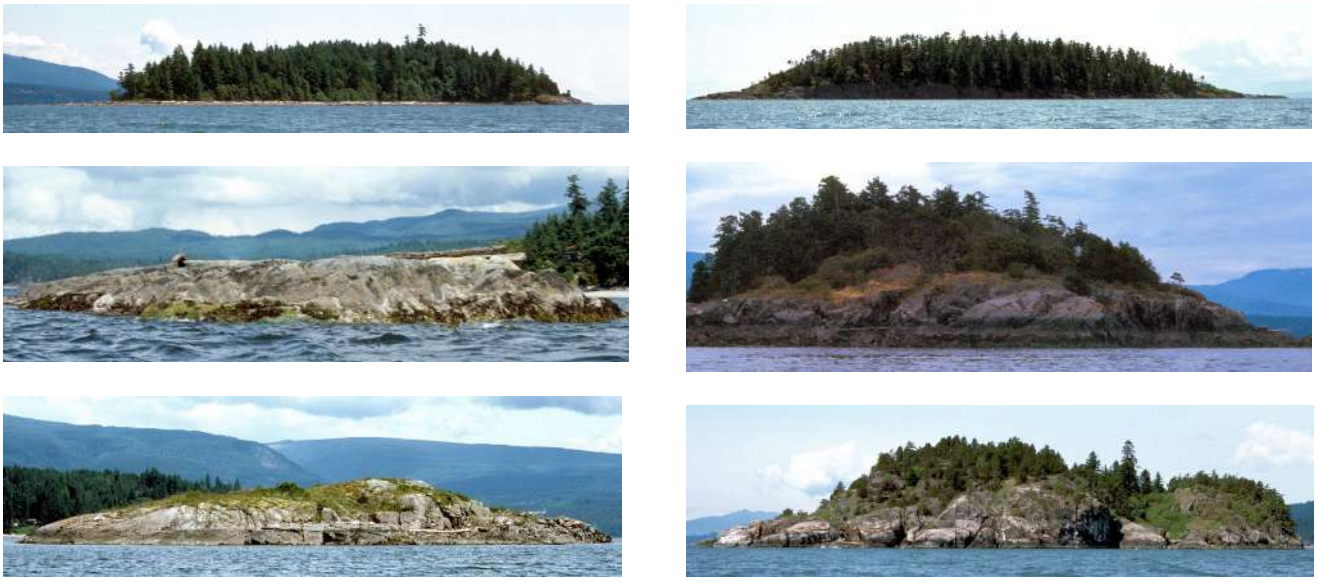


Figure 316. The six islands of the Trail Islands (clockwise from top left): east island, middle island, larger west island, smaller west island, north rock, and northwest rock. *Photos by R. Wayne Campbell, 8 July 1974 (larger west island) and 11 June 1981.*

Historical summary: The first nesting records for these islands were submitted by Lola Caldwell of Sechelt in 1973 (Table SG-390). Surveys between 1974 and 1981 were conducted by Wayne Campbell and others from the BCPM. Only the northwest rock was landed on in 1978; other islands were checked by boat. Only Pelagic Cormorants were surveyed from the water in 1980.

Small numbers of Pelagic Cormorants nested here from 1973 to 1993 but had abandoned the site by 2000. The nesting location was described as "steep cliff on the south east side of Trail Islands" in 1973, but observers from 1974 to 1981 reported nests only on the south end of the smaller west island (Figure 317). We are uncertain whether there have been two historical nesting sites or whether Caldwell's description in 1973 was an error; perhaps she meant "southwest" side if the islands. The contents of three nests could be determined in 1973; two held single eggs and one was empty. Nests were built on ledges on the cliff in 1978 and on ledges in two crevices in the cliffs in 1981. Egg laying was in progress at the time of the 1981 visit. Nesting was last reported in 1993 by local birder Arnold Skei, who boated around all the islands and counted a total of 30 birds.

Black Oystercatchers have nested on the northwest rock (nest with 3 young in 1978) and the north rock (nest with 3 eggs in 1981). One oystercatcher on the middle island was sighted from the water in 2014.

Scattered pairs of Glaucous-winged Gulls were found nesting between 1973 and 1981 but we have no records of gulls nesting since 1981. These islands were not surveyed during the region-wide surveys in 1986 [420] or 2010.[30] Carter surveyed the islands from the water in 2014 and did not report any gulls; we assumed none were present (Black Oystercatchers and Pigeon Guillemots were recorded and Carter would have recorded gulls if they were present). Between 1973 and 1981, gull nests were found on low rocks and rocky outcroppings. Nests were found or pairs were suspected nesting on all four of the forested islands: near the Pelagic Cormorant cliff on the smaller west island (1 nest with 2 eggs in 1974; 2 pairs in 1978; 3 nests with eggs and 1 empty nest in 1981); on the larger west island (1 pair in 1978); on the middle island (two isolated nests with eggs and

Table SG-390. Seabird nesting records for Trail Islands. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
10 Jun 1973	10e		2[2]	2S	523
8 Jul 1974	2[1]	0	3[3]		70, 523
9 Jun 1978	4e	1	4eS	S(5)	523
27 Jun 1980	28	1eS			523
1 Jun 1981		1			523
11 Jun 1981	11[2]	1	5[4]	2(4)	523
29 May-13 Jun 1983	15				421
8-9 Jul 1987	14	0[a]		S(11)	158, 427, 428
1 Aug 1993	x			(5)	524
2000	0				114
12-16 Jun 2006	0	3eS			57, 522
2007	0				522
13 Jul 2014	0	[b]	0	S(3)	94
29 Jul 2017				(1)	524
7 Aug 2018				(2)	524

[a] No record was listed,[427] but we assumed the site was surveyed and no birds were seen (see section *Identifying and Addressing Issues with the Historical Data*).
[b] One oystercatcher was present.

Figure 317. Pelagic Cormorants were recorded nesting on the Trail Island for two decades from 1973 to 1993. Nests were located on cliffs at the southern end of the smaller west island. The colony has been abandoned since 2000. *Photo by R. Wayne Campbell, 11 June 1981.*

young in 1974; 1 pair in 1978); and on the southern headland of the east island (1 nest with 3 eggs in 1981).

Pigeon Guillemots were seen off three of the forested islands in 1978. Two birds flew from crevices on the cormorant cliffs in 1981 and joined two birds on the water. Guillemots were sighted on the water off the smaller west island in 2014.

Remarks: Crows were constantly patrolling cormorant nests and one depredated cormorant egg was found on the rocks below the nests in 1973. No signs of predation were reported in other years. Fourteen crows were recorded in 1981. One adult Bald Eagle was present in 1978, 1980, and 1981, and six adult and four juvenile eagles were present in 2014.

Oystercatcher eggs were collected (Figure 318) from the nest found in 1981 and shipped to Dr. Allan Baker at the Royal Ontario Museum for physiological studies of incubation.

Figure 318. Small numbers of eggs of several seabird species are routinely collected for studies that monitor levels of heavy metals and other contaminates that bioaccumulate in seabirds and other marine species. Some eggs are also collected under permit for other research purposes. A clutch of three Black Oystercatcher eggs was collected from Trail Islands in 1981 for physiological studies of incubation. *Photo by Michael S. Rodway.*

SG-400 WHITE ISLETS

Location: *49°25'05"N 123°42'43"W; 92 G/5.*
South of Wilson Creek, midway between Sechelt and Roberts Creek. Locally known as Gull Island.

Description: *0.8 ha; 13 m high; Bare rock; Cliffs.*
The main islet is a rounded dome of bare, whitish granite, with a few pockets of grass. There are cliffs on the western portion of the south side. Deep crevices separate the dome from other sections of the main islet on the northwest corner, and there is an isolated rock, locally known as Little White Islet, off the southeast corner. There is a navigational beacon on the rock. A 29 km^2 area around White Islets and Wilson Creek has been designated as an Important Bird Area by Birds Canada.

Historical summary: Breeding by Glaucous-winged Gulls was first reported in 1923 (Table SG-400). Gull eggs were collected in 1933 and the Merilees family frequently visited these islets and observed gulls nesting during the years 1935-1958. Lorne Frost confirmed nesting by Pigeon Guillemots in 1964. Rudi Drent with his son Jan conducted the first full survey of the colony in 1968 and first documented breeding by Pelagic Cormorants and Black Oystercatchers. They returned in 1969. Surveys in 1974-1981 were conducted by personnel from the BCPM, except Wayne Diakow from Madeira Park counted nests on 10 June 1979. Cormorants were surveyed from the water in August 1979 and in 1980.

Table SG-400. Seabird nesting records for White Islets. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
Aug 1923			x		144
1 Jul 1933			x		539b
1935-58			x		144
14 Jun 1964				x	536f
11 Jun 1968	3	1	345[330][a]	4[4]	523
31 Jul 1969	3[3]		x	10-15e	523
8 Jul 1974	4[4]	0	279[278]	8e(12)	70, 523
9 Jun 1978	15[14]	0	458[410]	x(19)	523
10 Jun 1979	50	2eS	470	S(8)	523
8 Aug 1979	15			S(16)	523
27 Jun 1980	37		310[297]		523
9 Jun 1981	49[17]	1	314[185]	5-10e(5)	523
29 May-13 Jun 1983	38				421
Jun 1986			490		420
8-9 Jul 1987	13	2		S(11)	158, 427, 428
1 Aug 1993				(6)	524
Jul-Sep 2000	2				114
12-16 Jun 2006		0			57
19 Jun 2010	7	0	328[253]		30, 453
11 Jul 2014	1-2S		many	x(8)	524
13 Jul 2014	1	[b]	S	S(7)	94, 101
14 Sep 2014	x		x		524
23 Aug 2015			x		524
4 Aug 2016				(8)	524
26 Aug 2017			x		524
7 Aug 2018				(6)	524
9 Aug 2020			x		524
25 Jul 2021			x		524
16 Jul 2023			x	S(12)	524

[a] The contents of 340 nests were determined; 10 were empty.
[b] Two oystercatchers were present.

Pelagic Cormorants have mainly nested on the cliffs along the southwest side of the main islet, except in 1974. Three nests were recorded in 1968 without details. The three nests held young in 1969 and were located on a sheer rock face. In 1974, there were two nests with eggs or young on both the west

and east sides of the main islet. All nests were again along the southwest portion of the main islet in 1978. Wayne Diakow counted 47 nests (45 with eggs) and estimated a total of 50 nests on 10 June 1979. Large young were seen in August. Egg laying was in progress at the time of the 1981 visit. Numbers nesting declined after the early 1980s. A total of 33 birds, seven on nests, were seen in 2010; nests were small and appeared recently built. In 2014, Arnold Skei reported one or two nests on 11 July, Carter saw one nest with an adult standing beside it on 13 July, and young in a nest and a total of 50 birds were reported on 14 September.

One Black Oystercatcher nest with three eggs was found in 1968. The nest was in a deep fissure. Drent recorded 60 oystercatchers in 1969 but made no mention of nesting. Five birds were present but no nests were found on 10 June 1979. Six oystercatchers were present in 1980 and one nest with two eggs was found among the wooden structure around the navigational beacon in 1981. None were seen from the water in 2006 and none were seen on the main islet in 2010, but two were seen from the water and may have been nesting in 2014.

Drent tallied 340 Glaucous-winged Gull nests and estimated a total of 345 nests in 1968. Young were fledging at the time of the 1969 visit. Ten nests were recorded on Little White Islet in 1974; the rest were on the main islet. That year and 2010 were the only years that observers specifically recorded nests on Little White Islet. In 1979, Wayne Diakow counted 455 nests (434 with eggs; 2 of those with newly hatched chicks) and estimated a total of 470 nests on 10 June. The maximum number of gull nests was recorded in 1986 after which the breeding population appeared to decline. In 2010, six nests (5 with eggs) were counted on Little White Islet; the rest were on the main islet (Figure 319). In 2014, Arnold Skei estimated 300 gulls present, with many on nests, on 11 July. Two days later, Carter reported only about 200 gulls present: 17 were visible sitting on nests but most were roosting and Carter suspected that the majority of nesting attempts had likely failed. However, many large juveniles were running around on 14 September

Figure 319. Glaucous-winged Gull nests on White Islets in 2010 were built of a wide variety of materials, including grasses, lichens, bark, feathers, seaweeds, twigs, and even a Douglas-fir cone. One nest of mostly red-cedar bark had been built in a square hollow in an old, concrete base of what was likely a former light tower. There is little vegetation on the islets and most nesting material was likely gathered from the adjacent mainland shore. *Photos by Louise Blight, 19 June 2010.*

that year. Large chicks and recently fledged young were recorded in 2015, 2017, 2020, and 2021. Ken Wright reported nests with young and about 250 gulls present in 2023.We considered the nest count from 2010 the best recent estimate of population size for Glaucous-winged Gulls.

Pigeon Guillemots have been observed during most surveys in the years since they were confirmed nesting in 1964. Four Pigeon Guillemot nests with eggs were found in 1968, and five nests with eggs or young were located after a brief search in 1969. In 1968, two nests were under boulders and two were in open clefts and easily visible from above. Four nests with eggs or young found in 1974 were all in exposed locations in open cracks (Figure 320), as was one nest with an egg found in a rock crevice on the west side of the main islet in 1978, and three nests with eggs found in 1981. In 2014 Pigeon Guillemots were seen carrying food on 11 July, and three birds were on land in nesting habitat and four were on the water on 13 July. Wright saw 12 birds, nine of them perched on the islets, in 2023.

Figure 320. Pigeon Guillemots typically place their nests in concealed locations in crevices in cliff faces or under rocks or logs, but several nests found on White Islets in different years have been located in open rock clefts and were easily visible from above. *Photo by R. Wayne Campbell, 8 July 1974.*

Remarks: Nine dead and three near-dead young Pelagic Cormorants were seen in 1974. No details as to possible causes were provided. In 1981, there were four crows on the islet: two freshly broken Pelagic Cormorant eggs and eight freshly broken gull eggs were found that had been preyed on by crows. However, Wayne Campbell suspected that the high proportion of empty gull nests in 1981 was due to human disturbance. One depredated cormorant egg was found in 2010.

Many gull nests were poorly built in 1981 and some eggs had been laid on bare rock with only traces of nesting material. This is similar to what was observed on Merry Island in that year and on Franklin Island in 1971.

One Canada Goose nest with one egg was found on the main islet in 2010.

SG-410 POPHAM ISLAND

Location: *49°21'42"N 123°29'17"W; 92 G/6.*
Most western of the group of islands west of Bowen Island at the mouth of Howe Sound.

Description: *19 ha; 76 m high; Forested.*
This is a heavily forested island, with exposed rocky promontories. Some summer homes are tucked away around the shoreline (Figure 321).

Historical summary: Keith Taylor and Gary Seedhouse from the BCPM saw no seabirds when they boated around the island in 1974 (Table SG-410). Wayne Campbell saw one Pigeon Guillemot fly from a nest in a vertical crevice on the rocky shoreline in 1981.

Table SG-410. Seabird nesting records for Popham Island. See Appendix 2 for codes.

DATE	PIGU	SOURCE
8 Jul 1974	(0)	523
23 Jun 1981	1(2)	523

Figure 321. Popham Island is densely forested, with some bluffs around the rocky shoreline. Some dwellings are visible at the edge of the forest. *Photo by R. Wayne Campbell, 23 June 1981.*

SG-414 PASLEY ISLAND

Location: *49°21'16"N 123°27'47"W* (south rock)*; 92 G/6.*
West of Bowen Island on the west side of Collingwood Channel. Colony includes all unnamed rocks around Pasley Island.

Description: *102 ha; 65 m high; Forested; Grassy rock.*
The main forested island has some rocky bluffs and beaches and several homes around the shore (Figure 322). Small rocks off the north and south ends are mostly bare, with some grassy areas.

Figure 322. There are no records of seabirds breeding on the main, forested Pasley Island (top), although rocky bluffs around the perimeter likely provide suitable nesting habitat for Pigeon Guillemots. Black Oystercatchers have been reported nesting on the small, mostly bare rocks off the north and south ends of the island. *Photos by R. Wayne Campbell, 23 June 1981 (top) and Paula Courteau.*

Historical summary: No evidence of nesting seabirds was seen by BCPM crews in 1974 or 1981 (Table SG-414), although habitat on the smaller rocks seemed suitable for nesting gulls. Five adult Glaucous-winged Gulls were roosting in 1981.

One pair of Black Oystercatchers was suspected nesting on the larger of the south rocks in 2006. The rock was surveyed from the water. Two empty nests were found and one pair was alarm calling on that rock in 2015. Old, unattended nests were also found in 2015 on the smaller south rock and on the rock off the north end between New Islet and Mickey Island.

Table SG-414. Seabird nesting records for Pasley Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
8 Jul 1975	0	523
23 Jun 1981	0	523
12-16 Jun 2006	1eS	57
22 Jun 2015	1S	62

SG-416 "ONION" ROCK

Location: *49°21'20"N 123°25'29"W; 92 G/6.*
In Tunstall Bay on the west side of Bowen Island. Also locally known as Onion Island.

Description: *0.3 ha; 9 m high; Grassy rock.*

Historical summary: We have no record of this rock being surveyed prior to 2015. A Black Oystercatcher nest with three eggs and one empty scrape were found in 2015 (Table SG-416). Two pairs were present. In 2022, Trisha Beaty from Bowen Island reported an adult sitting on a nest on 7 June and Ken Wright observed a pair of adults on the rock on 20 July.

Table SG-416. Seabird nesting records for "Onion" Rock. See Appendix 2 for codes.

DATE	BLOY	SOURCE
22 Jun 2015	2[1]	62, 456
7 Jun, 20 Jul 2022	1	524

SG-420 RAGGED ISLAND

Location: *49°22'38"N 123°27'01"W; 92 G/6.*
Between Pasley and Keats islands on the south side of Barfleur Passage.

Description: *5.6 ha; 58 m high; Forested; Grassy rock.*
The main island is forested, with a mostly rocky shoreline and some rock bluffs. The tidally-connected east rocks have some grassy areas and a few trees (Figure 323). There is a dwelling on the main island.

Figure 323. The main Ragged Island is forested, with steep rocky shorelines (top). Higher sections of the tidally-connected east rocks are grassy, with a few trees on top. *Photos by R. Wayne Campbell, 23 June 1981 (top) and 8 July 1974.*

Historical summary: One old Glaucous-winged Gull nest was found in 1974 (Figure 324). In 1981, a Black Oystercatcher nest with two eggs was found on the top of the east rocks (Figure 325; Table SG-420). A single Pigeon Guillemot was reported present but not nesting. In 2001, Delta birder Brian Self saw four adult oystercatchers and found a nest with three eggs. In 2015, three adults, one pair alarm calling, were observed on the southeast point of the east rocks; old, unattended oystercatcher nests were also found on the east rocks.

Table SG-420. Seabird nesting records for Ragged Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
8 Jul 1974	0	523
23 Jun 1981	1	523
2 Jul 2001	1	524
22 Jun 2015	1eS	62

Figure 324. Although several Glaucous-winged Gulls were present and aggressive on Ragged Island in 1974, only one old nest was found and nesting on the island has never been confirmed. In this photo, Gary Seedhouse from the BCPM is searching for nests. Note the oar Gary is holding to protect his head from dive-bombing gulls. *Photo by R. Wayne Campbell, 8 July 1974.*

Figure 325. Black Oystercatcher nest of rock chips and clam shell fragments found on Ragged Island in 1981. *Photo by R. Wayne Campbell, 23 June 1981.*

Remarks: An old Canada Goose nest that had obviously been used earlier in the season was found on the north tip of the island in 1981.

SG-424 "GALBRAITH" ROCK

Location: *49°24'09"N 123°22'43"W; 92 G/6.*
In Galbraith Bay on the northwest side of Bowen Island.

Description: *0.1 ha; 6 m high; Bare rock.*

Historical summary: One Black Oystercatcher was seen sitting on a nest in 2015 (Table SG-424).

Table SG-424. Seabird nesting records (nests) for "Galbraith" Rock.

DATE	BLOY	SOURCE
22 Jun 2015	1	62

SG-426 GRACE ISLANDS

Location: *49°25'51"N 123°26'49"W; 92 G/6.*
Off the tip of the southwest peninsula of Gambier Island.

Description: *3.7 ha; 44 m high; Forested; Grassy rock.*
Grace Islands are composed of three, tidally-connected islands. Two larger, northern islands are mostly forested. A mostly bare rock, with some grassy patches on top, is connected to the south side of the western, forested island. There is a small dock on the north side of the western island.

Historical summary: No evidence of nesting was seen in 1974 or 1981 (Table SG-426). A Black Oystercatcher nest with one egg was found on the south rock in 2009.

Table SG-426. Seabird nesting records (nests) for Grace Islands.

DATE	BLOY	SOURCE
8 Jul 1974	0	523
23 Jun 1981	0	523
9 Jun 2009	1	456

SG-428 MARINERS' REST

Location: *49°28'18"N 123°27'36"W; 92 G/6.*
West side of Gambier Island, off the point south of Andys Bay. Formerly called Steamboat Rock.

Description: *0.1 ha; 5 m high; Grassy rock.*
The rock is a provincially designated site for the burial of ashes at sea. A stainless steel cross marks it as consecrated ground. Services for the burial of ashes at sea are conducted offshore, not on the islet.

Historical summary: A Black Oystercatcher nest with two eggs was seen on the rock in 2009 (Table SG-428).

Table SG-428. Seabird nesting records (nests) for Mariners' Rest.

DATE	BLOY	SOURCE
3 Jun 2009	1	456

Remarks: Shoreline areas of Gambier Island to the north and south of Mariners' Rest are used for log booming operations associated with the Terminal Forest Products Langdale sorting facility located to the west across Thornbrough Channel.

SG-430 CHRISTIE ISLET

Location: *49°29'58"N 123°18'06"W; 92 G/6.*
South of Anvil Island and east of Gambier Island. Formerly known as Cynthia Island, Centre Island, and Gull Island. After buying the islet around 1914, Mr. Hugh Christie named it Christie Islet in honour of his father.[144] However, it was labelled Cynthia Island on charts published up to 1944, then changed to Christie Islet on nautical charts published in 1949.

Description: *0.8 ha; 28 m high; Grassy rock; Cliffs.*
Much of the top of this rocky islet is covered with grasses and patches of shrubs. Maguire [488] noted dense thickets of wild plum and brier in 1940, likely referring to serviceberry or saskatoon berry (*Amelanchier alnifolia*) and wild rose, respectively, which are common on the islet.[374] Except for a bouldery bay on the northwest corner (Figure 326), most of the shoreline drops steeply into the sea, with particularly steep cliffs along the east and south to southwest sides (Figure 327). Christie Islet was established as a federal Migratory Bird Sanctuary in 1962 and was the first and only Migratory Bird Sanctuary in BC specifically designated to protect nesting seabirds (Figure 328).

Figure 326. The small bouldery bay on the northwest corner of Christie Islet generally provides the most sheltered landing spot for authorized personnel conducting surveys on the islet. *Photo by Moira J.F. Lemon, 7 June 1999.*

Figure 327. Views of Christie Islet from the south, with Anvil Island in the background (top), and from the southeast, showing the bluffs along the east and southern sides where cormorants have nested. *Photos by R. Wayne Campbell, 6 July 1974.*

Figure 328. Christie Islet is the first and only federal Migratory Bird Sanctuary in BC specifically designated to protect nesting seabirds. It was established in 1962. The nesting seabirds seem to agree with the designation. *Photo by R. Wayne Campbell, 18 July 1970.*

Historical summary: Some uncertainty surrounds many early egg specimens that may have been collected on Christie Islet. There is a Glaucous-winged Gull egg record [540b] dated 7 June 1842 with a location of "Howe Sound, small island" that likely refers to Christie Islet or Pam Rock. However, the date is probably an error and should read "1942." Maguire is listed as the collector and he visited both Pam Rock and Christie Islet on 7 June 1942.[488] A Glaucous-winged Gull egg specimen [536g] in the RBCM from 24 June 1908 with a location given as "Gull Island" and the collector just listed as "museum" could be from Christie Islet but most likely came from Mandarte Island. Many gull eggs were collected from Mandarte Island on this date and other dates in 1908, and this particular specimen number is part of the sequence of specimen numbers assigned to eggs collected on Mandarte Island on that day.

A number of Glaucous-winged Gull egg specimens from the 1940s, including many reported for Christie Islet by Drent and Guiguet,[144] have locations variously given as "Howe Sound," "Howe Sound, small island," "Howe Sound, unnamed islet," "Christie Islet, Howe Sound," "Howe Sound, Anvil Island," "Anvil Island (off; Howe Sound)," "Anvil Island (near)," or "Howe Sound, Cynthia Island." Many of those specimens were collected by Maguire. A Pigeon Guillemot egg specimen from 15 June 1940 and Pelagic Cormorant egg specimens from 31 May 1941 and 10 June 1943 in "Howe Sound" may also have been from Christie Islet as Maguire collected on Christie Islet on all those dates. The only other likely location for most of those records would be Pam Rock but no records from this time specifically list Pam Rock as the location. However, location descriptions given on the egg specimen record cards provide further clues to where these egg specimens may have been collected.

Many specimen records in Maguire's collection with collection dates from 1941 to 1950 were clearly labelled from Cynthia Island. Middleton also collected in the area during the years 1942 to 1947 and all relevant specimens from him are labelled Christie Islet. We can thus confidently assign all those records to Christie Islet. The uncertainty surrounds other specimen records in Maguire's collection without exact locations. We think it is safe to assume that some of those came from Christie Islet but others were likely collected on Pam Rock and elsewhere. Those likely to have originated on Christie Islet include Glaucous-winged Gull and Pigeon Guillemot eggs (Figure 329) collected on 15 June 1940 on "small island, Howe Sound." The gull nests were described as "on ground, in dense plum thicket," which corresponds to the habitat on Christie Islet but not Pam Rock. Egg specimens that we think originated on Pam Rock are described in the colony account for Pam Rock below.

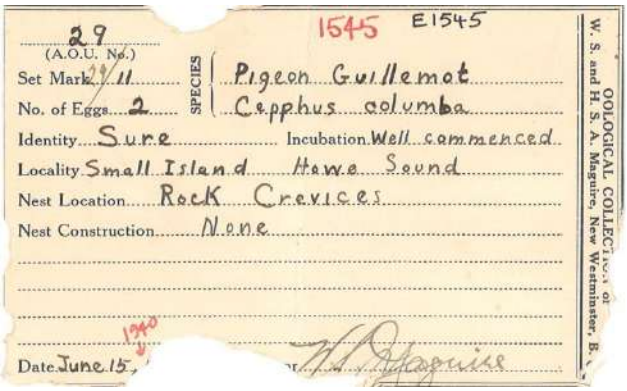

29 1545 E1545
(A.O.U. No.)
Set Mark 11 11
No. of Eggs 2
SPECIES
Pigeon Guillemot
Cepphus columba
Identity Sure
Incubation Well commenced
Locality Small Island Howe Sound
Nest Location Rock Crevices
Nest Construction None
Date June 15, 1940
W. S. and H. S. A. Maguire, New Westminster, B. C.
OOLOGICAL COLLECTIONS OF

Figure 329. Some uncertainty surrounds some early egg specimens collected by Maquire that were labeled "small island, Howe Sound." From other information about Maquire's collecting trips, we are fairly confident that this Pigeon Guillemot record is from Christie Islet. *Image courtesy of Royal BC Museum collections.*

One clutch of Glaucous-winged Gull eggs collected by Maguire on 31 May 1941 was from "a large wooded island in Howe Sound." We are unsure of this location; perhaps the eggs were collected on Passage Island.

The earliest definite report of seabirds nesting on Christie Islet is from 1914 (Table SG-430). Glaucous-winged Gulls were nesting on the islet

when it was bought and given its current name by Mr. Hugh Christie in that year.[144] Pelagic Cormorants were next confirmed breeding by R.A. Cumming in 1924. Pigeon Guillemots were confirmed breeding in 1940 and Double-crested Cormorants were reported nesting in 1941. In 1950, Maguire noted that Black Oystercatchers occasionally used the islet but it was not until 1964 that a nest was documented. Maguire saw some Tufted Puffins around the islet in 1944 and wondered if they might be nesting in "the innumerable fissures, clefts and crannies with which these islands abound." He was disappointed that no evidence of nesting was found. Tufted Puffins have not been recorded around the islet on any survey since.

Table SG-430. Seabird nesting records for Christie Islet. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
c1914				x		144
11 Jun 1924		x				536h
1926-31				x		369
2 Aug 1938				x		169, 345, 348
7 Aug 1939				x		346, 347, 348
1940				x		348, 349
15 June 1940				x	x	488, 536i, 539c, 540c
31 May 1941	x			150-160e[a]		144, 488
7 Jun 1942				200e+	40-50e	488, 536j,k, 539d
10 Jun 1943		6		x	x	144, 488, 536l, 539e
9 Jun 1944		x		x	x	534a, 536m, 539f, 540d
1 Jun 1945		x		x	x	144, 536n, 539g, 540e
8 Jun 1946		x		x	x	144, 534b, 536o, 539h, 540f
1 Jun 1947					x	536p
5 June 1948				x		539i
1948-54	once					144
1948-60		x		x	50-60e	144
5, 15 Jun 1949		x		x	x	144, 532b,c,d, 539j, 540g
11 Jun 1950		25-30e[a]	noted	500e	50e	144, 523, 539k
21 Jul 1952					x	144
1955-60	0					144
26 Jun 1955		7[7]		247[247]	11[11]+	144, 523
10 Jun 1956		20-25e[b]		30+	3+	144
26 Jun 1956		15[15]		419[419]	8+	144
30 May 1957		x		x	x	523
12 Jun 1958					x	536q
22 Jun 1958		24[24]		219[219]		144
20 Jul 1958		15-20		x		316, 350
21 Jun 1959		8[8]		299[299]	x	144
19 Jul 1959		3		x		316, 350
15 Jul 1960		few		x		144
27 Jul 1963	1	15-20e		250-350e		523
25 Jun 1964			1			67
12 Jun 1968		26[22]		285e[c]	7-10e(14)	523
12 Jul 1968	0	33[19]				523
9 Jul 1969		38		x	5-10e	523
18 Jul 1970	3[3]	45[42][d]	1eS	400-450e[b,e]	30-40e(50)	87, 523
6 Jun 1971	5[1]	23[21]		300e	2e	523
2 Aug 1973	46	20	0	x		523
6 Jul 1974	25[0][f]	47[40]	0	477[430]	15e(23)	70, 523
20 Jun 1976	79[68]	x	2eS		6e	523
25 Jul 1976	59	47	1eS	x	S(7)	523
11 Aug 1977	61	36	0	x	S(1)	523
10 Jun 1978	98[30][g]	43[23]	1	722[655][g]	x2+(36)	523
8 Aug 1979	94	27				523
10 Jun 1980	136[0]	29		499[434]	S(11)	523
8 Jun 1981	169[84]	48[26]	0	558[518]	10-15e(26)	523

Table SG-430. cont'd

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
29 May-13 Jun 1983	120[b]	80[b]				421
24 Aug 1983	164	51[23]	0	x	S(9)	523
31 May 1985	82[0][h]	17[0][h]		218[130]	x(29)	374
Jun 1986				454		420
8-9 Jul 1987	119[b]	44[b]	2[b]		S(23)[b]	158, 427, 428
May-Jul 1989	145	10				375
1994	64					376
7 Jun 1999	66	17	3[3]	246e[i]	S(8)	377, 484
Jul-Sep 2000	42[b]	19[b]				114
12-16 Jun 2006			2eS[b]			57
19 Jun 2008		x		160eS+	x	45
11 Jul 2009		x				45
2009	0					1
17 Jun 2010		1	2eS	54+		456
20 Jun 2010			2eS	255[198]		30, 453
26 Jul 2011	0	9				456
30 Jun 2013		x	1	x	x(6)	524
19 June 2014	0	9				456
13 Jul 2014	0	17	1	x	S(20)	94
22 Jun 2015		12	2e			62
16 Aug 2017					(20)	524
24 Aug 2018		x			(14)	524
25 May 2021		x	1		(4)	524

[a] Estimates may have included Pam Rock.[144, 488]
[b] Estimates given included both Christie Islet and Pam Rock.
[c] Blight [30] gave an estimate of 293 pairs but this was based on the number of birds estimated present (285-300 pairs) rather than the total number of nests estimated (285).
[d] Corrected from 44 nests listed in Campbell et al.[87]
[e] Drent and Campbell gave an estimate of 400-500 pairs for Christie Islet on a nest record card submitted in 1970 but in a subsequent publication [87] estimated 400-450 pairs for both Christie Islet and Pam Rock.
[f] Nests were abandoned.
[g] Totals for Double-crested Cormorant and Glaucous-winged Gull nests were previously recorded as 108 and 718, respectively, but we found errors in summation and the correct totals were 98 and 722, respectively.[523]
[h] All cormorant nests were empty but the survey was early in the season.
[i] Corrected from 232 nests reported in Sullivan et al.[377] using original data collected by Moira Lemon showing that 221 nests were counted and coverage of the colony was estimated at 90%.[484]

Glaucous-winged Gull Trends. Christie Islet became a focus for Glaucous-winged Gull banding programs and gulls were frequently recorded breeding after banding began in 1926. Egg specimens were often collected. Maguire estimated 150-160 pairs nesting in 1941, although this estimate likely included Pam Rock, and made what he called a conservative estimate of 200 pairs nesting on Christie Islet in 1942. He stated that gulls were on the increase in 1943 and 1944 but did not estimate numbers. The next population estimate for gulls on Christie Islet that we know of was made in 1950, when 500 pairs were estimated nesting, and the first actual nest count was recorded in 1955. Numbers of nests counted varied considerably from year to year at that time, from 219 to 419 nests in the years 1955 to 1959. All nests reported in those years held eggs or young; thus, it is possible that empty nests were not recorded and the nesting population was larger than the number of nests reported. Numbers increased to a maximum of 722 nests counted in 1978 (Figure 330), after which they declined so that population estimates were similar on the latest surveys in 1999 and 2010 as they were in 1955. Numbers were also particularly low in 1985, which seemed to be a poor year for cormorants as well as gulls.

In 1940, Maguire found numerous gull nests located in what he called unusual locations under dense growths of wild plum and brier (likely rose bushes) as well as deep under rock ledges that were also obscured by a heavy growth of brier. Maguire also noted that many gull nests were unlike any that he had seen before, being built largely of "brushy twigs" and looking something like Double-crested

Figure 330. Numbers of Glaucous-winged Gulls nesting on Christie Islet increased to a maximum of 722 nests in 1978. Numbers have decreased since to 255 nests as of the last complete survey in 2010. *Photos by R. Wayne Campbell, 18 July 1970 and 2 August 1973 (bottom left).*

Cormorant nests. In 1968, Rudi and Nora Drent noted that the islet was hard to survey completely for gull nests due to the dense shrub vegetation and difficult terrain and estimated that their coverage of the colony was about 80%. They counted 226 nests, 223 of which held eggs or young, and estimated a total of 285 nests and 285-300 pairs present (but not all necessarily nesting) on the islet. The maximum count in 1978 of 722 nests may have been partially due to survey effort. Campbell and Garrioch surveyed the islet in 1978 and made a concerted effort to search everywhere, finding nests as far as 2 m into thick rose bushes. However, a similarly intensive search was conducted in 1981 when fewer nests (558) were found. That year many nests were also found deep into grass and bush cover as well as under large boulders and on cliff ledges where Pelagic Cormorants were nesting (in 1974, one pair of gulls had built their nest in one of the abandoned Double-crested Cormorant nests; Figure 331). In 1999, gull nests were counted over 90% of the colony and estimated for the rest to avoid disturbing nesting cormorants: 221 nests were counted; contents were determined in 209 nests, 153 of which

Figure 331. Abandoned Double-crested Cormorant nest with a clutch of Glaucous-winged Gull eggs seen on Christie Islet in 1974. Gulls on territories are visible in the background. *Photo by R. Wayne Campbell, 6 July 1974.*

contained eggs and 56 were empty (Figure 332).[484] About 160 territories were tallied from the water in 2008 and Carter counted 180 adults and 24 downy chicks from the water in 2014. We considered the count of 255 nests from 2010 the best recent estimate of population size for Glaucous-winged Gulls on Christie Islet.

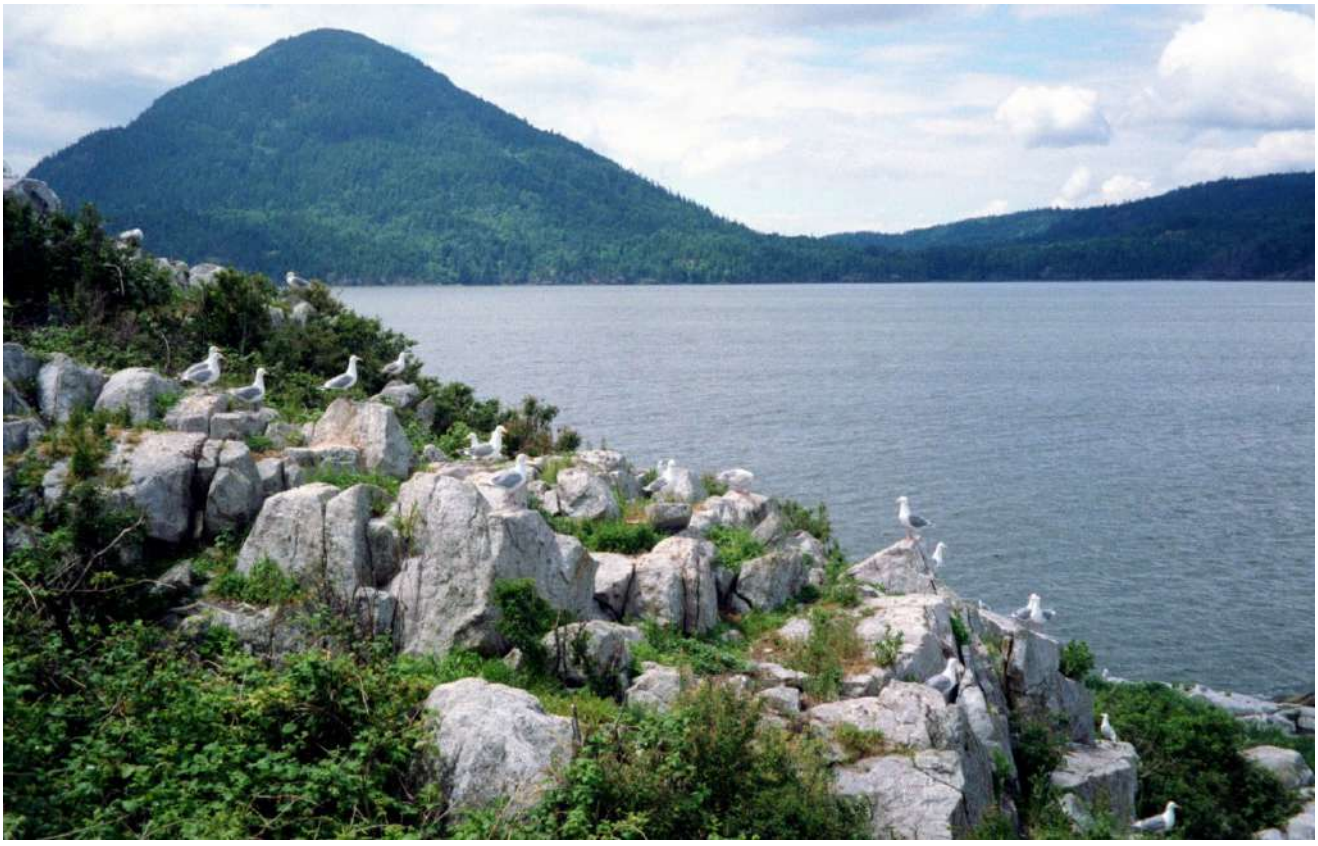


Figure 332. Glaucous-winged Gulls on territories in mixed rock and shrub nesting habitat on the west side of Christie Islet in 1999. Gambier Island is visible in the background. *Photo by Moira J.F. Lemon, 7 June 1999.*

Pelagic Cormorant Trends. Pelagic Cormorants have persisted nesting on Christie Islet over the last century but numbers have oscillated. Maguire found six Pelagic Cormorant nests on the east cliffs in 1943 and noted several nests there in 1944. In 1943, he was able to reach five of the nests to collect eggs (1 nest held 5 eggs, 3 held 4 eggs, and 1 was empty). Hughes reported that Pelagic Cormorants nested every year between 1948 through about 1960 but noted that the colony was "rapidly dwindling." Maguire called it a small colony in 1949 and estimated about 25-30 pairs in 1950. In 1956, Meugens and Cooper inspected eight nests with eggs on Christie Islet and estimated a combined total of 20-25 pairs nesting on Christie Islet and Pam Rock on 10 June, and Hughes counted 15 nests with eggs or young on Christie Islet on 26 June. Numbers counted by Merilees and McKay decreased from 24 nests in June 1958 to eight nests in June 1959. Sarles, visiting in July of those two years, reported slightly fewer nests, stating that the colony had declined from 15-20 nests in 1958 to only three nests in 1959. The few nests seen in 1960 were all empty and Drent and Guiguet stated that the colony was disappearing.

The declining trend for Pelagic Cormorants reversed after 1960. In 1963, 15 nests with eggs or young were inspected and a total of 15-20 nests were estimated located on the east side of the islet. Numbers generally continued to increase for the next two decades, with considerable year-to-year variation, to a peak of 51 nests in 1983. Numbers again declined afterwards, and less than 20 nests have been recorded on visits since 1989. The most recent nest count available is from 2015, when 12 nests were reported. Fledglings were seen in August 2018 and multiple nests were reported on the north and east sides of the islet in 2021.

The distribution of Pelagic Cormorant nests has varied through the years but most nesting has occurred along the east-side and south- or southwest-side cliffs (Figure 333), except in 1955 and 2021 when nests were reported on cliffs on the north side of the islet. On 22 June 1958, five nests were seen on west- and southwest-facing cliffs and 19 nests were recorded on east-facing cliffs. All eight nests found in June 1959 were on east- and northeast-facing cliffs. In 1968, Rudi and Nora Drent counted 26 nests located on south- and east-facing cliffs on 12 June. Rudi returned that year on 12 July with a party of five from UBC and after a thorough search found

Figure 333. Pelagic Cormorants have nested mainly on the east- and south-side cliffs on Christie Islet since they were first confirmed breeding there a century ago in 1924. *Photos by R. Wayne Campbell (top to bottom), 25 July 1976, 8 June 1981, and 18 July 1970.*

33 nests in the same areas. In 1969, Drent counted 23 nests along the east-side cliffs and 15 nests on the southwest corner from a boat, and inspected 31 of those nests from land, 30 of which contained eggs or young. Drent and Campbell counted 33 nests on the east side and 12 nests on the southwest cliffs in 1970. Nests were found in the same areas in 1971. On 2 August 1973, 13 of the 20 nests were empty but 24 large young were counted outside of nests. At this time, most nests (17) were located on the south end of the islet, with three nests below the Double-crested Cormorant colony on the east side. Most nests (31) were again on the east-side cliffs, with 16 nests on the south side in 1974. Similarly, on 25 July 1976, there were 30 nests (counted from the water) along the east side and 17 nests (counted from land) on the south side. Contents were determined in 33 of the 47 nests; all contained chicks or in one case an egg. In 1977, 12 nests were on the south side and 24 nests were on the east side in two groups below the northern and southern ends of the Double-crested Cormorant colony. Of the 36 nests counted, young were seen in 26, seven were empty, and the contents of three were unknown. Egg laying was still in progress at the time of the survey in 1978; 29 and 14 nests were counted on east- and south-side cliffs, respectively. Locations of nests were not specified in 1979 or 1980. The colony was surveyed from the water in 1979 and nest contents were not determined. Six of 11 nests inspected in 1980 held eggs; contents were not determined in 18 nests. In 1981, 38 and 10 nests were counted on east- and south-side cliffs, respectively. There were nine and eight nests on east and south cliffs in 1985; all nests were empty but the survey occurred early in the season. Nests were reported on a small cliff on the east side of the islet in 2009.

Double-crested Cormorant Trends. Drent and Guiguet reported Double-crested Cormorants first nesting on Christie Islet in 1941 based on a clutch of five eggs collected by Maguire on 31 May. Maguire described the nest as "a small stack of sticks with a saucer-like depression lined with a scanty amount of seaweed." It was built on a ledge on a low cliff face. Drent and Guiguet were confident that Maguire had correctly identified it as a Double-crested Cormorant nest and gave the location as Christie Islet. However, based on the information we have, we think there is a possibility that this nest, and thus the first nesting record for Double-crested Cormorants in Howe Sound, was actually on Pam Rock. The location given on the original specimen card was "an unnamed islet, Howe Sound." We think this location may refer to Pam Rock because many specimens collected by Maguire on that day (31 May 1941) were clearly labelled as from "Cynthia Island," while others, with location and habitat descriptions that correspond to Pam Rock, were called unnamed (see Pam Rock account below). It seems likely that Maguire would have given the location for the Double-crested Cormorant eggs as "Cynthia Island" rather than "an unnamed islet" if indeed they were collected on Cynthia Island (i.e., Christie Islet).

Nevertheless, we have accepted the judgement of Drent and Guiguet about the location because they may have had additional information about where the nest was found and we have listed the breeding record here for Christie Islet (Figure 334).

Figure 334. Double-crested Cormorants were first reported nesting on Christie Islet in 1941.[144] The report was based on a clutch of five eggs collected by Maquire on 31 May 1941, similar to this one seen in 1970. However, based on the location description and other records given by Maquire, we think that the clutch may have been collected on Pam Rock rather than on Christie Islet. *Photo by R. Wayne Campbell, 18 July 1970.*

At any rate, Double-crested Cormorants did not successfully colonize the islet in the 1940s and after 1941, nested once sometime during the years 1948-1954, and then not again until Wayne Campbell and Allister Muir, from Nanaimo, found one nest with three young in 1963. Nesting was still intermittent until 1970. Drent observed three adults roosting on the east side of the islet but found no signs of a nest on 12 July 1968. Three nests with eggs were found along the top of the cliff on the central east side of the islet in 1970 (Figure 335). The colony became successfully established after that and numbers increased dramatically over the next decade (Figure 336) to a maximum of 169 nests in 1981. Vermeer and Rankin counted 120 nests (reported for Christie Islet and Pam Rock combined) in June 1983 but a survey in August that year tallied 164 nests on Christie Islet. Terry Sullivan found decreased numbers of cormorant and gull nests in 1985 compared to previous years. There was no sign of eggs in or about any of the cormorant nests. Sullivan noted that cormorants on Mandarte Island nested late that year and was unsure whether his observations indicated breeding failure or perhaps also late nesting on Christie Islet. Large numbers were still nesting in 1989, but declined after that. The colony was abandoned by 2009 (Figure 337).

Figure 335. Double-crested Cormorants nested on Christie Islet a couple of times between the 1940s through the 1960s. It was not until 1970 that the colony became more permanently established; three nests with eggs were located atop the eastern cliffs that year. *Photos by R. Wayne Campbell, 18 July 1970.*

Double-crested Cormorants have mainly nested along the edge and top of the central east side of the islet, but the colony has occasionally expanded to other areas. In 1973, most nests were along the central east side, but several had been built on rocky promontories west of the main colony. On 2 August 1973, 38 of the 46 nests were empty but 42 large young were grouped outside of nests. The fewer nests found the following year were all located along the central east side, although they had all been abandoned at the time of the visit on 6 July (see Remarks). The population had recovered by 1976 and 76 nests were counted along the northeast side of the islet and three nests were found on the west side on 20 June. On 25 July that year, only 59 nests were tallied, clustered in two groups along the northeast side. Twenty-two of the 59 nests counted at that time were empty, but 68 young were creching outside of nests. All nests were again located on the central east side in 1977; the majority of young (58 of 75) were large and in creches outside nests on 11 August. Campbell and Garrioch found expanded numbers in 1978, with 67 nests on the central east side and 31 nests on two rocky promontories in the

centre of the islet west of the main colony where nests had been seen in 1973. Locations of nests were not specified in 1979 or 1980. About 95 large young were seen outside nests in 1979. All nests were

Figure 336. Double-crested Cormorants numbers on Christie Islet increased rapidly after 1970. By 1973, there were 46 nests. Most nests in 1973 were located along the top of the eastern cliffs where three nests were found in 1970, but several were placed on rocky promontories towards the interior of the islet. *Photos by R. Wayne Campbell, 2 August 1973.*

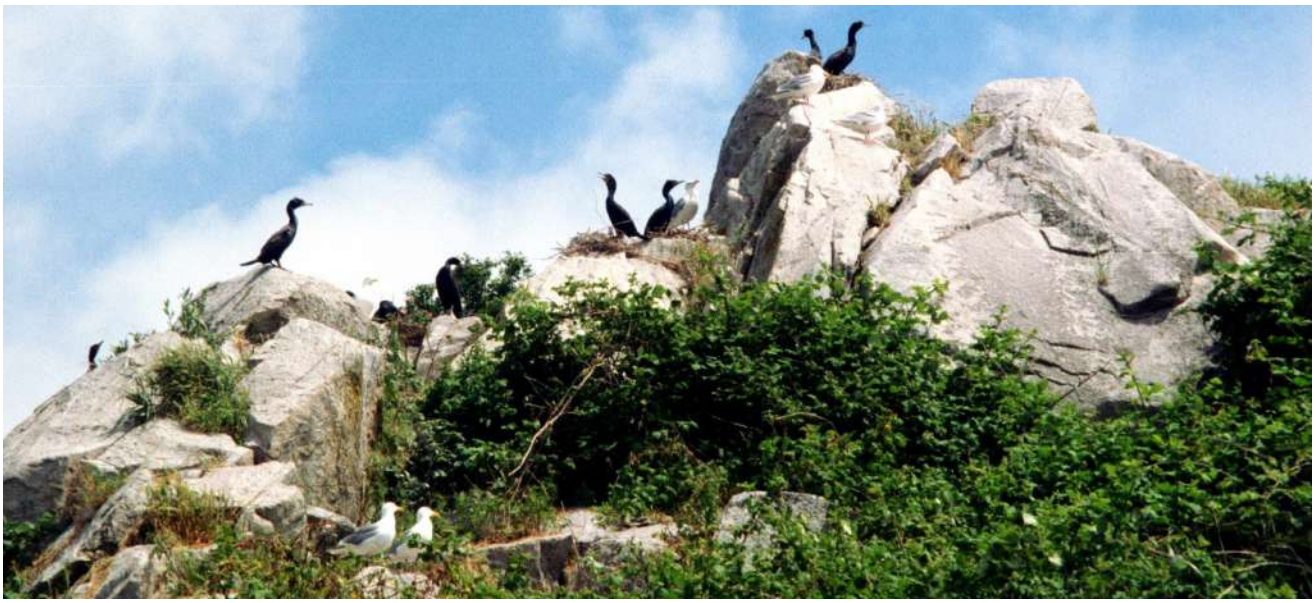


Figure 337. Double-crested Cormorants were last recorded nesting on Christie Islet in 2000. They can be seen here on the ridge crest of the island in 1999 when 66 nests were counted. *Photo by Moira J.F. Lemon, 7 June 1999.*

empty in 1980, but egg laying may not yet have begun, although many nests held eggs on a similar date in 1981. In 1981, there were 106 and 63 nests on the central east side and top centre of the islet, respectively. The expanded population was occupying areas formerly used for nesting by gulls (Figure 338). Further expansion was seen on 24 August 1983; the largest number of nests was again located on the central east side, but there were now four subunits of nests on flat-topped rocky promontories in the centre of the island. Ninety large young were still in nests and 180 young were in creches outside nests at that time. In 1985, there were 53 and 29 nests on the central east side and centre top of the islet, respectively. All nests were empty, but the survey was conducted early and egg laying may have been delayed that season.

Figure 338. By 1981, the Double-crested Cormorant colony on Christie Islet had expanded to 169 nests and was occupying central parts of the islet in areas where Glaucous-winged Gulls previously nested. *Photos by R. Wayne Campbell, 8 June 1981.*

Black Oystercatcher Trends. Small numbers of Black Oystercatchers have been observed on the islet occasionally since 1950. On a specimen label for a set of Pelagic Cormorant eggs collected on 11 June 1950, Maguire [523] noted that Black Oystercatchers occasionally use the islet so it is likely that he saw them there prior to 1950. The first nest was found in 1964. Breeding by a maximum of three pairs has been confirmed on only eight of the over 50 recorded visits to the islet. One adult was seen in 1970 and in July 1976, and two pairs were recorded in June 1976, but observers did not search for nests in those years. Two adults were present in 1974 but they were not defensive and no evidence of nesting was seen. A nest with one egg found in 1978 was located at the base of a rock in the northeast bay. None were nesting in 1981 and the area where the nest was found in 1978 had gull nests throughout. The maximum of three nests (1 with 2 eggs and 2 with 3 eggs) was found in 1999. In 2010, two pairs were seen from the water on 17 June and two territories and one empty nest were located on 20 June. A pair with young were recorded in 2013, two adults with two chicks were seen from the water in 2014, two pairs, one on the northwest side and one on the west side, plus one chick were seen in 2015, and a nest with eggs was found in 2021.

Pigeon Guillemot Trends. In 1940, Maguire found Pigeon Guillemots nesting in crevices on the east cliffs and in "cracks, crannies and crevices" amongst a "large mass of broken rock" on the west side of the islet. In 1942, he estimated 40-50 pairs nesting. Maguire felt that guillemot numbers had increased in 1943 and 1944, and about 50-60 pairs of guillemots were estimated nesting in the late 1940s through the 1950s. Fewer have been estimated nesting since, but data are not adequate to define a trend in guillemot numbers. The maximum number counted around the islet was 50 birds in 1970. The nest found in 1943 was located under a pile of huge boulders. Nests found in 1955 and 1956 were in rock crevices or under large rocks. A single nest with eggs was found in a crevice in 1959, two nests with eggs were found under boulders in 1968, two nests were found, one under a boulder and one in a crevice, in 1970, six nests with eggs or young were found under boulders in 1974, an unspecified number of birds were seen flying from under boulders and crevices in 1978, and three nests with eggs were found under boulders in 1981. In 2014, one guillemot seen in flight was holding a fish, nine were on the rocks, and 10 were in the water.

Remarks: Declines in Pelagic Cormorant numbers between 1948 and 1960 were attributed to ever-increasing human disturbance that facilitated egg predation by crows and gulls (Figure 339).[144, 350] Broken eggshells were found around some of the 14 empty Pelagic Cormorant nests inspected on 12 July 1968. On 6 June 1971, only one of five Double-crested Cormorant nests held eggs, and one of the two eggs in that nest was eaten by crows. The observer, Ross Waters, suspected that intense predation by crows and gulls had delayed laying. Crow and gull predation may have accounted for many empty cormorant nests seen in 1978: 23 freshly broken Double-crested Cormorant eggs and two depredated Pelagic Cormorant eggs were found around nests; gulls were seen stealing two Double-crested Cormorant eggs while observers were present (Figure 340); and 12 crows were present. In

Figure 339. Predation on Pelagic (top) and Double-crested cormorant eggs by crows and gulls has been observed on Christie Islet in several years. Human disturbance, that flushes cormorants off their nests, has likely facilitated much egg predation and contributed to the many empty nests seen in some years and to the declines in nesting populations since the 1980s. *Photos by R. Wayne Campbell, 8 June 1981 (top) and 25 June 1976.*

1981, one young (Figure 341) and nine adult crows were recorded. Nine freshly broken Double-crested Cormorant eggs and four whole Double-crested Cormorant eggs found outside of nests in 1981 were attributed mainly to crows and at least one gull. No evidence of predation on Pelagic Cormorant eggs was seen that year and no evidence of predation on either cormorant species was seen in August 1983, although many Pelagic Cormorant nests were empty and chicks had not yet begun to fledge at that time. In 1985, Sullivan observed a Bald Eagle fly from the islet and flush large numbers of gulls and cormorants.[374] Two Northwestern Crows were also present and suspected nesting but no evidence of predation on cormorant eggs was seen. In 1999, three depredated cormorant eggs were found.[484]

Figure 340. Glaucous-winged Gulls regularly patrol cormorant nesting areas and are quick to take advantage of opportunities to prey on cormorant eggs or perhaps to grab fish brought in by parent cormorants to feed their young. *Photos by R. Wayne Campbell, Christie Islet, BC, 18 July 1970 (top left) and 2 August 1973.*

Figure 341. Young Northwestern Crow with pin feathers just emerging seen on Christie Islet in 1981. *Photo by R. Wayne Campbell, 8 June 1981.*

A total of 34 dead gull chicks and five dead adults were found in 1974, and five dead chicks were seen on 24 August 1983.

Research on the islet likely impacted nesting birds in 1974. That summer, a UBC graduate student set up a Stevenson Screen for relative humidity measurements near the Double-crested Cormorant colony (Figure 342). Campbell [523] noted that this was undoubtedly the reason that all Double-crested Cormorant nests were abandoned. It appeared that most of the birds relocated to Pam Rock (see below). Egg temperatures in Pelagic Cormorant nests were also monitored that year (Figure 343). Other research has been conducted on the islet: about 25-30 young gulls were collected for CWS toxicity studies in

1973; and Vermeer collected regurgitated pellets from gulls as part of a comparative study of adult and chick diets on the east and west coasts of Vancouver Island in 1980.[415]

Figure 342. Graduate students from UBC set up monitoring equipment adjacent to the Double-crested Cormorant colony on Christie Islet in 1974. Disturbance from this research was thought to be the cause for the abandonment of all nests by early July that year. It appeared that the displaced cormorants relocated to Pam Rock that season. Disheveled and abandoned nests are visible in the centre and left of the photo. *Photo by R. Wayne Campbell, 6 July 1974.*

Figure 343. A research project on Christie Islet in 1974 involved putting temperature sensors in Pelagic Cormorant nests. Sensor wires are visible in this photo. *Photo by R. Wayne Campbell, 6 July 1974.*

As noted above, many egg specimens were collected on Christie Islet, especially in the 1940s. In 1941, Maguire was delighted to find about 10 gull nests with egg sets of "rare greenish blue basic shell color." He also collected several sets of similarly-coloured eggs in 1942 and 1943.

Banding was first conducted by Kenneth Alexander in 1926-1931.[150, 369] He banded 75 young gulls in 1938,[169, 345] 47 in 1939,[346, 347] and 64 in 1940 [348, 349] as part of the Pacific Gull Color Banding Project. A more intensive banding program by the Pacific International Chapter of the Western Bird Banding Association was begun in 1949.[221, 351] From 1949 to 1960, 3,880 nestling Glaucous-winged Gulls were banded.[221] A total of 1,342 chicks were banded in 1963-1965.[82] Some banding of Pelagic Cormorants has also been conducted; 45 young were banded in 1958 [316] and 93 were banded in 1970 (Figure 344).

Figure 344. Banding of nestling Glaucous-winged Gulls has been conducted on Christie Islet since 1926. Here, Rudi Drent is rowing a bird-banding team to the island in 1970. *Photo by R. Wayne Campbell, 18 July 1970.*

A Canada Goose nest with one egg was found in 1999 [484] and one old goose nest was seen on the islet in 2010.

SG-440 PAM ROCK

Location: *49°29'16"N 123°17'58"W; 92 G/6.*
South of Christie Islet, east of Brigade Bay on Gambier Island. Also known as White Rock; often called Pam Rocks.

Description: *0.2 ha; 8 m high; Grassy rock; Cliffs.*
The main rock is steep-sided and is mostly bare, with some grassy growth along crevices where soil has collected. Small low rocks off the northwest corner

and to the southeast (south rock) are bare. There is a navigational beacon on the main rock (Figure 345), and Pam Rock is a reporting weather station for the marine weather system.

Historical summary: Though not previously reported, we think that in the early 1940s Maguire collected a number of egg specimens on Pam Rock. He recorded visits to the "Gull Colony in Howe Sound" on 15 June 1940, 31 May 1941, 7 June 1942, 10 June 1943, and 9 June 1944 [488] (note that Maguire's transcribed field notes give the date of his visit in 1943 as 15 June, but we think that is a mistake for three reasons: first, he noted that he got home from a trip to the Cariboo on 5 June and immediately prepared for a trip to the sea bird colony in Howe Sound the next week; second, all his specimen cards from his egg-collecting trip that year record the date as 10 June; and third, the next entry in his notebook after his visit to Howe Sound is dated 14 June). On 15 June 1940, Maguire described the Howe Sound colony as "two islands & a couple of rocks which can not be much above high tide when a full sea running," and noted that he did not know whether they were named or not. The islands he was referring to were undoubtedly Pam Rock, the

Figure 345. The Pam Rock colony includes three small rocks south of Christie Islet in Howe Sound. This view from the south rock shows the main Pam Rock with the navigational beacon. *Photo by Moira J.F. Lemon, 7 June 1999.*

smaller rocks associated with Pam Rock, and Christie Islet. Approaching from Horseshoe Bay on 15 June 1940, Maguire first stopped at the "smaller rock," which we think refers to the rock south of Pam Rock. After going on to Anvil Island to cook his dinner, Maguire went back to the larger island, which, from his descriptions, was undoubtedly Christie Islet. On 7 June 1942, Maguire numbered the islands #1 to #3, almost certainly referring to the rock south of Pam Rock (#1), Pam Rock proper (#2), and Christie Islet (#3). He described nesting birds and eggs on each of these islands (see below), and although he does not specifically state where he collected eggs, he implies that he obtained specimens from each island he visited.

Several specimens collected on 31 May 1941 (and many collected in subsequent years) were clearly labelled by Maguire as from Cynthia Island (i.e., Christie Islet), but some Glaucous-winged Gull egg specimens collected on the same day were labelled (in the same handwriting) as from a "small barren rock, Howe Sound…only slightly above high tide." Maguire noted that Glaucous-winged Gull eggs here were laid on a small amount of bark chips and seaweed that had likely washed up in stormy weather. The description of the site fits Pam Rock. Other specimens collected in Howe Sound that we think also likely originated on Pam Rock and have listed here (Table SG-440) include: Pelagic Cormorant eggs also collected by Maguire on 31 May 1941 and not labelled from Cynthia Island but rather from "small islet, Howe Sound;" Glaucous-winged Gull eggs collected on 10 June 1943 from "small unnamed islet, Howe Sound," on 1 June 1945 from "the open face of a tiny islet," and on 15 June 1949 from "a depression in the rock 15 [feet] above

tide [on] a tiny islet;" and Pigeon Guillemots eggs collected on 31 May 1941 from "a crevice in the rocks of a small island," on 7 June 1942 from a "cranny in the rocks of a tiny island," and on 10 June 1943 from a rock slit on a "tiny islet." If our conclusions are wrong about any of these specimens, then the most likely alternative is that they were collected on Christie Islet. It is also possible, given the various names used to refer to these islands, that some early specimen records that we and Drent and Guiguet [144] listed for Christie Islet actually were collected on Pam Rock.

We suspect that the first Double-crested Cormorant nest found by Maguire on 31 May 1941 was located on Pam Rock rather than on Christie Islet, although, in deference to Drent and Guiguet,[144] we have continued to list that record for Christie Islet (see Christie Islet account above). In any case, Double-crested Cormorants were not recorded nesting again on Pam Rock until the 1970s. Nine Double-crested Cormorants were seen sitting on Pam Rock, but no nests were visible from the water in 1973. The first definite record of nesting was in 1974 when Wayne Campbell and Gary Seedhouse discovered 29 nests on the top of the rock (Figure 346), including one empty nest built on the navigational beacon. Nesting birds had likely moved from Christie Islet, which had been abandoned that year due to disturbance [523] (see Christie Islet account above). The colony was short-lived: two years later in 1976, only three empty nests attended by two adults were found (Figure 347); and in 1977 there was no evidence of nests, although four adults were roosting on the rock. On 10 June 1978, two nests had been built and one egg had been laid in one nest, but no cormorants were present. There was no sign of nesting in 1979. One nest had been started in 1980 but no birds were present at the time of the survey on 10 June. We do not know whether Double-crested Cormorants were nesting on Pam Rock during the regional surveys conducted in 1983, 1987, and 2000 because data for Pam Rock and Christie Islet were lumped together. Since 1978, the only record of Double-crested Cormorants nesting on Pam Rock is from 2009 when Adkins and Roby reported four nests.

Figure 346. The first and only time that large numbers of Double-crested Cormorants nested on Pam Rock was in 1974, when birds likely relocated there after being disturbed and abandoning their nests on nearby Christie Islet. A total of 25 abandoned nests were seen on Christie Islet on the same date that 29 occupied nests were counted on the top of Pam Rock (shown here). Eggs had been laid in most nests seen on Pam Rock. *Photos by R. Wayne Campbell, 6 July 1974.*

Small numbers of Pelagic Cormorants have nested intermittently on Pam Rock since at least the 1940s up to the 1980s. Maguire found Pelagic Cormorants nesting in 1941 on what he called island #2, which we are certain refers to Pam Rock proper (see above), and noted that they were absent from that site in 1942. In 1941, he reported about 200 cormorants present but found only two nests (with 4 and 5 eggs, respectively). Pelagic Cormorants nested every year from 1948 to at least 1956, but no nests were seen on Pam Rock between 1958 and 1960. On 10 June 1956, 20-25 pairs were estimated nesting on both Pam Rock and Christie Islet and six nests with eggs were inspected on Pam Rock. Campbell saw no cormorants in 1963 and the next record of nesting on Pam Rock was in 1968 when Rudi and Nora Drent found eight nests on the west-facing cliff face. In other years, nests have also been located on the west cliffs, except in 1978, when some nests had also been built on the southeast tip of the main rock. The largest number of nests ever recorded was 25 nests reported by John Toochin from Vancouver on 20

Figure 347. After 1974, Double-crested Cormorants nested on Pam Rock only intermittently and in small numbers. Only three empty nests with two adults in attendance were seen in 1976. *Photo by R. Wayne Campbell, 25 July 1976.*

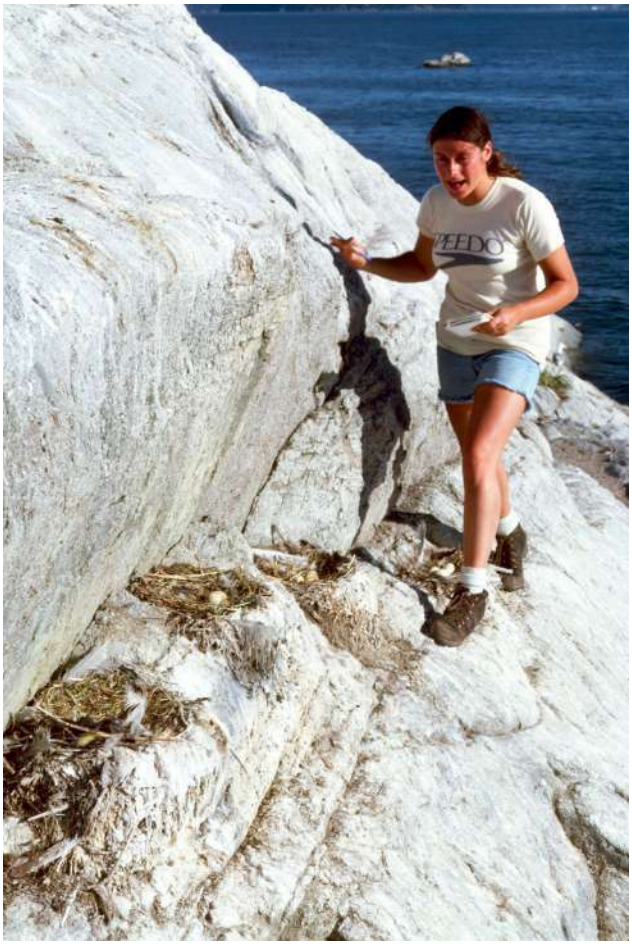


Figure 348. Marilyn Paul (now Lambert) checking contents of Pelagic Cormorant nests on Pam Rock in 1976. *Photo by R. Wayne Campbell, 25 July 1976.*

June 1976. However, Wayne Campbell and Marilyn Paul (now Lambert) found only seven nests later that year on 25 July (Figure 348), and it seems likely than there has never been more than about eight pairs nesting. As with Double-crested Cormorants, we do not know whether Pelagic Cormorants were nesting on Pam Rock during the regional surveys conducted in 1983, 1987, and 2000 because data for Pam Rock and Christie Islet were lumped together, but the last definite record of nesting on Pam Rock was two nests seen by Terry Sullivan in 1985.

Glaucous-winged Gulls were reported nesting in large numbers in the 1940s and again in the 1960s through the 1980s (Figure 349). The nesting population may have been smaller in the 1950s and then rebounded. It has declined since the 1980s. In 1940, Maguire noted 25-30 nests on what we assume was the south rock (see above); he did not estimate numbers on the main Pam Rock. In 1942, Maguire reported 17 pairs nesting on island #1 (south rock) and 60-70 pairs nesting on island # 2 (Pam Rock proper; see above), with at least 200 pairs nesting on island #3 (Christie Islet; see Christie Islet account). Meugens and Cooper examined 7-8 nests and estimated 10 pairs nesting in 1956. If that was an accurate estimate, the nesting population rebounded in the next few years as 222 young gulls were banded on 27 July 1963, suggesting a nesting population in the order of 100 pairs. Campbell recorded seven nests with eggs or young on that date but stated that he could not estimate total numbers of nests or pairs because most chicks were large and many flew to the ocean while observers were on the rock. Around 100 to 150 nests were found over a number of years from 1968 to 1986, with a maximum of 151 nests counted in 1978. In 1986, Vermeer and Devito reported 96 nests on the main rock and 13 on the south rock. Gulls were not specifically reported nesting on the south rock in earlier years, except in 1942. Fewer nests have been

recorded since, and only seven nests with eggs were found in 1999 [484] and 2010. In 2010, two nests with eggs were found on the south rock; all other nests were on the main rock. From the water in 2014, 10 adult Glaucous-winged Gulls were seen on the main rock, and an adult sitting on a nest was visible on both the main rock and the south rock. We considered the nest count from 2010 the best recent estimate of population size for Glaucous-winged Gulls.

Table SG-440. Seabird nesting records for Pam Rock. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
15 Jun 1940				25-30+	x2	488
31 May 1941		2[2]		x	x	488, 536r, 539l, 540h
7 Jun 1942		0		77-87e	x	488, 540i
10 June 1943				x	x	488, 523[a]
1 June 1945				x		523[a]
1948-56		x				144
15 Jun 1949				x		523[a]
1958-60		0				144
1948-60					8-10e	144
10 Jun 1956		x[b]		10e	8-10e	144
22 Jun 1958		0				144
21 Jun 1959		0				144
27 Jul 1963	0	0		x	(0)	523
12 Jun 1968	0	8[5]		109[109]	(0)	523
9 Jul 1969	0	3[3]		99[96]	(0)	523
18 Jul 1970		7[7]		x[b]		87
6 Jun 1971		4[4]		30e		523
2 Aug 1973		7	0	x	S(2)	523
6 Jul 1974	29[20]	3[3]	1	121[113]	2e(2)	70, 523
20 Jun 1976	0	25		x		523
25 Jul 1976	3[0]	7[6]		x	S(2)	523
11 Aug 1977	0	3[3]	1eS	x	(0)	523
10 Jun 1978	2[1]	5[4]	0	151[115]	(1)	523
8 Aug 1979	0	0		x		523
10 Jun 1980	0	0		105[88]		523
8 Jun 1981	0	0	0	131[103]		523
29 May-13 Jun 1983	[b]	[b]				421
31 May 1985	0	2	1			374
Jun 1986				109		420
8-9 Jul 1987	[b]	[b]	[b]		S[b]	158, 427, 428
May-Jul 1989	0	0				511
7 Jun 1999	0	0	1	25[7]	(0)	377, 484
Jul-Sep 2000	[b]	[b]				114
12-16 Jun 2006			[b]			57
2009	4					1
13-20 Jun 2010				11[7]		30, 453
13 Jul 2014	0	0	[c]	S	S(2)	94
22 Jun 2015			1eS			62
6 Apr 2017					(4)	524
25 May 2021			1S		(1)	524

[a] Copies of original egg specimen cards from Maguire's oological collection are housed in the BCNRS.[523]
[b] See Christie Islet. Estimates given included both Christie Islet and Pam Rock.
[c] Seven oystercatchers were present.

In 1940, Maguire noted that gull nests were "loosely fabricated of what must have been floating materials, [including] stringy cedar bark, small twigs, and bits of bark." Campbell in 1981 described nests as "sparse collections of materials," with only a few nests being well built.

Black Oystercatchers were first found nesting in 1974 when one small chick was found hiding in a crevice. Two adults were present in August 1977 but no nest or young were found. One oystercatcher was seen on the south rock in 1981 but no signs of a nest were found and the adult was not defensive. One

adult was seen on 24 August 1983, but the rock was not searched for nests. A nest with one egg was found in 1985 and a nest with two eggs was seen in 1999. Seven oystercatchers were seen from the water in 2014, one on the south rock and six on the main Pam Rock. In 2015, three oystercatchers were seen on the main rock and one was alarm calling on the south rock. Ornithologist Ken Wright from Lillooet, BC reported 14 birds and at least one occupied nest in 2021.

Figure 349. Over 100 pairs of Glaucous-winged Gulls nested on Pam Rock through the 1960s, 1970s, and 1980s. Gulls were nesting over most rocky areas in those years. In this photo from 1976, some Double-crested and Pelagic cormorants are also visible on the top and face of the rock, respectively. *Photo by R. Wayne Campbell, 25 July 1976.*

Except for 8-10 pairs estimated nesting in 1948-1960, only small numbers of Pigeon Guillemots have been recorded around the rocks and only one or two pairs have ever been confirmed nesting in any one season. Nests were first reported by Maguire in 1940. All nests found have been located in rock crevices. One guillemot was seen offshore in 1978, two were seen on the water around the main rock in 2014, and four were reported in 2017.

Remarks: A pair of crows was nesting on the rock in 1968 and two crows were present in 1978 but no evidence of predation was recorded in those years or in other years. Drent noted that the Pelagic Cormorant colony showed signs of human disturbance in 1969 (Figure 350). River otter trails and scats were seen in 1999.

Some banding has been carried out at Pam Rock. The Pacific Chapter of the Western Bird Banders Association banded 222 young gulls on 27 July 1963.[523] Ken Kennedy banded Pelagic Cormorant chicks from the three nests found in 1969.

One Canada Goose nest was found in 1999.[484]

Figure 350. In an effort to inform the public and hopefully ward off disturbance to nesting birds, Ken Kennedy posted a Migratory Bird Sanctuary sign on the support post of the light beacon on Pam Rock in 1967. *Photo by R. Wayne Campbell, 29 May 1967.*

SG-444 SQUAMISH HARBOUR

Location: *49°40'56"N 123°10'27"W; 92 G/11.*
Head of Howe Sound at the mouth of the Squamish River. Pilings are located about 200 m south of the Squamish Terminals deep sea port (Figure 351).

Description: *Pilings.*

Historical summary: A Glaucous-winged Gull nest was located atop the same piling in 2008 and 2009 (Table SG-444). In 2008, an adult was sitting on the nest in May and one chick was visible in the nest in July. An adult was seen on the nest in 2009. During a thorough survey of the harbour in 2021, 12 adult and one immature Glaucous-winged Gulls were present off the end of Squamish Spit, but no evidence of nesting was seen.

Figure 351. Squamish Terminals deep sea port viewed from the end of Squamish Spit, with Shannon Falls in the background. *Photo by Heidi M. Regehr, 31 May 2021.*

Table SG-444. Seabird nesting records (nests) for Squamish Harbour.

DATE	GWGU	SOURCE
30 May 2008	1	45
13 Jul 2008	1	45
5 Jul 2009	1	45
31 May 2021	0	501

SG-446 "BRITANNIA" ROCK

Location: *49°37'53"N 123°12'43"W; 92 G/11.*
East side of Howe Sound, north of Britannia Beach.

Description: *0.1 ha; 7 m high; Grassy rock.*
The island is mostly bare rock, with some grassy patches and a few shrubs.

Historical summary: A single adult Black Oystercatcher was seen on this rock on 8 May 2008 (Table SG-446). Two adults were present and were observed changing incubation duties during a return visit on 1 June.

Table SG-446. Seabird nesting records (nests) for "Britannia" Rock.

DATE	BLOY	SOURCE
1 Jun 2008	1	45

SG-450 BOWYER ISLAND

Location: *49°25'35"N 123°16'08"W; 92 G/6.*
North of Horseshoe Bay and northeast of Bowen Island.

Description: *111 ha; 197 m high; Forested.*
The island is heavily forested. Most of the shoreline is abrupt and rocky, with small beaches and some rocky promontories around the southern end (Figure 352). There are several dwellings around the island.

Figure 352. Bowyer Island (centre of photo) is a large forested island with rocky and grassy bluffs around the southern end. This photo of the west side of the island was taken from the top of Mount Artaban on Gambier Island. *Photo by Christopher McNeill, 15 July 2014.*

Historical summary: The island was surveyed by boat in all years, except in 1978, when some lower, rocky promontories were landed on. No seabirds were seen around the island by the BCPM crew in 1974 (Table SG-450). Glaucous-winged Gulls had colonized the island by 1978 when 11 pairs were seen nesting on hills and rocky promontories along the east side. In 1981, gulls were nesting along the south half of the east side; adults were seen on 12 nests located under trees and on rocky promontories (Figure 353).

Five Pigeon Guillemots were counted on the water around the island in 1978 but none were seen in 1974 or 1981. We have no recent records for this colony.

Table SG-450. Seabird nesting records for Bowyer Island. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
8 Jul 1974	0	(0)	523
10 Jun 1978	11S	S(5)	523
8 Jun 1981	12	(0)	523

Remarks: One adult Bald Eagle was recorded in 1978 and two were seen in 1981.

Figure 353. No seabirds were detected nesting on Bowyer Island when it was first surveyed in 1974, but Glaucous-winged Gulls and possibly Pigeon Guillemots were found nesting by 1978. In 1981, scattered pairs of gulls were seen nesting on rocky and grassy bluffs along the southern end of the east side of the island. *Photo by R. Wayne Campbell, 8 June 1981.*

SG-460 "SUNSET BEACH" CLIFFS

Location: *49°24'00"N 123°15'02"W; 92 G/6.*
Approximately three kilometres north of Horseshoe Bay, just south of the community of Sunset Beach. The original nesting record described the location as two miles north of Horseshoe Bay.[144] We previously thought that this site was likely located north of Sunset Beach in the vicinity of Montizambert Creek and had named the site "Montizambert" Cliffs. However, following an inspection of the area on 31 May 2021 we decided that the most likely nesting cliffs were located south of Sunset Beach. We thus revised the name.

Description: *Cliffs.*

Historical summary: An isolated pair of Glaucous-winged Gulls was seen nesting on these cliffs in 1956 and 1957 (Table SG-460). The report by Campbell [70] of a single pair for Horseshoe Bay likely referred to these observations. We have no good records since; the cliffs were viewed from the Sunset Beach marina on 31 May 2021 and no sign of nesting gulls was seen, but much of the cliff face is not visible from that vantage point.

Table SG-460. Seabird nesting records (nests) for "Sunset Beach" Cliffs.

DATE	GWGU	SOURCE
16 Jul 1956	1	144
15 Jun 1957	1	144

SG-470 "BAY" ROCK

Location: *49°22'49"N 123°16'24"W; 92 G/6.*
At the outer northwest entrance to Horseshoe Bay, on the east side of Tyee Point.

Description: *0.1 ha; 1 m high; Bare rock.*
This bare rock lies just offshore of the mainland and is mostly tidal. There is a navigational beacon on the north end.

Historical summary: Martin Lee recorded Glaucous-winged Gulls nesting on this rock in 1980 (Table SG-470). Five nests were found: two eggs were found in one nest and eight large young were counted outside of nests. We have no other records for this rock for the next 40 years, which is surprising, because the rock is clearly visible from the ferry coming out of Horseshoe Bay. There were no gulls present in 2021.

Table SG-470. Seabird nesting records (nests) for "Bay" Rock.

DATE	GWGU	SOURCE
1 Aug 1980	5	523
31 May 2021	0	501

Remarks: The area is heavily disturbed by ferries and recreational boat traffic, expansion of the ferry terminal, and building developments along the shore of Horseshoe Bay.

SG-475 HORSESHOE BAY – FERRY TERMINAL

Location: *49°22'32"N 123°16'19"W; 92 G/6.*
On the east side of Queen Charlotte Channel, east of Deep Bay on Bowen Island.

Description: *Pilings.*

Historical summary: One adult Pigeon Guillemot carrying fish was seen entering pilings at the ferry dock in 1974 (Table SG-475). The nest site appeared to be on top of a broken timber in the middle of the pilings. No guillemots were visible in the area in 2021.

Table SG-475. Seabird nesting records for Horseshoe Bay - Ferry Terminal. See Appendix 2 for codes.

DATE	PIGU	SOURCE
6 Jul 1974	1	71
31 May 2021	(0)	501

Remarks: Major expansions and structural modifications to the ferry terminal have occurred since Pigeon Guillemots were found nesting in 1974.

SG-480 LOOKOUT POINT

Location: *49°22'36"N 123°17'24"W; 92 G/6.*
West of Horseshoe Bay, north of Whytecliff. We include only the cliffs on the point within this colony; residential buildings above the cliffs are included within the SG-595 West Vancouver colony.

Description: *Cliffs.*

Historical summary: One Pigeon Guillemot flew from a nest site in a rocky crevice in 1981 (Table SG-480). Two other guillemots were on the water below the cliffs. We have no good records since. On 31 May 2021, the east side of the point was inspected from Cliff Cove and the west side was viewed from Whytecliff; no seabirds were seen but the outer north face of the point was not visible from those vantage points.

Table SG-480. Seabird nesting records for Lookout Point. See Appendix 2 for codes.

DATE	PIGU	SOURCE
6 Jun 1981	2e(3)	523

Remarks: One adult Bald Eagle was present in 1981.

SG-490 WHYTE ISLET

Location: *49°22'12"N 123°17'31"W; 92 G/6.*
South of White Cliff Point, west of Batchelor Cove.

Description: *0.7 ha; 20 m high; Grassy rock.*
This rounded, steep-sided island is mostly bare rock, with some grassy patches, some shrubs, and a few trees. It is tidally connected to the mainland shore by a narrow, bouldery isthmus (Figure 354).

Historical summary: Glaucous-winged Gulls and Black Oystercatchers were first recorded nesting in 1978 (Table SG-490). Numbers of gulls nesting increased over the next three years, but the colony was likely deserted in 1986 and no birds were seen when it was checked from the water in 1999 and 2010. Vermeer and Devito presented no data for

Figure 354. Whyte Islet is easily accessible at low tide and is a popular attraction for visitors to Whytecliff Park on the adjacent mainland shore. *Photo by Heidi M. Regehr, 31 May 2021.*

Whyte Islet for 1986 but we assume that they checked it and saw no sign of gulls nesting, as they surveyed all the other islands nearby. In 2021, the islet was scanned from the adjacent shoreline around Whytecliff Park; no seabirds were visible and we presumed that none were nesting (see Remarks).

Table SG-490. Seabird nesting records for Whyte Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
11 Jun 1978	1	6[4]	523
6 Jun 1981	1	22[19]	523
Jun 1986		0[a]	420
7 Jun 1999	0	0	484
20 Jun 2010		0	30, 453
31 May 2021	0[b]	0[b]	501

[a] Note that Blight [30] erroneously lists 10 nests for Whyte Islet in 1986 from Vermeer and Devito [420] that were counted on "Eagle" Rocks to the south.
[b] See text.

Remarks: At least 20 people were on the rock when it was inspected in 2021. Accessible from Whytecliff Park at lower tides, the islet is an extremely popular recreational site with high levels of human disturbance throughout the summer months.

SG-500 BIRD ISLET

Location: *49°21'48"N 123°17'28"W; 92 G/6.*
Off Kettle Point, south of Batchelor Cove.

Description: *0.1 ha; 4 m high; Bare rock.*
This small rock is mostly bare, with a few small patches of grass.

Historical summary: One pair of Black Oystercatchers has been confirmed or suspected nesting on most visits since 1987 (Table SG-500). A pair was seen with one fully grown young on three days in 1996. On 7 June 1999, a pair was attending an empty nest with two depredated eggs beside it. In 2010, Butler saw a pair from the water on 17 June, but no oystercatchers were recorded when Blight surveyed the colony on 20 June. Ken Wright has made frequent observations since 2015. A pair was present, but no evidence of nesting was found in 2016. Otherwise, in all years between 2015 and 2023, a pair or a single parent was seen with 1-3 chicks. A nest with two eggs was found on 29 May 2020 and a nest with three eggs was seen on 17 June 2022. Wright reported a nest with three eggs in a new location on the western side of the islet in 2023. He saw adults with one or two chicks several times in June and July.

Table SG-500. Seabird nesting records for Bird Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
6 Jul 1974	0	3[3]	70, 523
Jun 1986		38	420
8 Jun 1987	1eS		523
8 Jun 1988	1eS		523
20 Aug, 5, 14 Sep 1996	1		524
7 Jun 1999	1	31[26]	377, 484
21 Jun 1999		35[33]	524
17 Jun 2010	1S	11S+	456
20 June 2010	0	45[15]	30, 453
30 Jun 2015	1	3[1]	524
2, 16 Jul 2016	0	5[4]	524
8 Aug 2017	1		524
28 Aug 2018	1	x	524
3, 11 Jul 2019	1	1	524
29 May-21 Aug 2020	1		524
9 Jul-8 Aug 2021	1		524
15 Jun-19 Jul 2022	1		524
22 May 2023	1		524

Contrary to the trend at most colonies, the greatest number of Glaucous-winged Gull nests was recorded in 2010, although most nests were empty. The maximum number of nests with eggs was counted in 1999. Two surveys conducted two weeks apart in 1999 showed a small increase in total nests and numbers of nests with eggs, indicating that nests were still being built and eggs laid over that period. Fewer pairs have nested in recent years. Wright counted nests on 30 June 2015 and 2 July 2016. Three adults and one hatched chick were seen from his kayak on 16 July 2016. Only five adults and one large juvenile being fed by parents were seen from the water in 2018, although the visit that year occurred late in the season and some birds may already have left. One adult was seen sitting on a nest on 3 and 11 July 2019. We considered the nest count from 2016 the most current estimate for the Glaucous-winged Gull nesting population.

SG-505 KETTLE POINT

Location: *49°21'44"N 123°17'12"W; 92 G/6.*
Mainland point between Batchelor Cove and Larsen Bay. We include only the outer rocky point within this colony; residential buildings above the rocky

shoreline are included within the SG-595 West Vancouver colony (Figure 355).

Figure 355. Image of Kettle Point showing the rocky shoreline and housing developments on the point. *Image from Google Earth, 2024.*

Description: *Rocky point.*

Historical summary: Wayne Campbell surveyed the point from a boat in 1981. Two adult Glaucous-winged Gulls were sitting on nests and likely incubating eggs (Table SG-505). Ken Wright can see the point from his home in West Vancouver and has never seen gulls nesting there in recent years.

Wright has on several occasions observed 1-2 pairs of Pigeon Guillemots on the water around the granite cliffs just north of Kettle Point. He notes it as a possible nesting site.

Table SG-505. Seabird nesting records (nests) for Kettle Point.

DATE	GWGU	SOURCE
6 Jun 1981	2	523
2023	0	604

Remarks: Campbell noted that housing development was encroaching on the point in 1981. There is now a large dwelling above the point.

SG-510 BATCHELOR POINT

Location: *49°21'27"N 123°17'04"W; 92 G/6.*
Mainland point between Larsen Bay and Fishermans Cove. We include only the cliffs on the point within this colony; residential buildings above the cliffs are included within the SG-595 West Vancouver colony (Figure 356).

Figure 356. Image of Batchelor Point showing the rocky shoreline and housing developments on the point. *Image from Google Earth, 2024.*

Description: *Cliffs.*

Historical summary: Pigeon Guillemots were seen flying to and from nest sites on the cliffs in 1953-1959 and one guillemot was sitting on the water below the cliffs in 1981 (Table SG-510). None have been recorded since. Ken Wright has frequently kayaked past these cliffs and confirms that guillemots have not nested on the point in recent years.

Table SG-510. Seabird nesting records for Batchelor Point. See Appendix 2 for codes.

DATE	PIGU	SOURCE
1953-59	x	144
6 Jun 1981	S(1)	523
8-9 Jul 1987	(0)	158
2023	(0)	604

SG-520 "EAGLE" ROCKS

Location: *49°21'16"N 123°16'44"W; 92 G/6.*
Northwest of Eagle Island, west of the entrance to Fishermans Cove. Colony includes the light beacon east of the rock at the entrance to Fishermans Cove.

Description: *0.2 ha; 3 m high; Grassy rock.*
These low rocky knobs have some patches of grass and are littered with driftlogs (Figure 357). There was a shack on the rocks in 1974. A light beacon sits just east of the rocks (Figure 358).

Historical summary: Nesting was first documented in 1974: there was one Glaucous-winged Gull nest with two young on the roof of the small shack, and one nest with three eggs on the light beacon (Table SG-520). Gull nests were found on the rock in other

years. Eggs were still being laid at the time of the visits in 1980 and 1981. One gull nest with two eggs was found in 1999. Large gull chicks were seen from the water in 2018. In May 2021, the colony was scanned from the adjacent shore along Marine Drive: no signs of nesting gulls were seen on the light beacon or the rock but the outer, southern parts of the rock were not visible.

Figure 357. South side of "Eagle" Rocks, with houses along Marine Drive in the background (top), and the north side of the rocks viewed from Marine Drive. *Photos by R. Wayne Campbell, 6 June 1981 (top) and Michael S. Rodway, 31 May 2021.*

Figure 358. The light beacon at the entrance to Fishermans Cove has been included within the "Eagle" Rocks colony. A pair of Glaucous-winged Gulls nested on the beacon in 1974. *Photo by Michael S. Rodway, 31 May 2021.*

Table SG-520. Seabird nesting records for "Eagle" Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
6 Jul 1974	0	2[2]	70, 523
9 Jun 1980		15[9]	523
6 Jun 1981	1eS	17[5]	523
Jun 1986		10	420
21 Jun 1999	1eS	1	524
28 Jul 2018		x	524
13 May 2020	1		524
31 May 2021	1eS		501
24 Mar-29 Sep 2022	1eS		524
8, 20 Jul 2023	1		524

An agitated pair of Black Oystercatchers was suspected nesting in 1981 and 1999, but no nests were found in either year. A nest with three eggs was found in 2020. Three oystercatchers were seen chasing around the rock in 2021. In 2022, from his kayak, Ken Wright noted a pair on the rock on six occasions and a single adult present on two other occasions between 24 March and 29 September, including with a juvenile on 29 September. He stated that they were not nesting on 12 June 2022, but, considering the number of sightings of a pair on the rocks, we have estimated one pair nesting for 2022. A pair with one large chick was seen by Wright in July 2023.

Remarks: This area experiences intensive boat traffic in and out of the marinas in Fishermans Cove. The nearby rocky islet on the west side of Eagle Island is now covered by a house and massive deck.[453] A Canada Goose was seen sitting on a nest on the rocks in 2021.

SG-530 PASSAGE ISLAND

Location: *49°20'35"N 123°18'20"W; 92 G/6.*
South end of Queen Charlotte Channel between Point Atkinson and Bowen Island.

Description: *13 ha; 60 m high; Forested; Cliffs.*
Most of this island is forested, with open rocky areas and some cliffs around the perimeter, and a few small beaches. There is a grassy rock (south rock) connected to the south end (Figure 359). Many dwellings and docks have been built around much of the island, including on the south rock.

Historical summary: The seabird colony on Passage Island has been a direct victim of the expanding human population in the Vancouver area. In the late 1970s, this was the fifth largest Glaucous-

winged Gull colony in BC, exceeded only by Mitlenatch Island, Mandarte Island, and Chain Islets/Great Chain Island in the BC Salish Sea and by Cleland Island on the west coast of Vancouver Island. It was also a major Pelagic Cormorant colony (Figure 360). Today there are no cormorants nesting and only a few gulls persist.

Figure 359. View of Passage Island from the east, showing the south rock on the left. *Photo by R. Wayne Campbell, 2 June 1981.*

Racey observed Pigeon Guillemots nesting in holes and crevices on the cliff face and under slabs of rock in 1921 and 1922 (Table SG-530). In 1924, Donald W. Gillingham reported that Pigeon Guillemots had "increased considerably during the last season…each pair of birds rearing at least two broods." Cumming also notes Pigeon Guillemots nesting on Passage Island during his observations between 1909 and 1931.[132] Two nests with eggs were found under rocks in 1948, one nest with two eggs was located in a crevice on a cliff face on 2 June 1968, one nest with two eggs was seen under a large rock in a crevice in 1971, and three nests with eggs or young were found in rock crevices in 1974, two on the east side of the south tip of the island and one on the south rock. Adults were seen flying out of rock crevices in 1978, and in 1980, a pair was seen fly out of a crevice on the south rock, and 27 adults were seen and suspected nesting around the main island. In 1981, six nests with eggs were found in crevices, under rocks, and under driftlogs. Guillemots were seen all around the island and nests were found on the east side at the north end, on the mid-west side, and on the southeast corner of the main island, and on the south rock. One Pigeon Guillemot was seen on the water in 2014.

Racey made no mention of Glaucous-winged Gulls in his notes from 1921 and 1922 and gulls were first recorded nesting when Maguire collected eggs in 1940. Gulls were nesting on the south tip of the island and south rock in 1958 and 1959. John Toochin recorded 38 nests with eggs on 31 May 1959 and estimated a total of 50 nesting pairs as eggs were still being laid. In 1963, Wayne Campbell and Ken Kennedy found gulls nesting at the north end of the main island as well as at the south end and on the south rock. They inspected 32, about 40, and 22 nests in those three areas, respectively, and estimated 100-150 pairs nesting in total. Many young had fledged by 13 July, making an accurate count of nests difficult. Gull nests were located in crevices or under shrubs and clumps of grass.

Four different visits were made to the island in 1964, and estimates of the numbers of gulls nesting ranged from 100 to over 300 nests. Terrance Robertson inspected 13 nests, 11 of which held eggs, and estimated over 300 pairs nesting on 31 May. He described the colony as large and spread out and said numbers were difficult to estimate. Dave Woolgar estimated 200 pairs nesting and recorded one nest with three eggs at the south end of the island on 1 June. On 10 June, Fred Gornall estimated 100 nests, mainly at the south end and south rock but occurring on all exposed rocks around the outer periphery of the island. He noted that some nests were well hidden in clumps of tall grass. Ten of 15 nests he inspected held eggs. Terrance Robertson returned on 21 July 1964, inspected nine nests with eggs or

young, and again estimated 300+ nests around the island.

George Sirk estimated 70 gull nests and a total of 75 pairs present on the south end of the main island and on the south rock in 1966. Higher numbers were estimated on 2 June 1968, when Ross Waters found eggs in 92 of 100 nests examined, and estimated a total of 550 nests around the island, mostly on the southern end. He estimated that 2,000 gulls were present. Rudi and Nora Drent also visited the island in 1968, inspected 121 nests with eggs or young, and estimated 275-325 pairs nesting, with about 150-200 pairs nesting on the main island and the rest on the south rock. On a visit in 1971, Ross Waters noted that most of an estimated 400 nests contained full clutches of three eggs.

Figure 360. In the 1970s, Passage Island supported large colonies of Glaucous-winged Gulls and Pelagic Cormorants. Nesting occurred around the island in seven or eight separate areas for gulls and four or five different areas for cormorants. These photos show three of the areas used in 1974, with cormorants nesting on the cliff faces and gulls in rocky and grassy areas above. *Photos by R. Wayne Campbell, 7 July 1974.*

The first complete count of gull nests was conducted in 1974. Nests were tallied for eight different areas in 1974, 1978, and 1981, only seven of which were used in 1974 and 1978. From north to south, those areas were: 1) the west side at the north end; 2) the east side at the north end; 3) along the mid-east side; 4) the west side just south of the mid-west bay; 5) the inner rocky area at the southwest corner; 6) the outer rocky knob at the southwest corner; 7) the east side of the south tip; and 8) the south rock. Numbers of nests in those eight areas were: 70, 0, 13, 19, 92, 11, 79, and 212 in 1974; 42, 0, 37, 41, 123, 116, 127, 312 in 1978; and 35, 4, 48, 28, 39, 102, 130, and 322 in 1981. During that period, numbers increased to the maximum of 798 nests counted in 1978 (Figure 361), and started to decrease by 1981. Between 1974 and 1978, numbers increased in all areas except #1. Between 1978 and 1981, numbers continued to increase in areas 2, 3, 7, and 8, but declined in other areas due to persecution from the new human residents (see Remarks). A high proportion of empty nests (36% overall, 55% at the south tip of the main island in areas 5-7) in 1981 was also likely due to human disturbance. Separate tallies were not kept for all areas in 1980, but there were 349 nests on the main island and 294 nests on the south rock. Observers in 1980 wondered if egg laying had been delayed as there were so many empty nests, but most empty nests on the main island were located at the south tip, suggesting some

impact concentrated in that area, and a much greater proportion of nests were empty on the main island (66%) than on the south rock (33%). Human persecution was likely the cause (see Remarks).

Figure 361. The Glaucous-winged Gull breeding population on Passage Island peaked at 798 nests in 1978. At that time it was the fourth largest gull colony in the BC Salish Sea and the fifth largest in Canada. Today, only a few pairs still nest. *Photo by R. Wayne Campbell, 7 June 1981.*

The gull population had been reduced to half by 1986, and only 11 nests with eggs were found in 2010. No gulls were seen from the water in 2014. Small numbers have been reported nesting on the south rock since 2016: in 2016, one adult sitting on a nest was seen from a kayak on 16 July, and large young were recorded on 7 August; a minimum of eight juvenile gulls were present in August 2017; two half-grown chicks were seen on 11 July 2019; at least 10 recently fledged juveniles were seen on 9 August 2020; and a minimum of five large, not-yet-fledged young were seen on 11 July 2021. In 2022, Ken Wright from his kayak could see four chicks and suspected many more on 16 July. In 2023, Wright confirmed nesting on the south rock, reporting about 15 large chicks and a total of 65 birds on 11 July and lots of chicks and 100 birds total on 15 July. Two begging chicks were still present on the southeast point on 2 September. Thus, a few pairs of gulls still persist on what used to be one of the major gull colonies in the BC Salish Sea. We considered the nest count from 2010 the best recent estimate of population size for Glaucous-winged Gulls.

One Black Oystercatcher was seen on the south rock on 13 July 1963, but the bird was not defensive and no evidence of nesting was found.[67] Pairs were suspected nesting at the south end in 1975, 1976, 1978, and 1980. In 1978, observers were sure that birds were nesting on the south rock and on the outer, southwest rocky knob, but no nests could be found. Nesting was first confirmed in 1981 when a nest with two eggs was found on a rocky headland on the east side at the north end of the main island (area 2 described above for gulls). Two other oystercatchers were seen around the island in 1981 but there was no indication that they were nesting. Four oystercatchers were present in early September 1996, but no young were seen and observers assumed nesting had failed. On the south rock in 2010, Blight found one nest with three eggs and suspected nesting by a second territorial pair. Carter saw one oystercatcher on the south point of the main island in 2014. Twelve oystercatchers were counted from a kayak on 16 July 2016. Observers reported no sign of successful breeding on that visit, but two adults were feeding one young on the south tip of the island and adults with a fledgling were seen on the south rock on 7 August. In 2017, one pair with two chicks was seen on the south rock on 8 August, and a pair with one young chick was seen on the southwest side of the main island on 10 August. Chicks from at least one pair were recorded each year from 2019 to 2021. In 2021, Wright saw two large chicks on the southeast point on 29 July and broods of two chicks each on the east side and the southwest side on 2 August. Wright made many observations in 2022 and 2023, recording nests with eggs on 21 May and three broods on 16 July 2022, and at least two nests (one with three eggs) on 7 May and four chicks on 8 August 2023. We considered the three nesting pairs seen in 2022 to be the best estimate for the current breeding population.

Pelagic Cormorants were first found nesting in 1968 when Ross Waters saw two nests on a cliff face and observed three eggs in one of the nests. Waters returned in 1971 and reported nests on the southeast side of the island. The nesting population increased rapidly over the next few years to a maximum of 180 nests in 1981 (Figure 362), and then declined. As for gulls, detailed records of the distribution of cormorant nests were kept in 1974, 1978, and 1981. Cormorants were found nesting in four areas in 1974 and five areas in 1978 and 1981. The areas are the same as those described above for gulls. Numbers of nests were: 13, 20, 0, 8, and 7 in 1974; 26, 56, 26, 26, and 38 in 1978; and 39, 69, 3, 35, and 34 in 1981 in areas 1, 4, 6, 7, and 8, respectively. Between 1975 and 1978, numbers increased in all areas where nests had been found in 1974, including area 1 where gulls had decreased during that interval. Distributional changes between 1978 and 1981 also differed somewhat for cormorants and gulls. Cormorant

Table SG-530. Seabird nesting records for Passage Island. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
22 Jul 1921				x	274
22-23 Jul 1922				10e(29)	318, 523
1924				x	182
22 Jun 1940			x		540j
7 Jun 1948				8(3)	144
Jun 1958			x	6e	144
22 Jul 1958			16[16]		316, 144
31 May 1959			50e	S	144
2, 13 Jul 1963	0	0	100-150e	15e	67, 523
31 May 1964			300+		523
1 Jun 1964			200e		536s
10 Jun 1964			100e		523
21 Jul 1964			300+		523
24 Jun 1966			70e	5e	523
2 Jun 1968	2		550e	2	523
16 Jun 1968	11		275-325e	3e	523
6 Jun 1971	8[7]		400e	2	523
7 Jul 1974	48[42]	0	496[456]	20e(33)	70, 523
1975		1eS			523
1976		2eS			523
11 Jun 1978	172[150]	2eS	798[701]	x(12)	523
9 Jun 1980	153	2eS	643[333]	x(29)	523
7 Jun 1981	180[133]	1	709[451]	6+(36)	523
29 May-13 Jun 1983	72				421
Jun 1986			384		420
8 Jun 1987		1eS			523
8-9 Jul 1987	16	0[a]		S(8)	158, 427, 428
5 Sep 1996	x	S			524
24 Apr 1999	x				524
Jul-Sep 2000	21				114
20 Jun 2010		2e	25[11]		30, 453
13 Jul 2014	0	[b]	[b]	S(1)	94
19 Aug 2014	0				524
16 Jul 2016	0		x		524
7 Aug 2016		2[2]	x		524
8, 10 Aug 2017		2[2]	x		524
2018-2021	0				524
17 Aug 2019	0	1			524
13 Jun, 12 Aug 2020	0	1			524
29 Jul 2021	0	1			524
2 Aug 2021		2[2]			524
16 Jul 2022		3[3]	x		524
7 May, 8 Aug 2023		2[2][c]	x		524

[a] No record was listed,[427] but we assumed the site was surveyed and no birds were seen (see section *Identifying and Addressing Issues with the Historical Data*).
[b] One oystercatcher but no gulls were seen from the water in 2014.
[c] At least 2 nests were reported; there may have been more.

numbers increased while gull numbers decreased in areas 1 and 4, and cormorants decreased while gulls increased in area 8. Both species decreased in area 6 at the southwest corner of the main island. In 1981, some gulls were nesting on cliff ledges suitable for cormorant nests, which, if gulls were excluding cormorants from nesting habitat, may have contributed to contrary trends for the two species in some areas. Separate tallies were not kept for all areas in 1980, but there were 122 nests on east and west sides of the main island and 31 nests on the southeast side of the south rock (area 8). Of 84 nests whose contents were determined in 1980, 73 held eggs and 11 were empty; eggs were likely still being laid. Nests and one large young were seen on the cliffs on the west side of the island in 1996.

Cormorants were incubating in two nests in April 1999, and nesting was last recorded in 2000. The colony was abandoned in 2014 and 2016, and observers that kayaked around the island on several days in 2017 and 2018 recorded roosting and feeding cormorants but made no mention of nesting. Similarly, over the years in 2018-2021, many eBirders reported cormorants around the island but no sign of nesting on the former nesting cliffs.

Figure 362. Numbers of Pelagic Cormorants nesting on Passage Island increased from two pairs in 1968 to a maximum of 180 nests in 1981. They decreased just as quickly and were last seen nesting in 2000. *Photos by R. Wayne Campbell, 7 June 1981.*

Remarks: A number of crows were seen on 31 May and 21 July 1964, two pairs were recorded in 1968, and 12 were counted in 1974, but no evidence of predation was reported in those years. Two dead crows were found in the gull colony in 1974. A crow was seen stealing one cormorant egg in 1981. Eleven dead gull chicks were seen in 1974. A Black Rat was seen on the island and one Bald Eagle was present but not nesting in 1981. Eight depredated gull eggs were found in 2010. Ken Wright reported a large, Brown (Norway) Rat on the south rock on 15 June 2023.

In 1968, Drent reported that the island had been subdivided into 16 lots. Construction began in 1968, and by 1974, several houses had been built on the island. The developer, Phil Matty was interested in the future of the nesting gulls and apparently had intentions to set aside the south islet as a sanctuary at that time. Gull nesting populations continued to increase after housing developments began, but new human residents were not tolerant of nesting birds and disliked the noise, the smell, and the fouling of roofs and water collection systems. They began shooting gulls and removed or covered nests to discourage nesting birds (Figure 363). In 1981, gulls were being shot in areas 1, 5, and 7. In area 7 at the south end, more than 48, 24, and 18 birds were shot in 1979, 1980, and 1981, respectively. Surprisingly,

Figure 363. The large Glaucous-winged Gull and Pelagic Cormorant colonies on Passage Island were direct victims of human intervention and persecution. Real estate development usurped nesting habitat and incoming residents were intolerant of nesting birds. Several measures were enacted to discourage nesting, including shooting adults and hanging their carcasses up as deterrents (this page) and destroying or covering nests (next page, top). Residents also installed wires and spikes on their roofs in an attempt to dissuade roosting gulls and prevent contamination of their rain-water collection systems. *Photos by R. Wayne Campbell, 7 June 1981 and 11 June 1978 (next page, bottom).*

numbers of gulls nesting in area 7 were similar in 1981 and 1978, although a high proportion of nests were empty (48%) in 1981. Blight noted several houses on the island in 2010, including one that had been recently built on the rock off the south point.

A female Common Merganser (*Mergus merganser*) with a brood of five small young was seen swimming off from the southwest corner of the island in 1974. She may have nested on the island. In 1981, a hatched out Canada Goose nest was found on the south rock and two adults with two small young were present. Two Canada Goose nests were found in 2010, one with four eggs and one with eggshell fragments.

Some banding of gull chicks has been conducted: 16 were banded on 22 July 1958 [316] and 100 were banded on 13 July 1963.[67, 523]

SG-540 GREBE ISLETS

Location: *49°20'27"N 123°16'32"W; 92 G/6.*
Off Indian Bluff north of Point Atkinson.

Description: *0.7 ha; 8 m high; Grassy rock.*
The two main Grebe Islets (west islet and east islet) are low, mostly bare rocks, with some grassy patches and a few rose bushes in hollows where soil collects. There is a small bare rock (north rock) just north of the east islet. There is a navigational beacon on the west islet (Figure 364). West Grebe Islet was recently donated to the public by its former owners, the Lando family. It was declared a park by the District of West Vancouver on 27 March 2023.

Figure 364. View of the Grebe Islets from the mainland shore, with the west islet at the centre top and the east islet to the left closer to shore (top photo). The bottom photo shows the rocky and grassy habitat on the west islet. *Photos by R. Wayne Campbell, July 1991 (top) and 7 June 1981.*

Historical summary: Black Oystercatchers may have been nesting here in 1792. Referring to Howe Sound, Archibald Menzies made a note in his journal for 23 June 1792, "Near the entrance they passed some Rocky Islands on which they shot a few Sea Pies [oystercatchers]." [281] Butler et al.[62] suspected that Menzies was referring to the Grebe Islets.

The first survey of the islets was in 1974. Only Glaucous-winged Gulls were found nesting, with four nests on the west islet and three nests on the east islet (Table SG-540). There were six gull nests on each islet in 1978, but four of six were empty on the east islet and one of six was empty on the west islet. Many nests also were empty in 1980: 13 of 20 nests on the west islet, and two of four nests on the east islet; and in 1981: 15 of 17 nests on the west

islet, and five of five nests on the east islet. Egg laying may still have been in progress at the time of the surveys in early June in those years. Numbers of gulls nesting increased dramatically from 1981 through 1986 to 1999 when a peak of 257 nests (189 on the west islet and 68 on the east islet) were counted. Those birds may have been displaced from the Passage Island colony that was declining over the same period (see above). However, the trend on Grebe Islets reversed sometime after 1999. From the water, Butler estimated 30 nests in 2007 and made a partial count of 13 nests on the west islet and one nest on the east islet on 17 Jun 2010. On the more thorough survey conducted on 20 June 2010, Blight counted 58 nests (53 on the west islet and only one nest containing one egg and four empty nests on the east islet). Five years later, Ken Wright searched both islets for gull nests and found none.

A pair of Black Oystercatchers with two small young was found on the west islet in 1978, an empty nest attended by a pair was seen on the east islet in 1980, and a nest with two eggs was located away from the main gull colony on the west islet in 1981 (Figure 365). Six oystercatchers were record on 10 September 1996 but no information on nesting was collected in that year. Two nests found during the survey on 7 June 1999 contained three eggs and two young, respectively.[484] Later that season on 21 June, two pairs were seen and a nest with two young was recorded on the east islet. In 2007, Butler found three nests: one each on the west islet, east islet, and north rock; adults were sitting on the nests on the west and east islets, and there was one chick at the nest on the north rock. In 2010, a pair was seen on the west and east islet on 17 June, and three birds were present and may have been nesting but were not very aggressive on 20 June. In July 2015, one nest with two eggs and one empty nest were found on the east islet. Seven adults were seen from a kayak on 4 July 2016; none appeared to be nesting or tending young. Agitated adults were recorded and six adults were present on 18 June 2017. In 2021, two pairs with chicks were seen on 20 June, and one chick with adults was recorded on each islet on 3 August. In 2022, a pair was seen on each island on 20 April and 12 June, and adults with three young were recorded in July and September.

Two Pigeon Guillemots were observed on the water in 1978. Nesting was suspected but no evidence was obtained. One to three guillemots have been sighted around the islets in other years but nesting has never been confirmed. Two nests were suspected on 20 June 2010. Two birds were seen in 2018 on the west islet.

Figure 365. One Black Oystercatcher nest with two eggs was found on the west Grebe Islet in 1981. The nest was placed away from the main Glaucous-winged Gull colony area. *Photo by R. Wayne Campbell, 6 June 1981.*

Table SG-540. Seabird nesting records for Grebe Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
6 Jul 1974	0	7[7]	(0)	70, 523
11 Jun 1978	1	12[7]	S(2)	523
9 Jun 1980	1S	24[9]	(0)	523
6 Jun 1981	1	22[2]	(0)	523
Jun 1986		108		420
8 Jun 1987	1eS			523
18 Jul 1994		x		524
7 Jun 1999	2[2]	257[217]	(0)	377, 484
21 Jun 1999	2e			524
6 Apr 2002			(1)	524
7 Apr 2007			(3)	524
30 Jun 2007	3	30eS+		456
17 Jun 2010	2eS	14S+		456
20 Jun 2010	2eS	58[33]	2eS	30, 453
11 Jul 2010			(1)	524
9 Apr 2011			(2)	524
21 Aug 2014			(1)	524
18 Apr 2015			(2)	524
1 Jul 2015	2[1]	0		524
18 Jun 2017	S			524
4 Jul 2017			(1)	524
1 Apr 2018			(2)	524
20 Jun 2021	2[2]			524
3 Aug 2021	2[2]			524
20 Apr-19 Jun 2022	2		(2)	524

Remarks: People were picnicking on the islet in 1978 and the area receives a large volume of recreational boat traffic. One depredated gull egg was found on each islet in 1999.[484] On 13 June 2020, Ken Wright saw two pairs of oystercatchers on the west islet that were disturbed by two kayakers having lunch on the islet.

Canada Goose nests with eggs or young were found on the west (1 nest) and east (4 nests) islets in 1999,[484] and one nest was found on each islet in June 2010.[453]

SG-550 POINT ATKINSON

Location: *49°19'47"N 123°15'54"W; 92 G/6.*
Point marking the north side of the entrance to Burrard Inlet.

Description: *Cliffs.*
This is the site of the historic Point Atkinson lighthouse. The first lighthouse was erected above the cliffs in 1874 and replaced with the current structure in 1912 (Figure 366). The area around the lighthouse was set aside and became West Vancouver's Lighthouse Park. The park lands are owned by the federal government and are leased to the District of West Vancouver until 2026. The area was declared a National Historic Site of Canada in 1994.

Historical summary: Kay Smith reported four Glaucous-winged Gull nests on the cliffs below the Point Atkinson lighthouse in 1968 (Table SG-550). She was travelling in Rudi Drent's boat. Campbell [70] lists three gull nests for this site but we think the record comes from the 1968 observation. We have no other records of this site being specifically surveyed for nesting birds. However, this is a popular birding area and there are many records of Glaucous-winged Gulls that have been submitted to eBird in recent years. There are no eBird records of gulls nesting in the area, and we think it is safe to conclude that gulls no longer nest at this site. We saw no sign of gulls on the cliffs in 2021.

Table SG-550. Seabird nesting records (nests) for Point Atkinson.

DATE	GWGU	SOURCE
12 Jul 1968	4	523
2000-2019	0[a]	524
31 May 2021	0	501

[a] See text.


Figure 366. The historic Point Atkinson lighthouse has been operating since 1874. The current light tower was erected in 1912. Glaucous-winged Gulls were nesting on the cliffs below the light tower in 1968 but have not been recorded nesting since. *Photos by Heidi M. Regehr, 31 May 2021.*

Remarks: Lighthouse Park is an extremely popular recreational site and attracts large numbers of visitors throughout the year.

SG-555 CAPILANO LAKE

Location: *49°21'50"N 123°06'35"W* (approximate raft location); *92 G/6.*
North Vancouver west of Grouse Mountain.

Description: *Raft.*
Historical summary: Poynter observed one pair of Glaucous-winged Gulls courting and building a nest on a small raft in the lake in 1972 (Table SG-555). One member of the pair was a subadult bird. A pair, presumably the same pair, returned the next two seasons and successfully laid eggs and raised young. We have no subsequent records of nesting at this site; there were no gulls present in 2021, although an old raft that provided suitable nesting habitat was still anchored near the south end of the lake.

Table SG-555. Seabird nesting records (nests) for Capilano Lake.

DATE	GWGU	SOURCE
1972-1974	1	313
4 Jun 2021	0	501

SG-560 WIGWAM INN

Location: *49°27'43"N 122°53'09"W; 92 G/7.*
At the north end of Indian Arm on the western shore just south of the Indian River estuary.

Description: *Pilings.*
This area is within Say Nuth Khaw Yum Provincial Park, established in 1995.

Historical summary: William Hughes reported one pair of Glaucous-winged Gulls nesting on a piling here for three consecutive years in the early 1940s (Table SG-560). Rob Butler saw none nesting in this area during his surveys of Indian Arm in 2013.

Table SG-560. Seabird nesting records (nests) for Wigwam Inn.

DATE	GWGU	SOURCE
1940s	1	144
2013	0	456

SG-562 CROKER ISLAND - CLIFFS

Location: *49°25'55"N 122°52'02"W; 92 G/7.*
Along the south and west sides of Croker Island near the north end of Indian Arm, west of Helga Bay, south of Granite Falls.

Description: *Cliffs.*
This area is within Say Nuth Khaw Yum Provincial Park, established in 1995.

Historical summary: Pigeon Guillemots were reported nesting on the cliffs at the south end of the island in 2013 (Table SG-562). One bird was seen fly from the cliffs and three others were on the water nearby (Figure 367). We know of no other observations for this site.

Figure 367. Pigeon Guillemots have been found nesting at two cliff sites in Indian Arm in recent years. There may be other nesting sites yet undiscovered in these inner waters near the Vancouver metropolis. *Photo by Paula Courteau.*

Table SG-562. Seabird nesting records for Croker Island - Cliffs. See Appendix 2 for codes.

DATE	PIGU	SOURCE
2013	x(4)	58

SG-565 "BUNTZEN" CLIFFS

Location: *49°21'10"N 122°53'14"W; 92 G/7.*
On the east side of Indian Arm, west of Buntzen Lake, north of Twin Islands.

Description: *Cliffs.*
This area is within Say Nuth Khaw Yum Provincial Park, established in 1995.

Historical summary: SFU professor John Reynolds confirmed Pigeon Guillemots nesting here in 2008 (Table SG-565). He observed an adult coming and going to a nest and could hear young calling inside. Nesting was also reported on these cliffs in 2013 and Rob Butler saw one adult carrying fish to the cliffs in 2015.

Table SG-565. Seabird nesting records for "Buntzen" Cliffs. See Appendix 2 for codes.

DATE	PIGU	SOURCE
28 Jun 2008	x(1)	45, 497
2013	x	58
10 Jul 2015	x(1)	456

SG-568 PORT MOODY

Location: *49°17'52"N 122°53'28"W* (BC Hydro station)*; 92 G/7.*
Head of Burrard Inlet east of Indian Arm. Colony includes all habitats along the shoreline and urban buildings away from the shore. Presently there is only one confirmed nesting record in this area at the BC Hydro Burrard Generating Station located on the north side of Burrard Inlet in Ioco. For future considerations we have designated this colony to include the entire City of Port Moody, except for the undeveloped rocky shoreline areas of Belcarra Regional Park and the Admiralty Point Lands, which in 2014 were taken back by the federal government and absorbed into the Parks Canada system. We also extend the boundaries of this colony south to Como Lake Avenue, which forms the northern boundary of the Queens Reach to North Arm colony, and east to the Coquitlam River. The Port Moody colony thus includes northern parts of the City of Coquitlam (see Figure 154 on page 168).

Description: *Pilings; Wharves and terminal structures, Rooftops; Rocky shoreline.*
Along the approximately 11.7 km of shoreline within the designated Port Moody colony are industrial, commercial, recreational, and residential developments and some park lands. Clockwise, beginning along the north side of Burrard Inlet east of the Admiralty Point Lands in Ioco are: a BC Hydro generating station; an Imperial Oil docking facility; the Ioco boat club docks; and then a long stretch of residences with small boat docks in front of almost every house. A forested, green space extends along the shore around the head of Burrard Inlet from Old Orchard Park to Rocky Point Park, with commercial, residential, and recreational buildings away from shore. The old town of Port Moody on the south shore of Burrard Inlet has mostly commercial and industrial buildings near shore with residential neighbourhoods further inland. The large Pacific Coast Terminal facility at the west end of the old town is a major port for dry bulk sulphur and potash as well as bulk liquids like canola oil. Towards Barnet along the south shore is the Reed Point Marina.

Historical summary: Rob Butler observed a pair of Glaucous-winged Gulls attending a nest on a piling at the Burrard Generating Station on 11 June 2013 (Table SG-568). Two fledglings were seen at the nest on 12 August. In 2021, Michael Rodway and Heidi Regehr inspected the Reed Point Marina and, from there, scanned by spotting scope the waterfront area and wharves around the Burrard generating station and the Imperial Oil terminal wharf on the north side of Burrard Inlet. Two adult gulls were seen flying but no sign of nesting was observed around the Reed Point Marina. A pair of adults was seen and suspected nesting on wharf structures in front of both the Burrard generating station and the Imperial Oil terminal.

Table SG-568. Seabird nesting records for Port Moody. See Appendix 2 for codes.

DATE	GWGU	SOURCE
11 Jun, 12 Aug 2013	1	456
2 Jun 2021	2eS	501
10 Jul 2022	0[a]	501

[a] Areas where nesting was observed in 2013 and 2021 were not surveyed (see text).

On 10 July 2022, from shoreline roads and trails, Rodway and Regehr scanned all visible rooftops and port structures in the area from Rocky Point to the north end of the Pacific Coast Terminal facility. No evidence of nesting was seen, but visibility was severely limited in the port area due to dense shoreline vegetation. Three adult gulls were seen on rooftops of loading conveyors north of the stored sulphur piles in the terminal but they flew off after a few minutes. The area would be better surveyed from the water.

Remarks: One adult Bald Eagle was sighted on port structures of the Pacific Coast Terminal in 2022.

SG-570 BARNET

Location: *49°17'32"N 122°56'12"W* (location of 1977 nest)*; 92 G/7.*
Southern shore of Burrard Inlet within the City of Burnaby from Boundary Road east to the border of Port Moody. Colony encompasses the historic community of Barnet and includes all habitats along the shoreline and buildings and other structures away from the shore as far south as the Trans-Canada Highway 1, running between Boundary and North roads. Areas south of Highway 1 we have designated as part of the Queens Reach to North Arm colony (see Figure 154 on page 168).

Description: *Rooftops; Pilings; Oil refinery towers; Wharves and terminal structures.*
About 10.7 km of shoreline lie within this designated colony. Industrial development has occurred along the shoreline, including oil refineries, shipping terminals, and an industrial chemical plant. However, much of the shoreline is still forested and several parks front on the shore, including Montrose Park, Confederation Park, and Barnet Marine Park. The Canadian Pacific Railway mainline runs close to the shore and above that is the Barnet Highway. Steep forested slopes rise away from the shore in many areas. Above the steep slopes along the western portion of the colony are residential developments with some commercial buildings further inland. Simon Fraser University sits above the slopes to the east. Areas surrounding the university lie within the Burnaby Mountain Conservation Area.

Historical summary: In 1977, John Kirbyson reported two Glaucous-winged Gull nests with three young each located on top of a 20’ high wooden piling, located about 50’ (15 m) offshore of Barnet Beach (Table SG-570). The beach is west of Gosse Point, directly south of Indian Arm. That area is now within Barnet Marine Park.

In 2021, spot checks were conducted from accessible vantage points along roads running close to the shore. Residential rooftops were inspected in the Burnaby Heights area above Montrose Park to Confederation Park. All the oil refineries and other industrial complexes along Penzance Drive and Barnet Highway were viewed as best as possible from nearby roads. The entire shoreline area of Barnet Marine Park was inspected. No signs of gulls on rooftops were seen in the residential areas of Burnaby Heights. Gulls were seen at the Chevron oil refinery at Barry Point below Penzance Drive, at the Suncor refinery at the east end of the colony, and in Barnet Marine Park.

Nesting was confirmed in 2021 at the Chevron oil refinery at Barry Point. One adult was sitting on a nest on a low-slope, mossy roof of a small building in the middle of the refinery complex (Figure 368). The adult was watched on the nest for an extended period of time and was undoubtedly incubating. Five other adults were seen roosting and flying around the refinery complex but only the one nest was spotted. Five adult gulls were also seen perched on structures of the Suncor refinery but no nests could be seen. In Barnet Marine Park, one pair was seen standing and sitting on a piling along the shore at the east end of the park for about an hour. No nest could be seen but nesting was suspected. There were likely more nests than the one spotted at the Chevron refinery and we used the number of gulls seen around possible nesting territories at the above locations to estimate a total nesting population for this colony in 2021.

Table SG-570. Seabird nesting records for Barnet. See Appendix 2 for codes.

DATE	GWGU	SOURCE
14 Jul 1977	2[2]	523
2 Jun 2021	7e	501

Figure 368. Glaucous-winged Gulls have been found nesting in a variety of urban habitats in the Greater Vancouver area, but this nesting location discovered in 2021 on a small rooftop in the middle of the Chevron oil refinery at Barry Point within the Barnet colony is one of the most unusual. An adult gull sitting on a nest is visible in the upper right quadrant of this photo and in the centre of the close-up photo on the next page. *Photos by Heidi M. Regehr, 2 June 2021.*

SG-580 SECOND NARROWS

Location: *49°17'42"N 123°01'34"W; 92 G/6.*
Burrard Inlet just west of the mouth of the Seymour River. Colony includes the Ironworkers Memorial Second Narrows Crossing (also called the Second Narrows Bridge and the Ironworkers Memorial Bridge; Figure 369), the adjacent Canadian National Railway bridge, and the power tower on the north shoreline adjacent to the railway bridge.

Description: *Bridge and tower structures.*
A bridge crossing Second Narrows was built in 1925 and was used by both cars and trains. A second larger bridge for cars was built in 1960 alongside the first one; the original bridge was then used exclusively for trains. The car bridge was renamed the Ironworkers Memorial Second Narrows Crossing in 1994 in honour of the ironworkers who died in accidents while building it. In 1968, the original bridge was replaced with the present railbridge. Transmission line towers were first installed around 1946 as part of a plan to bring electric power from the Bridge River hydroelectric complex to Vancouver.

Historical summary: Surveys have been conducted from the water under the bridges, except: in 1984-1985, May 2018, May-June 2019, May 2021, and June 2022, when surveys on the Ironworkers Memorial Bridge were conducted from maintenance vehicles or "travellers" that run on tracks under the bridge deck; in May-August 2017, when Ed Kroc counted gull nests visible from a vantage point on land at the south end of the bridge near Bates Park; on 26 and 27 April 2018, when preliminary surveys were conducted from four vantage points on land located on the north (3 points) and south shores of Burrard Inlet; in May-June 2020, when surveys were conducted from vantage points on land; and in July 2020 when nests were counted from photographs taken from two vantage points on land under the north and south ends of the bridge. In May 2021, surveyors also viewed nesting areas between piers 10 and 12 (see below) from scaffolding that had been erected under the bridge for maintenance activities in that area. In 2009, Rob Butler counted nests only on the south half of the Ironworkers Memorial Bridge. Surveys were not conducted in 2023 but are planned for 2024.[611]

Figure 369. East side of the Ironworkers Memorial Second Narrows Crossing as seen from the north shore of Burrard Inlet. *Photo by Macus Ong, 2020.*

In May 2018, 2021, and 2022, the locations of all nests on the Ironworkers Memorial Bridge were mapped in relation to the bridge support piers, numbered 10 to 17 from north to south.[204, 208, 396] The two piers supporting the main span over Burrard Inlet were numbered 15 (north) and 16 (south). To the north, piers 10 and 11 are on land and piers 12-14 are in the water. The shoreline under the bridge lies midway between piers 11 and 12 on the north side and just south of pier 16 on the south side.

In 1975, Martin Lee recorded two isolated Glaucous-winged Gull nests at this site: one on a cement bridge support of the Ironworkers Memorial Bridge, and one on a cement bridge support of the adjacent railway bridge (Table SG-580). The four gull nests he observed in 1978 were all on the supports of the railway bridge. Numbers of gulls nesting increased to over 40 pairs in the 1980s but appear to have decreased since. Butler counted 15 nests on the south half of the bridge in 2009. In 2014, Carter recorded 16 adults scattered over the Ironworkers Memorial Bridge.[94] They did not appear to be nesting but a few nests may have been present. Carter reported none nesting on the railway bridge, with 43 birds (one third immature) roosting. An additional 35 gulls were counted on the water around the bridges. In 2017, from his viewpoint below the south end of the Ironworkers Memorial Bridge, Kroc could see three nests located high over water among the metal lattice supports below the area where Double-crested Cormorants were nesting. In 2018, numerous Glaucous-winged Gulls were seen on the railway bridge during a preliminary survey on 26 and 27 April.[204] Large numbers of gulls were observed there again in May and nesting was suspected, but no nests were seen. On the Ironworkers Memorial Bridge at that time (May 2018), 29 gulls were scattered along the bridge and two empty nests were seen on lower horizontal beams over piers 10 and 16. Seventeen nests were counted in 2019, Macus Ong saw adults sitting on two nests on the Ironworkers Memorial Bridge in July 2020, and Triton and Hemmera biologists counted 10 nests there in 2021 and 21 nests in 2022. In 2021, five of the nests were over land between piers 10 and 11; the rest were over water between piers 12 and 16. In 2022, 13 nests were over land between piers 10 and just south of pier 11 and eight nests were over water from just north of pier 12 to pier 16.

Pelagic Cormorants were first observed nesting on the Ironworkers Memorial Bridge in 1983. The colony then grew to become one of the largest in the BC Salish Sea. Numbers reached a maximum of about 250 nesting pairs in 2010 but have declined since. In 2010, 231 nests were visible and 15-25 were suspected where standing birds were present but nests could not be seen; Carter et al.[101] listed 244 nests for 2010. In 2014, 116 Pelagic Cormorant nests were visible plus eight nests were suspected; [94] Carter et al.[101] listed 120 nests for that year. Numbers have varied since 2014, with greater numbers seen in 2017, 111 nests counted in 2019, and a low count of 51 nests in 2021. The most recent survey in 2022 tallied 73 nests. The Hemmera survey in 2018 was conducted early in the season

and nests were still being built; 128 nests were counted but observers considered it highly probable that additional nests would be constructed as the season progressed. All nests observed had one or two adults on the nest at all times. The same was true for all Double-crested Cormorant nests counted in 2018. In May-June 2020, a total of 522 cormorant nests were counted but nests were not separated by species; [208] in July that year, Macus Ong counted 61 Pelagic Cormorant nests and suspected nine more behind girders on the bridge. In 2022, both Double-crested and Pelagic cormorants were still building

Table SG-580. Seabird nesting records for Second Narrows. See Appendix 2 for codes.

DATE	DCCO	PECO	GWGU	PIGU	SOURCE
30 Jul 1975			2		523
13 Jun 1978			4		523
1982		0			518
1983	0	10e			215
29 Jun 1984	0	63	40		215
23-25 Apr 1985	0	85			215
21 May 1985			x		536t
May-Aug 1986			40		431
8-9 Jul 1987	0	90	46		428, 525
Jul-Sep 2000	0	201			114
12 Jun 2006	67				456
26 Jun 2007	41				456
12 May, 27 Jun 2008	17	x			45
26 Jun 2009		71+	15+		456
22 Sep 2009	32				456
2009	53-63e[a]	130			1, 101
2010	69-72e[b]	231-256e[c]			101, 522
27 May 2011	x				45
11 Jun 2012	93				456
2013				1	58, 456
16 Jul 2014	157-158e[d]	116-124e[e]	S	(1)	94, 101
11 Jul 2016	248	106-113e[f]			98, 193
May-Aug 2017			x3		480
5 Jul 2017	288-299e[g]	166-168e[h]			112, 193
1-2 May 2018	298	128	2S		204
13 Jul 2018	177-183e[i]	59-72e[j]			466
16 May 2019	333-336e[k]	8+[l]			478
May-Jun 2019	383	111	17		208
May-Jun 2020	x[m]	x[m]			208
8-10 Jul 2020	296	61-70[n]	2		285, 492
27 May 2021	466[o]	51[o]	10		208, 396
3 Jun 2022	520	73	21		208

[a] Fifty-three nests were counted and 10 were suspected where birds were standing but nests could not be seen.[95, 193] The WSI database [522] lists 58 nests for 2009 but both Adkins and Roby [1] and Carter et al.[101] list 63 nests.
[b] Observers counted 69 nests; 2-3 were suspected.[95, 193]
[c] Observers counted 231 nests; 15-25 were suspected.[95, 193] Carter [94] gave a count of 172 nests but the WSI database [522] listed 244 nests and 244 nests is the count used by Carter et al.[101] (see their Appendix 1).
[d] Observers counted 157 nests; 1 was suspected.[95, 193]
[e] Observers counted 116 nests; 8 were suspected.[94, 193]
[f] Observers counted 106 nests; 7 were suspected.[98, 193]
[g] Observers counted 288 nests; 11 were suspected.[193]
[h] Observers counted 166 nests; 2 were suspected.[193]
[i] Observers counted 177 nests; 6 were suspected.[466]
[j] Observers counted 59 nests; 13 were suspected.[466]
[k] Observers counted 333 nests; 3 were suspected.[478]
[l] Survey occurred before most Pelagic Cormorants were nesting.[478]
[m] A total of 522 cormorant nests were counted but were not separated by species.[208]
[n] Ong [285, 492] counted 61 nests and suspected 9 more hidden behind girders.
[o] Numbers of nests in 2021 were initially reported as 452 and 50 for Double-crested and Pelagic Cormorants, respectively [396] and were later revised.[208]

nests at the time of the survey and total numbers of nests that season may have been greater than what was counted.

First nesting by Double-crested Cormorants was recorded in 2006 when 67 nests were counted on the power tower. Fewer nests were seen on the power tower over the next two years. In 2008, only 17 nests and 106 birds were counted on the power tower. Nests in those years were located on the upper parts of the tower. Increasing numbers of nests were seen on the power tower in 2009 to 2012, when nesting occurred only on the power tower, but by 2014 most of the colony had moved to the Ironworkers Memorial Bridge with only 16 nests counted on the power tower, 15 of which were empty.[94] In 2014, 141 nests were counted on the bridge plus one nest was suspected where a standing adult was visible.[94] Carter noted that this was the first year nesting occurred on the bridge.[94] Numbers nesting on the bridge increased dramatically over the next few years to over 300 nests in 2019, 296 nests in 2020 (Figure 370), 466 nests in 2021, and 520 nests in 2022. The Ironworkers Memorial Bridge has become the largest Double-crested Cormorant colony in BC. No cormorants have been recorded nesting on the power tower since 2014, although in 2017, two empty, unattended nests were seen on the tower,[193] and in May 2018 small amounts of old nesting material were observed at two locations near the top of the tower and at one location near the bottom.

Figure 370. Macus Ong counted 296 Double-crested Cormorant nests on the Ironworkers Memorial Bridge during his Master's studies in 2020. Most Double-crested Cormorant nests were built on horizontal beams. *Photo by Macus Ong, 2020.*

Different survey methods have likely confounded comparisons among years. A later count in July 2018 from the water recorded many fewer nests of both cormorant species than were counted from the travellers in May. This suggests either that many nests had been abandoned and had disappeared during the two-month interval between the surveys or that many nests are not visible from the water below the bridge. If the latter is true, which seems likely, then counts only from the water may have underestimated nesting populations in other years. During the preliminary surveys from land in April 2018, observers estimated about 170 cormorant nests in total, much fewer than the total of 426 nests counted from the travellers less than a week later.[204] This again suggests that many nests are not visible

from vantage points below the bridge, although nest building was still in progress at the time of the April and May surveys (Figure 371). Hemmera biologists also thought that counts from the ground likely underestimated numbers of nests in 2020.[208]

Hemmera and Triton biologists documented the specific locations of cormorant nests on the Ironworkers Memorial Bridge from 2018 to 2022 (nests were not identified to species in 2020). In those years, all cormorant nests were located directly over water and not over land. Double-crested Cormorants placed their nests in the open on lower horizontal beams or centre gusset plates, while Pelagic Cormorant nests were built where there was overhead covering, such as where two structural components meet, above piers, or in the upper beams. The majority of Pelagic but not Double-crested cormorant nests were located on critical structural elements.

Segregation of the two cormorant species along the bridge was also evident in all years. Most Pelagic Cormorant nests were located in areas where Double-crested Cormorants were not nesting, specifically between piers 11 and 14 and just north of pier 16. Between piers 11 and 14, there were 67 (52% of the total), 88 (79%), 35 (69%), and 54 (74%) Pelagic Cormorant nests in 2018, 2019, 2021, and 2022, respectively. Only one Double-crested Cormorant nest was located between piers 11 and 14 in those years (in 2018 one Double-crested Cormorant nest was located just north of pier 14). A smaller group of Pelagic Cormorant nests was also isolated from nesting Double-crested Cormorants in the area just north of pier 16 in 2018 and 2019, but Double-crested Cormorants had expanded into that area by 2021. There were 24 (19%) and 17 (15%) Pelagic Cormorant nests where there were no Double-crested Cormorant nests in the area just north of pier 16 in 2018 and 2019, respectively. In those two years, Double-crested Cormorant nests were concentrated in the areas from pier 14 to mid-way between piers 15 and 16. In 2021 and 2022, respectively, there were 73 and 80 Double-crested Cormorant nests in the area north of pier 16 where none were located in 2018 and 2019. There were also 10 (20%) and 17 (23%) Pelagic Cormorant nests in that area in those two years, respectively, indicating little change in the proportion of Pelagic Cormorant nests occurring there after Double-crested Cormorants expanded into the area.

Figure 371. Double-crested Cormorant carrying a stick (left) and a Pelagic Cormorant carrying a clump of grasses to nests on the Ironworkers Memorial Bridge. *Photos by Macus Ong, 19 April 2020 (left) and 5 May 2021.*

The decrease in the number of Pelagic Cormorant nests in the area between piers 11 and 14, from 88 nests in 2019 to 35 nests in 2021, may have been due to the installation in 2021 of netting to exclude birds from the upper beams of the bridge during maintenance work in that area (see Remarks), although only 44 cormorant nests (likely all Pelagic Cormorant nests) were counted in that area in 2020, prior to the installation of exclusion netting. Pelagic Cormorants and Glaucous-winged Gulls continued to nest directly below netting and scaffolding that had been installed in that area in 2021. Numbers of Pelagic Cormorants nesting there increased somewhat in 2022 but had not returned to 2019 levels after the exclusion netting had been removed. The decrease in the number of Pelagic Cormorant nests in the area between piers 14 and 16, from 61 nests in 2018 to 19 nests in 2022, may have been influenced by the expanding numbers of Double-crested Cormorants nesting there, although the tendency to use different types of bridge structures (see above) for nesting would limit competition for nesting habitat between the two species. Also, as noted above, similar numbers of Pelagic Cormorants

continued to nest in the area just north of pier 16 after Double-crested Cormorants began nesting there in 2021 and 2022. In addition, an isolated pocket of five Pelagic Cormorant nests present in 2018 over pier 15 was absent in 2021 and 2022, suggesting that other factors may have contributed to the decrease in Pelagic Cormorants because no Double-crested Cormorants nested in that area in any year.

Rob Butler saw one Pigeon Guillemot fly up into the girders of the Ironworkers Memorial Bridge in 2013. Carter saw one on the water under the bridge in 2014 but thought it was probably not nesting.[94] Guillemots have not been recorded during other surveys.

Remarks: Pelagic Cormorant nests were removed by the Ministry of Transport and Highways in 1985: 85 nests were removed on 23-25 April; and 70 and 80 nests, that had been re-established, were removed on 29 April and 21 May, respectively.[215] Construction activities in 2014 were kept away from breeding areas or were scheduled for after the breeding season and did not appear to affect nesting birds.[94] In 2018, in response to concern about possible deterioration of bridge structural members due to accumulated bird feces, a study was commissioned to determine bird use of the bridge and to present management options.[204, 205] In 2021, exclusion netting and scaffolding was installed between piers 10 and 12 to accommodate bridge maintenance work, including cleaning, sandblasting, and painting. Triton biologists reported that maintenance activities caused no apparent disturbance to birds nesting outside the exclusion netting. During the winter following the 2021 breeding season, exclusion measures were removed between piers 10-12 and installed between piers 12-16 for the next stage of bridge maintenance work. Those measures were removed prior to the 2022 breeding season and likely had no effect on nesting populations in 2022.

In 2014, the observation that most Double-crested Cormorant nests found on the power tower were empty while many nests on the bridge held chicks suggested poor reproductive success on the power tower, perhaps due to human and eagle disturbance.[94] This may account for the move by most of the Double-crested Cormorant colony from the power tower to the bridge between 2012 and 2014 (Figure 372).

Peregrine Falcons were reported nesting under the bridge in 1991 [523] but have not been recorded in recent years. In 1991, bridge painters reported that Double-crested Cormorants roosting under the bridge were chased away by the nesting falcons.[547] There was one active Canada Goose nest on the bridge in 2018.[204] Thirty suspected Northwestern Crow nests were also counted on the bridge in 2018; the survey occurred early in the season before eggs were laid.

Figure 372. In 2014, Double-crested Cormorants nesting on the Ironworkers Memorial Bridge appeared to be more successful than those nesting on the adjacent power tower. This may explain why between 2012 and 2014 the colony relocated from the power tower to the bridge and why nesting on the power tower was not observed again after 2014. *Photo by Macus Ong, 9 June 2021.*

The Ironworkers Memorial Bridge was the main study site used by Macus Ong for his M.Sc. research in 2020. Ong investigated the use of photogrammetric methods to monitor cormorant breeding populations and nesting chronology.[285]

SG-590 NORTH VANCOUVER

Location: *49°18'30"N 123°04'43"W* (Burrard Drydocks); *92 G/6.*
North shore of Burrard Inlet between Capilano River and Seymour River, including all urban habitats along the shoreline and buildings away from the shore. This colony thus extends a little west and east of the City of North Vancouver boundaries and includes shoreline habitat under the First and Second narrows bridges (see Figure 154 on page 168).

Description: *Rooftops, Jettys, Wharves, Pilings, Light beacons, Machinery, Stumps.*
The designated North Vancouver colony area extends along about 9.4 km of urban shoreline. Areas near shore are dominated by commercial and industrial buildings, including ship-building facilities, tugboat harbours, a Metro Vancouver

Translink SeaBus terminal, and other piers and wharves. The area includes about eight major marine terminals as part of the Port of Vancouver, with facilities for loading and unloading breakbulk cargo such as forest products, steel, and machinery, and dry and liquid bulk cargoes such as potash and other chemicals, grains, canola oil, and wood pellets. Areas away from the shoreline are predominantly commercial and residential buildings.

Historical summary: Glaucous-winged Gulls have been reported nesting in several areas along this shoreline. Nests were first reported in 1967 and 1968 by Mr. and Mrs. R.T. Wright from Port Moody. Nests were located on top of wooden pilings on the North Vancouver shoreline underneath the Lions Gate Bridge. In 1974, Campbell counted 71 nests on a wide, flat-topped, man-made jetty (Figure 373) just east of the Vancouver Shipyards at the foot of Pemberton Street, west of Mosquito Creek in North Vancouver (Table SG-590). Most nests were on the rocky sides of the jetty (49 on the west side and 8 on the east side), with 14 nests built on the flat top. He recorded an additional nest on a nearby piling (Figure 374). The colony there had been first observed by CBC cameraman Doug MacKay in 1971 (reported in Campbell [69]). Major modifications to the site occurred in 1974 (see Remarks). Subsequent records at the Vancouver Shipyards location included: 25 nests in 1977 along the edge of the jetty; 28 nests in 1978, most on the jetty and some on pilings, buildings, metal frameworks, and machinery; and 18 nests in 1981 along the rocky bank and among and on top of machinery and fallen buildings. Many nests were empty in 1978 but egg laying was still in progress.

Figure 373. Glaucous-winged Gulls colonized this jetty at the Vancouver Shipyards in North Vancouver in about 1971. In 1974, there were 49 nests on the west side (shown here), eight nests on the east side, and 14 nests built on the flat top of the jetty. The upper photo shows one nest with three eggs (bottom of photo) among some boulders and fireweed (*Chamaenerion angustifolium*) growing along the west side of the jetty. *Photos by R. Wayne Campbell, 11 July 1974.*

Figure 374. In addition to 71 Glaucous-winged Gull nests found on a jetty at the Vancouver Shipyards in 1974, one nest with three chicks was also spotted on a piling nearby. *Photo by R. Wayne Campbell, 11 July 1974.*

Gulls were first documented nesting at the Burrard Drydocks area, located east of Mosquito Creek and east of the Lonsdale Quay, in 1975, although Poynter stated at that time that two or three pairs had traditionally nested in the area. In 1975, Poynter observed 14 nests on a steep, 70-foot-high roof, one nest on the top of a piling, one nest on the flat roof of an elevated control room, and one nest on the control cab of a mobile crane that was in constant operation during daylight hours. In 1981, Wayne Campbell found three nests with broods on light beacons just offshore of the Burrard Drydocks. Vermeer et al. reported about 150 pairs nesting on buildings associated with Burrard Drydocks, and Vermeer and Devito recorded eight nests on pilings along that area in 1986. On 21 July 2008, 47 adult gulls and 29 fledged young, with four adults still sitting on nests, were seen on the arched rooftops of two adjacent buildings located just east of the drydocks at Pier 94 south of St. Andrews Avenue. Nesting gulls were seen at the same location in 2009. Each year from 2019 to 2021 and in 2023, eBird contributor Joe Denham, who works nearby, observed a pair nesting on the roof of the British Columbia Institute of Technology Marine Campus located west of Waterfront Park, west of the Lonsdale Quay: in 2019 and 2020, young were seen in a nest in July; in 2021, one nest held an incubating adult on 28 May, three eggs on 19 June, one egg on 3 July, and one chick from 7 July through fledging in early August; and in 2023, Denham saw a nest with three eggs on 9 July and a nest with young several times between 15 and 23 July. On 16 June 2021, an adult was seen sitting on a nest located on top of the seabus terminal on the Lonsdale Quay.

Further east, Martin Lee recorded an isolated gull nest on top of a stump at the mouth of the Seymour River under the Second Narrows railway bridge in 1975. In 1983, Mark Daly saw one pair of gulls nesting on a piling near the mouth of Lynn Creek. On 12 May 2009, several pairs were seen nesting on a warehouse roof located under the east side of the Ironworkers Memorial Bridge, between the bridge and the railway track.

Recently, Glaucous-winged Gulls have been recorded nesting further inland in this urban area. A pair of gulls with two young was seen near the North Vancouver City Hall at 141 W 14th Street on 5 July 2018. That location is about 1.3 km from the nearest shore. On 24 March 2021, eBird contributor James Park photographed a courting pair consisting of a Glaucous-winged Gull female and a Western x Glaucous-winged Gull hybrid at a rooftop nest located nearby at 117 E 14th Street, about 1.4 km from the shore.

Table SG-590. Seabird nesting records for North Vancouver. See Appendix 2 for codes.

DATE	BLOY	GWGU[a]	PIGU	SOURCE
13 Jul 1967		1		523
19 Jun 1968		1		523
18 Jun 1970			(1)	457
1971-73		x		69, 523
11 Jul 1974		72[57]		70, 523
19 Jun 1975		18		313, 523
1 Jul 1977		25[20]		523
11 Jun 1978		28[5]		523
1 Aug 1981		21[10]		523
24 Jun 1983		x		523
May-Aug 1986		158e		420, 431
12 May, 21 Jul 2008		30e+[b]		45
26 Jun 2009	1			456
5, 9 Jul 2009		x	x(7)	45
3 Apr 2013			S(11)	524
2013	1		x	58
11 Apr 2014			S(22)	524
17 May 2015			x(10)	524
11 Aug 2016			x(15)	524
Mar-May 2017			x(13)	524
Mar-Aug 2018		x	x(10)	524
26 Jul 2019		x		524
1, 7 Jul 2020		x		524
Mar-Aug 2021		x2	x(2)	524
30 Jun 2022			x(7)	524
9 Jul 2023		x		524

[a] See text for derived total estimate of 200 pairs for the current breeding population.
[b] Estimate in 2009 was derived from counts of adults and nests at two separate locations (see text).

Pigeon Guillemots were seen in the area in 1970. They were first reported nesting under the concrete pier just east of Lonsdale Quay in 2009 and many were reported nesting there in 2013-2015.[524] In July 2009, birds carrying food were seen entering cavities under the pier. Observers in 2014 noted that the birds appeared to be nesting underneath the pier in several large square channels that pass through the pier. On 9 March 2017, a flock of 13 birds was seen on the water west of the pier, some periodically flying under the pier to suspected nest locations. One adult brought food to a nest very close to the land end on the west side of the pier on 20 August 2018. Guillemots have also been seen nesting at Burrard Drydocks further to the east (some records refer to this site as Wallace Shipyards; Burrard Drydocks was originally called Wallace Shipyards from 1905 to 1921). A few pairs were observed courting on the water and flying up into the infrastructure in 2013. In 2016, several birds were regularly sighted around the long pier, and in 2017 birds were seen tending nests built under the shipworks moorage on 1 April. Observers on 18 February 2017 stated that there is a population of about 20 Pigeon Guillemots that nest underneath the "Dry Dock," which is likely the same location. Birds Canada BC team member Kris Cu recorded adults feeding young at Burrard Drydocks in 2022.

One pair of Black Oystercatchers was reported nesting on a pier close to the western side of the Iron Worker's Memorial Bridge in 2009 and 2013.[58, 456] The pier was on the southeast corner of the Lynnterm Terminal at the entrance to J.S. McMillan Fisheries. One chick was seen in 2009.

Available data do not provide an overall estimate of seabird populations nesting in the North Vancouver colony area. For Glaucous-winged Gulls, we derived a best approximation by adding the 18

nests counted at the Vancouver Shipyards in 1981, the 158 nesting pairs reported by Vermeer et al. and Vermeer and Devito at the Burrard Drydocks in 1986, single pairs seen nesting on pilings under the Lions Gate Bridge and near the mouths of Seymour River and Lynn Creek between 1967 and 1983, and incidental records of gulls nesting at various locations since 2009, giving a total estimate of over 180 pairs. That likely underestimates the current breeding population in the North Vancouver colony area, given the age of most of the data, the general increasing trend for gulls in urban habitats, and the fact that surveys have only covered a portion of available nesting habitat. We thus suggest rounding up to 200 pairs for a working estimate of the number of Glaucous-winged Gulls nesting in the designated North Vancouver colony area. For Pigeon Guillemots, we have used the highest count of 22 birds recorded in 2014 as the current best estimate of the population.

Remarks: In 1974, after their census on 11 July, Wayne and Eileen Campbell revisited the site on 25 July and found the Vancouver Shipyards jetty site under construction and most nests abandoned. The top of the jetty had been bulldozed and additional docking facilities were being constructed. Most nesting areas along the North Vancouver shoreline are heavily disturbed by human activity.

SG-595 WEST VANCOUVER

Location: *49°19'46"N 123°10'10"W* (Bellevue apartments); *92 G/6.*
We expanded the boundaries for this colony in 2023 to accommodate new nesting records within the West Vancouver area (see Figure 154 on page 168). The colony now covers the north shore of Burrard Inlet between Lighthouse Park and Capilano River, and the shore north of Lighthouse Park to Horseshoe Bay, including all natural and urban habitats along the shoreline and buildings away from the shore, except excluding four colony sites located along the shore between Lighthouse Park and Horseshoe Bay that we retain because of their historical status. The four historical colonies are: SG-475 Horseshoe Bay - Ferry Terminal; SG-480 Lookout Point; SG-505 Kettle Point; and SG-510 Bachelor Point. We have delineated the boundaries of the latter three colonies to include only the rocky and cliff habitats at the shore, which are the historically-used nesting habitats at those sites. Residential dwellings built on the points are included within the newly designated West Vancouver colony. This entire colony lies within the District of West Vancouver.

Description: *Rooftops; Wharf; Piers; Pilings.*
The designated West Vancouver colony area extends along about 18 km of urban shoreline. The shoreline is a mix of rocky and beach habitat. The few shoreline structures include: marinas in Horseshoe Bay and Eagle Harbour in the western portion of the colony; a wharf on pilings and a dock at the Pacific Science Enterprise Centre in Sandy Cove just east of Lighthouse Park; and some breakwaters, piers, and boat launches in the Ambleside area towards the east end of the colony. Areas near shore are dominated by residential houses, apartment buildings, and small parks. Away from shore are stretches of commercial buildings, especially along Marine Drive in the eastern portion of the colony.

Historical summary: In 2021, Michael Rodway and Heidi Regehr conducted a search for Glaucous-winged Gulls on rooftops of visible buildings along the entire length of Marine Drive within the West Vancouver colony area. Nesting was not confirmed but individuals or pairs of adult gulls were seen standing near likely nesting territories on many apartment and some commercial buildings in the Ambleside and Park Royal areas towards the east end of the colony (Figure 375). The greatest concentration of gulls on rooftops was seen along Bellevue Avenue, between Marine Drive and the coast. Gulls (2 pairs and 9 individuals) were seen standing on 11 possible territories on 10 buildings along Bellevue Avenue between 23rd and 18th streets. Gulls (1 pair and 4 individuals) were also seen on rooftops of five buildings just north of Marine Drive in the vicinity of Duchess Avenue between 16th and 14th streets. One adult was also seen on the roof of a building along Marine Drive just west of the Park Royal shopping centre and one pair was visible on a building within the Park Royal shopping centre on the south side of Marine Drive. In total, gulls were seen at 18 possible nesting territories on rooftops of 17 buildings (Table SG-595).

In 2023, Ken Wright observed three pre-fledged young on the roof of a house at 6658 Marine Drive on 7 August. The waterfront house is located on the east side of Batchelor Cove, east of Whytecliff Park. We added this nesting pair to the estimate of 18 pairs suspected nesting in 2021 to obtain a current estimate of 19 breeding pairs for this colony.

Figure 375. Glaucous-winged Gulls were suspected nesting on several apartment rooftops along Bellevue Avenue in West Vancouver in 2021. *Photo by Heidi M. Regehr, 31 May 2021.*

Table SG-595. Seabird nesting records for West Vancouver. See Appendix 2 for codes.

DATE	GWGU[a]	SOURCE
31 May 2021	18eS	501
7 Aug 2023	x	524

[a] See text for derived total estimate of 19 pairs for the current breeding population.

SG-600 VANCOUVER HARBOUR

Location: *49°17'10"N 123°05'57"W* (old CN Terminal); *92 G/6.*
South shore of Burrard Inlet within the City of Vancouver from Coal Harbour, on the east side of Stanley Park, to the Burnaby border at Second Narrows along Boundary Road. Colony includes all urban habitats along the shoreline and buildings away from the shore inland to the borders of the False Creek and South Vancouver colonies (see Figure 154 on page 168; and see colony accounts SG-660 and SG-667 below).

Description: *Rooftops, Pilings, Port facilities.*
The designated Vancouver Harbour colony area extends along about 8.8 km of urban shoreline. Areas near shore are dominated by commercial and industrial buildings, with some residential towers, private marinas, and parklands, especially along the western end of the area. This colony includes about ten major marine terminals as part of the Port of Vancouver, with facilities for loading and unloading container cargo, dry and liquid bulk cargoes such as grains, sugar, and canola oil, and cruise ships. Areas away from the shoreline are predominantly commercial and residential buildings.

Historical summary: Oldaker [284] documented the first rooftop-nesting Glaucous-winged Gulls in Vancouver. He reported two young fledged from a single nest on the roof of the Canadian National Steamship Terminal in 1962 (Table SG-600). In 1964, David Woolgar observed a nest on the flat roof of a building in the 400 block of Railway Street. One of three eggs hatched in that nest. A nest with three eggs reported by Ross Waters in 1968 was located on a piling at the Vancouver Rowing Club wharves at the west end of Coal Harbour on the edge of Stanley Park. Young were seen in three of four nests in 1972 and two nests in 1973 on rooftops at 101-321 Water Street. Numbers of gulls nesting along Vancouver Harbour increased dramatically between 1973 and 1986. In 1986, Vermeer et al. found 12 pairs nesting on roofs of HMCS Discovery in Coal Harbour plus about 100 pairs, including 14 pairs on the Centennial Building, along the industrial shore east of there. Most of the increase likely occurred after 1980.[431] Based on recent observations by maintenance personnel accessing rooftop equipment, we know that hundreds of pairs now nest on the tops of high-rise towers in the downtown core of Vancouver that was not part of Vermeer's study area.[335]

Ed Kroc began studies of urban-nesting gulls in Vancouver in 2015.[240, 241, 242] He documented 142 nests in the downtown area in 2015,[241] but his study area only covered a small proportion of available habitat. He observed gull nests from two vantage points in 2015: Vancouver Lookout at 555 W. Hastings Street (120 nests); and a private residence, with a NE view, on the 21st floor of 699 Cardero Street (22 nests). Observations from such vantage points would detect only a portion of the nests within

the viewable area as many nests would be hidden by obstructions.

Table SG-600. Seabird nesting records for Vancouver Harbour. See Appendix 2 for codes.

DATE	GWGU[a]	SOURCE
Jul 1962	1	284
Jun 1964	1	523
17 Jul 1968	1	523
Jul-Aug 1972	4	344
Aug 1973	2	344
May-Aug 1986	112e	431
19 Jun 2011	x	524
Jul-Aug 2014	x2	524
May-Jun 2015	142+	241
Jun-Aug 2016	x3	315, 524
Apr-Aug 2017	x5	315, 524
May-Aug 2017	173+	480
9 Jun-Aug 2018	x3	524
May-Jul 2019	x5	315, 524

[a] See text for derived total estimate of 1,000 pairs for the current breeding population.

In 2017, Kroc conducted surveys of nesting gulls at 20 study areas distributed throughout the City of Vancouver (which includes this colony as well as SG-660, SG-661, and SG-667). Data from those surveys were used to develop a predictive model to estimate probabilities of gull nests occurring on different types of rooftop structures across the city.[242] Nine of those study areas were located within the Vancouver Harbour colony: three covering much of the downtown core north of West Georgia Street from Coal Harbour to Gastown (identified, west to east, as Coal Harbour, Downtown Burrard North, and Downtown Lookout Tower); three in East Vancouver near the shore of Burrard Inlet, located around Clark Drive and East Hastings Street, north of the intersection of McGill and North Nanaimo streets, and just west of the Ironworkers Memorial Bridge at Second Narrows; and three further inland in East Vancouver located along the Skytrain Expo Line corridor from Clark Drive to Victoria Drive (eastern part of the Skytrain West Corridor study area), along the Skytrain Millennium Line corridor from Penticton Street to Boundary Road (Skytrain East Corridor), and at Joyce Station on the Expo Line. Rooftops were viewed from elevated vantage points throughout study areas. A total of 173 nests were counted in those nine study areas, with 21, 33, 101, 5, 1, 3, 4, 5, and 0 nests, located on 16, 33, 81, 5, 1, 3, 4, 3, and 0 rooftop structures (defined as any whole or part of a building with a separate rooftop), respectively (Figure 376). As is evident from the number of rooftop structures where nests were detected, most rooftops held single nests; multiple nests, up to seven per rooftop, were seen on 13 rooftops. The three nests in the study area near Second Narrows were seen on Viterra Cascadia Terminal buildings. Nests in the Skytrain East Corridor were located over 3 km from the nearest marine shore in Burrard Inlet.

There have been frequent incidental observations of gulls nesting on the tops of high-rises and other buildings throughout the downtown core of the Vancouver Harbour colony area. World travelers Sue and Gary Milks reported adults with two downy chicks on a hotel roof at Barklay and Jervis streets in 2011. Fledglings were seen at Burrard and Nelson on 13 August 2014, and there were two young being fed by parents on the roof of the Vancouver Convention Centre on 8 August 2016.[524] In 2017, a nest with young was seen at 699 Howe Street on 22 July.[524] In 2018, an adult on a nest was seen on the rooftop at 1109 W Pender Street on 9 June, a nest with young was recorded at 1148 Hornby Street on 1 July, and recently fledged young were seen on a rooftop at 1047 Barclay Street, near Stanley Park, on 18 August. In 2019, a pair was seen building a nest on the roof of the Blue Horizon Hotel at 1225 Robson Street on 16 May,[524] a nest with two eggs and one newly-hatched chick was sighted atop the office tower at 837 W Hastings Street on 4 July,[524] and a gull nest with chicks was reported on the roof of the CBC building at 700 Hamilton Street.[315]

East of the downtown core, downy young were seen on a rooftop near Grandview Park on 10 July 2014, and a pair were seen at the same site on several days around 5 April 2017. That location is about 1.5 km from the closest marine shore in Vancouver Harbour. Nesting on the roof of a house was observed on 6 August 2016 at 2647 Cambridge Street, near the Second Narrows Bridge close to the border with Burnaby and about 0.7 km from the shore of Burrard Inlet. Nests were seen on the roof of the low-rise apartment building at 1809 Frances Street, near Victoria Drive, in 2016 and 2017.[315] On 14 June 2019, Dan Tyson from Langley saw three adults sitting on nests built on the structure of a grain elevator conveyor located adjacent to New Brighton Park, just west of the Iron Workers Memorial Bridge.

A thorough survey of the Glaucous-winged Gull breeding population in the Vancouver Harbour colony area has not been conducted. However, the model derived from the data gathered by Kroc in 2017 allowed Kroc et al.[242] to generate an estimate of approximately 1,690 pairs (which we have rounded to 1,700 pairs) for the total breeding population in

the City of Vancouver. We considered that estimate to be the best estimate of the current nesting population of Glaucous-winged Gulls in the entire City of Vancouver. For numbers specifically in the Vancouver Harbour colony, the derived model predicted generally high probabilities of nests occurring over much of the colony area, especially in the downtown core. Also, rooftop structures with high probabilities of nests were more frequent in the Vancouver Harbour colony area than in the other colony areas within the City of Vancouver. We can infer from this that the majority of the estimated 1,700 nests for the City of Vancouver likely occurred in the Vancouver Harbour colony. To help us partition the total estimate of 1,700 pairs among the four designated colonies within the city (see also SG-660, SG-661, and SG-667 below), Kroc kindly ran his model separately for each colony. For the Vancouver Harbour colony, his model generated a total estimate of 973 nesting pairs, which rounded to 1,000 pairs.[480] We have thus used 1,000 pairs (of the total 1,700 pairs predicted for the entire City of Vancouver) as a working estimate for the current Glaucous-winged Gull breeding population in the Vancouver Harbour colony area.

Other considerations of available data also suggest that 1,000 pairs is an appropriate estimate for the Glaucous-winged Gull nesting population in the Vancouver Harbour colony. First, the 142 nests counted by Kroc from just two vantage points in downtown Vancouver in 2015 and the 173 nests counted in nine study areas in 2017, the recent estimate of hundreds of pairs nesting on high-rise towers throughout the downtown core,[335] and many records of gulls nesting away from the downtown core, suggest a nesting population of at least 1,000 pairs. Secondly, we can derive an estimate if we consider the count of 120 nests made by Kroc [241] from the Vancouver Lookout in 2015 as a partial count. If we assume that the viewable area from the Vancouver Lookout had an average radius of about 500 m (see Figure 1 in Kroc [241]), then that area sampled just over 10% of the shoreline urban habitat within the designated Vancouver Harbour colony area. Extrapolating from that partial count yields an estimate of 1,056 nests along the 8.8 km shoreline extent of this colony. That is likely a conservative estimate because some nests within the sampled area were undoubtedly missed, due to limited visibility, and because the viewable area from the Vancouver Tower extended about 750 m inland from shore and

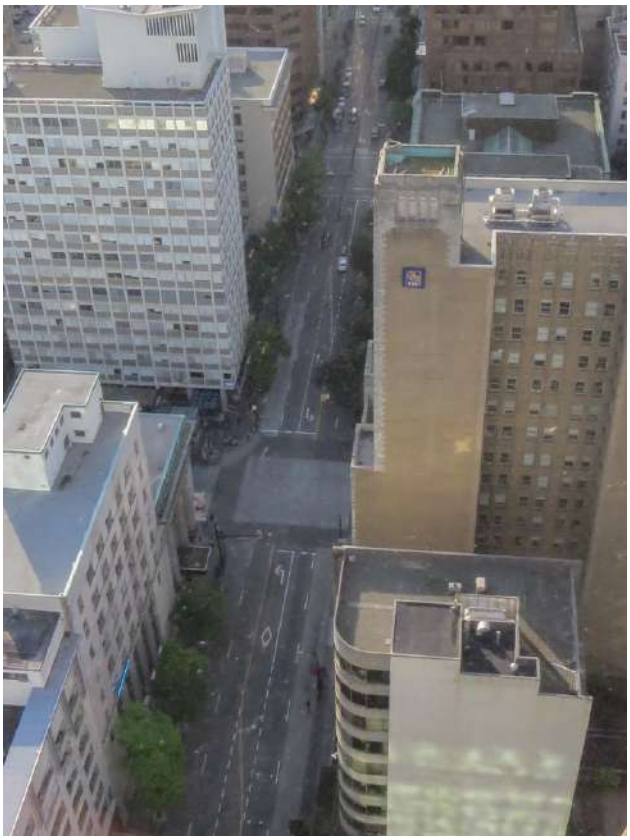


Figure 376. Examples of Glaucous-winged Gull nesting locations on rooftop structures within the Vancouver Harbour colony documented by Ed Kroc during his studies conducted in 2017. Five nests were located on rooftops shown in the left photo, including on the Royal Bank Tower on West Hastings Street. In the above photo, an adult is incubating eggs just above a flurry of human construction work on the surrounding roof. Other photos (next pages) show a variety of nesting locations. *Photos by Edward Kroc.*

nests have been found over 3 km from shore in this colony. We are thus comfortable suggesting 1,000 pairs as a minimum estimate for the current Glaucous-winged Gull nesting population in the designated Vancouver Harbour colony.

Remarks: Nesting gulls foul roofs and are aggressive to maintenance workers trying to access rooftop installations on high-rise towers. They are thus discouraged from nesting by some building managers. Gull pairs can be quite persistent in their attempts to nest in spite of disturbance. Kroc [240] observed one pair in downtown Vancouver during the demolition of the building that the pair had occupied for five nesting seasons. Over a period of two weeks, demolition crews destroyed the gulls' nest every morning; every evening the pair would reconstruct their nest within two hours of the departure of the human crew. They kept that up until the roof was gone. In addition to having to tolerate some human disturbance, rooftop-nesting gulls may experience extreme temperatures and have been observed panting throughout much of the day (Figure 377).

Figure 377. Glaucous-winged Gulls nesting on exposed rooftops often have to contend with extreme temperatures, which are becoming more frequent due to climate change. A bit of shade provides some respite for mobile chicks on this Vancouver Harbour colony rooftop (right). Note the faux-osprey dangling in the stagnant air in the right photo. *Photos by Edward Kroc, 5 July 2018 (left) and 31 July 2015.*

Nests seen at 1809 Frances Street in 2016 and 2017 were destroyed by the building owner, who was charged and had to face prosecution in provincial court.[315]

There are hazards to gulls foraging in the city. In 2016, staff and volunteers with the Wildlife Rescue Association of BC rescued 62 gulls from a vat of waste tofu byproducts at an East Vancouver tofu processing plant.[17]

Tofu Gulls – March 11, 2016

I was working when we got calls about gulls being trapped in a large container with food waste. I'm pretty sure it was a Friday afternoon. The number of gulls involved got larger and larger and the circumstances were a bit unclear. An experienced rescue volunteer was at the scene with other rescue volunteers. As more and more patients came in, we moved all our current patients out of the main animal care room and set up large tables to fit all the gulls in separate kennels. Staff and volunteers examined each and every one that afternoon/night. They all got washed over the next couple of days and remained in care for 12 days. Details of the cleaning were described by hospital manager Janelle Stephenson:

"More than 30 people took part, staff and volunteers, scrubbing each feather by hand and using a toothbrush and dish detergent to clean the gulls' heads [this is an intense process and we follow international protocols]. The birds were rinsed off and dried with a specialized blow dryer in their kennels. The birds then needed to preen their feathers to ensure they are waterproof again. The gulls seemed mostly calm, and when handled by staff and volunteers, their heads are covered with towels, but Stephenson warned that handling them could be tricky. With gulls, they are quite dangerous. They do bite a lot. They have very sharp bills so we need to take safety precautions when we're [handling them] as well." [17]

The gulls were all released together at a local park with water access in the presence of many staff and volunteers and other cheering onlookers (Figure 378).

(contributed by Linda Bakker)

Figure 378. In March 2016, staff and volunteers with the Wildlife Rescue Association of BC rescued 62 gulls from a large bin of food waste in East Vancouver. Attracted to the waste food, the gulls had severely soiled their feathers and would not have survived without the intervention of Wildlife Rescue personnel. Over 30 staff and volunteers helped in the rescue and cleaning efforts and all gulls were successfully rehabilitated and released 12 days later (photos this page and next page). *Photos by Paul Steeves.*





SG-610 LIONS GATE BRIDGE

Location: *49°18'55"N 123°08'19"W; 92 G/6.*
Across the First Narrows of Burrard Inlet.

Description: *Bridge, Pilings.*
The Lions Gate Bridge was built by the Guinness brewing family in 1937-1938 and was purchased by the provincial government in 1955. It was designated a National Historic Site of Canada in 2005.

Historical summary: Small numbers of Glaucous-winged Gulls have nested on the bridge since 1958 (Table SG-610). John Toochin observed two downy young on the south-most support in 1958, and one nest with two young at the base of the steel girders on top of the same support in 1961. Nests in 1972, 1974, and 1981 were all located on concrete abutments supporting the bridge (Figure 379), as in 1958 and 1961. Vermeer et al.[431] reported about 12 nests on the bridge while Vermeer and Devito [420] listed one nest on the bridge in 1986. We listed the 12 nests reported by Vermeer et al.[431] on Table SG-610. Two nests were reported in 2010.

In 2023, eBird contributor Allan Jensen confirmed nesting by at least one pair of gulls. He

photographed three downy young on the base of one of the bridge pillars on 19 July. Johannes Paschmanns from Germany also reported young at the same location on that date. We suspect that another eBird record also relates to nesting on the bridge: S. Bryce Robeson reported nests with young and five eggs on 12 July. The record is reported for Prospect Point but we assume Robeson was viewing nests on the base of the bridge pillar from Prospect Point as it is difficult to see eggs in nests on the cliffs at Prospect Point and gulls have not been recorded nesting on the Prospect Point cliffs since 1986. His record suggests at least two nests were seen.

Figure 379. One or more pairs of Glaucous-winged Gulls have been recorded nesting on the concrete abutment at the southern end of the Lions Gate Bridge in several years between 1958 and 2023. The site can be viewed from the Stanley Park seawall. *Photo by R. Wayne Campbell, 7 August 1974.*

Table SG-610. Seabird nesting records (nests) for Lions Gate Bridge.

DATE	GWGU	SOURCE
1958	1	144
4 Aug 1961	1	523
6 Jul 1972	1	523
7 Aug 1974	1	70, 523
1 Aug 1981	4	523
May-Aug 1986	12e	431
13-20 Jun 2010	2	30, 453
12 Jul 2023	2	524

Remarks: Steven Baillie observed an adult Peregrine Falcon flying to a nest located under the north end of the bridge on 4 June 2013.[451] The nest was built on top of the crossed girders under the bridge structure, over dry land.

SG-620 PROSPECT POINT

Location: *49°18'49"N 123°08'31"W; 92 G/6.*
South side of First Narrows in Burrard Inlet, just west of the Lions Gate Bridge.

Description: *Cliffs.*
This conspicuous point is the northern point of the peninsula, formerly called Coal Peninsula, which was established as Vancouver's renowned Stanley Park in 1888. The park was designated a National Historic Site of Canada in 1988 and has been named the best urban park in the world by some travel guides.

Historical summary: Glaucous-winged Gulls were first recorded nesting in 1959 when two nests were

seen at the base of the cliffs by William Hughes as he was boating by (Table SG-620). A nest with two young was seen on a small ledge about 45 m high on the cliffs in 1961. About 10 pairs were estimated nesting in 1970, five nests were seen in 1974 (Figure 380), and nine nests were counted in 1981. Chicks were visible in two nests in 1974 and 1981. The last record of gulls nesting was in 1986. No gulls were seen in 2010 or 2014.

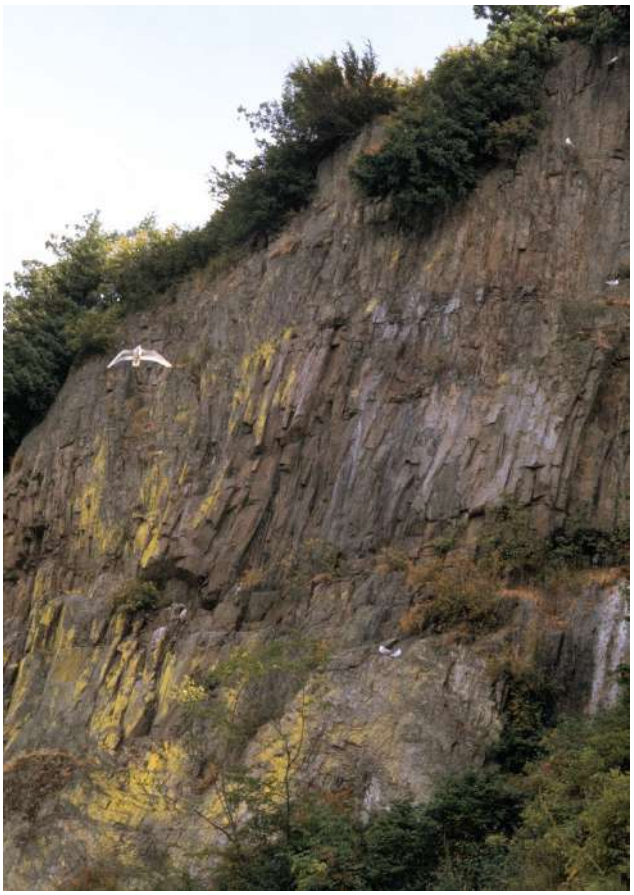


Figure 380. Glaucous-winged Gulls were recorded nesting on the Prospect Point cliffs in several years between 1959 and 1986. Five nests were seen in 1974. *Photos by R. Wayne Campbell, 7 August 1974.*

Pigeon Guillemots were noted nesting in 1971 and adults were seen delivering fish to at least five nests on the cliff in 1972. Three guillemots were seen flying into crevices in 1974 and single birds were seen delivering fish to crevice nests in 1976 and 1981. Two pairs appeared to be nesting on the cliff face in 2000 and subsequent records of birds in the area suggest that Pigeon Guillemots may still nest on these cliffs.

Table SG-620. Seabird nesting records for Prospect Point. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
1959		2		144
4 Aug 1961		1		523
1970		10e		87
12 Jul 1971			2	88
9 Jul 1972		6e	5-7e	89, 523
7 Aug 1974	0	5	3	70, 523
16 Jul 1976			1	523
1 Jul 1977	0	4		523
2 Aug 1978		1		523
8 Aug 1978			(10)	524
1 Aug 1981	1	9	1	523
29 May-13 Jun 1983	64			421
1984	68			215
Jan-Mar 1985	S			524
30 May 1986	60+e			523
Jun 1986		4		420
8-9 Jul 1987	93[a]		S(4)[a]	158, 428
May-Jul 1989	86[a]			375, 511
10 May 1993	14			524
Mar-Aug 1994	22			524
13 Apr 1997	3			524
7 July 1999	x			524
2 Jun 2000	4			524
23 Jul 2000			x(10)	524
Jul-Sep 2000	12			114, 459
13-20 Jun 2010		0		30, 453
2010	0			522
22 Jun 2013			(1)	524
2013	0			522
13 Jul 2014	0	0	(0)	94
7 Jun 2016			(10)	524

[a] Includes Siwash Rock.

Pelagic Cormorants likely first colonized this site in 1981; one nest with three large young was seen near the top of the cliff. It quickly attracted other nesting birds and two years later numbers had increased to 64 nests. In 1985, ornithologist Christopher Harris from Regina, Saskatchewan reported seven cormorants repairing nests on the cliffs on 26 January, six on the cliffs on 22 February, and at least 66 and 55 birds on the cliffs on 16 and 30 March, respectively. Brian Kantesk from Vancouver saw many adults building nests in May

1986. We are not sure how many nests were at Prospect Point in 1987 or 1989 because counts were lumped with the nearby Siwash Rock, but we suspect that most (or perhaps all) nests counted in those years were on the Prospect Point cliffs. Thus, numbers at Prospect Point likely peaked in the late 1980s, after which they declined. In 1994, Pelagic Cormorants were seen on 22 nests on 6 March, nest building was still proceeding on 25 March, and nests with young were seen on 14 May. This is an early date for young. No birds were seen at this nest site on 7 August 1994 but birds could have left with fledged young by then if there already were young on 14 May. Three birds were sitting on nests on 13 April 1997, and 12 nests were counted during the major survey in 2000. Overall, the colony was short-lived and was abandoned sometime after 2000.

Nesting by Pelagic Cormorants was reported at Brockton Point, which is 2.4 km east of Prospect Point on the north side of Stanley Park, on 30 April 1994 and 29 July 1996 by renowned Vancouver birder Keith Riding.[524] However, without further confirmation, we have not listed Brockton Point as a colony site because: human disturbance at Brockton Point is intense throughout the summer; nesting habitat is marginal; and there are no other records of cormorants nesting at this well-visited site. We thus considered it likely that the location given was an error and Riding was actually referring to Prospect Point. Unfortunately, we were unable to find a contact address for Riding to ask him.

Remarks: This area is highly disturbed, especially since the Stanley Park seawall was completed in 1980 that provides a popular walking route around the base of these cliffs.

SG-630 SIWASH ROCK

Location: *49°18'32"N 123°09'24"W; 92 G/6.*
Northwest corner of Stanley Park, north of Ferguson Point.

Description: *0.1 ha; 14 m high; Cliffs; Grassy rock.*
This landmark, basaltic sea-stack along the Stanley Park seawall has near vertical sides with a cap of grasses, shrubs, and a few small trees (Figure 381). A historic single Douglas-fir that was part of the legend of the rock died in 1965 and attempts have been made to grow replacement trees on the top. Three young firs have become established.

Figure 381. Siwash Rock is a historic basaltic sea-stack along the Stanley Park seawall. The park sees about 8 million visitors every year and the rock has probably been photographed by millions of people. Three species of seabird have nested on the rock. *Photo courtesy of Fawcett5, 18 August 2005.*

Historical summary: A variety of people have contributed records of nesting birds on this rock. Nesting was first reported by Ed Moody in 1958 when he saw 3-4 pairs of Glaucous-winged Gulls and a single pair of Pigeon Guillemots nesting (Table SG-630). Drent observed nests in 1961 and noted that according to Moody, 1-2 pairs of gulls and one pair of guillemots were regular nesters in previous years. In 1962, Gwen Wright, from Vancouver, saw three young gulls on a grassy ledge on the south side of the rock, and witnessed guillemots twice delivering fish to two chicks in a nest located in a crevice under a large rock. Two gull nests in similar positions on ledges at the top of the rock, including one at the northeast corner of the rock, were recorded by Glen Ryder in 1967. A Pigeon Guillemot was seen carrying a fish in 1971, which is the last definite observation of guillemots at the rock until 2011. It is possible that guillemots were present in 1987 and 2003. In 1987, data were lumped with Prospect Point.[158] In 2003, eBird contributor Michael Lancaster submitted a record of

guillemots seen at Stanley Park on 16 July and noted "nest at 'rock'," which likely referred to Siwash Rock (we did not list this record as the location was uncertain). In 2011, a guillemot was recorded entering or leaving a presumed nest. No guillemots were seen in 2014.

Gull chicks were visible at six and five nest sites when BCPM crews surveyed the rock in 1974 and 1981. Nest sites in 1981 were distributed at different levels around the rock. The maximum number of gull nests was reported in 1986, which was also the last time nesting by gulls was observed. No signs of nesting gulls were seen in 2010 or 2014.

Table SG-630. Seabird nesting records for Siwash Rock. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
1958		3-4e	1	144
1959		1-2	1	144, 523
1 Jun 1961		2	1	523
20 Jul 1962		1	1(1)	523
30 Jul 1967		2		523
18 Jul 1970	2		1(1)	87
24 Jul 1971			1S	88
7 Aug 1974	0	6[6]	(0)	70, 523
16 Jul 1976		3		523
1 Jul 1977		4		523
1 Aug 1981		5[5]	(0)	523
Jun 1986		8		420
8-9 Jul 1987	[a]		[a]	158, 428
May-Jul 1989	[a]			375, 511
2000	0			459
13-20 Jun 2010		0		30, 453
2010	0			522
9 May 2011			x(1)	45
2013	0			522
13 Jul 2014	0	0	(0)	94

[a] Records combined with Prospect Point.

Pelagic Cormorants have been confirmed nesting only once, in 1970 when two adults were seen sitting on nests. None were nesting in 1974 and none have been seen during surveys conducted since 2000. It is possible that cormorants were nesting in 1987 and 1989 when surveys were conducted, but we could not tell because data for Siwash Rock and Prospect Point were lumped together in the publications from those studies [375, 428] and were no longer available to enable us to separate records for each site.

Remarks: As with Prospect Point, the Stanley Park seawall brings crowds of people by this site throughout the summer. However, when we surveyed the rock in the 1970s, nesting gulls were attentive to people walking by but were obviously habituated and did not appear to be very disturbed. The rock is also a popular "illegal ascent" by climbers who engage in a little "midnight mountaineering." Such direct disturbances may be more traumatic for nesting gulls.

SG-640 BURRARD BRIDGE

Location: *49°16'31"N 123°08'15"W; 92 G/6.*
The most western bridge across False Creek.

Description: *Bridge.*
The Burrard Street Bridge was built in 1930-1932. It is ranked highly as an important heritage building by the Vancouver Heritage Foundation (Figure 382).

Historical summary: Nesting was first recorded on the bridge in 1986 when Vermeer and Devito found Glaucous-winged Gulls nesting (Table SG-640). There are few confirmed records of gulls nesting after 1986. Blight reported one nest in 2010. Three single adult gulls were seen along the bridge in 2014; they did not appear to be nesting but nests may have been present. In 2015, Kroc photographed small chicks at two nests located atop the concrete towers that support the bridge (Figure 383). In 2017, he inspected the bridge from the ground at the north and south sides of False Creek and from the Granville Street Bridge and saw three nests, one atop a concrete pile cap under the bridge deck on the southwest side of the bridge, and one each atop the southeast and southwest concrete towers, high above the car traffic. There have been no dedicated surveys for Glaucous-winged Gulls since 2017. During cormorant surveys conducted for the City of Vancouver, an adult gull with three chicks was seen on the base of the southern of the main concrete piers supporting the central span on 10 July 2020. No gulls were reported in 2021, 2022, or 2023 but observers were not specifically looking for nesting gulls. We considered the 2017 count of three nests to be the best current estimate of the Glaucous-winged Gull nesting population on the bridge.

Pelagic Cormorants were first reported nesting in 1997 by long-time Vancouver birder Keith Riding, who noted many nesting under the bridge. Nests were first counted in 2000. Cormorant numbers increased rapidly after 2000 and the bridge was one of the largest Pelagic Cormorant colonies in the BC Salish Sea by 2010. Fewer nests were counted in 2014 and 2015, although the 2015 count of 72 nests by Golder biologists was made late in the season and could have been an underestimate.[183] Kroc made a rough estimate of 50 nests earlier in the season in 2015 (Figure 384). In 2014, Carter

reported 85 visible nests and six possible nests where much guano could be seen. No cormorants nested from 2016 to 2018 because exclusion netting was installed under the central span of the bridge in those years [184] (see Remarks). Many fledged young were seen around the bridge on 13 August 2018,[524] but they likely originated from the nearby Granville Bridge. The nesting population re-established following removal of the netting from the central portion of the bridge in February 2019. Numbers increased to the maximum ever recorded on the bridge by 2021, but then were much reduced in 2023. Surveys for the City of Vancouver tallied 63, 116, 147, 138, and 55 nests in 2019, 2020, 2021, 2022, and 2023, respectively. Other observations were also made in those years: Mason King counted nests from shore in 2019, and Macus Ong conducted a partial count in 2020. Breeding success was poor in 2023: most nests contained adults with eggs or small young on 21 June, but by 31 July, 35 nests had been abandoned. Reasons for the decreased number of nests and the poor success in 2023 were unknown. Some of the birds that abandoned nests may have moved to the Granville Bridge, as at least 20 new nests were built there over the period that nests were abandoned at Burrard Bridge.[608]

Figure 382. The Burrard Street Bridge, with its distinctive architecture, has been designated an important heritage building in Vancouver. The bridge is pictured here from the Yaletown area on the north side of False Creek. *Photo by Edward Kroc, 4 August 2015.*

Figure 383. Glaucous-winged Gulls were first recorded nesting on the Burrard Street Bridge in 1986. In this photo, taken in 2015, a pair with three small chicks is visible at a nest located atop one of the decorative concrete towers that support the bridge. *Photo by Edward Kroc, 1 July 2015.*

Cormorant surveys up to 2014 were conducted from the water, except in 2008 when counts were made from four vantage points located close to sea level on the shore of False Creek near the north and south ends of the central span. Surveys conducted for the City of Vancouver in 2015 were conducted from vantage points on land. In 2019 to 2023, both land-based (on 13 June and 15 August 2019; 10 July and 13 August 2020; 23 June and 20 July 2021; 17 June and 21 July 2022; 21 June, 31 July, and 3 August 2023) and boat-based (on 22 July 2019; 14 August 2020; 20 July 2021; 20 July 2022; 31 July 2023) surveys were conducted.[15, 184, 206, 207, 608] Land-based counts were made from two vantage points near the north end of the central span in 2019 and from seven vantage points, four on the north side and three on the south side of False Creek, in 2020 to 2023.

Results of land-based and boat-based surveys in 2019-2022 [15, 184, 206, 207] revealed the need to conduct both types of surveys in order to obtain accurate nest counts. Some nests could not be seen during each type of survey. Multiple surveys through the season also resulted in more accurate nest counts because they detected new nests built as well as previously-used nests that had already disappeared by later in the season. In 2019, totals of 35, 51, and 43 nests were counted during surveys on 13 June (land), 22

July (boat), and 15 August (land), respectively. Mapping of individual nest locations during each survey allowed surveyors to combine data from each survey to determine the total number of nests present. Those counts represented 56, 81, and 68% of the total number of nests in 2019. The boat-based survey detected more nests that the land-based surveys but still missed almost 20% of nests. A greater proportion of nests were detected during land-based surveys in 2020 and 2021, likely because counts were made from seven vantage points located adjacent to either end of the bridge rather than from just two vantage points located at the north side of the bridge in 2019. In 2020, 112 nests (97% of the total) were counted during the land-based survey on 10 July 2020; four nests were detected during the boat-based survey on 14 August that were not visible during the land-based survey of 10 July. However, the effectiveness of the boat-based survey in 2020 could not be evaluated because more than half of the colony had completed breeding by that date and many nests that had been occupied on 10 July were completely gone by 14 August. Thus, it is likely that more nests were missed during the 10 July land-based survey than the four that were mapped on 14 August. Those results indicated that mid-August was too late for surveys designed to count cormorant nests. In 2021, 136 active nests plus seven fully-constructed but unattended nests were counted from land on 23 June; and 100 active nests, 15 unattended nests, and eight nests that may have been attended were counted from land or water on 20 July. Total counts from land and water surveys conducted on 20 July were not presented separately, but observers did report that seven of the nests (5% of the total) that were detected during the boat-based survey were not visible during land-based surveys on that date. In 2022, 110 attended and five unattended nests were detected from land on 17 June; 107 active nests were counted during land and boat surveys on 20 and 21 July (again separate counts were not reported from the land and water surveys in July). Nests were seen at 28 new locations in July; tallying the mapped locations of nests from all surveys gave a total of 138 nests. In 2023, 51 nests were counted during the land-based survey on 21 June, and a maximum of 16 nests were counted during land- and boat-based surveys on 31 July and 3 August (counts for each type of survey were not separated). Nests were seen at four new locations during the latter surveys, giving a total of 55 nests built in 2023. The difference between the June survey and the later surveys meant that at least 35 nests had been abandoned during the interval between surveys.

Figure 384. In 2022, the Pelagic Cormorant colony under the Burrard Street Bridge was the largest colony for that species in the northern Strait of Georgia, and second in size only to Mandarte Island in the BC Salish Sea. That status shifted to the Granville Bridge with the redistribution of nests between the bridges that occurred in 2023. There were also fewer nests in 2015 when this photo was taken. *Photo by Edward Kroc, 20 June 2015.*

Table SG-640. Seabird nesting records for Burrard Bridge. See Appendix 2 for codes.

DATE	PECO	GWGU	SOURCE
Jun 1986		9	420
4 Aug 1997	many		524
23 Jul 2000	20+		524
Jul-Sep 2000	39		114
17 Jun 2008	48		45
2009	47		458
13-20 Jun 2010		1	30, 453
2010	137-142[a]		94, 458
16 Jul 2014	85-91e[b]	S	94
20 Jun 2015	50e		480
1 Jul 2015		x2	480
25 Aug 2015	72		183
2016	0		463
May-Aug 2017		3	480
2017	0		463
13 Jul 2018	0		466
13 Jun, 22 Jul, 15 Aug 2019	63		184
12 Jul 2019	24-39e[c]		478
2020	10-30e+		492
10 Jul, 13-14 Aug 2020	116	x	206
23 Jun, 20 Jul 2021	147		207
17 Jun, 20-21 Jul 2022	138		15
21 Jun, 31 Jul, 3 Aug 2023	55		608

[a] Carter [94] gave 137 for his nest count in 2010 but the data Trudy Chatwin [459] had from Carter's survey gave a count of 142 nests.
[b] Eighty-five nests were counted and six were suspected where nests could not be seen.[94]
[c] Twenty-four nests were counted and 15 possible nests were recorded.[478]

The positions of individual cormorant nests were recorded during some surveys. In 2008, nests were placed on ledges of steel (29 nests) or concrete (19 nests) under the central span of the bridge directly above the waters of False Creek. All nests were under the central span of the bridge in 2019 and 2020 as well. In 2020, most nests (69) were on structural members under the middle of the bridge deck between the two main longitudinal beams supporting the main span. Outside of the longitudinal beams, there were 18 and 29 nests on the eastern and western wings, respectively. There were 90, 20 and 37 nests in 2021; 85, 22, and 31 nests in 2022; and 22, 19, and 14 nests in 2023 under the middle section, eastern wing, and western wing, respectively. There were two, eight, and 14 nests detected over land at the north end of the bridge in 2021, 2022, and 2023, respectively. The two nests over land in 2021 were unattended when they were first observed on 24 August.

Remarks: According to Carter,[94] portions of the bridge were covered with netting in 2010 to discourage nesting and prevent fouling of boats. A greater proportion appeared to be covered in 2014 (about 50% of the bridge) than in 2010. Loss of available habitat may have been related to declines in the cormorant nesting population over that period, although a similar pattern of decline was seen on the adjacent unnetted Granville Bridge. Construction work conducted during April-June 2014 within 25 m of the cormorant colony also may have disturbed nesting birds.[94] In 2015, the City of Vancouver installed avian exclusionary netting beneath the central span of the bridge to prevent disruption of Pelagic Cormorant nests during reconstruction work conducted from 2016 to 2018. The netting was removed from the main span of the bridge as of 28 February 2019 but was retained under the south end of the bridge over the Burrard Civic Marina to prevent fouling of boats that are moored there.[463]

In 2020, two dead Pelagic Cormorants were seen hanging from bridge girders on the east and west wings of the central span.[206] Observers suspected that they were tangled in fishing line. No live or dead cormorants were seen within the exclusion netting over the Burrard Civic Marina. Four crows were seen scavenging in that area, perhaps preying on dead rock pigeons (*Columba livia*) that were seen inside the exclusion netting. Recommendations were made to repair all gaps in the netting that were allowing birds access.[206] Two Pelagic Cormorant carcasses were also seen hanging from the bridge superstructure in 2021; one appeared to be hanging from a bridge cable. No birds of any kind were observed inside the exclusion netting over the marina in 2021 to 2023.

Some mortality of nestling Pelagic Cormorants was reported by a concerned citizen in 2021.[207] Apparently, nestlings that tried to fledge from nests located over land at the north end of the bridge impacted the walkway below and died. Recommendations were made to install exclusion netting in those areas to prevent cormorants from nesting over land and thus avoid possible future mortality of fledglings.[207]

A female Peregrine Falcon was seen perched in the bridge superstructure but no evidence of nesting was observed on 20 July 2021. Nesting by one pair was documented in 2022; the nest was located on the pier under the bridge deck at the north end of the bridge; one young was fledged. Dedicated surveys for falcons were conducted in 2023, but none were detected.

SG-650 GRANVILLE BRIDGE

Location: *49°16'19"N 123°08'02"W; 92 G/6.*
East of Burrard Bridge, crossing Granville Island and False Creek.

Description: *Bridge.*
The first Granville Street Bridge was a wooden trestle bridge completed in 1889. It was replaced by a steel bridge in 1909 and by the present bridge in 1954.

Historical summary: As for Burrard Bridge, Glaucous-winged Gulls were first reported nesting in 1986 (Table SG-650). There has been only one definite record of breeding since, in 2017. In 2014, two single adult gulls were seen along the bridge. They did not appear to be nesting but nests may have been out of sight. In 2017, Kroc inspected the bridge from the ground on the north and south sides of False Creek and saw three gull nests atop concrete pile caps at the north (1 nest) and south (2 nests) sides of the bridge. Macus Ong detected no gulls nesting in 2020, and none were recorded during surveys conducted for the City of Vancouver from 2015 to 2023, but those surveys were focused on cormorants, and gulls were only recorded incidentally. We considered the 2017 count to be the best current estimate of the Glaucous-winged Gull nesting population on the bridge.

Terry Sullivan recorded Pelagic Cormorants nesting for the first time in 2000 when 47 nests were counted.[459] In 2008, about 20 nests were seen and a total of 40-60 were estimated; about 100 adults were present, some sitting on nests and many flying in with nesting material. Most nests were located high up under the bridge (Figure 385) but one or two were located on the concrete bases. Similar to the pattern seen on the Burrard Bridge, numbers of nests increased up to 2010 and then declined by 2014 and 2015, although the 2015 count by Golder biologists was made late in the season and could have been an underestimate.[183] In 2014, a total of 77 nests were visible plus three nests were suspected where standing birds could be seen. The trend reversed after 2015 and numbers increased dramatically between 2015 and 2017. The rapid increase between 2015 and 2017 in the number of nests may have been partially due the relocation of birds from the Burrard Bridge following the installation of exclusion netting there during those years. However, numbers nesting in 2017 exceeded the combined population on the two bridges as of 2014 or 2015 and indicated continued growth at these bridge colonies. Numbers nesting were relatively stable from 2017 to 2019, with a maximum of 306 nests counted in 2019, and then decreased again in 2020 to 2023 following the installation of exclusion netting under the Granville Bridge in 2020. Substantial variation occurred in the numbers of nests on the Burrard and Granville bridges after 2019, but total numbers on the two bridges remained relatively stable from 2020 to 2023, though less than the maximum counted in 2019 (totals of 369 and 237 in 2019 and 2023, respectively). Incidental records of nests with young were reported in 2012, 2013, and 2017 and cormorants were seen building nests in April and May 2018.[524]

Table SG-650. Seabird nesting records for Granville Bridge. See Appendix 2 for codes.

DATE	PECO	GWGU	SOURCE
May-Aug 1986		10	431
Jul-Sep 2000	47		114
Jun 2008	40-60e		45
2009	26		458
Jul 2010	127		94
12 Aug 2012	x		524
26 Jun 2013	x		524
16 Jul 2014	77-80e[a]	2S	94
25 Aug 2015	67		183
Jun-Aug 2016	146		183
May-Aug 2017		3	480
Jun-Aug 2017	292		183
Jun-Aug 2018	273		184
13 Jul 2018	121-155e[b]		466
Jun-Aug 2019	306		184
12 Jul 2019	128-154e[c]		478
11 May 2020	26		285
13 Jun 2020	16	0	285, 492
23 Jun 2020	73-80[d]		206
23 Jun, 20 Jul 2021	95-97[e]		207
Jun-Jul 2022	108		15
21 Jun, 31 Jul, 3 Aug 2023	182		608

[a] Carter [94] counted 77 nests and suspected three others that were out of view.
[b] Observers counted 121 nests and suspected 34 possible nests that were out of view.[466]
[c] King counted 128 nests and recorded 26 possible nests that were out of view.[478]
[d] Hemmera biologists [206] counted 73 nests and suspected 7 possible nests that were out of view.
[e] Hemmera biologists [207] saw a total of 95 nests in June and July; during the survey on 23 June, 92 nests were counted and 5 additional nests may have been present.

Pelagic Cormorants were not expected to nest in 2020 following the installation of exclusion netting under the entire central portion of the bridge during the previous winter.[206] The netting was installed to

exclude cormorants from former nesting areas and allow construction activities associated with needed structural upgrades to the bridge to proceed without impacting nesting birds (see Remarks). Cormorants did not behave as expected and began to nest in formerly unused areas outside the exclusion netting on the outer, cantilevered wings along each side of the bridge. About 80 nests were counted on the Granville Bridge in 2020. In 2021, exclusion netting installed before the 2020 breeding season remained in place, and Pelagic Cormorants continued to nest on the outer wings of the bridge outside the netting. Greater numbers (95-97 nests) nested there in 2021 than 2020.

In 2022, exclusion netting was removed from the southern half of the central span and added under the outer wings of the northern half of the bridge, in an attempt to prevent nesting in those areas where maintenance activities were planned during the upcoming breeding season. Cormorants again did not behave as expected and a total of 17 nests were built on top of the netting at the inside corners of wing support beams on the northern part of the bridge. All other nests (91) were on the unnetted southern portion. In 2023, modifications to the exclusion netting on the northern part of the bridge prevented cormorants from nesting in those areas. In spite of that, numbers nesting on the bridge increased from 108 nests in 2022 to 182 nests in 2023.

All surveys up to 2014 and surveys on 13 July 2018 were conducted from the water. A single survey from land was conducted for the City of Vancouver in 2015. In 2016-2019, three surveys per year were conducted for the City of Vancouver, two from land and one from the water each year. Land-based surveys in 2015-2019 were conducted from five vantage points, three adjacent to the north end and two adjacent to the south end of the bridge. Land surveys in 2016-2019 were conducted during the incubation and chick-rearing periods: on 8 June and 8 August 2016; 12 June and 15 August 2017; 12 June and 10 August 2018; and 13 June and 15 August 2019. Surveys from the water were conducted during the chick-rearing period: on 13 July 2016; 19 July 2017; 10 July 2018; and 22 July 2019.[183, 184] In 2016 to 2019, total numbers of nests counted on each of the three surveys were: 127, 146, and 119 on 8 June, 13 July, and 8 August 2016, respectively; 249, 158, and 102 on 12 June, 19 July, and 15 August 2017, respectively; 210, 232, and 150 on 12 June, 10 July, and 10 August 2018, respectively; and 211, 233, and 188 on 13 June, 22 July, and 15 August 2019, respectively.

Figure 385. Most Pelagic Cormorant nests on the Granville Street Bridge have been located on metal girders under the bridge (shown here). A few nests have been built on concrete bridge supports. *Photos by Edward Kroc, 21 June 2015.*

Only land-based surveys were conducted in 2020, but both land- and vessel-based surveys were again conducted for the City of Vancouver in 2021 to 2023. Land-based surveys in 2020 to 2023 were conducted from four vantage points on land, two at each end of the bridge.[15, 206, 207, 608] In 2020, four comprehensive nesting surveys were conducted on 1

May, 25 May, 10 June, and 23 June; and 25 supplemental construction surveys were conducted between 5 May and 8 October. In 2021 to 2023, land-based (23 June and 20 July 2021; 17 June and 21 July 2022; and 21 June, 31 July, and 3 August 2023) and vessel-based (20 July 2021; 20 July 2022; and 31 July 2023) surveys were conducted. In 2022, a comprehensive survey for nesting cormorants was also conducted on 29 June from travellers on the bridge's motorized gantry system that runs under the car deck. As well, supplemental construction and disturbance monitoring was conducted in each year.

Other independent surveys by SFU students were conducted in 2019 and 2020. A survey by Mason King on 12 July 2019 was made from a vantage point on land. In 2020, Macus Ong counted nests from photographs taken of the west side of the bridge. Fewer total nests were counted by King and detected by Ong than were counted during the surveys by Hemmera biologists for the City of Vancouver in 2019 and 2020, respectively.

As was the case for the Burrard Bridge colony, the most accurate count of cormorant nests was obtained by combining data from both land-based and boat-based surveys. This was only possible during years when both types of survey were conducted. Relative numbers of nests counted on each type of survey varied: maximum numbers were counted during July boat-based surveys in 2016, 2018, and 2019 and during the June land-based survey in 2017. In 2017, the count from land of 249 nests in June was the maximum counted during any one survey, but an additional 43 nests that had not been visible from land were identified during the later boat-based survey, giving a total maximum count of 292 nests that year. Thus, 15% of nests were not detected from land and 46% of nests were not detected from the water in 2017. In 2019, the maximum of 233 nests counted during the boat-based survey represented 76% of total nests; 31% of nests were not detected during land-based surveys and 24% were not detected during the boat-based survey.

A further comparison of survey methods was possible in 2022 when surveys were conducted from land, water, and the gantry system. A total of 69 nests, 18 in the central superstructure and 51 in the wings, were counted from land on 17 June. Many more nests (44) were detected in the central superstructure during the survey conducted from the gantry on 29 June, suggesting that numbers of nests were seriously underestimated during the land-based survey on 17 June, or that many new nests had been built during that period. During the land- and water-based surveys on 20 and 21 July, 48 and 37 nests were detected in the central superstructure and in the wings, respectively (separate counts for the land- and water-based surveys were not given). Thus the counts from the water and land in July also detected many more nests in the central superstructure than the count from land in June. Though nest counts from each type of survey in July were not available, Ausenco biologists estimated that in 2022 the land-based surveys detected about 40-75% of the nests documented by boat. They further stated that the total number of nests was likely underestimated during the July surveys because some nests in the central superstructure were also not visible from the water. Results of all comparisons suggest that the most accurate nest counts are obtained by a combination of all three types of surveys. Multiple surveys through the season combined with mapping of individual nest locations also resulted in more accurate nest counts because they detected new nests built as well as previously-used nests that disappeared as the season progressed.

Nesting progress through the season was documented during construction monitoring surveys conducted for the City of Vancouver in 2020 to 2023. In 2020, about 55 pairs had initiated nesting on 1 May; on 25 May, 59 active nests were visible and an additional 15-20 nests may have been present where cormorant activity was seen; on 10 June, 65 nests were counted and an additional 15 nests may have been present; and on 23 June, 73 nests were counted and, based on cormorant activity, an additional seven nests may have been present.[206] Later surveys were also conducted by Hemmera biologists in 2020 that documented the seasonal decline in nesting activity: on 13 August, most birds had completed breeding and only 15-20 nests had cormorants still present; on 17 September, only three active nests remained, containing nearly-fledged young; and on 8 October, no nesting activity was observed and only seven of the 73 nests that had been used were still in existence (much whitewash was visible but nesting material was gone).

As in 2020, seasonal changes in nesting activity were documented during construction monitoring surveys conducted in 2021 to 2023. In 2021: on 11 March, 13 nests attended by adult cormorants were seen; on 23 June, 92 nests were counted and an additional five active nests may have been present; on 20 July, 72 active nests (6 of those were in new locations since the 23 June survey) and five unattended nests were counted; on 7 September, three or four nests were still active and held large young; and on 14 October, there were no cormorants

at nests, and nesting material remained at only 30-35 nests. In 2022, numbers of occupied nests were: 14 on 7 March; 95 on 17 and 29 June; 85 on 20 and 21 July; and none on 29 September. Between the June and July surveys, 13 new nests were constructed and 10 nests disappeared. Some young had likely already fledged from some nests by 20 July, while other nests held incubating or brooding adults. In 2023, numbers of nests counted during each survey were: 47 on 25 May; 121-124 on 21 June (observers were uncertain about 3 nests); 144 on 31 July and 3 August; and none on 26 September. At least 20 nests were seen at new locations during the 31 July and 4 August surveys compared to the June survey. Observers mapped 182 nests over the entire season.

The positions of cormorant nests were recorded during surveys for the City of Vancouver. In 2015-2019, all nests were built over water in the central span of the bridge except one nest located to the north of the central span in 2017.[184] In 2020, most nests (65) were built over the waters of False Creek under the central span; eight nests were built over land to the north (6 nests) and south (2 nests) of the central span. Nests over land were built later than nests over water. Thirteen nests (12 to the north and 1 to the south) were over land in 2021, the rest (82 nests) were over water. In 2022, 103 nests were over water and five (4 to the north and 1 to the south) were over land. In 2023, all nests were built over water. As noted above, nests were not seen on the wings of the bridge outside the main support girders until 2020 and 2021 when all nests occurred there. There were 32 and 41 nests in 2020, and 36 and 59 nests in 2021, on the east and west wings of the bridge, respectively. In 2022, there were 52 nests in the central superstructure and 39 on the outer wings of the southern, unnetted portion of the bridge. With the 17 nests built under the wings on the netted, northern half, there were thus a total of 56 nests built on the outer wings, 31 on the west side and 25 on the east side of the bridge. In 2023, all cormorant nests were built over water in the unnetted southern portion of the central span, with seasonal totals of 107, 45, and 30 nests under the central section, eastern wing, and western wing, respectively.

Remarks: Structural and seismic upgrades were started in November 2019 on the approaches of the main span. Scaffolding was installed under the bridge. Bird netting was also installed under the central portion of the main span to exclude Pelagic Cormorants from former nesting locations and facilitate construction activities without causing disturbance to nesting birds. Netting was removed from the south half of the central span before the breeding season in 2022. At the same time, additional netting was installed under the outer wings of the northern half of the central span to exclude nesting birds from areas where they had begun nesting in 2020. In 2023, the exclusion netting over the outer wings was modified and bird spikes were added to flat areas adjacent to the northern exclusion zone to better discourage nesting birds and allow maintenance activities to proceed.

Ten adult Pelagic Cormorant carcasses were documented within the exclusion area in May 2020.[206] Identified gaps in the netting had allowed ingress, trapping cormorants within the netted area. Carcasses were found on old nests, on or beside gusset plates, or hanging from the netting. Closure of gaps in the netting was completed in May and June 2020 to prevent further mortalities. One dead juvenile cormorant found outside the exclusion area on 21 September had become tangled in snow fencing that had been erected as part of the exclusion barrier. All the snow fencing was inspected and trimmed to remove protrusions that could entangle birds. In 2021, gaps in the exclusion netting were identified but no live or dead cormorants were seen inside the netting. In 2022, four Pelagic Cormorants gained access inside the netting; three perished and one was rescued, rehabilitated, and released. Holes in the netting were repaired soon after they were identified, but inadequate closures in the netting where human workers needed to enter and leave were ongoing issues and may have been where cormorants gained access.[15] In 2023, gaps and tears in the exclusion netting allowed nine Pelagic Cormorants to enter netted areas; six of those perished, two managed to find a way out through a narrow (~10 cm wide) gap, and one was freed by cutting a hole in the netting through which the bird escaped.

Reactions of nesting cormorants to construction activities were monitored in 2020 to 2023.[15, 206, 207, 608] Adults and nestlings showed little response to loud noises from jackhammering, air compressors, grinders, and other construction tools used directly above or below their nests. Birds showed increased alertness when noises first began but quickly relaxed and ignored ongoing activities. Some cormorants flushed from their nests when the maintenance traveller approached closely but returned to nests with 10 minutes after the traveller had passed.

Several crows were seen near cormorant nests in 2020; no nest predation was observed.[206] One active crow nest in 2020 and two nests in 2021were located on or above the upper surface of exclusion netting

towards the north end of the bridge. Crows as well as rock pigeons were often seen flying or perching within the exclusion area in 2020, 2021, and 2022. Several rock pigeon carcasses were seen entangled in the netting in 2020; one rock pigeon and three crow carcasses were seen in 2021.

A female Peregrine Falcon was seen with a recently killed Rock Pigeon on the east bridge wing on 23 June 2021. No evidence of nesting by falcons was observed.

Granville Bridge was one of three study sites used by Macus Ong in 2020 for his M.Sc. research investigating the use of photogrammetric methods to monitor cormorant breeding populations and nesting chronology.[285]

SG-660 FALSE CREEK

Location: *49°16'18"N 123°06'30"W* (south shore)*; 92 G/6.*

Along the north and south shore of False Creek and extending west of False Creek to Stanley Park and Kitsilano Beach. Colony includes all urban habitats along the shoreline and buildings away from the shore. The colony thus includes shoreline habitat under the Burrard, Granville, and Cambie street bridges. We have defined the boundaries for the False Creek colony as running from Stanley Park along Nelson Street to Cambie Street to West and East Pender Street to Clark Drive and Knight Street to East and West 33rd Avenue to Arbutus Street to Kitsilano Beach. This includes English Bay and much of Kits Point neighbourhood within the False Creek colony (Figure 386). West of Cambie Street, areas northeast of Nelson Street lie within the Vancouver Harbour colony. All areas east of Clark Drive also lie within the Vancouver Harbour colony area, inland as far as East 33rd Avenue. At Kitsilano Beach, we have placed the border between the False Creek and Point Grey colonies at the north end of the beach where Arbutus Street meets McNicoll Avenue (see Figure 154 on page 168).

Description: *Rooftops; Wharves.*

The False Creek colony has a convoluted shoreline extending for approximately 10 km from Stanley Park to Kitsilano Beach. There are numerous marinas and small boat docks in False Creek, including the False Creek Yacht Club, the Yaletown ferry dock and Quayside Marina, Heather Civic Marina, Spruce Harbour Marina, docks along Granville Island, Fisherman's Wharf, the Burrard Civic Marina, and the Kitsilano Coast Guard base. Buildings near shore are a mix of residential complexes, commercial establishments, and large public recreational facilities like the BC Place stadium and Science World at the head of False Creek. Inland from the head of False Creek are railyards and industrial and commercial buildings around Terminal Avenue. There are several shoreline parks, including Sunset Beach Park, George Wainborn Park, David Lam Park, Creekside Park, Charleson Park, and Vanier Park.

Figure 386. Downtown Vancouver showing the English Bay portion of the False Creek colony. Mount Baker in Washington looms in the background. *Photo by Heidi M. Regehr, 31 May 2021.*

Historical summary: Kees Vermeer was the first to report Glaucous-winged Gulls nesting in this colony area. A large nesting population was already established when he began his studies in 1986. In 1986, Vermeer et al. found 136 Glaucous-winged Gull nests distributed over 34 of 126 rooftops surveyed in a study area along the south side of False Creek bounded by Cambie Street, Fourth Avenue, and Quebec Street (Table SG-660). An additional five pairs were found nesting west of Cambie Street, about 30 pairs were nesting on buildings on the north shore of False Creek, northwest of the 1986 Exposition site, and one pair nested on a gravel pile in the area. Vermeer returned to the False Creek study area in 1989 and found 148 nests on 44 of the 126 rooftops. In the publication presenting results of the 1989 study,[417] Vermeer quoted the number of nests found in 1986 on those rooftops as 114 instead of the 136 nests given in the previous publication; [431] we list the original estimate of 136 nests here. Changes from 1986 to 1989 indicated a rate of increase of 9% per year in both the number of rooftops utilized and the total number of nesting pairs.

During his study of Glaucous-winged Gull reproductive ecology, Ed Kroc observed rooftop nests from three vantage points in 2015: a private residence with a southwest view on the 19th floor of 1022 Nelson St. (15 nests); the pedestrian walkway along the north end of the Granville Bridge (4 nests visible on rooftops off the west side of the bridge); and the pedestrian walkway along the south end of the Cambie Bridge (1 nest visible on rooftops off the west side of the bridge). In 2017, Kroc [242] surveyed rooftops in five study areas within the False Creek colony, including: several city blocks bounded by Nelson, Burrard, just south of Davie, and Thurlow streets (identified as Downtown Burrard South); much of the area on the north and south shores of False Creek under the Burrard and Granville street bridges, south as far as West Broadway (False Creek West); a large area surrounding the east end of False Creek between the Georgia Viaduct and West 2nd Avenue to just east of Main Street (False Creek East); an area along Terminal Avenue and the Sky Train route from just east of Main Street to the border of the False Creek colony at Clark Drive (Skytrain West Corridor); and a small area around West Broadway and Ontario Street (Broadway). Numbers of nests detected in those five study areas were 13, 35, 25, 6, and 3 respectively, for a total of 82 nests. Nests were found along the Skytrain West Corridor study area to Clark Drive, which is about 2 km inland from the end of False Creek. That study area also extended east beyond Clark Drive into inland portions of the Vancouver Harbour colony area, where nests were found over 3 km from the nearest marine shoreline (see SG-600). The False Creek East study area encompassed much of the study areas where Vermeer counted 148 nests in 1989; [417] numbers of gulls nesting in that area appear to have declined since the 1980s (see Remarks).

As noted in the Vancouver Harbour colony account (see SG-600 above), using data gathered in 2017 at study areas throughout the City of Vancouver (see also colonies SG-661 and SG-667), Kroc et al.[242] developed a predictive model to estimate the probabilities of gull nests occurring on different types of rooftop structures across the city. To test his predictive model, Kroc counted nests in small test areas, three of which were in the False Creek colony area at Beach Avenue and Cardero Street (6 nests in 2018), along Pacific Boulevard west of Cambie Street (2 nests in 2018), and at Granville Street and West Broadway (5 nests in 2019). Numbers of nests counted in test areas agreed closely with predictions.

Table SG-660. Seabird nesting records for False Creek. See Appendix 2 for codes.

DATE	GWGU[a]	SOURCE
May-Aug 1986	172e	431
1989	148+	417
5, 8 Aug 2009	x	524
12 Aug 2012	x	524
6 Aug 2014	x	524
May-Jun 2015	20+	241
20 Jun 2015	x	524
May-Aug 2017	82+	480
15 Jul 2017	x2	524
May-Aug 2018	x8	480
May-Aug 2019	x5	480
21 Jul-4 Aug 2020	x3	524
12 May 2022	S	524
13 Jul 2023	x3	524

[a] See text for derived total estimate of 500 pairs for the current breeding population.

Incidental observations have also been made of pairs nesting in the False Creek colony area. Richard Erickson, from Irving, California, reported a nest with two young on the roof of a motel at Howe and Pacific streets in 2009. On 6 August 2014, a pair was seen feeding three large young on top of the Jim Pattison wing at the Vancouver General Hospital, which is about 730 m south of False Creek. Closer to shore at Granville Island, large young were spotted on 12 August 2012, and a nest with young was seen on 15 July 2017. Richmond birder Yousif Attia

reported a nest with two young near the shore east of Granville Island on 20 June 2015. In 2017, Annie Dupras photographed a pair with two small young on a rooftop at the Holiday Inn at Howe and Helmcken streets on 15 July. In 2020, eBirders Ashley van der Pouw Kraan and M. Cox repeatedly observed nests with eggs or small chicks and parents feeding chicks on the rooftops of two buildings at 206 and 230 E 6th Avenue, located just east of Main Street, about 800 m from the end of False Creek. In 2022, Allan Jensen reported a pair at a nest on a building on the corner of Comox and Bidwell streets on 12 May. He stated that the same nest spot had been used in previous years. In 2023, Frank Lin observed an incubating adult on 28 June and three nests with two young each on 13 July on rooftops of buildings adjacent to the Stanley Park tennis courts on Park Lane.

As with other designated colony sites within urban areas of Vancouver, accurate counts of the numbers of Glaucous-winged Gulls nesting within the False Creek colony area are not available. As noted above, it is likely that nesting gull populations have declined in the area at the east end of False Creek surveyed by Vermeer in 1986 and 1989 and by Kroc in 2017. Declines are likely associated with habitat changes in that area (see Remarks). Combining non-overlapping counts from surveys conducted between 2015 and 2022 yields a total of about 100 nests, a substantial decrease from the approximately 172 nests counted in parts of those same areas in 1986. However, observations by Kroc and others indicate that gulls are using rooftop habitats throughout the length of the False Creek colony and we suspect that overall numbers within this colony area have not decreased and have likely increased from the total numbers counted by Vermeer in 1986 and 1989. The best estimate of numbers nesting in the entire City of Vancouver (about 1,700 pairs) is based on the predictive model developed by Kroc et al.[242] from data gathered in 2017. For numbers specifically in the False Creek colony, their model predicted medium to high probabilities of nests occurring on rooftops over much of the colony area. Highest predicted nest densities occurred over the downtown part of the colony, on the north side of False Creek. Nests were counted in only a small proportion of that downtown area (in the Downtown Burrard South study area and in the test area at Beach Avenue and Cardero Street), and there are likely well over a hundred pairs nesting in that area. Kroc kindly ran his model separately for the False Creek colony area and generated a total estimate of 486 nesting pairs, which rounded to 500 pairs.[480] We have thus used 500 pairs (of the total 1,700 pairs predicted for the entire City of Vancouver) as a working estimate for the current breeding population of Glaucous-winged Gulls in the False Creek colony area.

Remarks: Dramatic changes have occurred in the study area used by Vermeer in 1986 and 1989. By the time of Kroc's studies in 2015 and 2017, the industrial warehouse area along the south side of False Creek, which was the main study area used by Vermeer, had been converted into a residential and low-density commercial community. The two adjacent warehouse roofs where Vermeer observed a colony of 80 nesting pairs in 1986 were gone, and other rooftop habitat there is now less suitable for nesting gulls.

SG-661 POINT GREY

Location: *49°15'54"N 123°15'10"W* (UBC campus)*; 92 G/6.*

All Vancouver areas around the north and south sides of the Point Grey peninsula west of Arbutus Street, including all natural and urban habitats along the shoreline and buildings away from the shore. Colony also includes Deering Island, which is connected to the mainland by Carrington Street. That island lies in the North Arm of the Fraser River, north of Sea Island. On the north side, we have placed the border between the Point Grey and False Creek colonies at the point where Arbutus Street meets McNicoll Avenue at the north end of Kitsilano Beach. On the south side, the border between the Point Grey and South Vancouver colonies was placed at the east end of Fraser River Park at the foot of Angus Drive. The eastern border of the Point Grey colony thus lies, from north to south, along Arbutus Street, West Boulevard, and Angus Drive (see Figure 154 on page 168).

Description: *Rooftops; Wharves; Pilings.*

The Point Grey colony includes marine shoreline around the north and west sides and riverine shoreline along the North Arm of the Fraser River on the south side. Perimeter distance around the entire colony is about 21 km. Shoreline topography becomes steeper around western portions of the peninsula and there are steep sandy bluffs around Point Grey at the northwest tip of the peninsula. Much of the shoreline is relatively undeveloped and lies within the University Endowment Lands (including Pacific Spirit Regional Park), several

foreshore parks, and other green spaces. There are few docks and piers within this colony, mainly the Kitsilano and Royal Vancouver yacht clubs and the Jericho Pier on the shore of English Bay on the north side of the peninsula and small docks along the inside of Deering Island on the south side. Most developed areas near shore are residential, recreational, or are part of the UBC campus located on the west end of the peninsula. There are log-booming grounds protected by a breakwater along the southwest side of the peninsula.

Historical summary: In response to our query in June 2021, James Bellavance from the UBC Building Ops-Service Centre confirmed recent nesting by Glaucous-winged Gulls on UBC buildings. He said that, "nests can be constructed on [rooftops or] any 90 degree surface that provides some shelter." As an effort to quantify the number of gulls nesting, James did a computer search of the Building Centre's records. Data were inadequate to estimate total numbers nesting in any particular year, but, from the records from 2013 up to November 2020, a search revealed 18 campus buildings reporting issues with seagull droppings or nests. We used that information to derive a rough estimate of 20 pairs nesting on UBC buildings in those years (Table SG-661).

Table SG-661. Seabird nesting records for Point Grey. See Appendix 2 for codes.

DATE	GWGU[a]	SOURCE
2013-2020	20e	452
May-Aug 2017	35+	480
May-Aug 2018	x3	480

[a] See text for derived total estimate of 100 pairs for the current breeding population.

The Point Grey colony area was included in Ed Kroc's study [242] designed to predict habitat use and population size of Glaucous-winged Gulls nesting within the City of Vancouver. Numbers of rooftop nests were counted in 2017 in four study areas within the Point Grey colony, two in Kitsilano (with 3 and 11 nests), one at UBC (20 nests), and one in Kerrisdale on the boundary of the colony at West Boulevard and West 41st Avenue (1 nest located just west of West Boulevard). In 2018, to test model predictions, nests were counted in three small areas located at: Alma Street and West 4th Avenue (2 nests); Dunbar Street and West 16th Avenue (1 nest); and West Boulevard and Southwest Marine Drive (0 nests). Numbers of nests counted in the UBC study area in 2017 were similar to numbers estimated nesting from the information provided by James Bellavance covering the years 2013 to 2020. In total, 38 nests were counted by Kroc in 2017 and 2018 in his study and test areas combined.

As with the other designated colonies within the City of Vancouver, the best estimate of numbers nesting in the Point Grey colony is based on the predictive model developed by Kroc et al.[242] from data gathered in 2017. For numbers specifically in the Point Grey colony, their model predicted predominantly low probabilities of nests occurring on rooftops over most of the colony area, with higher probabilities predicted for the Kitsilano area and at UBC. When run separately for the Point Grey colony,[480] Kroc's model generated an estimate of 124 nesting pairs, which rounded to 100 pairs. We have thus used 100 pairs (of the total 1,700 pairs predicted for the entire City of Vancouver) as a working estimate for the current Glaucous-winged Gull nesting population in the designated Point Grey colony.

We have no records of other species nesting in this colony area, but Caspian Terns carrying food have been recorded. In 2019, UBC student Kaichi Huang reported two terns carrying food at Spanish Banks on 7 September and 10 birds at Wreck Beach on 8 September.[524]

SG-664 OAK STREET BRIDGE

Location: *49°12'00"N 123°07'33"W; 92 G/3.*
Across the North Arm of the Fraser River on Highway 99 from the Marpole area of Vancouver to the Bridgeport area of Richmond on Lulu Island.

Description: *Bridge.*
The bridge was completed in 1957 (Figure 387).

Historical summary: In 2017, Ed Kroc viewed the bridge from the ground at the north and south ends of the bridge and from the Canada Line Bikeway bridge and saw no nests (Table SG-664). In 2021, Michael Rodway and Heidi Regehr saw one adult Glaucous-winged Gull sitting on a nest located on the base of the most northern bridge support that is in the river. The nest was placed on a horizontal indent running across the support (Figure 388).

Table SG-664. Seabird nesting records (nests) for Oak Street Bridge.

DATE	GWGU	SOURCE
May-Aug 2017	0	480
5 Jun 2021	1	501

Figure 387. View of the west side of the Oak Street Bridge from the north shore of Lulu Island. *Photo by Heidi M. Regehr, 5 June 2021.*

Figure 388. In 2021, one Glaucous-winged Gull nest was located on the lower, horizontal ledge of this support at the north end of the Oak Street Bridge. *Photo by Heidi M. Regehr, 5 June 2021.*

SG-665 MITCHELL ISLAND

Location: *49°12'09"N 123°05'23"W; 92 G/3.*
In the North Arm of the Fraser River on the north side of Lulu Island, east of the Oak Street Bridge and straddled by the Knight Street Bridge. Colony includes all urban habitats along the shoreline and buildings away from the shore.

Description: *140 ha; 5 m high; Rooftops; Wharves; Pilings.*
Industrial developments, including sawmills and shipyards, cover most of Mitchell Island. There are some wharves around the island, including the historic Mitchell Island Pier and park located on the north side. Logs are boomed along much of the south shore and parts of the north shore. There are numerous pilings associated with the log-booming grounds.

Historical summary: Ed Kroc surveyed buildings on the eastern tip of Mitchell Island under the Knight Street Bridge for Glaucous-winged Gull nests in 2017 and saw no nests (Table SG-665). In 2021, parts of the southern shore of Mitchell Island were scanned from River Road on the north side of Lulu Island. Glaucous-winged Gulls were seen and suspected nesting on two rooftops on either side of the shipyard on the mid-south side of the island.

Table SG-665. Seabird nesting records for Mitchell Island. See Appendix 2 for codes.

DATE	GWGU	SOURCE
May-Aug 2017	0	480
5 Jun 2021	2eS	501

SG-666 KNIGHT STREET BRIDGE

Location: *49°12'11"N 123°04'39"W; 92 G/3.*
Across the North Arm of the Fraser River over the east end of Mitchell Island, connecting South Vancouver and Richmond (Figure 389).

Description: *Bridge.*
The bridge was completed in 1974.

Historical summary: Ed Kroc inspected the bridge from the ground at the north and south ends of the bridge and in the middle from Mitchell Island, and saw no nests in 2017 (Table SG-666). In 2021, one adult Glaucous-winged Gull was sitting on a nest located on the base of one of the southern supports for the central arch over the river channel between

Lulu and Mitchell islands. The nest was placed almost exactly in the middle of the base between the two vertical columns (Figure 390). It appeared to be made of cedar bark.

Table SG-666. Seabird nesting records (nests) for Knight Street Bridge.

DATE	GWGU	SOURCE
May-Aug 2017	0	480
5 Jun 2021	1	501

Figure 389. Portion of the Knight Street Bridge crossing from Mitchell Island to Lulu Island. *Photo by Heidi M. Regehr, 5 June 2021.*

Figure 390. A single Glaucous-winged Gull nest was seen on the Knight Street Bridge in 2021. It was located on the base of one of the bridge supports near the shore of Lulu Island (top left). The gulls had conspicuously placed the nest almost exactly in the middle of the base between the two vertical columns (bottom left). The nest appeared to be made of cedar bark. The adult gull on the nest seemed oblivious to a pair of Peregrine Falcons nesting on the top of the adjacent bridge support. *Photos by Michael S. Rodway, 5 June 2021.*

Remarks: In 2021, two Peregrine Falcons emerged from a likely nest site on top of the bridge support south of the one where the gull nest was located. The nest site was situated on the cement crosspiece just under the bridge deck.

SG-667 SOUTH VANCOUVER

Location: *49°12'10"N 123°07'40"W* (east side of the Oak Street Bridge)*; 92 G/3.*
Vancouver areas along the North Arm of the Fraser River east of West Boulevard and Angus Drive to the border of Burnaby, including all urban habitats along the shoreline and buildings away from the shore. We have placed the inland, northern border of this colony along West and East 33rd Avenue and then east along Kingsway to the Burnaby border at Boundary Road. Areas north of that border have been included in the False Creek and Vancouver Harbour colonies (see Figure 154 on page 168). Colony includes the Vancouver neighbourhoods of Marpole, Oakridge, Sunset, Victoria-Fraserview, and Killarney. Also included at the west end of the colony is Richmond Island, which is connected to the mainland shore by Bentley Street. The colony extends under the Arthur Laing, Oak Street, and Knight Street bridges.

Description: *Rooftops; Wharves; Pilings.*
The shoreline of this designated colony extends about 9.8 km along the North Arm of the Fraser River. There are many wharves, piers, and pilings for log-booming along shore. Some small parks, including Gladstone Park and Riverfront Park, create narrow strips of green space along the river towards the east end of the colony. Commercial and industrial developments cover most other areas near shore. Further inland are residential areas, golf courses, and small parks.

Historical summary: The South Vancouver colony area was included in Ed Kroc's study [242] designed to predict habitat use and population size of Glaucous-winged Gulls nesting within the City of Vancouver. Numbers of rooftop nests were counted in 2017 in three study areas within the South Vancouver colony: around Cambie Street and West 41st Street (identified as Oakridge); along the North Arm of the Fraser River from the Arthur Laing Bridge to Yukon Street, which included buildings under the Oak Street Bridge and the Skytrain Canada Line (Oak Street Bridge); and areas west and east of the Knight Street Bridge (Knight Street Bridge). A total of 20 nests were counted, with 6, 8, and 6 nests in the three study areas, respectively (Table SG-667). Four of the 10 areas used to test model predictions were in the South Vancouver colony and were surveyed in 2019: Victoria Drive and East 33rd Avenue (2 nests); Windsor Street and East 49th Avenue (0 nests); Adera Street and West 57th Avenue (0 nests); and along the North Arm of the Fraser River from Main Street to Fraser Street, inland to Southeast Marine Drive (10 nests). Numbers of nests counted in test areas showed good agreement with predictions. The buildings where nests were found on Victoria Drive were over 4.5 km from the nearest marine waters at the east end of False Creek and about 3.5 km inland from the Fraser River.

Table SG-667. Seabird nesting records (nests) for South Vancouver.

DATE	GWGU[a]	SOURCE
May-Aug 2017	20+	480
May-Aug 2019	x12	480
5 Jun 2021	x2	501

[a] See text for derived total estimate of 100 pairs for the current breeding population.

In 2021, Michael Rodway and Heidi Regehr examined buildings near shore under the east side of the Oak Street Bridge (Figure 391). Those buildings would have been part of Kroc's Oak Street Bridge study area in 2017. In 2021, Glaucous-winged Gulls were sitting on nests on the rooftops of two buildings just along the east side of the bridge.

Figure 391. In 2021, Glaucous-winged Gulls were found nesting on rooftops of commercial buildings located below the north end of the Oak Street Bridge. Nests had also been found in this area in 2017. Many other commercial buildings in the South Vancouver colony area provide suitable nesting habitat but have not been well explored for nesting birds. *Photo by Heidi M. Regehr, 5 June 2021.*

We have no comprehensive counts of gull nests throughout this colony area. As with the other three designated colonies within the City of Vancouver, the best estimate of numbers nesting is based on the predictive model developed by Kroc et al.[242] from data gathered in 2017. Non-overlapping counts from the study and test areas surveyed in the South Vancouver colony by Kroc in 2017 and 2019 totaled 32 nests. Kroc's model predicted medium to low nest densities over most of this colony area, and when run separately for the South Vancouver colony generated an estimate of 97 nesting pairs, which rounded to 100 pairs.[480] We have thus used 100 pairs (of the total 1,700 pairs predicted for the entire City of Vancouver) as a working estimate for the current breeding population of Glaucous-winged Gulls in the South Vancouver colony area.

SG-670 QUEENS REACH TO NORTH ARM

Location: *49°13'18"N 122°50'12"W* (historical DCCO nesting location; approximate); *92 G/2.*
Shoreline areas along the north side of the Fraser River from the Vancouver-Burnaby border at Boundary Road east to the mouth of the Coquitlam River, including urban buildings away from the shore. Colony extends under the Queensborough, Pattullo, and Port Mann bridges and includes the southern portion of Burnaby, all of New Westminster, and the southern portion of Coquitlam. The east tip of Lulu Island, Poplar Island, the Sapperton Bar, and Tree Island near the Coquitlam River are within the cities of New Westminster and Coquitlam and are considered part of this colony. The colony thus includes small portions of the North Arm and Annacis Channel along the north and south sides of the Queensborough area on Lulu Island. We place the northern boundary of this colony along Highway 1 from Boundary Road to North Road, along North Road to Como Lake Avenue, and then east along Como Lake Avenue to the Coquitlam River. The Barnet and Port Moody colonies lie north of this boundary (see Figure 154 on page 168).

Description: *Pilings; Wharves; Rooftops; Towers.*
This colony extends for about 18.8 km along the north shore of the Fraser River plus 6.5 km around the perimeter of the Queensborough area on the east tip of Lulu Island. Numerous pilings used mostly for log-booming activities line much of the river, especially in Queens Reach and around Queensborough. Most of the areas close to the river are developed with industrial and commercial buildings. There are some small parks along the river, including Maquabeak Park under the Port Mann Bridge, Sapperton Landing Park below the historic location of the BC Penitentiary, and Burnaby Fraser Foreshore Park. The penitentiary was a federal maximum security prison that operated from 1878 until it was decommissioned in 1980. That area is now a residential development. There are also residential buildings in areas away from the river. There is a patch of farmland, a golf course, and some small, riparian green spaces in south Burnaby.

Historical summary: Ron Pilkey made two observations of a single Double-crested Cormorant nest on a piling on the Fraser River between Port Mann and Pattullo bridges in 1983 (Table SG-670). Birds were building the nest on 30 May, and on 19 July, there were four young, about three-quarters grown, in the nest. This is the only nesting record we know of for this species in this area. Moul and Gebauer [266] list a record of zero nests for this site in 1987, citing Vermeer et al.,[428] but there is no evidence that this site was surveyed in 1987.[428] Adkins and Roby [1] also list the same record. In 2012 and 2013, Rob Butler surveyed this area and found no cormorants nesting. In 2021, a survey from shoreline vantage points of the entire length of this colony also found no signs of nesting cormorants.

Glaucous-winged Gulls have been recorded nesting in the area on rooftops and pilings. Birds were seen carrying nesting materials to rooftop locations in downtown New Westminster in 2012 and 4-5 nests were seen at those locations in 2013.[460] The downtown buildings were located along Columbia Street between 4th and 8th streets. In 2014, a pair was seen nesting on a roof near the west end of Carnarvon Street in the same area. Adults were seen sitting on four nests on pilings located along Queen's Reach and the Sapperton Bar in 2012. In 2013, an adult appeared to be sitting on a nest on pilings in Queens Reach.

Table SG-670. Seabird nesting records for Queens Reach to North Arm. See Appendix 2 for codes.

DATE	DCCO	GWGU	SOURCE
19 Jul 1983	1		76, 523
18 Jun 2012	0	4	456
2013	0	5-6	59, 460
5 Jul 2014		1	524
3, 5 Jun 2021	0	12eS	501

In 2021, Michael Rodway and Heidi Regehr observed adult gulls standing near possible nesting territories on rooftops of buildings and other

structures in New Westminster and further east in Coquitlam. In New Westminster, adults were visible on two buildings south of the 700 block of Carnarvon Street and on top of a tower in the Portland Cement yard on Capilano Way in Sapperton. In Coquitlam, adults were seen on rooftops of six buildings along United Boulevard east and west of King Edward Street and a courting pair plus an individual adult were seen on the Westworld Paper building on Brigantine Drive south of United Boulevard. Nesting was not confirmed at any of those locations; one adult was seen carrying nesting material over a building at the foot of King Edward Street; in total we suspected 12 nesting territories. There was no evidence of nesting seabirds on the numerous pilings in the Fraser River or on Tree Island, the Sapperton Bar islands, or Poplar Island in 2021; one adult gull was observed on a piling in Coquitlam but appeared to be just roosting.

Remarks: Bald Eagles were nesting in a black cottonwood (*Populus trichocarpa*) tree on the Sapperton Bar island just south of Spruce Street in 2021. Young were visible in the nest and two adults were perched nearby. Also seen in the area in 2021 was an Osprey sitting on a nest on a piling near the southern shore of the Fraser River east of the Pattullo Bridge.

SG-672 PATTULLO BRIDGES

Location: *49°12'27"N 122°53'40"W; 92 G/2.*
Across the Fraser River connecting the cities of New Westminster and Surrey. Colony includes the New Westminster Rail Bridge on the north side and the skytrain SkyBridge on the south side of the Pattullo Bridge (Figure 392).

Figure 392. View of the Pattullo Bridge from the north showing the New Westminster Rail Bridge in front of and the skytrain SkyBridge behind the Pattullo Bridge. In 2021, Glaucous-winged Gulls were nesting on the girders of the rail bridge and at the base of the pillar supporting the main span of the Pattullo Bridge. *Photo by Heidi M. Regehr, 5 June 2021.*

Description: *Bridge.*
The first bridge built for this crossing was the New Westminster Rail Bridge, which was completed in 1904. It is a swing bridge and was originally built with two decks, with the upper deck used for vehicle traffic. The upper deck was dismantled after the Pattullo Bridge opened to handle vehicle traffic in 1937. The SkyBridge was completed in 1990. The Pattullo Bridge is slated to be replaced by a new bridge, expected to be completed in 2025. The old bridge will be demolished.

Historical summary: Butler et al. reported two pairs of gulls possibly nesting on a support for the Pattullo

Bridge in 2013 (Table SG-672). From vantage points along the New Westminster shoreline, Michael Rodway and Heidi Regehr scanned all three bridges for nests in 2021. Adult Glaucous-winged Gulls were seen sitting on 10 nests on the railway bridge and one nest on the Pattullo Bridge. Most nests on the railway bridge were located on the top, longitudinal girders on either side of the bridge sections (4 nests on the north side and 2 nests on the south side of the central swing section [Figure 393]; 1 nest on the north side of the section west of the swing section; and 1 nest on the south side of the section east of the swing section). One nest was located on the bottom girder of the more western bridge section with the control house on top. It was placed where two diagonal beams join. The tenth nest was located on the east end of the base of the swing section. The nest on the Pattullo Bridge was located on the north side on the base of the support for the west end of the main arch. On the SkyBridge, a pair of courting adults was present on the south side of the base of the main, west pillar, but no nest was visible. The pair departed after about 10 minutes.

There was no sign of cormorants on the bridges in 2021.

Figure 393. Central swing section of the New Westminster Rail Bridge where six Glaucous-winged Gull nests were located in 2021. Supports of the Pattullo Bridge and the SkyBridge are visible behind the rail bridge. Gulls on nests were unperturbed by the opening and closing of the swing bridge. *Photo by Heidi M. Regehr, 5 June 2021.*

Table SG-672. Seabird nesting records for Pattullo Bridges. See Appendix 2 for codes.

DATE	GWGU	SOURCE
2013	2S	59
5 Jun 2021	11	501

Remarks: Opening of the swing span during the survey in 2021 had no apparent effect on the nesting gulls, which remained sitting on their nests.

SG-674 ANNACIS ISLAND

Location: *49°10'14"N 122°56'40"W; 92 G/2.*
In the Fraser River south of the Queensborough area on the east end of Lulu Island. Colony includes all urban habitats along the shoreline and buildings away from the shore.

Description: *555 ha; 14 km perimeter; 5 m high; Rooftops; Pilings; Wharf.*
Most of Annacis Island is covered with commercial and industrial developments. On the northeastern end of the island is the Annacis Auto Terminal, which is one of two major ports for automobiles in Greater Vancouver. There is a Fisheries and Oceans Canada base on Shoal Point at the northeastern tip of the island. The central portion of the island is occupied by the Annacis Island wastewater treatment plant, which provides secondary treatment for about 175 billion litres of wastewater for over a million Vancouver residents every year. Logs are boomed along the shore for several sawmills on the island and numerous pilings line shoreline areas, especially on the north side of the island.

Historical summary: In 2021, Michael Rodway and Heidi Regehr explored the eastern and southern sides of the island along Derwent Way. Shoreline areas were examined from side streets off Derwent Way. The northwestern side of the island was scanned from South Dyke Road along the south shore of Lulu Island. Glaucous-winged Gulls were suspected nesting on three rooftops (Table SG-674). A pair was seen on the northeast corner of the Ideal Welders building at 1010 Derwent Way. A nest was not visible but one adult that was only partially visible was likely sitting on a nest with the other adult standing immediately above. The two other likely nesting locations were at the sawmill and the building just west of the sawmill on the mid-northwest side of the island (Figure 394). One adult was seen atop the sawmill. On the building west of the sawmill, a pair was present with just the head visible of one adult that was likely sitting on a nest.

Table SG-674. Seabird nesting records for Annacis Island. See Appendix 2 for codes.

DATE	GWGU	SOURCE
5 Jun 2021	3eS	501

Remarks: In 2021, an Osprey was sitting on a nest atop a double piling located just off the end of Fraserview Place off the south side of the island, west of the Alex Fraser Bridge (Figure 395).

Figure 394. Glaucous-winged Gulls were suspected nesting on the rooftops of the sawmill and adjacent buildings on the mid-north side of Annacis Island in 2021. *Photo by Heidi M. Regehr, 5 June 2021.*

Figure 395. Osprey nest on top of a double piling in the Fraser River along the shore of Annacis Island, west of the Alex Fraser Bridge, in 2021. Due to factors similar to those that impacted Bald Eagles, Osprey populations were decimated during the mid-20th century and have since recovered.[25] During surveys in 2021, a second Osprey nest was seen on a piling along the eastern shore of the Fraser River, just upstream from the Pattullo Bridge in New Westminster, across the river from where Butler et al.[59] recorded a nest in 2012 and 2013. *Photo by Heidi M. Regehr, 5 June 2021.*

SG-675 LULU ISLAND - NORTH

Location: *49°12'00"N 123°04'36"W*; *92 G/3.*
All of the north side of Lulu Island north of Westminster Highway, except Queensborough which is a neighbourhood of New Westminster and has been included in the Queens Reach to North Arm colony (see Figure 154 on page 168). The Lulu Island - North colony includes shoreline areas of the Fraser River North Arm and urban buildings away from the shore. It covers the northern part of the city of Richmond, excluding Sea Island (see SG-677).

Description: *Rooftops; Pilings.*
The northern half of Lulu Island is a mix of agricultural, residential, and commercial areas.

About half the area is still agricultural fields, most of which are on the eastern portion of the island. Urban buildings over the rest of the area provide abundant rooftop nesting habitat. There are log-booming grounds with numerous pilings along the shoreline.

Historical summary: A colony of Caspian Terns was discovered on the roof of the Fraser River Terminal warehouse in 2012 (Table SG-675). The warehouse is located just west of the Canada Line Skytrain bridge over the North Arm of the Fraser River (Figure 396). The colony was initially reported as the first in BC,[317] but an earlier colony had been discovered in 1998 in the interior west of Prince George.[86] The terns were discovered nesting at the Fraser River Terminal by Mike Boyd, a consulting ecologist and Vancouver director of the conservation group, WildResearch. Boyd followed terns flying up the Fraser River carrying fish on 19 May 2012.[317] He saw birds building nests on the metal roof and one nest that contained an egg. UBC Professor Emeritus Peter Candido estimated 250-500 terns present and saw nine eggs in nests on 22 May and Quentin Brown of North Vancouver recorded 120 birds and one egg on 23 May. Brown noted that more eggs had been seen by others but had been eaten by gulls. On 25 June, Delta birder Brian Self recorded only five Capsian Terns present and could see no tern nests, but he could only view part of the roof from his lookout on the nearby Skytrain line footbridge. Local birdwatcher Richard Swanston made extensive observations that summer. He estimated as many as 600 terns present and saw several nests with eggs. On 7 July, a maximum of 674 terns were counted; at least 31 appeared to be incubating although only a few nests with eggs were seen.[326] All nests were unsuccessful and on 14 August only 21 adults were present and no active nests were seen. We have no records of terns nesting since 2012.

Glaucous-winged Gulls were first recorded nesting in this colony area in 2008. Large numbers were nesting in 2015, 2017, and 2021 (Figure 397). In 2008, a pair with large young was seen on the rooftop of a warehouse building below the Knight Street Bridge. The warehouse was located near the shore of the North Arm just on the east side of the bridge. In 2012, on the Fraser River Terminal warehouse where Caspian Terns were found nesting, Brian Self counted 91 adult gulls and 27 unfledged juveniles and could see 16 gull nests on 25 June. Pynn also reported gulls nesting in 2012 on the roofs of buildings adjacent to the Fraser River Terminal warehouse.[317]

Table SG-675. Seabird nesting records for Lulu Island - North. See Appendix 2 for codes.

DATE	GWGU[a]	CATE	SOURCE
19 Jul 2008	1		45
7 July 2012	x	31e+	317, 326
14 Aug 2012		0	326
14 Jun 2015	100e+		480
May-Aug 2016	x	0	480
May-Aug 2017	220e	0	480
5 Jun 2021	195e	0	501

[a] See text for derived total estimate of 220 pairs for the current breeding population.

Ed Kroc visited the colony in 2015, 2016, and 2017. In 2015, he estimated over 100 pairs of gulls nesting on the Fraser River Terminal warehouse. In 2017, he conducted a survey of buildings and other structures in two areas around the south ends of the Oak Street and Knight Street bridges, respectively.[242] The area around the Oak Street Bridge encompassed structures north of Bridgeport Road and west of No. 4 Road, which included the Fraser River Terminal warehouse and a section of the Skytrain tracks. In that area, Kroc counted 91 active nests on the Fraser River Terminal warehouse roof, two nests on the top of support pillars of the Skytrain tracks (Figure 398), and 24 nests on rooftops of 11 other buildings. Nests were counted on the terminal warehouse roof from

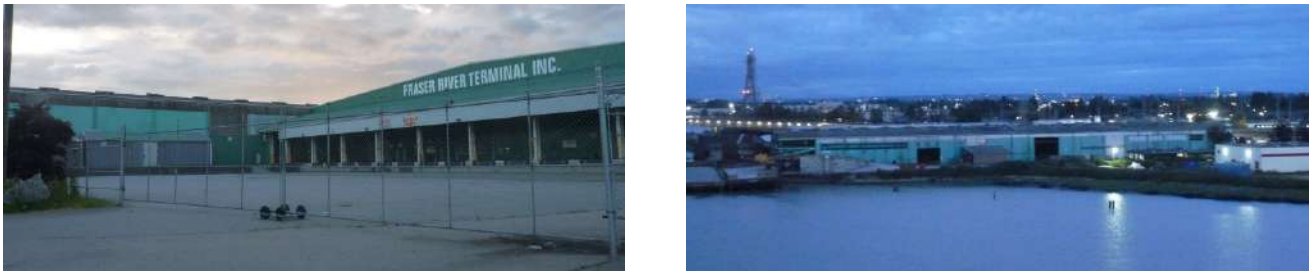


Figure 396. Fraser River Terminal warehouse on the north shore of Lulu Island as seen from its south-side entrance (left) and from the crest of the Oak Street Bridge. The evening view from the Oak Street Bridge shows the west face of the western section of the roof where 48 Glaucous-winged Gull nests were counted in 2021. *Photos by Heidi M. Regehr, 5 June 2021.*

vantage points on the Oak Street Bridge and the Canada Line Bikeway bridge. Kroc estimated that about half of the warehouse roof was visible from those vantage points and estimated that the total number of nests on that roof was about double what was counted, or about 182 nests. In the second area surveyed by Kroc in 2017, located along the north shore of Lulu Island just east and west of the Knight Street Bridge, nine nests were counted on eight separate rooftops. Results of Kroc's surveys in 2017 suggested a minimum nesting population of about 220 nests for the Lulu Island – North colony area.

In 2021, Michael Rodway and Heidi Regehr scanned pilings, buildings, and other structures visible along River Road and adjacent roads in the area from near the east end of the colony where River Road meets Westminster Highway to the Oak Street Bridge. Rooftops of the Fraser River Terminal and nearby buildings were also viewed from the middle of the Oak Street Bridge. For the Fraser River Terminal, gull nests were thus counted on portions of the warehouse roof that were visible from the ground around the terminal and from the middle of the Oak Street Bridge. The roof is formed of three peaked sections (western, eastern, and middle sections) oriented north-south (i.e., each section has an east and a west face). The western and middle sections are longer and, in 2021, had more moss growth than the shiny eastern section. On the western section, about half the total roof area was visible, including the entire west face and only a small portion (~5%) at the south end of the east face; on the middle section, the top third of the west face and about 40% at the south end of the east face were visible; on the shiny east section, about the top half of the west face and none of the east face were visible. Numbers of nests counted on the above visible roof faces were: 48, 2, 20, 11, and 5, respectively, for a total of 86 nests counted. All nests contained sitting adults. Overall, as Kroc found in 2017, about half the roof top area could be seen. Assuming similar numbers of nests on roof sections that were not visible gave an estimate of 170 nests for the entire warehouse in 2021.

Gulls on nests were also seen on other rooftops viewed from the Oak Street Bridge in 2021. Buildings below the bridge with nests, included: the Fantastone Marble building located under the east side of the bridge north of the railway tracks just west of Fraser River Terminal (1 nest with an egg rolled out of the nest); one building south of the railway tracks on the east side of the bridge (3 nests); and two buildings on the west side of the bridge (1 nest on each).

Adult gulls on nests and standing near possible nests were also seen on rooftops of other buildings along the north side of Lulu Island in 2021 (Figure 399). Viewed from roads on Lulu Island, those

Figure 397. A large colony of Glaucous-winged Gulls has been established on the rooftops of the Fraser River Terminal warehouse likely since 2012. Caspian Terns briefly established a colony here in 2012 but were unsuccessful and have not been seen nesting since. *Photos by Edward Kroc, 14 June 2015 (top left) and Heidi M. Regehr, 5 June 2021.*


Figure 398. In 2016 and 2017, Ed Kroc discovered two pairs of Glaucous-winged Gulls nesting on support pillars for the Skytrain Canada Line running across the north side of Lulu Island. Those nesting locations were unusually close to the ground compared to other urban nests. *Photos by Edward Kroc, 16 July 2016.*




Figure 399. In addition to the Fraser River Terminal illustrated above, other commercial buildings provide abundant rooftop nesting habitat for Glaucous-winged Gulls along the northern shore of Lulu Island. Examples of other buildings where gulls were observed and suspected nesting in 2021 included (clockwise from top left): the Riverside Palace Banquet Hall; Intercity Packers; Cathay Importers; and Richmond Plastics. On the rooftop of Richmond Plastics, gulls were nesting immediately under a plastic owl (visible in silhouette) that had been installed to deter nesting birds. *Photos by Heidi M. Regehr, 5 June 2021.*

buildings included: Riverside Palace at the corner of Burdette Street and Knox Way (2 adults, 30 m apart); Intercity Packers at 1900 No. 6 Road (1 pair); Cathay Importers at 12631 Vulcan Way (1 adult on a nest located on the peak at the east end of the low-slope roof, 1 pair near a started nest next to a vent chimney, and 1 single adult); five other buildings along Vulcan Way between No. 6 and No. 5 roads (5 single adults); Food Process Solutions at 13201 River Road, just west of the Knight Street Bridge (1 adult); two buildings across the street from the Fraser River Terminal on either side of Van Horne Way (1 adult on E side and 5 adults on W side of Van Horne Way); two buildings at 9211 and 9111 Van Horne Way (2 single adults); and Richmond Plastics at 9500 Van Horne Way (1 adult on a nest and 1 adult standing nearby). The latter nest was placed on a small, raised tower immediately under a plastic owl used to deter birds; the second adult was standing near another plastic owl on a corner of the building. In sum, two nests were seen and a total of 20 pairs of gulls were estimated nesting on the above buildings. No evidence of gulls nesting on pilings was seen in surveyed areas in 2021.

Summing all counts in 2021 brought the total estimate of the number of gull nests in surveyed areas to 195. Given that many areas were not surveyed, this undoubtedly underestimates the current total gull nesting population in the Lulu Island – North colony. Although slightly fewer nests were counted on the Fraser River Terminal warehouse in 2021 than in 2017, considering the number of nests counted in 2021 in areas that were not surveyed in 2017 and *vice versa*, suggests that about 220 pairs, as was estimated in 2017, is an appropriate and likely minimum estimate of the current nesting population for this colony.

Remarks: Breeding failure of Caspian Terns in 2012 was likely caused by frequent disturbance, which flushed birds from their nests, followed by egg predation by Glaucous-winged Gulls and crows.[317]

SG-677 SEA ISLAND

Location: *49°11'49"N 123°10'26"W; 92 G/3.*
Mouth of the North Arm of the Fraser River, off the northwest side of Lulu Island.

Description: *1,625 ha; 3 m high; Rooftops; Towers.*

Sea Island is the site of the Vancouver International Airport (YVR) and most of the area of the island is occupied by the airport terminal, runways, and associated buildings. There is a small residential community of Burkeville on the southeast end of the island. In 1999, the 140 ha Sea Island Conservation Area was set aside along the north side of the island as mitigation for wildlife habitat lost as a result of runway expansion. The Conservation Area is comprised of old agricultural fields, with small pockets of wetland and forest. It is managed by Environment and Climate Change Canada. The large estuarine area of Sturgeon Bank extends west from the island.

Historical summary: David Bradbeer, Wildlife Program Coordinator for Airside Operations at YVR, has confirmed Glaucous-winged Gulls nesting on airport buildings since at least 2018 (Table SG-677). Gulls were likely nesting prior to 2018 but records were incomplete at that time. In 2018, 13 building were inspected for nesting birds. Four buildings had gull nests: two buildings with at least one occupied nest; one with two occupied and one empty nest; and one with two occupied and two empty nests. Occupied nests had a total of 13 eggs (see Remarks). Nests were found on nine buildings in 2019: six with one occupied nest; two with one occupied and one empty nest; and one with three occupied nests (total of 27 eggs). In 2020, only one building was inspected and one nest with two eggs was found. Nest searches were not conducted in 2021 or 2022, but single nests were reported on two buildings at 4831 and 4851 Miller Road in 2022 (Figure 400). A flightless juvenile was present around one of the nests in 2022.

Table SG-677. Seabird nesting records for Sea Island. See Appendix 2 for codes.

DATE	GWGU	SOURCE
5-17 Jul 2018	9[6]	454
17-19 Jun 2019	13[11]	454
10 Jun 2020	x	454
25 Jul 2022	x2	454
Jun-Jul 2023	7[4]	454

In 2023, as part of ongoing Glaucous-winged Gull management activities at YVR, repeated surveys and associated control measures were carried out during the breeding season under the Migratory Bird Damage-Danger permit DA-BC-2023-0246. Surveys of 14 rooftop areas were conducted on 6 June, 22 June, and 18 July by Aaron Ritchie, Jesse Krecsy, and Elliot Flynn-Williams of

Falcon Environmental Inc. Nests were found on four of the buildings surveyed (Table SG-677.1). A total of seven nests were found; four of the nests contained eggs when they were found, others were empty. Nests were made of sticks and grass; one nest had some moss and one had some leaves. We used the seven nests found in 2023 as the current estimate of the nesting population at YVR. The total nesting population is likely larger, given that only a subset of buildings were searched for nests.

Figure 400. Glaucous-winged Gulls have been nesting on building rooftops at the Vancouver International Airport since at least 2018. One nest built in 2020 (left) was composed of a copious amount of gathered moss lined with cattail (*Typha* spp.) leaves, an unusual nesting material. The right photo shows a well-used nest from 2022 that had one flightless young associated with it on 25 July. *Photos by David Bradbeer, 10 June 2020 and Aaron Ritchie, 25 July 2022.*

Managing "bird strikes" at YVR

YVR runs a Wildlife Management Program year round to mitigate the risk of bird-aircraft collisions ('bird strikes'). Gulls are managed using non-lethal techniques. Diet analysis of gulls struck by aircraft has been conducted to determine which prey species attract gulls to the airfield. The most frequently recovered terrestrial prey items were earthworms (Lumbricidae)*, larvae of crane flies* (Tipulidae)*, and larvae of noctuid moths. The majority of noctuid moth larvae identified have been those of* Noctua pronuba*, a large invasive moth from Europe that is abundant in the grassy infields near YVR's runways. YVR applies an insecticide, cholorantraniliprole, to grass meadows adjacent to the departure runway to reduce the abundance of invertebrate prey for gulls. Earthworms and crane fly larvae can be driven onto paved taxiway and runway surfaces during rainfall events. A broom sweeper is deployed to masticate and disperse, thereby denying access to these obvious prey items. Enclosed trash compactors are used to stage putrescent food waste to prevent this potential food source attracting gulls.*

Wildlife Management Technicians patrol the airfield 24 hours a day and use a variety of tools to disperse gulls that are encountered feeding, loafing, or overflying the airfield. These tools include pyrotechnic charges (including exploding cartridges, flares, and 'screaming' cartridges); green lasers, stock whips; sirens and horns; human presence; trained dogs; and trained raptors (including Harris's Hawks [*Parabuteo unicinctus*] *and falcons).*

Gulls migrate past Sea Island on a daily basis in winter as they travel between their overnight foreshore roost and inland feeding sites. When flocks of gulls overfly the airfield, Wildlife Management Technicians will alert Air Traffic Control personnel if they perceive a conflict with arriving aircraft and the birds. ATC may take further action to alert flight crews of the gulls' presence.

(contributed by David Bradbeer)

Table SG-677.1. Glaucous-winged Gull surveys and associated control measures conducted at Vancouver International Airport in 2023.

Building Address	Survey Results 6 June	22 June	18 July	Notes
4831 Miller Rd.	Nil	Nest #5 (0 eggs)	Nest #6 (1 egg)	Nest destroyed on June 22 and egg addled on Jul 18. GWGU parents seen nearby
4840 Miller Rd.	Nil	Nil	Nil	
4851 Miller Rd.	Nest #1 (2 eggs)	Nest #1 (3 eggs)	Nest #1 (0 eggs; destroyed) Nest #7 (0 eggs; destroyed)	All eggs addled
4871 Miller Rd.	Nest #2 (0 eggs) Nest #3 (3 eggs)	Nest #2 (3 eggs) Nest #3 (3 eggs)	Nest #2 (1 chick, 2 eggs) Nest #3 (1 whole +1 broken egg. No new)	Nest destroyed June 6, but rebuilt by June 22. All eggs addled
5000 Miller Rd.	Nil	Nil	Nil	
5200 Miller Rd.	Nil	Nil	Nil	
5980 Miller Rd.	Nil	Nil	Nil	
3511 Jericho Rd.	Nil	Nil	Nil	
3611 Jericho Rd.	Nil	Nil	Nil	
6020 Russ Baker Way	Nest #4 (0 eggs)	Nil	Nil	Nest destroyed
6080 Russ Baker Way	Nil	Nil	N/A	No check on Jul 18 due to construction
6082 Russ Baker Way	Nil	Nil	Nil	
6086 Russ Baker Way	Nil	Nil	Nil	
5400 Airport Rd.	Nil	Nil	Nil	

Remarks: Sanctioned measures to control gull populations are used at YVR to try and prevent bird-aircraft collisions.[454] Eggs found in nests were coated with vegetable oil to prevent hatching in 2018 (13 eggs) and 2019 (27 eggs). In 2020, the two eggs found were removed. In 2023, all nests were destroyed and eggs were addled.

SG-678 IONA ISLAND

Location: *49°12'20"N 123°15'21"W* (west end of south jetty)*; 92 G/3.*
Mouth of the North Arm of the Fraser River, connected by a causeway to the northwest corner of Sea Island. Colony includes the North Arm jetty and light beacon, the south jetty, and offshore pilings and dolphins (see Figure 154 on page 168).

Description: *157 ha; 2 m high; Offshore dolphins; Jetties; Beach.*
Iona Island was originally a low-lying floodplain island composed of estuarine marshes and tidal channels. Sediments from dredging of the Fraser River channel in the early 20th century were deposited on the island and changed its topography. In the late 1950s, the island was connected by a causeway to the adjacent Sea Island during the construction of a primary sewage treatment plant and associated structures, including settlement ponds and the south jetty. The jetty was built over the first 4 km of the outfall pipe that continues offshore for another 3 km past the end of the jetty to discharge waste into the waters of the Salish Sea. A large dolphin sits offshore of the west end of the jetty. Proposed upgrading of the sewage plant to tertiary treatment is currently in the design phase. The North Arm jetty extends along the channel of the Fraser River for 6 km and is used extensively for log-booming activities. There is a navigational beacon at its west end.

Part of the island has been set aside as the Iona Beach Regional Park and the entire area lies within the Fraser Estuary Important Bird Area.

Historical summary: Double-crested Cormorants have been reported nesting in several years since 1999, although quantitative data on numbers of nests are lacking in most years (Table SG-678). Vancouver birder and retired biochemist Peter Candido reported birds at nests and gave total counts of birds in several years: 35 on 17 July 1999, 54 on 6 August 2001, 30 on 19 June 2003, and 29, 8, and 8 on 22 July, 31 July, and 2 August 2004, respectively.

Delta birder Brian Self reported: 49 birds on 19 July 2000, with many nests on the metal structure off the end of the jetty; 55 adults and 15 immatures seen with fellow birder Mike Fung on 31 August 2005, with many birds still sitting on nests on the offshore structure to the west of the outer end of the jetty; and 19 adults and 8 juveniles on 19 August 2007, some of which were around the nests on the outer pipe marker off the western tip of the jetty. Roger Burrows from New Brunswick recorded 15 cormorants on nests on 10 August 2001. In 2021, Ken Wright counted 20 cormorants and reported possible nesting on a structure about 275 m off the tip of the jetty on 10 July. We have assumed that the location of all nesting records is on the dolphin off the end of the south jetty, although the locations of nests have not been specified in many cases. In 2022, Moira Lemon and Christopher McNeill saw no evidence of active nesting on any of the structures off the south jetty, although a pile of sticks on the outer west dolphin may have been the remnants of an old Double-crested Cormorant or Bald Eagle nest (Figure 401).

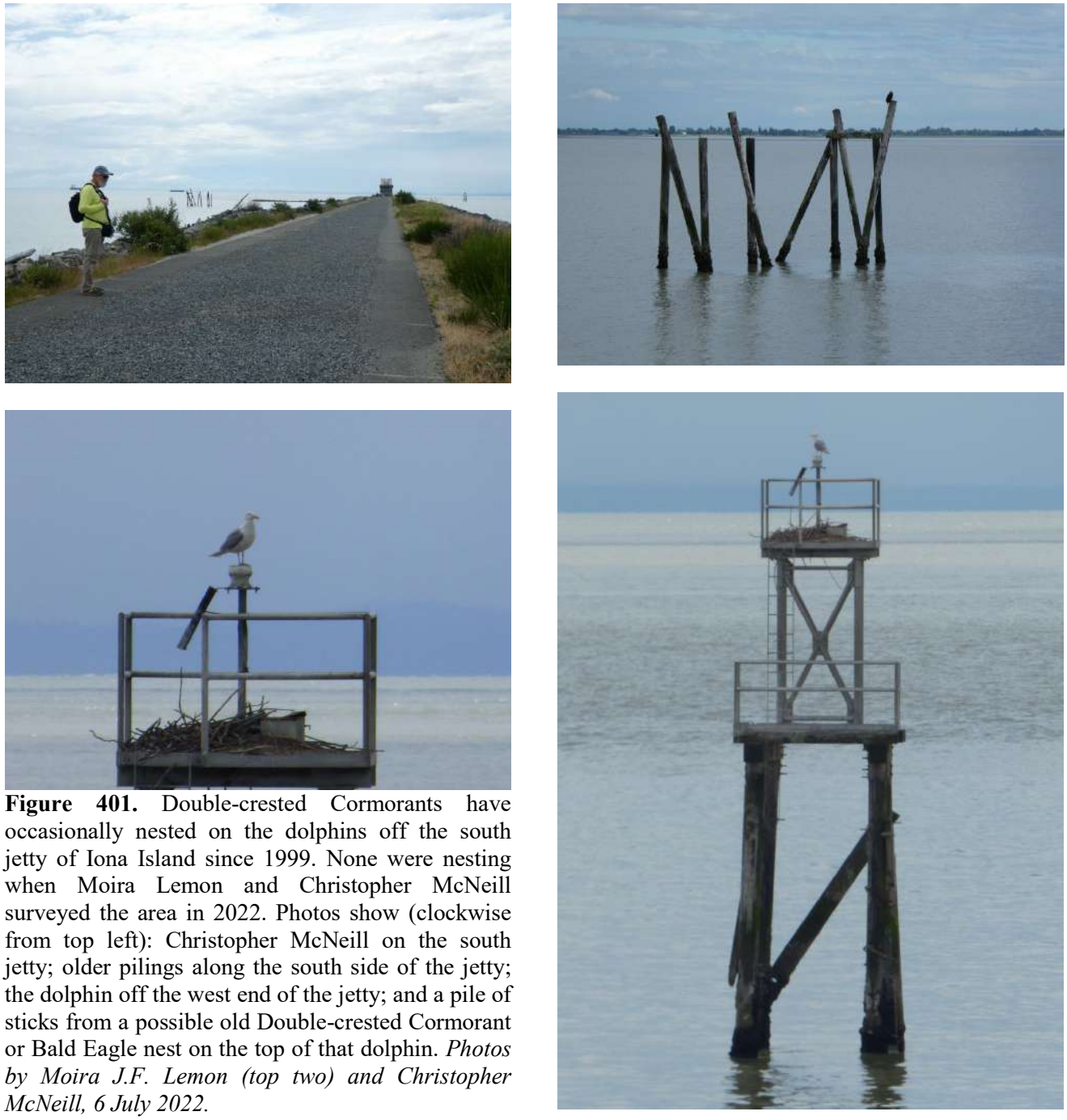


Figure 401. Double-crested Cormorants have occasionally nested on the dolphins off the south jetty of Iona Island since 1999. None were nesting when Moira Lemon and Christopher McNeill surveyed the area in 2022. Photos show (clockwise from top left): Christopher McNeill on the south jetty; older pilings along the south side of the jetty; the dolphin off the west end of the jetty; and a pile of sticks from a possible old Double-crested Cormorant or Bald Eagle nest on the top of that dolphin. *Photos by Moira J.F. Lemon (top two) and Christopher McNeill, 6 July 2022.*

Caspian Terns have been commonly reported in this area and may nest. A total of 35 birds with many juveniles begging parents for food were recorded by eBird contributor Cole Gaerber on 7 August 2019.[524] In 2020, Ken Wright reported about 50 birds including recently fledged young around the south jetty on 25 August and a pair and one juvenile were seen on the causeway between Iona and Sea islands by Robin Taylor on 28 August.[524] Courtship feeding was observed by Vancouver birders Rosemary and Paul Clapham on 19 April 2021.[524]

Table SG-678. Seabird nesting records for Iona Island. See Appendix 2 for codes.

DATE	DCCO	SOURCE
17 Jul 1999	x	524
19 Jul 2000	x	524
6, 10 Aug 2001	15	524
19 Jun 2003	x	524
Jul-Aug 2004	x	524
31 Aug 2005	x	524
19 Aug 2007	x	524
10 Jul 2021	S	524
6 Jul 2022	0	485

Remarks: Iona Island is a popular recreational site close to the urban centres of Greater Vancouver and is also one of the best birding locations in western Canada. It sees hundreds of thousands of visitors annually.

SG-679 LULU ISLAND - SOUTH

Location: *49°07'30"N 123°11'13"W* (Steveston)*; 92 G/3.*
All of the south side of Lulu Island south of Westminster Highway. Colony includes shoreline areas of the Fraser River south arm and urban buildings away from the shore. It covers the southern part of the city of Richmond, including the village of Steveston (see Figure 154 on page 168).

Description: *Rooftops; Shoreline.*

Historical summary: At present, we have two records of Glaucous-winged Gulls nesting in this area. Two pairs were seen nesting in Steveston in 2008 on rooftop structures of the Gulf of Georgia Cannery buildings, a National Historic Site (Table SG-679). Adults were sitting in nests located within 5-10 m of each other, with two other adults nearby. In 2019, local resident Julian Hudson saw an adult with two young on the rooftop at 3171 Williams Road, near the West Dyke. We used the total of three nests seen at different locations in 2008 and 2019 as the best estimate of the current nesting populations for this colony area.

Caspian Terns have not been confirmed nesting in this area but Julian Hudson observed three adults carrying food at the shoreline at the west end of Williams Road on 14 July 2019.[524]

Table SG-679. Seabird nesting records (nests) for Lulu Island - South.

DATE	GWGU[a]	SOURCE
12 Jun 2008	x2	45
17 Jul 2019	x	524

[a] See text for derived total estimate of three pairs for the current breeding population.

SG-680 WESTHAM ISLAND

Location: *49°05'54"N 123°10'43"W* (Reifel Bird Sanctuary)*; 92 G/3.*
At the mouth of the south arm of the Fraser River, south of Steveston, west of Ladner. Westham Island officially includes Reifel Island, which is locally known as Smokey Tom Island. Colony includes the George C. Reifel Migratory Bird Sanctuary.

Description: *Tubs.*
The area at the north end of Westham Island was acquired by George C. Reifel in 1927 and was sold and donated to the federal government in 1972 to form the George C. Reifel Migratory Bird Sanctuary. That area also lies within the Alaksen National Wildlife Area.

Historical summary: Glaucous-winged Gulls built three nests in tubs erected for a Canada Goose project at the Reifel Sanctuary in 1972 (Table SG-680). In 1987 and 1988, Jim Perry from New Westminster reported one pair of gulls nesting in a galvanized tub on top of a piling in the sanctuary. Three young about two weeks old were seen in the nest in 1987. In 1988, an adult was sitting on the nest in June but the nest was abandoned in July.

Table SG-680. Seabird nesting records (nests) for Westham Island.

DATE	GWGU	SOURCE
Jun 1972	3	56
Jun 1972	0	523
20 Jul 1987	1	523
18 Jun 1988	1	523
23 Jul 1988	0	523

Remarks: As gulls were conflicting with the Canada Goose project in 1972, the nests were destroyed and the adults shot.

SG-685 SURREY - NORTH

Location: *49°11'25"N 122°50'57"W* (Surrey Library City Center Branch)*; 92 G/2.*
All of the City of Surrey (including the neighbourhood of South Westminster) lying north of 72nd Avenue (see Figure 154 on page 168). Colony includes shoreline areas of the Fraser River south arm and urban buildings away from the shore. This is a new colony designation since 2022.

Description: *Rooftops; Pilings; Docks.*
Industrial developments and rail yards dominate shoreline areas along the south arm of the Fraser River in the neighbourhood of South Westminster. Further inland are mostly commercial and residential buildings with a few green spaces.

Historical summary: In 2022, Michael Rodway and Heidi Regehr explored the Fraser River shoreline area west of Pattullo Bridge to the boundary of North Delta.[501] They viewed rooftops from River Road and from roads near the Fraser River north of River Road. No evidence of nesting was seen during that survey (Table SG-685).

Glaucous-winged Gulls were first reported nesting in this area of Greater Vancouver in 2023. From her room at the Civic Hotel in Surrey, biologist Abby Walter from Washington, DC photographed an adult feeding a large, downy chick on the roof of the Surrey Library City Center Branch building at 10350 University Drive (Figure 402). The location is 3.5 km from the nearest shore of the Fraser River, 10 km from the nearest salt water at the head of Burrard Inlet, and 11.4 km from the shore of Boundary Bay.

Table SG-685. Seabird nesting records (nests) for Surrey - North.

DATE	GWGU	SOURCE
11 Jul 2022	0[a]	501
21 Aug 2023	1	524

[a] See text.

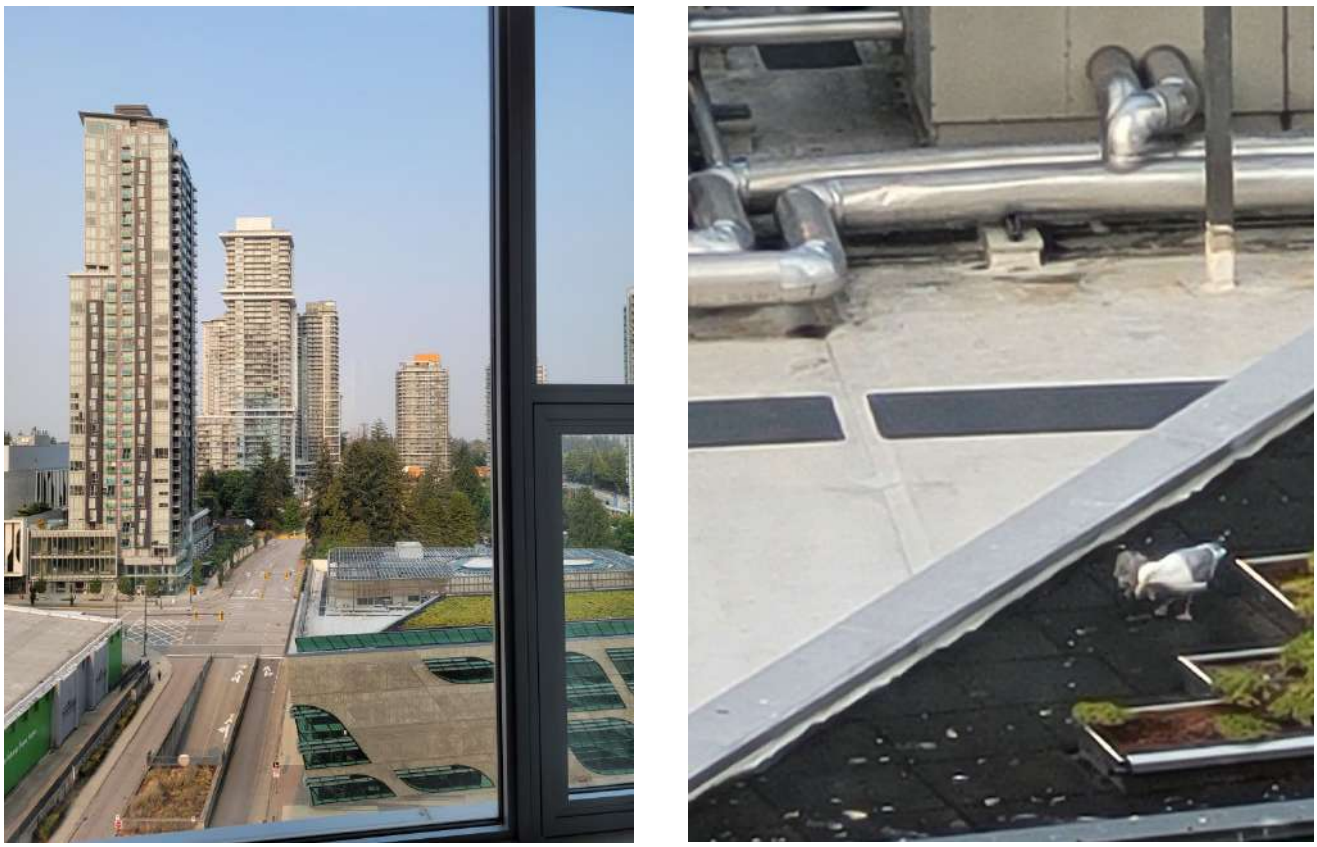


Figure 402. Glaucous-winged Gulls were first recorded nesting in the City of Surrey in 2023. An adult with a large, downy chick was seen on the roof of the Surrey Library City Center Branch building at 10350 University Drive on 11 July. This was a surprising first nesting location in this area as it is 3.5 km inland from the shore of the Fraser River. *Photos by Abby Walter, 11 July 2023.*

SG-690 SAND HEADS

Location: *49°06'20"N 123°18'12"W; 92 G/3.*
West end of the Steveston Jetty at the mouth of the south arm of the Fraser River, at the western edge of Sturgeon Bank.

Description: *Pilings; Dolphins; Beacon towers.*

Historical summary: Double-crested Cormorants were nesting on pilings and beacons near the Sand Heads lighthouse in 1985 (Table SG-690). Chatwin et al. noted nests on eight dolphins in 2000. Numbers declined since 1985 and all nesting locations were abandoned by 2009.

There have been no records of nesting seabirds on the Steveston Jetty or on the Sand Heads lighthouse. The jetty was checked on 7 August 1974 (Figure 403), and in 1981, Wayne Campbell was informed by Fisheries Officer John Lewis, who regularly patrolled the area, that waves splash over the jetty during storms and he had never seen or heard of gulls or cormorants nesting along the jetty.

Figure 403. Double-crested Cormorants have been recorded nesting on pilings and beacons off the west end of the Steveston Jetty, but there are no records of seabirds nesting along the 8 km-long jetty. *Photo by R. Wayne Campbell, 7 August 1974.*

Table SG-690. Seabird nesting records for Sand Heads. See Appendix 2 for codes.

DATE	DCCO	SOURCE
1985	100e	56
Jun 1987	86	428
May-Jul 1989	29	375
1993	12	376
1994	12	376
Jul-Sep 2000	35	114
2009	0	1, 101, 522

Remarks: This was one of the colony sites used by Terry Sullivan in his study of Double-crested Cormorants in 1993-1994.[376]

SG-700 ROBERTS BANK - SUPERPORT

Location: *49°01'10"N 123°09'43"W; 92 G/3.*
South of the Fraser River south arm estuary, north of the Tsawwassen Ferry Terminal. Colony includes the range light towers and other pilings and dolphins located between the Westport Coal Terminal and the Tsawwassen Ferry Terminal.

Description: *Jetty and port structures including docks, cranes, pilings, and offshore light towers.*
The port facilities are situated at the end of a 4 km-long, man-made causeway and first opened in 1970. Initially a coal port, the facilities have been greatly expanded since to also handle container traffic. Recently approved [593] is the proposed and controversial Roberts Bank Terminal 2 expansion, which will be a new container terminal to be built further offshore to the west of the current port facilities. It will also require widening of the causeway.

Historical summary: Wayne Campbell found no birds nesting anywhere on the Roberts Bank jetty or on the rocky breakwater perimeter of the coal port after a thorough search by boat and car in 1981 (Table SG-700). Some adult Glaucous-winged Gulls were seen but they were not nesting (Figure 404).

Figure 404. No seabirds were found nesting on the Roberts Bank jetty or terminal in 1981. Double-crested Cormorants and Glaucous-winged Gulls began nesting on structures around the port in 1986 and 1988, respectively. *Photo by R. Wayne Campbell, 2 June 1981.*

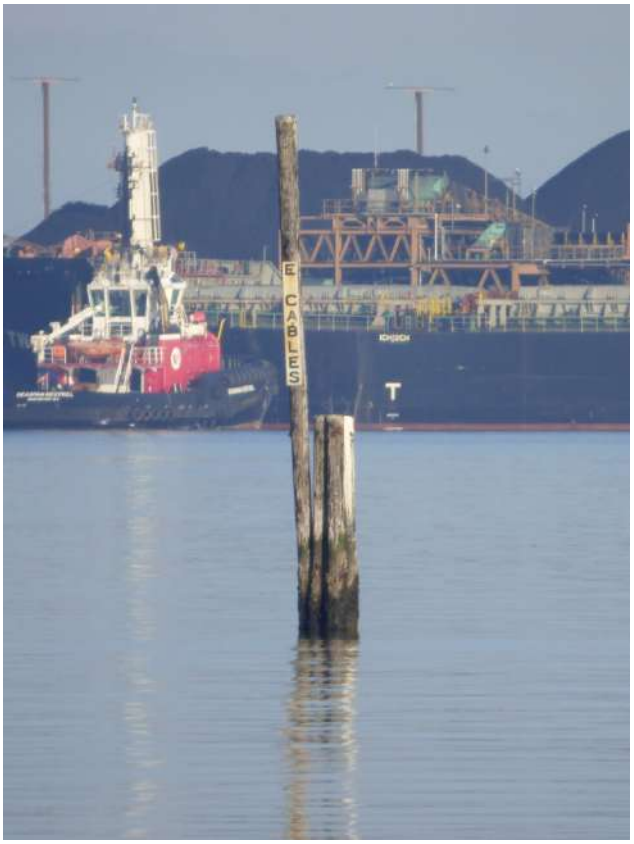
Since 1981, Double-crested Cormorants have nested on the two range light towers located south of the port facilities. Nests were first described in 1986. At least seven nests with incubating adults were visible in May 1988. In July 1988, Christopher Harris from Regina noted that two small colonies of nesting cormorants could be seen from the coal port causeway on markers or dolphins to the southeast of the port, which we assumed also referred to the range light towers. He counted 12 nests on the southerly marker and 24 nests on the northerly marker. Despite viewing through a spotting scope, the exact number of nests was hard to determine due to the distance to the markers. However, he could see incubating adult cormorants on the nests and adult birds leaving and coming to other nests. Maximum number of nests was recorded by Terry Sullivan in 1993. Numbers subsequently decreased and the towers had been abandoned by 2009. In 2022, scanning from the Tsawwassen ferry terminal, Moira Lemon and Christopher McNeill saw no sign of nesting on the range light towers or on other pilings visible between the ferry terminal and the superport (Figure 405).

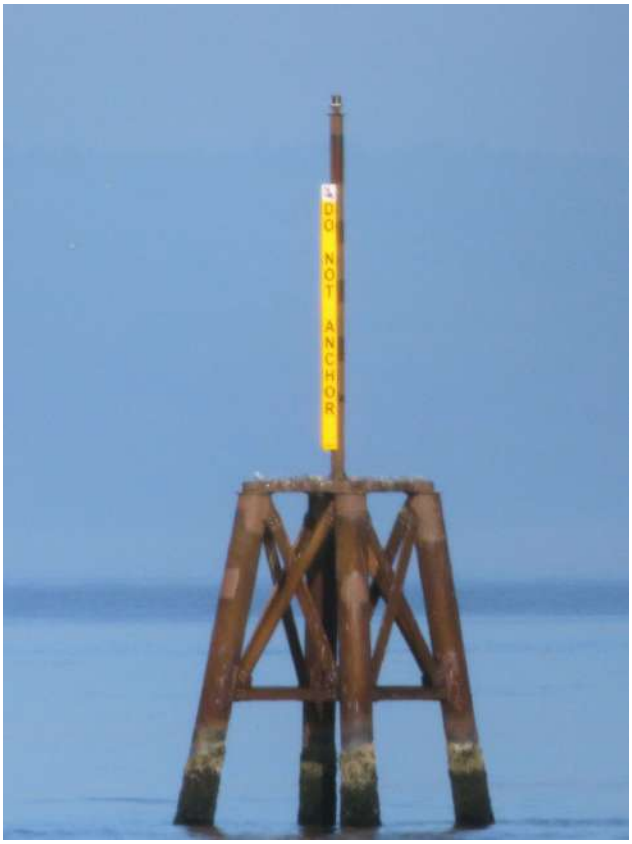
Harris saw at least three incubating adult Glaucous-winged Gulls nesting on the piles of coal in 1988. He also noted 11 Caspian Terns that he thought could have been nesting around the port and causeway.[524] We have no records about gulls nesting at the port since 1988.

Table SG-700. Seabird nesting records for Roberts Bank - Superport. See Appendix 2 for codes.

DATE	DCCO	GWGU	SOURCE
2 Jun 1981	0	0	523
1986	30e		56
Jun 1987	42		428
15 May 1988	7+		524
10 Jul 1988	36	3	523, 524
1993	52		376
1994	26		376
Jul-Sep 2000	11		114
2009	0		1, 101, 522
6, 20 Jul 2022	0		485

Figure 405. One of the range light towers (this page, left) off the south side of the Roberts Bank Superport causeway where Double-crested Cormorants nested between 1986 and 2000. The towers were partially covered with netting in 1994 and are completely enclosed in exclusion netting in this photo taken in 2022. No evidence of nesting was seen on any of the dolphins or pilings in the area in 2022 (this page and next page). *Photos by Moira J.F. Lemon (this page) and Christopher McNeill, July 2022.*





Remarks: Terry Sullivan included this colony in his study of Double-crested Cormorants in 1993-1994.[376] The decrease in the number of nests seen in 1994 was attributed to netting being placed on portions of the towers that limited nesting space. The towers were completely enclosed in exclusion netting when they were observed in 2022. Restoration of nesting habitat by removing the exclusion netting on the range towers or by creating other similar artificial nesting structures would be an appropriate and recommended mitigation measure associated with the superport development.

Egg laying, that typically begins in late April to mid-May at other colonies in the Strait of Georgia, was delayed until late July in 1994 and until early August in 1993. No evidence of disturbance or predation was observed in either year and reasons for the delayed nesting were unknown.

Shorebird Migration in the Salish Sea

The Salish Sea provides habitats for many wintering and migrating marine birds. But it is not just the open water areas that are important. For instance, the immense mudflats of the Fraser River Delta and Boundary Bay are an integral link in the chain of stop-over sites that support migrating shorebirds on their way between southern wintering areas in Central and South America and nesting areas in the north.[60] In spring, these mudflats are host to one of the most amazing wildlife spectacles in the Salish Sea.

Throughout the winter, flocks of Dunlin feed on the mudflats and in the surrounding agricultural fields of the Fraser River Delta at the northern extent of their wintering distribution. As winter fades, the arrival of spring brings a sudden flurry of activity on these mudflats. Huge flocks of tiny Western Sandpipers, and Dunlin from wintering sites further south, overwhelm the smaller but no less impressive flocks of other shorebird species also on their way to their own nesting sites (Figure 406).

From 1992 to 2013, as part of CWS's Western Sandpiper migration monitoring program,[147] I (Moira) conducted daily counts of sandpipers during the spring migration along the stretch of Roberts Bank between Brunswick Point (at the mouth of the Fraser Rivers' Canoe Pass) and the Roberts Bank Superport causeway (part of seabird colony SG-705). This was no easy task – the mudflats are immense, and at the peak of migration over 100,000 sandpipers could be present daily in the study site. The optimum survey time depended on the tidal cycle and was when either the rising or dropping tide confined the birds to a 250 m band of mud along the marsh edge. It was only at those times that it was possible to view the whole foraging area from a number of stops along the two and a half kilometer stretch of mudflat.

On warm days, when the tide was still far off in the distance, the flocks of sandpipers and the heat of the day would create a mirage on the horizon – a dark haze, which would occasionally rise up to give a hint of the magnitude of the flocks. Then as the tide rose and chased the birds shorewards, the shimmering clouds would clarify into dense flocks of sandpipers in a frenzy of feeding and flying. One moment they would be feeding with singular intensity, the next they would have instantaneously risen up, flying in undulating shapes, their movements precise and coordinated. It was mesmerizing to watch, the flocks pulsating from impossibly dense to thin and spread out, but always apparently in constant communication. These aerial flocks took on fantastical shapes – looming towers, spirals, sinuous serpent-like forms, amoeba shapes flying close to the water surface, or celestial bodies morphing from one shape to another (Figure 407). *These implausible shapes often formed as a result of coordinated evasive maneuvers when Peregrine Falcons were in pursuit.*

These mudflats are incredibly important as a "refueling" stop to these long distance migrants. Once thought to feed exclusively on a variety of invertebrates within the mud ecosystem, it is now known that Western Sandpipers also feed on a bacterial assemblage on the muds' surface known as biofilm. Research has shown that this biofilm provides an estimated 50% of the sandpipers' daily energy budget.[156, 243] *Industrial developments or other disturbances that pose threats to the growth and availability of biofilm could impact the sandpipers' ability to acquire the needed energy for their long distance migration* (Figure 408).

No sooner have the last couple of weeks in April swept by and May has hardly begun when the twittering multitudes of Western Sandpipers and Dunlin have moved on. With their energy reserves replenished they can continue their long journey northwards. With two large estuaries further north along the coast of North America to provide final major stopover sites, they then arrive in their arctic nesting grounds by about mid May.

Then in less than 2 months, in the first days of July, Western Sandpipers start to appear again on these life-sustaining mudflats, although not in such a hurried manner as in the spring. The females arrive first, the chicks left behind in the care of the males for a few short weeks. Shortly afterwards, the males arrive for a needed meal break, before continuing southwards. A slight pause, then in August the young of the year start to appear in the mudflat habitats of the Salish Sea having made their way southwards without any adult to guide them. Their belly plumage is a crisp brilliant white, feathers soft and new, in such contrast to the tired and worn feathers of the adults. Those feathers have transported and protected the adults over their immense journey with no time for a renewing molt until they reach their winter home in the south again.

Figure 406. A flock of Western Sandpipers and a few Dunlin rest with their bills tucked under their wings on a bit of exposed mud on Roberts Bank during the spring migration. *Photo by Moira J.F. Lemon, 25 April 2006.*

SG-705 ROBERTS BANK - FORESHORE

Location: *49°02'00"N 123°06'00"W; 92 G/3.*
Foreshore and dikes between the mouth of Canoe Passage of the Fraser River south of Westham Island and the Canada-U.S. border. Colony includes all foreshore areas at the base of the Roberts Bank Superport and Tsawwassen ferry terminal causeways (Figure 409).

Description: *Dike; Beach.*

Historical summary: An adult Caspian Tern with two flightless young was sighted on a sandy beach at Roberts Bank in 1984. There have been no other observations of nesting although adults are commonly seen in the area.[524] A pair of Black Oystercatchers with one chick was seen on the dike about 800 m north of the Tsawwassen ferry terminal in 2017 (Table SG-705).

Table SG-705. Seabird nesting records (nesting pairs) for Roberts Bank - Foreshore.

DATE	BLOY	CATE	SOURCE
21 Jun 1984		1	84
1986		0	56
17 Jun 2017	1		524

Figure 407. Two of the ever changing and enthralling shapes formed when sandpiper flocks take to the air. *Photos by Moira J.F. Lemon, 17 and 20 April 2012.*

Figure 408. A dense flock of Western Sandpipers and Dunlin roosting and feeding on the mudflat near Brunswick Point with the Roberts Bank Superport jetty in the background. *Photo by Moira J.F. Lemon, 22 April 2005.*

Figure 409. Roberts Bank foreshore from the base of the Roberts Bank Superport causeway looking northwest towards Brunswick Point and Canoe Pass, showing the marsh edge and a flock of sandpipers foraging on the tidally-exposed mudflats. Caspian Terns are frequently seen feeding on the mudflats in spring and summer. *Photo by Moira J.F. Lemon, 24 April 2005.*

SG-710 TSAWWASSEN - FERRY TERMINAL

Location: *49°00'57"N 123°07'00"W; 92 G/3.*
South of the Fraser River estuary, between Roberts Bank Superport and the Canada-U.S. border.

Description: *Jetty and ferry terminal docks and pilings.*

The Tsawwassen Ferry Terminal was constructed in 1959 to 1960. The terminal sits at the end of a 3 km-long, man-made causeway (Figure 410). It is the largest ferry terminal in North America, servicing ferries operating between the Lower Mainland and Vancouver Island.

Figure 410. The Tsawwassen Ferry Terminal and jetty were constructed in 1959 to 1960. Within a year of completion, Glaucous-winged Gulls were nesting along the jetty. *Photo by R. Wayne Campbell, 2 June 1981.*

Historical summary: Wayne Campbell remembers at least three pairs of Glaucous-winged Gulls nesting within a year after the Tsawwassen jetty and ferry terminal were completed in 1960 (Table SG-710). The greatest number of gull nests was seen in 1974. Nests that year were scattered along most of the length of the jetty and some nests were situated in deep recesses among the boulders. Three pairs were suspected nesting in 1977 but no nests were located. All nests were empty in 1978 but nests were just being completed and eggs had not yet been laid. Eggs were also still being laid in 1981. Nests in those latter two years were located near the tip of the rock jetty between the ferry berths. In 2008, an adult was seen sitting on a nest on the breakwater at ferry terminal berth 2. The nest was visible from the waiting room. A nest with one two-week-old chick was found on the jetty on 19 August 2012.

Table SG-710. Seabird nesting records for Tsawwassen - Ferry Terminal. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
~1961			3+		523
7 Jul 1974			9[7]		70, 523
2 Jul 1977			3eS		523
7 Jun 1978			4S		523
1979-1986				1	56
2 Jun 1981			7[3]		523
1989		1			457
Aug 1990				S(1)	457
9 Jun 1995		1			524
29 May 1997		1			524
10 Jun 1998		1			524
10-20 Jun 2006		1eS	x		57, 524
9 May, 7 Jun 2007		2[1]	4		456
11 Jun 2008			x		45
13-20 Jun 2010			4		30
May-Aug 2012		1	x	(2)	524
May-Aug 2013				(4)	524
May-Aug 2014		1	x	(8)	524
May-Aug 2015		1	1+	(1)	524
May-Aug 2016		1		(3)	524
May-Aug 2017		1	x	(3)	524
May-Aug 2018		1	x	(2)	524
May-Aug 2019			x	(3)	524
May-Aug 2020		1	x	(8)	524
May-Aug 2021		1	x	(7)	524
6, 19 Jul 2022	4		8		485
9 Jul-16 Aug 2022		1			524
17 May 2023	x	2[2]	x3+		524, 605

More recently, gulls have also been reported nesting on ferry terminal structures. Rob Butler saw four nests on pilings on 7 June 2007. Two downy chicks were spotted in a nest at the terminal on 11 August 2014. In 2015, four young were seen at the terminal on 15 July, and two downy chicks with adults were seen on the rooftop of a building along the jetty on 1 August. In 2017, a pair was seen building a nest on a piling on 3 July, nests with young were reported on 15 July, and an adult on a nest was seen on 26 July at the terminal. Two fledglings were seen on 21 August 2018. Nests with young were seen from the foot passenger waiting area on 29 July 2019, 11 July 2020, and 22 July and 4 August 2021. In 2022, Moira Lemon and Christopher McNeill observed nesting birds while they were on the ferry waiting to depart from Berth #3 on the Duke Point ferry on 19 July. They could see: two nests each with three large young on the pilings of the passenger loading ramp for Berth #3; one nest with an attending adult on one of the concrete supports of the vehicle loading ramp; and three nests with adults sitting in them on the walkway out to the outer concrete buttresses on the south side of Berth #3. Earlier, on 6 July 2022, Lemon also saw two nests, one with an adult sitting, on the sloping roof of the ferry traffic control tower (Figure 411). Several pairs were confirmed nesting in 2023. Ashlea Veldhoen reported adults sitting on two nests at the walkway to berth #5 on 11 June.

Several nests were observed tucked into the dock infrastructure on 28 June. Zachary Tonzetich photographed an adult feeding a still-downy chick on one of the metal dock beams on 30 July.

Figure 411. Eight Glaucous-winged Gull nests were seen on various structures at the Tsawwassen ferry terminal in 2022, including the two nests visible in this photo of the roof of the ferry traffic control tower. *Photo by Moira J.F. Lemon, 6 July 2022.*

Black Oystercatchers were first observed nesting by Wayne Campbell in 1989. Roger Burrows from New Brunswick photographed a nest with three eggs in 1995. A nest with two eggs was seen in 1997, a pair with two downy young was recorded in 1998, and Butler and Golumbia [57] suspected a pair nesting in 2006. On 9 May 2007, Butler found one nest with two eggs on the west side of the terminal and a pair attending an empty scrape on the east side. Two unfledged juveniles were reported on 29 June 2012. In 2014, a pair, with one bird on a nest, was sighted on 5 June, and fledged young were seen at the site on 10 July. In 2015, a nest held eggs on 16 May and two young on 30 June, and fledglings were seen on a number of occasions in July. Agitated adults were performing distraction displays on 18 June and were defending a small chick on 30 June 2016. One fledged young with adults was seen later on 6 July. A pair was again present and suspected nesting on 7 May, and two adults were seen feeding two young on 20 June 2017. Adults with young were again seen on 23 June 2018, in August 2020, and in July and August 2022.

In 2023, while on a ferry leaving the dock, Richard Marshall observed a pair of oystercatchers taking turns sitting on a nest with 2 eggs on 18 June. The nest was located on a pile of gravel in the middle of the dock finger. Likely the same nest was photographed by L. Smith on 19 June (Figure 412). Between 3 and 24 July, several observers, including Mohammad Nazmul Hassan Bhuiyan, Pam Cahn, Joe Denham, Mike Fung, Krissi Martin, Jeffrey Nicholls, and Barbara Webster, reported a pair with 2-3 young along the ferry jetty.

Figure 412. In 2023, a pair of Black Oystercatchers nested on the concrete buttresses of one of the ferry slips in full view of ferry patrons. *Photos by L. Smith, 19 June 2023.*

Butler and Campbell reported that at least one pair of Pigeon Guillemots nested among pier structures at the ferry terminal from 1979 to 1986.

There have been no confirmed breeding records since but there are numerous recent records on eBird of small numbers of guillemots in the vicinity.

Pelagic Cormorants were first observed nesting in 2022. While waiting to depart from Berth #3 on the Duke Point ferry, Lemon and McNeill could see four nests, three with adults sitting on them, situated on ledges on the outer face of the westernmost of the concrete buttresses on the south side of Berth #3. In 2023, Scott Wilson reported 11 cormorants, including adults sitting on nests, in the same location.

Although nesting has not been confirmed, Caspian Terns have been frequently recorded and evidence of nesting in the vicinity has been reported.[524] Delta resident Brian Self counted 111 adults and 14 fledged young, many begging for food, on 20 July 2005. In 2015, Hui Sim from Burnaby saw one pair copulating on 25 June, Michelle Hamilton saw adults feeding two juveniles on 4 September, and Michael Shepard saw an adult carrying a fish and a begging juvenile on 4 October. Rick Zapf from Burnaby recorded two adults feeding one juvenile on 6 August 2017, and a group of seven birders from Taiwan and Wisconson, including Pei-Tsen Liao, Tsai Yi-Hua, Michael Yablick, Louise Venne, Lee-Lien Wang, Da Chih Chen, and Jo-Szu Tsai, reported feeding of recently fledged young and a total of 13 birds on 24 August 2018. In 2020, recently fledged young were reported by Vancouver resident Ilya Povalyaev on 2 August (total of 8 birds) and by Melissa Hafting on 20 August (total of 4 birds). Courtship behaviour in a group of 30 birds was noted by James Park on 20 July 2021.

SG-720 TSAWWASSEN - BREAKWATER

Location: *49°00'12"N 123°07'32"W; 92 G/3.*
Just south of the Tsawwassen Ferry Terminal; the southwest end of the breakwater is only 56 m north of the Canada-U.S. border.

Description: *Rocky breakwater.*
This 330 m-long breakwater was constructed in association with the Tsawwassen Ferry Terminal, which was completed in 1960.

Historical summary: Glaucous-winged Gulls were first recorded nesting in 1970 (Table SG-720). Numbers steadily increased and numbers of nests estimated on the most recent survey in 2010 exceeded the highest actual nest count in 1985 and 1986, contrary to recent trends at the majority of colonies in the BC Salish Sea (Figure 413). Many nests were empty in 1978-1981, but surveys occurred early in the season in those years and egg laying was still in progress. Thirty adults on territories, including four adults with large young, were visible from the ferry in 1990. Thirty adults, with birds on nests, were also recorded in 2016.

Figure 413. Large numbers of Glaucous-winged Gulls colonized the Tsawwassen breakwater after it was constructed in 1960. Totals of 115 and 223 nests were counted along the breakwater in 1974 (previous page) and 1981, respectively. *Photos by R. Wayne Campbell, 7 July 1974 and 2 June 1981.*

A few non-breeding Double-crested and Pelagic cormorants were roosting on the breakwater in 1981 but there was no sign of nesting by cormorants.

Table SG-720. Seabird nesting records for Tsawwassen - Breakwater. See Appendix 2 for codes.

DATE	GWGU	SOURCE
1970	10e	87
7 Jul 1974	115[102]	70, 523
2 Jul 1977	160[147]	56, 523
7 Jun 1978	150[103]	56, 523
8 Jun 1980	191[165]	56, 523
2 Jun 1981	223[106]	56, 523
1985	238	56
Jun 1986	238	420
26 Jul 1990	x	524
13-20 Jun 2010	250e	30
5 Jun 2016	x	524

Remarks: Signs of river otter were seen in 1981 but all scats were composed of fish remains and there was no evidence of predation on nesting gulls. One dead adult gull was found that had been tangled in fishing line.

Vermeer collected regurgitated pellets from gulls as part of a comparative study of adult and chick diets on the east and west coasts of Vancouver Island in 1980.[415]

SG-730 WHITE ROCK

Location: *49°01'23"N 122°47'52"W; 92 G/2.*
North shore of Semiahmoo Bay from the Canada-U.S. border west and north to the Nicomekl River (see Figure 154 on page 168). Colony includes all shoreline areas and urban buildings away from the shore. The City of White Rock is part of this colony.

Description: *Rooftops, Pier.*

Historical summary: Glaucous-winged Gulls have nested on rooftops in White Rock likely since at least 2010. In 2010, an adult was repeatedly observed carrying grass and sod to the same rooftop location at 1656 Martin Drive in the Semiahmoo Shopping Centre (Table SG-730). That location is 1.2 km from the ocean shoreline. In 2017, Ed Kroc located four rooftop nests in an area close to shore that he surveyed along Marine Drive from Anderson Street to Johnson Road, inland as far as Victoria Avenue. In 2020, a pair was seen at a rooftop nest at 952 Kiel Street on 8 May, and a gull nest with three eggs was discovered on the roof of the RCMP building on Pacific Avenue on 26 June. The nesting gulls on the RCMP building made the news on 9 July when a downy chick was found on the ground and was rescued by police officers, who placed it back in the rooftop nest. The two 2020 nest locations are 0.6 and 0.5 km from the sea, respectively. Gulls have also been reported nesting on the White Rock pier; an adult on a nest was seen in 2013. Cumulatively, these records suggest a nesting population of at least eight pairs in this colony.

Table SG-730. Seabird nesting records for White Rock. See Appendix 2 for codes.

DATE	GWGU[a]	SOURCE
6 Jul 2010	1S	45
23 May 2013	x	524
May-Aug 2017	x4	480
May-Jul 2020	x2	217, 524

[a] See text for derived total estimate of eight pairs for the current breeding population.

GULF ISLANDS

The Gulf Islands is the second of the two geographic regions we have used to organize colony accounts for the BC Salish Sea (see Figure 149 on page 160; also see Figure 58 on page 58 in Part 1 [335]). Current estimates as of 2022 of seabird breeding populations at each colony in the Gulf Islands are listed in Table 9. Summary information for this region was presented together with that for the Northern Strait of Georgia in the introduction to seabird breeding populations in the BC Salish Sea (Table 1 on page 92). This provided a more coherent account of the status, trends, and conservation issues for breeding seabirds throughout the inner waters of the BC Salish Sea. Here we continue the colony accounts for the areas along the east side of Vancouver Island from Nanoose to Victoria (Figures 414 to 416).

Table 9. Current estimates of seabird breeding populations at colonies in the Gulf Islands as of 2022. Estimates are numbers of breeding pairs except for numbers in parentheses and totals in the "All species" column, which are numbers of individuals. Numbers in parentheses, given mainly for Pigeon Guillemots, are numbers of birds counted around colonies, likely include non-breeding birds, and thus are not reliable estimates of actual breeding populations. See Appendix 2 on pages 655-656 for an explanation of the letter codes used to qualify population estimates.

SITE CODE	SITE NAME	DCCO	BRCO	PECO	BLOY	GWGU	PIGU	RHAU	TUPU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
GI-010	Ballenas Islands			0	1	0	S(20)			22	1987, 2006, 2014, 2021
GI-012	Mistaken Island				1					2	2023
GI-015	Yeo Islands				2	1S				6	1978, 1981
GI-020	Ada Islands				0	73				146	2010
GI-030	"Wallis" Rocks – this colony site has been deleted (see colony account for Ada Islands)									n/a	n/a
GI-040	Maude Island					0				0	2010
GI-045	Long Lake					1				2	1986
GI-050	Five Finger Island	0		0	1	9	S(8)			28	2003, 2010, 2014
GI-060	Hudson Rocks	0		0	3eS	10eS	S(1)			27	2003, 2010, 2019
GI-070	Snake Island			0	2	23e	S(8)			58	2003, 2010, 2014
GI-074	Entrance Island				3		(1)			7	2003, 2014
GI-076	Brandon Islands				4e	3S	S(2)			16	1999
GI-080	Newcastle Island - East Dock						1			2	1976
GI-085	Nanaimo Harbour				1	100e				202	1989, 2020
GI-089	Descanso Bay						S(1)			1	2020
GI-090	Gabriola Island - West Cliffs	154		86		1	S(10)			492	2020, 2023
GI-095	Harmac - Mill					100e+				200	2005
GI-100	Gabriola Island - East Cliffs					1	(0)			2	1977, 1987
GI-110	Carlos Island				1	1				4	1978, 2018
GI-112	Breakwater Island					1S+	x(35)			37	2012
GI-120	Mudge Island				0		(0)			0	1987
GI-130	Round Island					3	(0)			6	1981, 1987
GI-140	Link Island						S(48)			48	2016
GI-150	De Courcy Island			0		0	(3)			3	1987, 2010, 2018
GI-160	Valdes Island - West Cliffs			19		1	x(83)			123	2015, 2018, 2022
GI-170	Ruxton Island				1	2	(6)			12	1986, 2018, 2023
GI-171	Whaleboat Island					1				2	1986
GI-180	Tree Island				0	2				4	1978, 1987
GI-190	Miami Islet				0	5eS	(0)			10	1987, 2010
GI-195	Ladysmith Harbour	0								0	2019
GI-200	Ragged Islets				1S	28	S(2)			60	1987, 2010
GI-210	Rose Islets	0		0	0	0	(3)			3	2014, 2019
GI-220	Canoe Islet	2+			1	1S				8	2005, 2014, 2019
GI-230	Galiano Island - North Cliffs			0		6	S(26)			38	1986, 1987, 2014
GI-238	Scott Island				2					4	2010
GI-240	"Preedy" Rock					2				4	1978
GI-250	Augustus Point			8		8	(0)			32	1986, 1987, 2019
GI-258	Jackscrew Island				1S					2	2010
GI-260	Wallace Island				1	3	(5)			13	1986, 2005, 2017
GI-270	Tent Island			14		12	S(2)			54	1986, 1987, 2019
GI-280	Bare Point	0		0		5	S(6)			16	1986, 1987, 2019
GI-285	Chemainus - Harbour					3	2			10	1974, 2010
GI-290	Shoal Islands	0			0	1	(0)			2	1978, 1987, 2020
GI-292	Crofton - Mill					20e				40	2016

Table 9. cont'd

SITE CODE	SITE NAME	DCCO	BRCO	PECO	BLOY	GWGU	PIGU	RHAU	TUPU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
GI-300	Cowichan Lake					1				2	1985
GI-310	Vesuvius Bay					4				8	1986
GI-320	Ballingall Islets	0		0	1	0	(30)			32	2010, 2014, 2015, 2019
GI-330	Galiano Island - Central Cliffs	0		6		1eS	x(1)			16	2009, 2010, 2019
GI-340	"Wise" Rock				1S	0				2	1978, 2005
GI-350	Charles Island	0		0						0	1987
GI-360	Parker Island - Cliffs						(0)			0	1987
GI-370	Galiano Island - South Cliffs					0	S(10)			10	1978, 1987
GI-380	Lion Islets					1				2	1986
GI-390	"Gossip" Rock					1				2	1986
GI-400	Galiano Island - Active Pass Cliffs			0			x(89)			89	2000, 2021, 2022
GI-408	Clamshell Islet						(0)			0	1987
GI-410	"Long Harbour" Islet					~1[c]				2	1986
GI-420	Chain Islands	0		0		~5[c]	S(4)			14	1986, 1987, 2000, 2009
GI-424	Hawkins Island				1S	0				2	1978, 2011
GI-426	Portlock Point						(30)			30	2017
GI-430	Annette Inlet	0								0	2009
GI-440	Red Islets	0			1eS	1S				4	1978, 2009, 2023
GI-450	Prevost Island - South Cliffs			0		3	S(47)			53	1978, 1987, 2021
GI-460	Channel Islands	0			1S	1[d]	(0)			4	1987, 2014, 2015, 2023
GI-465	"Grainger" Rocks				1					2	2012
GI-470	Belle Chain Islets				8eS	32	(6)			86	2012, 2016, 2023
GI-480	"Minx" Rocks				1eS					2	2023
GI-490	Pine Islet				0	3				6	2014, 2023
GI-500	Cabbage Island				0		(10)			10	2012, 2023
GI-510	East Point - Cliffs			1		7	(6)			22	1986, 2013, 2017
GI-520	Lyall Harbour - Cliffs					1	(0)			2	1986, 1987
GI-530	Elliot Bluff			0			(0)			0	1987, 2013
GI-535	Razor Point - Cliffs						x(55)			55	2019
GI-540	"Croker" Rock					0				0	1978
GI-550	Java Islets				6eS	42	S(15)			111	1987, 2012, 2023
GI-560	Blunden Islet					0				0	1980
GI-570	Oaks Bluff			11			(10)			32	2014, 2017
GI-580	"Peter" Rock				0					0	2023
GI-588	"Kingfisher" Rocks				1					2	2005
GI-590	Jackson Rock				1eS	0				2	2015, 2023
GI-595	Fulford Harbour					1				2	2022
GI-600	Isabella Island				0					0	2023
GI-610	Pellow Islets				0		(0)			0	1987, 2023
GI-620	Tortoise Islets				1	1S				4	1978, 2023
GI-630	Arbutus Island	0		54	2eS	45	x(13)			215	2020, 2022, 2023
GI-640	Hatch Point - Wharf					2	2			8	1981
GI-650	Pym Island				0					0	2005
GI-656	Swartz Bay - Ferry Terminal			6		1	1(2)			16	1995, 2020, 2023
GI-660	"Swartz Head" Rocks				0	1				2	1978, 1987
GI-665	Point Fairfax				0					0	1987
GI-670	Imrie Island				6S	0	x(21)			33	1999, 2007, 2023
GI-680	Reay Island				0	0	(0)			0	1999, 2010, 2023
GI-690	Greig Island				1S	21	x(3)			47	2010, 2012, 2023
GI-700	"Killer Whale" Rocks				0					0	2005
GI-710	Little Group			0	3eS	0	S(5)			11	1999, 2010, 2023
GI-720	Rubly Island				0	0				0	1978, 2005
GI-725	Gooch Island						(1)			1	2016
GI-726	Rum Island				1					2	2017
GI-730	Forrest Island				0		(0)			0	1987, 1997
GI-735	Sidney Spit				3					6	1997
GI-740	Sidney			3		10e	x(1)			28	1974, 2019, 2023

Table 9. cont'd

SITE CODE	SITE NAME	DCCO	BRCO	PECO	BLOY	GWGU	PIGU	RHAU	TUPU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
GI-750	Mandarte Island	398	12	598	6	2,432	x(300)	15e	E	7,222	1997, 2009, 2010, 2019, 2020, 2022, 2023
GI-760	Halibut Island				0		S(4)			4	1987, 2005
GI-765	James Island - West Dock						x(8)			8	1987
GI-770	Sallas Rocks				3eS	8				22	2011, 2023
GI-780	Little D'Arcy Island				3eS	3				12	2014, 2023
GI-782	Unit Rocks				1S					2	2023
GI-790	Gordon Head			0	1S					2	2014, 2016
GI-800	Ten Mile Point				1	0				2	2023
GI-810	Flower Island				0					0	2005
GI-820	Jemmy Jones Island				1	1S				4	1978, 2021
GI-825	Chatham Islands				1					2	2012
GI-830	Discovery Island				1		(20)			22	2005, 2022
GI-840	Fiddle Reef			0						0	2022
GI-850	Mary Tod Island				0	0				0	2021, 2022
GI-860	Emily Islet				1eS		S(15)			17	2022
GI-870	Lewis Reef			0						0	2022
GI-880	Harris Island			0	1eS	0	S(35)			37	2021, 2022
GI-890	Chain Islets/Great Chain Island	0		5	4eS	2,066	x(172)			4,322	2005, 2009, 2021, 2023
GI-900	Trial Islands			0	2e	72	S(12)			160	2019, 2021, 2022
GI-905	Ogden Point - Port				1	57	25e(58)			174	2018, 2020, 2021
GI-910	Harrison Island					1				2	1980
GI-915	Berens Island				1					2	2014
GI-920	Colvile Island				1S					2	2020
GI-925	Pelly Island				1S					2	2020
GI-930	Victoria					700e				1,400	2018-2020
GI-938	Gillingham Islands				1					2	1980
GI-940	Brothers Islands			0	1S	0				2	2021
GI-950	Coburg Peninsula				1eS					2	2017

[a] Number of individuals.
[b] For sources see individual colony accounts.
[c] See colony account.
[d] The nest contained two addled eggs and was abandoned.

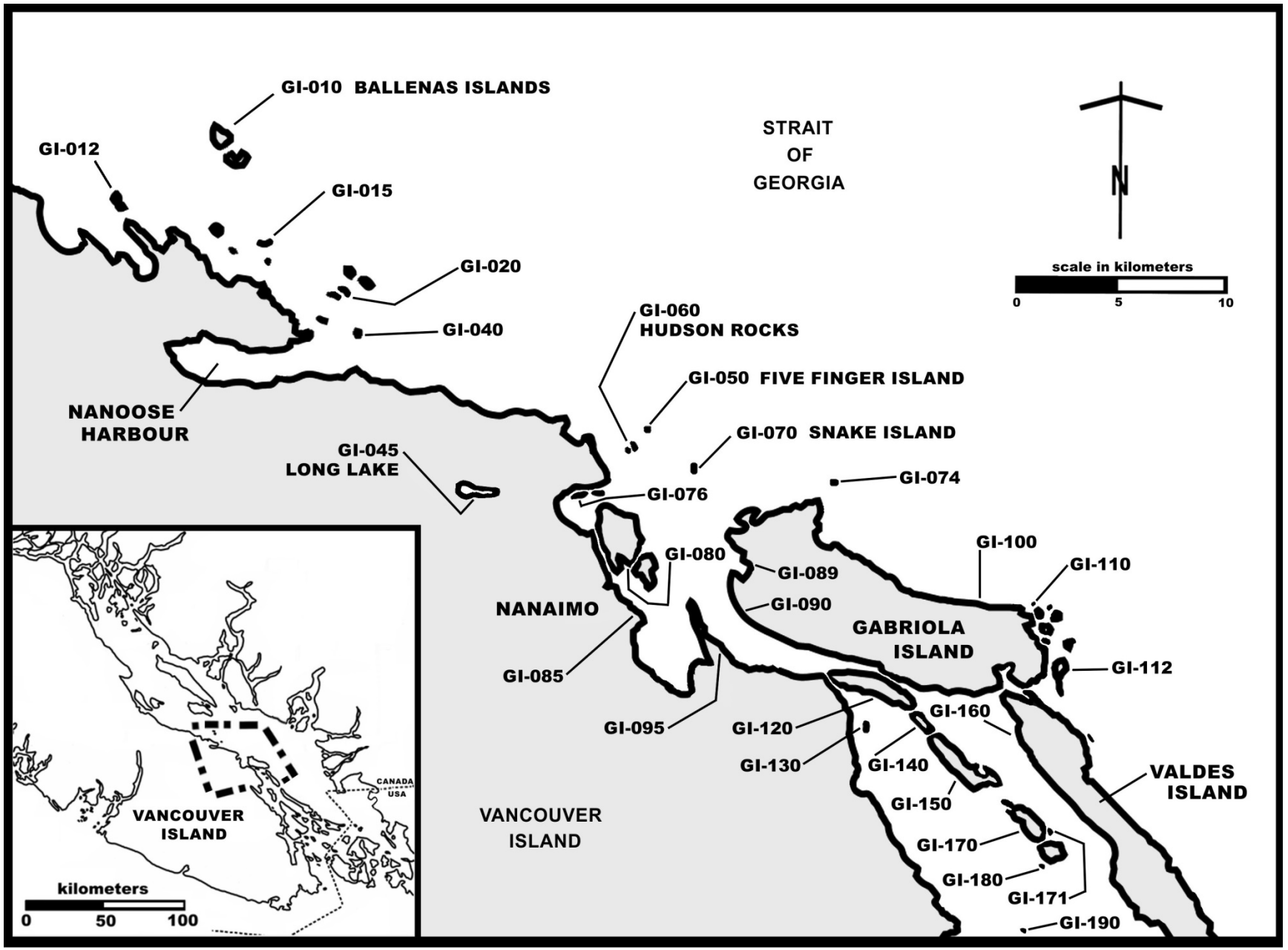


Figure 414. Locations of seabird colonies in the Gulf Islands - northern section (colonies GI-010 to GI-190).

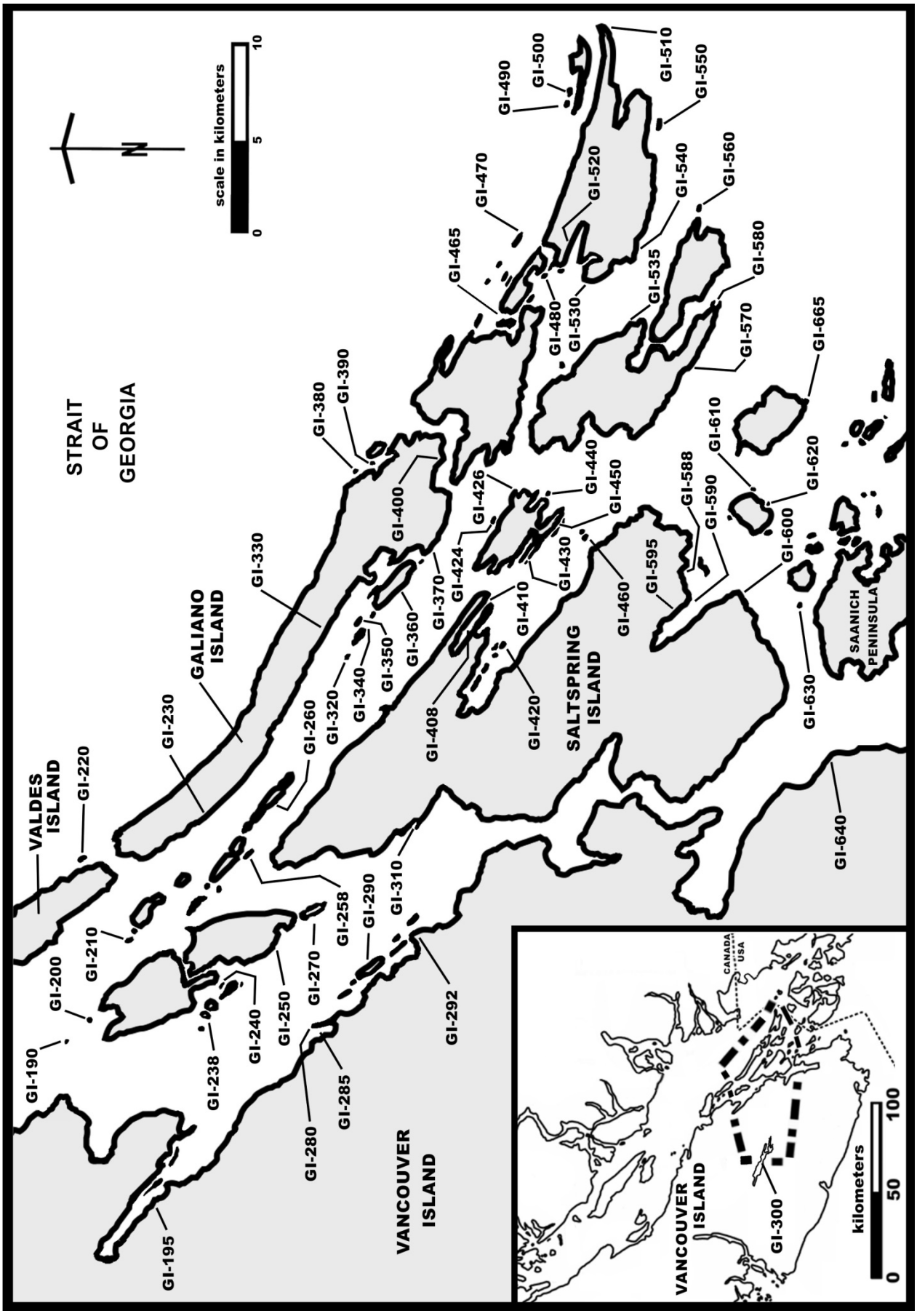


Figure 415. Locations of seabird colonies in the Gulf Islands – middle section (colonies GI-190 to GI-640 and GI-665).

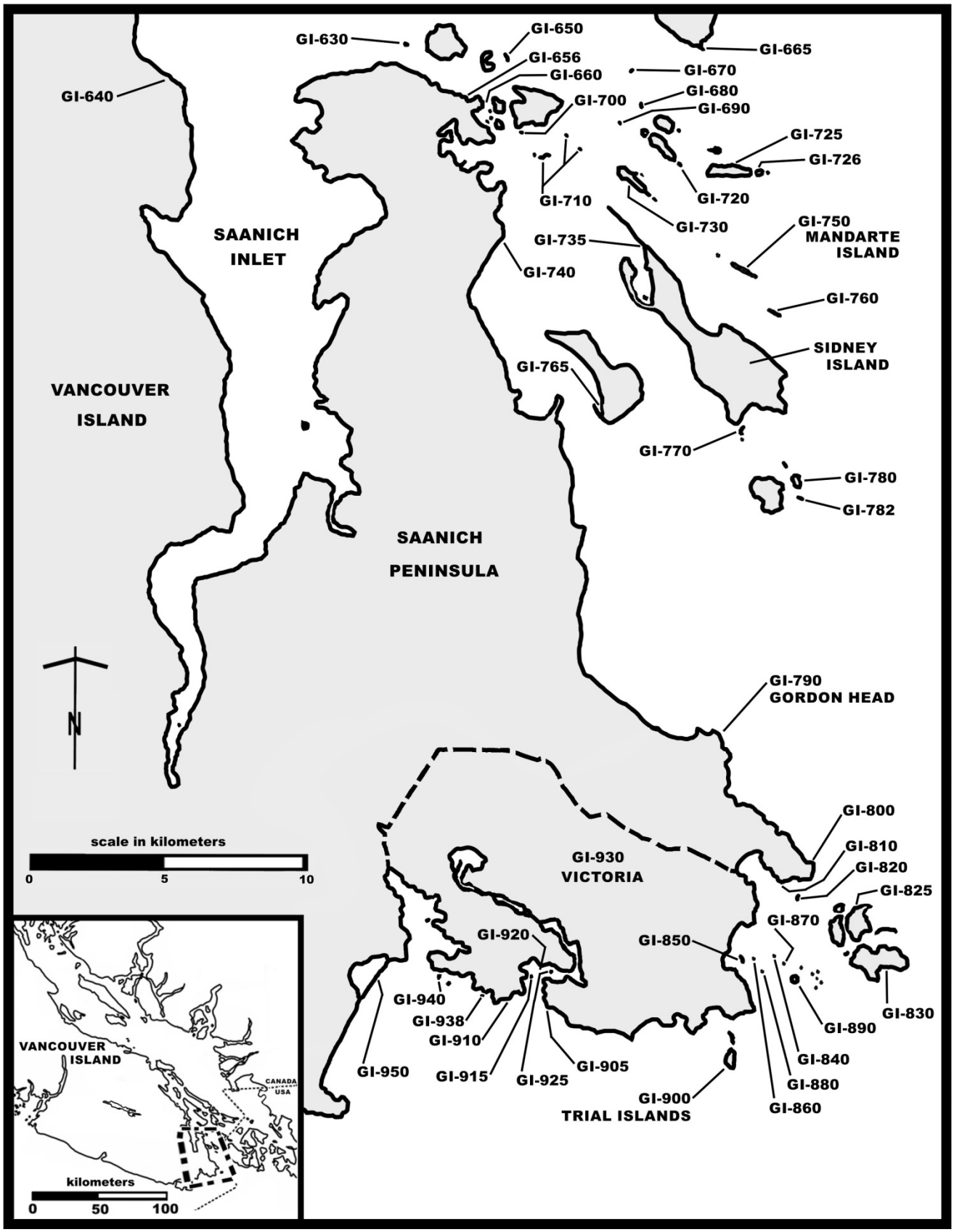


Figure 416. Locations of seabird colonies in the Gulf Islands – southern section (colonies GI-630 to GI-950).

GI-010 BALLENAS ISLANDS

Location: *49°20'47"N 124°09'29"W; 92 F/8.*
About 8 km north of Nanoose Harbour.

Description: *72 ha; 47 m high; Forested; Grassy rock; Cliffs.*
The north and south Ballenas islands are about 36 ha each. Shorelines are rocky and often steep, with cliffs along the east side of the north island. Higher sections are forested, but in many areas the forest is fragmented with extensive patches of exposed rock (Figure 417). Some areas are grassy, especially around the lighthouse. There is a small, 1 m-high rock between the two main islands.

A wooden lighthouse tower was built on a knoll on the southeasterly part of the south island in 1900. In 1907, a building to house a fog alarm and a wood-frame dwelling were added on the northern tip of the north island. The light operated on the south island until 1912, at which time it was dismantled and moved to a site near the fog alarm on the north island. A new dwelling, a boathouse, and other structures were also added at that time. The light tower was replaced in 1917 with a concrete tower. The lighthouse was de-staffed in 1996 and has been maintained as an automated station since.

Ballenas Islands were privately owned when the first lighthouse was established and the owners became the first lightkeepers. Presently, the Department of National Defence owns and manages the south island and the northern tip of the north island is owned by the Federal Government for the operation of the lightstation. Until recently, the rest of the north island was still privately owned and in April 2019 was for sale for $3.6 million. BC Parks Foundation campaigned to protect the island and successfully raised enough money to purchase the island for $1.7 million in November 2020. Plans are to designate the island area as a provincial park, in consultation with the Snaw-naw-as First Nation.

Figure 417. Views of the north (top) and south Ballenas Islands showing the extensive, exposed, rocky habitats interspersed with forested areas. *Photos by R. Wayne Campbell, 4 July 1974.*

Historical summary: Pelagic Cormorants and Glaucous-winged Gulls have abandoned these islands. Mary Waldern, who had previously been stationed with her husband Arthur at the Sisters Islets lighthouse, confirmed nesting by Pelagic Cormorants, Glaucous-winged Gulls, and Pigeon Guillemots in the years 1952-1956 (Table GI-010). Cormorants were nesting on cliffs along the northeast side of the north island up until 1981 (Figure 418) but have not been recorded since. They may have ceased breeding on the island earlier: nests were inactive in 1980; and two nests had been built, plus two others had been started, but breeding was not confirmed in 1981. All surveys of cormorant nests since the 1950s were conducted from the water. The islands were not surveyed during the major cormorant survey in 2000 [114] but Trudy Chatwin kayaked by these islands in 1999 and saw no cormorants nesting.[459] None were present in 2014.

Figure 418. Pelagic Cormorants nested on the cliffs along the northeast side of the north island of the Ballenas Islands up until 1981. The colony was well established in the 1950s, 55 nests were counted in 1968, and 30-40 pairs were estimated nesting in 1969 when these photos were taken. *Photos by R. Wayne Campbell, May 1969.*

Table GI-010. Seabird nesting records for Ballenas Islands. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
1952-56	x		50e	10e	144
10 Jun 1968	55		5eS	3	523
13-29 May 1969	30-40		20e[a]	x	74, 523
4 Jul 1974	24	0	0	S(6)	70, 523
5 Jun 1978	46				523
20 Jun 1980	6-inactive			S(26)	523
8 Jun 1981	2		2eS	S(18)	523
29 May-13 Jun 1983	0				421
Jun 1986			0		420
Jun 1987	0	1		S(4)	158, 427, 428
1999	0				459
2006			0		30
2007	0				522
2009	0				522
2014	0				101, 522
31 May 2021				S(20)	524

[a] Blight [30] erroneously listed 120 pairs for 1969.

Maximum numbers of Glaucous-winged Gulls were estimated nesting by Mary Waldern in the 1950s. In 1968, Drent saw only a few pairs from the water, and in 1969, Campbell and Foottit reported a small colony of about 20 pairs on the north island. Gulls had ceased nesting by 1974, although two pairs were suspected nesting in 1981 on the cliffs where the cormorant colony has been located. None have been seen since.

Campbell and Foottit noted good numbers of Pigeon Guillemots breeding in 1969. Six guillemots were seen offshore and suspected nesting in 1974. Largest numbers recorded were in 1980 and 2021. In 2021, ornithologists John M. Cooper and Suzanne

Beauchesne recorded three individuals on the south side and 17 on the north side at likely nesting cliffs.

Black Oystercatchers have been recorded nesting only in 1987. We have no subsequent records for that species.

Remarks: The islands are subject to high levels of human disturbance. In addition to lighthouse and National Defence activities, the islands, as part of the Ballenas/Winchelsea Archipelago, are a popular boating and recreational area near the expanding urban populations of Nanaimo and Parksville. The south island is known for its beach and backshore camping opportunities, while the north island offers hiking with excellent view points from the island's summit.

GI-012 MISTAKEN ISLAND

Location: *49°19'21"N 124°13'07"W; 92 F/8.*
Off Cottam Point at the entrance to Northwest Bay, east of Rathtrevor Beach Provincial Park. Colony includes the rock off the north end.

Description: *14 ha; 41 m high; Forested; Bare rock.*
The main island is mostly forested, with many open patches and rocky outcrops through the interior. The shoreline is rocky with a few pocket beaches. The small, north rock is bare. The island is privately-owned and there is a dwelling on the mid-east side.

Historical summary: An adult Black Oystercatcher feeding a large, flightless chick was photographed by eBird contributor Cos van Wermeskerken in 2023 (Table GI-012). The precise location of the adult and chick was not specified. This is a new nesting site for oystercatchers and a newly designated colony.

Table GI-012. Seabird nesting records (nests) for Mistaken Island.

DATE	BLOY	SOURCE
14 Jul 2023	1	524

GI-015 YEO ISLANDS

Location: *49°18'19"N 124°08'06"W; 92 F/8.*
On the south side of Ballenas Channel, south of Ballenas Islands, north of Schooner Cove.

Description: *4.3 ha; 16 m high; Grassy rock; Bare rock.*
Yeo Islands are comprised of one main, large island with a couple of small bare rocks off the east and west ends. The large island has a convoluted rocky shoreline, and some rocky knobs are separated at the highest tides. Higher sections are covered with grasses with some patches of shrubs.

Historical summary: Black Oystercatcher pairs were seen on these islands in 1974 and 1978 (Table GI-015). They were confirmed nesting in 1981 when Mike McNall found two nests with three eggs each; one nest on the south side of the main island and one on the east rock. One empty Glaucous-winged Gull nest was found in 1978.

Table GI-015. Seabird nesting records for Yeo Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
4 Jul 1974	2eS		523
5 Jun 1978	1eS	1S	523
8 Jun 1981	2[2]		523

GI-020 ADA ISLANDS

Location: *49°17'07"N 124°05'38"W; 92 F/8.*
North of the mouth of Nanoose Harbour, southwest of Winchelsea Islands.

Description: *8.6 ha; 10 m high; Grassy rock; Bare rock.*
There are about six tidally-connected rocks in this cluster. Patches of grasses, shrubs, and some trees adorn higher sections (Figure 419).

Historical summary: Records for 1961 and 1963 were extracted from the notes of W.E. Ricker of the Biological Station in Nanaimo (Table GI-020). The exact location of his observations has been puzzling (Blight [30] referred to this site as "Nanoose Bay" Island). Ricker described the site as "a small island of the group near the mouth of Nanoose Harbour on the north side; the one closest to Maude Island," and stated that "this small rock has the densest colony of gulls I've seen; nests are often within 2 or 3 feet of each other." We believe he was referring to the most southern bare rock of the Ada Islands mentioned below. No other location in this area matches his description.

Ricker's records, and a record from 1981 by Scott Webb and Gary Kaiser referring to a location east of Nanoose Bay, were formerly thought to refer to the islet off Wallis Point, which we had assigned a unique colony identifier, GI-030 "Wallis" Rocks.

That was a mistake. The 1981 record actually referred to rocks off Wallace Island, which is further south in the Gulf Islands. The original record describes the site as "set of rocks west of Wallace Island;" someone later changed the record to "Wallis Point." Also, the date of the 1981 observations corresponds to the date of other records in the Wallace Island area by those observers and not to the date of their other observations in the Ada Islands area. We are thus now quite certain that the 1981 record is for the rocks west of Wallace Island and not off Wallis Point and that the description of "east of Nanoose Bay" is a mistake. The colony GI-030 "Wallis" Rocks has thus been deleted.

Figure 419. One of the cluster of rocks in the Ada Islands. Some shrubs and small trees can be seen in a central pocket on this island. *Photo by Moira J.F. Lemon, 5 September 2020.*

Table GI-020. Seabird nesting records for Ada Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
1961		75+	523
16 Jun 1963		100e	523
4 Jul 1974		171e	70, 523
3 Jul 1975		100e	523
5 Jun 1978	0	154[127]	523
20 Jun 1980		81[29]	523
8 Jun 1981		155[108]	523
Jun 1986		124	420
5 Jul 1995	1	0[a]	468, 524
17 Jun 2010	0	73[69]	30, 453

[a] Many birds had initiated nesting in 1995 but all nests had been destroyed and eggs smashed when the site was surveyed on 5 July.

Largest numbers of Glaucous-winged Gulls were recorded nesting in 1974, 1978, and 1981. Lowest numbers were seen in 2010, with the exception that there were no active nests in 1995. Gulls were nesting on three of the western rocky sections in 1974: the southeast end of the large west island (about 40 pairs estimated nesting); the rocky knob just off the southeast end of the large west island (18 nests counted); and the small, most southern bare rock (113 nests counted; Figure 420). This southern rock is where we think Ricker counted 75 occupied nests (and noted that some nests were missed) in 1961 and estimated 200 or so gulls on the rock in 1963. In 1974, most nests inspected were empty but many chicks were scattered outside nests. Separate tallies for different rocks were not kept in other years. Numbers of nests were estimated from a boat in 1975. Young were visible. In 1995, only three adult Glaucous-winged Gulls were present and no active nests were seen by David Fraser and Leah Ramsay on 5 July. Many smashed eggs were seen on the southern rock (see Remarks) and Fraser speculated that the gull population had moved to Maude Island after being vandalized (see Maude Island below). They apparently moved back to Ada Islands in subsequent years. We have several records of cormorants moving colony sites within a season but this is the only instance we know of where gulls have likely relocated en masse to another colony site within a season after being disturbed.

Figure 420. Glaucous-winged Gulls on nesting territories are visible on this southern bare rock of the Ada Islands in 1974. *Photo by R. Wayne Campbell, 4 July 1974.*

Two Black Oystercatchers were present when observers first arrived in 1978, but the pair quickly disappeared and no sign of nesting was found.

Nesting has only been recorded in 1995 when a pair with one chick was seen.

Remarks: In 1980, a helicopter was making repeated passes low over the islands and flushing all nesting birds every time. Many empty nests and depredated eggs were found. A crow was seen harassing a gull at its nest and one depredated gull egg was found in 1981.

In 1995, Fraser and Ramsay saw many smashed gull eggs that looked like they had been stomped on by a boot.

GI-030 "WALLIS" ROCKS (no longer a designated colony – see Ada Islands above).

GI-040 MAUDE ISLAND

Location: *49°16'14"N 124°04'55"W; 92 F/8.*
Mouth of Nanoose Harbour, north of Blunden Point.

Description: *7.4 ha; 36 m high; Forested; Grassy rock.*
Trees line the north side of the island, but the shoreline and most of the south face is rocky with some grassy areas. There is a navigational beacon on the east end.

Historical summary: Keith Taylor and Gary Seedhouse saw no birds in 1974, and only two Glaucous-winged Gull nests were found in 1986 (Table GI-040). In 1995, David Fraser and Leah Ramsay made an intriguing discovery. They found 74 gull nests and counted 169 adults on Maude Island on 5 July. Most nests were empty; only two held eggs. Fraser speculated that nesting birds had moved from the nearby Ada Islands, after that colony was vandalized and nests were destroyed, and had built new nests on Maude Island. That explained why most nests were still empty in July. It is likely that the nesting population moved back to Ada Islands in subsequent years (see Ada Islands above). No gulls were seen by binoculars from a distance on the most recent survey in 2010.

Table GI-040. Seabird nesting records for Maude Island. See Appendix 2 for codes.

DATE	GWGU	SOURCE
4 Jul 1974	0	523
Jun 1986	2	420
5 Jul 1995	74[2]	468, 524
13-20 Jun 2010	0	30, 453

GI-045 LONG LAKE

Location: *49°12'40"N 124°01'15"W; 92 F/1.*
West of Departure Bay, north of Wellington, along the east side of Highway 19A.

Description: *Bucket.*

Historical summary: Mike Chutter from the BC Ministry of Water, Land and Air Protection in Nanaimo found a Glaucous-winged Gull nest with three eggs in 1986 (Table GI-045). The nest had been built in a bucket that had been set out on a platform in the lake by a local landowner. The bucket had been put out with soft vegetation for geese. Two of the chicks from this clutch died at about 2-3 weeks of age; one chick fledged around mid-August.

Table GI-045. Seabird nesting records (nests) for Long Lake.

DATE	GWGU	SOURCE
20 Jun 1986	1	523

Remarks: Long Lake is a busy residential and recreational area on the outskirts of Nanaimo with high levels of human disturbance.

GI-050 FIVE FINGER ISLAND

Location: *49°13'52"N 123°54'57"W; 92 G/4.*
East of Hammond Bay on the north side of Rainbow Channel.

Description: *2.0 ha; 12 m high; Grassy rock; Cliffs.*
From some perspectives, the five hummocks forming this sedimentary island resemble the knuckles of a closed hand. There are three knolls, oriented north to south, on the main, eastern portion of the island (main section), and two partially separated knolls on the west side (northwest and southwest knolls). Some of the rocky areas are inundated by tides, especially on the west side, and there is a tidally-connected rocky knob at the south end of the main island. There are small bluffs on the edges of some of the rocky knolls. Most area is bare rock, with some grass and pockets of rose bushes on higher sections (Figure 421).

Five-finger Island is part of a three-island colony complex (the Five Finger-Hudson Rocks-Snake Island complex; see colony accounts below), some portions of which have received protective status or priority designation.

Figure 421. Five Finger Island is a rugged, sedimentary rock. A view from the south (top) shows some of the five rocky knolls that, from some perspectives, resemble the knuckles of a closed hand. The bottom right photo shows the rocky and grassy habitat on the higher sections of the island, and the bottom left photo shows the small bay on the west side between two of the "fingers" of the island. *Photos by Moira J.F. Lemon, 14 August 2022 (top) and 2 June 1999 (bottom left), and R. Wayne Campbell, 5 July 1974.*

Historical summary: By the 1980s and early 1990s, the Five Finger-Hudson Rocks-Snake Island complex had grown to be one of the major breeding centres for Double-crested and Pelagic cormorants and Glaucous-winged Gulls in BC, supporting maxima of 396 pairs of Pelagic Cormorants and 1,626 pairs of Glaucous-winged Gulls in 1981, and 394 pairs of Double-crested Cormorants in 1994 (Tables GI-050, GI-060, and GI-070). Unfortunately, their prominence as an importance breeding centre was short lived. All three of these colonies were abandoned by both species of cormorant after about 2000, and only small, remnant populations of gulls persist on these islands, despite receiving protective status as Ecological Reserves (Hudson Rocks) and being recognized as an Important Bird Area (Snake Island).

Data for Hudson Rocks have sometimes been included with Five Finger Island and some observers have considered the four main Hudson Rocks as part of the "Five Fingers," with Five Finger Island being the "fifth finger." This has complicated the interpretation of some historical records.

John Sarles and William Hughes made a preliminary check to assess the colonies in this area for banding purposes and estimated a potential banding population of about 1,000 Glaucous-winged Gulls on "Five Finger Islands" in early June 1958.[316] We are not sure if they were including Hudson Rocks in that estimate but it seems likely. Banding was never carried out that year; a ferry strike derailed travel plans to return to the island on 20 July and rough weather prevented landing when they were able to return to the area on 27 July. A banding team returned the next year (1959) and visited "two of the Five Fingers Islands." [350] Bill Merilees reported five gull nests with eggs specifically on Five Finger Island that year,[144] but no overall estimate was made. In 1959, the team also recorded a fairly large colony of Double-crested Cormorants on one of the islands; [350] this nesting record was either missed or omitted by Drent and Guiguet [144] and all subsequent compilers except Campbell et al.[83] and Merilees and Monty.[255] It is possible that without further confirmation Drent and Guiguet dismissed this record, but we could find no reason not to accept it as valid. The observers were experienced and had been banding gulls and Pelagic Cormorants in the area and it is very unlikely that they would have misidentified nesting Double-crested Cormorants. We have listed that record here for Five Finger Island, but observers may have been

referring to one of the Hudson Rocks because nesting by that species was later documented on both Five Finger Island and Hudson Rocks in 1987.[428]

A young Mike Shepard made several visits to Five Finger Island, Hudson Rocks, and Snake Island in 1966 and wrote up his observations a couple of years later as a Grade 12 English report.[353] He confirmed Black Oystercatchers and Glaucous-winged Gulls nesting on Five Finger Island in 1966: an oystercatcher nest with two eggs was found on a rock outcropping, and about 50 gull nests were seen scattered over the island. Mike reported Pelagic Cormorants nesting at all three colonies but did not provide specific details for any nests on Five Finger Island.

The Double-crested Cormorant colony documented by the banding team in 1959 [350] did not persist and no sign of Double-crested Cormorants nesting or roosting was reported from several surveys conducted from 1966 to 1983. A fairly large colony was again established by 1987, increased to a maximum of 378 nests in 1994, and then declined precipitously to only 43 nests in 1998. Fifteen active nests seen in June 2000 were abandoned later that year [181] and nesting has not been observed since. About 20 old, unattended nests were seen by Blight in 2010.[453] There is little information from most years on where Double-crested Cormorant nests have been located, except Sullivan [376] reported them on the northwest side of the island in 1993 and 1994, and Moira Lemon recorded them on the north side of the west bay in 1999 (Figure 422).

Table GI-050. Seabird nesting records for Five Finger Island. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
Jun 1958				x		316
26 Jul 1959	x			x		350, 144
May-Jun 1966	0	x	1	50[50]e		353, 524
10 Jun 1968	0	0	1	110e	28e(56)	523
5 Jul 1974	0	0	3[3]	311[288][a]	x7	523
23 Jun 1977	0	7[3]	3[3]	459[422]		523
22 Jun 1978	0	48[47]	5[5]	473[454]	x(77)	523
20 Jun 1980	0	189	1	380[380][b]	S(23)	523
9 Jun 1981	0	124	3[3]	599[559]	S(14)	523
15 Jul 1981	0	118[111]		x	S(25)	523
29 May-13 Jun 1983	0	115				421
Jun 1986				671		420
5-23 Jun 1987	138	17	3		S(19)	158, 427, 428
May-Jul 1989	180[c]	52				375
17 Aug 1990	153+	51+				43
1991	186	77				517
1991	118	37				114
1992	191	118				114
1993	306	52				114, 376
1994	378	96				114, 376
1995	295	78				114, 266
1998	43					114, 266
2 Jun 1999	42	0	2[2]	288e	(0)	57, 114, 266, 377, 484
Jul-Sep 2000	15[d]	2				114, 181
31 Jul 2000	24[e]	34[f]	x	57[8]	S(14)	255
19 Jul 2001	0	0		x	S(3+)	255
17 Jun 2003	0	0		50	S(8)	255
2007	0	0				522
2008	0	0				522
2009	0	0				1, 101, 522
17 Jun 2010			1	9[2]		30, 453
2013	0	0				522
2014	0	0				101, 522

[a] Campbell [70] listed 559 nests for Five Finger Island but that count included Hudson Rocks.
[b] A summation error previously gave 364 nests for 1980.[523]
[c] Sullivan in his thesis [376] erroneously listed this count as 115.[511]
[d] Nests were abandoned sometime before 7 July.[181]
[e] Nests were abandoned.[255]
[f] Many of these nests may have been abandoned (see text).[255]

Figure 422. Double-crested Cormorants were still nesting on Five Finger Island in 1999, though the population was much reduced, with only 42 nests in 1999 compared to 378 nests only five years earlier. In 1999, all nests were located on the rock finger on the north side of the west bay (shown). Terry Sullivan [511] noted that, in past years, Double-crested Cormorants also used to nest on the rocky knob south of the west bay. *Photo by Moira J.F. Lemon, 2 June 1999.*

Numbers of Pelagic Cormorants nesting have shown large oscillations. Pelagic Cormorants reported nesting by Mike Shepard in 1966 were no longer present in 1968 or 1974 (note that the 91 Pelagic Cormorant nests listed for Five Finger Island on the map by Campbell [70] were actually counted in 1974 on Hudson Rocks, which we list separately – see next account). Nesting was next recorded on Five Finger Island in 1977, after which numbers increased rapidly to a maximum of 189 nests in 1980. In 1980, 130 nests that could be inspected held eggs or young; contents could not be determined in the other 59 nests. Fewer nests were counted in 1981: in June, 113 of 114 nests observed from land contained eggs and 124 nests were counted from the water; and in July, 118 nests were counted. A few years later, numbers were again much reduced, and in 1987 were less than 10% of the 1980 maximum. Nest counts were incomplete in 1990. Numbers varied through the 1990s, with a peak of 118 nests in 1992 and a low of zero nests in 1999. Similar in timing to the abandonment of the colony by Double-crested Cormorants, nests seen in 2000 were the last time Pelagic Cormorants were found nesting. There were two surveys for nesting cormorants in 2000 with different results: Chatwin et al.[114] reported two Pelagic Cormorant nests, whereas Merilees and Monty counted 34 nests.[255] We suspect that many of the nests reported by Merilees and Monty were unattended because they reported only five Pelagic Cormorants present at that time. Still, their count suggests that 34 pairs attempted to nest that year.

Specific locations of Pelagic Cormorant nests were described in 1978 and 1981. Nests were located on bluffs around the two western knolls in 1978. Four nesting areas were mapped in July 1981: 77 nests on the south side of the southwest knoll; 19 nests on the northwest corner and five nests on the south side of the southern knoll of the main section; and 17 nests on the east side of the northern knoll of the main section.

Large increases in the Glaucous-winged Gull nesting population were seen over a two-decade period from the 1960s to the 1980s, followed by the near-extirpation of the colony by 2010. Estimated numbers doubled between 1966 and 1968. Mike Shepard found 50 nests with eggs in 1966, and in 1968, Rudi and Nora Drent counted 99 gull nests with eggs, estimated that they had surveyed 90% of the colony area, missing some of the more thickly vegetated areas, and estimated a total of 110 nests. Between 1968 and 1986, the breeding population increased six-fold to the maximum of 671 nests. There are few survey data after 1986, but by 1999 numbers had dropped to less than half what they were in 1986. In 1999, gull nests were counted over

80% of the colony and estimated for the rest to avoid disturbing nesting cormorants; [377] of 230 nests counted, 142 contained eggs and 88 were empty.[484] The population plummeted between 1999 and 2000, when only 57 nests were counted, most of them empty. By 2010 the colony had been virtually eliminated, with only a remnant nine nests found, only two of which held eggs.

Specific locations of nesting gulls have not generally been described. In 1978, there were 11 gull nests on the tidally-connected rock off the south end; all other nests were on the main parts of the island. Those areas were not distinguished in other years.

Data are inadequate to determine trends for Black Oystercatchers and Pigeon Guillemots. An oystercatcher nest with three eggs was found on the northwest knoll in 1968 and a maximum of five oystercatcher nests, all with eggs, were found in 1978 (Figure 423). Six pairs of oystercatchers were seen in 1980 but only one nest could be found. One to three nests have been found in most years that observers looked for nests. Five Pigeon Guillemot nests with eggs were found under boulders in 1968, seven nests with eggs or young were located in crevices or under boulders in 1974, and one nest with two eggs was found in a crevice in 1978. No count was made of adults around the island in 1974. No guillemots were seen in 1999 but a few were present in 2000-2003.

Figure 423. Four of five Black Oystercatcher nests found on Five Finger Island in 1978. Nests were made mostly of rock chips. *Photos by Michael S. Rodway, 22 June 1978.*

Remarks: Situated in close proximity to the urban centre of Nanaimo, this area has high volumes of recreational boat traffic and nesting seabirds likely suffer high levels of human disturbance, which may be the main reason for the general decline in nesting cormorants and gulls in the area. Disturbance and predation by Bald Eagles and perhaps river otters may also have contributed to seabird declines. Merilees and Monty [255] speculated that human disturbance, possibly from fishermen but more likely from the considerable number of loud, low flying seaplanes that are continually entering or exiting Departure Bay during landings and takeoffs, as being the probable cause for abandonment. Moira Lemon reported a bunch of people and kayaks on the shore of a little tiny bay on the island in 2022 (Figure 424).

Figure 424. Human disturbance is likely one of the main reasons for the decline of nesting seabirds on Five Finger Island and other colonies in this area close to the urban centre of Nanaimo. Visible in this photo taken in summer 2022 are two kayaks, one canoe, and eight or nine people disembarking in one of the small bays on the west side of Five Finger Island, close to the area where Double-crested Cormorants used to nest. *Photo by Moira J.F. Lemon, 14 August 2022.*

In 1974, a river otter was scared from the island and 33 dead gull chicks that may have been preyed on by the river otter were found. Dead birds were also found in other years: three adult gulls and one oystercatcher in 1978; and six gull chicks, three adult gulls, one Pigeon Guillemot, and two crows in 1980. In 2000, disturbance and predation by Bald Eagles and possibly river otters may have been associated with the abandonment of the Double-crested Cormorant colony by 7 July.[181]

Crows likely prey on cormorant and gull eggs. One Pelagic Cormorant nest contained a broken egg in 1978 and two depredated nests were seen in 1980. Fourteen depredated gull eggs were also seen in 1980. Two dead but uneaten crows were found among gull nests in 1974. Observers suspected they had been attacked and killed by the gulls. Drent suspected that there was one crow nest on the island in 1968, and two crow nests were found in June 1981. Two crows were seen in 1978. Two depredated Double-crested Cormorant eggs and six depredated gull eggs were found in 1999.

Gull chicks were banded on 26 July 1959; in total, 416 chicks were banded on Snake Island, Five Finger Island, and one of the Hudson Rocks.[350] Five Finger Island was one of the sites used by Terry Sullivan in his study of Double-crested Cormorants in 1993-1994.[376]

A Canada Goose nest with five eggs was found in 1980, two nests were seen in 1999, and one nest was recorded in 2010.

GI-060 HUDSON ROCKS

Location: *49°13'33"N 123°55'30"W; 92 G/4.*
On the east side of Horswell Channel, southwest of Five Finger Island.

Description: *2.0 ha; 12 m high; Grassy rock; Cliffs.*
There are five rocks in this group arranged in a roughly rectangular pattern, with the largest rocks at the northeast, southeast, and southwest corners, a smaller rock at the northwest corner, and a low, bare rock between the northwest and northeast rocks. We refer to the four largest rocks (northeast, southeast, southwest, and northwest rocks) as the main rocks. The northeast rock is the highest. These crumbly, mudstone and sandstone rocks are mostly bare, with some grass and pockets of rose bushes, especially on the northeast and southeast rocks (Figure 425). There is a navigational beacon on the southwest rock. Hudson Rocks was established as an Ecological Reserve in 1996.

Historical summary: Data for Hudson Rocks and Five Finger Island have at times been reported together and it was difficult in some cases to tell where specific nesting observations were made (see Five Finger Island account). Nevertheless, data indicate increasing then decreasing trends in cormorant and gull nesting populations that parallel the pattern seen on the adjacent Five Finger Island. Seabirds have nested on the four main rocks.

John Sarles first reported Glaucous-winged Gulls nesting in 1958, Bill Merilees estimated 75

Figure 425. Views of Hudson Rocks: seen from the summit of Newcastle Island (top); the two largest, eastern rocks from the southeast, with the southeast rock on the left, the northeast rock on the right, and roosting Double-crested Cormorants visible in the centre on the northeast rock (middle); the southwest rock with the navigational beacon (bottom left); and the northwest rock. *Photos by Moira J.F. Lemon, August 2023 (top) and August 2022 (middle) and R. Wayne Campbell, July 1974.*

pairs with juveniles in 1959, and Kees Vermeer reported half-grown young on the rocks in 1960 (Table GI-060). Mike Shepard counted about 106 nests with eggs in 1966, with 80 nests on the largest of the rocks, which we assume was the northeast rock. We are not sure how complete that count was in 1966. In 1968, Rudi and Nora Drent counted 64 nests with eggs on the northeast rock and estimated 15 pairs nesting on the southeast rock. They saw no gulls on the southwest rock with the marker beacon. The BCPM crew in 1974 tallied gull nests separately for the four main rocks and found 155, 86, 3, and 4 nests on the northeast, southeast, southwest, and northwest rocks, respectively (Figure 426). On the northeast rock, 129 nests were on the main section and 26 nests were on the rocky ridge on the west side that is separated from the main section at high tides. On the southeast rock, there were 61 and 25 nests on the larger and smaller of the rocky knolls. BCPM crews tallied 153, 87, 7, and 12 nests in 1977; 141, 79, 6, and 10 nests in 1978; and 175, 101, 20, and 12 nests in June 1981, respectively, on the

Figure 426. Well over 200 pairs of Glaucous-winged Gulls nested on Hudson Rocks during the 1970s and 1980s. By 2010, only about 10 pairs were still nesting. Here, Gary Seedhouse (on the left) and Keith Taylor are searching for nests on the northwest rock in 1974. *Photos by R. Wayne Campbell, 5 July 1974.*

same four rocks. As in 1974, separate tallies were made in June 1981 for the two sections of the northeast rock (109 and 21 nests, respectively). Gull numbers peaked in 1981, declined to less than half by 1999 (with 57, 41, 16, and 8 nests on the four rocks), and only ten pairs were estimated nesting on all the rocks during a survey from the water in 2010.

Table GI-060. Seabird nesting records for Hudson Rocks. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
Jun 1958				x		144
26 Jul 1959	[a]	30-35		75e		144
18 Jul 1960		38[36]		x		144
May-Jun 1966	0	47[47]	0	106[106]e		353, 523
10 Jun 1968	0	55[51]	3e	79e	6e	523
5 Jul 1974	0	91[85]	3[3]	248[242]	x2	523
23 Jun 1977	0	43[40]	6[3]	259[252]	3e(4)	523
22 Jun 1978	0	169[164]	5[4]	236[225]	x(6)	523
20 Jun 1980	0	32[32]	2e	226[226]	S(5)	523
9 Jun 1981	0	181	2e	308[291]	S(24)	523
15 Jul 1981	0	129[122]		x	S(6)	523
29 May-13 Jun 1983	0	30				421
5 May 1984		S				524
Jun 1986				247		420
5-23 Jun 1987	17	142	2		S(2)	158, 427, 428
May-Jul 1989	26	104				375
1991	67	40				114
1992	30	39				114
1993	25	31				114, 376
1994	16	59				114, 376
1995	15	61				114, 266
1 May 1997	13+					255
1998	0					114, 266
3 Jun 1999	0	48[14][b]	6[4][c]	122[74]	(0)	114, 266, 377, 484
Jul-Sep 2000	0	3				114
15 Jun, 13 Jul 2000	0	4	x	68	S(1)	255
19 Jul 2001	0	6[d]		2		255
17 Jun 2003	0	0	x	19	S(1)	255
2006	0	0				522
2008	0	0				522
2009	0	0				1, 101, 522
17 Jun 2010			3eS	10eS		30, 453
2013	0	0				522
2014	0	0				101, 522
12 Jul 2019	0	0				514

[a] A fairly large colony reported on one of the "Five Finger islands" by Sarles [350] in 1959 may have been on Hudson Rocks.
[b] Chatwin et al.[114] list 37 pairs for Hudson Rocks in 1999 but 48 nests were counted in 1999.[484]
[c] Butler and Golumbia [57] list four nests for Hudson Rocks in 1997-1999 but 3 nests with 3 eggs each, 1 nest with 1 chick, and 2 territorial pairs at empty nests were counted on 3 June 1999.[484]
[d] Merilees and Monty [255] reported that Pelagic Cormorants were observed nesting but all six nests were empty.

Pelagic Cormorants have been recorded nesting on two of the rocks. In most years nests have been found only on one rock, usually the largest, northeast rock, but in 1960 nests may have been located on the southeast rock, and in 1981 nesting occurred on the northeast and southeast rocks. Cormorants were recorded nesting in 1959 and 1960 on the "inner rock" of the group. We thought that location likely referred to the northeast rock, but our interpretation of a rough map drawn on a nest record card submitted by Kees Vermeer in 1960 indicated that the nesting site was on steep, east-facing cliffs on the southeast rock. In 1966, Mike Shepard inspected 47 nests with eggs that could be viewed from the clifftop on the "largest of the Hudson Rocks," likely also referring to the northeast rock. Again, we are not sure how complete that count was or whether there were any nests on the other rocks in 1966. In 1968, Rudi and Nora Drent clearly identified the nesting site as on the "largest of cluster, 39 feet [12

m] high," which is undoubtedly the northeast rock. All nests were also located on the northeast rock in 1974, 1977, and 1978 (note that the 1974 record of 91 Pelagic Cormorant nests was incorrectly listed for Five Finger Island on Campbell [70]). In 1974, nests were scattered on ledges and rocky outcroppings around the top of the main section of that rock (Figure 427); none were on the west ridge. Observers at that time noted that suitable nesting habitat occurred on some of the other islands but Pelagic Cormorants were nesting only on that one rock. In 1978, nests were also located around much of the perimeter of the northeast rock on bluffs on the west, north, and east sides.

Figure 427. During the years from 1959 to 2001 that Pelagic Cormorants nested on Hudson Rocks, they nested mainly on the northeast rock. In 1974, nests were located around the top of the main section of that rock (top). Observers checked nests quickly so that still-naked chicks were not exposed for very long. *Photos by R. Wayne Campbell, 5 July 1974.*

The Pelagic Cormorant colony expanded to the southeast rock in 1981. In June, 137 and 44 nests were counted from the water on the northeast and southeast rocks, respectively. Of 97 and 31 nests inspected from land on those same two rocks, 81 and 31 contained eggs. Nests were located on cliff ledges around the northeast rock as in previous years and on cliffs mainly on the north and south sides of the southeast rock where nests had not been recorded before. Observers in July 1981 mapped the location of cormorant nests in more detail: from land they counted 83 nests along the north, east, and south sides of the main section of the northeast rock; 14 nests on the west side of the tidally-separated west ridge of the northeast rock; and 18 nests on west-facing and 14 nests on east-facing cliffs near the north end of the southeast rock. Nest counts from land in June and July were almost the same (128 and 129 nests, respectively). Locations of nests were not specified in subsequent years, except in 1999 all nests were on the northeast rock; most were empty.

The maximum number of Pelagic Cormorant nests was counted in 1978. The population was much reduced in 1983, which may have been a poor year, and large numbers were still nesting 1987. Nest building was observed on 5 May 1984. Numbers nesting declined through the 1990s and Pelagic Cormorants were last seen nesting in 2001.

Double-crested Cormorants were first reported nesting in 1987, although an earlier nesting record from 1959 that we have listed for Five Finger Island may have referred to one of the Hudson Rocks (see Five Finger Island account above). Recorded numbers of nests peaked in 1991 then declined, and the colony was abandoned by 1998. According to Sullivan,[376] Double-crested Cormorants have nested mainly along the south side of the rocks, but we are not sure to which rocks he was referring.

Black Oystercatchers have nested on the four main rocks: on the northeast, southeast, and southwest rocks in 1968, on the southeast, southwest, and northwest rocks in 1974 (Figure 428) and 1978, and on all four of the main rocks in 1977 and 1999. In addition to six nests, each attended by a pair, seven old nests were also found in 1977. More nests, especially those with eggs or young, have been found on the southwest rock with the light beacon than on the other rocks: three nests with eggs or young were found on the southwest rock in 1977 and 1978, one nest with three eggs was found there in 1980, one nest with one egg and a total of two pairs were seen in June 1981, and two nests with three eggs each were found there in 1999. One additional pair was seen and suspected nesting on one of the other rocks in 1980 and three oystercatchers were roosting on the northwest rock in June 1981. Blight identified three territories in 2010.

Pigeon Guillemot nests have been found on the northeast rock (1968, 1974, and 1978) and the northwest rock (1977). Adults have been seen around all rocks. Two nests with two young each in 1974 (Figure 429) and one nest with two eggs in 1978 were located in rock crevices on the northeast rock. Few guillemots have been recorded since 1981; two were seen in 1987 and one was sighted during surveys in 2000 and 2003.

Figure 428. Partially feathered Black Oystercatcher chick found trying to be inconspicuous in the intertidal zone of the southwest rock of the Hudson Rocks in 1974. *Photo by R. Wayne Campbell, 5 July 1974.*

Figure 429. Pigeon Guillemots likely nest on all four of the main Hudson Rocks, although nests have been found only on the northeast and northwest rocks. Two nests with two young each were found in 1974; one chick seen here still has its egg tooth. *Photo by R. Wayne Campbell, 5 July 1974.*

Remarks: Some predation on Glaucous-winged Gulls has been recorded: two dead adults were found in 1978; two dead chicks and one depredated egg were found, plus three abandoned gull eggs were seen outside of nests in 1980; one depredated egg was found in June 1981; and there were two depredated eggs on the northeast rock in 1999. Evidence of predation on Pelagic Cormorant eggs by gulls while observers were on the island was seen on the northeast but not on the southeast rock in June 1981. Two Bald Eagles were seen on the southwest rock in 1999,[484] and one was recorded in 2001.

Some banding of gull chicks was conducted in 1959 (see Five Finger Island above). Sullivan included Hudson Rocks in his study of Double-crested Cormorants in 1993-1994.[376]

GI-070 SNAKE ISLAND

Location: *49°12'56"N 123°53'26"W; 92 G/4.*
Northwest of Gabriola Island on the south side of Rainbow Channel.

Description: *3.4 ha; 10 m high; Grassy rock; Cliffs.*
Snake Island is composed of two, parallel, north-to-south-running ribs of sandstone connected by tidal rock for much of their length. The flat top of the higher and longer west rib is covered with grass and some patches of rose and other shrubs (Figure 430). In some areas the grasses are a meter tall. The northern half of this rib is more heavily vegetated than the southern half. Eroded sandstone cliffs, honeycombed with wave-cut pockets, run along the west side of the west rib (west cliffs). The east side of that rib slopes steeply to the water. The smaller eastern rib is bare rock. There is a navigational beacon on the north end of the island. The island is recognized as an Important Bird Area by Birds Canada.

Historical summary: Similar to neighbouring colonies on Five Finger Island and Hudson Rocks, Pelagic Cormorant and Glaucous-winged Gull nesting populations on Snake Island increased into the late 1970s and 1980s and then decreased (Table GI-070). Pelagic Cormorants had abandoned the colony by 2007 and only a remnant population of gulls was still nesting in 2010. Interestingly, unlike the neighbouring islands, Snake Island has apparently never been colonized by Double-crested Cormorants.

The earliest record of nesting seabirds is from 1947 when Munro and Cowan reported Glaucous-winged Gulls nesting. According to Pyle and Sarles,[316] in early June 1958, during a reconnaissance visit to assess the island for banding, William Hughes and John Sarles estimated a potential banding population of 600-700 Glaucous-winged Gulls. In his response to Drent's questionnaire requesting information about nesting seabirds in BC, John Sarles similarly reported 300-400 pairs as an estimate for that visit.[144] The banding team estimated 500 pairs nesting during their visit in 1959. The banding team returned in 1964 and estimated 500-600 young on the island, of which they banded 398. Blight [30] interpreted that as an estimate of 300 nesting pairs, but no estimate of the breeding population was actually made on that visit. Mike Shepard counted 108 nests with eggs in 1966 but he did not specify whether that was a complete count.

Figure 430. Views of Snake Island (clockwise from top left): distant view of the west side of the island showing the rocky shoreline, the grass-covered top, and, in the central portion, the cliffs where Pelagic Cormorants have nested; wave-cut sandstone outcroppings on the western rib; grassy habitat on the top of the western rib; and rocky areas on the eastern rib. *Photos by R. Wayne Campbell, 5 July 1974 and Moira J.F. Lemon, 2 June 1999 (top right).*

The first definite, thorough count of gull nests was conducted by Rudi and Nora Drent in 1968. They counted 323 nests, 315 of which held eggs, and estimated a total of 330 nests. They estimated slightly more than they counted presumably because they assumed that they had missed a few nests, even though they indicated that they did a thorough search. The BCPM crew in 1974 noted that there were many gull runways through the tall vegetation and careful searching was required to find many nests and hidden young (Figure 431). They found 207 nests in the more heavily vegetated, southern half of the west rib and 351 nests on the northern half. Ken Kennedy visited the island in mid-May 1975 and found 378 prepared nests, a few of which contained eggs, and noted that nest-building was still in progress and perhaps a third of the population had not yet built nests; 610 nests were counted on a return visit on 2 June and eggs were still being laid at that time. In 1977, the BCPM crew noted that they were too late to count nests and estimated 400 pairs nesting. Few gulls were nesting in the southern portion of the west rib in 1977, apparently due to intense river otter predation. The following year, gull nests were again found throughout that area, and, for the first time, nests (2 with 3 eggs; 1 empty) were found on the eastern rocky rib. Fewer nests were reported in 1980, but no empty nests were recorded, which is unusual. The historical maximum number of nests was counted and many nests were found throughout the tall grassy areas in 1981. Rob Butler made a rough estimate of approximately 1,000 pairs nesting in 1983, and it is possible that nesting populations continued to increase somewhat after 1981. Large numbers were still nesting in 1986, but the colony was a fraction of its former size by 1999, and only 23 pairs were estimated nesting (8 nests with eggs and 3 empty nests were counted, plus an estimated 12 nesting pairs were viewed from the water) in 2010. As on Five Finger Island and Hudson Rocks, drastic declines in the Glaucous-winged Gull nesting population occurred between 1999 and 2000.

The banding team first confirmed Pelagic Cormorants nesting when they returned in July 1958. Bill Merilees estimated 15 pairs nesting during their second banding trip in 1959. Allister Muir counted

Figure 431. In 1974, many Glaucous-winged Gull chicks had hatched and were hiding away from their nests by the time of the Snake Island survey on 5 July. Many were hiding in the thick grasses that cover much of the upper portions of the western rib of the island. Here, in the left photo, chicks from two different broods are hiding under the rock crevice shown in the upper middle of the photo. The right photo shows two young chicks under the rock overhang at the bottom right. *Photos by R. Wayne Campbell, 5 July 1974.*

Table GI-070. Seabird nesting records for Snake Island. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
1947			x		274
Jun 1958			300-400		316, 144
27 Jul 1958	x		x		316, 144
26 Jul 1959	15e		500e	x	350, 144
5 May 1960			300-400e		144
18 Jul 1964	5[5]		x		82, 523
1965			x		82
May-Jun 1966	x	1	108[108]		353, 524
10 Jun 1968	15	1	330e	x6(33)	523
5 Jul 1974	22[21]	1	558[432]	10e(16)	70, 523
16 May 1975	3S	2e	396[18]+		523
2 Jun 1975	20[11]	2[1]	610[437]	S(1)	523
20 Jul 1977	96[95][a]	2e	400e	S(50)	523
21 Jun 1978	174[167][a]	1	615[582]	x5(14)	523
21 Jun 1980	97	2eS	423[423]	S(14)	523
9 Jun 1981	91	1eS	719[631]	S(30)	523
15 Jul 1981	87[73]	1eS	x	x(18)	523
29 May-13 Jun 1983	60				421
21 Jun 1983	63	1	1000e	S(25)	456
5 May 1984	S				524
Jun 1986			673		420
5-23 Jun 1987	74	0		S(6)	158, 427, 428
2 Jun 1999	16	5[4][b]	204[44]	x	38, 377, 484
Jul-Sep 2000	41				114
31 Jul 2000	49		42	x(4)	255
17 Jun 2003	18	x	32	S(8)	255
2006	1				522
2007	0				522
2008	0				522
2009	0				522
17 Jun 2010		2[1]	23e		30, 453
2013	0				522
2014	0				101, 522

[a] Contents were not determined in two nests in 1977 and one nest in 1978 but they likely held eggs or young.
[b] Butler and Golumbia [57] list four nests for Snake Island in 1997-1999 but four nests with 3 eggs each plus one territorial pair attending 2 empty scrapes were observed on 2 June 1999.[484]

five Pelagic Cormorant nests with young on the west cliffs in 1964, and Rudi and Nora Drent found 15 nests in 1968, nine of which they could determine the contents of (8 held eggs and one was empty); some nests were tucked into eroded pockets in the sandstone cliffs and their contents could not be seen from above. Observers were able to determine contents in almost all nests between 1974 and 1978 and in July 1981. Nest contents were not reported in 1980, and nests were counted from the water in June 1981 (17 nests were inspected from land, of which 15 held eggs) and in all years after 1981. In 1974, all 22 nests were located on eroded ledges and cavities on the west cliffs, towards the north end (Figure 432), and in 1975, Ken Kennedy noted three pairs nesting on 16 May and found 20 nests on 2 June in the same area. Pelagic Cormorants were reported building nests on 5 May 1984.

Figure 432. Pelagic Cormorants historically nested along the eroded sandstone cliffs along the west side of Snake Island. Nests were typically built within eroded cavities and under overhangs in the cliffs. In 1974, all nests were on the northern portion of the west side. Almost all nests held eggs or newly-hatched young; one was empty. *Photos by R. Wayne Campbell, 5 July 1974.*

The Pelagic Cormorant nesting population expanded rapidly between 1975 and 1978. Numbers peaked at 174 nests and nesting occurred along much of the west cliffs in 1978. A reduced population was found in 1981, and observers in July that year mapped two sub-colonies along the west cliffs, with 77 nests in the area towards the north end and 10 nests in a pocket towards the south end of the island. With some oscillation, numbers continued to decline in subsequent years: Vermeer and Rankin reported 60 nests and Rob Butler counted 63 nests in 1983; Chatwin et al. and Merilees and Monty reported 41 and 49 nests, respectively in 2000; and a last single nest was seen in 2006.

Pigeon Guillemots were confirmed nesting during the banding trip in 1959 when Bill Merilees found a nest with downy young located under driftwood.[144] Six nests with eggs were found in clefts in the sandstone and under boulders in 1968, and two nests with eggs were found in rock crevices on the east side of the main rib in 1974. In 1978, four nests with eggs were found in rocky crevices, and one nest with eggs was found inside a hollow log on the beach at the south end of the west rib. One nest with an egg was found in a rock crevice in July 1981. Most recently, Pigeon Guillemots were confirmed

nesting in 2000, and likely still nest on the island.

Black Oystercatchers were confirmed breeding when Mike Shepard found one nest with two eggs nestled in the beach gravel between two logs just above the high tide level in 1966 (there is a record in eBird [524] of 2 nests on 11 June 1966, but we suspect this refers to the total of two nests found by Mike Shepard on the Five Finger-Hudson Rocks-Snake Island complex). A nest with eggs was also found in 1968. Ken Kennedy found a nest with three eggs and suspected another pair nesting on 16 May 1975. When Kennedy returned with a larger survey crew on 2 June, the nest with eggs was empty, and another nest with two eggs was found in a different location. Four adults were seen about the island, but observers were uncertain whether eggs seen in May and June had been laid by the same or different pairs. Two pairs were again present in 1977, but only one nest with eggs was found. A nest with one egg found in 1978 (Figure 433) was located on the beach at the south end of the west rib. No nests were found in 1980, but two pairs were present. In June 1981, seven empty scrapes were found and one pair was suspected nesting, but no positive nesting site was discovered; one pair was again seen in July. Six adults were present on 21 June 1983 but again only one nest with two eggs was found. Maximum numbers of oystercatchers were found nesting in 1999 when Moira Lemon found four nests with eggs and suspected one other pair nesting. An additional two empty scrapes were also found in 1999.

Figure 433. The Black Oystercatcher nest found on Snake Island in 1978 was located on the beach at the south end of the west rib of the island. The nest was little more than a depression in the pebble beach. *Photo by Michael S. Rodway, 21 June 1978.*

Remarks: As with the other colonies in this area, the close proximity of the urban centre of Nanaimo results in high levels of human disturbance from boaters who land to picnic and party on the island or simply approach the colony too closely. The BCPM crew in 1974 noted high disturbance to the colony, with a lot of people camping and picnicking on the island during the summer. Fisherman's wives and children were also dropped off on the island to sunbathe and swim. In 1980, the survey crew met a fisherman and his two children wandering around the gull colony for an afternoon break from their boat anchored offshore. They retreated to non-nesting areas after they were informed about the potential impacts of their disturbance.

Evidence of high mortality of gull chicks due to unknown causes was reported in 1958.[316] Severe predation by river otters in the southern portion of the island was reported in 1977. River otter scats but no signs of predation were seen in 1978. Observers sighted a river otter and found three depredated gull eggs, three dead adult gulls, and one dead crow in 1980. River otter trails and scats were also seen in 1999,[377] and four depredated gull eggs were found.[484] Two pairs of crows were noted nesting on 16 May 1975, and one crow nest with young was found in June 1981. Six crows were seen in 1983.[456] Two Bald Eagles were present in 2000.[255]

A total of 313 Glaucous-winged Gull chicks were banded in 1958,[316] a number were banded in 1959 (see Five Finger Island above),[350] and 565 were banded in 1964 and 1965.[82] Fifteen Pelagic Cormorants were also banded in 1958. Vermeer collected regurgitated pellets from gulls as part of a comparative study of adult and chick diets on the east and west coasts of Vancouver Island in 1980.[415]

A pair of Canada Geese nested on the island in 1981 and 1999. In 1999, a nest with six eggs was found.

GI-074 ENTRANCE ISLAND

Location: *49°12'32"N 123°48'33"W; 92 G/4.*
Off Orlebar Point at the north end of Gabriola Island.

Description: *2.4 ha; 9 m high; Grassy rock.*
This is a flat-topped, grass-covered island with rounded rocky shores. A lighthouse tower and associated buildings and other structures occupy much of the surface of this rock (Figure 434). The original manned lighthouse was completed and went into operation in 1876. The original lighthouse was replaced with the present concrete tower in 1971. Repeated proposals to automate the light have been protested, and the station is still manned. It was designated a Heritage Lighthouse by Parks Canada in 2015.

Figure 434. The Entrance Island lightstation is a historic lighthouse that has been guiding mariners into the entrance to Nanaimo Harbour for almost 150 years. Areas of the island not occupied by lighthouse facilities are grassy above the rocky shore. *Photo by R. Wayne Campbell, 5 July 1974.*

Historical summary: No seabirds were found nesting in 1974 (Table GI-074). According to the lightkeepers at that time, none had been known to nest there since at least 1968, although a couple of Black Oystercatchers occasionally came to the island to feed. Two were present in 2003. Oystercatchers were confirmed nesting in 2014: two oystercatcher nests with eggs were reported several times in May, and three nests with eggs were seen in June. Six adults and six young were seen on 29 June and 22 July that year. One Pigeon Guillemot was seen around the island in 2003.

Table GI-074. Seabird nesting records for Entrance Island. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
5 Jul 1974	0		523
5-23 Jun 1987	0		427
17 Jun 2003		(1)	255
19, 24, 29 May 2014	2[2]		524
1, 7 Jun 2014	3[3]		524

GI-076 BRANDON ISLANDS

Location: *49°12'25"N 123°57'25"W; 92 G/4.*
On the north side of Departure Bay, east of Jesse Island.

Description: *1.8 ha; 7 m high; Grassy rock.*
Brandon Islands are a narrow, east-west running rock, separated into two or three islands at high tides. The main, west island is steep on the north side, with broad, rocky shorelines on the south side and west and east ends. Higher sections along the north side are covered with grass and shrubby vegetation. The west island is owned by Fisheries and Oceans Canada, and there are experimental fish farm pens off the north side. Cleats and ladders for mooring and accessing boats have been installed along the north cliffs. Grassy vegetation covers the top of the middle island, and the tidally-connected east island is bare rock.

Historical summary: We assumed that Vermeer et al. and Emms and Morgan surveyed these islands in 1987 and saw no Black Oystercatchers or Pigeon Guillemots (Table GI-076). Other than that, we surprisingly only have records from 1999 for this rock close to the city of Nanaimo. Black Oystercatchers were nesting on all three sections of the islands on 3 June 1999: one nest with three eggs on the east island (Figure 435); one empty nest attended by a territorial pair and likely with hidden

Figure 435. This Black Oystercatcher nest on Brandon Islands was highly visible, with the eggs nestled on a large collection of bright white clam shell fragments on a contrasting dark conglomerate rock substrate. *Photo by Moira J.F. Lemon, 2 June 1999.*

young on the middle island; and two territorial pairs seen from the water and suspected nesting on the west island. Three Glaucous-winged Gull nests were also found: one empty nest on the east island and two nests with unknown contents on the middle island. Two Pigeon Guillemots were seen around the middle island.

Table GI-076. Seabird nesting records for Brandon Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
5-23 Jun 1987	0		(0)	158, 427
3 Jun 1999	4e[a]	3S	S(2)	484

[a] Butler and Golumbia [57] list two nests for Brandon Islands in 1997-1999, likely because only two nests were found (see text).

GI-080 NEWCASTLE ISLAND - EAST DOCK

Location: *49°10'49"N 123°55'44"W; 92 G/4.*
East of Nanaimo; the main dock is at the southeast end of Newcastle Island, east of Mark Bay. The site is also known as Saysutshun.

Description: *Wharf.*

Historical summary: A Pigeon Guillemot nest with one egg was found under the wharf in 1976 (Table GI-080). We have no recent records for this site.

Table GI-080. Seabird nesting records (nests) for Newcastle Island - East Dock.

DATE	PIGU	SOURCE
8 Jun 1976	1	523

Remarks: Newcastle Island is a Marine Provincial Park and receives a large volume of tourist traffic. Raccoons are abundant on the island.

GI-085 NANAIMO HARBOUR

Location: *49°09'46"N 123°55'53"W; 92 G/4.*
City of Nanaimo, south of Newcastle Island. Colony includes all urban habitats along the shoreline and buildings away from the shore.

Description: *Rooftops; Wharves.*

Historical summary: Black Oystercatchers and Glaucous-winged Gulls have been recorded nesting in this area. Bill Merilees observed a pair of Black Oystercatchers that successfully raised a brood in 1988 and 1989 on the rooftop of a building on the Canadian Pacific Wharf (Table GI-085). Merilees and Monty and Trudy Chatwin reported Glaucous-winged Gulls nesting on rooftops in 2005. Gulls had likely been nesting in the urban areas of Nanaimo for several years before that. A thorough census of the gull nesting population has not been carried out.

Table GI-085. Seabird nesting records for Nanaimo Harbour. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
1988	1		84
1989	1		84
2005		10e+	255, 459
8 Aug 2016		1	524
May-Aug 2017		31+	480
2020		100e	459

Around 2005, a problem arose with gulls nesting on the MacPherson Theatre roof while they were trying to replace it. Chatwin was called in to assist with the problem, and from that roof in August she could see tens of nesting gulls, with evidence of nesting on many flat or flattish roofs around town. In 2016, local birder Ken Langelier reported a nestling that had fallen from the roof of a building on Chapel Street (Figure 436). In 2017, Ed Kroc surveyed part of downtown Nanaimo in an area from Comox Road in the north to Albert Street, Crace Street, and Port Way in the south, and from the waterfront inland as far as Richards Street to the west. He counted 31 nests on the rooftops of 28 buildings (26 buildings with single nests, 1 building with 2 nests, and 1 building with 3 nests). In 2020, Chatwin made an

Figure 436. The increasing prevalence of rooftop nesting Glaucous-winged Gulls in urban habitats has introduced a new hazard for young chicks raised in those environments. Many rooftop nests are located on multi-storied buildings and the risk of injury or death is high for chicks that inadvertently fall off. *Photo by Ed Kroc, 3 August 2015.*

estimate of about 100 pairs nesting based on observations of the numbers of gulls flushed from rooftops when Bald Eagles flew over.

Remarks: The gull nestling that fell from a roof in 2016 was humanely euthanized at the Island Veterinary Hospital.

GI-089 DESCANSO BAY

Location: *49°10'41"N 123°51'30"W; 92 G/4.*
On the west end of Gabriola Island facing Nanaimo.

Description: *Rocky shore; Pilings; Wharf.*
Colony includes the rocky shoreline of Descanso Bay and the Gabriola Island ferry terminal structures.

Historical summary: One or two Pigeon Guillemots have been seen in the area around the ferry terminal in several years, and one was seen entering a hole in the rock on shore adjacent to the ferry terminal in 2009 (Table GI-089). An anonymous eBird contributor in 2020 reported one guillemot in appropriate nesting habitat at the ferry terminal.

Table GI-089. Seabird nesting records for Descanso Bay. See Appendix 2 for codes.

DATE	PIGU	SOURCE
8 August 1992	(2)	524
6 Aug 2009	1	45
19 Jul 2014	(2)	524
3 Jul 2020	S(1)	524

GI-090 GABRIOLA ISLAND - WEST CLIFFS

Location: *49°09'21"N 123°51'25"W; 92 G/4.*
South of Descanso Bay, facing Northumberland Channel.

Description: *20-30 m high; Cliffs.*
These eroded sandstone cliffs extend sporadically for about 4 km along the southwest side of Gabriola Island between Descanso Bay and Hoggan Lake (Figure 437).

Figure 437. The cormorant nesting cliffs on Gabriola Island's west side extend along approximately 4 kilometres of the island's coastline. The area lies across Northumberland Channel from the Duke Point Ferry Terminal on Vancouver Island. *Photo by Moira J.F. Lemon, 12 August 2022.*

Historical summary: Pelagic Cormorants were first reported nesting by Bill Merilees in 1960 (Table GI-090), although there is possible confusion about this record (see following account for Gabriola Island - East Cliffs). According to Drent and Guiguet, in 1960 there were about 25 pairs on the cliff, at least 6-7 pairs were nesting, and some nests were seen. Regardless of the possible confusion about the 1960 record, it is likely that Pelagic Cormorants were nesting at that time given that there was definitely a large colony established here by 1968 when Drent counted 390 occupied nests. Nests were counted

from a boat on this and all subsequent surveys (Figure 438).

The number of Pelagic Cormorant nests counted by Drent in 1968 was the maximum ever seen at this colony. The colony declined through the mid-1970s and suddenly collapsed between 1977 and 1978. The colony appeared active and healthy when we surveyed it in 1977, with many birds still building nests and many nests attended by a pair. In 1978, there were 25 empty nests that may have been begun that year, but there were no birds at the colony, and only one adult was seen flying in the vicinity. No evidence of nesting was seen in 1980 through 1987. Pelagic Cormorants had again colonized the cliffs by 2000 and have persisted at a smaller population size of generally less than 100 pairs through to the present. Recent surveys by SFU students Macus Ong, Rose Wilkin, and Rachel Stapleton, assisted by their supervisor Ruth Joy as well as Trudy Chatwin, tallied 64, 124, and 90 nests, in 2020, 2021, and 2022, respectively. Chatwin and Joy counted 86 nests in 2023.

Figure 438. Two portions of the west cliffs of Gabriola Island (top two photos), where Pelagic Cormorants were first recorded nesting in 1960, and Double-crested Cormorants have nested since 2003. The bottom two photos show Pelagic Cormorants nesting in eroded cavities on the cliffs in 1974, prior to their two-decade long absence between 1978 and 2000. Since 2018, some Double-crested Cormorant nests have been built in Douglas-fir trees (visible against the face of the cliff in the top right photo). Although residential development and nesting seabirds often conflict, cormorants have nested successfully for the last two decades below the highly developed residential areas along the tops of the cliffs. *Photos by Sheila Harrington, 24 July 2021 (top two) and R. Wayne Campbell, 5 July 1974.*

Drent saw two Glaucous-winged Gull nests on the cliffs in 1968, and the BCPM crew noted four nests on ledges and caves in the cliffs in 1974. Two young could be seen at one nest. Nests were isolated and scattered within the cormorant colony. Similar numbers of gull nests were seen in similar locations in other years, including three birds sitting on nests in 1978 when the cormorant colony was abandoned, except none were seen in 1980. Gulls on nests and 12 birds in total were recorded in 2018,[524] and one nest with large young was seen in 2020.

Pigeon Guillemots were first recorded nesting in 1974 when an adult carrying a fish was seen entering a rock crevice within the cormorant colony. That was the only guillemot seen on that survey, but more nests seemed likely and two pairs were estimated nesting.[70] That supposition was likely correct and up to 33 birds, with several flying into crevices, were seen on later surveys.

Table GI-090. Seabird nesting records for Gabriola Island - West Cliffs. See Appendix 2 for codes.

DATE	DCCO	PECO	GWGU	PIGU	SOURCE
8 Jun 1960		25e			144
9 Jun 1968	0	390	2		332, 523
5 Jul 1974	0	367	4	2e(1)	70, 523
4 Jul 1975	0	225e		20e	523
15 Jun 1977	0	237	5	x(28)	332, 523
21 Jun 1978	0	0	3	x3(33)	523
21 Jun 1980	0	0	0	(2)	523
29 May-13 Jun 1983	0	0			421
5-23 Jun 1987	0	0		S(3)	158, 428
Jul-Sep 2000	0	62			114
2 Aug 2000	0	22	4		255
17 Jun 2003	2	88		x(10)	255
2006	27	94			522
30 Jun 2007		16			456
2007	95	56			522
2008	0	2			522
2009	39[a]	75			101, 522
29 May 2010	57	87	6	S(4)	456
13-20 Jun 2010			4		30, 456
2013	83	85			522
2014	64	67			101
14 May 2016		S			524
2017	53	67			112
23 Jul 2018	92	69	x	x(4)	459, 524
25 Jul 2019	111	79			459
18 Jul 2020	126	64	1	S(10)	285, 459, 492
30 Jun 2021	181	124			459, 598
5 Jul 2022	205	90		S(4)	459, 508
17 Jul 2023	154	86			459

[a] Adkins and Roby [1] list 43 nests for 2009.

Double-crested Cormorants colonized these cliffs in 2003 and have nested in variable but generally increasing numbers since, with high counts of 95 nests in 2007, 181 nests in 2021, and a maximum of 205 nests in 2022. Fewer nests were counted in 2023 than in 2022. In 2018, at least one pair was nesting on a dead tree branch (Figure 439).[459] In 2020, six of the nests were located in a dead Douglas-fir tree; the rest were on cliff ledges (Figure 440). Eight tree nests were seen in 2022.

Remarks: Human disturbance was likely responsible for the abandonment of the Pelagic Cormorant colony in 1978.[421] Construction of the Duke Point Industrial Site across Northumberland Channel was underway at that time. Duke Point was being leveled by blasting, the noise of which must have had a considerable effect on this colony.[255] Nesting cormorants may have relocated to Five

Figure 439. Double-crested Cormorants were first recorded nesting on the west cliffs of Gabriola Island in 2003, and were first seen nesting in trees at this colony in 2018. *Photo by Trudy Chatwin, 23 July 2018.*

Finger Island, Hudson Rocks, Snake Island, and Bare Point, where numbers increased that same year. Observers in 1980 also suspected that blasting across the channel at Duke Point had contributed to the abandonment of the colony. Increased residential and tourist activity in the vicinity of the cliffs, and log-booming operations below the cliffs to the east of the main colony site were also likely contributing factors, although anchored log booms can actually offer some protection to nesting birds by keeping boat traffic away from the cliffs.

Figure 440. Double-crested Cormorant nests on the west cliffs of Gabriola Island in 2020. Six nests had been built in a dead Douglas-fir tree that had grown from the face of the cliffs; the rest were on ledges and eroded pockets in the sandstone cliffs. *Photos by Macus Ong, 23 May 2020.*

Peregrine Falcons were reported nesting on the bluffs and three falcons were seen in 2003. Steven Baillie [451] recorded one adult falcon at the usual nest location on the cliffs on 21 June 2008. Trudy Chatwin [459] noted one falcon present in 2022. Three or four Bald Eagles were present in 2003, and Bald Eagles were seen preying on cormorants in 2014.

Macus Ong [285] included Gabriola Island-West Cliffs as one of three study sites used to investigate the use of photogrammetric methods to monitor cormorant breeding populations and nesting chronology for his M.Sc. research conducted in 2020 (Figure 441). Rachel Stapleton conducted further photographic monitoring of Double-crested Cormorant nests for her M.Sc. studies in 2022. She remotely monitored 30 nests, at 16 of which she saw adult cormorants flushed off their nests on a daily basis. The causes of the disturbances were not known, but birds at those 16 nests failed to raise any young.

Figure 441. In 2020, Macus Ong [285] set up cameras on the Gabriola Island cliffs to monitor cormorant breeding populations and nesting chronology for his M.Sc. research. *Photo by Alex Harris, 23 May 2020.*

GI-095 HARMAC - MILL

Location: *49°08'15"N 123°51'27"W; 92 G/4.*
On Northumberland Channel, southeast of Duke Point, west of Dodds Narrows.

Description: *Rooftops.*
This colony includes all facilities associated with the Harmac pulp mill that began operations in 1950. The mill is currently employee-owned and operates under the banner of the Harmac Pacific trademark owned by Nanaimo Forest Products.

Historical summary: In 2005, Merilees and Monty reported observations by Sandy Shaw of upward of 100 pairs of Glaucous-winged Gulls nesting on rooftops at the Harmac Pulp Mill (Table GI-095).

Table GI-095. Seabird nesting records for Harmac - Mill. See Appendix 2 for codes.

DATE	GWGU	SOURCE
2005	100e+	255

GI-100 GABRIOLA ISLAND - EAST CLIFFS

Location: *49°09'39"N 123°43'40"W; 92 G/4.*
Northeast side Gabriola Island, near the east end of the island, west of Law Point and Flat Top Islands.

Description: *Cliffs.*

Historical summary: There is no definite evidence that Pelagic Cormorants have ever nested at this colony site. However, we have a nest record card [523] submitted by Bill Merilees with an estimate of about 25 Pelagic Cormorant nests on "sandstone cliffs on north east coast of Gabriola Island." It states that the observation was made from the CPR ship and, although Merilees noted an estimate of about 25 nests, he gave the number of nests tallied as "none." Date of visit is listed as 8 June and 5 September 1960. Merilees noted that "…the cliff was stained with droppings and one adult was seen flying in that direction." There is possibly some confusion between this record and a second record, also from Merilees on 8 June 1960, of about 25 pairs, with at least 6-7 pairs nesting, on the cliffs facing Northumberland Channel on the southwest coast of Gabriola Island (listed above for Gabriola Island - West Cliffs). However, although there are similarities between the two records, we have assumed that they are different records at different locations, because the record for the southwest cliffs reported that nests were seen and at least 6-7 pairs were nesting, whereas the record for the northeast cliffs reported nests as "none." Drent and Guiguet [144] cited the record for the southwest cliffs but not the one for the northeast cliffs. Drent [144] was likely aware of both records, and perhaps decided to ignore the record for the northeast cliffs because there was no confirmation of nesting. We have also not accepted this as a breeding record given the distance that the CPR ships sailed from shore and the lack of a definite sighting of nests. In 1977, we saw guano on these northeast cliffs but no cormorants or cormorant nests were present.

Glaucous-winged Gulls and Pigeon Guillemots were nesting in 1977: an adult gull was sitting on a nest on an inaccessible cliff ledge, and a guillemot flew from a crevice on the cliffs (Table GI-100). Other guillemots were on the water below the cliffs.

We assumed that Emms and Morgan surveyed these cliffs in 1987 and saw no Pigeon Guillemots. We have no subsequent survey data for this site.

Table GI-100. Seabird nesting records for Gabriola Island - East Cliffs. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
15 Jun 1977	1	x(4)	332, 523
5-23 Jun 1987		(0)[a]	158

[a] See text.

GI-110 CARLOS ISLAND

Location: *49°09'33"N 123°41'49"W; 92 G/4.*
Part of the Flat Top Islands at the southeast end of Gabriola Island.

Description: *0.7 ha; 5 m high; Grassy rock.*
This is a flat-topped, grassy island with patches of shrubs. Driftwood litters the beach along the south side; the rest of the shoreline is rocky (Figure 442).

Historical summary: No nesting seabirds were found here in 1974, but one Glaucous-winged Gull nest with two eggs was found at the edge of the grass on the northeast corner of the island in 1978 (Table GI-110). No Black Oystercatchers were seen during surveys in the 1970s and 1980s, but eight were present and a nest with eggs was found in 2018.

Table GI-110. Seabird nesting records (nests) for Carlos Island.

DATE	BLOY	GWGU	SOURCE
10 Jul 1974	0	0	523
21 Jun 1978	0	1	523
5-23 Jun 1987	0		427
26 May 2018	1		524

Figure 442. Carlos Island has a mostly rocky shoreline and a grass-covered top with large patches of shrubs. Piles of driftwood have been washed up along the southern shore. *Photo by Michael S. Rodway, 21 June 1978.*

GI-112 BREAKWATER ISLAND

Location: *49°08'10"N 123°40'57"W; 92 G/4.*
South of the Flat Top Islands, east of Gabriola Passage that separates Gabriola and Valdes islands.

Description: *30 ha; 19 m high; Forested.*
The island has a rocky shoreline with some higher beach habitat above the shore rock. It is mostly forested, with some open grassy meadows on the flattish top. A long narrow point extends off the south end. There is a residence and dock towards the north end of the island.

Historical summary: In 2012, a total of 30-40 Pigeon Guillemots were observed on the water near shore, diving for fish, and carrying them up to young in nest cavities in rocky bluffs at several locations along the east side of the island (Table GI-112). Glaucous-winged Gulls were also recorded at likely nests on ledges on the rock bluffs, but no estimate of numbers was given.

Table GI-112. Seabird nesting records for Breakwater Island. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
22 Jun 2012	1S+	x(30-40)	45

GI-120 MUDGE ISLAND

Location: *49°07'41"N 123°47'15"W* (south cliffs); *92 G/4.*
Off the southwest side of Gabriola Island, east of Dodd Narrows at the northwest end of the De Courcy Group. Colony includes the rock off the southwest side.

Description: *220 ha; 65 m high; Forested; Cliffs; Bare rock.*
Mudge Island is mostly forested, with a network of roads and human settlement throughout. Seabird nesting habitat includes scattered cliffs (Figure 443) around the perimeter and a small, 0.3 ha, 1 m-high, bare rock connected at low tide off the mid-south side.

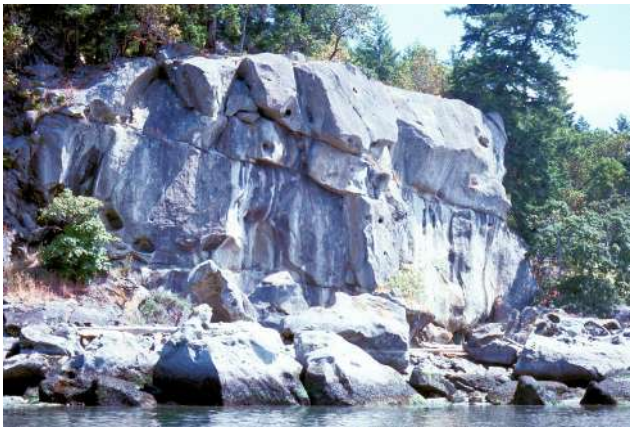


Figure 443. Pockets of cliffs along the shore of Mudge Island provide nesting habitat for Pigeon Guillemots. *Photo by Michael S. Rodway, 16 June 1977.*

Historical summary: Pigeon Guillemots were nesting on a 15 m-long stretch of sandstone cliffs, about 10 m high, on the mid-south side of the island in 1977 and 1978 (Table GI-120). Two guillemots could be heard whistling from nest sites on the cliffs in 1977, and five birds were present on the water below the cliffs in 1978. One Black Oystercatcher nest with two eggs was found on the rock off the southwest side in 1978. No birds were seen in 1987.

Table GI-120. Seabird nesting records for Mudge Island. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
16 Jul 1977	0	2(3)	332, 523
20 Jun 1978	1	S(5)	523
5-23 Jun 1987	0	(0)	158, 427

GI-130 ROUND ISLAND

Location: *49°06'53"N 123°47'44"W* (south rock); *92 G/4.*

North end of Stuart Channel, south of Mudge Island. Colony includes the rock off the southwest corner.

Description: *3.4 ha; 42 m high; Forested; Bare rock.*
The main island is forested except for rocky promontories at the southwest and northwest corners. There is a small, 0.1 ha, 2 m-high, bare rock, with a bit of sparse grass off the southwest corner (Figure 444). There are some dwellings on the main island.

Historical summary: Seabirds have been recorded nesting only on the small, southwest rock. A few pairs of were reported nesting from 1977 to 1981 (Table GI-130). In addition to the adult gulls associated with the five and three nests found in 1977 and 1978, there were 170 adults and 80 immatures and 153 adults and 26 immatures roosting on the rock in 1977 and 1978, respectively. Two nests with eggs were found in each of the three years that gulls were found nesting. In 1981, two nests held two eggs each on 10 June, but only three empty nests were found on a second visit 10 days later. We have no records for gulls since. One Pigeon Guillemot was present in 1978, but no evidence of nesting was obtained.

Table GI-130. Seabird nesting records for Round Island. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
16 Jun 1977	5[2]	(0)	332, 523
20 Jun 1978	3[2]	(1)	523
10 Jun 1981	2[2]	(0)	523
20 Jun 1981	3[0]	(0)	523
5-23 June 1987		(0)	158

Remarks: River otter scats were seen on the small rock in 1977.

Figure 444. Up to five pairs of Glaucous-winged Gulls have been recorded nesting on the small, bare rock off the southwest corner of Round Island. *Photo by Michael S. Rodway, 16 June 1977.*

GI-140 LINK ISLAND

Location: *49°06'58"N 123°45'49"W* (west cliffs); *92 G/4.*
In the De Courcy Group between Mudge and De Courcy islands.

Description: *27 ha; 58 m high; Forested; Cliffs.*
Link Island is forested, with a rocky shoreline and cliffs, 15-20 m high, that run about 400 m along the west side (Figure 445). A 0.6 ha, grassy islet with a few trees lies off the northeast end.

Figure 445. Link Island is forested above the rocky shore. A band of cliffs that run along the west side of the island provide nesting habitat for Pigeon Guillemots. One old, unattended Pelagic Cormorant nest was seen on these cliffs in 1978, but no evidence of breeding has ever been reported. *Photo by Michael S. Rodway, 16 June 1977.*

Historical summary: Evidence of nesting seabirds has been found only on the west cliffs. One old, unattended Pelagic Cormorant nest was seen in 1978. Carter et al.[101] listed Link Island as a historical nesting site for Pelagic Cormorants based on this observation, but we did not consider the unattended nest seen in 1978 a breeding record for this site.

Pigeon Guillemots were confirmed nesting in crevices on the cliffs in 1977 and 1978 (Table GI-140). None were recorded in 1987, but 48 were seen swimming in groups near the cliffs on the northwest side in 2016.

Table GI-140. Seabird nesting records for Link Island. See Appendix 2 for codes.

DATE	PIGU	SOURCE
16 Jun 1977	x(28)	332, 523
20 Jun 1978	5(5)	523
5-23 June 1987	(0)	158
8 Aug 2016	S(48)	524

Remarks: A Bald Eagle was recorded in 1978.

GI-150 DE COURCY ISLAND

Location: *49°05'54"N 123°44'45"W* (south cliffs); *92 G/4.*
In the De Courcy Group south of Gabriola Island, west of Valdes Island.

Description: *186 ha; 75 m high; Forested; Cliffs.*
Several bands of eroded sandstone cliffs, 10-20 m high, along the southwest side of the island (Figure 446), provide nesting habitat for seabirds on this otherwise forested island laced with a network of roads and human settlement. There is a provincial marine park and marina at Pirates Cove on the east side of the island.

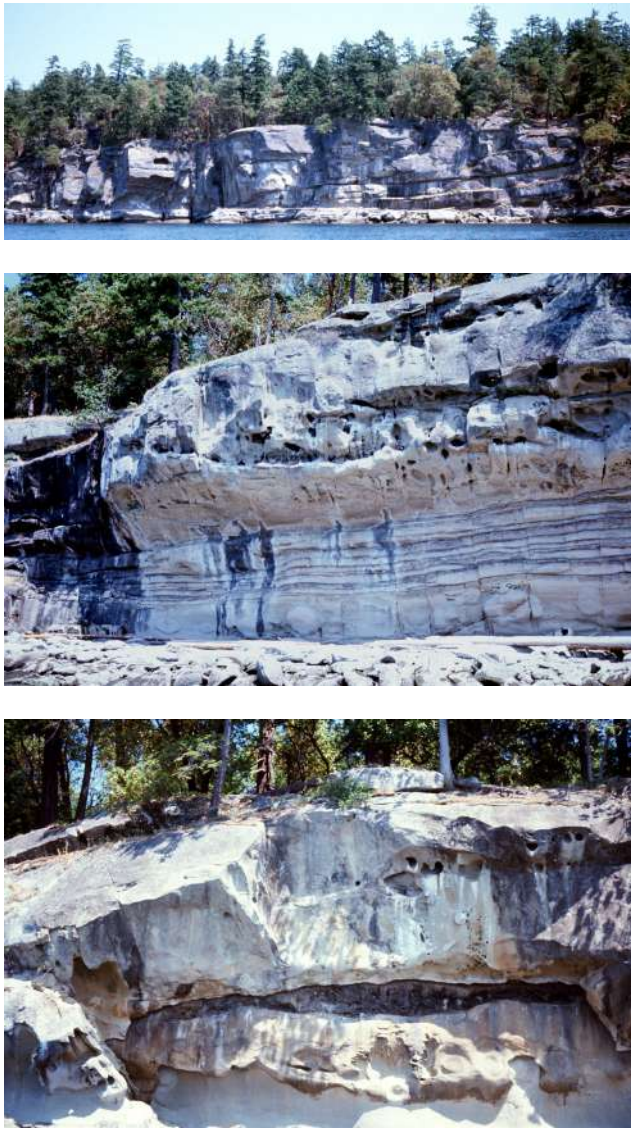


Figure 446. Three seabird species have nested on the cliffs along the southwest side of De Courcy Island. Images here show (from top to bottom): sections of cliffs near the north end; north of the mid-point; and just south of the mid-point. Pelagic Cormorants and Glaucous-winged Gulls have not been seen nesting since the 1970s and 1980s, respectively. *Photos by Michael S. Rodway, 16 June 1977.*

Historical summary: Nesting has been recorded at three bands of cliff along the southwest side of the island: one about 100 m long near the north end; one about 400 m long north of the mid-point; and one 500 m long stretch just south of the mid-point. Pelagic Cormorants were nesting on the cliffs north and south of the mid-point in 1977 and 1978, with most nests (22 in 1977 and 12 in 1978) on the cliffs north of the mid-point (Table GI-150). There were one and three isolated nests on the cliffs south of the mid-point in 1977 and 1978, respectively, and one isolated nest north of the main cluster of nests on the cliffs north of the mid-point in 1978. Adults were sitting on all nests, and most nests had pairs at them with a total of 45 adults present in 1977. In 1978, 13 nests had adults sitting on them, three did not, and there were 35 adults present in total.

We assumed that Vermeer et al. boated by these cliffs in 1987, but otherwise there are no records of De Courcy Island being surveyed for Pelagic Cormorants since 1978. Vermeer and Devito counted gulls here in 1986 but no data remain on whether or not cormorants were present that year. Carter et al.[101] reported the historical record from 1977, but Vermeer and Rankin,[421] Vermeer et al.,[428] and Chatwin et al.[114] did not list De Courcy Island as a historical nesting site for Pelagic Cormorants.

Table GI-150. Seabird nesting records for De Courcy Island. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
16 Jun 1977	23	3	x(7)	332, 523
20 Jun 1978	16	2	S(2)	523
Jun 1986		2		420
5-23 June 1987	0[a]		(0)[a]	158, 428
22 Jun 1991			(2)	524
13-20 Jun 2010		0		30, 453
10 Jun 2018			(3)	524

[a] See text.

Glaucous-winged Gulls were seen sitting on nests situated on ledges on the north end cliffs (1 nest in 1977 and 1978) and on the middle cliffs where most cormorants were nesting (2 nests in 1977; 1 nest in 1978). The nesting location mapped by Vermeer and Devito [420] in 1986 corresponded to the north end cliffs. No nesting gulls were seen in 2010.

Pigeon Guillemots have been recorded and suspected nesting at the northern and middle cliffs. One bird was seen fly out of a hole in the cliffs at the north end in 1977. We assumed that Emms and Morgan surveyed these cliffs in 1987 and saw no Pigeon Guillemots. Locations of birds seen in 1991 and 2018 were not specified.

Remarks: Pirates Cove Marine Provincial Park and marina on the east side of the island is a popular destination for recreational boat traffic and the area sees a high volume of human visitors.

GI-160 VALDES ISLAND - WEST CLIFFS

Location: *49°06'20"N 123°42'10"W; 92 G/4.*
Western shoreline of Valdes Island between Dibuxante Point and Blackberry Point.

Description: *Cliffs.*
Several sections of 20-30 m high cliffs occur along the shore for about 7 km south of Dibuxante Point. Cliffs are composed of sandstone and other sedimentary deposits (Figure 447).

Historical summary: This is one of the earliest documented Pelagic Cormorant colonies in the BC Salish Sea; only Mandarte Island has earlier records of Pelagic Cormorants nesting. The cormorant colony site has been located on a stretch of cliffs lying about 3-4 km south of Dibuxante Point, facing the north end of Ruxton Island across Pylades Channel. Only small and variable numbers were recorded nesting, but the colony apparently persisted for many decades after it was first noted by young Elton Anderson in 1920 (Table GI-160). Maximum numbers were recorded in 1963 when George McKay tallied 25 nests with adults. Drent saw only four nests in 1968 and the site was not used for much of the 1970s. Old, unattended nests were seen in 1977 (Figure 448). In 1978, George Sirk saw one nest with an incubating adult here on 18 June, but three days later we saw no cormorants along the entire stretch from Dibuxante Point to Blackberry Point. A few pairs nested in the early 1980s, but none were found nesting during any of the major cormorant surveys conducted after 1983. Then, after apparently being abandoned for decades, the Pelagic Cormorant colony was again active in 2015 when Rob Butler counted 19 nests and 75 birds on the cliffs (Figure 449). In August 2017, Daniel Dönnecke counted 20 cormorants on the cliffs and submitted photographs to eBird showing three nests with large young. In March 2018, Dana Gullison from Nanaimo counted 20 cormorants, mostly paired, in weathered sandstone nesting cavities. More birds may have been nesting in 2019; on 18 May, biologist Robin Weber counted a total of 125 birds on the cliffs and suspected that there were 89 occupied nests.[524] That estimate was based on a count of well stained sites that were occupied by one

or two adult birds and was not a count of actual nests.[515] As many birds often roost on the nesting cliffs (for example Butler's observation of 19 nests and 75 birds in 2015), we did not try to estimate the number of nests from Weber's observations. Valdes Island resident Dan White also reported active cormorant nests in 2019 and Gullison reported birds on nests and 11 birds present in 2022.

Pigeon Guillemots have also been recorded nesting on the cliffs south of Dibuxante Point since the 1920s. Elton Anderson estimated 50 pairs nesting in the 1920s, and W.A. Newcombe noted 100 guillemots at the cliffs in 1934.[96] Fewer were seen in most years after 1958; 12 was the maximum seen and Drent estimated 10 pairs nesting in 1968, except 83 were counted in 2018. One guillemot was seen fly from a crevice on the cliffs just south of Dibuxante Point in both 1977 and 1978, and eight were seen along the cliffs further south across from Ruxton Island in 1977. Guillemots were seen all along the sandstone galleries on the west shore in 2017 and 2018.

A pair of Glaucous-winged Gulls has occasionally been seen nesting at this colony. They were first recorded nesting in 1977 when one adult was seen sitting on a nest among old cormorant nests on the cliffs across from Ruxton Island. In 1978, a pair was seen on territory on 18 June, and six adult gulls were present along these cliffs, including one sitting on a nest located on a cliff ledge about halfway between Dibuxante Point and Blackberry Point, on 21 June. No gulls were reported in 1981. We suspect that Vermeer and Devito [420] checked these cliffs in 1986 and saw no nesting gulls, but no specific record remains. Rob Butler saw one nest and a total of six adults on the cliffs in 2015.

Table GI-160. Seabird nesting records for Valdes Island - West Cliffs. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
1920-23	x		50e	144
22 May 1934			S(100)	96
1939	x			144
1955	6			144
1958			50e	144
3 Aug 1963	25			332, 523
17 Jul 1968	4		10e	332, 523
10 Jul 1974	0	0	S(2)	70, 523
15 Jun 1977	0	1	x(9)	332, 523
18 Jun 1978	1	1eS		523
21 Jun 1978	0	1	x(3)	523
20 Jun 1981	10	0	S(3)	523
29 May-13 Jun 1983	6			421
5-23 Jun 1987	0		(0)	158, 428
2000	0			114
2007	0			522
2009	0			522
2013	0			522
2014	0			101, 522
6 Jun 2015	19	1	S(4)	456
9 Aug 2017	3+		(12)	524
30 Mar 2018	S			524
2 May 2018			(83)	524
18 May 2019	x			516, 524
26 May 2022	x		x(45)	524

Figure 447. These two pictures show the lengthy stretch of cliffs along the west side of Valdes Island. The cliffs are occasionally cut by steep forested gullies as seen in the right photo. *Photos by Moira J.F. Lemon, 22 July 2018.*

Remarks: Log booms are frequently moored along the cliffs south of Dibuxante Point and may impact nesting birds. A pair of Peregrine Falcons was chasing a Bald Eagle and was suspected nesting on the cliffs midway between Dibuxante Point and Blackberry Point on 21 June 1978. One adult and one immature eagle were present in the area. Eagles were reported nesting along the west shore of Valdes Island in 2022.

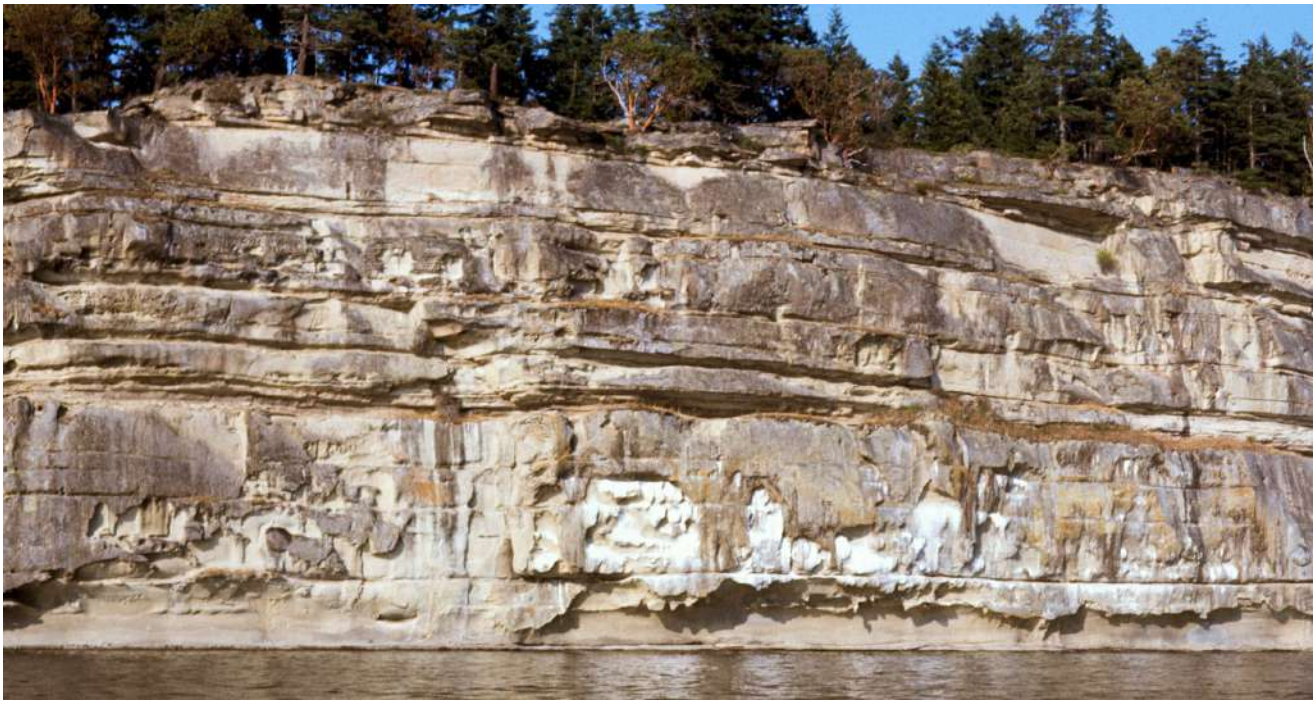


Figure 448. Old, unattended Pelagic Cormorant nests were seen on this stretch of cliffs along the west side of Valdes Island in 1977. *Photo by Michael S. Rodway, 15 June 1977.*

Figure 449. Pelagic Cormorants were first recorded nesting on the Valdes Island – West Cliffs in 1920, making it one of the oldest known colony sites in the BC Salish Sea. After apparently being absent for decades, Pelagic Cormorants re-established a colony here in 2015. *Photo by Douglas Campbell, 6 June 2015.*

Across Four Decades

The nesting site on the west cliffs of Valdes Island is one of the earliest documented Pelagic Cormorant colonies in BC. The histories of the nesting cormorants at this site and of the early naturalists that documented their presence are equally interesting.

Although Coast Salish people traditionally harvested nesting seabirds and their eggs for food and were likely familiar with the locations of most seabird colonies in the BC Salish Sea, the first documented records of seabirds nesting in the area date back only about 160 years. Early records were primarily from specimen collectors. By the turn of the last century in 1900, records of nesting seabirds were known from only three colonies in the BC Salish Sea: Mitlenatch Island, Mandarte Island, and Chain Islets/Great Chain Island near Victoria. Pelagic Cormorants had been confirmed nesting only on Mandarte Island. Egg collectors confirmed other nesting sites in the 1920s, but not on Valdes Island. We now know that Pelagic Cormorants were first noted nesting on the Valdes Island cliffs in 1920, making it the second known colony in the BC Salish Sea. But it was 40 years before that knowledge surfaced. The 40-year hiatus connects two young people with keen interests in the natural world and a lifelong dedication to its conservation.

Elton Alexander Anderson was born in Saanich in 1907. When he was eleven his family moved to Valdes Island, where he and his younger brother were pulled out of school to work as their father's logging crew.[7] The boys also rowed around the islands and to Nanaimo to gather and sell fish. Elton made observations of seabirds in the area. After the family left Valdes Island, Elton worked for many years as an independent logger in the Duncan and Cowichan area and later on Cortes Island. Throughout his adult life he was a keen naturalist and ardent conservationist.[8] He served as president of the Federation of BC Naturalists from 1971 to 1973 and helped stimulate the formation of many natural history clubs around BC. He promoted increased communication and collaboration amongst the various clubs so they could present a stronger voice for conservation in the province. After he died in 1975, the Federation created the Elton Anderson Award to acknowledge outstanding conservation efforts.

Rudolf (Rudi) Herman Drent had a large impact on the study and conservation of nesting seabirds in BC, both as a young university student and later as a professor at UBC.[336] It was his early dedication to gathering information on nesting seabirds that connected him to Elton Anderson. Rudi was born in the Netherlands in 1937. In 1954, he enrolled as an undergraduate at the University of British Columbia where he was inspired to study biology by Dr. Ian McTaggart-Cowan. He carried on at UBC and in 1959 and 1960 studied Pigeon Guillemots nesting on Mandarte Island for his Master's thesis under the supervision of Dr. Miklos Udvardy.[143] During that time, Rudi became aware of how little was known about the distribution and abundance of nesting seabirds in BC. He also became concerned about the escalating threats to nesting seabirds from ever-increasing human disturbance. He decided to tackle both problems by compiling all the information he could find to produce the first catalogue of British Columbia seabird colonies.[144] To augment the limited data that were available, he sent out a questionnaire to lighthouse keepers, naturalists, and any other persons he thought might be able to contribute records of nesting seabirds. The questionnaire was titled "B.C. Sea-bird Inquiry 1960." Elton Anderson was one of the people who received it. When he answered Rudi's seabird questionnaire in 1960, Elton was able to contribute observations that he had made as a young lad around Valdes and Galiano islands in 1920-1923.

GI-170 RUXTON ISLAND

Location: *49°04'33"N 123°42'23"W* (west cliffs)*; 92 G/4.*
Towards the southeast end of the De Courcy Group, west of Valdes Island.

Description: *96 ha; 98 m high; Forested; Cliffs.*
This is a forested island, with a rocky shoreline and long, rocky fingers off the northwest end. Small, 10 m-high bands of eroded sandstone cliffs occur along the southwest side (Figure 450). There are many seasonal and some year-round residences on the island.

Historical summary: Two pairs of Glaucous-winged Gulls were recorded nesting on cliffs in the 1970s and 1980s (Table GI-170). In 1977, gulls were seen sitting on isolated nests on cliff ledges located just south of West Bay on the mid-southwest side and towards the south end of the island. In 1978, one nest was located on cliffs northwest of West Bay and one was southeast of the bay. We were able to access the nest northwest of the bay; it contained three eggs. Locations of nests were not specified in 1986. There are no survey records for gulls since.

One Pigeon Guillemot nest with one egg was located in a hole in the sandstone cliff on the southwest side of the island in 1978. One adult flew out of the nest. Two guillemots were also seen in Herring Bay at the northwest end of the island in 1978. Locations of guillemots sighted in 2016-2018 were not specified.

No Black Oystercatchers were seen in 1977 or 1978, but one pair was nesting on one of the rocky points at the northwest end of the island in 1987. The island was not visited during oystercatcher surveys

in 2006.[57] John Reynolds reported a pair breeding in 2022, and Connie Haist observed a territorial pair on the rocks at the northwest end on 1 July 2023. On a return visit on 23-26 July, she saw a juvenile (Figure 451) foraging with three other oystercatchers in the same area.

Figure 450. These photos show the cliffs on the mid-southwest side (top) and near the south end of Ruxton Island where Glaucous-winged Gulls and Pigeon Guillemots have been confirmed nesting. *Photos by Michael S. Rodway, 16 June 1977.*

Table GI-170. Seabird nesting records for Ruxton Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
16 Jun 1977	0	2	(0)	332, 523
20 Jun 1978	0	2	1(1)	523
Jun 1986		2		420
5-23 Jun 1987	1		(0)	158, 427
30 Jun 2016			(1)	524
21 Jul 2017			(4)	524
3 Jul 2018			(6)	524
3 Jul 2022	1			524
1 Jul 2023	1			475

Remarks: One adult bald Eagle was present in 1978. River otters and mink frequent the area, but they have not been recorded during seabird surveys.

Figure 451. Single pairs of Black Oystercatchers were recorded nesting on Ruxton Island in 1986 and in 2022 and 2023. A nest was not found in 2023, but a territorial pair was observed on 1 July, and a juvenile was seen foraging on the island later in July. *Photo by Paula Courteau.*

GI-171 WHALEBOAT ISLAND

Location: *49°04'26"N 123°41'33"W; 92 G/4.*
Off the southeast corner of Ruxton Island. Formerly known as Eagle Island.

Description: *3.7 ha; Forested.*
This small, forested island has a steep rocky shoreline of sculpted sandstone and scattered large boulders. The island was designated as Whaleboat Island Marine Provincial Park in 1981.

Historical summary: Vermeer and Devito reported one Glaucous-winged Gull nest on an unnamed islet off Ruxton Island in 1986 (Table GI-171). The mapped location of that islet corresponds to Whaleboat Island, which was generally unnamed on marine charts from that time. There is no other islet around Ruxton Island that Vermeer and Devito could have been referring to, and we believe it is a safe assumption that the pair of nesting gulls was seen on Whaleboat Island. We saw no gulls here in 1977 or 1978 and we have no records since 1986.

Table GI-171. Seabird nesting records (nests) for Whaleboat Island.

DATE	GWGU	SOURCE
16 Jun 1977	0	332, 523
20 Jun 1978	0	523
Jun 1986	1	420

GI-180 TREE ISLAND

Location: *49°03'39"N 123°41'52"W; 92 G/4.*
Southwest of Pylades Island at the south end of the De Courcy Group.

Description: *0.6 ha; 18 m high; Forested.*
This small islet is partially forested and has broad rocky shorelines (Figure 452). A small rock is isolated by high tide on the south side. Much of the area has been modified by a house, outbuildings, and dock.

Figure 452. East end of Tree Island where Glaucous-winged Gulls and Black Oystercatchers were recorded nesting in the 1970s. A house and outbuildings were subsequently built on the island and now occupy much of the area. *Photo by Michael S. Rodway, 16 June 1977.*

Historical summary: One Glaucous-winged Gull nest with three eggs was found at the edge of the grass on the east point of the island in 1977 (Table GI-180). One nest was found in the same location and a second was found on the south rock in 1978; both contained eggs. We saw a pair of Black Oystercatchers attending an empty nest scrape on the south rock in 1978, but none were seen by Vermeer et al. in 1987. We have no recorded observations since 1987.

Table GI-180. Seabird nesting records for Tree Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
16 Jun 1977	0	1	332, 523
20 Jun 1978	1S	2[2]	523
5-23 Jun 1987	0		427

Remarks: There was no human residence on the island when we found gulls and oystercatchers nesting in 1977 and 1978.

GI-190 MIAMI ISLET

Location: *49°02'14"N 123°42'34"W; 92 G/4.*
East of Yellow Point on Vancouver Island, north of Fraser Point on Thetis Island.

Description: *0.2 ha; 3 m high; Bare rock.*
This low bare rock has a small white-shell beach on the south side (Figure 453).

Figure 453. Miami Islet is a low, bare rock. There is some beach habitat on the south side and some piles of driftwood left ashore by winter storms. *Photo by R. Wayne Campbell, 13 July 1974.*

Historical summary: Rudi and Nora Drent counted 22 Glaucous-winged Gull nests scattered over the rock in 1968 (Table GI-190). Numbers more than doubled by 1974 (Figure 454), but then declined somewhat into the 1980s, and then more so sometime after 1986. Five abandoned nest starts were seen in addition to the 32 nests counted in 1978. In 2010, gulls were counted from the water, and five pairs were suspected nesting.

Figure 454. Maximum numbers of Glaucous-winged Gulls nesting on Miami Islet were recorded in 1974. Nests were scattered over the bare rocky surface of the islet (top). Note the nest built mainly of seaweeds at the bottom left of the photo. The lower photo shows a young gull chick trying to hide in a small crevice. *Photos by R. Wayne Campbell, 13 July 1974.*

Pigeon Guillemot nests with eggs and young were found under beach debris in 1968. One nest under a rock was found in 1974 (with one small young) and in 1978 (with at least one egg). Ten roosting guillemots were recorded on 9 June 1981.

A pair of Black Oystercatchers with two large young was seen in 1974. None have been recorded since. Ten Double-crested Cormorants were standing on the islet, but there was no evidence of nesting in 1980.

Table GI-190. Seabird nesting records for Miami Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
17 Jul 1968	0	22[22][a]	5	332, 523
13 Jul 1974	1	52[47]	3e(5)	70, 332, 523
16 Jun 1977	0	43[39]	S(4)	332, 523
20 Jun 1978	0	32[25]	x(8)	523
27 Jun 1980	0	27[17]	(0)	523
9 Jun 1981	0	19[5]	(10)	523
21 Jun 1981	0	26[16]		523
Jun 1986		38		420
5-23 Jun 1987	0		(0)	158, 427
17 Jun 2010	0	5eS		30, 453

[a] Listed as 25 pairs by Blight [30] but that was the number of birds estimated present and not the number of nests counted.

Remarks: Two dead gull chicks were seen in nests in 1974, and one dead Pelagic Cormorant was found in 1977. Observers noted three broken gull eggs in 1978, three depredated one-egg nests in 1980, and one depredated egg on 9 June 1981. Compared to other colonies, few gull nests contained eggs on 9 June 1981 (only five nests contained single eggs), which suggested possible disturbance. Surveyors saw human footprints on the islet and it is possible the nests were egged. Gull eggs were present and fresh (eggs were float tested; fresh eggs sink when placed in water) on a second visit in 1981 on 21 June. Seven crows were seen on the islet on 9 June 1981, but no predation of gull eggs was observed.

GI-195 LADYSMITH HARBOUR

Location: *49°00'11"N 123°49'10"W; 92 G/4.*
Ladysmith foreshore west of Woods Islands.

Description: *Dolphins; Pilings.*

Historical summary: Double-crested Cormorants were first recorded nesting in April 2004; about 32 birds and numerous occupied nests were seen on a dolphin near the saw mill in the harbour (Table GI-195). In 2005, birds were reported sitting on nests on pilings; 65 birds were reported. Carter et al. counted seven nests in 2006, but the site has been abandoned on all visits since then.

Table GI-195. Seabird nesting records for Ladysmith Harbour. See Appendix 2 for codes.

DATE	DCCO	SOURCE
Apr 2004	x	524
24 Apr 2005	x	524
2006	7	101
2007	0	522
2009	0	1, 101, 522
2013	0	522
2014	0	101, 522
1 Aug 2019	0	459

GI-200 RAGGED ISLETS

Location: *49°01'35"N 123°41'46"W; 92 G/4.*
Northwest of Pilkey Point at the north end of Thetis Island.

Description: *0.7 ha; 11 m high; Grassy rock.*
Ragged Islets is only one islet with some separation of northern rocky knobs at high tide. Beach and rock habitat connect the main southern section to the northern rocky knobs. Higher portions of the main southern section are vegetated with grasses, shrubs, and a few juniper, arbutus, and crabapple trees.

Historical summary: Glaucous-winged Gulls apparently colonized this islet sometime between the 1920s and 1960s, increased to a maximum of 130 nesting pairs in 1978, and then declined through the 1980s and since (Table GI-200). Numbers found nesting in 2010 were similar to the number estimated nesting when the colony was first documented in 1961.

Kenneth Racey reported no seabirds nesting in 1923.[523] William Ricker, from the Nanaimo Biological Station, reported 10-20 Glaucous-winged Gull nests in 1961 and noted gulls nesting in 1963, although he did not land on the islets that year. In 1968, Rudi Drent boated by the islets and counted 114 adults on territories around the islet and estimated 50-60 pairs nesting. Many young were visible with their parents (Figure 455). The first thorough count of gull nests was made in 1974. Nests were scattered about the islet except among the trees and taller grasses. George Sirk noted that the gull colony seemed at maximum density in 1978,

and 12 of the nests had been built on the beach below high tide level. On a second visit two days later in 1978, we found a greater proportion of empty nests, likely a result of river otter predation (see Remarks). We tallied nests separately for the main southern section (83 nests) and the northern rocky knobs (43 nests) on 20 June 1978. A few nests were found hidden in the tall grasses in 1980, but observers in 1981 again noted no nests under trees or in long grasses. Gary Kaiser and Scott Webb found a high proportion of empty nests and partial clutches on both visits in 1981 compared to other colonies (e.g., Five Finger Island) that they surveyed at those times. Eggs that were float tested were fresh, whereas many eggs were hatching on other colonies at the same time. This suggested that eggs were being lost throughout the colony in 1981, and some pairs had relaid by the time of the visits.

Pigeon Guillemots were seen carrying food in 1968. Six nests with eggs or young were found under rocks in 1974. Most adult guillemots seen were on the water off the east side of the islet. In 1978, two nests with eggs found on 18 June were located in crevices in a sandstone bluff, and three nests with eggs found on 20 June were under rocks. Fewer guillemots were seen around the islet in the 1980s than in the 1960s and 1970s.

Figure 455. Many Glaucous-winged Gull chicks were seen by Rudi Drent when he boated by Ragged Islets on 17 July 1968. *Photo by Paula Courteau.*

Black Oystercatchers were confirmed breeding in 1974 when a pair with one large young was sighted (Figure 456). A pair has been reported nesting in most years since. In 1977, a nest with three eggs was located on beach habitat. In 1978, while leading an extended field trip for Continuing Education out of UBC, George Sirk discovered a nest with two eggs at the northwest end of the islet on 18 June. A second empty nest was also found about 12 m away, which likely belonged to the same nesting pair. Two days later, we found only an empty scrape attended by two adults. Nests with eggs were found in 1980 and 1981, but Vermeer et al. saw no oystercatchers nesting in 1987. Most recently, Blight recorded one occupied territory in 2010.

Figure 456. Black Oystercatchers were first confirmed nesting on Ragged Islets in 1974 when a pair with one large young was seen. A single pair has been found nesting on most visits since. *Photo by Paula Courteau.*

Table GI-200. Seabird nesting records for Ragged Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
2 Jun 1923	0	0	0	332, 523
1961		10-20e		523
16 Jun 1963		x		523
17 Jul 1968		50-60e	15-20e	332, 523
13 Jul 1974	1	103[75]	12e(22)	70, 523
16 Jun 1977	1	126[117]	x(14)	332, 523
18 Jun 1978	1	130[111]	x2(10)	523
20 Jun 1978	1S	126[99]	x3(10)	523
27 Jun 1980	1	78[78]	S(8)	523
9 Jun 1981	1	89[29]	(3)	523
21 Jun 1981	1	87[40]		523
Jun 1986		69		420
5-23 Jun 1987	0		S(2)	158, 427
17 Jun 2010	1S	28[18]		30, 453

Remarks: This small colony has likely been impacted by human disturbance, river otter predation, and Bald Eagle disturbance. Drent observed tourists land on the islet in 1968 and noted that the nature of the islet will serve to attract visitors. One of the oystercatcher eggs was accidentally crushed underfoot on 18 June 1978. When Gary Kaiser and Scott Webb surveyed the colony in 1981, footprints of previous visitors were obvious and may have been related to the high proportion of empty nests and few eggs seen that year. Egg harvesting was suspected.

One dead adult and four broken gull eggs were seen in 1977. On 18 June 1978, George Sirk noted that 10 of the 19 empty nests had been destroyed within the last couple of days, and six dead adults found had been killed about a month earlier. Two days later, we found river otter pathways with 12 depredated gull eggs on them (Figure 457). We also found four dead adults, two with heads and wings ripped off, and one beside a nest with three depredated eggs. Evidence of two older kills and one broken guillemot egg was also seen. No positive evidence of river otters was seen in 1981, although seven and five broken gull eggs were found on the two visits that year.

An adult Bald Eagle was perched in a tree on the islet when the survey crew arrived on 9 June 1981. Interestingly, seven crows were also present but no sign of crow predation on gull eggs was seen. Frequent disturbance by Bald Eagles may have contributed to poor reproductive performance in 1986 (Figure 458).[420]

Figure 457. Signs of river otter predation were seen on Ragged Islets in 1978. Several adult Glaucous-winged Gull carcasses and depredated gull eggs were found along river otter pathways. *Photo by Paula Courteau.*

Figure 458. Bald Eagles frequent most seabird colonies in BC. A great deal of disturbance results when an eagle perches within a colony of surface-nesting seabirds. *Photo by Paula Courteau.*

GI-210 ROSE ISLETS

Location: *49°00'29"N 123°38'38"W; 92 G/4.*
Off the northwest end of Reid Island, east of Thetis Island.

Description: *0.8 ha; 4 m high; Grassy rock; Bare rock.*
Depending on tide level and how you count them, this is a chain of 5-8 small islets and rocky knobs running northwest to southeast. The largest islet (#1) is at the north end of the chain. The next islet to the south (#2) is the second largest and the highest in elevation, with the highest, main section at the north end. Tidally connected to the south end of islet #2 are rocky and grassy knobs (#3-5). South of these islets towards Reid Island are three smaller, isolated rocks (numbered north to south #6-8). Grasses and other herbaceous vegetation plus a few shrubs adorn higher sections of larger islets (Figure 459). The islets were established as an Ecological Reserve in 1971.

Figure 459. Views of some of the Rose Islets. The top photo, taken from the north, shows islet #2 in 1974, with nesting Double-crested Cormorants and Glaucous-winged Gulls. The skeleton of an old tree where Double-crested Cormorants previously nested is still visible. The bottom photo, taken from the south in 2009, shows islets #2-5 (left to right) with, on the right, one of the small, isolated rocks (#6) at the southern extent of this small islet chain. Shrub cover is more abundant on islet #2 in 2009 than in 1974, likely due to the absence of nesting cormorants and gulls in recent decades. *Photos by R. Wayne Campbell, 13 July 1974 (top) and Moira J.F. Lemon, 17 August 2009.*

Historical summary: Drent and Guiguet [144] were unaware of this colony. William Ricker provided the first data on nesting seabirds in 1963 (Table GI-210). Ricker counted birds from a boat and did not land, but he documented all five breeding species ever known to nest on the islets. The colony was well established in 1963 and undoubtedly was in existence when Drent and Guiguet compiled known records in 1961. When Rudi and Nora Drent surveyed the site in 1968, a local fisherman informed them that the Double-crested Cormorant colony had been in existence since at least 1958. The colony has been a victim of human disturbance, and the cormorant colony is now extirpated and only a remnant few Glaucous-winged Gulls still nest.

Double-crested Cormorants were nesting on the two largest, northern islets (#1 and 2) in 1963, with about 25 nests visible on islet #1 and 40 on islet #2. Two of the nests were in a small dead tree on islet #2; the rest were on the ground. Ricker counted 120 adults, and birds remained sitting on all nests as the survey crew boated by. Almost three times as many nests were counted in 1968 on the same two islets. The increase had occurred entirely on the northern islet (#1) where Rudi and Nora Drent found 163 nests. There were only 19 nests on the southern islet (#2), with two nests still in dead, gnarled trees that Drent thought were juniper trees, similar to those used for nesting on Ballingall Islets (see colony GI-320 below). Rudi and Nora Drent returned with Ian

Robertson in 1969 and found fewer nests: 134 on islet #1 and 12 nests on islet #2. All 12 nests (11 of which held small chicks and one was empty) on islet #2 were in the dead juniper tree.

We are unsure about records from 1972, when John Comer estimated 38 Double-crested Cormorant nests on Rose Islets. Comer described the site as a small barren rock island in Stuart Channel with little or no vegetation. He was unable to land on the island and estimated numbers from the water. He also estimated a total of only one Glaucous-winged Gull nest, and noted that the nest was located in a hollow in the rock. It is possible, but seems unlikely that there was only one pair of gulls nesting on Rose Islets in 1972, given that 208 nests were counted in 1974. Also, Rose Islets are not in Stuart Channel, but rather are in the adjacent Trincomali Channel, and the main islets where Double-crested Cormorants have nested do not really fit the description of "a small barren rock," although Drent described Rose Islets as devoid of vegetation when viewed from the water in 1968. Perhaps Comer was referring to just one of the smaller, unvegetated islets.

Table GI-210. Seabird nesting records for Rose Islets. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
1958	x					523
16 Jun 1963	65e	6e	1eS	x	some	332, 523
17 Jul 1968	182[161]	0	2eS	100e	10-15	332, 523
20 Jul 1969	146[114]	0	2-3eS	100e		332, 523
4 Jun 1972	38e[a]	0		1e[a]		332, 523
13 Jul 1974	89[73][b]	0	1	208[113]	1(2)	70, 523
8 Jun 1976				119[13]		332, 523
27 Jul 1976	108[73]	0	1S	x	S(12)	332, 523
17 Jun 1977	111[75]	0	1	167[160]	S(10)	332, 523
21 Jun 1978	100[2]	0	2[2]	167[135]	S(1)	523
4 Aug 1979	87[31]					523
26 Jun 1980	45[2][c]		S	156[156]	S(8)	523
10 Jun 1981	33[0]		1	211[183]	S(6)	523
15 Jul 1981	33[18]		1eS	x	S(4)	523
29 May-13 Jun 1983	12	0				421
1984[d]				41[d]		30
Jun 1985				112		420
Jun 1986				116		420
5-23 Jun 1987	2	0[a]	3		(0)	158, 427, 428
1999	6					114, 266
Jul-Sep 2000	15	0[a]				114
16 Jun 2005			0	7[1]		57, 456
2007	0					522
2009	0					1, 101, 522
17 Jun 2010			0	21[12]		30, 453
2013	0					522
11 Jul 2014	0	0	0	0	(3)	101, 109, 522
1 Aug 2019	0	0				459

[a] See text.
[b] Total nests was given as 80 on the original seabird inventory form and on Campbell,[70] but this was due to a summation error.
[c] Eggs were depredated in the two nests with eggs.
[d] Blight [30] lists a record from the BCNRS [523] of 41 nests for 1984, but we were unable to locate this record.

Double-crested Cormorant numbers continued to decline, likely due to repeated nesting failures on first the southern (#2) and then the northern (#1) islet. Cormorants were still nesting on both northern islets in 1974 (Figure 460), with 82 and seven nests counted on islets #1 and 2, respectively. On islet #2, there were an additional five nests that had only been started, and only one of the seven completed nests held eggs. No mention was made of nests in a dead juniper tree as in earlier years, although part of the dead tree was still standing (see Figure 459). Seven nests were again found on islet #2 in July 1976, but all seven were empty that year. Similarly, in 1977 and 1978 there were six nests, all empty, on islet #2. However, in 1977, most nests on islet #1 held eggs, but in 1978, virtually all nests were empty; only two nests on islet #1 contained single eggs each. Nests were found only on the northern islet (#1) in August

1979: most nests were empty or contained small clutches of eggs; only three contained single young; and breeding success had again obviously been compromised. In 1980, only two nests contained eggs, and they had been preyed upon. In 1981, all nests were empty in June, and 18 of the 33 nests contained a total of 43 eggs in July. However, surveyors in July rechecked the nests after they had been disturbed and 10 of the eggs had been taken by gulls. Nest contents were not reported in subsequent years. Small numbers of Double-crested Cormorants continued to nest up to 2000, but none have been recorded since.

Figure 460. Double-crested Cormorants historically nested on the two most northern islets (#1 and 2) of the Rose Islets. When the colony was first discovered in 1963, more nests were seen on islet #2 than on islet #1, but that pattern reversed afterwards and only a small proportion of nests were built on islet #2 over the years from 1968 to 1978. Photos here show the still thriving colony on islet #1 in 1974. *Photos by R. Wayne Campbell, 13 July 1974.*

Ricker saw about six Pelagic Cormorant nests on a small cliff on the east side of islet #2 in 1963. Pelagic Cormorants have not been observed nesting since. Twenty adults in full breeding plumage were present but the BCPM crew saw no evidence of nest-building in 1974, even though the cliff ledges on the east side of islet #2 where Ricker had seen nests seemed like good nesting habitat. No data were reported for Pelagic Cormorants in 1987 or 2000 but a nest count for Double-crested Cormorants was presented in those years.[114, 428] Thus, it is clear that the islets were surveyed for cormorants in those years, and we think it is safe to assume that no Pelagic Cormorants were nesting.

A pair of Black Oystercatchers was sighted from the water in 1963, two pairs were present in 1968, and 2-3 pairs were suspected nesting in 1969. Oystercatchers were confirmed nesting in 1974 when an adult with one half-grown young was found on one of the southern rocky knobs (islet #5). Young were suspected near an agitated pair seen in July 1976, and a nest with three eggs was found in 1977. In 1978, a nest with one egg was found on islet #5, and a nest containing a dead young was found on islet #1. In 1980, seven pairs of oystercatchers were seen but no nests were found. A nest was found on islet #2 in June 1981. Vermeer et al. reported pairs nesting on three different islets in 1987, but Butler and Golumbia found no oystercatchers nesting in 2005, and Blight saw none in 2010. Four oystercatchers were present in 2014, but no evidence of nesting was found.[109]

About 100 Glaucous-winged Gulls, some sitting on nests, were present in 1963. Rudi and Nora Drent did not take time to count gull nests in 1968 because they were worried about day-old cormorant chicks that were vulnerable to heat exposure (Figure 461), and they wanted to minimize their disturbance. They estimated 75 pairs on the northern (#1) and 25 pairs on the southern (#2) of the two main islets where cormorants were nesting. They estimated similar numbers in 1969. Nests were first counted by a BCPM crew in 1974 (Figure 462). They tallied gull nests for six different areas: the main north islet (#1); four tidally-connected sections of the highest islet (#2-5, from north to south); and the small rock that is the second islet north of Reid Island (islet #7). Tallies for these six areas were 122, 48, 17, 3, 17, and 1 nests, respectively. The nest on islet #7 contained two small young, but all three nests were empty on islet #4, which is a very small rocky knob. Most nests were empty in 1976, although the survey for gulls was conducted early in June, and egg laying may still have been in progress. In 1977, there were 99, 67, and 1 nests on islets #1, #2-5, and #7, respectively, and almost all nests contained eggs. The maximum number of gull nests was counted in 1981: nests were tallied for three areas in June 1981: 158, 42, and 11 nests on islets #1, #2-3, and #5, respectively. Four years later, the nesting population had dropped by half, and by 2010, only a small fraction of the 1981 maximum was still nesting. In 2014, three gulls were present but none were nesting.[109]

Ricker recorded several Pigeon Guillemots around the islets in 1963. In 1968, Drent estimated 10 and five pairs on islets #1 and 2, respectively. Only two birds were present in 1974; one nest with one young was found under a rock on islet #5. Four birds were seen around islet #1, and two were present around islet #2 in June 1981, but none were present when Emms and Morgan surveyed the area in 1987. Three guillemots were seen in 2014.

A single Tufted Puffin was sighted around Rose Islets on 28 July 2018,[524] but no evidence of nesting was reported.

Figure 461. Naked cormorant chicks are extremely vulnerable to heat exposure if brooding adults are flushed off their nests. It can take only minutes in the hot sun for chicks to sustain this kind of injury seen on Rose Islets in 1974. *Photo by R. Wayne Campbell, 13 July 1974.*

Figure 462. The first complete count of Glaucous-winged Gull nests on Rose Islets was conducted by a crew from the BCPM in 1974. Here, Gary Seedhouse is trying to stay cool while conducting the survey on a hot day in July. *Photo by R. Wayne Campbell, 13 July 1974.*

Remarks: This colony has been heavily impacted by human disturbance.[188] Drent noted that hatching chronology of Double-crested Cormorants on Rose Islets was at least 2-3 weeks behind Mandarte Island in 1969. He suspected that human disturbance early in the season may have been responsible. Too much

human disturbance may have been the reason Pelagic Cormorants failed to nest after 1963, even though breeding adults were still attending the colony, as was seen in 1974. Human disturbance was also blamed for the large proportion of empty gull nests and small clutch sizes seen in 1974. A total of 40 dead gull chicks were found on the northern islet (#1) that year (Figure 463). Vermeer and Rankin [421] suspected that declines in Double-crested Cormorant numbers in the 1970s and 1980s were related to increasing disturbance from pleasure boaters, although frequent disturbance by Bald Eagles may have contributed to poor reproductive performance of gulls in 1986.[420] No sign of Bald Eagles was recorded in earlier years. We are not sure what caused the almost complete lack of eggs seen in cormorant nests in 1978; human disturbance or egg-harvesting again seemed likely culprits, although many gull nests still contained eggs. Observers in 1979 thought that the Double-crested Cormorant colony would undoubtedly be a complete failure that year due to human disturbance.

Figure 463. Territorial disputes are common among Glaucous-winged Gulls nesting in large colonies and young gull chicks often suffer from aggressive attacks by neighbouring gulls if they wander into their territories. Human disturbance can exacerbate the risks of injury to young chicks if it flushes them away from their nests and into neighbouring territories. A dispute among adults nesting on Rose Islets in 1974 is depicted in the left photo. A pecked chick is visible at the bottom middle of the left photo and shown in the right photo. Chicks often die from such attacks. *Photos by R. Wayne Campbell, 13 July 1974.*

Northwestern Crows likely take advantage of human disturbance on these islets. Four crows were seen overlooking cormorant nests on islet #2 in July 1976. In 1977, we found four broken Double-crested Cormorant eggs, four other cormorant eggs outside of nests, and two broken gull eggs, although we recorded no crows that year. One crow and four broken cormorant eggs were seen in 1978. Gulls also take cormorant eggs; we found a gull pellet containing cormorant eggshell in 1978. Many depredated cormorant and gull eggs were seen in June 1981.

One Glaucous-winged Gull nest contained two gull eggs and one Double-crested Cormorant egg in 1980.

GI-220 CANOE ISLET

Location: *49°01'41"N 123°35'19"W; 92 G/4.*
North of Porlier Pass, east of the south tip of Valdes Island.

Description: *0.6 ha; 3 m high; Bare rock.*
These two, tidally-connected, low bare rocks were established as an Ecological Reserve in 1971. The southern rock is likely washed by high waves, and only the main northern rock supports nesting seabirds (Figure 464).

Historical summary: Black Oystercatcher eggs were collected on 1 and 5 June 1895 at a location called "Valdes Island." [99] This location may have referred generally to the surrounds of Valdes Island, and Carter and Sealy [99] speculated that the eggs could have come from Canoe Islet. William Ricker saw the remains of several gull nests late in the summer of 1962 and provided the first definite record of nesting in 1963 (Table GI-220). From the water in 1963, Ricker saw one Glaucous-winged Gull sitting on a nest, but he did not land to check on others. He made no mention of cormorants nesting in his notes, and it is likely that he saw none as he made detailed notes on the cormorants nesting on nearby Rose Islets that he visited on the same day

and presumably would have done the same if they were present on Canoe Islet.

Assuming we are correct that no cormorants were present in 1963, Double-crested Cormorants apparently colonized the islet by the time Drent visited in 1968. They were still nesting in the early 1970s but then were absent for many years. In the 1970s, nesting was likely not successful. Most nests were empty in 1974; two contained single eggs each (Figure 465). In 1976, three of the six nests were empty and birds were sitting on three nests in June, but in July nests had been destroyed; nesting material was scattered about the top of the islet, and only four adults were standing around where nests used to be. No Double-crested Cormorants and no sign of nests were seen in 1977. Roosting birds were recorded on other visits: 13 in 1978; 15 in June 1981; and 50 in July 1981. For the first time in many decades, active cormorant nests were reported by Valdes Island resident Dan White in 2019. He did not identify species or number of nests, but we suspect that they were Double-crested Cormorant nests as other species of cormorant have not been recorded nesting at this site. We assumed that he saw at least two nests.

Figure 464. Bare rocky habitat on the higher, northern portion of Canoe Islet has been used for nesting by three seabird species. *Photo by R. Wayne Campbell, 13 July 1974.*

Table GI-220. Seabird nesting records for Canoe Islet. See Appendix 2 for codes.

DATE	DCCO	BLOY	GWGU	SOURCE
16 Jun 1963	0		x	332, 523
1968	30e			286
13 Jul 1974	12[2]	0	67[60]	70, 523
8 Jun 1976	6	0	37[11]	332, 523
27 Jul 1976	0	0	x	332, 523
16 Jun 1977	0	0	57[21]	332, 523
21 Jun 1978	0	0	50[30]	523
4 Aug 1979	0	0	x	523
27 Jun 1980		0	45[31]	523
11 Jun 1981	0	0	62[23]	523
15 Jul 1981	0	0	x	523
29 May-13 Jun 1983	0			421
Jun 1986			56	420
5-23 Jun 1987	0	1		427, 428
2000	0			114
16 Jun 2005		1	28e	57, 456
2007	0			522
May-Jun 2008		1		529
2009	0			1, 101, 522
2013	0			522
11 Jul 2014	0		1S	101, 110, 522
2019	2+			516

Figure 465. Double-crested Cormorants nested on Canoe Islet for a few years between 1968 and 1976. The colony suffered from human disturbance; most nests were empty in 1974, and all nests had been destroyed in 1976. After 1976, the colony was apparently abandoned for the next 40 years. *Photo by R. Wayne Campbell, 13 July 1974.*

Peak numbers of Glaucous-winged Gulls were also recorded in 1974, but unlike the Double-crested Cormorants, gulls continued to nest in only slightly fewer numbers through to at least 1986. However,

high proportions of empty nests were found in most years after 1974, although observers reported many large young in July 1976 and in August 1979. Rob Butler counted 28 adults on nests from the water in 2005; he saw two chicks. Blight [30] did not survey this colony during her study in 2010. When volunteer warden Roger Allen and BC Parks staff visited the colony in 2014, they found only one empty nest, although 10 birds were present.[110]

No Black Oystercatchers were seen through the 1970s, but one nesting pair was reported in 1987, 2005, and 2008. Four oystercatchers were present in 2014, but no evidence of nesting was reported.[110]

Remarks: Observers in 1974 reported that egg laying by Double-crested Cormorants was just beginning, but most nests on the nearby Rose Islets colony contained eggs on this date and we suspect the large proportion of empty nests seen on Canoe Islet that year was due to human disturbance or egg-collecting. The destruction of cormorant nests in 1976 was obviously due to humans.[332] The large proportion of empty gull nests found in most years after 1974 may also have been due to disturbance. Surveyors found five broken gull eggs and one dead adult in 1977, two depredated gull eggs in 1980, and four depredated eggs in June 1981. Three crows were present in 1977, and one was seen in 1978. Two adult and one immature Bald Eagle were present and disturbing gulls in June 1981; one Bald Eagle was present in 2014 (Figure 466).

Figure 466. Bald Eagles were reported disturbing nesting Glaucous-winged Gulls on Canoe Islet in 1981 and were present on the islet in other years, but disturbance by humans probably had the greatest impact on Double-crested Cormorants and gulls that historically nested on the islet. *Photo by Paula Courteau.*

GI-230 GALIANO ISLAND - NORTH CLIFFS

Location: *48°58'21"N 123°33'47"W; 92 B/13.*
Southeast of Spotlight Cove to Shaw's Landing.

Description: *20 m high; Cliffs.*
Sandstone cliffs run for about 2 km along the shoreline between Spotlight Cove and Shaw's Landing. There are cabins and houses immediately above the cliffs (Figure 467).

Figure 467. Many of the larger Gulf Islands have bands of eroded sandstone cliffs along their southwest sides. Most of those areas now also have human residences above the cliffs. Eroded pockets, crevices, and ledges in these cliffs can provide protected nesting sites for cormorants, gulls, and guillemots, although nesting seabirds, especially cormorants, have abandoned many such sites, most likely as a result of human disturbance. Pigeon Guillemots were recorded nesting on these cliffs at the northern end of the southwest side of Galiano Island over a century ago and may still nest. *Photo by R. Wayne Campbell, 27 July 1976.*

Historical summary: All surveys have been conducted from the water. Elton Anderson reported possibly 100 pairs of Pigeon Guillemots nesting along these cliffs in 1920 (Table GI-230). The maximum counted since then was 51 birds that we thought were nesting all along the cliffs in 1977. Guillemots were seen flying into crevices in the cliffs in 1978 and 1979, one carrying fish in July 1978. We saw only two birds on 19 June 1978, but seven pairs were nesting that year according to local residents D. and N. Russell that lived above the colony. Guillemots likely still nest on the cliffs, although we have no records since 1987.

Anderson made no mention of cormorants or gulls in the 1920s, and Pelagic Cormorants and Glaucous-winged Gulls were first recorded nesting when the site was surveyed by Wayne Campbell and

Marilyn Paul in 1976. The Pelagic Cormorant colony extended for about 200 m along the cliffs in 1976. Nest contents could not be determined from the water, but a total of 48 young were visible at 21 of the 44 nests counted. The colony was described as at the Spotlight Cove end of the cliffs in 1977. There were 99 adults present at the 56 nests counted that year, and adults were sitting on all nests in June 1978 when the colony was at its maximum size. In 1979, one cormorant nest held four large young, but 22 nests looked abandoned; contents of one other nest were unknown. There are no recorded data for Pelagic Cormorants at this site during the 1980s, but we suspect the site has been abandoned since 1979. Vermeer and Devito counted nesting gulls at this location in 1985 and 1986, and Emms and Morgan surveyed the site in 1987. No information about cormorants was given for those years, but the Pigeon Guillemot survey by Emms and Morgan was conducted at the same time as the cormorant survey in 1987.[428] Nesting was not reported by Vermeer et al., and we think it is safe to assume that no cormorants were present in 1987. No cormorants were nesting in 2000, and Carter et al. mapped the site as inactive in 2014.

Small numbers of Glaucous-winged Gulls have nested on cliff ledges in all years they have been surveyed since 1976. Two young were visible at one nest site in 1976. Adults were sitting on nests located right below cottages at the Spotlight Cove end of the cliffs in 1977. In 1978, we saw one pair on the cliffs in June, and Andy Stewart recorded two young visible in one nest in July. The maximum number nesting was six pairs in 1985 and 1986. There are no data for gulls since 1986.

Table GI-230. Seabird nesting records for Galiano Island - North Cliffs. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
1920-23			100e	144
27 Jul 1976	44	4	S(28)[a]	332, 523
20 Jun 1977	56	2	S(51)	332, 523
19 Jun 1978	79	1eS	7e(2)	523
24 Jul 1978		1	x(8)	523
4 Aug 1979	24		1	523
Jun 1985		6		420
Jun 1986		6		420
5-23 Jun 1987	0[b]		S(26)	158, 428
Jul-Sep 2000	0			459
2014	0			101

[a] Number of Pigeon Guillemots listed by Rodway and Campbell [332] was wrong and has been corrected.

[b] See text.

Remarks: Bald Eagles have been frequently sighted around these cliffs: two adults in 1976; one adult in 1977; and three adults in June 1978 (Figure 468). Chris Shepard and Penny Gee from the BCPM suspected that human disturbance was the cause of the abandoned cormorant nests in 1979.

Figure 468. Bald Eagles often perch and may nest in forested areas above cliffs where cormorants, gulls, or guillemots are nesting. *Photo by Paula Courteau.*

GI-238 SCOTT ISLAND

Location: *48°58'32"N 123°41'39"W; 92 B/13.*
West of Dayman Island off the southwest corner of Thetis Island.

Description: *2.6 ha; 37 m high; Grassy rock; Forested.*
The main Scott Island has a wide rocky shoreline and a central forested area. Much of the area of the main island is now occupied by a residential development, including a tennis court and dock facilities. Tidally-connected off the north end of the main island is a small rock with some shell beach habitat on its southeast corner and grasses and some shrubs on the highest central section.

Historical summary: Black Oystercatchers have nested intermittently at this site. No birds were seen in 1974, but a nest with two eggs was found on the north rock in 1978 (Table GI-238). No oystercatchers were seen during the survey in 1987. More than two decades later in 2010, Brian Self saw two pairs and found two nests with two and three eggs, respectively.

Table GI-238. Seabird nesting records (nests) for Scott Island.

DATE	BLOY	SOURCE
13 Jul 1974	0	523
20 Jun 1978	1	523
5-23 Jun 1987	0	427
12 May 2010	2	524

Remarks: Construction and occupancy of the residence on the main island likely caused disturbance to birds nesting on the north rock.

Two Canada Goose nests with eggs and two adult Bald Eagles were recorded in 2010.

GI-240 "PREEDY" ROCK

Location: *48°58'03"N 123°40'32"W; 92 B/13.*
At the south entrance to Preedy Harbour between Hudson Island and Foster Point at the south end of Thetis Island.

Description: *0.1 ha; Bare rock.*

Historical summary: Two Glaucous-winged Gull nests were found on this low, narrow rock in 1978 (Table GI-240). Nests were empty, but one had broken eggshell beside it. Only one adult gull was present. We have no other records for this site.

Table GI-240. Seabird nesting records for "Preedy" Rock. See Appendix 2 for codes.

DATE	GWGU	SOURCE
20 Jun 1978	2[1]	523

Remarks: There were river otter scats on the rock in 1978. This rock lies in the path of frequent boat traffic.

GI-250 AUGUSTUS POINT

Location: *48°56'42"N 123°39'10"W; 92 B/13.*
On the southwest shore of Penelakut Island (formerly Kuper Island) facing Stuart Channel.

Description: *10-15 m high; Cliffs.*
Eroded sandstone cliffs extend 60-70 m along the shore at Augustus Point (Figure 469). The land in this area is part of the Penelakut Island Indian Reserve No. 7.

Historical summary: John Comer first recorded nesting here in 1972 (Table GI-250). All three species recorded were nesting in holes in the eroded cliff face. Numbers of Glaucous-winged Gulls and Pigeon Guillemots remained relatively constant through the 1970s and early 1980s, except no gulls appeared to be nesting in 1980, but Pelagic Cormorants showed rapid changes in population size over that time period.

Figure 469. Eroded sandstone cliffs at Augustus Point on the southwest side of Penelakut Island. Pelagic Cormorants nested in large numbers on these cliffs in the mid-1970s and intermittently in smaller numbers since. *Photo by R. Wayne Campbell, 27 July 1976.*

Table GI-250. Seabird nesting records for Augustus Point. See Appendix 2 for codes.

DATE	PECO	GWGU[a]	PIGU	SOURCE
4 Jun 1972	20e	4e	6e	332, 523
13 Jul 1974	19[b]	10[b]	x(4)[b]	332, 523
27 Jul 1976	54	11	x(17)	332, 523
16 Jun 1977	81	6	S(3)	332, 523
20 Jun 1978	56	3	x2(13)	523
27 Jun 1980	3	0	S(1)	523
10 Jun 1981	0	6+	S(16)	523
Jun 1986		8		420
5-23 Jun 1987	0		(0)	158, 428
2014	18			101
2015	0			522
1 Aug 2019	8			459

[a] Blight [30] presented historical Glaucous-winged Gull records for this site under two different locations, Augustus Point and Kuper Island, but they are all from the Augustus Point colony site.
[b] These data were accidentally omitted by Campbell.[70]

Numbers of Pelagic Cormorant nests were similar in 1972 and 1974, but then increased almost three-fold by 1976 and four-fold to a peak in 1977. All nests were on cliff ledges in 1974. Small to large young could be seen in most nests in 1974 and 1976. There was a total of 142 adults present around the 81 nests counted in 1977. The nesting population declined just as quickly after 1977 to only three nests

in 1980 and none in 1981. In 1978, though numbers had declined from the year before, adults were sitting on all but one nest, and a total of 79 adults were present. The site was not surveyed by Vermeer and Rankin in 1983,[421] but it appears that it has been used intermittently since 1980. Eight nests were counted during the most recent survey in 2019; a single chick was visible in one nest and only two nests had attending adults.

Glaucous-winged Gull nests were located on ledges and at the top of the cliffs in 1974. Four of the nests seen in 1976 were at Augustus Point; the rest were scattered along the west side cliffs to the north. Young could be seen in five of the 10 nests in 1974 and three of the 11 nests in 1976. Adults were sitting on all nests seen in 1977. Fourteen adult gulls were present in 1978, but only three could be seen sitting on nests located in holes in the cliff. No gulls appeared to be nesting in 1980, although 10 adults were roosting on the cliff, but observers saw eight pairs of gulls on the cliffs and reported at least six nests in 1981. We have no survey data for gulls since 1986 when eight nests were counted.

Pigeon Guillemots were seen flying into holes and crevices during several surveys and were seen on the water at the base of the cliffs in all years that they were present. One small chick was seen in a nest located in a shallow crevice in 1974. In 1976, most guillemots were gathered on the water about 200 m south of Augustus Point.

No evidence of nesting by Double-crested Cormorants has been seen but one bird was perched in a tree below the Pelagic Cormorant colony in 1978.

Remarks: No evidence of disturbance or predation was recorded on any survey, and the reasons for the collapse of this cormorant colony are unknown. However, the area is a popular dive site, and boats approaching close to the colony would disturb nesting birds.

GI-258 JACKSCREW ISLAND

Location: *48°57'12"N 123°35'15"W; 92 B/13.*
Northeast of Southey Point at the northern tip of Saltspring Island, southwest of Secretary Islands.

Description: *8.1 ha; 46 m high; Forested; Grassy rock.*
The main island is forested and has broad rocky shorelines. There is a small rock, tidally connected off the east side. The rock is bare except for a small patch of shrubs.

Historical summary: A Black Oystercatcher nest with an apparently incubating adult was seen from the water in 2010 (Table GI-258). We have no other records for this site.

Table GI-258. Seabird nesting records for Jackscrew Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
20 May 2010	1S	456

GI-260 WALLACE ISLAND

Location: *48°56'19"N 123°33'00"W* (west cliffs)*; 92 B/13.*
Trincomali Channel between Galiano Island and the north end of Saltspring Island. Formerly known as Narrow Island. Colony includes the rocks along the southwest side.

Description: *89 ha; 65 m high; Forested; Cliffs; Bare rock.*
As its former name implies, Wallace Island is a long, narrow island, oriented northwest to southeast, with sedimentary strata forming a convoluted series of points and bays. Most of the main island is forested, and there are cliffs on the mid-southwest side between Princess Cove and Conover Cove. Small ribs of bare, 2-3 m-high rock lie off the southwest side, southwest (south rocks) and northwest (north rocks) of Princess Cove (Figure 470). Residences and resorts have been developed on the island in the past. Wallace Island Marine Provincial Park was established in 1990 and includes the entire main island except a 4.5 ha strip of private property north of Princess Cove. Camping and picnic sites and a network of trails have been developed in the park, adding to the attraction of the area for many boaters.

Historical summary: As noted in the GI-020 Ada Islands colony account, there has been some confusion about records from 1981 for Wallace Island. However, we are confident that records from 1981 are correctly listed here for Wallace Island.

Glaucous-winged Gulls have been found nesting only on the rocks off the southwest side of the main island. Phil Nott and Bruce Ford from the BCPM first recorded gulls nesting on the south rocks in 1974 (Table GI-260). Thirty adults were counted on the rock, but only three nests with eggs were found. Lynne Milnes and Michael Rodway found gulls

nesting on both sets of rocks, with 10 nests on the south rocks and two nests on the north rocks in 1977. Similarly, Harry Carter and Michael Rodway found eight nests on the south rocks and two nests on the north rocks in 1978. In 1981, Gary Kaiser and Scott Webb found four and three nests on those same two rocks, respectively, but only one nest on the south rock contained an egg; the rest were empty. Gulls may still nest on these rocks, but the three nests found by Vermeer and Devito in 1986 is the last record we have for gulls at this site.

Figure 470. Long, narrow rock ribs along the southwest side of Wallace Island provide nesting habitat for Glaucous-winged Gulls and Black Oystercatchers. Harbour Seals frequently haul out along the rocky ribs. *Photo by Moira J.F. Lemon, 28 August 2021.*

No Black Oystercatchers were seen on surveys from 1974 to 1987, but a pair with one chick was seen in 2005.

Pigeon Guillemots were nesting on the cliffs on the mid-southwest side of the main island in 1977; one bird was seen flying out of a crevice on the cliffs (Figure 471). Small numbers of guillemots have frequently been seen around the island in other years, although no evidence of nesting has been reported since 1977.

Table GI-260. Seabird nesting records for Wallace Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
22 Jun 1974	0	3[3]	(0)	332, 523
17 Jun 1977	0	12[8]	1(2)	332, 523
19 Jun 1978	0	10[6]	S(2)	523
10 Jun 1981	0	7[1]	(0)	523
Jun 1985		3		420
Jun 1986		3		420
5-23 Jun 1987	0		(0)	158, 427
16 Jun 2005	1			57
17 Apr 2007			(1)	524
29 Jul 2009			S(1)	45
19 Apr 2016			(10)[a]	524
11 Aug 2017			(5)	524
12 Jun 2018			(2)	524

[a] Included birds seen around Wallace and Secretary islands.

Figure 471. The eroded sandstone cliffs along the shores of Wallace Island where Pigeon Guillemots nest within hollows and crevices. *Photo by Moira J.F. Lemon, 7 September 2020.*

Remarks: In 1978, two depredated gull eggs were found under a rock on the north rocks, and two intact eggs were found outside of nests on the south rocks. One old gull kill was also found on the south rocks in 1978. Two crows were recorded on the north rocks in 1981. Bald Eagles and mink are common in the park.

GI-270 TENT ISLAND

Location: *48°55'30"N 123°37'49"W* (west cliffs)*; 92 B/13.*
Tidally connected to Josling Point at the south tip of Penelakut (formerly Kuper) Island.

Description: *26 ha; 57 m high; Forested; Cliffs.*
The island is forested and largely undeveloped. There are eroded sandstone cliffs, 5-10 m high, extending for about 30-40 m along the southwest side of the island (Figure 472). The Penelakut First Nation has aboriginal rights and title to Tent Island and manages a campsite in the west bay. For several years the Penelakut Band leased the island to BC Parks for use as a Provincial Park, but that lease ended many years ago.

Figure 472. Eroded sandstone cliffs extend for about 30-40 m along the southwest side of Tent Island. *Photo by Michael S. Rodway, 16 June 1977.*

Historical summary: All surveys have been conducted from the water. Nesting by seabirds has been recorded only on the west cliffs, where Pelagic Cormorants, Glaucous-winged Gulls, and Pigeon Guillemots were first seen nesting on ledges and in holes on the cliff by John Comer in 1972 (Table GI-270). Since then, breeding by Pelagic Cormorants has been intermittent; the site was not used in several years, and the nesting population in other years has oscillated from zero to 74 pairs. Highest numbers were counted in 1978 and 1987 and 14 nests were seen on the most recent survey in 2019. A total of 74 adults were present at the 42 nests counted in 1977, adults were sitting on all nests in 1978, and 55 adults were counted near nests in 2019.

Table GI-270. Seabird nesting records for Tent Island. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
4 Jun 1972	4e	1	25e	332, 523
13 Jul 1974	0	3[3]	5e(11)	70, 523
27 Jul 1976	0	5	(0)	332, 523
16 Jun 1977	42	16	S(5)	332, 523
19 Jun 1978	71	7	S(4)	523
27 Jun 1980	23	4	S(1)	523
10 Jun 1981	37	15e	S(8)	523
Jun 1985		11		420
Jun 1986		12		420
5-23 Jun 1987	74		S(2)	158, 428
2000	0			114
2006	34			522
2007	2			522
2009	34			522
2013	0			522
2014	5			101
1 Aug 2019	14			459

Gull numbers increased from one to 16 nesting pairs in the 1970s, and there were still a dozen nests on the cliffs on the last gull survey in 1986. Young were visible in all three nests in 1974 and in two nests in 1976. Adults were sitting on all nests in 1977 and 1978. Thirty-five adults were counted on the cliffs and observers estimated 15 nests in 1981.

John Comer estimated 25 pairs of Pigeon Guillemots nesting in 1972, but a maximum of 11 birds have been seen in other years. Two young were visible in one Pigeon Guillemot nest found, and three of the 11 birds seen at the base of the cliffs were holding fish in 1974.

Remarks: One adult Bald Eagle was recorded in 1974 and 1978, and two immatures were seen in 1980 (Figure 473). A Bald Eagle nest was located at

Figure 473. Immature and adult Bald Eagles were recorded on Tent Island in several years and a pair was nesting at the north end of the island in 1974. *Photo by Paula Courteau.*

the north end of the island in 1974. Seven crows were present in 1974, and one was seen in 1978. An empty stick nest that we thought was a crow nest was found in a hole in the sandstone cliff in 1978. No evidence of predation on nesting seabirds has been reported.

The island sees high tourist traffic and has been a popular camping spot for boaters for years.

GI-280 BARE POINT

Location: *48°55'40"N 123°42'23"W; 92 B/13.*
Point forming the east side of Chemainus Bay, opposite the town of Chemainus.

Description: *15-20 m high; Cliffs.*
Sheer cliffs run about 80-100 m along the west side of Bare Point facing Chemainus. There are trees below and above the cliffs, although much of the forested top of the point has been modified by industrial development. A Shell Canada petroleum tank farm runs along much of the top along the west side of the point, linked to a terminal facility on the east side. There is a light beacon on the tip of the point.

Historical summary: This site supported a large Pelagic Cormorant colony from the 1950s to the mid-1980s (except none nested in 1980) and was a major Double-crested Cormorant colony in the early 1970s and the early 1980s (Table GI-280). Both cormorant species declined through the 1990s, and neither has been seen nesting since 2000. Surveys were conducted from a boat except in 1981, when counts were made by telescope from the dock at Chemainus because log booms prevented observers from approaching the colony.

Pelagic Cormorants were first reported breeding in the early 1950s by Reverend John Stainer. Guiguet saw nests and eggs and made the first estimate of numbers in 1959. Drent made the first thorough count of nests in 1968 and tallied 231 occupied nests on ledges and crannies in the cliff face. Fewer nests were seen through the 1970s, and none nested in 1980, but the colony then reached its maximum size in 1981 and 1983. Most nests were clustered in a central part of the cliff in 1974 (Figure 474), with four isolated nests to the north and three isolated nests to the south of the main group. Young were visible in 45 of the 118 nests that year. In 1978, adults were sitting on 162 of the 173 nests, and a total of 237 adults were present, some still bringing in nesting material. By 1987, the colony had declined to less than half its maximum size and by 1990 was only a tenth of its former size. The last active nests were recorded in 1999. In 2019, Trudy Chatwin and Jenna Cragg noted that there may have been empty, inactive Pelagic Cormorant nests that had been built that year; they were unable to approach close enough to the cliffs to be sure.

Figure 474. A large colony of Pelagic Cormorants nested on these cliffs on the west side of Bare Point until the mid-1980s. The site has been abandoned since 2000. *Photo by R. Wayne Campbell, 13 July 1974.*

John Comer first reported Double-crested Cormorants (Figure 475) nesting in 1971 and estimated 200 nests in 1973. No sign of nesting was seen in 1974-1980, but large numbers were again nesting in 1981. Nests have been located in trees at the base of the cliffs.[83] Most nests were towards the north end of the cliffs, with some in the middle in 1981. In 1990, only one of the 18 Double-crested Cormorant nests and eight of the 40 Pelagic Cormorant nests were still active (with young) on the date of visit. The last Double-crested Cormorant nests were also recorded in 1999.

Small numbers of Glaucous-winged Gulls have been seen nesting on ledges on the cliffs in most years. Two nests were located along the top of the cliffs in 1974 and 1977. Nest contents could not be determined in most cases, but one nest with three eggs and three nests with young were visible in 1974. Adults were sitting on all nests in 1977. Eight adults were present in 1978; three could be seen sitting on nests, and a fourth nest was suspected. Five pairs were still nesting when the colony was last surveyed for gulls in 1986.

Figure 475. Double-crested Cormorants nested in trees at the base of the Bare Point cliffs between 1971 and 1999. *Photo by Paula Courteau.*

Table GI-280. Seabird nesting records for Bare Point. See Appendix 2 for codes.

DATE	DCCO	PECO	GWGU	PIGU	SOURCE
1952-59		x			144
28 May 1959		50e			144
9 Jun 1968		231	1	x(8)	332, 523
1971	30-35e				382
1973	200e				523
9 Jun 1974	0	125e	2		523
13 Jul 1974	0	118	11	2e(3)	70, 523
16 Jun 1977	0	115	8	S(6)	332, 523
20 Jun 1978	0	173	4e	x4(14)	523
27 Jun 1980	0	0	0	(0)	523
10 Jun 1981	118e	356e	16e		523
29 May-13 Jun 1983	198	373			421
1984	x	300e			16
1985	x	x	x	x	16
Jun 1986			5		420
5-23 Jun 1987	0	142		S(6)	158, 428
8 Jul 1988	25				455
28 Jul 1990	18	40			43
1996	23				114
1998	19	26			114, 266
1999	11	8			114, 266
2000	0	0			114
2007	0	0			522
2009	0	0			1, 522
2010	0				522
2013	0	0			522
2014	0	0			101, 522
2015	0	0			522
1 Aug 2019	0	0			459, 462

Drent saw one pair of Pigeon Guillemots sitting at the mouth of a crevice on the cliff and three pairs on the water below the cliffs in 1968. Three guillemots were seen flying into crevices or holes in the cliff face and one nest with one young was reached in 1974. Four birds flew out of crevices in 1978 and six birds were present when the site was last surveyed for guillemots in 1987.

Remarks: The entire west side of the point is currently used as a booming ground (Figure 476). Log-booming in front of the nesting cliff began in 1980 and was thought to be the cause of complete nesting failure that year.[16] However, birds were nesting in good numbers the following year and Baird et al.[16] speculated that once in place, log booms may provide some benefit to nesting cormorants by keeping pleasure craft farther away from nesting cliffs and by providing additional roost sites. Still, further disturbance from log-booming activities likely contributed to declines in cormorant numbers since 1983.[105] Insect traps to protect logs and lumber from beetle infestations were hung in the Double-crested Cormorant colony trees and may have disturbed nesting birds and delayed breeding in 1985. Nesting trees were being impacted by guano from nesting birds and some may have been dying in 1985, although quite a few other trees were still available as potential nest sites.[16] Some nesting trees had blown down in the years prior to 1985.

Figure 476. Log booms have been stored in Chemainus Bay on the west side of Bare Point for many decades. Disturbance from log booming activities likely impacted cormorants when they were nesting on the Bare Point cliffs, especially when booms were anchored next to the cliffs, although, once in place, log booms may have offered some protection for nesting birds by preventing boats from approaching the cliffs. *Photo by R. Wayne Campbell, 13 July 1974.*

One crow was recorded in 1978. One dead adult Double-crested Cormorant and three dead adult Pelagic Cormorants were found below nests in 1990.

GI-285 CHEMAINUS - HARBOUR

Location: *48°55'32"N 123°42'52"W; 92 B/13.*
Vancouver Island shoreline southeast of Ladysmith.

Description: *Wharf, Lighting towers.*

Historical summary: Two Pigeon Guillemot nests with two eggs each were located on narrow ledges under the municipal wharf in 1974 (Table GI-285). In 2010, Glaucous-winged Gulls were seen sitting on three nests located on lighting towers in the Western Forest Products yard in the harbour.

Table GI-285. Seabird nesting records (nests) for Chemainus - Harbour.

DATE	GWGU	PIGU	SOURCE
22 Jun 1974		2	71
11 Jun 2010	3		45

GI-290 SHOAL ISLANDS

Location: *48°54'00"N 123°40'00"W; 92 B/13.*
Close to the Vancouver Island shore south of Chemainus, just north of the town of Crofton. Colony includes Willy Island, the dolphins to the east and west of the islands, the marine marker on the tidal Indian Reef east of the islands, and the artificial island built around the southern islands in the group and connected by a causeway to the main shore of Vancouver Island near the Crofton mill site.

Description: *70 ha; 35 m high; Forested; Dolphins, Rooftops.*
The entire Shoal Islands complex lies within the sedimentary plume at the mouth of the Chemainus River. It is made up of about 17 islands, tidally connected at various depths by mud and sand sediments. Islands are mostly forested, with some rocky shoreline and separate rocky knobs. The northern cluster of islands includes Willy Island, which is the largest island in the group and lies directly off what is currently the main outlet channel of the Chemainus River. A southern cluster of small islands forms the northern boundary of Osborn Bay just north of the main town of Crofton. There is a series of dolphins erected for log-booming operations at the north end of Osborn Bay to the west of the southern group of islands and two large pulp mill effluent dolphins placed at the outer edge of the estuarine sediments about 600 m northeast of the southern cluster of islands. In 1978, an artificial, 20 ha island connected by a causeway to the main

Vancouver Island shoreline was created around the southern islands to serve as a log-sort depot. Log booms are also frequently anchored around the most northern islands. There is a navigational beacon on the small rock at the very southeast end of the complex and a marine marker on Indian Reef about 560 m east of the southern islands.

There has been some variation in the naming and composition of this colony site. Shoal Islands was the location cited by Vermeer et al.[428] and Rodway [328] for this colony of Double-crested Cormorants discovered in 1987 on the pulp mill effluent dolphins located east of the Shoal Islands. More recent summaries have named this colony "Crofton" [43, 114] or "Crofton Dolphins" [101] and "Shoal Island." [375, 266] We think that Shoal Islands is the appropriate name for this colony because cormorants have nested on the islands as well as on the adjacent dolphins to the east and because the main nesting site on the dolphins is much closer to Shoal Islands than to the town of Crofton.

We now have included all the dolphins and navigational markers nearby as part of the Shoal Islands colony. We had formerly designated the dolphins west of the southern Shoal Islands as a separate colony site, GI-300 Osborn Bay.[525] Glaucous-winged Gulls were nesting on one of those dolphins in 1978 (Figure 477). We decided it was more appropriate to include all those dolphins and that 1978 gull nesting record under the Shoal Islands colony, especially after Double-crested Cormorants were found nesting on the pulp mill effluent dolphins (see below). This meant that there is no longer a GI-300 Osborn Bay colony site; we have now assigned that colony number to Cowichan Lake.

Figure 477. A pair of Glaucous-winged Gulls was nesting atop this piling in Osborn Bay in 1978. We designated the site as a separate colony at that time, but have since amalgamated the site with the adjacent Shoal Islands and other pilings and dolphins in the area that now constitute the Shoal Islands colony. *Photo by Michael S. Rodway, 20 June 1978.*

Historical summary: There are a couple of records of Black Oystercatchers and Glaucous-winged Gulls nesting in the 1970s (Table GI-290). One gull nest with two eggs was found on the island just northwest of Willy Island in 1974. In 1978, one Black Oystercatcher nest with two young was located on the rock with the light beacon located at the southeast end of the islands, and one pair of gulls was nesting on the top of a group of eight pilings tied together in the booming grounds west of the southern cluster of islands (formerly the GI-300 Osborn Bay colony site; see Figure 477).

Double-crested Cormorants (Figure 478) were first found nesting on the two pulp mill effluent dolphins in 1987. With some variation, the nesting population was relatively stable for most of the next three decades, but has declined in recent years. Numbers were somewhat higher in 2002 and lower in 2006 and reached a maximum in 2009. Only a partial count was conducted in 1990. In 1993, 23 cormorant nests were built in a small stand of Douglas-fir on one of the Shoal Islands, about 600 m southwest of the main colony site on the dolphins (note that Moul and Gebauer [266] gave the distance as 200 m but we think that was a mistake). Moul and Gebauer [266] also reported a solitary nest located on a marine navigational marker approximately 500 m south of the main colony, which we believe is the marker located on Indian Reef. We do not know whether cormorants continued to nest in trees after 1993, but by 2000 all nests were again located on the two large dolphins; no tree nests were seen.[459] In 2009, when the nesting population peaked, in addition to 70 nests on the two dolphins, there were 89 nests on a logging crane structure on the artificial island built around the southern Shoal Islands.[459] The crane was abandoned in subsequent years,[101, 459, 522] and numbers nesting on the dolphins began to decline after 2009. Thirty-five nests were seen on the dolphins in 2015, and the entire colony was reported abandoned in 2017 through 2020, although not all potential tree-nesting locations in the Shoal Islands were searched for nests during those surveys.

Two Pigeon Guillemots were present around Shoal Islands in 1978, but no evidence of nesting has ever been obtained.

Remarks: Disturbance from log-booming activities and from the construction of the artificial island and causeway connecting the southern Shoal Islands to Vancouver Island has likely impacted nesting birds. Disturbance from those activities may explain the lack of nesting records for gulls and oystercatchers after 1978 and account for the brief occupation by

Double-crested Cormorants of the tree-nesting site on the southern islands. However, the construction of the pulp mill effluent dolphins and the presence of the logging crane have provided artificial nesting habitat for Double-crested Cormorants, and the dolphins are likely the reason the colony was established in the first place.

Figure 478. Double-crested Cormorants were first reported nesting at Shoal Islands in 1987. Between 1987 and 2015, they nested on two large dolphins to the east of the main islands, a navigational marker south of the islands, in trees on one of the islands, and a logging crane structure on the artificial island built around the southern island. In this photo, a Double-crested Cormorant is drying its wings after a bout of diving. *Photo by R. Wayne Campbell.*

In May 1991, Ian Moul observed a commercial fishing boat tied to the pilings of the cormorant colony. All adult Double-crested Cormorants were flushed off their nests and were flying in circles around the site.[266] Giesbrecht [181] frequently observed boats and eagles approach the cormorant colony during her study in 2000 on the effects of boat and Bald Eagle disturbance. Cormorants became agitated but were not observed flushing from their nests when boats approached closely and only 14% of cormorants left their nests during one of 23 recorded incidents of eagles flying nearby. Thus it appeared that cormorants gained some measure of security from nesting on the dolphins and would not flush from their nests unless boats actually tied up to the dolphins or presumably if eagles landed on the dolphins. Even so, the colony declined in recent years and was abandoned when it was most recently surveyed in 2017 and 2020. Infrequent disturbance events such as Ian Moul observed in 1991 but were not detected during Giesbrecht's study may have drastic effects on the reproductive success and behaviour of nesting cormorants and may be related to the recent population decline. Such events have likely become more frequent, given the ever-increasing volume of boat traffic in the Salish Sea. Eagles also may occasionally have greater impacts on nesting birds. Eagles were observed eating two adult or juvenile Double-crested Cormorants on 15 July 2000.[181]

Table GI-290. Seabird nesting records for Shoal Islands. See Appendix 2 for codes.

DATE	DCCO	BLOY	GWGU	PIGU	SOURCE
13 Jul 1974			1	(0)	70, 523
20 Jun 1978	0	1	1	(2)	523
5-23 Jun 1987	65	0		(0)	158, 427, 428
May-Jul 1989	72				375
Jul 1990	44+				43
1991	78				114
1992	74				114
1993	74				114, 376
1994	75				114, 376
1995	71				114, 266
1999	83				114, 266
Jul-Sep 2000	104				114
2006	50e				522
2007	95				522
2009	159[a]				101, 459, 522
2013	65				522
2014	48				101, 522
2015	35				522
2017	0[b]				112
6 Aug 2018	0[b]				459
1 Aug 2019	0[b]				459
2020	0[b]				459

[a] Includes 89 nests on a logging crane structure. Note that Adkins and Roby [1] listed only 83 nests for 2009.
[b] The Crofton dolphins and the logging crane were abandoned in 2017-2020 but potential tree-nesting locations in the Shoal Islands may not have all been surveyed.

Double-crested Cormorant eggs were repeatedly collected from nests in 1990 for a UBC toxicology monitoring study.[43] All eggs were taken from 19 nests on the lower two rungs of the northwest dolphin on 29 May (3 eggs), 27 June (48 eggs), and 10 July (33 eggs). On 24 July, four clutches (13 eggs) were collected from nests on the southeast dolphin.

GI-292 CROFTON - MILL

Location: *48°52'45"N 123°38'59"W; 92 B/13.*
On the Vancouver Island shore north of Crofton, south of the Chemainus River estuary.

Description: *Rooftops.*
This colony includes all facilities associated with the Crofton pulp and paper mill that began operations in 1957 and is currently run by Catalyst Paper Corporation.

Historical summary: During surveys of Great Blue Herons in 2016, Trudy Chatwin observed Glaucous-winged Gulls nesting on the rooftop of one of the buildings close to shore at the pulp and paper mill (Table GI-292).

Table GI-292. Seabird nesting records for Crofton - Mill. See Appendix 2 for codes.

DATE	GWGU	SOURCE
2016	20e	459

GI-300 COWICHAN LAKE

Location: *48°52'00"N 124°14'00"W; 92 C/16.*
Central Vancouver Island west of Crofton. Note that this colony number formerly referred to Osborn Bay, but that site is no longer considered a separate colony site (see GI-290 Shoal Islands).

Description: *Pilings.*

Historical summary: During surveys of Mew Gulls (now Short-billed Gull) at inland lakes on Vancouver Island in 1985, Vermeer and Devito found one pair of Glaucous-winged Gulls nesting on a piling in the lake (Table GI-300). We have no other records for this site.

Table GI-300. Seabird nesting records (nests) for Cowichan Lake.

DATE	GWGU	SOURCE
May-Jun 1985	1	419

GI-310 VESUVIUS BAY

Location: *48°52'52"N 123°34'24"W* (ferry dock); *92 B/13.*
On the west side of Saltspring Island near the north end. Colony includes the ferry dock and unnamed rocks in Vesuvius Bay and the unnamed rock off Dock Point.

Description: *0.5 ha; 3 m high; Bare rock; Grassy rock; Wharf.*
There are rocky knolls tidally connected to the point forming the southwest side of Vesuvius Bay and to Dock Point northwest of the ferry dock in Vesuvius Bay. Sedimentary rocks on the southwest side of the bay are bare but the rock off Dock Point has grass and a few shrubs on higher sections. There are houses on both points.

Historical summary: Vermeer and Devito recorded one pair of Glaucous-winged Gulls nesting at Dock Point and three pairs at the ferry dock and on the rocks in Vesuvius Bay in 1986 (Table GI-310). We have no other records for this colony area.

Table GI-310. Seabird nesting records (nests) for Vesuvius Bay.

DATE	GWGU	SOURCE
Jun 1986	4	420

GI-320 BALLINGALL ISLETS

Location: *48°54'26"N 123°27'34"W; 92 B/14.*
On the northeast side of Trincomali Channel, off the mid-southwest side of Galiano Island, northwest of Wise Island. Also known as the Twins in the 1930s.[368]

Description: *0.2 ha; 6 m high; Grassy rock.*
These two rocky islets are capped with grass and some patches of shrubs. A clump of seaside juniper trees (*Juniperus maritima*) once grew on the larger, north islet (Figure 479). They were mostly dead in 1936, likely killed by guano from the nesting cormorants.[272] Remnants of the trees still remain on the north islet (Figure 480). In 1963, BC Parks designated the islets as a Nature Reserve, which

became an Ecological Reserve under the *Land Act* after the Ecological Reserves Committee was formed in 1968.

Historical summary: This picturesque and historic colony has been frequently surveyed and was given protective status when it was still a thriving colony, but unfortunately has suffered the same fate as so many other colonies in the BC Salish Sea.

Peter Thornton first reported Double-crested Cormorants nesting in 1933 (Table GI-320). Although this was the second known colony in BC, after Double-crested Cormorants were previously discovered nesting on Mandarte Island in 1927,[270] the apparent age of the nests and the condition of the juniper trees when they were described to Munro in 1933 led him to believe that this colony was older and was likely the first established in BC, perhaps around 1920.[144, 272] Francis John Barrow, cruising in his boat the *Toketie* out of Sidney, observed nests early in 1934 and returned with W.A. Newcombe in May 1934. Those observers returned twice in 1936, accompanied by Sprot on 14 June 1936.[368] On this date, they were able to inspect 10 nests; six held 2-4 eggs each. Munro first visited the colony on 7 July that year; all inspected nests then held eggs or newly-hatched young.[272] In the 1930s, all reported Double-crested Cormorant nests were built in the half-dead juniper trees on the north islet (Figure 481).

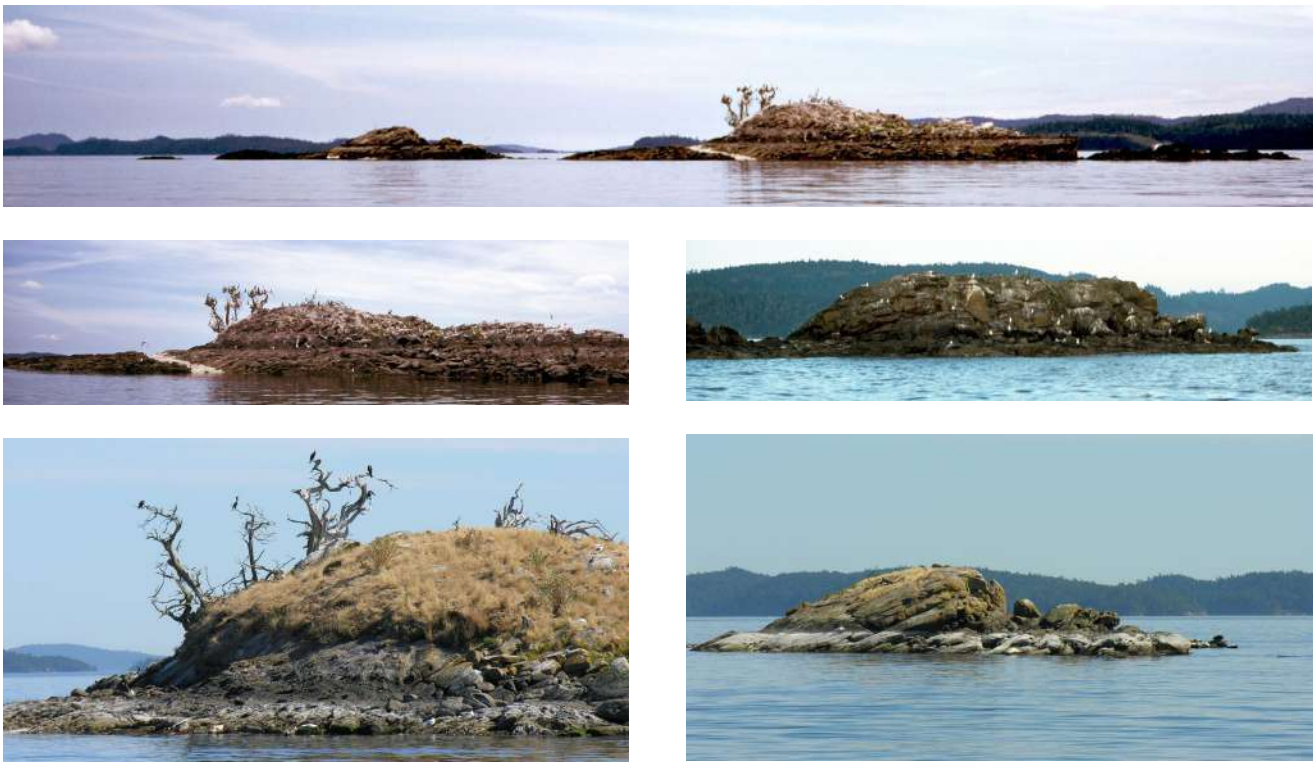


Figure 479. Views of the entire Ballingall Islets from the east (top) and of the north (left middle) and south (right middle) islets in 1974, and of the north (bottom left) and south islets in 2006. *Photos by R. Wayne Campbell, 22 June 1974 (top three) and Moira J.F. Lemon, 14 August 2006.*

Clifford Carl and Clarence Ferris made three visits in 1941, accompanied by A. A. Sherman in June. On an early visit to the north islet in April 1941, they tallied 6, 3, 6, 2, and 13 Double-crested Cormorant nests in five juniper trees ordered west to east. Thirteen of the 30 nests counted were being newly constructed; 17 were old nests being refurbished. No eggs had yet been laid. In June, the party counted 9, 3, 8, 5, and 17 nests in the same five trees, plus they found, for the first time, at least two nests on the ground (Figure 482), for a total of at least 44 nests. They did not specify where the ground nests were located, whether on the north or south islet. Young were seen in at least three tree nests; others contained 0-5 eggs per nest. Young were seen in all nests when these observers returned in July.

By 1943, Double-crested Cormorants were nesting on both islets: Ted White counted 37 nests in two dead trees and 19 nests on the ground on the north islet; and 10 nests on the ground and four nests on a low bush on the south islet. Some nests still had eggs but most nests held young of various sizes when White visited in August. In 1954, Clay found 20 nests in the dead junipers and 24 nests on the

ground on the north islet and 10 nests on the south islet; in 1957, Cowan counted 26 nests in the juniper clump and 48 nests built on the ground; and in 1959, Drent reported 28 nests in the juniper clump on the north islet and 31 nests built on the flat rock on the south islet. In 1964, Wayne Campbell noted 23 nests under construction in early May, and, making a visit after the islets were established as a Nature Park in November 1963, Alan Brooks and Yorke Edwards reported 30+ nests on the north and 25+ nests on the south islet in July 1964. Many large young were seen.

In 1966, Robin Best inspected 27 Double-crested Cormorant nests (23 with eggs, 4 empty) in the juniper trees, and noted about eight additional nests located higher in the juniper trees that he could not see into. Robin visited both islets to count gull nests, but from his description, he apparently saw Double-crested Cormorant nests only on the north islet where the dead junipers were located. Later, he noted that cormorants had a "full hatch" that year. In 1968, Drent surveyed the colony in June and Best returned in August. Similar numbers of nests were seen in the juniper trees in June 1968 (34 nests) as in 1966, but 23 nests were also counted on the south islet in June 1968, although all of those were empty. Nests on the north island were counted with binoculars from the boat and were not inspected by Drent. In August, Best reported 28 nests on the north and 10 nests on the south islet; only two nests were inspected, both contained eggs and young.

Figure 480. Remnants of the juniper trees on Ballingall Islets where Double-crested Cormorants historically nested from the 1920s to the 1980s. *Photo by Louise Blight, 18 June 2010.*

Figure 481. The Double-crested Cormorant colony on Ballingall Islets was likely the first one established within the BC Salish Sea, probably colonized sometime in the 1920s. It was an iconic colony, with nests built in the picturesque juniper trees on the north islet (this page and previous page). *Photos by R. Wayne Campbell, 8 June (previous page) and 27 July 1976.*

Figure 482. Double-crested Cormorants on Ballingall Islets initially nested in juniper trees and were seen nesting on the ground for the first time in June 1941. As the colony grew through the 1960s, more nests were built on the ground on both islets. As the colony declined through the 1970s, birds withdrew from nesting on the ground, and through the 1980s, nests were again found only in the dead juniper trees. These ground nests were seen in July 1968. *Photos by R. Wayne Campbell.*

Fewer Double-crested Cormorant nests were found and, except for one nest found on the south islet in 1978 and five nests found there in 1979, birds were nesting only on the north islet through the 1970s. Only 14 nests were seen in 1974, all in the dead junipers on the north islet. Nest contents were not determined as the trees were judged too fragile to climb (Figure 483), but adults were sitting on the nests and did not leave until observers got very close. Nests were again found only in the largest

Table GI-320. Seabird nesting records for Ballingall Islets. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
1933	x					272
8 May 1934	6	14		40		96, 368
3 June 1934	10	16		x		96
14 Jun 1936	23	9-12		85	1eS	368
7 Jul 1936	23					272
17 Aug 1939	33[28]	9[9]		x		144, 523
28-29 Apr 1941	30	3				523
17 Jun 1941	44[a]	23		"many"		332, 523
22 Jul 1941	x	x		x		523
5 Aug 1943	70	x		x		332, 523
16 Jun 1954	54			1+		122
8 Aug 1957	74					144
28 Jun 1959	59	11		57	6	144
7-8 May 1964	23+					65
28 Jul 1964	55+	10		50e	5e	332, 523
12 Jul 1966	35e	11[8]	1eS	94[67]	S	332, 523
9 Jun 1968	57	8-9		42e	6-10e	332, 523
5 Aug 1968	38	10e	1eS	150e	5e	332, 523
22 Jun 1974	14	0		96[96]	6e(12)[b]	70, 523
8 Jun 1976	15[2]	0		118[103]	S(4)	332, 523
27 Jul 1976	23[21]	0		x	x(7)	332, 523
19 Jun 1977	26[0]	0		118[116]	S(7)	332, 523
24 Aug 1977	29[26]	0				332, 523
19 Jun 1978	25[1]	0		106[105]	S(4)	523
4 Aug 1979	33	0				523
26 Jun 1980				108[108]		523
11 Jun 1981	20	0		63[30]	S(7)	523
29 May-13 Jun 1983	20	0				421
Jun 1985				37+[c]		420
Jun 1986				145		420
5-23 Jun 1987	25	2	1		S(13)	158, 427, 428
2000	0	0				114
16 Jun 2005			1S			57, 529
2007	0	0				522
May-Jun 2008			1S			529
2009	0	0				1, 101, 522
18 June 2010			1	22[6]	20eS	30, 453
2013	0	0				522
31 May 2014					(6)	524
11 Jul 2014	0	0		0	(8)	101, 111, 522
13 Jun 2015					(30)	524
2015	0	0				522
1 Aug 2019	0	0				459

[a] Due to a summation error, the total was tallied as 45 nests in the original compilation of this nesting record [523] and subsequently.[332] Note that Moul and Gebauer [266] report 36 nests in 1941 and 44 nests in 1944, citing Drent and Guiguet,[144] but we could find no such records in Drent and Guiguet.
[b] Corrected from Campbell.[70]
[c] See text.

juniper snags on the north islet in 1976; two of 15 nests contained single eggs each in June, and 21 of 23 nests counted in July contained eggs or small young. Similarly in 1977, all nests were empty in June but most nests held young in August. Adults were again tenacious on their nests in July 1976 and in August 1977 and did not fly off until observers approached with 25 feet (Figure 484). Birds returned to their nests within two minutes after observers departed. In June 1978, one nest with one egg was found on the south islet, and 24 empty nests were located in four remaining juniper snags (with 3, 8, 3, and 10 nests from west to east) on the north islet. The nest on the south islet was lined with oak leaves. There were five nests on the south and 28 nests (25 in the juniper snags and 3 on the ground) on the

north islet in August 1979; nine of 10 nests inspected contained eggs or very small young.

Figure 483. Bruce Ford (shown) and Phil Nott from the BCPM helped survey Ballingall Islets in 1974. Bruce is attempting to check Double-crested Cormorant nests in the dead juniper trees. The juniper snags were judged too fragile to climb and so nest contents were not determined. *Photo by R. Wayne Campbell, 22 June 1974.*

Only 20 to 25 pairs of Double-crested Cormorants nested in the 1980s and they were last reported nesting in 1987. All nests were in the juniper snags and 10 nests inspected were empty in June 1981. Similar numbers of nests were seen in 1983 and 1987.

Barrow and Newcombe noted Pelagic Cormorants nesting in 1934.[96] In 1936, Sprot reported that 6-8 Pelagic Cormorant nests were found amongst the roots of the juniper trees and on rock ledges below on the north islet, and 3-4 nests were seen on the south islet. Nest building had just been completed, and no nests yet held eggs. Cowan reported young in six nests on the north islet and three nests on the south islet in August 1939. Carl and Ferris recorded three nests at the base of the trees on the north islet in April 1941. Their party noted 23 nests in June 1941 but did not give details on nest locations. White recorded nests containing small young on cliffs on both islets in 1943, and Drent counted six nests on the north islet and five nests on the south islet in 1959. Nests were reported only on the south islet by Brooks and Edwards in 1964, but in 1968, Drent counted four nests on the south and 4-5 nests on the north islet in June, and Robin Best reported nests on both islets in August. No eggs or young were seen in nests in August 1968 and, except for two nests recorded in 1987,[428] Pelagic Cormorants have not been observed nesting on the islets since.

Figure 484. During surveys of the Double-crested Cormorant colony on Ballingall Islets by BCPM crews in the 1970s, cormorants did not flush off their nests until observers were almost under the juniper trees where the nests were located. They were also quick to return to their nests after observers departed. *Photos by R. Wayne Campbell, 27 July 1976.*

Glaucous-winged Gulls have been recorded nesting on both islets since 1934. Numbers have varied, with maxima counted in 1968 and 1986. A remnant population was still nesting in 2010 but none were nesting in 2014. W.A. Newcombe reported a dozen or more nearly completed nests on 6 April and counted 20 gull nests on each islet on 8 May 1934.[96] Eggs were seen in 10 nests inspected on 3 June that year. Sprot recorded 85 nests, all with eggs, 50 on the north islet and 35 on the south islet on 14 June 1936. In 1959, there were 35 and 22 nests on the north and south islets, respectively. Drent counted only 22 nests on the south island and estimated 20 pairs nesting on the north islet in June 1968, but in August, Robin Best reported 150 nests distributed over all faces of both islets except under the Double-crested Cormorant nests. There were 72 and 24, 86 and 32, 89 and 29, 76 and 30, and 49 and 14 nests on the north and south islets, in June of 1974, 1976 (Figure 485), 1977, 1978, and 1981, respectively. Many nests were empty in 1981. Vermeer and Devito surveyed only the south islet for Glaucous-winged Gulls in 1985 and counted 37 nests. In 1986, they tallied 89 nests on the north islet and 56 nests on the south islet. Only 14 and eight nests were found on the north and south islets, respectively, and only six nests, three on each islet, held eggs in 2010. No gull nests were found in 2014.

Figure 485. Glaucous-winged Gulls nested on both of the Ballingall Islets since at least 1934 and until 2010. Before their numbers decreased, their territories were distributed over most of the surface of both islets. *Photo by R. Wayne Campbell, 8 June 1976.*

Sprot suspected one pair of Pigeon Guillemots nesting on the north islet on 14 June 1936. Drent reported six pairs definitely nesting in 1959 but did not try to inspect nests so as to avoid disturbing nesting cormorants. Agitated guillemots, some carrying fish, were noted by Robin Best in 1966, but a count of birds was not given. Best found one nest with one egg in a hole in the rocks in August 1968 (the egg may have been abandoned), Phil Nott and Bruce Ford from the BCPM located one nest with two eggs in 1974 (Figure 486), and Wayne Campbell and Marilyn Paul found a nest with two eggs in a crevice on the west side of the north islet in July 1976. Various numbers of guillemots have been seen in subsequent years and Blight suspected about 20 pairs nesting on the north islet in 2010. Thirty birds were recorded around the islets in 2015.

Figure 486. Pigeon Guillemot nest with two eggs found on Ballingall Islets in 1974. *Photo by R. Wayne Campbell, 22 June 1974.*

Black Oystercatchers were first noted breeding by Best in 1966 but no observations of a nest were reported. A pair was also present and suspected nesting in 1968. Three birds were present in June 1976 and 1977, and one bird was recorded in 1978, but no evidence of nesting was reported in those years. One pair was nesting in 1987, and an adult was seen sitting on a nest on the south islet in 2005. A pair was reported nesting on the north islet in 2008, and a nest with two eggs was found on the south islet in 2010. One oystercatcher was seen but was not territorial on the north islet in 2010. Two oystercatchers were present in 2014, but observers did not determine whether they were nesting.[111]

Remarks: This colony has suffered from human and Bald Eagle disturbance and associated predation by crows and gulls. The area is popular with boaters and the picturesque islets attract visitors. The Double-crested Cormorant colony has also been directly impacted by people taking attractive pieces of the stunted juniper snags as house ornaments (Figure 487). Disturbance from surveyors has also had some impact on nesting birds.

W.A. Newcombe reported crows stealing cormorant eggs on 14 June 1936.[96] Sprot [368] described the behaviour more colorfully: “about half a dozen corvine gangsters were carrying on their nefarious work among the birds of both rocks.” Few crows were reported in other years: two were present in August 1977, and one was seen in 1978.

Figure 487. The twisted grain of juniper wood makes lovely ornaments. For this purpose, and to the detriment of nesting Double-crested Cormorants on Ballingall Islets, people in the past harvested parts of the dead trees that the cormorants used for nesting. The cut trunk of a tree is visible in this photo. *Photo by R. Wayne Campbell, 22 June 1974.*

Drent suspected that gulls were responsible for two depredated Double-crested Cormorant eggs found near nests on the south islet in June 1968 (Figure 488). Broken Pelagic Cormorant and gull eggs were found on the south islet in August 1968. Robin Best suspected that the gull colony on the south islet may have suffered predation from some animal early in the season in 1968. He had two reasons for this: 1) he saw broken gull eggs; and 2) only large young were present on the south islet, whereas there were still downy young on the north islet. Many broken Double-crested Cormorant eggs were found below nests in 1974. A Bald Eagle was perched in the dead juniper trees and all nesting birds were in the air when the islets were surveyed in June 1977 and 1981. All Double-crested Cormorant nests were empty and two broken eggs were found below the nests in June 1977, and one dead gull and three broken gull eggs were found in 1981. One broken gull egg was found in 1978.

Figure 488. Depredated or broken Double-crested Cormorant eggs were found below nests on Ballingall Islets in several years. Broken Pelagic Cormorant and Glaucous-winged Gull eggs were also found. Egg loss was likely associated with human and Bald Eagle disturbances. *Photo by R. Wayne Campbell.*

In July 1941, Carl and Ferris found many dead young gulls among nests and along the shore. One young was found at the water's edge, dying of a head wound. Observers did not speculate about the cause of this mortality but it may have been a result of human disturbance that pushed young gulls into neighbouring territories where they were attacked. Two newly-hatched Pelagic Cormorant chicks died, likely of heatstroke, while Carl and Ferris were on the island in July 1941. Cowan found only eight eggs and no young in Double-crested Cormorant nests in August 1957, and blamed heavy human disturbance for the poor success that year. Human disturbance repeatedly caused breeding failures in the early 1960s,[403] and declines in cormorant numbers in the 1970s and 1980s were likely related to increasing disturbance from pleasure boaters.[421] A dead gull was hung by a fishing line below the Double-crested Cormorant nests in the juniper snags only two feet from an active gull nest in 1978. Observers in 1979 saw two boats visit the island in the half hour that they were present and suspected that no young Double-crested Cormorants would be successfully raised that year because of excessive human disturbance.

Robin Best banded 100 gull chicks in August 1968.

GI-330 GALIANO ISLAND - CENTRAL CLIFFS

Location: *48°54'43"N 123°25'53"W; 92 B/14.*
Central southwest side of Galiano Island, north of Charles Island, northeast of Ballingall Islets.

Description: *10-20 m high; Cliffs.*
Sandstone cliffs extend for over 3 km along the southwest shore of Galiano Island between Grey Peninsula and Retreat Cove (Figure 489). There are homes above some sections of the cliffs. Montague Harbour Marine Provincial Park, established just southeast of these cliffs in 1959, is a very popular anchorage and camping site in the summer months and attracts a high volume of visitors. In 2001, through a joint effort by the Land Conservancy of British Columbia, Habitat Acquisition Trust, and the Islands Trust Conservancy, a 12 ha property that includes over 400 m of the coastal bluff habitat where seabirds nest was purchased and protected as the Trincomali Nature Sanctuary (Figure 490).

Historical summary: The main nesting cliffs stretch about 3 km northwest of Grey Peninsula, although some gull nests have also been found further northwest towards Retreat Cove. Cliffs have been surveyed from the water.

Pigeon Guillemots have been known to nest on these cliffs since 1934, Pelagic Cormorants have nested since at least 1957, a few Glaucous-winged Gulls were first seen nesting in 1976, and Double-crested Cormorants colonized the cliffs in 2000 (Table GI-330). This is one of the few, long-established Pelagic Cormorant colonies in the BC Salish Sea where cormorants have continued to nest through to the present, although only six nests were counted in 2019, three of which were empty. Gulls

and guillemots also likely still nest on the cliffs. Double-crested Cormorant numbers have varied since 2000, with a maximum of 96 nests counted in 2017. However, no active nests were seen during the most recent survey in 2019.

While visiting Ballingall Islets in 1934, W.A. Newcombe noted, "many [Pigeon] Guillemot[s] seen in nearby waters evidently from a nesting colony on the cliffs of Galiano Island." [96] He observed nests in 1936. Over 20 guillemots were seen flying to and from nest sites on the cliffs in 1977. The main nesting area was on the same section of cliffs where Pelagic Cormorants were nesting (see below). One adult was seen flying from a crevice in 1978. Fifty or more birds have been counted along the cliffs in several years, with a maximum of 59 birds seen in 1977. One adult carrying fish was seen flying to a jumble of rocks on shore in 2009.

Figure 489. There are four areas of cliffs along the perimeter of Galiano Island that are separately designated seabird colony sites, three along the southwest side of the island, including the north, central, and south cliffs colonies, and one in Active Pass at the southeast end of the island. This central cliffs colony encompasses over 3 km of sandstone cliffs between Grey Peninsula and Retreat Cove. *Photo by R. Wayne Campbell, 8 July 1976.*

Figure 490. Over 400 m of the coastal bluffs where seabirds nest at the Galiano Island - Central Cliffs colony site have been protected as part of the Trincomali Nature Sanctuary established in 2001. *Photo by Sheila Harrington, 22 July 2021.*

Table GI-330. Seabird nesting records for Galiano Island - Central Cliffs. See Appendix 2 for codes.

DATE	DCCO	PECO	GWGU	PIGU	SOURCE
3 June 1934				(many)	96
14 Jun 1936				x	96
1957-76		x			332, 523
22 Jun 1974	0	0			332, 523
1975	0	29			332, 523
8 Jun 1976	0	32	3-4eS	S(8)	332, 523
20 Jun 1977	0	31	1	x20(59)	332, 523
24 Aug 1977	0	13		(1)	523
19 Jun 1978	0	2	1	x(54)	523
26 Jun 1980		54			523
11 Jun 1981	0	60		(3)	523
5-23 Jun 1987	0	72		S(27)	158, 428
1990	0				522
1991	0				522
1992	0				522
1993	0				522
1994	0				522
1995	0				522
1996	0				522
1998	0				522
1999	0				522
Jul-Sep 2000	14	11	3	S(6)	114, 459
14 Jun 2001	20	70	3	S(50)	459, 524
2006	28	0			522
6 Jul 2007	23	33			456
2007	90	48			522
27 Jul 2009				x(1)	45
2009	51[a]	39			101, 522
28 May 2010	17		1eS		45, 456
2013	14	20			522
2014	8	2			101
2015	11	24			522
2017	96	22			112
6 Aug 2018	31	15			459
1 Aug 2019	0[b]	6			459

[a] Adkins and Roby [1] list 47 nests for 2009.
[b] Sixteen unattended empty nests but no active nests were seen.[459]

Numbers of Pelagic Cormorants nesting have varied considerably from year to year. No Pelagic Cormorants were found nesting by Phil Nott and Bruce Ford from the BCPM in 1974, but the Pelagic Cormorant colony had been present since at least 1957 according to local residents named Russell that spoke with Wayne Campbell and Marilyn Paul in 1976. They had counted 29 nests in 1975. Adults were sitting on 28 of the 31 nests counted in June 1977. Nests were located on the section of cliff directly opposite (northeast) of Ballingall Islets. Only 13 nests could be seen in cavities in the vertical rock face when a BCPM crew returned in late August 1977. One nest had an adult sitting but others were unattended. Twenty-one birds were roosting and observers assumed that most young would already have fledged. However, it is possible that the colony suffered some disturbance between June and August 1977 that caused many birds to abandon their breeding efforts. There were only two active nests with adults sitting on them in 1978; four, old, unattended nests were also seen. The nesting population recovered and increased over the next few years to 60 nests in 1981 and a maximum of 72 nests in 1987. Numbers have been up and down since, with 70 nests counted in 2001 and only six nests counted on the most recent survey in 2019.

Three to four pairs of Glaucous-winged Gulls were seen along the 3 km stretch of cliffs in 1976. One adult was seen sitting on a nest located on a cliff ledge northeast of Wise Island and southeast of the cormorant colony in 1977. A nest with two eggs was situated on a low cliff ledge southeast of Retreat Cove in 1978. In 2000, Trudy Chatwin recorded

three nests, which is the most current estimate from a full survey of the cliffs. A pair was seen on the cliffs in 2010.

Double-crested Cormorants colonized these cliffs in 2000 and nested in variable numbers since, with a high count of 90 nests in 2007 and a maximum of 96 nests in 2017. However, in 2018, the colony was a third the size of the year before, and in 2019 the colony had been abandoned; only 16 unattended nests were seen.

Remarks: Double-crested Cormorants may have moved here around 2000 from the adjacent Ballingall Islets, which was abandoned at that time. Perhaps the Galiano cliffs provide nesting habitat more protected from human and Bald Eagle disturbance.[114] Observers in 1981 saw boat traffic in the area but thought that it was unlikely to disturb nesting birds. However, human disturbance seems a likely cause for the collapse of the cormorant colony in 2019.

An active Peregrine Falcon nest was seen on a rock ledge within a crevice on the cliff in 1978. Bald Eagles are known to nest nearby in the area above the cliffs.

GI-340 "WISE" ROCK

Location: *48°53'52"N 123°26'20"W; 92 B/14.*
Southeast of Wise Island west of Montague Harbour. This site was called "Turtle Rock" by Butler and Golumbia.[57]

Description: *0.2 ha; 6 m high; Grassy rock.*

Historical summary: Two Black Oystercatchers were roosting in 1977, but a nest with three eggs was found in 1978 (Figure 491) and a pair was reported nesting in 1987 (Table GI-340). A pair was present and an empty nest was found in 2005.

One empty Glaucous-winged Gull nest with two adults attending was found in 1977. Three adult gulls were present in 1978 but no nests were found. There are no data for gulls since 1978.

Table GI-340. Seabird nesting records for "Wise" Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
19 Jun 1977	0	1S	523
19 Jun 1978	1	0	523
5-23 Jun 1987	1		427
16 Jun 2005	1S		57, 525

Figure 491. Black Oystercatchers were first confirmed nesting on "Wise" Rock in 1978 when this nest with three eggs was found. The nest was a large collection of shells. *Photo by Michael S. Rodway, 19 June 1978.*

Remarks: River otter scats and runways were seen on the rock in 1978.

GI-350 CHARLES ISLAND

Location: *48°54'05"N 123°26'06"W; 92 B/14.*
Northwest of Parker Island off the southwest side of Galiano Island.

Description: *3.7 ha; 46 m high; Forested; Cliffs.*
This torpedo-shaped island is densely forested, with a rocky shoreline. Some cliffs occur along the southwest side. There is a dwelling and dock at the southeast end.

Historical summary: In 1954, Clay and Davidson reported several Double-crested Cormorant nests in Douglas-fir trees at the top of the cliffs and several Pelagic Cormorant nests on the cliffs (Table GI-350). No other details were given. There are no records of nesting since.

Table GI-350. Seabird nesting records for Charles Island. See Appendix 2 for codes.

DATE	DCCO	PECO	SOURCE
16 Jun 1954	x[a]	x	122
19 Jun 1977	0	0	332
5-23 Jun 1987	0	0	428

[a] Moul and Gebauer [266] report 6 nests, also citing Clay and Davidson.[122]

GI-360 PARKER ISLAND - CLIFFS

Location: *48°52'57"N 123°24'50"W; 92 B/14.*

Southwest side of Parker Island west of Montague Harbour.

Description: *10-15 m high; Cliffs.*
Cliffs extend about 300 m along the southwest side of Parker Island. There are some dwellings along that side of the island above the cliffs.

Historical summary: Observers in 1977 saw four Pigeon Guillemots (Figure 492) at the base of the cliffs and noted signs of birds entering two crevices on the cliff (Table GI-360). No guillemots were recorded in 1987.

Figure 492. Pigeon Guillemots were nesting on the Parker Island cliffs in 1977 but have not been recorded since. They may still nest there. *Photo by Paula Courteau.*

Table GI-360. Seabird nesting records for Parker Island - Cliffs. See Appendix 2 for codes.

DATE	PIGU	SOURCE
19 Jun 1977	2(4)	332, 523
5-23 Jun 1987	(0)	158

GI-370 GALIANO ISLAND - SOUTH CLIFFS

Location: *48°52'10"N 123°23'23"W; 92 B/14.*
Just southeast of Phillimore Point.

Description: *10-15 m high; Cliffs.*
Eroded sandstone cliffs extend about 500 m along the Galiano Island shoreline southeast of Phillimore Point. There are houses above the cliffs.

Historical summary: W.A. Newcombe visited this site on 8 May 1934 (Table GI-370). He saw no Glaucous-winged Gulls but noted that they had been reported nesting here and suggested that the site may be occasionally used by isolated pairs.[96] We witnessed such an occasion in 1977 when we found one adult sitting on a nest on a cliff ledge, which is the only confirmed record of nesting here by Glaucous-winged Gulls.

Robin Best reported about 20 Pigeon Guillemot nests in eroded hollows in the sandstone cliffs 1968, but he noted that the birds were "not really actively nesting," so we are unsure whether he saw birds entering nest sites. One guillemot was seen fly into a nest site on the cliff in 1977. Guillemots may still nests on these cliffs but we have no records since 1987.

Table GI-370. Seabird nesting records for Galiano Island - South Cliffs. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
8 May 1934	0		96
15 Jun 1968		20e	332, 523
20 Jun 1977	1	x(3)	332, 523
19 Jun 1978	0	S(2)	523
5-23 Jun 1987		S(10)	158

GI-380 LION ISLETS

Location: *48°54'01"N 123°20'06"W; 92 B/14.*
Off the northeast side of Galiano Island, southeast of Salamanca Point, northwest of Gossip Island.

Description: *0.9 ha; 15 m high; Grassy rock.*
These islets are composed of two rocky knolls connected at low tide. Grasses and shrubs cover higher sections of both knolls (Figure 493). A large house was built on the larger, eastern knoll in 1988.

Figure 493. In 1977, grasses, large patches of shrubs, and one tree covered higher sections of Lion Islets above a rocky shoreline. The habitat on the islets was modified when a large house was built on the eastern knoll in 1988. *Photo by Michael S. Rodway, 20 June 1977.*

Historical summary: Glaucous-winged Gulls have been recorded nesting in three years (Table GI-380). In 1977, six adults were present, but only two nests with two eggs each were found; nests were in the grass near the edge of the vegetation on the northeast side of the larger knoll. In 1978, eight adults were present, and one nest with two eggs and one empty nest were found. We have no records since Vermeer and Devito found one pair nesting in 1986.

Table GI-380. Seabird nesting records for Lion Islets. See Appendix 2 for codes.

DATE	GWGU	SOURCE
20 Jun 1977	2[2]	332, 523
19 Jun 1978	2[1]	523
Jun 1986	1	420

Remarks: House construction and the presence of residents on the islets may have discouraged nesting birds, although we have no recent survey records.

GI-390 "GOSSIP" ROCK

Location: *48°53'33"N 123°19'45"W; 92 B/14.*
Off the northwest corner of Gossip Island at the mouth of Whaler Bay at the east end of Galiano Island.

Description: *0.2 ha; 5 m high; Grassy rock.*

Historical summary: We saw no birds here in the 1970s, but one Glaucous-winged Gull nest was found in 1986 (Table GI-390).

Table GI-390. Seabird nesting records (nests) for "Gossip" Rock.

DATE	GWGU	SOURCE
20 Jun 1977	0	332
19 Jun 1978	0	500
Jun 1986	1	420

GI-400 GALIANO ISLAND - ACTIVE PASS CLIFFS

Location: *48°51'45"N 123°19'50"W; 92 B/14.*
In Active Pass between Mary Anne Point and Georgeson Bay.

Description: *10-15 m high; Cliffs.*
Cliffs of conglomerate rock extend about 1,300 m along the south end of Galiano Island in Active Pass. The conglomerate bedrock is part of the Geoffrey Formation that underlies Parker Island and the south end of Galiano Island and contrasts with the sandstone of the Gabriola Formation that forms the north and central Galiano cliffs (Figure 494).[106] There are some dwellings in the area above the cliffs.

Historical summary: Wayne Campbell observed a Pelagic Cormorant sitting on a nest near the top of the cliffs in 1975 (Table GI-400). No evidence of nesting by cormorants has been observed since.

Allen Poynter first reported Pigeon Guillemots nesting in holes in the conglomerate cliff face in 1962. Birds were in pairs on the water at the base of the cliffs and were seen flying into nest holes. About 40 nest sites in splits in the cliff face were tallied by Robin Best in 1968. Guillemots have regularly been sighted along these cliffs in the years since, and evidence of nesting has recently been reported. Five

Figure 494. Conglomerate bedrock cliffs exposed in the Active Pass area of Galiano Island are part of the same geological formation that form conglomerate cliffs on nearby Mayne Island in the Gulf Islands and also at St. John Point on Hornby Island (shown here) in the northern Strait of Georgia. The conglomerate cliffs in Active Pass contrast with the sandstone cliffs that occur at colonies along the southwest side of Galiano Island. *Photo by R. Wayne Campbell, 4 July 1974.*

Table GI-400. Seabird nesting records for Galiano Island - Active Pass Cliffs. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
10 May 1962[a]		5(10)	332, 523
19 Jun 1968		40e	332, 523
1975	1		457
20 Jun 1977	0	S(27)	332, 523
19 Jun 1978	0	S(2)	523
27 Jun 1980	0	(0)	523
29 May-13 Jun 1983	0		421
5-23 Jun 1987	0	S(15)	158, 428
2000	0		114
21 Jul 2012		x(10)	45, 524
8 Mar 2014		S(45)	524
10 Jul 2015		x(2)	524
22 Apr 2016		S(5)	524
13 May 2017		x(19)	524
1 Jul 2021		x(25)	524
7 Mar 2022		(89)	524

[a] The year listed by Rodway and Campbell [332] was wrong and has been corrected.

to 10 birds were seen roosting on Salalikum Rock below Matthews Point on several occasions in June and July 2017. In 2021, 25 birds were recorded, including about 10 birds in crags and nooks in the cliffs. In 2022, Ian Cruickshank counted 89 guillemots concentrated along the base of the cliffs.

Four adult Glaucous-winged Gulls were present at the cliffs in 1977, and five were seen in 1978, but no sign of nesting by gulls has ever been reported.

Remarks: One immature and two adult Bald Eagles were recorded in 1978. Active Pass is well named and receives a high volume of boat traffic, including the main ferry run between Tsawwassen on the BC mainland and Swartz Bay on Vancouver Island.

GI-408 CLAMSHELL ISLET

Location: *48°51'07"N 123°26'29"W; 92 B/14.*
In Long Harbour on the east side of Saltspring Island.

Description: *0.5 ha; Grassy rock; Forested.*
This islet has a steep-sided rocky shoreline, with open, grassy areas and a sparse stand of trees on top. Clamshell Islet was a local name for this islet and was officially adopted in 1990.

Historical summary: One Pigeon Guillemot was heard whistling from a nest site in the steep shore rock in 1977, and one flew out of a crevice on the northeast side of the islet in 1978 (Table GI-408). None were recorded in 1987; we have no records since.

Six adult Glaucous-winged Gulls were present in 1978, but no evidence of nesting was found.

Table GI-408. Seabird nesting records for Clamshell Islet. See Appendix 2 for codes.

DATE	PIGU	SOURCE
18 Jun 1977	1(1)	332, 523
18 Jun 1978	1(2)	523
5-23 Jun 1987	(0)	158

Remarks: Clamshell Islet lies just off the Long Harbour ferry dock, and the area sees abundant boat traffic.

GI-410 "LONG HARBOUR" ISLET

Location: *48°50'43"N 123°25'35"W; 92 B/14.*
Near the mouth of Long Harbour on the west side of Nose Point. Colony includes the rock at the south end of the vegetated islet.

Description: *0.6 ha; Bare rock; Forested.*
The larger portion of this islet is covered with open grassy areas and sparse stands of trees. A large dwelling and dock have been built on the northeast side of the islet. There is a small, 0.1 ha, bare rock connected by tide at the south end (Figure 495).

Figure 495. "Long Harbour" Islet is an unnamed islet off the west side of Nose Point near the mouth of Long Harbour. This photo shows the bare rock at the south end of the islet where Glaucous-winged Gulls have nested. *Photo by Michael S. Rodway, 18 June 1977.*

Historical summary: Glaucous-winged Gulls have nested on the small south rock. Nests in 1974 and 1978 held eggs but only one broken egg beside an empty nest was found in 1977 (Table GI-410). Vermeer and Devito listed six gull nests in 1986 for Long Harbour and Ganges Harbour. We assumed that at least one of those nests was found on what we are calling "Long Harbour" Islet; the others would have been on the Chain Islands (see following account).

Table GI-410. Seabird nesting records for "Long Harbour" Islet. See Appendix 2 for codes.

DATE	GWGU	SOURCE
22 Jun 1974	3[3]	70, 523
18 Jun 1977	1	332, 523
18 Jun 1978	1	523
Jun 1986	~1[a]	420

[a] See text.

GI-420 CHAIN ISLANDS

Location: *48°50'15"N 123°27'14"W* (Second Sister); *92 B/14.*
In Ganges Harbour, Saltspring Island. Colony includes, from southeast to northwest, Second Sister Island, the rounded islet just northwest of Second Sister (known locally as Twilight Island), Third Sister Island (also known as Chocolate Island), First Sister Island, Deadman Islands, Goat Island, and Powder Islet (Figure 496). These islands have also

been known as Channel Islands, but the officially-named Channel Islands are to the southeast, south of Prevost Island. Second Sister Island was called Admiral or Light Island by Drent and Guiguet,[144] although Admiral Island was actually the name for Saltspring Island prior to 1910. Drent and Guiguet also referred to Chocolate Island (which they said was the same as Third Sister Island) but we think there was some confusion in Drent and Guiguet's island designations. They described Chocolate Island as "the rounded islet just northwest of Admiral (Second Sister) Island," which accurately describes Twilight Island and not Third Sister Island.

Figure 496. Names referred to in the text of the individual Chain Islands in Ganges Harbour, Saltspring Island. *Image from Google Earth.*

Description: *14 ha; 50 m high; Forested; Cliffs; Bare rock.*

This is a chain of long, narrow islands, oriented southeast to northwest and running the length of Ganges Harbour. Islands are mostly forested, with rocky shorelines. Powder Islet is bare and there are small bare rocks between some of the larger islands. There are also bare rocky points at the ends of some of the larger islands. Third Sister Island is treed, with cliffs along the northeast side and a shell beach at the north end (officially named Chocolate Beach in 1993). The islands are privately owned, and houses have been built and docks installed on some of the islands. There is a navigational beacon on the southeast end of Second Sisters Island and a marker on Powder Islet.

Historical summary: Based on communication with Alan Best, Drent and Guiguet reported Pelagic Cormorants nesting on the "rounded islet just northwest of Second Sister Island" in 1945-1948 (Table GI-420). Drent and Guiguet called this Chocolate or Third Sister Island, but as noted above, the description better corresponds to Twilight Island. We thus believe that Twilight Island and not Third Sister Island is the historical nesting location for Pelagic Cormorants. Nesting has not been recorded since 1948, although we found three old, unattended nests on the cliffs on the northeast side of Third Sister Island in both 1977 and 1978. This colony was not listed as a Pelagic Cormorant nesting site by Chatwin et al.,[114] but they reported zero Double-crested Cormorant nests here in 2000, and we think

it is safe to assume that they saw no Pelagic Cormorants either.

Double-crested Cormorants colonized the islands about a decade later than Pelagic Cormorants. Alan Best had seen Double-crested Cormorants roosting on Second Sister Island since about 1920 but did not observe the first nests there until 1956. The location of the nests was not specified in 1956 or 1957, but when Drent surveyed the site in 1959, he found nine nests built about 15 m up in Douglas-fir trees on the east side of Second Sister Island. Nesting was last reported in 1960. There were 15 adults roosting in 1978.

Pigeon Guillemots were confirmed nesting in 1966 when Robin Best found a nest with two eggs in a rock crevice on Chocolate Island, which we assume referred to Third Sister Island. We saw two guillemots at First Sister Island and two at the largest of the Deadman Islands in 1977 (Figure 497). In 1978, we saw one off Second Sister Island, one flying out of a crevice on the northeast side of Third Sister Island, nine off Deadman Islands, and one off Goat Island. Emms and Morgan saw a few birds in 1987 but we have no records since.

We found Glaucous-winged Gulls nesting at three sites in 1977 and six sites in 1978. In 1977, one nest with two eggs was inspected and one adult was sitting on a second nest on Third Sister Island, and an empty nest attended by two adults was found on both the largest of the Deadman Islands and on Powder Islet. A total of eight adults were present on Third Sister Island, and it is possible there were additional nests that were not found. In 1978, we found two nests on Twilight Island, six nests along the top of the cliffs on the northeast side of Third Sister Island, three nests on the rocks at the north end of Third Sister Island, two nests on the largest of the Deadman Islands, two nests on the rock at the northwest end of Deadman Islands, and one nest on Powder Islet. Only four of the nests held eggs: one on Twilight Island, two at the top of the cliffs on Third Sister Island, and one on Powder Islet. There was a total of 38 adults associated with these nest sites in 1978. As noted in the "Long Harbour" Islet account, Vermeer and Devito listed six gull nests for Long Harbour and Ganges Harbour in 1986, about five of which we assumed were found on the Chain Islands.

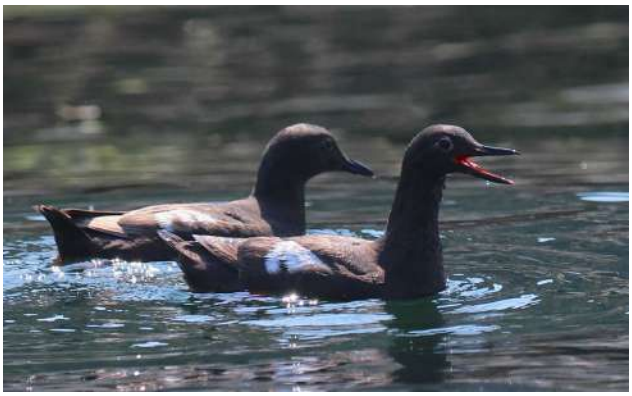


Figure 497. Pigeon Guillemots have been confirmed nesting in the Chain Islands only in 1966 and 1978, but they have likely nested in other years and perhaps still nest on the islands. *Photo by Paula Courteau.*

Table GI-420. Seabird nesting records for Chain Islands. See Appendix 2 for codes.

DATE	DCCO	PECO	GWGU	PIGU	SOURCE
1945-48		8-10e			144
1949-60		0			144
1956	8-9				144
7-8 1957	x				144
28 Jun 1959	9	0			144
1960	14[a]				144, 523
7 Jul 1966				1	332, 523
18 Jun 1977	0	0	4	S(4)	523
18 Jun 1978	0	0	16[4]	x(12)	523
29 May-13 Jun 1983	0	0			421
Jun 1986			~5[b]		420
5-23 Jun 1987	0	0		S(4)	158, 428
2000	0	0[b]			114
2009	0				1, 101, 522

[a] Drent and Guiguet [144] mistakenly listed 4 nests in 1960; the number has been corrected.[523]
[b] See text.

Remarks: Alan Best reported that mink were intensively trapped during the Second World War and no sign of mink was seen on the islands during the years 1945-1948. The first signs of mink were

reported in 1948 (Figure 498), and Pelagic Cormorants did not nest after that.[144] One adult Bald Eagle and three Northwestern Crows were sighted around the islands and one broken gull egg was found on the northwest rock of the Deadman Islands in 1978.

Figure 498. Mink were reported on the Chain Islands in 1948. They were absent before 1948, likely because they were intensively trapped during the Second World War. They may have impacted nesting Pelagic Cormorant as the cormorants ceased nesting after 1948. *Photo by Paula Courteau.*

Human disturbance likely discourages surface nesting species on these islands. Chocolate Beach is an attractive stop for boaters and kayakers, and the islands receive a high volume of local and tourist traffic. Further human disturbance has resulted from house construction and occupancy on Twilight and Deadman islands and the installation of docks on Second and First Sister islands. Future residential developments are also likely.

GI-424 HAWKINS ISLAND

Location: *48°50'25"N 123°22'18"W; 92 B/14.*
Off the northeast side of Prevost Island.

Description: *1.3 ha; 23 m high; Forested; Bare rock.*
Hawkins Island is a complex of rocky knolls joined by tidal rock and beach, with open forest on higher areas. The island is part of the Gulf Islands National Park Reserve established in 2003. In May 2014, Parks Canada issued an order to prohibit all vessels from approaching closer than 25 m to the island, other than for park management purposes or by written authorization from the Superintendent.

Historical summary: W.A. Newcombe noted about 10 pairs of Glaucous-winged Gulls present and found three nests in 1934 (Table GI-424). We recorded no gulls here in 1977 or 1978, and there are no nesting records for gulls since. Parks Canada surveyed the island only in 2011; one pair of Black Oystercatchers was sighted (Figure 499) and one empty scrape was found. Observers suspected that the pair had lost their eggs, but nesting was not confirmed.

Table GI-424. Seabird nesting records for Hawkins Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
8 May 1934		3	96
20 Jun 1977	0	0	500
18 Jun 1978	0	0	500
5-23 Jun 1987	0		427
14 June 2011	1S		529

Figure 499. One pair of Black Oystercatchers was seen and was likely nesting on Hawkins Island in 2011. *Photo by Paula Courteau.*

GI-426 PORTLOCK POINT

Location: *48°49'40"N 123°21'09"W; 92 B/14.*
East point of Prevost Island.

Description: *8-12 m high; Cliffs.*
Open bluffs and cliffs occur north and south of Portlock Point. The area is part of the Gulf Islands National Park Reserve established in 2003. There is a navigational light on the point.

Historical summary: Robin Best estimated 12 pairs of Pigeon Guillemot nesting in holes in the sandstone cliffs to the north and south of the point in 1968 (Table GI-426). No guillemots were present in 1977 and 1987, and only one was seen in 1978, but larger numbers were recorded again in 2017. In 2017, guillemots were recorded at the southeast bluffs of Prevost Island; we assumed this referred to the Portlock Point area.

Table GI-426. Seabird nesting records for Portlock Point. See Appendix 2 for codes.

DATE	PIGU	SOURCE
17 Jun 1968	12e	523
20 Jun 1977	(0)	500
18 Jun 1978	S(1)	500
5-23 Jun 1987	(0)	158
13 Jul 2017	(30)	524

GI-430 ANNETTE INLET

Location: *48°49'33"N 123°23'28"W; 92 B/14.*
Southwest side of Prevost Island, directly opposite Long Harbour on Saltspring Island.

Description: *Forested.*
This colony site encompasses the forested point that forms the west side of Annette Inlet. It extends northwest about 1.6 km from the head of the inlet.

Historical summary: On 20 June 1977, 26 Double-crested Cormorants (12 adults, 14 immatures) were perched in trees. Three more (1 adult, 2 immatures) were on the water nearby. We did not suspect nesting at that time, and no nests were reported in 1987 (Table GI-430). In 1988, two groups of nests were seen on the west side of the inlet. Birds sitting on nests, carrying nesting materials, and many perched in trees near nests were reported. Trees in the vicinity of the nests were white-washed and defoliated from birds plucking nesting material. There are no other records of nesting and the site was unused in 2009.

Table GI-430. Seabird nesting records for Annette Inlet. See Appendix 2 for codes.

DATE	DCCO	SOURCE
20 Jun 1977	0	332
5-23 Jun 1987	0	428
9 Jul 1988	25e	499
2009	0	1

Remarks: Annette Inlet provides good anchorage and is a popular stop for recreational boat traffic.

GI-440 RED ISLETS

Location: *48°48'58"N 123°21'22"W; 92 B/14.*
Southeast end of Prevost Island, off the point between Diver Bay and Ellen Bay.

Description: *1.2 ha; 27 m high; Forested; Bare rock.*
These islets lie just off Prevost Island. They are really one long, narrow island separated at high tides into a series of rocky knolls. The outer, southeast rocky knolls are bare (Figure 500), but open forest covers higher sections of central and northwestern knolls. There is some beach habitat at the northwest end. The islets are part of the Gulf Islands National Park Reserve established in 2003. As of May 2014, Parks Canada has prohibited all vessels from approaching closer than 25 m to the islets.

Figure 500. The three outer, southeast knolls of the Red Islets are bare rocks. *Photo by Michael S. Rodway, 20 June 1977.*

Historical summary: In 1960, R. Matthews reported that Double-crested Cormorant had roosted here for years, and Alan Best, from a distance, observed roosting and possibly nesting birds in July (Table GI-440). Drent saw birds roosting in snags ideal for nesting but could see no nests on 28 October and 9 December 1960. If they had not already been nesting, Drent suspected that Double-crested Cormorants would likely colonize this site in the near future. However, no subsequent use of this

Table GI-440. Seabird nesting records for Red Islets. See Appendix 2 for codes.

DATE	DCCO	BLOY	GWGU	SOURCE
Jul 1960	S			144
20 Jun 1977	0	1	1S	332, 523
18 Jun 1978	0	1	1S	523
5-23 Jun 1987	0	0		427, 428
16 Jun 2005		0		529
4 Jul 2007		1		529
11 Jun 2008		1S		529
15 Jun 2009		1		529
2009	0			1
9 Jun 2010		1		529
14 Jun 2011		1		529
11 Jun 2012		1		529
27 Jun 2014		1		529
2 Jun 2015		1eS		529
25 May 2016		1		529
7 Jun 2018		1S		529
3 Jun 2019		0		529
9 Jul 2020		0		529
25 May 2021		1S		529
2 Jun 2022		0		529
12 Jun 2023		1eS		529

site by Double-crested Cormorants has been reported.

We found Black Oystercatchers nesting on the outer, southeast rocky knolls in 1977 (1 nest with 3 eggs) and 1978 (1 nest with 2 eggs; Figure 501). Nesting has been intermittent since: none were seen nesting in 1987 or 2005; one pair was consistently found nesting each survey year from 2007 to 2018; and then none were seen nesting again in three of the last five years, up to 2023. Surveys were conducted from the water in 2015 and 2020 to 2023.

Figure 501. This Black Oystercatcher nest with two eggs was found on the outer, southeast rocks of the Red Islets in 1978. The nest was mostly rock chips with a few shells. *Photo by Michael S. Rodway, 18 June 1978.*

A pair of Glaucous-winged Gulls and one empty nest were seen in 1977 and 1978. In 1978, the nest was not yet completed. Two gulls were recorded in 2016, but no information about nesting was given.

GI-450 PREVOST ISLAND - SOUTH CLIFFS

Location: *48°48'46"N 123°22'30"W; 92 B/14.*
Southwest side of Prevost Island, cliffs between Glenthorne Point and Point Liddell.

Description: *15-20 m high; Cliffs.*
Cliffs extend for about 250 m along the shoreline of Prevost Island opposite Acland Islands (Figure 502).

Historical summary: Robin Best reported Pigeon Guillemots nesting in holes and crevices in the cliffs in 1968 (Table GI-450). He made no mention of other species. Only two guillemots were seen during surveys in 1978 and 1987; larger numbers have been recorded in recent years.

Seventeen attended Pelagic Cormorant nests were counted on the cliffs in 1977; 30 adult and six immature cormorants were present. There were four empty nests and no cormorants present in 1978; no nests were recorded in 1987. We have no records of surveys for cormorants since 1987.

Figure 502. The south cliffs colony on Prevost Island is a band of sandstone cliffs about 250 m long located between Glenthorne Point and Point Liddell. Pelagic Cormorants were nesting on these cliffs in 1977. *Photo by Michael S. Rodway, 20 June 1977.*

Glaucous-winged Gulls were seen sitting on two and three nests located on cliff ledges in 1977 and 1978, respectively. We were able to inspect one nest in 1978; it contained two eggs. This site was not surveyed by Vermeer and Devito in 1986,[420] and we have no records for gulls since 1978.

Table GI-450. Seabird nesting records for Prevost Island - South Cliffs. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
17 Jun 1968			10e	523
20 Jun 1977	17	2	(0)	332, 523
18 Jun 1978	0[a]	3	S(2)	523
5-23 Jun 1987	0		S(2)	158, 428
5 Jul 2020			S(25)	524
26 Jun 2021			S(47)	524

[a] Four unattended empty nests were seen.

GI-460 CHANNEL ISLANDS

Location: *48°47'58"N 123°23'03"W; 92 B/14.*
Middle of Captain Passage, between Yeo Point on Saltspring Island and Point Liddell on Prevost Island.

Description: *2.6 ha; 24 m high; Forested; Grassy rock.*
The larger, western island (west island) of these two islands has open forest over most of its area, a broad rocky shoreline, and tidally-connected rock knobs on the west side. The eastern island is composed of two main sections connected at low tide. There are

scattered trees on the northern section (northeast island) of that island; the southeast section (southeast island) is a grassy rock, with some shrub cover. There is a light beacon on the northwest end of the northeast island. The islands became part of the Gulf Islands National Park Reserve in 2003. As of May 2014, Parks Canada has prohibited all vessels from approaching closer than 25 m to the islands.

Historical summary: Double-crested Cormorants were first recorded nesting in 1950 (Table GI-460). Several local observers had noticed roosting birds here previously, but 1950 was likely the first time that birds nested.[10, 144] Cormorants were nesting in trees that were, as yet, little affected by the bird's activities. Observers were unable to approach closely but counted 24 nests and saw numerous birds in the trees. In 1959, the Douglas-fir trees where the cormorants were nesting were dead. That year, Drent and Guiguet gave the location of the colony as on the mid-east side of the west island, close to the beach. That was the last year cormorants were found nesting.

Drent specifically stated that he found no other seabird species nesting in 1959. Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots were confirmed breeding in 1977-1978. A pair of oystercatchers and an empty nest scrape were found on the northeast island in 1977, and a nest with two young attended by two adults was found on the southeast island in 1978. A gull nest containing three eggs and an empty nest attended by a pair of adults was found in 1977 and 1978, respectively, on the northeast island. One guillemot was seen around the northeast island in 1977, and in 1978, two were sighted on the west island, including one flying from a nest site on cliffs on the southwest side of that island.

Table GI-460. Seabird nesting records for Channel Islands. See Appendix 2 for codes.

DATE	DCCO	BLOY	GWGU	PIGU	SOURCE
1930-49	0				144
7 Jul 1950	24e				10
1951-52	x				144
28 Jun 1959	16	0	0	(0)	144, 523
18 Jun 1977	0	1S	1	S(1)	523
18 Jun 1978	0	1	1	1(2)	523
29 May-13 Jun 1983	0				421
5-23 Jun 1987	0	0		(0)	158, 427, 428
2000	0				114
2004			0		30, 449
16 Jun 2005		0			529
27 Jun 2007		1			529
11 Jun 2008		1			529
15 Jun 2009		2[2]			529
2009	0				1, 101, 522
9 Jun 2010		2[2]			529
14 Jun 2011		4e			529
11 Jun 2012		0[a]			529
27 Jun 2014		2S			529
2014	0				101, 522
2 Jun 2015		2[2]	1[b]		529
25 May 2016		2[2]			529
7 Jun 2018		2eS			529
3 Jun 2019		3S			529
9 Jul 2020		1S			529
25 May 2021		1S			529
1 Jun 2022		2S			529
12 Jun 2023		1S			529

[a] Only the west island was checked in 2012.
[b] The nest contained two addled eggs and was abandoned.

Parks Canada has found oystercatchers nesting in most years since they began their monitoring program in 2005 (Figure 503). Most nests have been found on the southeast island, but the west island has also been used, and the positions of the nests on the southeast island have varied over the years. Nests were found on the southeast island in all survey years except 2015 (the southeast island was not

surveyed in 2012) and were found on the west island only in 2009 (1 nest), 2010 (1 nest), 2011 (1 nest), 2015 (2 nests), and 2019 (1 nest; see Table 5 on page 110). In 2011, chicks were suspected around pairs at two empty scrapes and with a third pair whose nest was not found. In 2018, an adult was seen sitting on one nest, and chicks were suspected around a second defensive pair. Surveys were conducted from the water in 2020-2023.

Figure 503. Black Oystercatchers were first recorded nesting on the Channel Islands in 1977. Nesting was intermittent until about 2007, but one to four pairs have been found nesting in almost all years since. *Photo by Paula Courteau.*

We have no data for gulls or guillemots since 1978, except Parks Canada surveyors found one abandoned gull nest containing two addled eggs on the west island in 2015. No adults were present.

Remarks: Drent noted crows present and found three crow-punctured cormorant eggshells in 1959. We saw five crows in 1978 and two adult Bald Eagles in 1977. One eagle flew out of a nest on the west island in 2019. A river otter was seen on the southeast island in 2016. In 2021, Parks Canada surveyors found kayakers sitting on the beach and asked them to leave the restricted area.

One oystercatcher chick was banded in 2007.

GI-465 "GRAINGER" ROCKS

Location: *48°50'03"N 123°14'05"W; 92 B/14.*
Off Grainger Point at the northwest end of Samuel Island, between Mayne and Saturna islands.

Description: *0.3 ha; 9 m high; Grassy rock; Bare rock.*
These two rocks are connected at low tide. The higher, southeastern rock has a grassy top with some shrubs; the northwestern rock is bare.

Historical summary: Parks Canada surveyors found a Black Oystercatcher nest with two eggs on the southeastern rock in 2011 and one nest with three eggs on the northwestern rock in 2012 (Table GI-465). We have no other records for these rocks.

Table GI-465. Seabird nesting records (nests) for "Grainger" Rocks.

DATE	BLOY	SOURCE
May-Jun 2011	1	529
May-Jun 2012	1	529

GI-470 BELLE CHAIN ISLETS

Location: *48°49'28"N 123°11'03"W* (Anniversary Island); *92 B/14.*
Outer chain of islets northeast of Samuel Island between Mayne and Saturna islands. Colony includes Anniversary Island at the southeast end of the chain.

Description: *2.3 ha; 23 m high; Grassy rock; Bare rock.*
This needle-thin chain of four islets runs northwest from Anniversary Island at the southeast end. The islets are mostly bare rock, except Anniversary Island is grassy above the shore rock, with some shrubbery along higher sections (Figure 504). There are sandstone cliffs on the southwest side of Anniversary Island. We have numbered the islets #1 to 4, in sequence from northwest to southeast, ending with Anniversary Island (#4). The islets became part of the Gulf Islands National Park Reserve in 2003 and only authorized access is allowed.

Historical summary: Robin Best confirmed Glaucous-winged Gulls nesting in 1966 (Table GI-470). He did not specify the location of the nests or whether he surveyed all the islets. Locations of nests found and whether all islets were surveyed also were not specified in 1974. Thus, counts from 1966 and 1974 may be incomplete. Records from 1969, 1977, 1978, and 1981 indicated changes in the distribution of gull nests among these islets, especially on islets #1 and 2, and in the locations of nests on Anniversary Island. In 1969, Drent, accompanied by John Ward and J. Anvik, tallied 19, 21, and 3 gull nests for three islets ordered from north to south. It seems likely that they combined counts for what we are calling islets #2 and 3, which are close together. In 1977, we counted 16, 6, 3, and 4 nests on islets #1 to 4, respectively. All nests on Anniversary Island were on the southwest side of the island; one nest

was on a cliff ledge and could not be inspected but had an adult sitting and likely contained eggs. In 1978, there were 6, 36, 5, and 3 nests on those same islets. That year, all nests on Anniversary Island were at the edge of the grass on the northeast side. Nests were only found on islets #1 (16 nests) and #2 (62 nests) in 1981. Egg laying was still in progress at the time of the survey in 1981, and many nests were still empty. Numbers of nests peaked in 1981, decreased by 1986, and were much reduced in 2009, when 18 nests were counted on islet #2. A modest increase in numbers of nests was seen in 2011 and 2012; nests again were reported only on islet #2. There have been no other complete surveys for gulls. We have partial data from 2005: Peter Arcese [30, 449] reported zero gull nests on Anniversary Island; and six nests were counted on islet #3 during Parks Canada Black Oystercatcher surveys.

Figure 504. Distant view of Anniversary Island (on the right) from Boat Passage, between Samuel and Saturna islands. The foreground shows the southeast tip of Samuel Island. *Photo by Moira J.F. Lemon, 13 July 2013.*

Although gull populations have declined on these islets, Black Oystercatchers have increased since they were first detected nesting in 1978. Two Black Oystercatchers were present but no evidence of nesting was found in 1977. In 1978, we found one nest with two eggs on the northwest end of Anniversary Island (Figure 505) and one empty scrape attended by two adults on islet #3. Four adults were seen but no nests were recorded in 1980, and two adults were seen in 1981. Locations of three nests found in 1987 were not specified. Monitoring conducted by Parks Canada since 2005 found oystercatchers nesting on Anniversary Island and islets #2 and 3 in most survey years up to 2018 (islet #1 was not included in Parks Canada surveys). From 2018 to 2022, nests were absent from islet #2; two pairs were suspected nesting there again in 2023 (see Table 5 on page 110 for the numbers of nests found or suspected on each of the islets during Parks Canada surveys conducted since 2005). The nesting population increased between 2005 and 2009, and has been fairly stable at around 10 pairs since 2009, with fewer nests counted in 2016 and 2021. Eight pairs were suspected nesting during the most recent survey from the water in 2023. In 2016, many scrapes were seen, but fewer birds were reported nesting, although 16 adults were present. In 2006, five nests (3 with eggs or young) were located; a sixth nest was suspected near an agitated pair. In 2009, 10 nests (7 with eggs or chicks) were found, and an additional two pairs were suspected nesting. In 2010, seven of nine nests found held eggs or chicks, and in 2011, eight of 10 nests found held eggs or chicks. Chicks were suspected around empty or suspected nests in some years: around one nest in 2006; two in 2009; two in 2010; three in 2011; and five in 2012.

Figure 505. Up to 12 pairs of Black Oystercatchers have been found nesting on Belle Chain Islets during Parks Canada surveys conducted since 2005. Breeding was first confirmed on these islets in 1978 when this nest of rock and wood chips was found. *Photo by Michael S. Rodway, 18 June 1978.*

Table GI-470. Seabird nesting records for Belle Chain Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
23 Jul 1966		15[12][a]		332, 523
6 Jul 1969		43[27]	(0)	332, 523
26 Jun 1974		6[6][a]	10e(8)	70, 523
21 Jun 1977	0	29[23][b]	(0)	332, 523
18 Jun 1978	2[1]	50[43]	x3(10)	523
27 Jun 1980	2eS	37[25]	S(13)	523
12 Jun 1981	1eS	78[46]	S(15)	523
Jun 1986		56		420
5-23 Jun 1987	3		(0)	158, 427
15 Jun 2005	3[3]	6[5]+		57, 456, 525, 529
13 Jun 2006	6e			529
26 Jun 2007	6[5]			529
3, 12 Jun 2008	5[5]			529
12 Jun 2009	12e	18[14]		30, 529
10 Jun 2010	10e			529
14 Jun 2011	11e	24[21]		529
11 Jun 2012	10[4]	32[24]		529
21 May 2014	10e			529
2 Jun 2015	7eS	S		529
20 Apr 2016			(6)	524
13 Jun 2016	4[4]	x		529
19 Jul 2017			(5)	524
5 Jun 2018	10e			529
19 Jun 2019	9e			529
30 Jun 2020	7eS			529
31 May 2021	6e			529
2 Jun 2022	9eS			529
12-14 Jun 2023	8eS			529

[a] This may have been just a partial survey of one islet and may underestimate the total nesting population.
[b] One nest could not be inspected but was assumed to contain eggs (see text).

Survey methods changed over the course of the Parks Canada surveys conducted since 2005, compromising the comparability of the most recent survey data. From 2005 to 2014 and in 2016, observers landed on the islets to count nests. In 2015, surveyors did not land on any islets because many eagles were present (Figure 506); numbers were estimated from the water. Since 2016, surveyors landed in some areas but estimated numbers of nesting pairs from the water in other areas, except no islets were landed on in 2022. Observers went ashore: in 2018 on islet #3 (3 nests with 3 eggs each); in 2019 on islet #1 (3 nests with eggs), islet #3 (1 nest with 2 eggs), and on the north end of Anniversary Island (1 nest with 1 egg); in 2020 on islet #1 and Anniversary Island (only empty scrapes were found); and in 2021 on islet #1 (2 nests with 3 eggs each) and Anniversary Island (1 nest with 3 eggs).

Drent saw no Pigeon Guillemots in 1969. No nests were found but eight adults were flushed from rocky areas in 1974. A nest with one egg was found in one crevice and adults were seen fly out of two other crevices on the cliffs on the southwest side of Anniversary Island in 1978. Birds seen in 1981 were roosting on those cliffs. Guillemots were seen around islet #1 in 2017 and likely still nest on the islets.

Figure 506. Many Bald Eagles were present on Belle Chain Islets in 2015 when Parks Canada surveyors came to count Black Oystercatcher nests. To avoid flushing nesting birds, observers decided not to go ashore. Numbers of oystercatchers nesting that year were estimated from the water. *Photo by Paula Courteau.*

Remarks: Robin Best found three dead gull chicks that had just been killed in one nest in 1966. There was no evidence of the predator, but Best speculated that a river otter may have been responsible. River otter scats and trails were seen in 1977 and 1978, and a den was found on the northeast side of Anniversary Island in 1978, but no direct evidence of predation on seabirds by river otters has been reported.

Bald Eagles have been recorded during several visits: one immature and two adults in 1977; one in 1981; one on islet #3 in 2014; many in 2015 and about four in 2016 on Anniversary Island; one on islet #2 in 2019; and one each on islets #2 and #3 in 2020. However, little evidence of predation has been reported: there was one broken gull egg on islet #3, one dead adult gull on islet #2, and a dead Rhinoceros Auklet on Anniversary Island in 1978; and one depredated oystercatcher egg was found on islet #2 in 2009. One crow was seen in 1978 and four were seen in 2016 on Anniversary Island.

The southern two of the three islets that Drent visited in 1969 had been recently vandalized, probably by visitors on Dominion Day or 4th of July

holidays. The 19 nests on islet #1 were unmolested but 16 of the 24 nests on the other islets were empty. Observers in 1980 also commented on the large proportion of empty nests.

GI-480 "MINX" ROCKS

Location: *48°48'40"N 123°12'15"W; 92 B/14.*
Southeast of Minx Reef, off Mikuni Point at the northwest end of Saturna Island.

Description: *0.1 ha; Bare rock.*
This site includes the rock connected by tide to Mikuni Point and the isolated rock further offshore towards Minx Reef. There is a little vegetation on the rock close to Mikuni Point. Minx Reef and associated rocks are part of the Gulf Islands National Park Reserve.

Historical summary: We saw no Black Oystercatchers in 1977 or 1978 (Table GI-480). One pair was found nesting in 1987 on what Vermeer et al. called "Minx Reef Rock," which we suspect is the isolated offshore rock. Parks Canada has found or suspected a pair nesting on the rock connected to Mikuni Point in most years since 2005. Nests were not found but an agitated pair was present in 2005 and 2006. Nests with eggs were seen in 2010, 2011, 2014, and 2016. In 2016, the nest was discovered in a patch of vegetation on the rock. A pair of oystercatchers flew by while observers were checking all the rocks in 2018 but no nests were found. The rocks were surveyed from the water in 2020-2023.

Table GI-480. Seabird nesting records for "Minx" Rocks. See Appendix 2 for codes.

DATE	BLOY	SOURCE
21 Jun 1977	0	332
17 Jun 1978	0	500
5-23 Jun 1987	1	427
16 Jun 2005	1eS	57, 529
13 Jun 2006	1eS	529
9 Jun 2010	1	529
14 Jun 2011	1	529
21 May 2014	1	529
2 Jun 2015	0	529
1 Jun 2016	1	529
5 Jun 2018	0	529
12 Jun 2019	1S	529
30 Jun 2020	0	529
25 May 2021	1S	529
6 Jun 2022	1eS	529
12 Jun 2023	1eS	529

One Glaucous-winged Gull was recorded in 2014 but no evidence of nesting was reported.

GI-490 PINE ISLET

Location: *48°48'01"N 123°05'43"W; 92 B/14.*
North of the west tip of Tumbo Island, west of Cabbage Island.

Description: *0.2 ha; 4 m high; Grassy rock.*
Pine Islet is a grassy rock with a couple of small trees. An extensive tidal shelf surrounds the islet and connects it to nearby Cabbage Island (Figure 507). The islet became part of the Gulf Islands National Park Reserve in 2003 and currently only authorized access is allowed.

Historical summary: A pair of Black Oystercatchers was present in the vicinity of two empty scrapes found in 1977 (Table GI-490). We suspected young associated with one empty scrape found in 1978. Two nests were reported in 1987, and Parks Canada has found one pair nesting in almost all years that the islet has been checked since 2005. In 2010, eggs had been laid but only eggshells were found and no adults were present at the time of the survey. Chicks were suspected around one empty scrape found in 2011. One nest with eggs and two empty scrapes were found in 2016; three birds were present but only one pair was reported nesting. Two empty scrapes and five adults were seen in 2020, but only one pair was suspected nesting. Surveys by

Table GI-490. Seabird nesting records for Pine Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
21 Jun 1977	1S	4[1]	332
17 Jun 1978	1S	1	523
5-23 Jun 1987	2		427
14 Jun 2005	1		57, 529
26 Jun 2007	1		529
12 Jun 2009	1		529
10 Jun 2010	1[a]		529
14 Jun 2011	1S		529
22 May 2014	1	3[3]	529
2 Jun 2015	0		529
1 Jun 2016	1		529
5 Jun 2018	1		529
10 Jun 2019	0		529
30 Jun 2020	1S		529
31 May 2021	1S		529
31 May 2022	1		529
12 Jun 2023	0		529

[a] Eggs had been depredated and nest was abandoned.

Figure 507. The top picture, taken from Cabbage Island, shows Pine Islet (centre left) at the far end of the extensive intertidal rocky reef that connects it to Cabbage Island at low tides. The close-up picture shows the western face of Pine Islet with its conglomerate substrate and a few overhanging trees. *Photos by Moira J.F. Lemon, 13 August 2013 (top) and 23 August 2009.*

Parks Canada in 2021 to 2023 were conducted from the water only; one adult was seen sitting on a nest in 2021. SFU students reported a nest with two eggs in 2022.[529] One oystercatcher but no evidence of nesting was seen in 2023.

Only one Glaucous-winged Gull nest contained eggs in 1977, and only one nest with eggs was found in 1978. Nests were at the edge of the grass. There were 13 adults present in 1977 and four in 1978. We have no other data for gulls.

Remarks: Just broken oystercatcher eggshells were seen at the nest found in 2010. River otter and raccoon were reported in 2014. Observers in 2020 noted a dingy with two people landing on the islet. Numerous crows were seen in 2021.

GI-500 CABBAGE ISLAND

Location: *48°47'53"N 123°05'13"W; 92 B/14.*
North of the western end of Tumbo Island off the east end of Saturna Island.

Description: *4.3 ha; Forested.*
This forested island has a unique central wetland area that runs east-west across the island. The island is fringed with beach habitat and surrounded by extensive tidal, rock shelves. It is part of the Gulf Islands National Park Reserve.

Historical summary: We saw no evidence of nesting seabirds in 1977 or 1978, but Vermeer et al. reported one pair of Black Oystercatchers nesting in 1987 (Table GI-500). No oystercatchers were found nesting by Parks Canada since they began surveys in 2005, although birds were seen around the island in several years: 18 in the lagoon in 2005, three in 2015 and 2018, six flying between Cabbage Island and Pine Islet in 2019, and one that flew in from Pine Islet to forage in 2020.

Pigeon Guillemots have never been reported nesting and we saw none in the 1970s, but some were recorded around the island in 2002 and 2012.

Table GI-500. Seabird nesting records for Cabbage Island. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
21 Jun 1977	0	(0)	332
17 Jun 1978	0	(0)	500
5-23 Jun 1987	1	(0)	158, 427
10 Apr 2002		(1+)	524
15 Jun 2005	0		57, 529
27 Apr 2012		(10)	524
22 May 2014	0		529
2 Jun 2015	0		529
1 Jun 2016	0		529
5 Jun 2018	0		529
10 Jun 2019	0		529
30 Jun 2020	0		529
31 May 2021	0		529
6 Jun 2022	0		529
12 Jun 2023	0		529

Remarks: One raccoon was seen on the island in 2005 and four were reported in 2018. Bald Eagles are reported to nest on the island, and two were perched in trees on the southwest and east sides of the island in 2019. Many crows were recorded in 2021. The island receives a lot of tourist traffic. There is a Parks Canada campsite on the island, and Reef Harbour between Cabbage and Tumbo islands is a popular anchorage (Figure 508).

Figure 508. Cabbage Island, seen from the shore of Tumbo Island, is part of the Gulf Islands National Park Reserve and is a popular destination for the boating public. *Photo by Moira J.F. Lemon, 24 July 2016.*

GI-510 EAST POINT - CLIFFS

Location: *48°46'54"N 123°02'49"W; 92 B/14.*
East tip of Saturna Island.

Description: *10-15 m high; Cliffs.*
Sculpted sandstone cliffs extend about 50-60 m along the shore just south of East Point (Figure 509). The tip of land at East Point became part of the Gulf Islands National Park Reserve in 2006. There is a lightstation on the point.

Historical summary: Drent reported that around 1958, lightkeepers told Gerard van Tets about Pelagic Cormorants nesting here (Table GI-510). He did not include the site in his seabird catalogue [144] because he had no further confirmation by 1960, but in 1968, from a distance offshore, he saw rows of nests in deep, near-horizontal fissures on the cliffs and suspected at that time that the colony was an old one. The largest numbers of nests were recorded in 1974 (Figure 510) and 1983. Fewer nested from 1978 to 1981, and after 1983 the nesting population again declined. Records suggest that the site was largely abandoned after 1987, although one nest was seen in 2013. Cormorants appeared to be incubating in all nests seen in 1974, 1977, and 1978. A total of 82, 36, and 40 adults were counted on the cliffs in 1977, 1978, and 1981, respectively. Observers in 1981 noted that it was difficult to get an accurate count of nests because some areas on the cliff were hidden from view and some nests could have been missed.

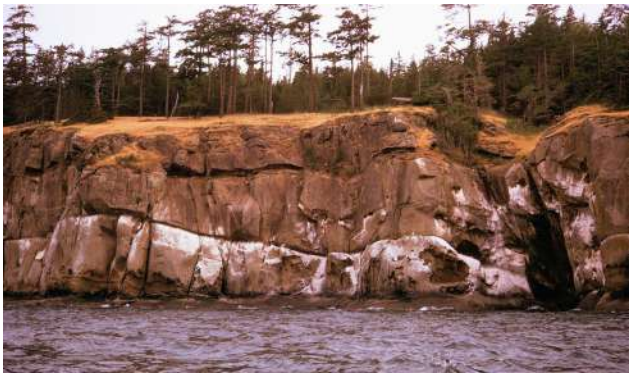


Figure 509. The East Point cliffs are a relatively short section of cliffs extending about 50-60 m along the shore of Saturna Island on the south side of East Point. The Pelagic Cormorant colony at this site was at its maximum size when this photo was taken. *Photo by R. Wayne Campbell, 26 June 1974.*

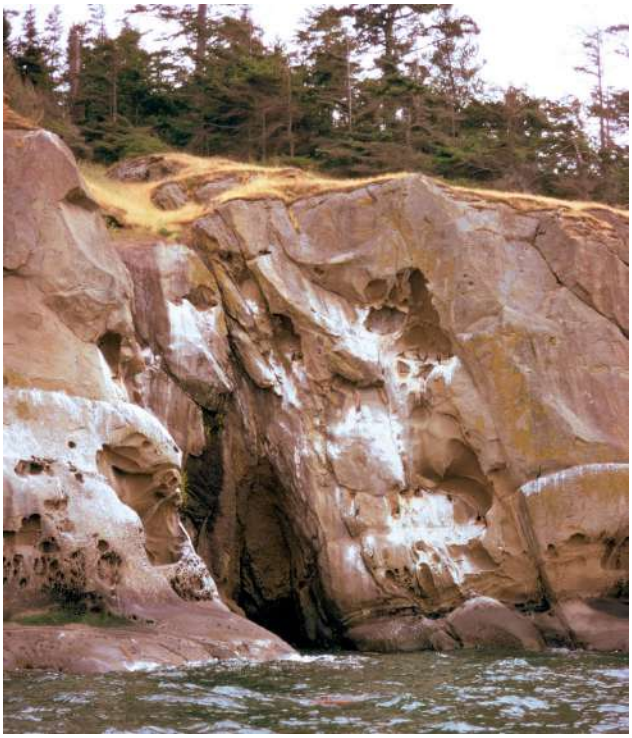


Figure 510. A total of 54 Pelagic Cormorant nests were counted on the East Point cliffs in 1974. Nests were located in cavities and crevices in the eroded sandstone cliffs. *Photo by R. Wayne Campbell, 26 June 1974.*

Table GI-510. Seabird nesting records for East Point - Cliffs. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
c1958	x			523
6 Aug 1968	30-40			523
26 Jun 1974	54	0	(0)	70, 523
21 Jun 1977	47	7	(0)	332, 523
17 Jun 1978	14	6	(0)	523
27 Jun 1980	28	5		523
12 Jun 1981	16	3	x(6)	523
29 May-13 Jun 1983	53			421
Jun 1986		7		420
5-23 Jun 1987	12		S(7)	158, 428
25 Jul 1989			(15)	524
2000	0			114
2007	0			522
2009	0			522
29 Mar 2013			(10)	524
2013	1			101
7 Jul 2014			(7)	524
15 May 2015			(3)	524
25 Mar 2016			(4)	524
18 Mar 2017			(6)	524
26 Jun 2018			(4)	524

No Glaucous-winged Gulls were seen nesting in 1974, but a few pairs were nesting in each year the colony was surveyed between 1977 and 1986. In all years, adults were observed sitting on nests on cliff ledges. One nest whose contents could be inspected in 1978 contained two eggs. There were 14 and 12 adults in attendance in 1977 and 1978, respectively. Only three nests were seen in 1981, but 24 adults were on the cliffs.

Pigeon Guillemots were first reported nesting on the cliff in 1981, and small numbers of guillemots have frequently been seen since.

Remarks: The area sees a high volume of human traffic. East Point is accessible by road and is a popular tourist destination both by road and by boat. Parks Canada advertises the site and has installed picnic tables, toilets, and hiking trails to service visitors. There are also many residences in the area.

One Bald Eagle was seen in 1977.

GI-520 LYALL HARBOUR - CLIFFS

Location: *48°48'06"N 123°11'21"W; 92 B/14.*
On the north side of Lyall Harbour at the northwest end of Saturna Island.

Description: *10 m high; Cliffs.*
These sandstone cliffs extend for about 50 m along the shore. There are residences scattered along the entire shoreline of Lyall Harbour.

Historical summary: In 1961, Dick Pillsbury, from UBC, flushed an incubating Pigeon Guillemot off one egg in a nest located in a niche in the cliff wall less than 2 m above the high tide line (Table GI-520). He could see into the nest while standing in a boat. We saw three guillemots at the base of the cliff in 1977; none were recorded in 1987.

Four adult and 14 immature Glaucous-winged Gulls were roosting in 1977. Vermeer and Devito found one nest in 1986.

There was one old Pelagic Cormorant nest on the cliffs in 1977. No cormorants were present and we did not consider this a breeding record for this site. The site has not been surveyed for cormorants since.

Table GI-520. Seabird nesting records for Lyall Harbour - Cliffs. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
3 Jun 1961		1(1)	332, 523
21 Jun 1977	0	S(3)	332, 523
Jun 1986	1		420
5-23 Jun 1987		(0)	158

GI-530 ELLIOT BLUFF

Location: *48°47'21"N 123°12'44"W; 92 B/14.*
West end of Saturna Island, south of Payne Point.

Description: *10-15 m high; Cliffs.*
There is about 1 km of cliff habitat along the shore in this area (Figure 511). Some residences line the forested top above the cliffs.

Figure 511. Elliot Bluff is a stretch of cliffs at the west end of Saturna Island. Pigeon Guillemots were confirmed nesting in 1959, and Pelagic Cormorants have been recorded nesting on the cliffs only in 1974. *Photo by R. Wayne Campbell, 26 June 1974.*

Historical summary: Cowan and Dick found Pigeon Guillemots nesting on the cliffs in 1959 (Table GI-530). Pillsbury monitored the fate of one nest that was visible from the water; one young successfully fledged. Fewer guillemots were present in 1977 and 1978, and none have been recorded since.

The BCPM crew saw about 50 Pelagic Cormorants on the water below the cliffs and about 10 nests on the cliffs in 1974. That is the only year that cormorants were found nesting although it is likely that they tried in other years (see Remarks).

Table GI-530. Seabird nesting records for Elliot Bluff. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
Aug 1959		30e(63)	144
26 Jun 1974	10e		70, 523
21 Jun 1977	0	S(13)	332, 523
17 Jun 1978	0	S(10)	523
29 May-13 Jun 1983	0		421
5-23 Jun 1987	0	(0)	158, 428
2000	0		114
2007	0		522
2009	0		522
2013	0		101, 522

Remarks: In 1978, there was a decapitated Pelagic Cormorant hung by a line over the nesting area on the bluff (Figure 512). Locals were clearly trying to discourage nesting.

Figure 512. Residents living above Elliot Bluff in the 1970s were obviously displeased with cormorants nesting on the cliffs. In 1978, they had hung a decapitated Pelagic Cormorant (centre of photo) down the face of the cliff to discourage nesting. *Photo by Michael S. Rodway, 17 June 1978.*

GI-535 RAZOR POINT - CLIFFS

Location: *48°46'31"N 123°14'40"W* (north cliffs)*; 92 B/14.*
East side of North Pender Island at the east entrance to Port Browning, facing Plumper Sound.

Description: *15-20 m high; Cliffs.*
There is a small band of shoreline cliffs located about 300 m west of Razor Point and a larger band of cliffs beginning about 600 m north of Razor Point. Areas above the cliffs are mostly forested, with some residences tucked along the edge.

Historical summary: Lynne Milnes and Michael Rodway saw four Pigeon Guillemots and one Glaucous-winged Gull but no evidence of nesting along this area in 1977 (Table GI-535). In 2019, local resident John Peetsma observed large numbers of guillemots, including several carrying fish up into the shoreline cliffs north of the point (Figure 513).

Table GI-535. Seabird nesting records for Razor Point - Cliffs. See Appendix 2 for codes.

DATE	PIGU	SOURCE
22 Jun 1977	(4)	523
1 Aug 2019	x(55)	524

Figure 513. Pigeon Guillemots may have nested on the Razor Point cliffs for many years, but it was not until 2019 that nesting was confirmed when birds carrying fish were seen flying to nests on the cliffs. *Photo by Paula Courteau.*

GI-540 "CROKER" ROCK

Location: *48°46'23"N 123°11'47"W; 92 B/14.*
West side of Saturna Island, about 500 m southeast of Croker Point, between Croker Point and Trueworthy Bight. This is an isolated rock only 3-4 m offshore.

Description: *0.03 ha; 2 m high; Bare rock.*

Historical summary: Two pairs of Glaucous-winged Gulls were reported nesting in 1955 (Table GI-540). No sign of nesting has been reported since, although we saw a pair of gulls at Croker Point in 1978.

Table GI-540. Seabird nesting records (nests) for "Croker" Rock.

DATE	GWGU	SOURCE
22 Jul 1955	2	144
21 Jun 1977	0	332
17 Jun 1978	0	500

Remarks: There are dwellings along the shore in this area.

GI-550 JAVA ISLETS

Location: *48°45'35"N 123°06'35"W; 92 B/14.*
Off the south side of Saturna Island, east of Taylor Point.

Description: *0.8 ha; 5 m high; Grassy rock.*
Both these rocky islets have grassy areas on top (Figure 514). The west islet is composed of two knolls connected by a grassy isthmus with beaches on either side. The islets are part of the Gulf Islands National Park Reserve, and as of 2014 all unauthorized vessels are prohibited from approaching closer than 25 m.

Historical summary: This long-established Glaucous-winged Gull colony had its heyday in the late 1960s to the early 1980s and, although protected within the National Park Reserve, unfortunately is no longer faring well. H. Spalding, from South Pender Island, noted gulls nesting every year since about 1900, with about 30-40 pair nesting when he first started visiting the islets (Table GI-550). P. Symons, out of UBC, also reported consistent nesting from 1946 to 1959. Carter [96] uncovered notes on a visit made by W.A. Newcombe on 7 May 1934. He recorded about 100 gulls present and inspected 17

Table GI-550. Seabird nesting records for Java Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
1900-59		x		144
7 May 1934		x		96
27 Jun 1959		372[372]	2[2]	144
27 Aug 1960		x	6-8e	144
6 Jun 1968	2	464[442]	5-6e	332, 523
6 Jul 1969	2	531[451]	5-10e	332, 523
26 Jun 1974	1	372[358]	(0)	70, 332, 523
21 Jun 1977	2[2]	374[348]	S(8)	332, 523
17 Jun 1978	2[2]	499[481]	S(14)	523
27 Jun 1980	1	195+	S(4)	523
10 Jun 1981	1	384[315]	S(5)	523
Jun 1986		298		420
5-23 Jun 1987	4		S(15)	158, 427
15 Jun 2005	1[a]	52		30, 57, 472, 529
13 Jun 2006	4e			529
Jun 2007		20		30, 472
25-26 Jun 2007	3[2]	23[23]		456, 529
Jun 2008		17		30, 472
10 Jun 2008	5eS			529
12 Jun 2009	6e	25[15][a]		30, 472, 529
10 Jun 2010	6e			529
16 Jun 2011	7[7]	26[19][a]		529
14 Jun 2012	8[8]	42[31][a]		529
22 May 2014	6e	0[a]		529
26 May 2015	5[5]	x3		529
1 Jun 2016	7[7]	x		529
5 Jun 2018	7e			529
10 Jun 2019	11e			529
14 Jul 2020	5e			529
1 Jun 2021	7e			529
31 May 2022	6eS			529
12 Jun 2023	6eS			529

[a] This may be an incomplete count; see text.

Figure 514. Java Islets are two low, grassy rocks that supported a large Glaucous-winged Gull colony until the mid-1980s. *Photos by R. Wayne Campbell, 26 June 1974.*

completed but still empty nests. Gull numbers peaked in 1969, were high through the 1970s, and then began to decline, especially since 1986. Only a small fraction of the maximum number recorded in 1969 was still nesting on recent surveys conducted since 2005. However, we are not sure how complete the recent surveys were; in 2009, 2011, and 2012, nests were reported on the east islet during the Parks Canada [529] oystercatcher surveys, but no observations were made for the west islet and it was not clear whether all nests on the east islet were counted. Surveyors noted 30-35 gulls on the east islet in 2014 but did not record information on nesting.[529] In 2015, observers noted a minimum of 16 gulls and one nest with four addled eggs on the east islet, and three gulls and two nests with two addled eggs each and two abandoned nests on the west islet. The survey in 2015 occurred early in the season and it is possible that eggs were not addled or abandoned but rather that egg laying was still progressing. In 2016, three gulls and one nest with an egg were recorded on the east islet. Regardless of how complete these recent counts were, it is clear that gulls have suffered a major decline on these islets since the 1970s. We have used the nest count from 2012 as the current estimate for this colony.

Records have been kept of the number of gull nests on the west and east islet, respectively: 158 and 214 in 1959; 224 and 240 in 1968; 243 and 288 in 1969; 180 and 192 in 1974; 177 and 197 in 1977; 243 and 256 in 1978; 214 and 170 in 1981; 132 and 166 in 1987; and 2 and 21 in 2007. Note that Drent and Guiguet in 1959, the BCPM crew in 1981, and Butler [456] in 2007 identified the islets as north and south, which we assumed referred to west and east; all other observers referred to the islets as west and east. If our assumption was correct, then 1981 was the only year when there were more nests on the west than on the east islet; but this would not be true if north actually referred to the east islet in 1981. In 1980, the BCPM crew counted 195 nests with eggs or young and noted many empty nests that they did not count. They did not separate the counts for each islet.

One Pigeon Guillemot nest with eggs was found on each islet in 1959. In 1960, one nest with a deserted egg and four nests that had young in the nest or recently fledged were found on the west and east islets, respectively. Nests were in crannies among boulder jumbles. On the east islet, nests were on the mid-north side of the islet facing Saturna Island. One nest with eggs was found under a boulder in 1969. We saw three guillemots around the west islet and five around the east islet in 1977 (Figure 515). There have been no records of guillemots since 1987.

As on Belle Chain Islets on the other side of Saturna Island, while the gull population has declined, the Black Oystercatcher nesting population on Java Islets appears to have increased and has been stable at around 6-7 pairs since 2009. Oystercatchers were first recorded nesting in 1968 when Drent found one nest on the beach (which we assume was on the west islet) and one in a rocky area. One nest with two eggs was found in 1974, and a nest with two eggs was found on each islet in 1977. Two nests with two eggs each found in 1978 were both on the west beach of the west islet. Two pairs were seen in 1980, but only one nest with three eggs was found. In 1981, a nest with two eggs was found on the west islet, and a pair was recorded roosting on the east islet. Vermeer et al. reported four nests in 1987.

Figure 515. Pigeon Guillemot nests were found on both the west and east Java Islets in the 1960s. Guillemots were seen around the colony in the 1970s and 1980s but there are no reported observations since. *Photo by Paula Courteau.*

Parks Canada surveyed only the west islet in 2005 and the oystercatcher nest count from that year may be incomplete (see Table 5 on page 110 for the numbers of nests found or suspected on each islet during Parks Canada surveys conducted since 2005). In 2006, three nests with eggs or young were found (2 on the west and 1 on the east islet) and a fourth pair was suspected nesting on the west island, where a total of 11 adults were seen. In 2007, the empty nest found on the east islet was in a depression and had been flooded by rain. Hidden chicks were suspected around two nests, one with broken eggshells, in 2009. In 2010, five nests with eggs or young were found and an additional nest was suspected on the west island where some eggshell fragments were found. In 2014, six possible scrapes and four nesting pairs were recorded for the west islet. In 2018, Morgan Davies from Parks Canada thought that they likely missed some scrapes on the west islet, but only four adults were present, two of which were sitting on nests. In 2019, five and three nests with eggs were found on the west and east islets, respectively, one pair with three chicks was seen on the west islet, and one additional pair was suspected nesting on each islet. In 2020, three pairs were suspected nesting on the west island, and a chick was seen with one pair and chicks were suspected around another pair on the east islet. In 2021, three nests with eggs were found on the west islet; four other pairs were suspected nesting. The islets were surveyed from the water in 2022 and 2023 (Figure 516).

Figure 516. As of 2022, Parks Canada decided to conduct all surveys of Black Oystercatchers from the water only. Estimating numbers of nesting pairs during such surveys requires that observers separate apparently breeding birds on territories from roosting birds, such as those shown here. *Photo by Paula Courteau.*

Remarks: One dead adult gull was found in 1977. More evidence of predation on gulls was found in 1980 (nine depredated eggs, one dead chick, and one dead adult) and 1981 (17 depredated eggs). Also, the many empty nests in 1980 and 1981 may have been a result of predation or disturbance. River otter trails were seen on the islets in 1980, and signs of river otter were noted on the east islet in 2014. A dead Bald Eagle with some kind of trap attached was found on the west islet in 2016. An eagle was seen on the east islet in 2019.

Canada Goose nests were found on the west (1 nest with 6 eggs and 1 nest with 3 crushed eggs) and east (1 nest with 4 eggs) islets in 2016.

Drent banded 10 gull chicks in 1959 and 11 gull chicks and four guillemot chicks in 1960.

GI-560 BLUNDEN ISLET

Location: *48°44'39"N 123°10'05"W; 92 B/11.*
Off Teece Point at the east tip of South Pender Island.

Description: *2.1 ha; 30 m high; Forested.*
Blunden is a steep-sided islet with broad rocky areas along the south side and east end and a rocky point off the west end. The higher northern side of the islet is covered with an open forest.

Historical summary: H. Spalding reported in 1960 that 1-2 pair of Glaucous-winged Gulls occasionally nested (Table GI-560). Three gulls were present in 1980, but none have been recorded nesting since 1960.

Table GI-560. Seabird nesting records (nests) for Blunden Islet.

DATE	GWGU	SOURCE
c1960	1-2	144
22 Jun 1977	0	332
17 Jun 1978	0	500
27 Jun 1980	0	523

GI-570 OAKS BLUFF

Location: *48°44'53"N 123°16'03"W; 92 B/11.*
Southwest side of North Pender Island from Wallace Point to Oaks Bluff.

Description: *10-15 m high; Cliffs.*
There are about 2 km of conglomerate cliffs extending sporadically from Oaks Bluff to Wallace Point (Figure 517). There are houses along the forested perimeter of North Pender Island above the cliffs and hiking trails to lookouts over Oaks Bluff.

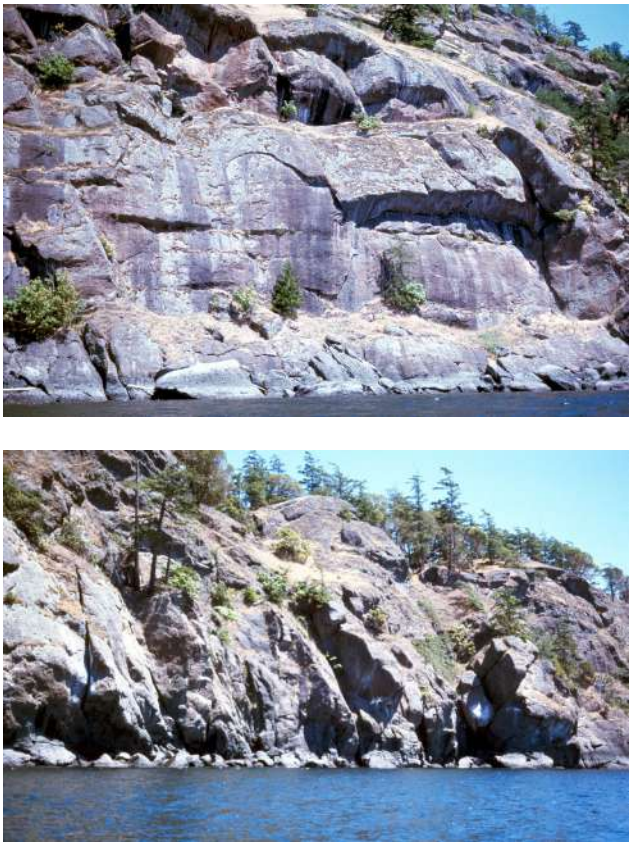


Figure 517. Views of two sections of cliffs in the Oaks Bluff colony, located at Oaks Bluff (top) and to the south just northwest of Wallace Point. *Photos by Michael S. Rodway, 22 June 1977.*

Historical summary: In 1975 and 1977, Pigeon Guillemots were heard calling from holes in the cliffs (Table GI-570). Chris Shepard heard young in 1975. Maximum numbers were recorded in 1987, and it is likely that guillemots still nest on these cliffs.

Table GI-570. Seabird nesting records for Oaks Bluff. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
4 Jul 1975		x	523
22 Jun 1977	0	x(34)	332, 523
17 Jun 1978	0	S(43)	523
5-23 Jun 1987	8	S(57)	158, 428
Jul-Sep 2000	17		114
2006	7		522
2007	6		522
2009	0		522
2013	2		522
2014	11		101
21 Apr 2017		(10)	524

Pelagic Cormorants were first found nesting in 1987. Since then, small numbers have nested in most years that the site has been surveyed for cormorants.

Three Glaucous-winged Gulls were seen along the cliffs in 1978, but we saw no evidence of nesting.

Remarks: One adult Bald Eagle was seen in the area in 1978.

GI-580 "PETER" ROCK

Location: *48°44'17"N 123°13'52"W; 92 B/11.*
In Peter Cove at the southeast tip of North Pender Island.

Description: *0.1 ha; 2 m high; Bare rock.*
This small, bare rock is part of the Gulf Islands National Park Reserve.

Historical summary: We detected no seabirds nesting on this rock during our survey of all the Gulf Islands in 1977, but Vermeer et al. found two pairs of Black Oystercatchers nesting in 1987 (Table GI-580). The site seems to be used intermittently: no oystercatchers were found nesting during Parks Canada surveys in the years 2005-2015 and 2023, but a nest with three eggs was found in 2016, and one pair was reported nesting each year between 2018 and 2022. The rock was surveyed from the water in 2018 and 2021 to 2023.

Table GI-580. Seabird nesting records for "Peter" Rock. See Appendix 2 for codes.

DATE	BLOY	SOURCE
22 Jun 1977	0	332
5-23 Jun 1987	2	427
20 Jun 2005	0	57, 529
22 May 2014	0	529
26 May 2015	0	529
1 Jun 2016	1	529
8 Jun 2018	1S	529
4 Jun 2019	1eS	529
7 Jul 2020	1	529
25 May 2021	1S	529
2 Jun 2022	1eS	529
13 Jun 2023	0	529

Remarks: A river otter was seen on the beach in 2019.

GI-588 "KINGFISHER" ROCKS

Location: *48°45'22"N 123°24'33"W; 92 B/14.*
Off Kingfisher Cove, east of Fulford Harbour on Saltspring Island.

Description: *0.1 ha; 2 m high; Bare rock.*
There are four or five small bare rocks close to shore off Kingfisher Cove.

Historical summary: We saw no sign of seabirds nesting on these rocks in 1977 or 1978, but one pair of Black Oystercatchers was found nesting on more recent surveys (Table GI-588).

Table GI-588. Seabird nesting records (nests) for "Kingfisher" Rocks.

DATE	BLOY	SOURCE
17 Jun 1977	0	332
18 Jun 1978	0	500
5-23 Jun 1987	1	427
15 Jun 2005	1	57

GI-590 JACKSON ROCK

Location: *48°45'14"N 123°25'42"W; 92 B/14.*
At the mouth of Fulford Harbour at the south end of Saltspring Island.

Description: *0.4 ha; 3 m high; Grassy rock.*
Jackson Rock is composed of two rocky knolls with some tidal areas and small shell beaches between. The rock is mostly bare, with some grassy patches (Figure 518). It is part of the Gulf Islands National Park Reserve.

Figure 518. Jackson Rock is a mostly bare rock with grassy patches on higher sections and small shell beaches between and off the ends of the rocky knolls. *Photo by Michael S. Rodway, 17 June 1977.*

Historical summary: A Black Oystercatcher nest with three eggs was located on the shell beach in 1977, and an adult oystercatcher tending three young

was seen in 1978 (Table GI-590; Figure 519). Vermeer et al. found no oystercatchers nesting in 1987, but a pair was again nesting in 2005, and Parks Canada has found them nesting almost every year since. An empty scrape was found in 2007, but no birds were present. Hidden chicks were suspected in 2012. Observers did not land in 2016 because 10 Turkey Vultures (*Cathartes aura*; Figure 520) were feeding near the two oystercatchers present. No nest was found in 2019, but one oystercatcher was chasing a couple of crows in the intertidal zone. The rock was surveyed from the water in 2022 and 2023.

Figure 519. Three Black Oystercatcher chicks were hiding away from this nest found on Jackson Rock in 1978. *Photo by Michael S. Rodway, 18 June 1978.*

Figure 520. Turkey Vultures, like these two on Wallace Island in 2021, are frequently seen around the islands of the Salish Sea. *Photo by Moira J.F. Lemon, 28 August 2021.*

Two adult Glaucous-winged Gulls were present but not nesting in 1977. A pair was again present, and we found a nest with one egg in 1978. After 1978, we have no data on gulls for almost four decades. Surveyors reported no gulls in 2015.

Table GI-590. Seabird nesting records for Jackson Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
17 Jun 1977	1	0	332, 523
18 Jun 1978	1	1	523
5-23 Jun 1987	0		427
15 Jun 2005	1		57, 529
12 Jun 2006	1		529
28 Jun 2007	0		529
10 Jun 2008	1		529
15 Jun 2009	1		529
9 Jun 2010	1		529
16 Jun 2011	1S		529
14 Jun 2012	1S		529
3 Jun 2014	1		529
23 Jun 2015	1	0	529
25 May 2016	1eS		529
7 Jun 2018	1S		529
3 Jun 2019	0		529
6 Jul 2020	1S		529
25 May 2021	1		529
6 Jun 2022	1eS		529
13 Jun 2023	1eS		529

Remarks: Two oystercatcher chicks were banded in 2009.

GI-595 FULFORD HARBOUR

Location: *48°45'44"N 123°26'17"W* (2022 nest location)*; 92 B/14.*
South end of Saltspring Island. Although only one nest has been recorded to date, for future consideration we have designated this colony to include all buildings and other human structures, including the ferry dock, along the shores of Fulford Harbour.

Description: *Rooftops; Wharf; Pilings.*

Historical summary: Richmond birder and photographer Brian Avent recorded a pair of Glaucous-winged Gulls nesting on the steeply-pitched rooftop of a house nestled in the forest near shore along Reginald Hill Road that runs along the east side of Fulford Harbour (Table GI-595). The nest was built against the frame of a skylight in the roof (Figure 521).

Table GI-595. Seabird nesting records (nests) for Fulford Harbour.

DATE	GWGU	SOURCE
8-9 Jul 2022	1	450, 524

Figure 521. An unusual Glaucous-winged Gull nest was discovered in Fulford Harbour by Brian Avent in 2022. Rooftop nests are common in urban areas, but this was the first rooftop nest reported in rural communities on the Gulf Islands. The location of the nest on a steeply-pitched roof on a building surrounded by forest is also unusual. *Photo by Kathy Rysiew, 9 July 2022.*

GI-600 ISABELLA ISLAND

Location: *48°43'44"N 123°25'50"W; 92 B/11.*
Southwest of Isabella Point at the southern end of Saltspring Island.

Description: *0.9 ha; 10 m high; Grassy rock, Bare rock.*
This island would be better called "Isabella Islets" because it is composed of several rocks. The main part of the island is formed by two large, rounded, grassy rocks and two small, bare rocks between them on their north side, all of which are connected by tidal beach. There is also a separate, small, bare rock just to the north of the group. There is a navigational beacon on the largest, southeast, grassy rock. The island is part of the Gulf Islands National Park Reserve and public access has been prohibited since 2014.

Historical summary: We found a Black Oystercatcher nest with three eggs on one of the small bare rocks between the two large grassy rocks in 1978 (Table GI-600). None were seen in 1987 or during the Parks Canada surveys in 2011, 2014, and 2023, but oystercatchers were nesting at the same location in 2015-2018. Adults were seen sitting on a nest but nest contents were not determined in 2018, 2019, and 2020. Surveys were conducted only from the water in 2020-2023. In 2021, Parks Canada surveyors saw only one oystercatcher sitting on a nest on the southern of the two small middle rocks, where they had been seen in previous years, but were informed by a local landowner that another pair was nesting on the northern of the middle rocks.

Table GI-600. Seabird nesting records for Isabella Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
18 Jun 1978	1	523
5-23 Jun 1987	0	427
15 Jun 2005	1S	529
16 Jun 2011	0	529
3 Jun 2014	0	529
23 Jun 2015	1	529
25 May 2016	1	529
7 Jun 2018	1S	529
3 Jun 2019	1S	529
6 Jul 2020	1S	529
25 May 2021	2eS	529
1 Jun 2022	1eS	529
13 Jun 2023	0	529

Remarks: Nine Canada Geese were present in 2016.

GI-610 PELLOW ISLETS

Location: *48°43'29"N 123°21'27"W; 92 B/11.*
East side of Portland Island facing Moresby Passage.

Description: *1.1 ha; 5 m high; Grassy rock.*
This small chain of tidally-connected rocky knolls lies just off the shore of Portland Island. Higher sections of the domed rocks are capped with grass and shrub growth (Figure 522). One large arbutus tree that had grown on the islets was dead in 2008 and gone in 2021.[484] The islets are protected as part of the Gulf Islands National Park Reserve and unauthorized persons and vessels are prohibited from going ashore, as of 2014.

Figure 522. Seen from the shore of a small bay on the east side of Portland Island, the top picture shows the Pellow Islets in the middle distance. The bottom photo shows the rocky shore, grassy perimeter, crown of shrubs, and the dead arbutus tree still standing in 2008 on one of the Pellow Islets nearest to the shore of Portland Island. *Photos by Moira J.F. Lemon, 25 July 2008.*

Historical summary: Black Oystercatchers have been confirmed nesting only in 1978 (Table GI-610). One was seen but no evidence of nesting was found in 1977. We found a nest with two eggs on the outer, southeast islet in 1978 (Figure 523). No birds were seen on visits in 1987 or between 2005 and 2015. A pair was present in 2016 and 2018 but no nest was found. The pair in 2018 was resting on a low rock

and flew away when observers got close. Only the northwest islet was landed on in 2020; surveys in 2021 to 2023 were conducted from the water.

Figure 523. Black Oystercatchers have been reported nesting on Pellow Islets only in 1978, when this nest was found. *Photo by Michael S. Rodway, 17 June 1978.*

Pigeon Guillemots were present in 1977 and 1978 and may have been nesting; none were seen in 1987.

Table GI-610. Seabird nesting records for Pellow Islets. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
22 Jun 1977	0	(3)	500
17 Jun 1978	1	(2)	523
5-23 Jun 1987	0	(0)	158, 427
15 Jun 2005	0		529
3 Jun 2014	0		529
24 Jun 2015	0		529
25 May 2016	0		529
7 Jun 2018	0		529
3 Jun 2019	0		529
6 Jul 2020	0		529
26 May 2021	0		529
1 Jun 2022	0		529
13 Jun 2023	0		529

Remarks: Nearby Portland Island is also part of the Gulf Islands National Park Reserve and has three campsites and numerous trails that are popular destinations for kayakers and boaters. The survey crew in 2014 reported 12 kayakers in the vicinity of Pellow Islets. Songbird researchers visited the islets several times in the spring of 2015. In 2019, a raccoon, two Bald Eagles, and nine Turkey Vultures were seen on the islets.

GI-620 TORTOISE ISLETS

Location: *48°42'58"N 123°22'07"W; 92 B/11.*
Off the southeast corner of Portland Island, east of Hood Island.

Description: *0.4 ha; Grassy rock.*
These two rocks are mostly bare, with small patches of grass. They are part of the Gulf Islands National Park Reserve.

Historical summary: Black Oystercatchers have nested intermittently on these islets. One pair was associated with two empty scrapes found in 1977, and there was a nest with three eggs in 1978 (Table GI-620; Figure 524). A single adult was very vocal and defensive in 2006, but no nest was found. Single nests were found in other years up to 2014, but no oystercatchers were found nesting on surveys conducted in 2015-2019. Three oystercatchers were present in 2019 but flew away when observers landed. Three were also present in 2020; two flew away but one behaved territorially and was suspected nesting. Nesting was confirmed again in 2021 when one nest with three eggs was found. A pair was suspected nesting on the east islet in 2022. Parents were seen feeding three young in 2023. Surveys in 2020, 2022, and 2023 were conducted from the water.

Figure 524. A single pair of Black Oystercatchers has been found nesting on Tortoise Islets in most years that surveys have been conducted, except for a hiatus from 2015 to 2019. Breeding was first confirmed in 1978 when this nest with three eggs was found. *Photo by Michael S. Rodway, 17 June 1978.*

A pair of Glaucous-winged Gulls was attending an empty nest in 1977, and a pair was building a nest

in 1978. We have no data for gulls since 1978, and they have not been confirmed nesting on the islets.

Table GI-620. Seabird nesting records for Tortoise Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
22 Jun 1977	1S	1S	523
17 Jun 1978	1	1S	523
5-23 Jun 1987	1		427
15 Jun 2005	1		57, 529
12 Jun 2006	1eS		529
3 Jun 2014	1		529
24 Jun 2015	0		529
25 May 2016	0		529
7 Jun 2018	0		529
3 Jun 2019	0		529
6 Jul 2020	1eS		529
26 May 2021	1		529
1 Jun 2022	1eS		529
13 Jun 2023	1		529

Remarks: A pile of gull feathers was found in 1978. There is abundant boat traffic past these islets. Tortoise Islets lie at the entrance to Princess Bay, which is a popular anchorage for visitors to the area.

Two Canada Geese were on the islets in 2014. A raccoon was seen on the west islet in 2019.

GI-630 ARBUTUS ISLAND

Location: *48°42'22"N 123°26'07"W; 92 B/11.*
Off the north end of the Saanich Peninsula, west of Piers Island.

Description: *0.4 ha; 7 m high; Grassy rock; Cliffs.*
This small, rocky island is vegetated on top with grasses, shrubs, and small trees, including roses, Oregon grape (*Mahonia aquifolium*), saskatoon, stunted Garry oak, and a few arbutus and Douglas-fir trees (Figure 525). There are cliffs along the south side.

Historical summary: The first records for this colony are from a BCPM survey in 1976 (Table GI-630). The site was not mentioned by Drent and Guiguet,[144] which is surprising given its proximity to, and ease of access from, Swartz Bay. This may suggest that the colony was not in existence then but, similar to other nearby colonies, such as Reay, Greig, and the Little Group islands, that were also not mentioned by Drent and Guiguet, may simply reflect the limited state of knowledge about nesting seabirds at that time.

Figure 525. The top of Arbutus Island is densely vegetated with grasses, shrubs, and small trees, including a few arbutus and Douglas-fir trees. The bottom photo shows Marilyn Paul (now Lambert) searching the thick vegetation for Glaucous-winged Gull nests; she did not find any in those areas. *Photos by R. Wayne Campbell, 8 June 1976.*

This is one of the few island colonies where Pelagic Cormorant numbers have been higher in recent years than historically. A BCPM crew, including Wayne Campbell, Marilyn Paul, and Michael Rodway, noted two Pelagic Cormorants but

reported no evidence of nesting in 1976. Pelagic Cormorants were first recorded nesting on the cliffs on the south side of the island in 1978 by Harry Carter and Michael Rodway. In addition to the 17 active nests counted, there was also one unused, old nest on the cliffs. Observers in 1978 landed on the island to count nests, and the contents of all nests were determined. The same methods were used by John M. Cooper and Phil Nott from the BCPM in 1981 and by Wayne Campbell, Ron Jakimchuk, and Mark Nyhof from the BCFWS in 2018 and 2020. In other years, Pelagic Cormorant nests have been counted from the water. Numbers nesting declined after 1981, with lowest numbers recorded around 2000-2006, but then increased again after 2010 and reached a maximum of 71 nests in 2014. Pelagic Cormorant nests with eggs were seen on 25 May 2012, adults carrying nesting material were noted in June 2016, and birds were sitting on nests in March 2017 and on 19 April 2022. Fewer nests were found during the complete counts from land in 2018 and 2020, but numbers were still greater than at any time prior to 2013. Louise Blight counted 54 nests from the water in 2023.

Double-crested Cormorants were reported nesting on the island in 2009. Adults with young were reported at nests located in vertical cracks in the rock, an unusual location for nests of this species. Six birds were recorded. Agnes Lynn from Victoria was one of three observers who conducted the survey in 2009. In response to an inquiry from Michael Rodway, Lynn said that she was confident that the three observers would have correctly identified the Double-crested Cormorant nests. There is a second record of a Double-crested Cormorant nest with eggs found while observers were counting nests of other species on 25 May 2012. It was reported by Christina Ball from southern Vancouver Island, who was one of four observers present at the time. No count of nests or birds was given. These are the only records of Double-crested Cormorants nesting on the island, but the species was recorded at the island on several occasions, including 26 Apr 2012 (8 birds), 20 July 2012 (2 birds), 26 June 2015 (6 birds), 7 June 2016 (3 birds), 3 May 2018 (12 birds), and 6 July 2021 (8 birds).[524] Wayne Campbell and others have visited the island several times in the last two decades and have not seen Double-crested Cormorants nesting.[457]

One or two pairs of Black Oystercatchers have been reported nesting in all years that surveys have been conducted for that species (Figure 526). One nest with three eggs and an empty nest attended by a territorial pair were found in 1999, and two nests with three eggs each were found in 2005. Blight found a nest with one egg and suspected a second pair nesting in 2010. In 2011, chicks were suspected around an empty scrape and one nest contained one egg. In 2012, Christina Ball reported one pair and a nest with eggs on 25 May, and Parks Canada surveyors found one nest with three eggs and a separate adult attending an empty scrape in June. One pair present in March 2017 likely nested that year. One nest was found in 2018 and 2020, and a second territorial pair was suspected nesting in 2020. Two pairs were seen from the water in 2022.

Figure 526. This Black Oystercatcher nest found on Arbutus Island in 1978 was made of rock chips and a few scattered cockle and other clam shell fragments. *Photo by Michael S. Rodway, 18 June 1978.*

Glaucous-winged Gulls were nesting mostly on the west and north sides of the island in 1976; nests were not found in the dense vegetation on the east and south sides. Similarly, in 1978 nesting occurred over most of the island except in dense shrubbery and on the cliffs. Numbers of gulls nesting increased from 1976 to a peak in 1986 and then declined, such that the number of nests tallied during the complete survey in 2010 was almost the same as the number counted in 1978. In 1999, nests were still being built on 1 June and only one nest held an egg; nests were completed but most were still empty on 25 June. Observers reported about 80 adult gulls and 20 chicks visible from a boat on 19 July 2009. About 120 and 90 adults were visible on territories and on nests on 5 May 2014 and 7 June 2016, respectively. A total of 45 gulls, including many juveniles were counted from photographs taken from a passing ferry by Michael Christie from Santa Barbara, California on 11 August 2022. Several complete surveys revealed variable numbers nesting after 2010, with low counts of 26 nests in 2012 and 2020, rebounding somewhat to 45 nests in 2023.

In 2023, Louise Blight conducted a ground survey of the gull colony on 14 June and two drone surveys on 13 and 15 June 2023. During the ground survey, nests were counted in all areas except close to the Pelagic Cormorant colony to avoid disturbing nesting cormorants. Nests near the cormorant colony were counted from the water. A total of 43 nests were tallied, including seven counted from the water. Two of the nests were empty; the rest held eggs. Blight noted that from the water it was difficult to determine which nests had been counted on land and there was possibly some double counting. Images from the drone survey yielded counts of 45 and 42-47 occupied (i.e., with an apparently incubating adult) nests on 13 and 15 June, respectively. The images taken on 15 June were lower resolution than those taken on 13 June and there was some uncertainty in identifying an incubating adult for five nests (thus the range of 42-47 occupied nests). Of the three surveys, counts from the 13 June drone imagery were considered the most accurate estimate of the number of nests in 2023. Later in 2023, Michael Shepard reported nests with young and 60 birds present on 6 July.

Pigeon Guillemots were confirmed nesting: in 1976, when a nest with two eggs was found in a rock crevice; in 1981, when birds were recorded nesting in a burrow on the northeast side of the island; and in 2009, when young were seen with adults. In 2020, one nest was found and two others were suspected. Maximum numbers were recorded in 2017 and 13 birds were present on 24 July 2022.

Table GI-630. Seabird nesting records for Arbutus Island. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
8 Jun 1976	0	0	1	39[22]	1	332, 523
18 Jun 1978	0	17[16]	1	69[55]	S(10)	523
17 Jun 1981	0	27[18]	1	89[83]	x(20)	523
29 May-13 Jun 1983	0	16				421
Jun 1985				115		420
Jun 1986				150[a]		420
5-23 Jun 1987	0	18	1		S(28)	158, 427, 428
21 Apr-30 May 1996			2[2]			202
9-30 May 1997			2[2]			202
1-9 Jul 1997				97		377
1 Jun 1999		6	2[1]	25[1]	(0)	57, 377, 484
25 Jun 1999		2+		55[7]	(0)	377, 484
Jul-Sep 2000	0	2				114
15 Jun 2005		16	2[2]	40		30, 57, 456, 525, 529
2006		0	1			522, 529
2007		9		35		30, 522, 525
May-Jun 2008			1			529
11 Jun 2009		19e				45
19 Jul 2009				40e		524
31 Jul 2009	x			x	x(10)	45, 487
2009		22	2[2]			522, 529
18 Jun 2010		22	2e	68[53]		30, 453
May-Jun 2011			2[1]	64[55]		529
25 May 2012	x	x	1	x		524
Jun 2012			2[1]	26[26]		529
2013		49				522
2014	0	71	1			101, 529
5 May 2014				60e	S(14)	524
7 Jun 2016		S		45e	(4)	524
24 Mar 2017		x	1eS		S(35)	524
2 Jun 2018	0	53	1	53	1S	457
24 Jun 2020	0	48	2e	26	3e	457
6 Jul 2021		x			(2)	524
Apr-Aug 2022		x	2eS	x	(13)	524
13-14 Jun 2023		54		45		600

[a] Vermeer and Devito [420] give two different numbers of nests for 1986: 150 nests on Table 1 and 190 nests on Table 3 in their paper.

Remarks: Four crows were seen on the island in 1976, and one was present on 1 June 1999. One dead adult gull and one broken gull egg were found in 1978. Frequent disturbance by Bald Eagles may have contributed to the almost complete reproductive failure of gulls in 1986.[420] River otter trails and scats were seen in 1997 and 1999.[377, 484] In 1999, the one gull egg found in a nest on 1 June was crushed, and 15 depredated gull eggs were found on 25 June. Remains of an adult oystercatcher were seen in 2012.

A Canada Goose nest containing one cold egg was found on the island in 1978 (Figure 527). No geese were present. Geese were also recorded nesting in 1981, a nest with six eggs was found in June 1999, a nest with three eggs and one depredated egg was seen in 2010, and one pair was present on 19 April 2022.

Figure 527. Canada Geese commonly nest on many Gulf Islands. This nest with one cold egg found on Arbutus Island in 1978 had been abandoned. *Photo by Michael S. Rodway, 18 June 1978.*

GI-640 HATCH POINT - WHARF

Location: *48°41'49"N 123°32'26"W; 92 B/12.*
Shore of Vancouver Island south of Cherry Point, west of Moses Point at the northwest tip of the Saanich Peninsula. Wharf is located about half a kilometre north of Hatch Point.

Description: *Wooden wharf.*

Historical summary: Wayne Campbell found two Glaucous-winged Gull nests (one with two eggs and one empty) in a corner of the wharf and two Pigeon Guillemot nests with eggs on horizontal beams under the wharf in 1981 (Table GI-640). We had no evidence that this site was surveyed in 1987,[158] and we have no other records for this site.

Table GI-640. Seabird nesting records for Hatch Point - Wharf. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
26 Jun 1981	2[1]	2	523

GI-650 PYM ISLAND

Location: *48°42'00"N 123°23'21"W; 92 B/11.*
North of Fir Cone Point on Coal Island, east of Knapp Island.

Description: *3.1 ha; 40 m high; Forested.*
Pym Island is mostly forested, with rocky points at the north and south ends and a broad rocky shoreline along the east side. The island is privately owned and most of the forested area has been modified by residential development.

Historical summary: One pair of Black Oystercatchers was found nesting in 1987, but there is no evidence that birds have nested since (Table GI-650).

Table GI-650. Seabird nesting records (nests) for Pym Island.

DATE	BLOY	SOURCE
5-23 Jun 1987	1	427
21 Apr-30 May 1996	0	202
9-30 May 1997	0	202
15 Jun 2005	0	57

Remarks: Disturbance from residents and guests to the island likely discourages nesting, although the date of construction of the palatial house is listed as 1985, before Vermeer et al. found oystercatchers nesting in 1987.

GI-656 SWARTZ BAY - FERRY TERMINAL

Location: *48°41'21"N 123°24'41"W; 92 B/11.*
On the east side of the north end of the Saanich Peninsula.

Description: *Ferry dock.*

Historical summary: Three seabird species have been reported nesting at this site. A pair of Pigeon Guillemots was seen nesting in the open ends of a horizontal steel channel beam of ferry dock #3 by eBird contributor Bruce Whittington in 1995 (Table GI-656). A pair was seen in a similar location in 2000 (Figure 528).

Table GI-656. Seabird nesting records for Swartz Bay - Ferry Terminal. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
11 Jun 1995			1(2)	524
15 Jul 2000			S(2)	484
30 Jun 2017	S			524
21 Aug 2018	1			524
10 Jun 2020	few			524
4 Jul 2020		1		524
5 Jul 2021	4			524
11 Jul, 13 Aug 2022	4			524
5 Jul 2023	6			524

Figure 528. Pigeon Guillemots have frequently been recorded nesting on man-made structures along the BC coast. Here, two guillemots are perched on part of the dock structure at the Swartz Bay Ferry Terminal. One bird is within one of the steel girders, where it was likely nesting. *Photo by Moira J.F. Lemon, 15 July 2000.*

Louise Blight saw Pelagic Cormorants carrying nesting material on 30 June 2017, but no evidence of actual nesting at the terminal was reported. In 2018, Richard Marshall observed two juvenile Pelagic Cormorants being fed in a nest which was situated on the sides of the dock. As the ferry docked, the adults flew off but the juveniles remained on the nest. Thirty birds were present and there may have been more than one nest. Jeff Gaskin reported a few cormorants on nests in 2020, and wildlife biologist Debbie Hlady observed four occupied nests along the ferry dock in 2021 and 2022. In 2023, Mike McGrenere reported six cormorant nests on one of the support beams of the ferry dock on 5 July, and three young in nests were seen by Harvey Laas on 18 July.

Glaucous-winged Gulls have also been observed nesting; Hlady reported adults on a nest on 4 July 2020.

Remarks: Whittington in 1995 noted that one guillemot appeared to be sitting on two white eggs, which were the wrong colour for Pigeon Guillemot eggs. He wondered if the bird could possibly have been sitting on Rock Dove eggs.

GI-660 "SWARTZ HEAD" ROCKS

Location: *48°41'11"N 123°24'00"W* (north rock); *92 B/11.*
Off Swartz Head, north of Canoe Bay.

Description: *0.1 ha; 4 m high; Bare rock.*
This site includes about three small, bare rocks just off the Vancouver Island shoreline between Swartz Head and Canoe Bay.

Historical summary: We found a Black Oystercatcher nest with two eggs on the northern of these rocks in 1978 (Table GI-660; Figure 529). Two adult Glaucous-winged Gulls were also present on this rock, but there was no sign that they were nesting. However, another pair was nesting on the southern of these rocks; a nest with two eggs in the nest and a cold egg outside the nest was found. We assumed that this site was within the area checked for oystercatchers by Vermeer et al. in 1987; we have no other records.

Table GI-660. Seabird nesting records (nests) for "Swartz Head" Rocks.

DATE	BLOY	GWGU	SOURCE
17 Jun 1978	1	1	523
5-23 Jun 1987	0		427

Remarks: There is a marina in Canoe Bay and the area is well travelled by pleasure craft.

Figure 529. This nest found in 1978 is the only known record of Black Oystercatchers nesting on the "Swartz Head" Rocks. The area sees a lot of recreational boat traffic. Note the difference in the speckling pattern on these two eggs. *Photo by Michael S. Rodway, 17 June 1978.*

GI-665 POINT FAIRFAX

Location: *48°41'57"N 123°17'55"W; 92 B/11.*
South tip of Moresby Island on the north side of Prevost Passage.

Description: *Rocky point.*

Historical summary: One Black Oystercatcher nest with two eggs was found in 1977 (Table GI-665). No oystercatchers were recorded in 1987.

Table GI-665. Seabird nesting records (nests) for Point Fairfax.

DATE	BLOY	SOURCE
22 Jun 1977	1	332, 523
5-23 Jun 1987	0	427

GI-670 IMRIE ISLAND

Location: *48°41'40"N 123°19'59"W; 92 B/11.*
Southwest of Moresby Island across Prevost Passage. Historically referred to as Yellow Island.[369]

Description: *0.7 ha; 5 m high; Grassy rock.*
This is a low, flat, circular island covered with grasses and a few shrubs. There are beaches on the southwest and northeast corners above an extensive rocky shoreline. The island is part of the Gulf Islands National Park Reserve and, as of 2014, all unauthorized persons and vessels are prohibited from going ashore and vessels are prohibited from approaching closer than 25 m to the island.

Historical summary: Imrie Island has been visited for over a century and was one of the main Glaucous-winged Gull colonies used in the early banding programs conducted in the 1920s to 1940s (Figure 530). Unfortunately, the gull colony has suffered declines in recent decades and was deserted when last surveyed in 2007 (Table GI-670). The earliest recorded visit was by Dawson and Edson who reached the island on 21 June 1905 while they were out on a two-week excursion in a sailing dingy to "…widen [their] knowledge of the summer sea birds inhabiting the San Juan Group of islands." [152] In reference to that visit, Drent and Guiguet [144] noted that they "…apparently found no nesting sea birds." We think that assessment may be inaccurate. Describing their trip that day, Edson noted that they travelled from Waldron Island in Washington, across the international border, to Yellow Island, a distance of about 15 miles, and reported that "only a few Guillemots and Harlequins were seen, with now and then a gull or murrelet." They then visited a rock designated on their chart as "Bird Island" (which is an old name for Greig Island), where they found birds were scarce, before turning around and fighting the winds and tidal currents back to Skipjack Island just north of Waldron Island. Edson did not specify what they saw on Yellow Island. We suspect that they had some prior knowledge that Yellow Island was a seabird colony, otherwise why would they have made that long-day trip to Yellow Island. At any rate, we do not think that Edson's comments can be interpreted to mean that no seabirds were nesting on Imrie Island at that time. R. Mathews, from Sidney, reported to Drent that gulls had been nesting on the island ever since he had been working in the area starting in 1927, and it was a well-established colony chosen for bird-banding by Sprot in 1929.[369]

Figure 530. Imrie Island was a major Glaucous-winged Gull colony until the mid-1980s. Along with Mitlenatch Island and Christie Islet, it was one of the main sites in the BC Salish Sea where early banding programs were initiated. George Sprot began banding gull chicks here in 1929. *Photo by Anna Smith.*

Table GI-670. Seabird nesting records for Imrie Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
21 Jun 1905		0		144
1927 on		x		144
1929-34		x	S	366, 369
8 May 1934		86		96
2 Aug 1935		150e		144, 274
1938-40		x		445
2 Aug 1938		x		169, 345, 348
3 Aug 1939		x		346, 347, 348
1940		x		348, 349
27 May 1945		x		144
10 Jun 1950	S	x		119
1957-58		x		144
1958	1			146
28 Jun, 19 Jul 1959	1	200e	x4	144, 146, 523
19 Jun, 18 Jul, 8 Aug 1960	1	290-300e	8	144, 146, 523
1961	1S			146
1962	1			146
6 Jun 1968	1	280e	(0)	332, 523
25 Jun 1974	1	298[298]	2S(4)	70, 523
22 Jun 1977	1	315[299]	1	332, 523
13 Jun 1978		355[287]	x(11)	523
20 Jun 1978		299[278]		523
26 Jun 1980	1	259[259]		523
17 Jun 1981	1eS	279[247]	S(6)	523
Jun 1985		120		420
Jun 1986		216		420
5-23 Jun 1987	2		S(8)	158, 427
21 Apr-30 May 1996	5[5]			202
9-30 May 1997	5[5]			202
1-9 Jul 1997		33		377
31 May 1999	3[3]	13[0]	S(6)	484
25 Jun 1999		41[2]	x(21)	377, 484
13 Jun 2005	1			57, 529
2005		1		30, 449
12 Jun 2006	3[3]			529
25, 29 Jun 2007	4eS			529
2007		0		30, 449
11 Jun 2008	3[3]			529
10 Jun 2009	5[4]			529
9 Jun 2010	4[3]			529
13, 17 Jun 2011	4[3]			529
14 Jun 2012	4e			529
22 May 2014	3[3]			529
24 Jun 2015	4e			529
10 Jun 2016	4[4]			529
28 May 2018	2eS			529
3 Jun 2019	5[5]			529
29 Jun 2020	5e			529
27 May 2021	5[5]			529
30 May 2022	6e			529
14 Jun 2023	6S			529

Estimates and nest counts suggest that the Glaucous-winged Gull population more than doubled from the early 1930s to 1978 when numbers peaked at 355 nests. W.A. Newcombe noted 86 gull nests completed or in preparation on 8 May 1934 [96] and Munro and Cowan estimated 150 pairs plus young on the island in early August 1935.[274] Blight,[30] citing Drent and Guiguet,[144] listed an estimate of 150 pairs also nesting in 1945. We have not listed that estimate because the record given by Drent and Guiguet is of a photograph from Meugens showing 150 adults on the northern half of the island; it is not a nesting population estimate. Meugens noted many freshly prepared nests, but few eggs had yet been laid at the time of his visit that year. Nest counts were conducted by Drent and others in June of 1959, 1960, and 1968, with tallies of 168 (all with eggs or just-hatched young), 270 (245 with eggs, one of which also held 2 young; 25 empty), and 244 (232 with eggs; 12 empty) nests in those three years, respectively. Drent estimated more nesting pairs than nests counted in those years because of the difficulty of finding nests in tall-grass habitat that covered much of the island. Later observers made no allowances for nests that may have been missed.

Similar numbers of gull nests with eggs were found in 1974, 1977, and 1978, but the maximum number of total nests was counted by Harry Carter and Chris Shepard on 13 June 1978 (Figure 531).

Figure 531. The Glaucous-winged Gull colony on Imrie Island reached a maximum size of 355 nests in 1978. Forty years later, it was deserted. The colony was likely a victim of human, Bald Eagle, and river otter disturbance and predation. *Photo by Michael S. Rodway.*

Interestingly, fewer nests were counted by George Sirk only a week later on 20 June 1978. Carter noted that many nests on the beach had been washed out and were not included in their count on 13 June. Thus, total number of nests built that year was greater than the 355 counted. Carter kept track of the habitat where nests were found and tallied 89, 96, 167, and 3 nests in beach, rock, grass, and shrub habitat, respectively. Perhaps more of the beach nests had washed out by the time Sirk surveyed the colony a week later. The nesting population declined during the 1980s, was a small fraction of its former size during the 1990s, and was extirpated by 2007. Vermeer and Devito reported a reproductive failure in 1985, and only two of 41 nests held eggs (1 egg each) in June 1999.[484]

Black Oystercatchers were first recorded and suspected nesting in 1950, and nesting was confirmed when one nest with eggs was found in 1958. Drent and company found a nest with eggs on the west side shell beach used for a landing beach in 1959 and 1960 and on a nearby rock ledge in 1968. One or two nests were frequently found during surveys in the 1970s and 1980s. Four and one adults were recorded on 13 and 20 June 1978, respectively, but no evidence of nesting was reported that year. A territorial pair was present in 1981, but observers were unable to locate a nest. Greater numbers of nesting birds have been found since the 1980s. Stephanie Hazlitt found five nests during her intensive studies in 1996-1997, and Parks Canada has reported up to six pairs nesting in the years since 2005. In May 1999, observers found three nests with eggs plus eight empty nest scrapes, four of them on the shell beach, but only three pairs of oystercatchers were present. Only one pair was present when observers returned in June 1999. Only one nest was reported by Parks Canada surveyors in 2005, although eight birds were present. In 2006, all nests were located on the beach among driftlogs. In 2007, three pairs of oystercatchers were present and suspected nesting on 25 June, one pair was present on 29 June, and four pairs in total were estimated nesting. In 2012, three nests with eggs were found, and chicks were suspected around a fourth pair seen on the beach. Three and four nests with eggs were found in 2015 and 2020, respectively, and an additional pair was suspected nesting in both years. The survey was conducted from the water in 2022 and 2023. Five adults were seen sitting on nests and two eggs were visible in another nest in 2022 (Figure 532). Six nests were visible in 2023, but no chicks could be seen.

Figure 532. Recent Black Oystercatcher surveys by Parks Canada on Imrie Island and other monitored colonies have been conducted from the water. Although nest contents are not usually visible from the water, birds sitting on nests often can be seen. *Photo by Anna Smith.*

As mentioned above, Edson noted Pigeon Guillemots seen on the trip from Waldron Island to Imrie Island in 1905, but the first report of guillemots on Imrie Island was in 1930 and 1931.[366] Nesting was first confirmed on July 1959 when Drent's party found four nests with eggs or young. Two nests were found in June 1960, but a more exhaustive effort was made to find all nests on subsequent visits in July and August 1960. The eight nests found is the maximum number of nests ever discovered on the island. No guillemots were seen and no nests were found on the single visit in 1968. A nest with two eggs was located under driftlogs in 1978. The maximum number of adults ever recorded around the island was in June 1999, when a nest with two eggs was found.

Remarks: Two crow nests with young were found in June 1960, and four crows were recorded in 1978 and 1981, but little evidence of crow predation on seabird eggs has been reported. Five gull eggs and eggs in the oystercatcher nest had been preyed on in 1980, which could have been by crows. Observers noted very little evidence of predation in 1981, again finding only five depredated gull eggs. In 1968, Drent noted that egg laying by gulls was less advanced than on Java Islets or Chain Islets/Great Chain Island, and he speculated that the colony may have suffered from human disturbance. River otters were suspected to have been responsible for reproductive failure of gulls in 1985 (Figure 533).[420] River otter trails and scats were seen in 1997.[377] One oystercatcher and 16 gull eggs were found depredated in June 1999. Eight Bald Eagles were on the island on 29 June 2007, and one eagle was being harassed by an oystercatcher in 2008.

Figure 533. River Otters may have been preying heavily on Glaucous-winged Gull chicks on Imrie Island in 1985. *Photo by Paula Courteau.*

Sprot banded gull chicks here in 1929-1934 [369] and Dennis Ashby colour-banded 149 nestling gulls in 1938,[169, 345] 250 in 1939,[346, 347] and 300 in 1940 [348, 349] as part of the Pacific Gull Color Banding Project.

Canada Geese also nest on the island; a nest with four eggs was found in 1974, and a nest with three eggs plus two old nests were found in May 1999. When observers returned in June 1999, one nest with three cold eggs and four empty nests were seen.

GI-680 REAY ISLAND

Location: *48°41'00"N 123°19'45"W; 92 B/11.*
South of Imrie Island and northwest of Brethour Island. Formerly also known as Tree Island.

Description: *1.1 ha; 12 m high; Grassy rock.*
This long, narrow, rocky island is covered with grasses on higher sections, with some patches of shrubs and a few trees, including some arbutus, especially towards the north end. Ribs and isolated knobs of bare rock extend off the south end (south rocks). There are pocket beaches on either side of an isthmus that connects the southwest rock rib to the main island. The island became part of the Gulf Islands National Park Reserve in 2003 and access or approach closer than 25 m has been prohibited since 2014.

Historical summary: A pair of aggressive, territorial Black Oystercatchers was present in 1974 and in June 1999, but a nest was not found in those years (Table GI-680). A nest with one egg confirmed breeding in 1978 (Figure 534), and nesting has been observed intermittently since. Nest locations were not specified for earlier records, but since 1999, all nests have been found on the south rocks except one pair was suspected nesting on the main islet in 2022. A pair was present on the main islet in 2007, 2015, and 2021, but they were not territorial and no nests were found. On the south rocks, a pair was reported nesting in 2012, 2015, 2018, 2020, and 2022; a pair was present in 2005, 2016, and 2019 but they did not appear to be nesting and no nests were found in those three years.[529] In 2012, three empty scrapes but no eggs or chicks were found. In 2015, a nest with three eggs was found on the south rocks on 27 May. An adult was sitting on a scrape in 2018, but nest contents were not determined. A pair with one chick was seen in 2020. No oystercatchers were seen in 2023. Surveys were conducted from the water in 2020-2023.

Table GI-680. Seabird nesting records for Reay Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
25 Jun 1974	1eS	5[5]		70, 332, 523
22 Jun 1977		6[6]		332, 523
12 Jun 1978	1	1	(0)	523
26 Jun 1980		9[5]	(6)	523
5-23 Jun 1987	0		(0)	158, 427
21 Apr-30 May 1996	0			202
9-30 May 1997	1			202
31 May 1999	0	0	(0)	484
25 Jun 1999	1eS	0	(0)	484
13 Jun 2005	0[a]			57, 529
29 Jun 2007	0[b]			529
13-20 Jun 2010		0		30, 472
14 Jun 2012	1S[c]			529
27 May, 24 Jun 2015	1[d]			529
10 Jun 2016	0			529
28 May, 4 Jun 2018	1S			529
27 May, 4 Jun 2019	0			529
29 Jun 2020	1			529
1 Jun 2021	0			529
30 May 2022	2eS			529
14 Jun 2023	0			529

[a] Butler and Golumbia [57] reported one nesting pair but no evidence of nesting was seen.[529]
[b] Only the main islet was checked; not the rocks at the south end.
[c] Only the south rocks were checked; not the main islet.
[d] The south rocks were checked on 27 May and the main islet was checked on 24 June.

Small numbers of Glaucous-winged Gulls nested in the 1970s, and a maximum of nine nests were counted in 1980. The single nest in 1978 was located on the south rocks. The island was apparently not

surveyed by Vermeer and Devito [420] in 1986, but no gulls were nesting during surveys in 1999 and 2010, although a possible nest start was seen in June 1999.

Six Pigeon Guillemots were rafting offshore in 1980, but no evidence of nesting has been reported.

Figure 534. Black Oystercatchers were suspected breeding on Reay Island in 1974. Breeding was confirmed in 1978 when a nest with a single egg was found, like the one found elsewhere shown in this photo. *Photo by Michael S. Rodway.*

Remarks: Four crow nests were found in 1978, and river otter runs were seen in June 1999.

GI-690 GREIG ISLAND

Location: *48°40'41"N 123°20'21"W; 92 B/11.*
Between Coal Island and Brethour Island. Labelled as Bird Island on nautical charts from 1862.

Description: *0.1 ha; 4 m high; Bare rock.*

Greig Island is composed of about four, above-tide rocky knobs. It is part of the Gulf Islands National Park Reserve and unauthorized access is prohibited.

Historical summary: Most Glaucous-winged Gull young were nearly fledged when George McKay surveyed the rock in 1963 (Table GI-690). He counted 45 young out of nests (Figure 535) and found four nests with cold eggs. Other nests were empty and trampled. He estimated a total of about 20 nests and about 30-35 pairs of gulls around the island. The nesting population was fairly stable at around 40-50 pairs through the 1970s and 1980s but fewer have nested since. Most nests were empty in June 1999; two nests contained single eggs each. In May 2020, pairs were seen on territories and building nests.

McKay estimated 2-3 pairs of Pigeon Guillemots nesting in 1963 but found no nests. Two nests found with eggs confirmed breeding in 1978. One adult was seen sitting at the entrance of a crevice in 2009.

Except for one pair of Black Oystercatchers present in 1980 (Figure 536), none were recorded through the 1970s and 1980s. Stephanie Hazlitt confirmed two pairs nesting in 1996, and 1-2 pairs have been found nesting during most surveys conducted since. In 1999, a nest with a single egg was recorded in May and June, plus an empty scrape was seen in June; only one pair of oystercatchers was present during both visits. In 2011 and 2014, one adult was present but did not appear to be nesting. An adult was seen sitting on a nest in 2018, 2021, 2022, and 2023 but nest contents were not determined. Surveys were conducted from the water in 2021 to 2023.

Figure 535. Greig Island was surveyed in early August 1963 and most Glaucous-winged Gull young were nearly fledged. During surveys conducted that late in the season, it is difficult to make an accurate count of nests because nests have often been demolished and young have gathered away from nests or even already fledged, like these juveniles seen on Mitlenatch Island. *Photo by R. Wayne Campbell, 25 August 1969.*

Table GI-690. Seabird nesting records for Greig Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
3 Aug 1963		20e	2-3eS	332, 523
25 Jun 1974		40[39]		70, 523
12 Jun 1978	0	44[38]	x2(16)	523
26 Jun 1980	1eS	44[44]		523
17 Jun 1981	0	53[46]	S(8)	523
Jun 1985		45		420
Jun 1986		52		420
5-23 Jun 1987	0		(0)	158, 427
21 Apr-30 May 1996	2[2]			202
9-30 May 1997	1			202
1-9 Jul 1997		5		377
31 May 1999	1		S(12)	484
25 Jun 1999	1	14[2]	S(15)	377, 484
13 Jun 2005	2[1]			57, 529
12 Jun 2006	2[1]			529
25 Jun 2007	1			529
11 Jun 2008	1			529
15 Jun 2009	1	17[14]		30, 472, 529
26 May 2010		S	x(3)	45
9 Jun 2010	1			529
13 Jun 2011	0	24[21]		529
14 Jun 2012	1	21[19]		529
25 Jun 2014	0			529
27 May 2015	1			529
10 Jun 2016	2[2]			529
4 Jun 2018	1S			529
27 May 2019	1			529
6 Jul 2020	1			529
27 May 2021	1S			529
30 May 2022	1S			529
14 Jun 2023	1S			529

Figure 536. A pair of Black Oystercatchers was present on Greig Island and may have nested in 1980, but it was not until 1996 that nesting was confirmed. *Photo by Anna Smith.*

Remarks: One Bald Eagle was recorded in 1978 (Figure 537) and river otter trails and scats were seen in 1997.[377] One and seven depredated gull eggs were found in 1981 and June 1999, respectively. The oystercatcher nest found in May 1999 contained one partially eaten egg in the nest.

Figure 537. One Bald Eagle was seen on Greig Island in 1978. There was no evidence of impacts to nesting birds. *Photo by Paula Courteau.*

GI-700 "KILLER WHALE" ROCKS

Location: *48°40'38"N 123°23'01"W; 92 B/11.*
South of Killer Whale Point at the southwest corner of Coal Island.

Description: *0.3 ha; 5 m high; Grassy rock.*

Historical summary: Vermeer et al. reported one pair of Black Oystercatchers nesting on these rocks in 1987 (Table GI-700). None have been found on other surveys.

Table GI-700. Seabird nesting records (nests) for "Killer Whale" Rocks.

DATE	BLOY	SOURCE
5-23 Jun 1987	1	427
21 Apr-30 May 1996	0	202
9-30 May 1997	0	202
13-16 Jun 2005	0	57

GI-710 LITTLE GROUP

Location: *48°40'18"N 123°21'27"W* (Dock Island); *92 B/11.*
South of Coal Island, northwest of Forrest Island. Colony includes Dock, Ker, and Little Shell islands and the rocks between. Dock and Little Shell islands are the most eastern and western islands, respectively, in the Little Group. Officially, Dock

Island refers only to the northern of the two adjacent east islands.

Description: *6.2 ha; 43 m high; Forested; Grassy rock; Cliffs.*
Ker Island is forested and there are trees on Little Shell Island, but smaller islets are mostly rock with grassy crowns. Dock Island and the islet just south of it are two tidally-connected ribs of rock, oriented in a southeast-northwest direction, both of which have some shrubby patches and a few trees on higher sections. Cliffs occur on the south side of the small islet with a grassy crown just west of Dock Island. Dock Island and the islets just south and west of it became part of the Gulf Islands National Park Reserve in 2003. Access has been restricted for the islet west of Dock Island and, as of 2014, all persons and vessels are prohibited from going ashore and unauthorized vessels are prohibited from approaching closer than 25 m to that islet. Landing is permitted on the shoreline of Dock Island. There is a private dwelling and dock on Little Shell Island.

Historical summary: Pelagic Cormorants have nested intermittently and sometimes in large numbers on the cliffs on the south side of the islet west of Dock Island (Figure 538). In 1978, five empty and abandoned nests were found on the cliffs (Table GI-710). We did not consider this a breeding record for this site; no cormorants were present and only one nest looked like it had been newly built. Pelagic Cormorants were not reported nesting in 1987 and have been confirmed nesting only in 1989 and 1990. Large numbers nested in both those years, however only 18% of nests were successful in 1990. Only eight roosting birds were seen on the northwest face of the islet in May 1999. This nesting site was apparently not included in subsequent cormorant surveys,[101, 114] but it is likely that none have nested since the 1990s. No evidence of nesting by Pelagic Cormorants was reported during Black Oystercatcher surveys conducted by Parks Canada since 2005; 24 cormorants were roosting on the west end of the islet in 2016.

Black Oystercatchers have been found nesting on five islets in the Little Group (Figure 539). In 1978, nests were found on Dock Island and on the islet west of Dock Island. Nest locations were similar in 1987. In 1996 and 1997, nests were found on Dock Island, the islets just south and west of Dock Island, and on Ker Island (one nest). There were four nests on Dock Island and one nest on the islet west of Dock Island in 1999. Surveys conducted by Parks Canada since 2005 have found

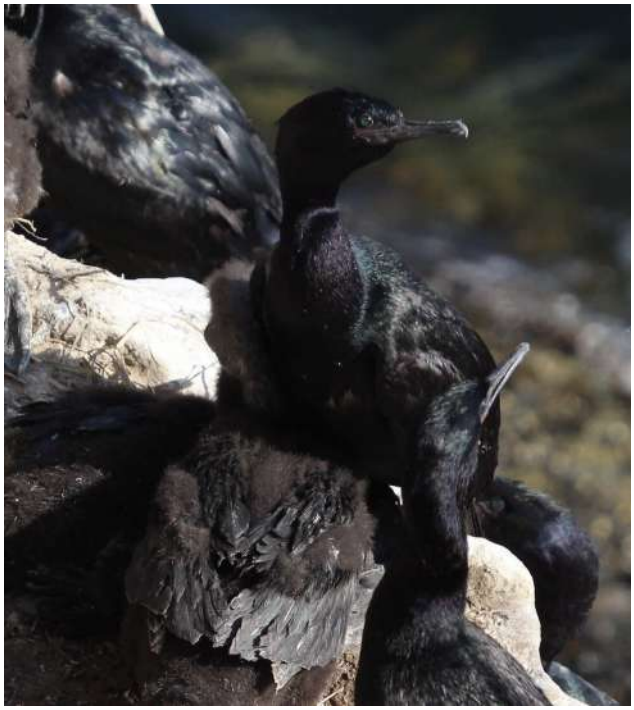


Figure 538. Pelagic Cormorants nested in large numbers on the Little Group in 1989 and 1990. Nests were located on the south side cliffs on the islet west of Dock Island. None were seen nesting in other years. *Photo by Paula Courteau.*

oystercatchers nesting on four islets, however only two or three of those islets were surveyed during most surveys (see Table 5 on page 110 for islets surveyed and the numbers of nests found or suspected on each surveyed islet during Parks Canada surveys conducted since 2005). Dock Island was surveyed most frequently, and 1-4 pairs were reported nesting there in most years between 2005 and 2023. One pair was found nesting on the islet just south of Dock Island in 2005, 2007, 2008, 2010, and 2014; one pair was nesting on the islet west of Dock Island in 2005, 2008, 2010, 2011, 2012, 2014, 2022, and 2023; and one pair was nesting on the largest of the rocks southeast of Ker Island in 2006, 2016, 2018, 2019, 2021, and 2023. In 2005, three nests (2 with eggs; 1 empty) were found and a fourth pair was suspected nesting on Dock Island; and a pair was attending two empty scrapes on both the islets west and south of Dock Island (eggshell fragments were seen in one scrape on the south islet). On all surveyed islets, only one nest was found that held eggs in 2007, 2008, 2010, 2011, 2012, 2014, 2016, and 2019; other nests found were empty or just suspected, based on the behaviour of attending birds. No oystercatchers were seen during gull surveys in 2010, but only the smaller islets were examined from the water.[453] Surveys were also

conducted from the water in 2020-2023, except observers landed on the rocks southeast of Ker Island in 2020.

Glaucous-winged Gull numbers have declined since they were first documented breeding in 1977. R. Hunter counted 35 nests on Dock Island on 22 June 1977, but some nests had been destroyed previously in a storm, and he estimated 40-50 pairs of gulls attempting to nest on the island. Most nests found contained eggs. Only two nests were seen the following year; one with an adult incubating a single egg on a rock ledge on the south side of the islet just south of Dock Island, and one empty nest on the islet west of Dock Island, where five adults were present. Small numbers of gulls were recorded nesting on Dock Island and adjacent islets through to 1999, although the one nest found on Dock Island in June 1999 was empty. Ten gulls were present on Dock Island (4 birds), the islet west of Dock Island (4 birds), and on the small, bare rock off the southeast end of the latter island (2 birds) on 31 May 1999, but no nests had yet been built. No gulls were seen nesting during binocular scans from the water in 2010.

Table GI-710. Seabird nesting records for the Little Group. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
22 Jun 1977			35	S(4)	332, 523
12 Jun 1978	0[a]	2	2[1]	x(17)	523
Jun 1986			6		420
5-23 Jun 1987	0	2		S(4)	158, 427, 428
May-Jul 1989	55				375
Aug 1990	71				43
21 Apr-30 May 1996		6[6]			202
9-30 May 1997		5[5]			202
1-9 Jul 1997			3		377
31 May 1999	0	5[5]	0	S(5)	484
25 Jun 1999	0		1S		484
13 Jun 2005		6e[b,c]			529
12 Jun 2006		2S[d]			529
14, 25 Jun 2007		3e[e]			529
10 Jun 2008		4e[c]			529
15 Jun 2009		1S[f]			529
9 Jun 2010		2e[g]			529
18 Jun 2010			0		30, 453
13 Jun 2011		3e[c]			529
12 Jun 2012		2e[f]			529
25, 27 Jun 2014		4e[h]			529
27 May, 21 Jun 2015		1eS[i]			529
10 Jun 2016		1[j]			529
4 Jun 2018		2S[j]			529
27 May 2019		2e			529
29 Jun, 6 Jul 2020		0[k]			529
27 May 2021		2S			529
30 May 2022		2S			529
14 Jun 2023		3eS			529

[a] Five empty and abandoned nests were found; no cormorants were present.
[b] Butler and Golumbia [57] reported two nests on Dock Island in 2005 but Parks Canada listed four pairs nesting on Dock Island and two pairs on other islets on that date.[529]
[c] Only Dock Island and the islets just south and west of Dock Island were surveyed (see Table 5 on page 110).
[d] Only Dock Island and the rock southeast of Ker Island were surveyed.
[e] The islet just south of Dock Island was surveyed on 14 June and Dock Island was surveyed on 25 June.
[f] Only Dock Island and the islet just west of Dock Island were surveyed.
[g] Only the islets just south and west of Dock Island were surveyed.
[h] Dock Island, the islets just south and west of Dock Island, and the rock southeast of Ker Island were surveyed.
[i] The islet just west of Dock Island and the rock southeast of Ker Island were surveyed on 27 May; Dock Island and the islet south of Dock Island were surveyed on 21 June.
[j] Only Dock Island, the islet just west of Dock Island, and the rock southeast of Ker Island were surveyed.
[k] The islet just west of Dock Island and the rock southeast of Ker Island were surveyed on 29 June; Dock Island was surveyed on 6 July.

Figure 539. Up to six pairs of Black Oystercatchers have been recorded nesting on the Little Group. Nests have been found on five different islets in the group. *Photo by Paula Courteau.*

Pigeon Guillemots were seen around Dock Island in 1977 and around the rocks southeast of Ker Island in 1978. A nest with two eggs was found in a rock crevice on the latter rocks in 1978. Small numbers of birds were seen in 1987, and two birds were seen around Dock Island and three were present around the islet west of Dock Island in May 1999 (Figure 540).

Figure 540. Pigeon Guillemots have been sighted around three islets in the Little Group. They have been confirmed nesting only on the rocks southeast of Ker Island, but they likely nest on other islands in the group as well. *Photo by Paul Courteau.*

Remarks: An adult Bald Eagle was seen on the southern section of Dock Island in 1978 (Figure 541). River otter trails and scats were reported during surveys in 1997 [377] and river otter trails were seen on the rocks southeast of Ker Island in 2015. Parks Canada surveyors found kayakers illegally camping and having fires on Dock Island in 2020.

Figure 541. Bald Eagles are often seen foraging around seabird colonies. They frequently prey on Glaucous-winged Gulls but their main prey is fish. This adult is feeding on a Pacific herring caught during herring spawning season in March. *Photo by Paula Courteau.*

One Canada Goose nest was found on Dock Island in June 1999.

GI-720 RUBLY ISLAND

Location: *48°39'55"N 123°18'45"W; 92 B/11.*
Off the southeast end of Domville Island, west of Gooch Island.

Description: *2.4 ha; 18 m high; Forested; Bare rock.*
Most of the island is treed, with open grassy and bare rock habitat around the perimeter, especially at the south end. Two small bare rocks lie off the southeast side of the main island. A dwelling and dock have been built on the northern end of the island.

Historical summary: Jamie Smith reported two pairs of Black Oystercatchers and a few pairs of Glaucous-winged Gulls nesting in 1977 (Table GI-720; Figure 542). Gulls have not been recorded nesting since, although three were present in 1978, but oystercatchers continued to nest until at least 1997. In 1978, one oystercatcher nest with three eggs was found on the rocky, south point of the main island, and one nest with two eggs was found on the southern of the adjacent rocks. Locations of nests have not been specified in other years.

Figure 542. A few pairs of Glaucous-winged Gulls were seen nesting on Rubly Island in 1977. We do not know if they successfully fledged any young. Nesting has not been reported since. *Photo by Paula Courteau.*

Table GI-720. Seabird nesting records for Rubly Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
Jun 1977	2eS	a few pairs	332, 523
13 Jun 1978	2[2]	0	523
5-23 Jun 1987	1		427
21 Apr-30 May 1996	1		202
9-30 May 1997	1		202
13 Jun 2005	0		57

GI-725 GOOCH ISLAND

Location: *48°39'47"N 123°17'27"W; 92 B/11.*
At the north end of Haro Strait, due north of Mandarte Island.

Description: *44 ha; 73 m high; Forested.*
Gooch Island is forested, with an abrupt rocky shoreline along the south side and some beaches along the north side. It is tidally connected to Rum Island at the east end. A dwelling and dock have been built on the northwest corner of the island.

Historical summary: W.B. Anderson visited Gooch Island while he was stationed on Mandarte Island in 1915 and reported Pigeon Guillemots nesting (Table GI-725). We have no other sightings for 100 years. One bird was seen in 2016 (Figure 543).

Figure 543. Pigeon Guillemots were found nesting on Gooch Island early in the last century. A hundred years later, one guillemot was seen around the island, but there are no records of nesting since that first report a century ago. *Photo by Paula Courteau.*

Table GI-725. Seabird nesting records for Gooch Island. See Appendix 2 for codes.

DATE	PIGU	SOURCE
Jun-Jul 1915	x	232
5-23 Jun 1987	(0)	158
18 Apr 2016	(1)	524

GI-726 RUM ISLAND

Location: *48°39'46"N 123°16'40"W; 92 B/11.*
Off the east end of Gooch Island in Haro Strait. Also known locally as Isle-de-Lis (Lily Island).

Description: *5.0 ha; 41 m high; Forested.*
This forested island has rocky points along the south and east sides. It is tidally connected to the east end of Gooch Island. Rum Island has the distinction of being the Gulf Island closest to the Canada-U.S. border, which runs about 1.4 km east of the island. The island is infamous as a staging ground for smugglers during Prohibition, hence its name. The island is part of the Gulf Islands National Park Reserve.

Historical summary: Two Black Oystercatchers were recorded on Rum Island in 1989 and 1999, but

no evidence of nesting was reported (Table GI-726). In 2015, a pair was seen courting (Figure 544), and in 2017, a territorial pair was sighted in June and was seen with one fledgling in August.

Figure 544. Black Oystercatchers were sighted several times on Rum Island in the 1980s and 1990s but they did not appear to be nesting. Years later, a courting pair was suspected nesting in 2015 and confirmed nesting in 2017. *Photo by Paula Courteau.*

Table GI-726. Seabird nesting records for Rum Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
5-23 Jun 1987	0	427
25 July 1989	0	524
20 August 1999	0	524
19 Apr 2015	1eS	524
25 Jun 2017	1eS	524
21 Aug 2017	1	524

Remarks: The island is a popular stop for kayakers. Parks Canada maintains a small campsite on the island and there are trails around the island.

GI-730 FORREST ISLAND

Location: *48°39'42"N 123°20'05"W; 92 B/11.*
Southwest of Domville Island, north of Sidney Spit. Formerly called Jones Island. Colony includes the islets and rocks off the southeast end and east side.

Description: *25 ha; 50 m high; Forested.*
The main island is forested and has a predominantly rocky shoreline, with some pocket beaches on northeast and southwest sides and at the southeast end. Small rocks off the southeast end and east side are mostly bare, with some grassy patches. Several dwellings, other structures, and dock facilities have been constructed on the northwestern half of the island.

Historical summary: There are only two records of seabirds nesting on the island. W.B. Anderson recorded Pigeon Guillemot nests on Jones Island (the former name for Forrest Island) while he was stationed on Mandarte Island in 1915 (Table GI-730). Guillemots have not been recorded since. Vermeer et al. found one pair of Black Oystercatchers nesting on the southeast rocks in 1987, but Stephanie Hazlitt found none during her study in 1996-1997.

Table GI-730. Seabird nesting records for Forrest Island. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
Jun-Jul 1915		x	232
5-23 Jun 1987	1	(0)	158, 427
21 Apr-30 May 1996	0		202
9-30 May 1997	0		202

GI-735 SIDNEY SPIT

Location: *48°38'31"N 123°19'50"W; 92 B/11.*
North tip of Sidney Island.

Description: *Sandy point.*
The spit and the northwestern third of Sidney Island, including the encircled lagoon, is part of the Gulf Islands National Park Reserve (Figure 545). Access is restricted around the lagoon and in vegetated areas around the spit.

Historical summary: Black Oystercatchers were discovered nesting by Stephanie Hazlitt during her study in 1996-1997 (Table GI-735). We have no other seabird nesting records for this site.

Table GI-735. Seabird nesting records for Sidney Spit. See Appendix 2 for codes.

DATE	BLOY	SOURCE
5-23 Jun 1987	0	427
21 Apr-30 May 1996	2[2]	202
9-30 May 1997	3[3]	202

Figure 545. Sidney Spit stretches out for nearly two kilometres as a long, narrow sandy peninsula from the northwestern end of Sidney Island. In some years, depending on sediment deposition, it is separated at high tide in several locations along its length. The top picture is taken from the far end of the spit looking back towards Sidney Island on the right. Halibut Island can be seen in the middle, far distance. The bottom picture shows one of the patches of dune grass that stabilize portions of the spit. *Photos by Moira J.F. Lemon, July 1992.*

Remarks: The perimeter beaches around Sidney Spit are attractive recreational areas accessible by boat and walk-on ferry. There are established campsites, trails, a dock, and other amenities that facilitate visits.

GI-740 SIDNEY

Location: *48°38'36"N 123°23'49"W; 92 B/11.*
On the east side of the Saanich Peninsula, south of Tsehum Harbour.

Description: *Wharf; Rooftops.*

Historical summary: As in the larger urban areas of Vancouver and Victoria, Glaucous-winged Gulls have colonized human habitats in the town of Sidney. Two isolated nests were reported in 1981: Mr. and Mrs. A. Muir, from Squamish, observed an adult sitting on a nest on one of the dolphins at the ferry terminal on 13 July; and Mark Nyhof saw one downy young on top of a small house on 8 August (Table GI-740). Tracey Hooper recorded four rooftop nests in 1986. During a problem assessment of gulls in the downtown core in 2018, David Bird observed 1-3 pairs of nesting gulls on several flat rooftops, including the Sidney Pier Hotel and Spa, the Landmark Hotel, and the Old Post Office. He did not attempt to estimate total numbers nesting in his

downtown study area. In 2019, Louise Blight explored the town on foot to estimate number of breeding pairs. She estimated ten pairs nesting.

Pigeon Guillemots have also been recorded nesting on the Sidney waterfront. An adult guillemot was seen flying to a nesting ledge under the wharf at the ferry dock in 1974.

Table GI-740. Seabird nesting records for Sidney. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
25 Jun 1974			x(1)	71
Jul-Aug 1981		2		523
May-Aug 1986		4		218
10 Jul, 3 Aug 2018		4+		26
2019		10e		453
26 Aug 2023	3			524

Pelagic Cormorants were reported nesting at two locations along the Sidney waterfront in 2023. This is a new colony site for this species. On 26 July, James Cosgrove recorded two birds on nests seen from Tulista Park near the Sidney-Anacortes ferry terminal. The exact locations of the nests were not specified, but we assume they were located on structures associated with the ferry dock. On 26 August, Enid Angelstad noted 20 cormorants present on the Beacon and Bevan Avenue piers, including seven chicks in three nests with adults guarding the nests.

Remarks: Nesting, roosting, and foraging gulls have become a management problem in Sidney, as they have in other urban centres, and a number of deterrent measures have been instituted, including wires, spikes, and netting installed along roof structures.[26]

GI-750 MANDARTE ISLAND

Location: *48°38'00"N 123°17'12"W; 92 B/11.*
Haro Strait, east of the northern end of Sidney Island. Formerly known as Bare Island and Ridge Island; name officially changed to Mandarte Island in 1934. Colony includes the rocks off the northwest and southeast ends.

Description: *11 ha; 29 m high; Grassy rock; Bare rock; Cliffs.*
Mandarte Island is a long, narrow island, oriented lengthwise southeast to northwest (Figure 546). It is composed of tilted sedimentary layers of sandstone and conglomerate rock that form precipitous faces along the long, southwest side (Figure 547) and more gradual slopes to the northeast. There are three small rocks off the ends of the island: a small bare rock about 400 m off the northwest end (north rock); a small bare rock connected by tide to the southeast end (small south rock); and a mostly bare rock with a few grassy patches about 165 m off the southeast end (south islet). Higher areas on the more gradual slopes of the main island are covered with grasses and forbs. Hollows with deeper soil support dense growths of stunted Garry oak and a number of shrub species. Historically, there was a small, wooded area on the northeast side of the island with a stand of Douglas-fir, grand fir (*Abies grandis*), and arbutus. Nesting seabirds and human activities, including traditional burning by First Nations and the importation of exotic plant species, have impacted vegetation communities.[245] Some of the Douglas-fir trees frequently used for perching by cormorants were already dead by 1957 (Figure 548),[402] and all three tree species were extirpated by 2002.[245] By 2012, 32 percent of 63 native plant species had been extirpated, shrub cover had declined, grass cover increased, and 31 exotic plant species had colonized the island. Most exotic species colonized the island after 1960, likely assisted by increasing tourist traffic. Soil depth has increased in vegetated areas by as much as 20 cm/decade since 1982 due to fertilization by gulls and growth of invasive grasses.[449]

In 1913, Kermode [230] initiated negotiations with the Department of Indian Affairs to designate the island a permanent bird sanctuary. Representatives of the Royal Commission on Indian Affairs in BC were invited to visit the island and were suitably impressed with the bird life. Little progress was made in this regard over the next two years, but an arrangement was made in 1914 to place a warden on the island to help protect nesting birds, as long as it did not interfere with First Nations people visiting the island to gather camas (*Camassia* spp.).[231] In 1915, W.B. Anderson was appointed warden and was stationed on the island from 15 June to 28 July 1915 [232] and from mid-June to the end of July in 1916.[233] Anderson contributed many observations about the nesting birds.

Mandarte Island was never formally designated as a bird sanctuary. As part of the enforcement of the *Migratory Birds Convention Act* under the supervision of James A. Munro, who was Chief Federal Migratory Bird Officer for BC at that time, the island was patrolled by the Royal Canadian Mounted Police during the 1920s and 1930s to

prevent illegal egg harvesting and molestation of nesting birds. Observations of nesting seabirds were reported by the Mounted Police staff that patrolled the island in those years, including Corporal Thos. C. Brice in 1928,[44] Sergeant J.R. Paton in 1929-1931,[297, 298, 299] and Constable J.S. Brandon in 1935-1936.[41, 42] Other observers accompanied police officers during their inspections, most frequently George Sprot, who made observations over a number of years,[364, 365, 366, 367] as well as Dr. L.B. Bishop from Pasedena, California and W.A. Newcombe from the BCPM in 1929, W. Winsen, Dr. Quinn, and Dr. L. Bishop and son in 1930, a banding party in 1931, W.J. Oliver and W.A. Newcombe in 1933, and Munro in 1936. The island is owned by the Tseycum and Tswaout Bands who allow ongoing annual wildlife research. There is a research camp with four small cabins built to house UBC students on the northeast side of the island (Figure 549).

Historical summary: There is some uncertainty surrounding a number of early specimen records with a location of "Bare" Island. Bare Island is an early name for Mandarte Island and the island is still designated as the Bare Island Indian Reserve No. 9. However, a number of other islands were also historically called Bare Island, including Cleland Island on the west coast of Vancouver Island near Tofino and Vivian Island in the northern Strait of Georgia. As well, there is a Bare Island in the western San Juan Islands in Washington, just across Boundary Channel, 23 km from Mandarte Island. This part of the San Juan Islands was part of British Columbia prior to 1872 (see Introduction) and some early records referring to Bare Island in this area (e.g., "Gulf of Georgia") cannot confidently be assigned to either Mandarte Island or the Bare Island in the San Juan Islands. A similar complement of seabird species have nested on both islands.[144, 361]

Figure 546. Views of the northeast (top) and southwest (bottom photo, centre) sides of Mandarte Island. A couple of remaining Douglas-fir snags were still standing in 2009. When seen in the distance from the northwestern point of Sidney Island (bottom photo, right), the southwest side of Mandarte Island appears as a brilliant white island. *Photos by Louise Blight, 18 August 2009 (top) and Moira J.F. Lemon, 27 August 2008.*

Figure 547. Visible along the precipitous, southwest side of Mandarte Island are tilted sedimentary layers of sandstone and conglomerate rock deformed by the collision of northward-moving crustal terranes with the south end of Vancouver Island about 55 to 40 million years ago.[92] *Photo by Louise Blight, 18 August 2009.*

Figure 548. There used to be a small stand of Douglas-fir, grand fir, and arbutus trees on the northeast side of Mandarte Island. The trees gradually died out through the first half of the 20th century, likely due to the activities of increasing numbers of nesting seabirds, especially Double-crested Cormorants and Glaucous-winged Gulls that liked to roost on the trees. Some of the trees were already dead by 1947 (left) and were falling over by 1974. Note the gulls roosting in the dead trees. *Photos by unknown photographer, 7 July 1947 (left) and R. Wayne Campbell, 25 June 1974.*

Figure 549. Mandarte Island has been a favourite site for academic studies since the 1950s. A research camp with four small cabins has long been established on the northeast side of the island. *Photo by Louise Blight, 18 August 2009.*

Early records that may be from Mandarte Island include: five Tufted Puffin eggs collected in "Haro Channel" in June 1858 by Lyall aboard the HMS *Plumper*; [100] two Black Oystercatcher eggs from "Vancouver Island" probably collected in 1860-1862; [104] a Black Oystercatcher adult and chick and nine Pigeon Guillemot eggs collected by Victoria naturalist James Hepburn on 25 June 1862 on "Barren Island;" [99, 104] and five Black Oystercatcher eggs and an adult Pigeon Guillemot that was killed on its nest by a dog and collected by Hepburn on 28 May 1864 at "Bare Island." [104] Many of these records have been considered to be from Mandarte Island,[99, 100, 104] but the locations remain speculative for those dating from before the BC border was finalized in 1872. Hepburn collected at other sites in the eastern San Juan Islands, Washington in the 1860s,[99] and there is no evidence to confirm that the "Bare Island" he was referring to was Mandarte Island and not Bare Island in Washington. We are more confident that a number of specimens collected in 1892 and later from this area and labelled "Bare" or "Barre" Island, British Columbia were from Mandarte Island. We have also assumed that BC locations for some Pelagic Cormorant records given as "Sydney, Vancouver Island" (in 1899), "Sidney Islands" (in 1900), "Karrow [i.e., Haro] Straits" (in 1919), "Straights of Karo, Bare Island" (in 1920), and "Karro Straights, Victoria" (in 1922), were from Mandarte Island.

The earliest breeding record definitely from Mandarte Island was, surprisingly, for Rhinoceros Auklet. Rhinoceros Auklets were confirmed nesting when I.A. Cunningham collected an egg on 20 June 1876 on Bare Island off Sydney Island, undoubtedly referring to Mandarte Island (Table GI-750). This record is from an egg specimen housed at the Carnegie Museum of Natural History that they obtained in 1951 from a collector in Warren, Pennsylvania who traded or purchased eggs from many parts of the world. The details, including the collector I.A. Cunningham, were confirmed accurate by the Collection Manager, Stephen Rogers, who wrote:

> *"I looked at the original catalog record which was copied by the person putting the data into the computer in the 1980's and it is clearly written 1876 and I. A. Cunningham. The curator at the time, Mr. Todd had very good quality handwriting and it was easy to tell an I from a J in his old-style ledger script. I looked at the egg and it also had a 76, not an 86 written in pencil on the egg. Perhaps I. A. Cunningham was a relative of J. A. Cunningham.*
>
> *"We obtained the egg as part of a gift from an egg collector from Warren, Pennsylvania in 1951. As with many egg collectors, he had obtained by trade or purchase eggs from many different localities including Iceland, Sweden, Canada (4), Mexico, the Bahamas, and 20 different US states. Most of the eggs were from Pennsylvania, but he had them from all over."*
>
> *Stephen P. Rogers (Mr.)*
> *Collection Manager of Section of Birds*
> *and Section of Amphibians and Reptiles*
> *Carnegie Museum of Natural History*

Carter and Sealy [100] report a later egg specimen from J.A. Cunningham housed at the Western Foundation

of Vertebrate Zoology with a collection date of 25 June 1886, but were apparently unaware of the earlier record. We have not been able to ascertain the relationship between I.A. and J.A. Cunningham.

Fannin [166] (cited in Drent and Guiguet [144]) in 1891 reported Pelagic Cormorants breeding on islands close to Sidney Island and Tufted Puffins breeding on islands of the Gulf of Georgia. Drent and Guiguet [144] were confident that those records referred to Mandarte Island. There seems little doubt that the Pelagic Cormorant record refers to Mandarte Island; there is a set of Pelagic Cormorant eggs collected by Walter Burton on "Bare Island" that further confirmed breeding in 1892. We are less certain about records for Tufted Puffins. As noted above, Carter and Sealy [100] speculated that Tufted Puffin eggs collected in "Haro Channel" in 1858 by Lyall aboard the HMS *Plumper* may have been obtained at Mandarte Island, although colonies in the San Juan Islands, including the Bare Island there, were also considered possible sources. Fannin [166, 167] may have been aware of these egg records when he stated that Tufted Puffins bred in the Gulf of Georgia. Kermode [229] provided the first specific statement that Tufted Puffins bred on Mandarte Island, perhaps based on an adult collected there that year.[100] The first definite confirmation of Tufted Puffins breeding on the island was two eggs collected by E.M. Anderson on 16 and 25 June 1908.[144, 536u]

C.F. Newcombe collected Black Oystercatcher [99] and Glaucous-winged Gull [540k] eggs from Mandarte Island in 1892. Pigeon Guillemots were first confirmed breeding in 1902.[144] Carter and Sealy [99] concluded that three Pigeon Guillemot egg specimens collected by Newcombe in 1892 on the west coast of Vancouver Island were actually collected on Mandarte Island, but we did not accept their reasoning (see section *Independent Collectors and Observers* in the Outer Coast volume [337]). A Black Oystercatcher nest with eggs was photographed on the island in 1896,[140] and J.A. Cunningham collected Glaucous-winged Gull and Pigeon Guillemot eggs in 1902 and 1903. Many Glaucous-winged Gull eggs were collected on 16 and 24 June 1908.[536v]

Two possible Double-crested Cormorant eggs [536w] obtained by E.M. Anderson on 10 July 1900 may have been collected on Mandarte Island.[97] The location was given as "Sidney Island" but likely referred to Mandarte Island. However, the species identity was recorded as "unsure" on the original specimen card and the nest was described as "grass, weeds and guano on steep cliff," which is a better description for a typical Pelagic than Double-crested cormorant nest (Figure 550). Later observations by Munro [272] also suggest that the nest referred to in 1900 was most likely a Pelagic Cormorant nest; in his description of Double-crested Cormorant nests, Munro [272] stated that "the bulky stick nests of the Double-crested Cormorant could not be confused with the smaller ones of the Baird's [Pelagic] Cormorant" [that were constructed mostly] of peppergrass (*Lepidium* spp.) which grows plentifully on the island" (Figure 551). The Double-crested Cormorant record from 1900 was not recognized in early checklists [229] or by Drent and Guiguet.[144] Given the uncertainty surrounding the species identity, and the difficulty of distinguishing Pelagic and Double-crested cormorant eggs,[407] we have also not accepted the record as an early confirmation of breeding by Double-crested Cormorants on Mandarte Island. Carter [97] considered the record from 1900 to be the second valid breeding record for Double-crested Cormorant in BC, the first being a set of eggs collected near Comox in 1896 from a nest similarly described as being constructed of seaweeds on a cliff ledge. Based on nest description, we think that nest was also more likely to be a Pelagic than Double-crested cormorant nest (see colony account SG-220 St. John's Point above). We have thus been reluctant to accept both the Comox record from 1896 and the Sidney Island record from 1900 to confirm early breeding by Double-crested Cormorants in BC and still consider the 1927 record reported by Munro [270] as the first definite evidence of breeding on Mandarte Island and in BC. Note that there is a third possible identity for these early egg specimens; they could possibly be Brandt's Cormorant eggs, given that there are early records of Brandt's Cormorant nesting in the Salish Sea and the nests of Brandt's Cormorants look more like Pelagic Cormorant nests than Double-crested Cormorant nests (see section on Brandt's Cormorant trends below).

Following the report of Double-crested Cormorants nesting by Burton earlier in 1927, Munro, accompanied by Burton, visited the island to further check for nests on 19 July.[270] They found three nests on small ledges about 20 feet below the top of the cliff at the northwest corner of the island where Pelagic Cormorants and a few gulls were also nesting. An adult Double-crested Cormorant was incubating two eggs in one of the nests; the other two were empty. Nests were constructed of Douglas-fir branches and the occupied nest was lined with gull feathers. Fir branches around the rim of the nests still had green needles.

Figure 550. These egg specimens housed at the RBCM present a challenge for researchers today. Lacking other supporting data, researchers must make the best deduction they can from available records. The collector, E.M. Anderson, tentatively identified the specimens as Double-crested Cormorant eggs with a location of "Sidney Island." Some researchers [97] have accepted the species identity and interpreted the location to refer to Mandarte Island. We agree with the location but not the species identity. We think, given the nest description and location (see Figure 551), that the species is most likely Pelagic Cormorant. They possibly also could be Brandt's Cormorant eggs (see text). Who is correct is uncertain at this point. Perhaps a DNA analysis could solve the issue in the future, as DNA can now be successfully extracted from many eggshell specimens.[609] *Images courtesy of Royal BC Museum collections.*

Brandt's Cormorants were reported nesting on Mandarte Island for the first time in 2013.[103] However, we have recently uncovered a Brandt's Cormorant egg specimen [539m] from Mandarte Island collected 82 years earlier on 11 June 1931. The collector of that specimen is not recorded. As we discussed in the introductory sections to this volume, this record is similar in timing to the earliest record in the Washington portion of the Salish Sea from 1928,[361] and we have accepted it as genuine. Although breeding was not confirmed again until 2013,[103] Brandt's Cormorants attended the colony and were observed building nests for many years before that.[144, 146, 402]

Frequent visits and surveys for over a century have provided detailed trend information for most nesting species. The first quantitative data come from W.B. Anderson's time as warden on the island in 1915 and 1916. In 1915, Anderson reported that Black Oystercatchers and the "little auklet" had deserted the island.[232] For the latter, he was likely referring to Rhinoceros Auklets, which was the largest of what used to be referred to as the "Little Auks." [385] In Anderson's second year as warden on the island in 1916, numbers of Pelagic Cormorants, Glaucous-winged Gulls, and Pigeon Guillemots increased considerably, but Tufted Puffins did not; only four pairs were present.[233]

Pelagic Cormorant Trends. Numbers of Pelagic Cormorants nesting on Mandarte Island have fluctuated dramatically since they were first reported nesting. Anderson reported 25 pairs of Pelagic Cormorants nesting on the high cliffs on the southwest side of the island (Figure 552) in 1915 [232] and increased numbers nesting in 1916.[233] Munro [269] saw about 30 birds in mid-May 1921, but they did not seem to be nesting that year. Signs of nesting in previous years were evident. They were nesting successfully in 1923 on the cliffs at the northwest corner of the island, although only four nests, which held full clutches, could be inspected.[269] In 1929, the largest group of nests was located on the south end of the island; all nests appeared to contain full clutches on 3 July,[297] but most nests had failed by 3 August, although some nests on the northwest cliffs still held eggs on that date.[364] Most nesting attempts failed again in 1930; on 31 July, very few nests still held eggs and only one nest was found containing young.[298] Despite previous failures, the nesting population appeared to increase in 1931; hatching success was also higher than in the previous two years.[366] Pelagic Cormorants again appeared more successful in 1935; most nests contained an average

of about four eggs on 14 July; few had hatched.[41] Population increases were dramatic over this period and over six times as many birds were recorded nesting in 1936 compared to 1915, likely due to the defense of the colony by the wardens and to the protection afforded by the *Migratory Birds Convention Act* of 1917.[272] Increases continued for the next four decades, with over twice as many nesting in 1959 as 1936. A total of 357 nests were tallied and 370-380 nests estimated in 1959; [146] by that time the colony had spread throughout the length of the cliffs on the southwest side of the

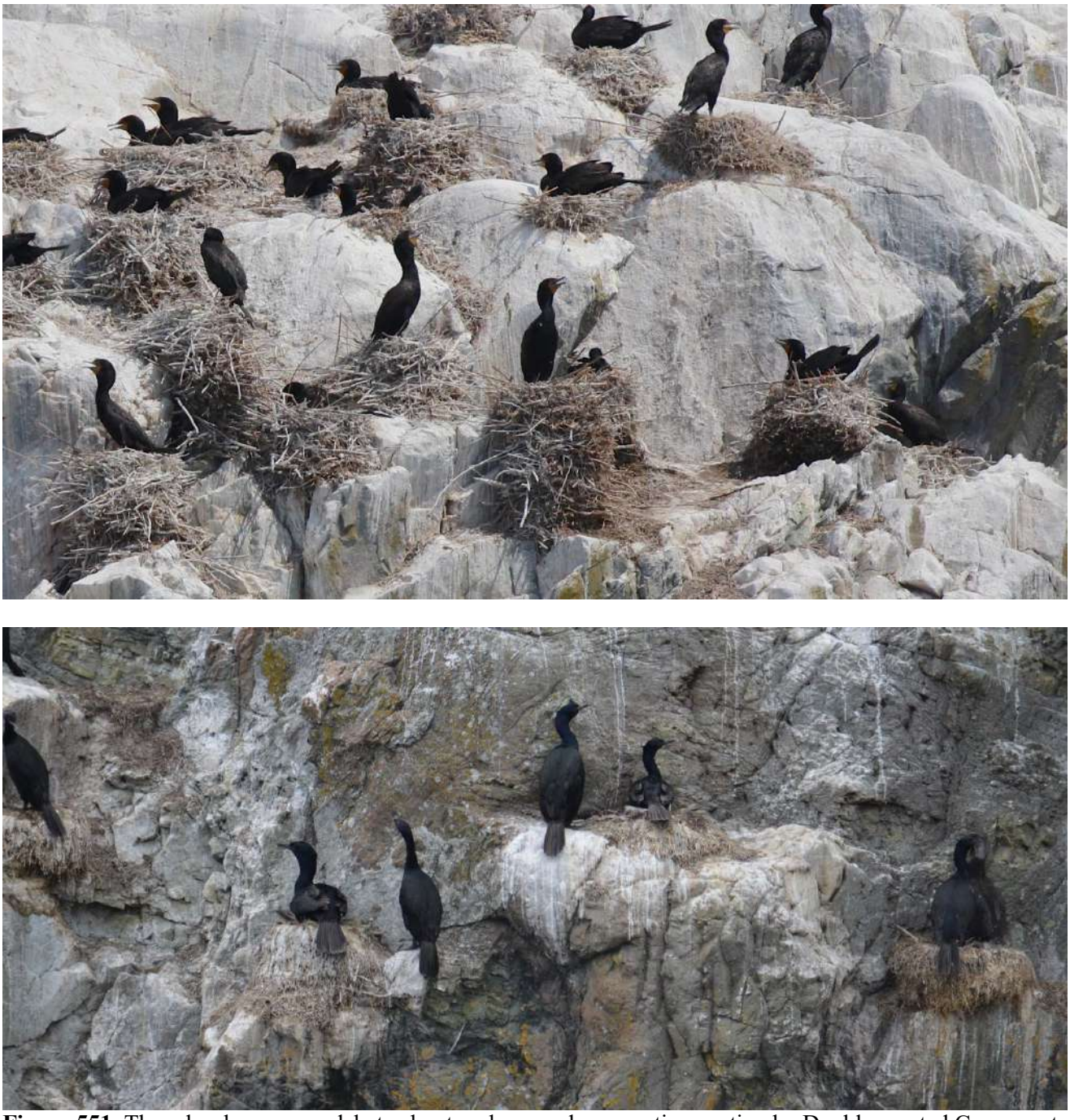


Figure 551. There has been some debate about early records suggesting nesting by Double-crested Cormorants on Mandarte Island in 1900 and at St. John Point in the northern Strait of Georgia in 1896.[97] However, the nest descriptions given in both those records correspond to typical Pelagic and not Double-crested cormorant nests. As Munro [272] stated when describing nests of the two species on Mandarte Island, "the bulky stick nests of the Double-crested Cormorant (top) could not be confused with the smaller ones of the Baird's [Pelagic] Cormorant (bottom)." *Photos by Paula Courteau, Mitlenatch Island, BC, 29 July 2018 (top) and Anna Smith, Sea Egg Rocks, BC, July 2011.*

Table GI-750. Seabird nesting records for Mandarte Island. See Appendix 2 for codes.

DATE	DCCO	BRCO	PECO	BLOY	GWGU	PIGU	RHAU	TUPU	SOURCE
20 Jun 1876							x		532e
25 Jun 1886							x		100, 540l
c1891			x					S	166
7 Jun 1892				x	x				99, 540k
1 Jul 1892			x						540m
May 1896				x					140
15 Jun 1899			x						523, 531a
14, 16 Jun 1900			x		x				144, 540n
14, 15 Jun 1902					x	x			144
24, 27 Jun 1903					x	x			100, 531b, 537a, 540o,p
24 Jun 1904								S	229
24 Jun 1907						x			144
Jun, Jul 1908			x	x	x	x		x	144, 146, 536x
Jun 1909			x		x	x			144, 523, 536y
Jun 1910				x	x	x		3-4	144, 146
20 Jun 1912			x						144
May-Jun 1913			x	x	x				230
15 Jun 1914				x				x	534c, 536z
Jun-Jul 1915			25e	0	450e[a]	200e		3e(6)	232
Jun-Jul 1916			x		x	x		4e(8)	233
Jun 1917					x				234
20 Jun 1919			x						535a
13 Jul 1920			x						535b
14 May 1921			0		350S	40e			269
13, 15 Jun 1921			x			x			539n,o
10 July 1922			x					2e	144, 540q
23 Jul 1923			4+		600e	150e			268, 269
19, 21 Jul 1927	3		x	0	1,000e	40e		15e	270, 271
15 Jun 1928					x				539p
12, 21, 26 Jul 1928			S		x	S		S	44, 523
Jun-Aug 1929	0		100e		300-330e	100e		3-6e(6)	27, 297, 364, 523
Jun-Aug 1930			x		x	100eS		3eS(6)	298, 365, 523
11 Jun 1931		x	x						144, 539a
Jul-Aug 1931			x		x	100eS		3eS	299, 366, 523
25 Jun 1932	x				x	x			144, 537b, 539q
Jun-Jul 1933			x		x	S		S	367, 523
14 Jul 1935			100e		500e+	100eS		S	41, 523
2 Aug 1935	5								272
12 Jun 1936					x	x		x	144, 421, 540r
8 Jul 1936	9-11		164	0	[534][b]	50e		2e	42, 272, 274, 523
20 May 1940								1(2)	144
22 Jun 1940	x		x		x	x	(0)	(0)	488, 536aa
18 Jun 1941			x		x			1(1)	144, 332, 523
23 Jul 1941			x		x	x		(0)	332, 523
1942	15-20								144
27 Jun 1943	11								536ab
13 Jun 1944						x			536ac
27 May 1945	23		x	1	x	(15)		(0)	256, 332, 523, 536ad
12 Jul 1946						x			539r
7 Jul 1947					x	(8)			523
10 Jun 1950	44		x	S	x				119
21 Jun 1952	80		x	S	x	S		(2)	120
27 Jun 1953	145							1e(2)	121
2 Jul 1955	100e		200e		1,500e			2e(4)	136
1957	135-150		300-400e	2[2]	1,800-2,000e	100-110e		2-3e	144, 146
1958	135-150		339	2[2]	1,800-2,000e	100-110e		2-3e	144, 146
1959	135-150		370-380e	2[2]	1,800-2,000e	100-110e		2-3e	144, 146
1960	135-150		x	2[2]	1,800-2,000e	100-110e		2-3e	144, 146
1961				2[2]	1,800-2,000e			2-3e	146
8 Jul 1961	200e		250e		1,500e	70e			137
19-20 Jul 1961	150e		250e	2e	1,500e	70e		2-3e	332, 523
1962					2,200e			2-3e	146, 412
1962	150e		350e		2,000e	100e			138
6 Jul 1963								(3)	524
17 Jul 1965								2eS(4)	371
26 Aug 1966	x							(3)	523, 524
5 Jun 1968	374		344	x	x	x		(0)	332, 523
1969	x		x		2,000e			(1+)	324, 523
1970	383		504	3	2,500e	100e		1(2)	332, 381, 523
May-Jun 1971	440		x		482+[c]	110e			4, 324, 382, 523
25 Jun 1974	582[502][d]		443[385]	4S	1,047[1,037]	100eS(348)		2eS(1)	70, 332, 523
1 Jul 1976	651		485		x				332, 406, 523

Table GI-750. cont'd

DATE	DCCO	BRCO	PECO	BLOY	GWGU	PIGU	RHAU	TUPU	SOURCE
22 Jun 1977	840[727]		501	6e	1,666	x4(200)		x	332, 523
13 Jun 1978	587		457		544[505]+[e]	100e			523
4 Aug 1979	505		594		x				408, 523
May-Jul 1980	794		545	5	2,200e	x			407
6 Jun 1981	744		331	3S	1,386[1,112]	S(349)			523
10 Jul 1981	1,463[1,129]		603[508]		x	x5		(1)	523
10, 19 Jul 1982				x		(50)		(2)	523, 524
1982								1(1)	449
29 May-13 Jun 1983	1,100		550						421
13 Aug 1983	971		403[316]	2[2]	x	x(46)		1(1)	523
1984							S		449
Jun-Jul 1985					2,157		x		419, 449
6, 7 Jul 1985	x					(200)		S(2)	523, 524
Jun 1986					2,363		6e		84, 415, 420, 449
5-23 Jun 1987	972		536	3		S(241)			158, 427, 428
1988							10e		523
May-Jul 1989	434		468						375
Aug 1990	473		311						43
23 Apr 1991	x					(300)			524
6 Jul 1991	x							(2)	524
2 Aug 1991								S(2)	524
12 May 1992						(480)			524
30 Jul 1992								S(1)	524
1992	280		297						114
1993	458		405						114, 266, 376
1994	403		280					1-2eS(1)	114, 266, 376, 524
15 Jul 1995								S(3)	524
13 Aug 1995								1eS(1)	524
1995	288		206						114, 266
21 Apr-30 May 1996				7[7]					202
1996								E	449
9-30 May 1997				6[6]					202
1-9 Jul 1997					2,221				377
1 Jun 1998						(99)			524
1998	178		91						114, 266
1999	43		37						114, 266
Jul-Oct 2000	215		270						114
early 2000s							90e	E	449
11 May 2003						(80)			524
28 May 2003	40+		20+						524
13 Jun 2005				2eS					57, 529
2005					1,700e				30, 449
25 Jun 2007	150e		433	1S[f]					456, 529
2007	167		374		1,100e				30, 449, 522
2 May 2008						(162)			524
10 Jun 2008				1[f]					529
12 Jun 2009				1[f]					529
20 Jun 2009					2,389[1,892][g]				30, 453
2009	137[h]		522						101, 522
10 Jun 2010				1[f]					529
28 Jun 2010					43[28][g]				30, 453
2010	168		558						522
13 Jun 2011				1[f]					529
13 Apr 2012	x		S			(40)			524
12 Jun 2012				1[f]					529
Jul 2013	267	4	444						103, 457, 522
12 May 2014			x			(100)			524
23 May 2014				1S[f]					529
13 Jul 2014		4							524
Jun-Jul 2014	307	5	645						101
27 May 2015				1eS[f]					529
26 Jun 2015	370	x	740			(261)			524
2015	457	7	590						101, 522
7 May 2016	x		x			(35)			524
10 Jun 2016				1[f]					529
17 Jun 2016	100e	12	150-200e						524
1, 5 Aug 2017	220	14	591			(40)			481, 524
3 May 2018						(100)			524
4 Jun 2018				1S[f]					529
28 Jun 2018	243		612						525
23 Jul 2018	312	15	479						481

Table GI-750. cont'd

DATE	DCCO	BRCO	PECO	BLOY	GWGU	PIGU	RHAU	TUPU	SOURCE
27 May 2019				1eS[f]					529
5 Jul 2019	x	x	x		x	x(300)			524
19 Jul 2019	328	21	586						481
7 Jul 2020				1eS[f]					529
15, 18 Jul 2020	156+	11-13	546+	2eS	x	S(40)	S		524
29 Jul 2020	252	9	570						481
2020							15e	E	449
26 May 2021				1eS[f]					529
12 Jun 2021				1	x	(10)			524
27 Jul 2021	271	10	573						481
22 May 2022	x	14e	480e		S	S(40)			524
1 Jun 2022				1eS[f]					529
30 Jun, 9 Jul 2022	345	11	598		S	S(50)			524
28 Jul 2022	398	11	515						481
13 Jun 2023				1eS[f]					529
26 Aug 2023	329+[i]	12	505+[i]						481

[a] Drent and Guiguet [144] listed 225 nests but this was a mistake.[146] Anderson [232] does say "not less than 450 bred this year," but he counted 352 nests by 19 July and estimated the remainder. Thus it is most likely he meant a total of 450 nests.
[b] Reported as 554 nests by Brandon [42] and 534 nests by Munro and Cowan [274] and Drent and Guiguet.[144]
[c] Blight [30] reported an estimate of 2,000 pairs made by Ward [523] in 1971, but that estimate actually referred to 1969.
[d] Previously reported as 482 nests [70, 332] but this was a summation error.
[e] Only a portion of the main island was surveyed in 1978.
[f] Only the north rock was surveyed.[529]
[g] Counted only on the main island in 2009; 43 nests were counted on the south islet in 2010.[30, 453]
[h] Adkins and Roby [1] list 143 nests for 2009.
[i] Lambert was unable to complete a cormorant count until 26 August in 2023. She counted only occupied nests at that time (see text).

Figure 552. Pelagic Cormorants nest on the steep cliffs along the southwest side of Mandarte Island. They were first recorded nesting on the island in about 1891. With considerable variation, numbers nesting generally increased over the next 120 years to a peak count of 740 nests in 2015. *Photos by Moira J.F. Lemon, July 1993 (top left) and R. Wayne Campbell, 25 June 1974.*

island. In 1957, there were 37 Pelagic Cormorant nests on the south islet,[146] but none have been recorded nesting there in other years. Robertson [324] reported a further 35% increase in breeding numbers between 1960 and 1971, most of it occurring between 1968 and 1970. Numbers fluctuated between 331 and 603 nests through the 1970s and 1980s, but decreased through the 1990s to a low of only 37 nests in 1999. After 2000, numbers rebounded, and the highest nest count ever was made by Peter McAllister from Saltspring Island on 26 June 2015 when 740 occupied nests were tallied. A lower count of 590 nests was also made that year.[522] Marilyn and Phil Lambert have surveyed cormorants every year since 2017, tallying between 479 and 591 Pelagic Cormorant nests. For the survey on 15 July 2020, Pirmin Nietlisbach cautioned that nests were hard to count due to rough seas. In 2022, Blight estimated numbers nesting in May, and Nietlisbach and Lambert made complete counts of 598 and 515 nests on 9 and 28 July, respectively. The count in 2023 was conducted late in the season on 26 August and only occupied nests were counted. Lambert noted many near fledged chicks, some young may have already fledged, and there were likely other empty nests at that time; we have thus considered the 2022 count the best, most recent estimate of the breeding population.

Comparisons across years for Pelagic Cormorants were somewhat confounded by differences in survey methods. Counts have been conducted four different ways: from the water; from blinds that were set up along the cliffs in 1957 for research studies; [146] by walking through the colony; and from photo transects taken from a boat followed by manual digital photo analysis (conducted by John Elliot, Sandi Lee, and Mason King in 2018). Pelagic Cormorant nests were counted from the water in 1976, 1978, 1979, June 1981, and most years since 1983, except observations were made from land during studies in 1989 and 1990. Counts by walking through the colony and inspecting as many nests as possible were conducted in 1974, 1977, July 1981, and August 1983 (Figure 553). In 1977, contents were determined in 466 of the 501 nests counted; 360 of the 466 nests contained eggs, the rest were empty. Comparison of multiple counts within the same season revealed inconsistent differences in the number of nests counted depending on how the surveys were conducted. In 1977, a second nest count conducted on the same day from the water tallied 488 nests compared to the 501 nests counted on land. In 1981, a total of 331 nests were counted from the water in June, compared to 603 nests counted by walking through the colony in July. In contrast, in 1983, Vermeer and Rankin counted 550 nests from the water in June compared to 403 nests counted from land in August.

Figure 553. Different methods have been used over the years to survey Pelagic Cormorant nests on Mandarte Island. Nests were counted by walking through the colony in 1974, 1977, July 1981, and August 1983. In recent decades, nests have been consistently counted from the water. In some years, both methods were used and results could be compared. There was no consistent trend in which method provided more accurate results; sometimes more nests were counted from land than from the water and sometimes the reverse was the case. Surveys from land have the advantage that nest contents can be determined when eggs or small chicks are in the nest, as seen in these Mandarte Island photos, but less disturbance is caused by surveys from the water. Note the size difference of the chicks in the bottom photo. *Photos by R. Wayne Campbell, 25 June 1974 (top) and 10 July 1981.*

Double-crested Cormorant Trends. Numbers of nesting Double-crested Cormorants increased, at first gradually, over the next 50 years after they were found nesting in 1927. Nesting was intermittent at first, and none were seen nesting by Sprot, who specifically looked for them in 1929.[364] A set of four eggs collected confirmed continued nesting in 1932,[144] and Munro [272] found five pairs nesting when he next visited in 1935: four nests were close together on one narrow ledge and single nest was located some distance away on a wider shelf; all were constructed of sticks and held eggs. The next year Munro [272] viewed nine nests with eggs from vantage points above the cliffs and suspected at least 11 pairs nesting based on what he could see from the water below the cliffs. The nesting ledges at the northwest corner of the island where Burton and Munro confirmed breeding in 1927 continued to be used until at least 1945, but were abandoned by about 1953.[146] In 1940, Maguire noted nests "in the larger gnarled Fir trees on crest, and one nest in Arbutus tree also." This is the only observation of Double-crested Cormorants nesting in trees on Mandarte Island that we know of. Maguire climbed up to the nest in the arbutus tree and found it empty but freshly refurbished.

In 1950, Double-crested Cormorant nests were found in two clusters, located at either end of the Pelagic Cormorant nesting area on the southwest cliffs, and by 1953, Double-crested Cormorants were nesting in three clusters along the southwest cliffs, south of the original nesting location. At that time, numbers had increased to 145 nests, with 25, 65, and 55 nests counted in the three clusters, from north to south. Similar numbers were found in 1960; Drent counted 14-18, 77, and 44 nests in those same three areas, and noted that there may have been as many as 150 nests in total.[144] Carl in 1961 and Davidson in 1961 and 1962 made rough estimates of 150 -200 pairs nesting. The next nest count was conducted by Drent in 1968, at which time numbers had increased substantially to a total of 374 nests in five groups; 39, 106, and 47 nests at the three locations where nesting occurred in 1960, and 82 and 100 nests at two additional locations further south along the southwest cliffs. Ian Robertson counted 383 nests in 1970 but did not separate counts by cluster.

A number of Double-crested Cormorant nest surveys were conducted by the BCPM between 1974 and 1983; counts were separated by cluster, from north to south, during two of those surveys: in 1978, totals of 152, 123, 176, and 136 nests were counted in four clusters along the southwest cliffs; and in 1979, totals of 147, 126, and 232 nests were counted in three clusters. The nesting population continued to increase through the 1970s and reached a peak of 1,463 nests in 1981 (Figure 554). Numbers stayed high through the 1980s but then, similar to the trend for Pelagic Cormorants, decreased severely through the 1990s to a low of 43 nests in 1999. Forty nests were reported in 2003, but it was not indicated whether this was a complete count. Numbers increased again between 2000 and 2015, but numbers in 2015 were still less than a third of the maximum counted in 1981. Note however, that this comparison is biased because it compares a count made from land in 1981 with a count made from the water in 2015; if we use a count made from the water in 1981, the difference between 1981 and 2015 is less (the 2015 count was 61% instead of 31% of the 1981 count; see discussion about survey methods below).

Numbers of Double-crested Cormorants nesting have shown no consistent trend since 2015. Two separate counts of 370 and 457 nests were made in 2015. From 2017 to 2022, numbers have varied between 220 and 398 nests. The count in 2023 was conducted late in the season on 26 August and only occupied nests were counted. Lambert noted many near fledged chicks, some young may have already fledged, and there were likely other empty nests at that time; we have thus considered the 2022 count of 398 nests the best, most recent estimate of the breeding population.

As for Pelagic Cormorants, comparisons across years for Double-crested Cormorants are somewhat confounded by differences in survey methods. Counts made by walking through the colony and inspecting all nests were conducted in 1974, 1977, 1979, July 1981, and August 1983. In 1979 and in August 1983, young were large and many left their nests during the count from land; thus, nest contents could not be reliably determined. Counts in 1976, 1978, June 1981, and most years since 1983 were conducted from the water. Multiple counts conducted within the same season provided some comparisons among survey methods. In 1976, a count from the blinds tallied 461 nests compared to 651 nests counted from the water. This difference likely resulted because not all nests were visible from the blinds. Counts from walking through the colony generally exceeded counts made from the water (Figure 555). On 22 June 1977, a count conducted from the water tallied 505 nests compared to 840 nests counted on land. In 1981, a total of 744 nests were counted from the water in June, compared to 1,463 nests counted by walking through the colony in July. In 1983, Vermeer and Rankin,

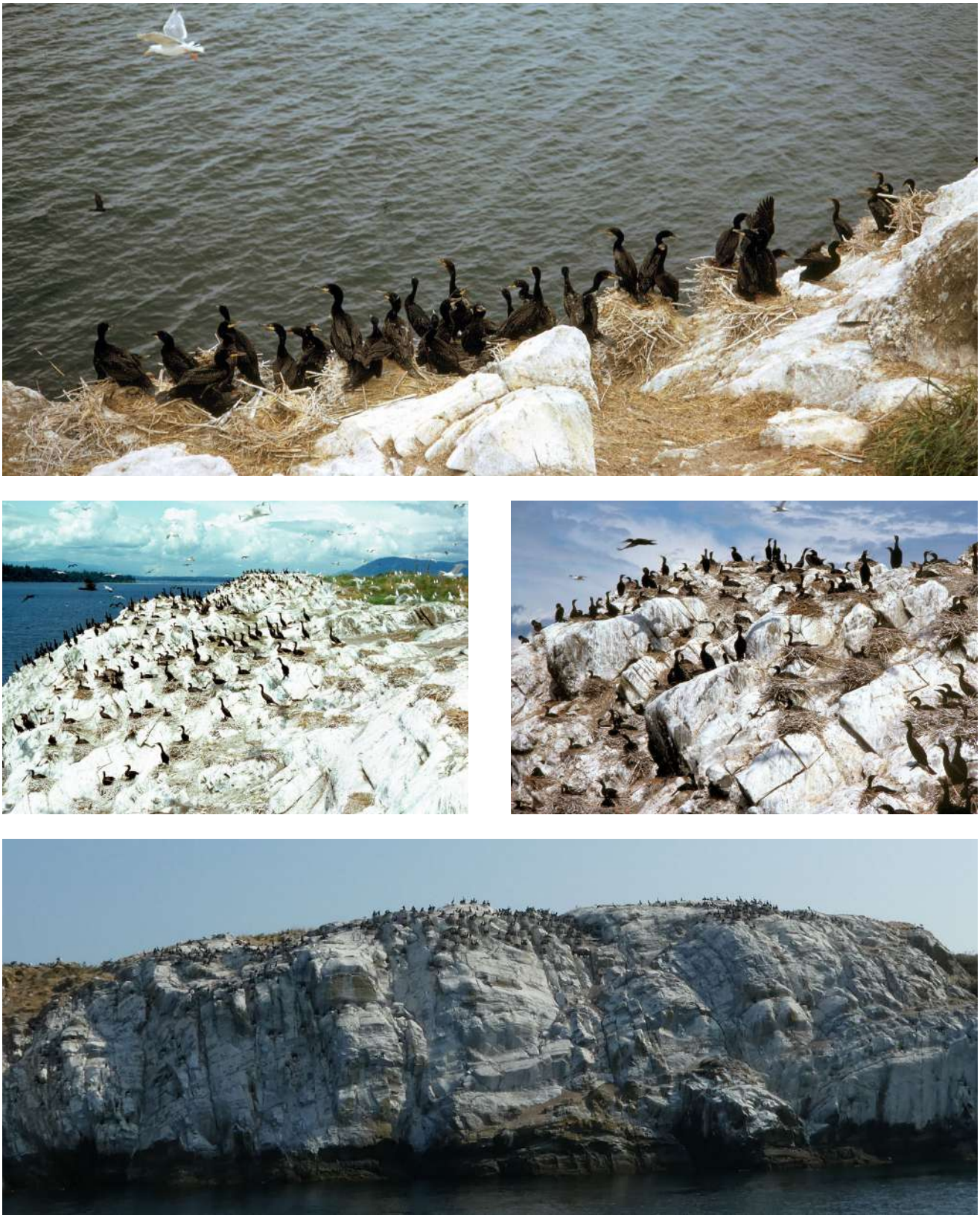


Figure 554. The population of Double-crested Cormorants nesting on Mandarte Island increased from three pairs found in 1927 to a maximum of 1,463 nests in 1981. Photos here show (top to bottom): a view from above of a pocket of nests at the upper edge of the cliffs along the southwest side of the island in 1974; two views of nesting aggregations when the colony was at its maximum size in 1981; and a current view of the colony in 2023. *Photos by R. Wayne Campbell, 25 June 1974 and 10 July 1981, and Marilyn Lambert, 26 August 2023.*

Figure 555. On Mandarte Island, Double-crested Cormorants build their nests on the rounded shoulders of the cliffs along the southwest side. When counting their nests from the water, it can be difficult to distinguish nests located behind each other or on the upper parts of the colony that are out of view from the water. In years when comparisons were made, counts from land generally exceeded counts from the water, sometimes by hundreds of nests, likely for this reason. Thus, though counts from the water cause less disturbance to nesting birds, they may underestimate nesting populations. *Photos by R. Wayne Campbell, August 1966 (top) and Marilyn Lambert, 26 August 2023.*

augmented counts made from the water with counts from land of nests that were not visible from the water; their count of 1,100 nests in June exceeded the count of 971 nests made only from land in August. This suggests that not all nests could be viewed from land. Counts of nests from photographs were made in 2018.

Brandt's Cormorant Trends. Numbers of Brandt's Cormorants (Figure 556) nesting have increased since 2013, with a maximum of 21 nests counted in 2019. In 2013, four nests were built, eggs were laid in three nests, and a total of three chicks fledged from two nests.[103] Four birds were sitting on nests on 13 July 2014, and 12 were on nests on 17 June 2016. In 2017, four nests were recorded along the southwest cliffs on 5 August, and a small group of breeding Brandt's Cormorants was reported building nests on the opposite (northeast) side of Mandarte Island from the Double-crested and Pelagic cormorant nesting areas on 24 May. UBC student Dominic Janus saw at least 35 Brandt's Cormorants were seen building and sitting on nests on 12 and 14 July 2018; there were no eggs in nests. Observers noted that all nests were concentrated on one ledge along the cliff, but they did not describe the location of that ledge; we assume that all nests have been located along the southwest cliffs in recent years. In 2020, Nietlisbach counted 11-13 occupied nests in rough weather on 15 July and at least nine occupied nests during a second visit on 18 July, the same number as Lambert counted on 29 July. Ten, 11, and 12 occupied nests were counted in 2021, 2022, and 2023, respectively. Daniel Dönnecke noted on 6 June 2022 that nest building was concentrated in two areas.[524] Nests were grouped together in one area in 2023 (see Figure 556).

Figure 556. Brandt's Cormorants were recorded nesting intermittently in the Salish Sea at three colonies in Washington and at Mandarte Island in BC during the first half of the 20th century. After an absence of 82 years, they were discovered nesting again on Mandarte Island in 2013. A few pairs have nested each year since on these cliffs along the southwest side of the island. *Photo by Marilyn Lambert, 26 August 2023.*

Black Oystercatcher Trends. Black Oystercatchers (Figure 557) were confirmed nesting several times between 1892 and 1914. In 1915, Anderson noted that Black Oystercatchers used to be plentiful but had disappeared; [232] they were not reported nesting again until 1945, when Meugens photographed a

nest with two eggs. Victoria resident Ted White also reported a nest with two eggs in 1945. Since 1945, the numbers of oystercatchers nesting have varied among years but overall appear to have increased, at least up to 1996.

Figure 557. Black Oystercatchers were reportedly common breeders on Mandarte Island at the beginning of the 20th century but were then absent for several decades. They have been consistent breeders again since 1945, with up to seven pairs found nesting. *Photo by Mark Nyhof.*

During their research on the island, Drent et al.[146] recorded two pairs of oystercatchers nesting each season between 1957 and 1961. Three locations were used: on the northeast shore of the main island, north of their base camp on the mid-northeast shore (1957-1961); on the south islet (1957-1959); and at the south end of the island, which we suspect referred to the small south rock (1960-1961). Ian Robertson reported three pairs nesting in 1970, and a BCPM crew estimated four nesting pairs in 1974, although no nests were found. In 1977, a BCPM crew found two nests with eggs and young on the main island, one nest with two eggs and two empty scrapes associated with one nesting pair on the north rock, and one pair that they suspected were nesting on the south islet. Jamie Smith, who was conducting songbird studies on the island at the time, told the BCPM crew that there were four nests on the main island that year; the crew thus estimated a total of six pairs nesting in 1977. In 1980, a BCPM crew found a pair of oystercatchers defending a flooded nest with one egg that was under water on the north rock; they relayed a report by two SFU students that there were a total of five nests on the island that year. In 1981, three pairs were suspected nesting but no nests were found, and in 1983, two family groups, each composed of a pair with one fledgling, were seen. The maximum number of Black Oystercatchers ever recorded nesting was in 1996 when Hazlitt found seven nests in which eggs were laid during her intensive studies; nests were located on the main island and adjacent rocks in 1996 and 1997.

Fewer oystercatcher nests have been reported since 1997, but lower numbers may be due to less thorough surveys in subsequent years than during the intensive studies by Hazlitt in 1996 and 1997. In 2005, four adults were present on the main island,[529] and two pairs were reported nesting,[57] but no nests were found. In 2014, two single birds were seen foraging, but none appeared to be nesting on the main island. We have no other oystercatcher records for the main island or for the two southern rocks. However, Parks Canada has repeatedly surveyed the north rock and single pairs have been seen nesting there in most years since 2007, although in 2007, the nest was washed out by rains, and in 2015, a pair was present but no nest could be found. Parks Canada surveyors did not land on the rock in 2020 due to the presence of Bald Eagles. In 2021, a nest was suspected but not found by surveyors on 26 May; Nietlisbach found a nest with eggs on the rock on 12 June. The rock was surveyed from the water in 2022 and 2023. We used the count of six nests by Hazlitt in 1997 as the best current estimate of the breeding population for the island (see Table 9).

Glaucous-winged Gull Trends. Anderson made the first estimate of Glaucous-winged Gull numbers in 1915 when he counted 352 nests and estimated a total of 450, which he considered a small number compared to what bred there 20 years before.[232] On his second year as warden on the island in 1916, Anderson reported that numbers of gulls about doubled, presumably a result of protection from egging and disturbance.[233] In 1923, Munro [269] examined about 200 nests and thought that represented about a third of the colony, but we suspect that numbers may have been much higher. Describing the distribution of nests, Munro said,

> *"Nests were found everywhere…one had to walk warily…many were unprotected from the full glare of the sun…some [were] concealed by clumps of withered vegetation… [and] on the cliff face itself, wherever there was a grassy ledge, one or more nests were found and practically every sheltered crevice was occupied."*

Munro estimated greater numbers in 1927 [271] and counted 534 nests with eggs and young in 1936.[274]

Fewer were estimated by Sprot [364] during this period: in 1929, Sprot counted 188 nests with eggs on 27 June, found 23 more nests and estimated 250-280 nests in total on 11 July, and added at least another 50 nests that he found on 19 July on cliff ledges that he had not searched previously. Paton estimated similar numbers nesting in 1930 as in 1929 [298] but twice as many nesting in 1931.[299] On 14 July 1935, Brandon [41] reported easily in excess of 1,000 individual gulls nesting and noted that "the ground was literally alive with young ones." Maguire [488] noted "a very great increase in gulls" in 1940. His description of the distribution of gull nests was similar to Munro's description from 1923. Maguire wrote:

> *"Gulls now nesting almost indiscriminately all over this island terrain, where formerly in the main only on the open areas of the ridge. Many nests now on the rocky ledges and basins on the cliffs mixed right in among the Baird [Pelagic] Cormorants. Gulls also had nested back among & under brier bushes & similar thickets, while several had nested well back under rock ledges."*

In 1957-1958, van Tets [402] noted that gradually expanding populations of nesting Double-crested Cormorants and roosting and courting Brandt's Cormorants were displacing Glaucous-winged Gulls from areas along the tops of the cliffs. Drent et al.[146] estimated about 1,800-2,000 pairs of gulls nesting in 1957-1961. In 1962, an estimate of 2,100 pairs nesting on the main island was derived by extrapolation from the 479 nests found in Vermeer's study area; [412] in addition, 100 pairs were estimated nesting on the south islet, for an overall total of 2,200 pairs.[146] Ward counted 546 and 482 nests in his study plots in 1969 and 1971, respectively, and estimated a total nesting population of 2,000 pairs in 1969.[523] In 1970, Robertson felt that numbers had increased since 1962, and estimated 2,500 pairs nesting, which is the maximum number ever estimated or counted on the island.

The first total nest count conducted in 1974 (Figure 558) tallied less than half the number of nests estimated by Robertson in 1970, suggesting that previous extrapolations over-estimated the size of the nesting population. Assuming that the nest count in 1974 accurately reflected the population size at that time, then numbers generally continued to increase through the 1970s and 1980s to 2,363 nests in 1986.[420] Verbeek estimated 2,200 pairs in 1980, but that estimate was not based on nest counts, but rather on his assessment that the size of the nesting population was similar to that estimated by Vermeer [412] in 1962. Complete nest counts in 1997 and 2009/2010 suggested relatively stable populations since 1986 at this important colony; the total number of nests counted in 2009/2010 was the highest ever recorded, although 21% of nests were empty on that survey, similar to the 20% of nests that were empty in 1981.

Numbers and contents of Glaucous-winged Gull nests found in different areas have been reported in several years. Gulls have nested on the main island and on the south islet in most years that nests were counted, except Peter Arcese [30, 449] reported no nests on the south islet in 2007. Sprot noted a few gulls sitting on nests on the south islet in 1929.[364] Nests have also been found on the small south rock and the north rock. Drent et al.[146] reported a couple of nests on the north rock and about 100 nests on the south islet in 1962. In 1974, the BCPM crew counted 976 nests on the main island and 71 nests on the south islet. In 1977, they found 1,522 nests (including 300 nests that were part of ongoing research and were reported by Niko Verbeek and Jamie Smith but were not inspected by the BCPM crew) on the main island, 111 nests on the south islet, 27 nests on the small south rock, and six nests on the north rock; of the 1,366 nests inspected, 1,321 contained eggs or young and only 45 were empty. A BCPM crew visited the island again in 1978, but at the request of Jamie Smith did not survey much of the main island so as to minimize disturbance to research areas and nesting cormorants; in the areas they did survey on the main island, they counted 392 nests, of which 365 contained eggs and 27 were empty. They also surveyed the outer rocks and found 125 nests (8 empty) on the south islet, 26 nests (3 empty) on the small south rock, and one empty nest on the north rock. During a partial survey on 25 June 1980, a BCPM crew counted three nests with eggs on the north rock and 106 nests with eggs on the south islet. Another full survey was conducted by the BCPM on 6 June 1981, finding 1,271 nests on the main island, 97 nests on the south islet, and 18 nests on the small south rock; no nests were reported on the north rock. Vermeer and Devito, during their main survey in 1986, counted 2,259 and 104 gull nests on the main island and on the south islet, respectively, and previously had counted 100 nests on the south islet in 1985. Sullivan et al. found 2,124 nests on the main island and 97 nests on the south islet in 1997, and Blight reported 2,389 nest on the main island in 2009 and 43 nests on the south islet in 2010, giving a total estimate for Mandarte Island in 2009/2010 of 2,432 nests, 1,920 of which held eggs or small chicks.

Figure 558. Mandarte Island is currently the largest Glaucous-winged Gull colony in BC. The size of the nesting population on the island has shown a consistent increasing trend over the last century, contrary to the trend at smaller island colonies in the BC Salish Sea. A maximum of 2,432 nests were counted during the most recent survey in 2009/2010. Photos here show gulls on territory and chicks just beginning to hatch in 1947, and a unique clutch with two unusually elongated eggs found in 1974 (bottom left). *Photos by unknown photographer, 7 July 1947 and R. Wayne Campbell, 25 June 1974 (bottom left).*

Pigeon Guillemot Trends. Data are not adequate to determine trends for Pigeon Guillemots (Figure 559). Anderson estimated 200 Pigeon Guillemot nests in 1915 [232] and Munro [269] estimated 150 pairs nesting in 1923. Maguire noted that guillemots were "much more numerous & nesting sites were in greater abundance" in 1940. The only accurate determination of the size of the nesting population comes from studies conducted in 1957-1960.[143, 146] By 1960, Drent et al. had located 102 nests, which they were confident represented more than 90% of the total on the island. Not all nest sites were used each year (82 were confirmed occupied in 1960), and Drent et al. estimated the nesting population to be 100-110 pairs. Nests were located around the entire perimeter of the main island in cavities within loose boulder jumbles, in hollows under larger boulders, in rock crevices, and in abandoned rabbit burrows. Pigeon Guillemots also likely nest on the north and south rocks; two pairs were suspected nesting on the north rock in 1977 and a nest with one egg was found there in 1978 (9 nests in boulder jumbles on the main island were also found in 1978). Drent et al. gave no counts of the total numbers of guillemots seen around the island during their studies, but observers in other years have reported as many as 480 individuals (in 1992).

Rhinoceros Auklet Trends. After 1886, Rhinoceros Auklets were not recorded nesting again for almost 100 years. Peter Arcese found signs of fresh digging at burrows in 1984 and found warm eggs in burrows in 1985.[84, 449] About 10 burrows were found in 1986 and at least 10 were found in 1988, located at the east end and the mid-north side of the island. Six pairs were estimated nesting 1986; [416] two abandoned eggs and one dead chick were collected on 25 June.[84] Numbers have varied since. Peter Arcese [449] noted about 120 burrows in the early-to-mid 2000s and lower numbers since, averaging 15-60 burrows, with about 20 burrows recorded in 2020. Toothpicks placed at the entrance to burrows when numbers

Figure 559. Mandarte Island is one of the few colonies in BC where the size of the Pigeon Guillemot breeding population has ever been determined. A dedicated study conducted by Rudi Drent in 1957-1960 estimated a population of 100-110 nesting pairs.[143, 146] However, there are no other data that provide trend information for this species. Numbers of guillemots seen around the island have been counted or estimated in many years but those counts are highly variable and are not valid indicators of numbers nesting. A small group of guillemots was seen on the island in 1947. *Photo by unknown photographer, 7 July 1947.*

Figure 560. Rhinoceros Auklets were confirmed breeding on Mandarte Island in 1876 and then again in 1886. There are no records of them breeding again until 1984, but it is possible that a few breeding pairs went undetected during the elapsed century, especially if they nested in rock cavities where signs of digging would not be evident. Nests found since 1984 have been in burrows. *Photo by R. Wayne Campbell.*

peaked in the mid-2000s revealed activity (indicated by displaced toothpicks) in 119 burrows. Because this does not reliably indicate breeding activity, we used a provincial median burrow-occupancy rate of 77% [339] to estimate about 90 and 15 pairs nesting in the early 2000s and 2020, respectively. Increased burrowing activity has been facilitated by increasing soil depths since the 1980s (Figure 560).[449]

The apparent absence of nesting Rhinoceros Auklets for a century after they were first recorded nesting is puzzling, especially given their expansion generally on the BC coast, at least in the latter half of that century. The persistence of Tufted Puffins nesting on the island would seem to rule out human persecution or food shortage as possible causes of their absence. There is a possibility that Rhinoceros Auklets were nesting in small numbers undetected for 100 years because of their nocturnal nesting habits, in spite of Anderson's statement that the "little auklet" had disappeared from the island in 1915. Scott et al.[352] also wondered whether historical breeding of Rhinoceros Auklets in Oregon and California may have gone undetected due to their cryptic nesting habits and small numbers. Although this scenario seems unlikely on Mandarte Island, given the frequent intensive studies that have been conducted on the island, Rhinoceros Auklets are common in the area during the summer [38] and were sometimes seen on the island by researchers in the decades before nesting was documented again in the 1980s.[449] Small numbers of nesting birds could possibly have gone undetected if they were nesting in unusual and unexpected locations. The egg collected by Cunningham in 1886 was described as "…laid in space between two rocks." This type of nest is uncommon in BC but is frequent on the Farallon Islands in California where Rhinoceros Auklets nest mainly in natural cavities.[178] In 1985, one nest on Mandarte Island was located in an arm's-length cavity under a large boulder and others were found in fractured rocks with some soil accumulation. Nocturnal birds at these types of nests would be less conspicuous and more easily overlooked than diurnal birds like Tufted Puffins nesting in similar sites. Thus, it is possible and perhaps likely that a few Rhinoceros Auklets nested undetected on Mandarte Island between 1886 and 1984. It is also possible that nesting was occasionally observed during that time interval but was not documented. In 1940, Maguire [488] recorded that he did not see any Tufted Puffins or Rhinoceros Auklets and did not discover nests with eggs of either species, noting that, "while not common, there is usually an odd one." Maguire's comments suggest that, although there are no documented records of Rhinoceros Auklets nesting at that time, he had

information on recent nesting on the island by both Tufted Puffins and Rhinoceros Auklets.

Concentrations of Rhinoceros Auklets seen in nearby waters during the summer may be at least partially associated with the colony on Mandarte Island. Large numbers have often been reported in the waters off Sidney Spit and in Sidney Channel, including: 100 feeding on 12 June 1986; 250, most carrying fish in their bills, on 15 August 1986; 208 in a feeding frenzy on 25 June 1987; 180 feeding on 10 July 1987; 2,000+ on 15 July 2007; 210 on 14 July 2012; 260 on 26 July 2014; 150 on 27 July 2014; 150-155 in feeding frenzies on 7 and 9 June 2015; 120 feeding and carrying food on 7 July 2015; 150 in a feeding frenzy on 19 June 2016; 220 on 14 July 2017; 800 on 6 July 2018; 300 on 27 July 2019; and 1,600 on 14 August 2019.[524] Several Rhinoceros Auklets with bill-loads of fish that may have been destined for nest sites on Mandarte Island were seen flying past Sidney Spit at 19:15 hr on 25 June 2017 and past Saanichton Spit at 20:34 hr on 31 July 2017.[524] Those birds may also have been heading for colonies across the border in Washington. Only small numbers of birds (< 20) have been sighted around Mandarte Island in most years, except 200 were recorded on 6 July 1987, 6 July 1991, and 16 July 2022, and Nietlisbach, by telescope, counted maxima of 426 and 404 offshore of the island on 10 and 18 June 2021, respectively.[524] Many were carrying fish on 18 June 2021. Large numbers of foraging birds and birds carrying fish are also often seen to the south off Victoria.[524]

Tufted Puffin Trends. Anderson reported that Tufted Puffins used to be numerous but had declined to only three pairs in 1915 [232] and four pairs in 1916.[233] There are no data to substantiate a decline, and Drent and Guiguet [144] were skeptical that large numbers ever nested on the island (they were also skeptical about the 15 pairs of puffins estimated nesting by Munro in 1927 as there had never been more than four pairs estimated in other years). Most records suggest a stable population of around two or three pairs nesting on Mandarte Island throughout most of the 20th century (Figure 561). In 1929, Burton found two puffin nests on 19 July, one with an egg and one with young, and estimated six pairs nesting; [364] Sprot disagreed and estimated only three pairs nesting. Pairs were seen on the southwest cliffs, at the eastern and western extremities of the island. Maguire saw no puffins during his visit on 22 June 1940, but Carl had earlier recorded one pair about the island on 20 May 1940 and saw one adult leaving a rock crevice where a nest with an egg was found. At least two and perhaps three pairs were nesting in 1957-1962; two nests were found in rock crevices along the southwest cliffs, one near the north end and one towards the south end of the main island,[146] similar to where Sprot [364] observed birds in 1929. Eggs or chicks were found in at least one of those nests in most years between 1957 and 1962. Puffins were seen visiting other crannies on the southwest cliffs during those years but only accumulations of grass and no eggs or chicks were found at those locations.[146]

Figure 561. Small numbers of Tufted Puffins consistently nested on Mandarte Island for at least a century, but they appear to have been extirpated since 1996. Mandarte Island was the only known nesting site for Tufted Puffins in the BC Salish Sea, and the breeding seabird community there is now missing this iconic seabird species. *Photo by Michael S. Rodway.*

Since 1962, other researchers have confirmed puffins nesting on the island: Ian Robertson reported one pair nesting in 1970; Jamie Smith and Niko Verbeek reported nesting in 1977; Anne Vallée and Peter Arcese confirmed one bird nesting in a crevice in 1982; and Peter Arcese reported that one pair raised a chick in 1983.[523] The crevice nest location identified in 1982 was used repeatedly in other years, likely by the same pair.[449] In 1974, Campbell

estimated two pairs nesting but only one puffin was seen flying around the island; [70] no nests were located. On 6 July 1985, Bruce Whittington saw a pair of puffins on land near what looked like the mouth of a burrow between two rocks about 5 m above high water on the northwest side of the island.[524] Rob Butler saw a pair on rocks near a burrow on 2 August 1991, recorded a puffin in a crevice on the cliff on 30 July 1992, and noted three puffins on the island on 15 July 1995. Victoria birder David Allinson photographed one puffin on the cliff and noted that a pair was breeding on the island on 13 August 1995. We have no records of puffins seen around the island since 1995 and they apparently last tried to nest in 1996 [449] (see Remarks).

Remarks: According to Anderson,[232] declines and abandonments apparent in 1915 were caused by the harvest of eggs and young by "whites, Indians, and Japanese." Shooting was also common as Mandarte Island was a "favourite haunt" of Canada Geese that were continually hunted. European Rabbits (*Oryctolagus cuniculus*, also called the Belgian Hare), that had been introduced some years prior to 1915, were also common and frequently hunted at that time. Anderson felt that shooting on the island further discouraged nesting birds and should be prohibited. Rabbits were also suspected to be displacing puffins and guillemots from nesting holes and crevices, and Anderson recommended that they be immediately exterminated. Munro [269] also noted in 1921 that many burrows had been usurped by the Belgian Hare. The rabbits persisted for many years, but died out around 1955 leaving many burrows that were then used by Pigeon Guillemots and Tufted Puffins.[402] During the six weeks that Anderson was warden on the island in 1915, he refused to let tourist parties land and convinced two First Nations groups that had begun to gather gull eggs to stop their harvest. Anderson returned as warden in 1916 [233] and again turned away unauthorized landing parties and reported that no First Nations people came to harvest camas bulbs or gull eggs. The birds were thus undisturbed during incubation which likely accounted for the increases in nesting numbers seen that year. Unfortunately, it was decided not to place a warden on the island in 1917 and as a result virtually all gull eggs were again harvested.[234] Observations by Brice in 1928,[44] indicated that egg harvesting also likely occurred that year; on 13 July there were few nests with eggs, almost none with full clutches, and no young yet, although Brice stated that there were no signs of people having visited the island or that nests had been interfered with. In 1930, Paton and Sprot reported that people had been on the island digging camas bulbs and presumably harvesting gull eggs during the latter half of June; all gull nests in the vicinity of the digging activity were empty, whereas those elsewhere on the island held full clutches.[298, 365] In 1933, Burton reported a canoe "loaded with eggs" taken from the colony in June, and Sprot found very few nests with eggs or young in July.[367] On 22 June1940, Maguire [488] saw many gull nests with only one or two eggs and wondered if the colony had been raided. Van Tets [402] reported that members of the East Saanich Band periodically visited the island to collect gull eggs during his studies in 1957-1959, and Vermeer [412] noted that egg harvesting, as well as visits by tourists, disrupted breeding phenology and success in four of five meadow areas used in his study in 1961. A BCPM crew in 1977 noted some evidence of egging.

Northwestern Crows were recognized as a threat to nesting seabirds by the 1920s, and attempts to control crow populations were instigated. Munro [269] found several Pigeon Guillemot eggs that had been eaten by Northwestern Crows or gulls in 1923. He noted that "the breeding crows have all been killed, but a few bold marauders still visit the island, in constant peril from the twelve gauge of the warden." Control efforts in subsequent years were minimally effective. In 1928, Brice [44] noted several crows present on 13 July, a large flock on 26 July, and reduced numbers on 27 July; "those that came within gunshot distance being accounted for." In 1929, Sprot requested that crows not be shot so that he could observe their behaviour and accurately determine their impact on gulls and other nesting species.[364] On 3 August 1929, Sprot counted a flock of 45 crows, which was only part of the population on the island. He noted that numbers of Pelagic Cormorant "eggs and young destroyed by crows was beyond estimation," and that it was "very obvious that crows were chiefly responsible for such a poor breeding season [for Pelagic Cormorants]." Crows were taking young up to two weeks old. As for impacts to nesting gulls, from his observations in 1929, Sprot concluded that crows did little harm to gull nests.[364] The next year, Sprot [365] recommended annihilation of the crow population and greater efforts were made to control crows in 1930; Paton shot five on 3 July and six on 17 July, but crows quickly became wary.[298] Paton noted that he was only able to shoot one crow on 24 July 1930; about 20 crows were present but they kept out of reach, moving from one end of the island to the other or out over the water as soon as the survey party approached.[365] As in 1929, crows were observed

pillaging cormorant eggs wherever the survey party approached; on 3 July, as Paton fired at crows in one direction, Sprot observed three other crows swoop in and steal eggs just behind Paton.[365] Thus, despite control efforts, crows were again considered responsible for the almost complete failure of nesting Pelagic Cormorants in 1930.[298] Sprot counted 51 crows on 30 July 1931 and noted that others were present.[366] In spite of increased crow numbers, predation on cormorant eggs and young was less severe in 1931, likely because human disturbance on the island was less frequent that year.[366]

Since 1931, crows have continued to have major impacts on most nesting species, including gulls (Figure 562). Munro [272] noted "constant destruction of [cormorant] eggs by crows" in 1936. In 1940, Maguire [488] was disturbed that every Double-crested and Pelagic cormorant nest that he examined had been completely "cleaned out" by predators. He found large quantities of fresh eggshells below nests on cliff ledges and also above nests on rocky and grassy knolls, where they had obviously been carried. Maguire also saw a few gull eggs that had been preyed on and noted that a lot of crows were present. Clay [120] also stated that "crows were busy moving or demolishing cormorant eggs" in 1952. Drent et al.[146] reported 9, 28, and 61% of Double-crested Cormorant eggs lost to predation, primarily by crows, in 1958, 1959, and 1960, respectively. Twenty-one crow nests were found on the island in 1960; the nesting population was estimated to be 20-25 pairs.[146] Overall, during the studies conducted between 1957 and 1962, Drent et al.[146] estimated per season predation by crows of 150 Double-crested Cormorant eggs, 450 Pelagic Cormorant eggs, 700 Glaucous-winged Gull eggs, and 30 Pigeon Guillemot eggs, as well as many small chicks of those species. Some of that predation was associated with investigator disturbance (see below).

Verbeek [407] observed high depredation of cormorant eggs by crows between 1976 and 1980; totals of 294, 267, 412, 1,388, and 1,167 cormorant eggs were taken by crows in 1976, 1977, 1978, 1979, and 1980, respectively. Number of cormorant eggs taken in 1980 represented 22% of eggs laid in first clutches. Similarly, in 1989, Sullivan [375] tallied 1,006 cormorant eggs taken by crows, representing about 29% of eggs laid in first clutches. Crows stole eggs from cormorant nests during incubation change-overs and during disturbances that flushed cormorants from their nests. Munro [272] saw one instance of a crow stealing an egg out from under a sitting bird. During Verbeek's study, crows preyed most heavily on cormorant eggs; few Glaucous-winged Gull or Pigeon Guillemot eggs were taken. Verbeek [407] suspected that most cormorant eggs taken by crows were Pelagic Cormorant eggs, but in 1989, based on egg measurements, Sullivan [375] estimated similar numbers of Double-crested and Pelagic cormorant eggs taken by crows. As for gulls, Vermeer [412] also noted little predation of gull eggs by crows unless gulls were disturbed by humans. In Verbeek's study, most gull eggs preyed on by crows were taken later in the season and appeared to be abandoned and addled. Crows also took some small gull chicks. Verbeek [407] attributed the increased predation of cormorant eggs in 1979 and 1980 to increasing numbers of crows nesting on the island (from 13 pairs in 1976 to 25 pairs in 1980) and to more frequent disturbances by Bald Eagles. Disturbance by Bald Eagles was also considered the main cause of high egg predation rates in 1989.[375]

Disturbance from humans, including researchers, surveyors, and tourists, and from Bald Eagles facilitates crow predation. In 1930, Sprot noted that, "our presence on the rock was [not] wholly responsible for the crow raids," some of it likely occurring in the absence of human disturbance during times parents were feeding young chicks.[365] However, by 1931, after many days spent on the island over several years, Sprot concluded that "human presence is very largely responsible" for the loss of eggs and young of cormorants and for mortality of young gull chicks that wander into foreign territories.[366] In 1931, he attributed greater hatching success by cormorants, despite increased crow numbers, to less frequent visits by First Nations people, RCMP patrols, and by researchers and banders, including himself.[366] Drent et al.[146] monitored predation on Double-crested Cormorant eggs and young during a 45 min banding operation in 1960; 25 eggs and eight newly-hatched young were carried off by crows. As much as 60% of the high egg loss recorded at other Double-crested Cormorant nests monitored in 1960 may have been caused by tourists.[146] In 1961, Vermeer [412] reported extensive crow predation on gull eggs while he was trapping and marking adult gulls. In Verbeek's study,[407] more Pelagic Cormorant eggs were lost to crows when Bald Eagles were present than when they were not. Small boats approaching too closely to the cormorant cliffs also flushed incubating adults and facilitated crow predation. In 1997, Sullivan also frequently observed Pelagic Cormorants flushing when tour boats, powered pleasure craft, and kayakers came close to the cliff face.[266] In Verbeek's study, predation rates were higher on the weekends

when more tourists were about than during the week. Tourist traffic also had an indirect effect by stirring up eagles over the surrounding areas, with the result that eagle disturbances on Mandarte were also higher on weekends. The presence of eagles around the island has increased since the 1970s.[375, 377, 407]

Figure 562. Northwestern Crows have been recognized as major predators of cormorant (left) and Glaucous-winged Gull eggs on Mandarte Island for over a century. Much of their predation is opportunistic in response to disturbances by humans or Bald Eagles that flush incubating or brooding cormorants or gulls off their nests. *Photos by R. Wayne Campbell.*

Gulls also prey on cormorant eggs (Figure 563) and young chicks, although less so than crows.[146] Van Tets [402] had many difficulties checking cormorant nests during incubation because of high predation by crows and gulls. Chicks younger than one week old also suffered severe gull predation during his study. Van Tets resorted to checking nests at night which worked for most Pelagic Cormorant nests on the main cliffs but not for the more accessible Double-crested Cormorant nests.

Nighttime checks eliminated crow predation, but Glaucous-winged Gulls continued to rob eggs from disturbed Double-crested Cormorant nests even during the night. Impacts on Pelagic Cormorant nests were greater on the south islet; in 1957, 32% of eggs laid were taken by predators, presumably gulls. Loss of young after hatching was also unusually heavy on the south islet in 1957,[146] and the combined mortality of eggs and young that year may be the reason why Pelagic Cormorants no longer nested there in subsequent years. In 1989, Sullivan [375] reported high predation by gulls on Double-crested Cormorant eggs; an estimated 411 Double-crested Cormorant eggs were taken by gulls, representing about 24% of eggs laid in first clutches. Predation by gulls and crows combined accounted for 55% of Double-crested Cormorant eggs laid; only 21% of nests produced young in 1989. Adult gulls also kill many foreign gull chicks that wander into their territories.[412]

Figure 563. Glaucous-winged Gulls frequently prey on cormorant eggs and small young, though their impact is likely less than that of Northwestern Crows. Most predation occurs when adult cormorants are flushed off their nests by human or Bald Eagle disturbances. Photos here show gulls stealing eggs from Double-crested Cormorant nests. *Photos by R. Wayne Campbell, 10 July 1981.*

Bald Eagles were frequently seen by van Tets [403] but, unlike on Mitlenatch Island, he never saw eagles prey on nesting seabirds during his four years of observations on Mandarte Island. Frequent disturbance by Bald Eagles on the south islet may have contributed to poor reproductive performance of Glaucous-winged Gulls in 1985 and 1986.[420] Repeated disturbance by Bald Eagles and humans delayed the completion of Double-crested Cormorant clutches by 45 days in 1993 and led to almost complete breeding failure in 1994.[376] Disturbances occurred daily throughout April and May and tapered off in late June and early July in 1993 but persisted throughout those months in 1994. Only six young were produced from 403 nests in 1994. During disturbances, eggs were preyed on by gulls and crows. Between 1 May and 31 July 1997, eagles flushed nesting gulls one to 23 times every day, with up to six eagles present on the island at any one time.[377] The frequency of disturbances by Bald Eagles (Figure 564) seen in 1993, 1994, and 1997 was much greater than in 1959 and 1960, when the number of days on which eagles caused panic flights of nesting Double-crested Cormorants was 13, 6, and 2 for May, June, and July 1959, respectively, and 12, 7, and 4 for those same months in 1960.[146] Double-

crested Cormorants failed completely in 1998 and 1999.[266] Bald Eagles were abundant and were seen preying directly on cormorants in 2014.[101, 529]

Figure 564. Disturbances to nesting cormorants and Glaucous-winged Gulls by Bald Eagles increased in frequency on Mandarte Island between 1960 and the 1990s, concomitant with the recovery of Bald Eagle populations in the Salish Sea. Fly-overs or landings of eagles on the colony flush nesting seabirds and expose eggs and small chicks to predation by Northwestern Crows and Glaucous-winged Gulls. *Photo by Paula Courteau.*

High predation on gull chicks by what seemed to be a single river otter was reported in 1977.[411] Between 7 July and 7 August 1977, the remains of 153 gull chicks, 19 adult gulls, and one adult Pigeon Guillemot were found and attributed to river otter predation. Remains of gull chicks were also found in 77 of 94 otter scats examined and suggested that another 100 chicks may have been taken. In total, predation by the river otter may have accounted for about 6% of the number of gull chicks that would have fledged.[411] The suspected culprit was not resident on Mandarte Island but apparently came from nearby Sidney Island at dusk or during the night to raid the gull colony. River otter trails and scats were seen in 1997.[377] River otters have also been reported preying on Rhinoceros Auklets and Tufted Puffins.[449] In 1996, a Tufted Puffin head was found on a trail and several Rhinoceros Auklet heads were found each summer during the mid-2000s. Arcese reported that river otters are constantly on the island eating gulls, lounging (Figure 565), mating, and occasionally denning.[449]

Mink have been rarely sighted on the island. One was seen in December 1960. They were never recorded on the island during the seabird breeding season when Drent et al.[146] were conducting studies on the island in the 1950s and 1960s. Arcese has seen mink on the island only once and has never seen any other signs of mink in 40 years of research.[449]

Figure 565. This lounging river otter is disarmingly cute, as are most other mammalian predators when seen resting or playing. Seemingly incongruous with their cute appearance, river otters are efficient killers and occasionally can have major impacts on nesting seabirds. A river otter may have been responsible for eliminating the last nesting Tufted Puffin on Mandarte Island. *Photo by R. Wayne Campbell.*

Great Blue Herons (Figure 566) used to nest on Mandarte Island. Seven heron nests were found by the Victoria Natural History Society on 27 May 1945; nests were located in arbutus and Douglas-fir trees.[146] One nest examined contained only broken eggshells, likely preyed on by crows. No herons were seen on subsequent visits on 10 June 1950 and 16 June 1951, but herons were flushed from trees when observers approached on 21 June 1952 and 27 June 1953. However, no nests were found in 1952 or 1953, and nesting has not been recorded since.

Figure 566. A small group of Great Blue Herons nested on Mandarte Island in the 1940s when there was a stand of Douglas-fir and arbutus trees on the island. Most of the trees died shortly after that and no evidence of nesting has been seen since the 1950s. *Photo by Paula Courteau.*

Mandarte Island has been a popular research site for graduate students and long-term studies. Banding of nestling gulls was first conducted in 1929 [364] and more intensively from 1952-1962.[150] In 1929, Bishop collected five adult Glaucous-winged Gulls,[364] one of which was an albino.[27] Van Tets [402, 403] conducted a comparative study of reproductive behaviour and communication patterns in Brandt's, Double-crested, and Pelagic cormorants in 1957-1962 (Figure 567). Most cormorant chicks were

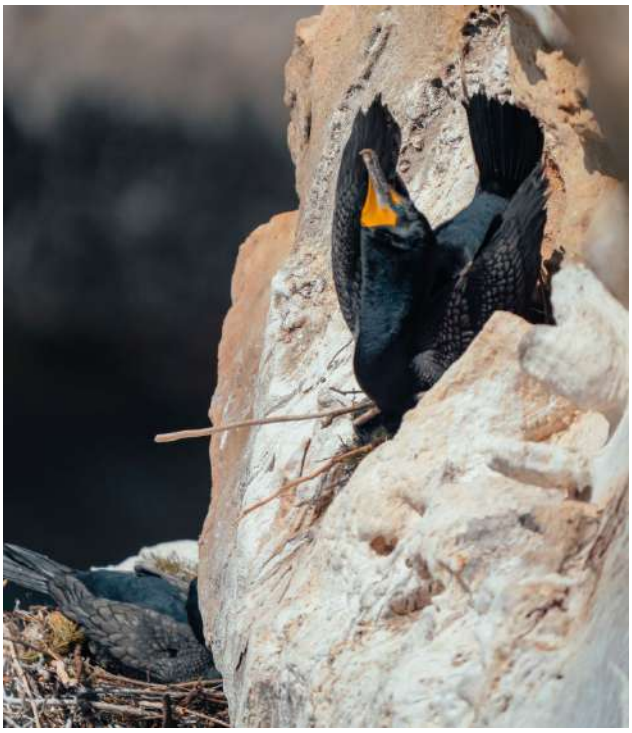


Figure 567. Gerard van Tets studied social displays and communication patterns of Double-crested, Brandt's, and Pelagic cormorants on Mandarte Island for his M.Sc. thesis conducted out of UBC in 1957-1958.[402] He carried on at UBC to investigate communication patterns in other related Pelecaniformes for his doctoral thesis, completed in 1963.[403] Six decades later, during his M.Sc. research out of SFU,[285] Macus Ong beautifully captured on film some of the displays performed by Double-crested Cormorants that had been identified by van Tets. "Wing-flipping" or "wing-waving" (top two photos) is an advertisement display performed by males during courtship. While holding this posture, the male raises and lowers his wings at a rate of about two beats per second accompanied by synchronized pulsations of the cloaca and "ugh" sounds.[402] The "recognition" display (middle right) is a bisexual greeting performed year-round at a nest or a display site whenever a mate arrives nearby. The wide-open bill is slowly waved upwards and forwards, showing the blue mouth lining, while the bird utters an "arr-r-r-r-r-t-t-t" call. The "water begging" display is performed by chicks by waving their wide-open bills upward (bottom right). This is quite a different behaviour from "food begging," which the chick performs with the bill closed by prodding at the adult's colourful gular pouch. In response to "water begging," an adult will descend to the sea to fill its gullet with water and return to pour water down the throats of each chick in turn. It will also often pour water down the throat of its mate when it exhibits the "recognition" display, which closely resembles the "water begging" display of the chicks.[402] *Photos by Macus Ong, Gabriola Island, BC, 23 May and 18 July (chicks) 2020.*

banded during his study; 165 Double-crested Cormorant and 264 Pelagic Cormorant nestlings were banded in 1957. During the cormorant studies, Pelagic Cormorants nesting on the south islet in 1957 were visited at night almost daily; that disturbance may have been responsible for the subsequent abandonment of that area.[146] Robertson [324, 325] manipulated brood sizes and studied feeding ecology of Double-crested and Pelagic cormorants in 1969-1971. Following up Robertson's studies, van de Veen [401] investigated reproductive success and survival of Double-crested Cormorants in 1972. Siegel-Causey and Hunt [355, 356] compared breeding site selection, colony formation, and colonial defense behaviour of Double-crested and Pelagic cormorants in 1975. Mandarte Island was one of the sites used by Terry Sullivan in his study of Double-crested Cormorants in 1993-1994.[376] Pigeon Guillemots were studied from 1957-1960.[143] Sixty-five guillemots were colour-ringed during that period. Overall, during the studies conducted by Drent et al.[146] over the years 1957 to 1962, the total number of nestlings that were banded included 909 Double-crested Cormorants, 1,325 Pelagic Cormorants, four Black Oystercatchers, 7,002 Glaucous-winged Gulls, 178 Pigeon Guillemots, and three Tufted Puffins. The same marked nests used by Drent for his Master's thesis work on the breeding biology of Pigeon Guillemots in 1959 and 1960 [143] were again used by Koelink for his Master's studies on Pigeon Guillemot energetics in 1969 and 1970.[236] A number of studies have investigated aspects of the breeding biology of Glaucous-winged Gulls, beginning with Vermeer in 1961-1962.[412] Ward studied reproductive success and food supply in relation to the evolution of optimal clutch size in 1969 and 1971.[435] To determine how far adults range when they are feeding chicks, wing tags were put on 150 adult gulls captured on the nest in 1969 and 1970.[145] Verbeek [406, 408, 409] compared reproductive performance in 1979-1980 with that previously determined by Vermeer in 1961-1962. Verbeek also monitored egg and chick predation of gulls and other seabird species during the years 1976-1980.[407, 411] Vermeer collected regurgitated pellets from gulls to compare adult and chick diets on the east and west coasts of Vancouver Island in 1980.[415] A Song Sparrow study begun in 1960 by Frank Tompa and carried on by Jamie Smith and Peter Arcese has involved numerous graduate students and is now one of the longest-term studies of a wild bird population in the world.[358]

Seabird Island Summer

There are many types of studies that are conducted on seabird breeding colonies and, as researchers, we interact with seabirds at colonies in many ways. Population surveys are exciting because you often get to explore remote island habitats and experience the thrill of new discoveries. However, for me, the most memorable and magical of experiences come from studies that involve detailed examination of reproductive performance at a colony throughout an entire breeding season, especially studies focused on surface-nesting or cliff-nesting species like gulls or kittiwakes that can be easily observed and that tolerate nest visits well (the nests of burrow-nesting species like puffins are secreted away underground and adults may abandon nests if they are disturbed). During such studies you become intimately familiar with individual birds and experience an intense immersion into seabird breeding ecology. Multiple study objectives can be met through intense study at breeding colonies. Examples include investigating causes of breeding failure, determining whether chick growth, breeding success, timing of breeding, or behaviour differ among areas or time periods, and comparing breeding performance among species during times of environmental change.

When conducting immersive studies on breeding seabirds, the season typically begins as soon as the adults begin to occupy their nesting areas. At this time individuals are returning to familiar nesting locations from previous years or looking for new ones. There is much interaction among adults as territories are occupied, and nest building begins. This is the time for identifying study plots and defining and marking the nests that will be included in your study. Once egg laying begins, regular surveys are started during which nest contents are recorded. For species with accessible nests, such as gulls, eggs within each study nest are counted, marked, and measured, and chick hatch and growth are documented. For inaccessible nests, such as those of cliff-nesting murres and kittiwakes, nest contents are determined through hours of patient observation (e.g., waiting for a change in position of the incubating adult or an incubation shift to occur so that the eggs in the nest can be seen). Many types of observations may be made, depending on study objectives, such as those related to pairing behaviour, timing of laying, length of incubation shifts, nest predation, chick feeding and food, parental care, and inter-neighbour interactions. Some studies involve individually marking adults (e.g., with coloured leg bands), or in some cases, individuals of a pair can be distinguished by natural variability in appearance, such as in wing-tip patterns.

One of the most magical times during the entire breeding season occurs at the time of hatch. One day, during a routine nest survey, a complete transformation has occurred: the rock-like inanimate eggs you have been

recording and measuring for several weeks have incredibly, almost magically, metamorphized into fuzzy, animated little beings. Although you have known all along what was developing inside the eggs, this dramatic metamorphosis nevertheless takes you by surprise. I recall, during my first summer on a seabird colony, walking around all day in a state of shock at this magical transformation that had suddenly occurred all around me.

Watching the youngsters grow is also a wondrous experience. Their speed of growth is astounding (Figure 568)*. When there is more than one nestling in a nest, individuals may be marked, first temporarily (e.g., with a small, coloured mark on the downy chest), and later with long-term measures (such as leg bands). This way you can track the progress of siblings. Families that you can frequently observe throughout the season particularly capture your attention. For example, we (Michael Rodway and I) thoroughly enjoyed the antics of two gull families that had nests in view of our research cabin on a seabird colony in Newfoundland, following with interest and fondness the journey of the young from hatch to fledgling and the interactions among family members.*

Time moves quickly on a seabird colony, in keeping with the multitude of events continuously and progressively unfolding all around you. Before long, little downy beings just emerged from eggs have become fully feathered youngsters that are yearning for flight. Young gulls begin to practice flying, first with awkward flapping, then gradually lifting higher and higher off the ground on extended wings. It is with a mix of exhilaration and sadness that you watch the young take to the air, or head out to sea. For some species, like gulls and murres, parental care is still provided for some time to bridge the path to independence. For others, like puffins, when the natal burrow is left behind, so is all parental care. As more and more birds leave the island with the fading summer, you become acutely aware of the emptiness of an island just recently so filled with life, and the wonder of this unique and magical experience that you had the privilege to enjoy.

(contributed by Heidi Regehr)

Figure 568. Watching the transformation of eggs into flying beings over a short period of time is a wondrous experience for those fortunate and adventuresome enough to spend an entire breeding season on a seabird colony. Only 30 days have passed since these large, mostly feathered Glaucous-winged Gull chicks emerged from eggs. In a short time, they will be ready to take flight. *Photo by Louise Blight, Mandarte Island, BC, 2008.*

GI-760 HALIBUT ISLAND

Location: *48°37'13"N 123°16'22"W; 92 B/11.*
Off the mid-east side of Sidney Island, southeast of Mandarte Island. Also known as Low Island and SISȻENEM.

Description: *3.9 ha; 26 m high; Forested.*
Like nearby Mandarte Island, Halibut Island is a long narrow island, oriented northwest to southeast. It has an extensive rocky shoreline, with beaches and tidal rock shelves along the northeast side. There are grassy fringes around the mainly forested top. The island is privately owned and relatively undeveloped. The owner for the last 50 years, Hilton Clarence Burry, lived in a small travel trailer, built a couple of small sheds, and grew a few holly trees that he sold as a source of income. The property went on the market for $2 million after Burry died in 2019. The Land Conservancy of British Columbia recently purchased the island for $1.55 million and as of February 2021 has transferred ownership to the W̱SÁNEĆ Leadership Council representing Tsartlip, Tseycum, and Tsawout First Nations.

Historical summary: Seabird nesting records are sporadic for Halibut Island. Anderson reported Pigeon Guillemot nests in 1915, and a few guillemots were seen in 1987 (Table GI-760). Drent et al. recorded a Black Oystercatcher nest with eggs in 1960 and 1961 and noted that they had not seen oystercatchers in previous years. Three to four pairs of oystercatchers were nesting during Stephanie Hazlitt's studies in 1996 and 1997, respectively. However, no oystercatchers were seen during the survey in 2005.

Table GI-760. Seabird nesting records for Halibut Island. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
Jun-Jul 1915		x	232
1958-1959	0		146
1960	1		146
1961	1		146
5-23 Jun 1987	2	S(4)	158, 427
21 Apr-30 May 1996	3[3]		202
9-30 May 1997	4[4]		202
13 Jun 2005	0		57

Remarks: Halibut Island has a variety of suitable habitats for nesting seabirds including potential burrowing habitat for Rhinoceros Auklets in forested areas. Under its new ownership, if given adequate protection from human disturbance, perhaps the island could become a major seabird colony like its close neighbour Mandarte Island.

GI-765 JAMES ISLAND - WEST DOCK

Location: *48°35'48"N 123°21'13"W; 92 B/11.*
On the west side of James Island, east of Cordova Spit off Saanichton.

Description: *Wharf; Pilings.*

Historical summary: Emms and Morgan reported Pigeon Guillemots nesting in the wharf pilings in 1987 (Table GI-765). We have no other records for this site.

Table GI-765. Seabird nesting records for James Island - West Dock. See Appendix 2 for codes.

DATE	PIGU	SOURCE
5-23 Jun 1987	x(8)	158

GI-770 SALLAS ROCKS

Location: *48°35'05"N 123°17'25"W; 92 B/11.*
Off the south tip of Sidney Island.

Description: *1.9 ha; 10 m high; Forested; Grassy rock; Bare rock.*
The five rocks in this group are mostly bare, except the southwestern rock has a grassy area on top, and the largest, northwestern rock has some trees. Sallas Rocks became part of the Gulf Islands National Park Reserve in 2003; access is restricted.

Historical summary: Black Oystercatchers were first recorded nesting in 1987 (Table GI-770). Stephanie Hazlitt found nests on all five rocks in 1996 and 1997 (Figure 569). In 2005, one empty scrape and one adult were seen on the southwest rock,[529] although zero nests were reported.[57] Parks Canada included the southern three rocks in their Black Oystercatcher monitoring surveys; they found three nests on those three rocks in most years between 2009 and 2023 (see Table 5 on page 110 for numbers of nests found on each rock). Chicks were suspected around three empty scrapes (associated with 1 pair) found on the southeast rock in 2011. Observers did not land on any rocks in 2014, 2022, and 2023 and the southwest rock was not landed on in 2020 and 2021.

Table GI-770. Seabird nesting records for Sallas Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
Jun 1986		29	420
5-23 Jun 1987	1		427
21 Apr-30 May 1996	5[5]		202
9-30 May 1997	4[4]		202
1-9 Jul 1997		13	377
13 Jun 2005	1S		529
2006		0	30, 456
11 Jun 2009	3[3][a]	9[1]	30, 472, 529
10 Jun 2010	3[3][a]		529
13 Jun 2011	2[1][a]	8[3]	529
12 Jun 2012	3eS[a]	1	529
23 May 2014	3eS[a]		529
27 May 2015	3[3][a]		529
14 Jun 2016	2[2][a]		529
4 Jun 2018	3eS[a]		529
4 Jun 2019	3eS[b]		529
29 Jun 2020	1[b]		529
26 May 2021	3e[a]		529
1 Jun 2022	3S[a]		529
13 Jun 2023	3eS[a]		529

[a] Only the southern three rocks were surveyed.
[b] Only the southwest rock and the rock southeast of the treed islet were surveyed.

Glaucous-winged Gulls were first reported nesting in 1986 (Figure 570); numbers have declined since. Nine nests were found on the southeast rock in 2009, but eight were empty and one contained a single egg. Nests were reported on that rock again in 2011 and 2012. It was unknown whether recent nest counts for gulls were complete; [529] we considered the count from 2011 as the best current estimate for the nesting population.

Figure 569. Black Oystercatcher nests were found on each of the five rocks of the Sallas Rocks during the thorough study by Stephanie Hazlitt in 1996 and 1997. Complete surveys of all rocks have not been conducted since. *Photo by R. Wayne Campbell, Mitlenatch Island, BC.*

Figure 570. A total of 29 Glaucous-winged Gull nests were counted on Sallas Rocks in 1986. Only eight nests were found during the most recent complete survey in 2011. *Photo by Paula Courteau, Norris Rocks, BC, 23 July 2018.*

Remarks: River otter trails and scats were seen in 1997.[377] Predation was suspected at the oystercatcher nest on the southwest rock in 2009; bits of down were observed at the nest. In 2010, eggs had been displaced outside the nest on the southeast rock; the adult was not sitting on the nest. A river otter was noted on the southeast rock in 2015. Two Bald Eagles were seen on the rock southeast of the treed islet in 2016; no oystercatchers were nesting there that year. In 2019, an eagle was being dive-bombed by crows on the southwest rock.

GI-780 LITTLE D'ARCY ISLAND

Location: *48°34'13"N 123°16'00"W; 92 B/11.*
Off the east side of D'Arcy Island, south of Sidney Island. Colony includes the rock to the north (the rock to the south is included with Unit Rocks below).

Description: *9.2 ha; 37 m high; Forested; Grassy rock.*
Little D'Arcy Island is composed of two tidally-connected, forested islets. Beaches occur around much of the perimeter between rocky points. There are grassy areas at the edge of the forest above the beaches and shore rock. The unnamed northern rock is grass covered above a rocky shore. That rock became part of the Gulf Islands National Park Reserve in 2003; access is restricted.

Historical summary: Black Oystercatchers were first reported nesting in 1987 (Table GI-780). They were nesting on two unspecified islands in 1997. Since 2005, nests have been found on the northern rock, where a maximum of five pairs were reported nesting in 2009 and 2010. Two nesting pairs were reported in 2006, but four additional empty scrapes were seen and a total of seven adults were present. Chicks were suspected around two empty scrapes in 2009, one in 2010, and four in 2011. Three nests with eggs were found in 2010. Seven adults were present in 2016 but only one nest was found (Figure 571). Surveyors did not land in 2020-2023.

Figure 571. Not uncommonly, groups of Black Oystercatchers are present on a colony but only one or two pairs are actually nesting. *Photo by Paula Courteau.*

Parks Canada surveyors reported three Glaucous-winged Gull nests with three eggs each on

the northern rock in 2014. We have no other records of nesting by gulls.

Table GI-780. Seabird nesting records for Little D'Arcy Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
5-23 Jun 1987	1		427
21 Apr-30 May 1996	1		202
9-30 May 1997	2[2]		202
13 Jun 2005	4[4]		57, 529
15 Jun 2006	2[2]		529
25 Jun, 4 Jul 2007	3[3]		529
10 Jun 2008	4[4]		529
12 Jun 2009	5[3]		529
10 Jun 2010	5e		529
13 Jun 2011	5[1]		529
12 Jun 2012	4[4]		529
23 May 2014	3[3]	3[3]	529
26 May 2015	3[3]		529
14 Jun 2016	1		529
4 Jun 2018	2[2]		529
27 May 2019	1eS		529
29 Jun 2020	2S		529
26 May 2021	2S		529
1 Jun 2022	2eS		529
13 Jun 2023	3eS		529

Remarks: A pair of geese with goslings was recorded in 2014, and a goose nest was seen on the north rock in 2021.

GI-782 UNIT ROCKS

Location: *48°33'53"N 123°15'52"W* (grassy rock)*; 92 B/11.*
South of Little D'Arcy Island, east of D'Arcy Island. We have included the grassy rock south of Little D'Arcy Island and the drying reefs to the east as part of Unit Rocks.

Description: *0.4 ha; 7 m high; Grassy rock.*
These rocks are part of the Gulf Islands National Park Reserve; access has been restricted.

Historical summary: Black Oystercatchers nest on the rock south of Little D'Arcy Island. They were first recorded nesting in 2005 and were nesting in most years between 2005 and 2023, except for a hiatus in 2015-2018 (Table GI-782). In 2006, a pair was very defensive and likely had chicks, but no nests or chicks could be found. Chicks were also suspected around one nest found in 2010 and 2011. One oystercatcher was present in 2016 and 2018 but did not appear to be nesting. The rock was surveyed from the water in 2012, 2014, 2022, and 2023. In 2022, Parks Canada surveyors recorded zero pairs nesting, but three adults were seen, including one that flushed from a spot higher on the rock when the boat approached and that the observers noted might be nesting. We thus have listed one pair suspected nesting for 2022.

Table GI-782. Seabird nesting records for Unit Rocks. See Appendix 2 for codes.

DATE	BLOY	SOURCE
5-23 Jun 1987	0	427
14 Jun 2005	1	57, 529
15 Jun 2006	1eS	529
25 Jun 2007	1	529
10 Jun 2008	1	529
12 Jun 2009	1	529
28 Jul 2010	1S	529
13 Jun 2011	1S	529
12 Jun 2012	1eS	529
23 May 2014	2eS	529
27 May 2015	0	529
14 Jun 2016	0	529
4 Jun 2018	0	529
27 May 2019	1	529
29 Jun 2020	1	529
26 May 2021	1	529
1 Jun 2022	1eS	529
13 Jun 2023	1S	529

Remarks: A dead oystercatcher chick was found at the nest located in 2020. Two Bald Eagles were present in 2022.

GI-790 GORDON HEAD

Location: *48°29'44"N 123°18'25"W; 92 B/6.*
Colony includes all Vancouver Island shoreline between Cormorant Point and Arbutus Cove.

Description: *14 m high. Cliffs; Bare rock.*
Sections of steep cliffs along the Gordon Head shoreline are about 14 m high, with houses above the cliffs. There are small bare rocky areas on Cormorant Point and north of Glencoe Cove.

Historical summary: Records suggest that Pelagic Cormorants colonized these cliffs sometime in the late 1940s, nested for about 50 years, and then abandoned the cliffs sometime in the late 1980s or 1990s (Table GI-790). The highest number of nests was reported in 1955. Ted White noted about 50 Pelagic Cormorants roosting on the cliffs at Gordon Head on 15-17 May 1943; he saw no nests (Figure 572). Nesting was first recorded on 29 June 1951

when Davidson saw about 40 nests, several with five eggs. In that year, Davidson noted that all eggs had hatched on 22 July and reported 70 young on 9 August and 60 young on 17 August. In 1955, Davidson reported 80 adult cormorants present and building nests on 1 June, 75 nests on three sections of cliff on 1 July, and only nine nests containing young left of 26 nests on one section of cliff on 20 August. In 1956, there may have been a total of 65 nests in this area: Drent and Guiguet reported 45 nests seen by Davidson on 24 June, and also noted that "Miss E. K. Lemon [from Victoria] reported 20 nests on the cliffs just south of here." Bob Bissenden, from Landsdowne Junior High School in Victoria, observed seven nests with eggs on 24 June 1958, but three weeks later found the nests deserted. In 1974, a BCPM crew counted 12 nests from the water on two sections of cliff about 100 m apart. In 1981, from the water, Doug Bertram and Mike McNall tallied 21, 1, and 15 nests on three sections of cliff between Glencoe Cove and Arbutus Cove. In 1982, Bertram recorded fewer nests on two sections of cliff in the same area; 72 cormorants were present. Cormorants were still nesting on surveys in 1983 and 1987 but have not been reported nesting since 1987.

Figure 572. Pelagic Cormorants were seen roosting on the cliffs at Gordon Head in 1943 before they were recorded nesting. They first began nesting on the cliffs around 1951, and by 1955, there were 75 pairs nesting. Like so many colonies in the Salish Sea, the breeding population subsequently declined and cormorants were last seen nesting in 1986. *Photo by Paula Courteau.*

A Black Oystercatcher nest with three eggs was found on the rocks off Gordon Head in May 2001. Nesting appeared successful; eggs were hatched on 24 June, and two adults with two chicks were seen on about 30 June. A pair was suspected nesting on Cormorant Point in 2016.

Table GI-790. Seabird nesting records for Gordon Head. See Appendix 2 for codes.

DATE	PECO	BLOY	SOURCE
Jun-Aug 1951	40e		135
1 Jul 1955	75		144
24 Jun 1956	45[a]		144
24 Jun 1958	7[b]		144
1959	x		144
13 Jun 1974	12[c]		523
24 Jun 1981	37		523
29 Jun 1982	14		523
29 May-13 Jun 1983	13		421
5-23 Jun 1987	24		428
1998	0		114
2000	0		114
27 May 2001		1	524
2007	0		522
2014	0		522
12 May 2016		1S	524

[a] See text.
[b] These nests were deserted three weeks later.
[c] Corrected from Campbell.[70]

Remarks: Human disturbance was blamed for the loss of Pelagic Cormorant nests in 1955 [144] and repeatedly caused breeding failures in the early 1960s.[403] Increased housing development above the cliffs may have further discouraged nesting by cormorants.[101]

GI-800 TEN MILE POINT

Location: *48°27'19"N 123°15'55"W; 92 B/6.*
The official, gazetteered location of Ten Mile Point is north of Cadboro Point and Maynard Cove on Vancouver Island. The Ten Mile Point Ecological Reserve is located on Cadboro Point and includes the small rocks off the point. We include the ecological reserve and all shoreline from Cadboro Point to Ten Mile Point in this colony.

Description: *Rocky point; Bare rock.*
From Ten Mile Point to Cadboro Point is now a highly developed, upscale residential area with much human activity. The shoreline is rocky and the offshore rocks off Cadboro Point are bare.

Historical summary: An isolated pair of Glaucous-winged Gulls was reported nesting on Ten Mile Point in 1960 (Table GI-800). We have no other records of gulls nesting at this site, or along the nearby rocky shore within the Ten Mile Point Ecological Reserve, which, oddly, is located south of Ten Mile Point on Cadboro Point. However, this is a popular birding area and there are many records of

Glaucous-winged Gulls that have been submitted to eBird in recent years. There are no eBird records of gulls nesting in the area and we think it is safe to conclude that gulls no longer nest at this site.

In 2023, Victoria birders Liam Ragan and Simone Littledale independently discovered and photographed a Black Oystercatcher nest with two eggs on the Vancouver Island shoreline (48.4514; -123.2659) at Cadboro Point within the Ten Mile Point Ecological Reserve on 17 June at 08:26 and 10:17 hr, respectively. The nest was made of crab and clam shells and a few rock chips (Figure 573). We had no previous records of oystercatchers nesting at this site.

Figure 573. This Black Oystercatcher nest was discovered on the main Vancouver Island shore at Cadboro Point within the Ten Mile Point Ecological Reserve in 2023. The nest with two eggs was the first confirmation of nesting by this species at this site. *Photos by Liam Ragan, 17 June 2023.*

Table GI-800. Seabird nesting records (nests) for Ten Mile Point.

DATE	BLOY	GWGU	SOURCE
1960		1	144
2011-2023		0[a]	524
17 Jun 2023	1		494, 524

[a] See text.

GI-810 FLOWER ISLAND

Location: *48°26'56"N 123°16'45"W; 92 B/6.*
West of Cadboro Point near shore, northwest of Jemmy Jones Island. Colony includes the small bare rock south of the island. On some maps, the small rock is labelled Evans Rock, but we think Evans Rock is the official name for a tidal rock located east of Flower Island.

Description: *0.8 ha; 15 m high; Forested; Bare rock.*
There is a small pocket of forest on the north side of Flower Island; most of the island is grassy rock. The small south rock is mostly bare. The area is part of the Victoria Harbour Migratory Bird Sanctuary established by the federal Wildlife Division of the Department of the Interior (now Environment and Climate Change Canada) in 1923 (Figure 574).

Historical summary: Vermeer et al. reported one Black Oystercatcher nest on this island in 1987 (Table GI-810). No oystercatchers were seen by Butler and Golumbia in 2005, and we know of no other records for this site.

Table GI-810. Seabird nesting records (nests) for Flower Island.

DATE	BLOY	SOURCE
5-23 Jun 1987	1	427
14 Jun 2005	0	57

GI-820 JEMMY JONES ISLAND

Location: *48°26'40"N 123°16'22"W; 92 B/6.*
In Baynes Channel, southwest of Cadboro Point, southeast of Cadboro Bay.

Description: *1.2 ha; 6 m high; Grassy rock.*
Jemmy Jones Island is mostly bare rock, with grassy patches on higher sections. The island lies within the Victoria Harbour Migratory Bird Sanctuary established in 1923 and is part of the Oak Bay Islands Ecological Reserve established in 1979 (Figure 575).

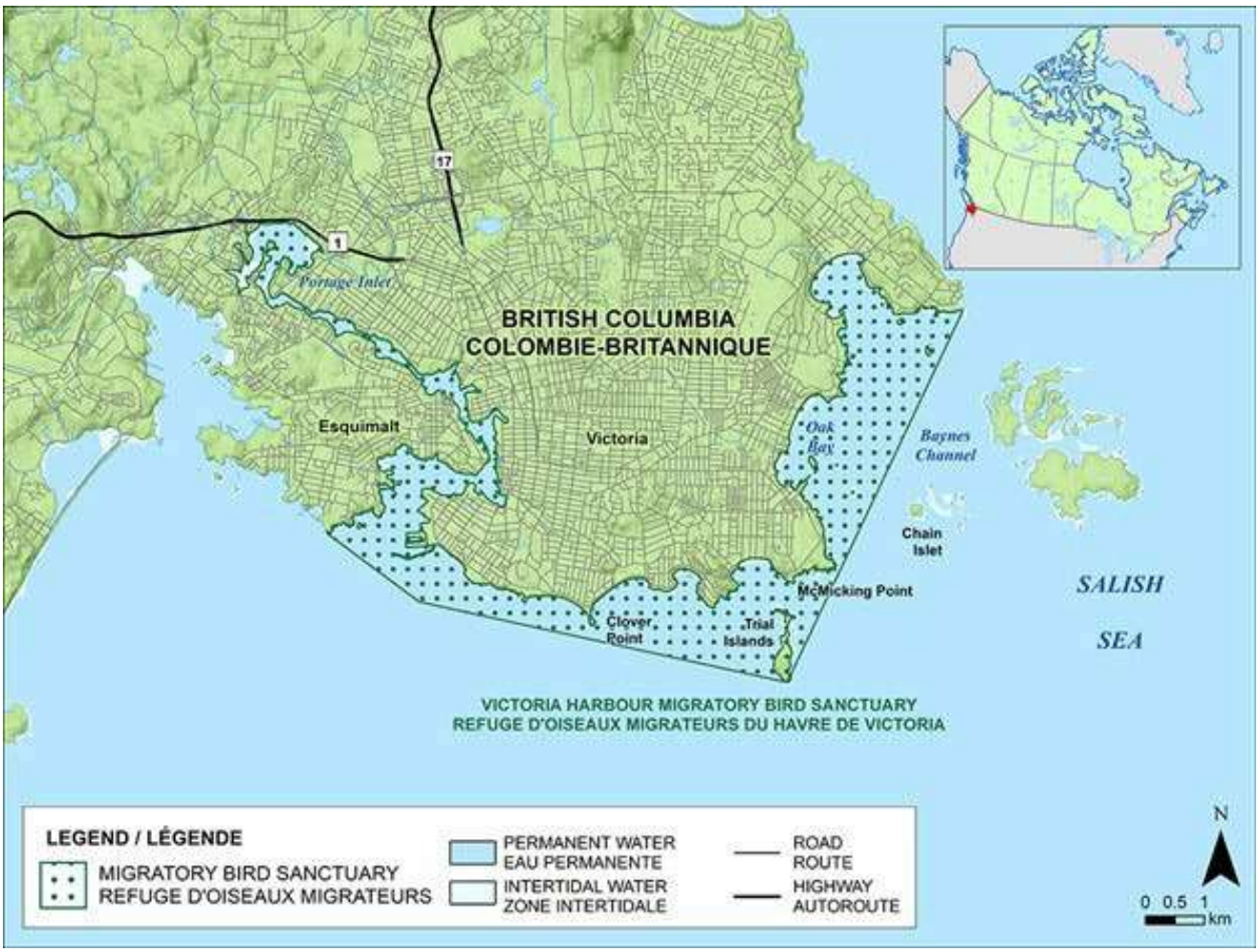


Figure 574. The Victoria Harbour Migratory Bird Sanctuary was designated in 1923 and was the first bird sanctuary established on the Pacific coast of Canada. Several seabird colonies lie within the reserve. *Map courtesy of Environment and Climate Change Canada.*

Historical summary: In 1978, one Black Oystercatcher nest held two broken eggs and one was empty (Table GI-820). Four adults were present. One pair of oystercatchers was reported nesting in 1987, but none were seen during the survey in 2005. Parks Canada surveyors found one nest with two eggs in 2006, and nesting was confirmed again in 2021, when Jacques Sirois observed a pair with a downy chick. One Glaucous-winged Gull nest found in 1978 was empty; there are no other records of gulls nesting on the island.

Table GI-820. Seabird nesting records for Jemmy Jones Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
12 Jun 1978	2	1S	523
5-23 Jun 1987	1		427
14 Jun 2005	0		57
2006	1		529
18 Jul 2021	1		524

Remarks: One Northwestern Crow was seen in 1978, but the cause of the broken oystercatcher eggs was unknown.

GI-825 CHATHAM ISLANDS

Location: *48°26'15"N 123°14'55"W; 92 B/6.*
South of Cadboro Point, north of Discovery Island. Chatham Islands officially include: two large, central islands, Strongtide Islet and Vantreight Island (formerly known as Camp Island) at the northwest corner of the group; Griffin Island and Alpha Islet (*48°26'03"N, 123°13'47"W*) at the southeast end of the group; and grassy rocks near Alpha Islet and Griffin Island.

Description: *82 ha; 32 m high; Forested; Grassy rock.*
Chatham Islands are a group of low islands, some of which are connected by extensive beach and tidal

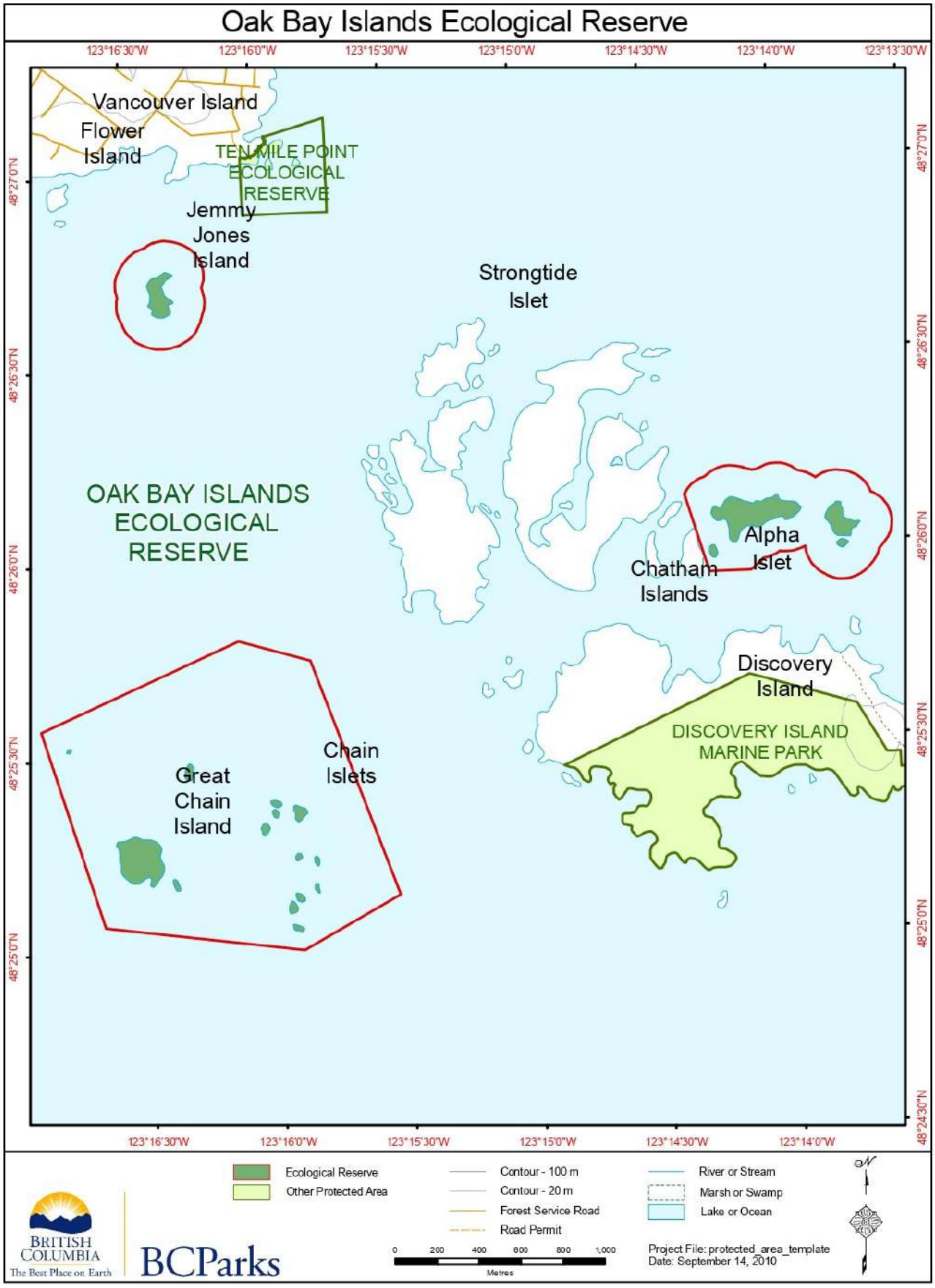


Figure 575. The Oak Bay Islands Ecological Reserve protects seabird colony areas on the eastern of the Chatham Islands, Jemmy Jones Island, and Chain Islets/Great Chain Island. *Map courtesy of BC Parks.*

flats. Higher areas are forested and many perimeter sections are covered with grasses, forbs, and shrubs above rocky and beach shorelines. Alpha Islet at the extreme southeast tip of the group, is a low, rocky, 0.7 ha islet, with a lush covering of grasses, forbs, and some rose bushes.[93] Griffin Island, just west of Alpha Islet, has an area of 3.1 ha and rises to a maximum elevation of 4 m. The eastern half of Griffin Island has similar vegetation communities as Alpha Islet; the western portion of Griffin Island has a stand of willow, Garry oak, arbutus, and trembling aspen.[93]

Most of Chatham Islands are part of Chatham Islands Indian Reserve 4. Griffin Island and Alpha Islet are not part of the reserve; they are included in the Oak Bay Islands Ecological Reserve established in 1979 (see Figure 575).

Historical summary: We have few records for these islands; only Black Oystercatchers have been recorded nesting. No oystercatchers were seen in the area by a BCPM crew in 1971 or by Vermeer et al. in 1987 (Table GI-825). Butler and Golumbia reported a pair of oystercatchers nesting on "Chatham Rock" and on one of the other Chatham Islands in 2005; we assumed that the location referred to as "Chatham Rock" corresponded to Alpha Islet or one of the other grassy rocks near Alpha Islet and Griffin Island. No eggs or young were seen at either location. One oystercatcher pair was present on Alpha Islet in 2012, with one adult sitting on a nest.

Table GI-825. Seabird nesting records for Chatham Islands. See Appendix 2 for codes.

DATE	BLOY	SOURCE
18 Jun 1971	0	523
5-23 Jun 1987	0	427
14 Jun 2005	2S	57, 529
11 May 2012	1	524

Remarks: According to Carson and Milnes,[93] some of the Chatham Islands were being grazed by sheep in 1977, Griffin Island was grazed by sheep and goats until 1971, and Alpha Islet had never been grazed by domestic animals. Carson and Milnes [93] also documented a group of more than eight river otters inhabiting Alpha Islet in 1977.

Twenty-one occupied and three unused Great Blue Heron nests were counted in the colony on the largest island on 7 June 1975 (Figure 576).[500] One nest was in a Douglas-fir tree, the rest were in lodgepole pines. Two mink were seen on the island at that time.

Figure 576. Valuable information on species other than seabirds is also collected during surveys of seabird colonies. A heronry was discovered on the largest of the Chatham Islands during explorations for nesting seabirds in 1975. *Photo by Paula Courteau.*

GI-830 DISCOVERY ISLAND

Location: *48°25'32"N 123°14'15"W; 92 B/6.*
East of Oak Bay and Chain Islets, south of Chatham Islands.

Description: *112 ha; 38 m high; Forested; Bare rock.*
Most of Discovery Island is forested, with extensive grassy areas around the edges. Numerous beaches alternate with rocky areas around the shoreline. There are a few small bare rocks just offshore. The southern 61 ha of the island was designated the Discovery Island Marine Provincial Park in 1972. The northern portion of the island is part of Discovery Island Indian Reserve 3. A lighthouse on Sea Bird Point at the eastern end of the island was built in 1886 and manned for 110 years before being fully automated in 1996. The lighthouse marks the junction of Haro and Juan De Fuca straits.

Historical summary: Munro collected downy young Pigeon Guillemots in 1927 (Table GI-830; Figure 577). We have no other nesting records for Pigeon Guillemots, but birds have been seen on and

around the island in a number of years since 1998. Butler and Golumbia reported one pair of Black Oystercatchers nesting in 2005.

Figure 577. Downy Pigeon Guillemot chicks collected by Munro in 1927 are the only confirmed breeding record for that species on Discovery Island, although guillemots have been seen around the island in several years since and probably still nest. *Photo by R. Wayne Campbell.*

Table GI-830. Seabird nesting records for Discovery Island. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
14 Jul 1927		x	274
18 Jun 1971		(0)	523
5-23 Jun 1987	0	(0)	158, 427
2 Jun 1998		(6)	524
14 Jun 2005	1		57
22 May 2013		(10)	524
20 Jun 2015		(12)	524
19 Jun 2016		(8)	524
4 May 2017		(10)	524
27 Mar 2022		(20)	524

GI-840 FIDDLE REEF

Location: *48°25'46"N 123°17'02"W; 92 B/6.*
In Baynes Channel, east of Oak Bay, south of Cadboro Bay.

Description: *Tidal reef with light beacon.*
A manned lighthouse was built on the tidal rock and was in operation from 1898 to 1958. In 1958 the wooden light tower was dismantled and replaced with a 7 m high cylindrical tower with an automated light. A ledge about 1 m wide extends around the top of the tower. The reef is within the Victoria Harbour Migratory Bird Sanctuary.

Historical summary: Pelagic Cormorants nested on the top ledge of the light tower from 1970 to 1978, but have not been reported nesting since (Table GI-840). Observers were able to access the stairs inside the light structure to view nests in 1973 and 1978: nests contained 32 young and five eggs in 1973; and all but two empty nests contained eggs in 1978. No other species have been recorded nesting; Blight reported no gulls nesting in 2009.[453]

Table GI-840. Seabird nesting records for Fiddle Reef. See Appendix 2 for codes.

DATE	PECO	SOURCE
17 Jul 1970	3-4e	523
2 Aug 1973	11[11]	523
12 Jun 1974	12	523
5 Jul 1975	10	523
30 Jun 1976	16	523
20 Jun 1977	24	523
14 Jun 1978	26[24]	523
5-23 Jun 1987	0	428
2013	0	522
2014	0	522
2021	0	505
15 Jul 2022	0	505, 524

Remarks: Two of 32 cormorant chicks found in nests in 1973 were dead. According to Carter et al.,[101] a change to the light tower structure displaced the cormorant colony on Fiddle Reef.

GI-850 MARY TOD ISLAND

Location: *48°25'39"N 123°17'55"W; 92 B/6.*
In Oak Bay, just northeast of Turkey Head and the Oak Bay Marina. Previously spelled Mary Todd Island; also known as Todd Island and locally as "Jimmy Chickens' Island."

Description: *3.2 ha; 8 m high; Grassy rock.*
Mary Tod Island is vegetated with grasses, forbs, and patches of shrubs. There are small beaches along the predominantly rocky shore. The island was privately owned but was donated to the municipality in 1929 and is now a designated park within the Oak Bay Parks and Recreation department of the Corporation of the District of Oak Bay. The park is undeveloped with unmaintained natural trails. The island is within the Victoria Harbour Migratory Bird Sanctuary.

Historical summary: Black Oystercatchers and Glaucous-winged Gulls have occasionally nested on this island, despite its proximity to the busy Oak Bay Marina and shoreline. However, the colony appears to have succumbed to intense human disturbance in

recent years. A pair of gulls was recorded nesting in 1986, and a pair of oystercatchers was reported nesting in 1987 (Table GI-850). A pair of oystercatchers was also reported nesting in 2005; one adult was sitting on a nest. An oystercatcher pair with one fledged young seen on Turkey Head near the Oak Bay Marina on the adjacent Vancouver Island shore on 14 and 15 July 2015 [524] may have nested on Mary Tod Island (Figure 578). Blight surveyed the island from a boat in 2009 and saw two gull nests; one among logs on the beach and one on the cliffy part of the island. In 2021, Sirois reported no oystercatchers or gulls nesting on the island, possibly for years. He visited the island in May and July 2022 and saw no sign of nesting, although two oystercatchers were foraging on the island in May.

Figure 578. Fledged juveniles are often seen around breeding colonies, but they may also have moved away from the colony. A Black Oystercatcher family seen on the Vancouver Island shoreline in 2015 may have originated from nearby Mary Tod Island. *Photo by Paula Courteau.*

Table GI-850. Seabird nesting records for Mary Tod Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
Jun 1986		1	420
5-23 Jun 1987	1		427
14 Jun 2005	1S		57, 529
13-20 Jun 2009		2S	30, 453
2021	0	0	505
22 May, 15 Jul 2022	0		505, 524

Remarks: Four people were on the island when Blight surveyed it from the water in 2010. Sirois noted abundant human traffic, often with pets, on the island in recent years.

GI-860 EMILY ISLET

Location: *48°25'37"N 123°17'36"W; 92 B/6.*
Oak Bay east of Mary Tod Island.

Description: *0.1 ha; 2 m high; Grassy rock.*
Emily Islet is a small rock with some grassy areas in crevices and hollows. Old driftlogs are scattered over the southern portion of the islet. The islet is within the Victoria Harbour Migratory Bird Sanctuary.

Historical summary: In 1978 and 1981, a Black Oystercatcher nest with two eggs was found; three empty nest scrapes were also found in 1978 (Table GI-860). Two Pigeon Guillemots were seen flying out from under driftlogs in 1978. Neither oystercatchers nor guillemots were recorded in 1987. In 2021, Sirois suspected one pair of oystercatchers nesting and stated that guillemots were not nesting. In 2022, two pairs of oystercatchers were seen from the water on 10 July, but Sirois suspected that one of the pairs was from nearby Harris Island (see Harris Island account below). On 15 July 2022, one pair of oystercatchers was again present and 15 guillemots were observed courting and socializing on the water near the islet. Blight reported no gulls nesting in 2009.[453]

Table GI-860. Seabird nesting records for Emily Islet. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
9 Jun 1978	1	x(2)	523
4 Jun 1981	1		523
5-23 Jun 1987	0	(0)	158, 427
19 Jun 2021	1eS	0	505
10, 15 Jul 2022	1eS	S(15)	505, 524

GI-870 LEWIS REEF

Location: *48°25'31"N 123°16'47"W; 92 B/6.*
East of Oak Bay, northwest of Great Chain Island, on the east side of Mayor Channel.

Description: *Tidal reef with light beacon.*
A light beacon was erected on this tidal reef in 1908.

Historical summary: Meugens first reported Pelagic Cormorants nesting on the light beacon in 1924, and Guiguet reported cormorants nesting every season between 1948 and 1960 (Table GI-870). In 1970, Campbell reported 3-4 nests on the "Blinker" Reef light; which we have assumed referred to Lewis Reef. Between 1974 and 1981, numbers nesting were stable, and almost all nests contained eggs or young, except in 1974, when observers thought that egg laying was still in progress (Figure 579). Nests were counted from the

water in 1979, but many young were visible. No cormorants have been reported nesting since 1981.

Figure 579. Pelagic Cormorants were recorded nesting on the Lewis Reef light beacon from 1924 to 1981. They had abandoned the light by 1983 and have not been seen nesting since. *Photo by R. Wayne Campbell, 12 July 1981.*

Table GI-870. Seabird nesting records for Lewis Reef. See Appendix 2 for codes.

DATE	PECO	SOURCE
1924	4	144
1948-60	x	144
4 Jun 1968	5	523
17 Jul 1970	3-4e	523
16 Jun 1971	17	523
3 Jun 1973	13[5]	523
2 Aug 1973	18[18]	523
12 Jun 1974	24[13]	70, 523
30 Jun 1976	23[23]	523
20 Jun 1977	23[23]	523
9 Jun 1978	21[21]	523
26 Jul 1979	25	523
12 Jul 1981	23[21]	523
29 May-13 Jun 1983	0	421
5-23 Jun 1987	0	428
2000	0	114
2013	0	522
2014	0	522
2021	0	505
15 Jul 2022	0	505, 524

Remarks: On 3 June 1973, two young people apparently visited the colony after it was surveyed and harvested all the eggs that were present.[523]

GI-880 HARRIS ISLAND

Location: *48°25'23"N 123°17'23"W; 92 B/6.*
East of Turkey Head at the south end of Oak Bay, on the west side of Mayor Channel.

Description: *0.1 ha; 3 m high; Grassy rock.*
This is a small rock with some grassy areas in crevices and hollows. Many old driftlogs are piled over the top of the rock. The island is within the Victoria Harbour Migratory Bird Sanctuary.

Historical summary: Campbell first recorded Pelagic Cormorants nesting in 1970; cormorants were attending six nests, but they were all empty (Table GI-880). Greater numbers were nesting in 1971; most nests were located on the northeast side of the island. Cormorants appeared to be nesting successfully in 1974 but have not been reported nesting since.

Nesting by Glaucous-winged Gulls was first recorded by a BCPM crew in 1971. Gulls were nesting through the 1970s and were last recorded nesting during the major gull survey conducted in 1986. In 1979, many young were seen away from nests (Figure 580) and most nests were empty; two nests held one egg each. The survey in 1981 was early in the season and only a few nests held partial clutches of one or two eggs. This colony was not surveyed by Blight in 2009.[453] Sirois kayaked around the island and reported no sign of gulls nesting in 2021.

Figure 580. The survey of Harris Island in 1979 was conducted late in July and many Glaucous-winged Gull chicks were seen away from their nests. *Photo by R. Wayne Campbell.*

Five Black Oystercatchers were present in 1971, but nesting was not reported until 1977, when a nest with two eggs was found. Single nests with eggs were also seen in 1979 and 1981. Vermeer et al. did not find oystercatchers nesting in 1987, but an adult was seen sitting on a nest in 2005, and one pair was suspected nesting in 2021 and on 15 July 2022 (in 2005, Butler and Golumbia [57] listed one nest for Harris Island and also one nest for "Harris Islet" [see Table 1 in that publication], but the nest listed for "Harris Islet" was a mistake due to a duplicate entry [472]). No oystercatchers were visible from the water on 10 July 2022, and Sirois speculated that a second pair present on nearby Emily Island at that time may have been the resident pair from Harris Island that had been flushed off the island by a roosting Bald Eagle.

Pigeon Guillemots were also present in 1971; nesting was confirmed in 1977 when a nest with one egg was found. A nest with one egg was also found in 1978, located under driftlogs. Sirois counted 35 guillemots on and around the island in 2021 and reported that the guillemot colony on Harris Island has been well established for years.

Remarks: One dead adult Pigeon Guillemot was found under driftlogs in 1978. A Bald Eagle was perched on a log on the island on 10 July 2022.

Sixteen gull chicks were banded in 1979.

Table GI-880. Seabird nesting records for Harris Island. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
17 Jul 1970	6[0]				523
16, 18 Jun 1971	22		41	S(13)	523
12 Jun 1974	30[26]				70, 523
20 Jun 1977	0	1	28[28]	1(2)	523
9 Jun 1978	0	1	47[38]	1	523
26 Jul 1979		1	36		523
5 Jun 1981		1	19[6]		523
29 May-13 Jun 1983	0				421
Jun 1986			22		420
5-23 Jun 1987	0	0		S(9)	158, 427, 428
2000	0				114
14 Jun 2005		1S			57, 529
2013	0				522
2014	0				522
19 Jun 2021	0	1eS	0	S(35)	505, 524
10, 15 Jul 2022		1eS		S(5)	505, 524

GI-890 CHAIN ISLETS/GREAT CHAIN ISLAND

Location: *48°25'14"N 123°16'31"W* (Great Chain Island)*; 92 B/6.*
West of Discovery Island, east of Oak Bay, between Mayor Channel and Hecate Passage. Previously known as Chain Islands. We have included Great Chain Island (which officially refers to only the one large island), the rock just southeast of Great Chain Island (islet #1; officially unnamed), and all the Chain Islets (which officially refers to all islets between islet #2 and 19) in this colony (Figure 581).

Description: *4.7 ha; 14 m high; Grassy rock; Bare rock.*
These islets are a cluster of at least 30 exposed rocky reefs, with some steep faces, crevices, and boulders around shoreline areas. There are small gravel beaches on Great Chain Island, which is by far the largest island in the group at 3.4 ha. Most islets are bare rock with sparse patches of vegetation; Great Chain Island is covered with grasses, forbs, and patches of shrubs (Figure 582).

Great Chain Island and Chain Islets are part of the Oak Bay Islands Ecological Reserve established in 1979 (see Figure 575).

Historical summary: The Chain Islets/Great Chain Island colony is readily accessible from the urban centre of Victoria and has been frequently visited for over a century, especially since the 1940s. Major changes in species composition and nesting populations have been documented. Five seabird species have been found nesting. Black Oystercatcher was the first species recorded nesting when C.F. Newcombe collected eggs in 1895 (Table GI-890). The location for those oystercatcher egg

specimens was given as Chain Island near Victoria and may have referred to Great Chain Island, although the entire group was called Chain Islands at that time. After a lapse of almost 20 years, Burton collected Pigeon Guillemot eggs in 1913 and then again in 1919. The location given for those specimens was "rock island near Victoria" in 1913 and simply "Victoria" in 1919. We have assumed that those eggs were collected on the Chain Islets/Great Chain Island colony. Meugens confirmed Pelagic Cormorant and Glaucous-winged Gull nesting in 1924. The fifth nesting species, Double-crested Cormorant, colonized the islets 50 years later.

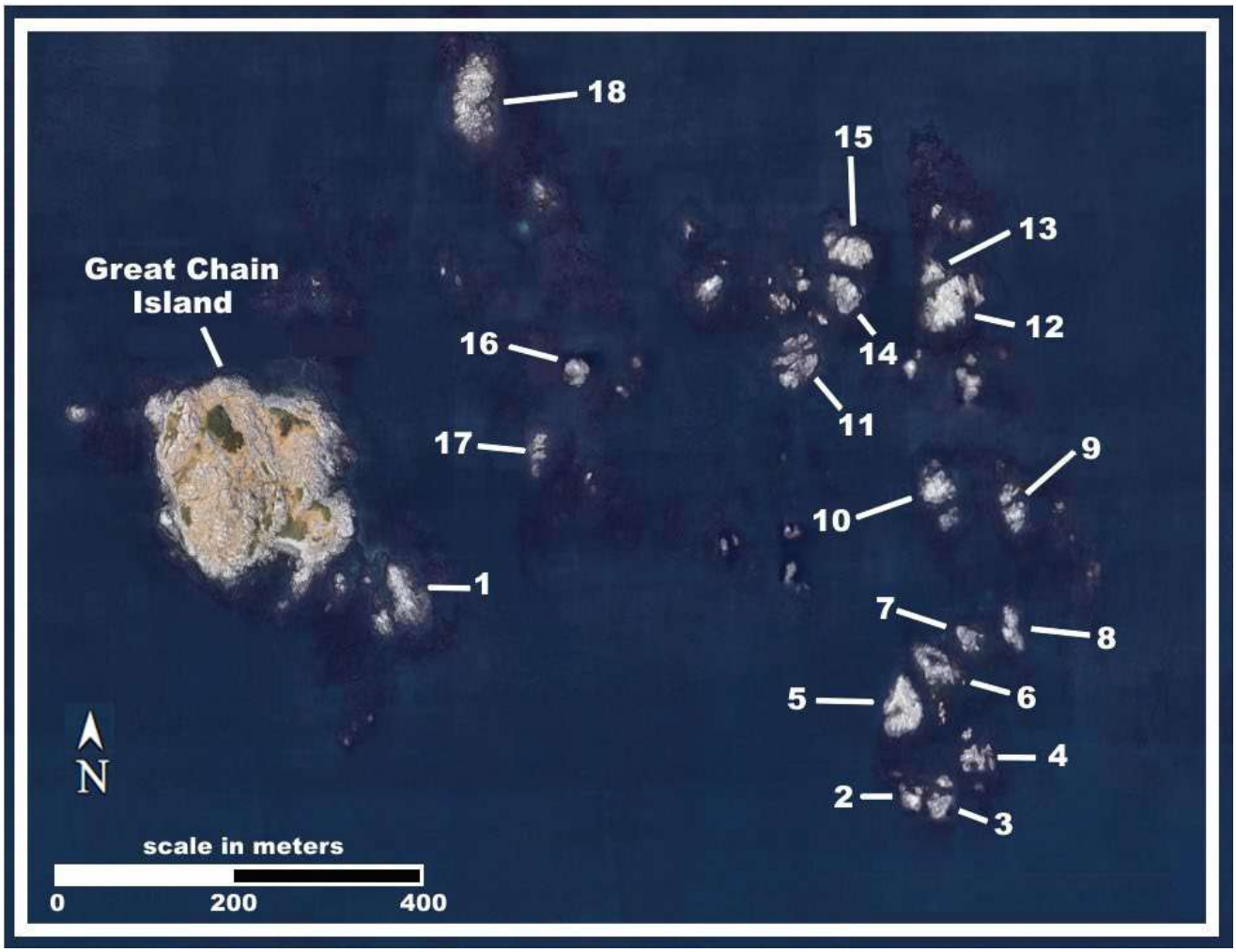


Figure 581. Great Chain Island and numbered islets in the Chain Islets colony referred to in the text. *Base map image from Google Earth.*

Figure 582. Great Chain Island and the associated Chain Islets are a cluster of about 30 small rocks and islands. Great Chain Island is the largest island in the group and much of it is covered with grasses and shrubs. Smaller islets are bare rock with scant vegetation. Photos here show (this page and next page, top to bottom): an overview of the entire Chain Islets/Great Chain Island group; Great Chain Island; shoreline and higher rocky habitat on Great Chain Island with nesting Double-crested Cormorants visible on the skyline (left); view of some of the islets looking back across Great Chain Island at the Vancouver Island shoreline in the distance (right); and views of some of the larger of the Chain Islets, including islets #1, #5, #10, #12, and #14 (see Figure 581). *Photos by R. Wayne Campbell, 1973 to 1981.*

Table GI-890. Seabird nesting records for Chain Islets/Great Chain Island. See Appendix 2 for codes.

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
15 Jun 1895			x			99, 536ae
13 Jun 1913					x	535c
15 Jun 1919					x	523[a]
1924		15+		x		144
Jun, Jul 1941		x		x	x	144
24 Jun 1943		14[14]	4e	80[80]+	10e	523
6 Sep 1943		x				523
17 Jun 1945		40e	3e	x	x3	523
3 Jun 1946			x			196
1948-60		x				144
12 Jul 1950		14[14]+				11
1950-53					x	144
1953		x	x	x	x	474, 523
29 Jul 1954			x			523
14 May 1955			x			536af
17 Jul 1955				1,000e	x(45)	144
16 Jun 1958					x	536ag
17 Jul 1958				x		474, 523
1959			x			314
29 May 1960		x	4e	200e/700e[b]	14+S	144, 523
19 Jun 1960	0	72-74		700-1,000e		144
4 Jun 1968		140e	1+	814[c]	40+S	523
17 Jul 1970		188[188]				523
16, 18 Jun 1971		151	1+	1,000's	S(51)	523
3 Jun 1973		129[29]+	3e	1,000e	30-50+S	523
22-23 Jun 1973		220[205]	4[4]	1,548[1,488][d]	x8(41)	523
19, 25 Jul 1973		245[226]	x	x	x12	523
11 Jun 1974		185[55]	5e	1,764[1,659]	30e(58)	70, 523
31 Jul 1974	0	176[120]				523
3, 6 Jun 1975		12[12]+	7[2]+	x		500
5 Jul 1975		88[88]+	1+	303[301]+	x2	523
30 Jun 1976	2[2]	281[229]	4[2]	1,825[1,624]	x	523
20 Jun 1977	5[4]	235[168]	6e	1,838[1,789]		523
26 Jul 1977	11[10]					523
9 Jun 1978	14[10]	215[95]	7e	1,956[1,765]	x(20)	523
Jun-Jul 1979	21[18]	371[312]	4e	2,080		523
23 Jun 1980	26	178	6e	[1,324]	x(30)	523
5 Jun 1981	17[1]	27[1]+	4e	1,880[1,508]	S(60)	523
12 Jul 1981	79[51]	367[242]			x	523
29 May-13 Jun 1983	135	203				421
3 Aug 1983	190[155]	381[315]	S	x	x(13)	72
11 Jul 1984	297[234]	163[121]	x	x	x	523
Jun 1986				2,432		420
5-23 Jun 1987	510	248	4		S(74)	158, 427, 428
May-Jul 1989	440	175				375
8 Aug 1990	702[e]	204				43
1993	339	41				114, 266, 376
18 Jul 1993				x		524
1994	444	51				114, 266, 376
1995	432	30				114, 266
1998	300	20				114, 266
1999	100	7				114, 266
Jul-Oct 2000	95	41				114
14 Jun 2005			4eS			57, 529
2006	40	19				522
2007	26	21				522

Table GI-890. cont'd

DATE	DCCO	PECO	BLOY	GWGU	PIGU	SOURCE
20 Jul 2008	x					45
19 Jun 2009				2,066[1,410]		30
8 Aug 2009	x					45
2009	16[0]	0				1, 244, 522
2010	16[0]	0				244
24 Jul 2011	16[0]			x		45
22, 24 Jul 2012	16[0]			x	x(20)	45
2013	0	0				522
28 Jul 2013			S	x	S(< 45)[f]	524
2014	0	0				101, 522
7 Jul 2014			2			524
19 Jun 2016					(20)	524
21 Jun 2019				1,012+[g]		596
19 Jun 2021	0	0	S	x	x(67)	524
25 Jul 2022	0	0	S	x	S(25)	524
15 May 2023				x	S(172)	524
1 Sep 2023	0	5				481, 524

[a] A copy of an egg specimen card from Burton is on file in the BCNRS,[523] but we do not know the present location of this specimen.
[b] David Stirling and party estimated 200 nests on the colony and 700 pairs present on this date in 1960.
[c] Blight [30] listed 1,754 pairs nesting in 1968 but that was an error.
[d] Total was previously reported as 1,550 nests [523] due to a summation error.
[e] We previously [335] listed a total count of 686 nests given by Breault [43] for this date, as have others,[114, 266] but a more careful perusal of his data revealed that this was a mistake. Breault counted 686 nests during his survey late in the season on 8 August to determine productivity (see his Appendix 10), but he counted 702 nests during his initial nest survey on 25 June (see his Table 9).
[f] The count given for Pigeon Guillemots in 2013 included both Chain Islets/Great Chain Island and Trial Islands.
[g] Glaucous-winged Gull nests in 2019 were counted from drone imagery and included only visible nests with adults sitting on them on Great Chain Island; nests could not be counted on other islets.[596] Applying an adjustment factor to the drone counts, Rodway et al.[602] estimated a range of between 1,612 and 2,169 pairs nesting on the Chain Islets/Great Chain Island colony in 2019.

Survey coverage has varied over the years and it was not always possible to ascertain which islets were surveyed in some years. A number of early records refer just to Great Chain Island. The first thorough survey of all the islets was conducted by Drent in 1968. Survey methods have also varied: most nest counts have been conducted from land, but some cormorant surveys were conducted from the water, and drone imagery was used to census nesting gulls in 2019. Counts of cormorant nests made from land and water could be compared in some years, and suggest that, on Chain Islets/Great Chain Island, counts from the water underestimate total nesting populations for both Double-crested and Pelagic cormorants. In 1971, Great Chain Island and islets #5 and 18 were boated around on 16 June and Great Chain Island and islets #5, 10, 12, and 14 were landed on to count nests on 18 June; other islets were not checked. On islet #5 during those surveys, 30 Pelagic Cormorant nests were counted from the water on 16 June, whereas 37 nests were counted from land on 18 June. In 1975, Great Chain Island was visited in June and the smaller islets were visited in July. A full census was not conducted that year. In 1983, cormorant nests were counted from the water by Vermeer and Rankin in May-June and from land by the BCPM party in August; the survey from the water tallied 71% of the Double-crested Cormorant and only 53% of the Pelagic Cormorant nests seen from land. Cormorant nests were counted from the water in 1989, which may account for the relatively lower count that year compared to 1987 and 1990, when nests were counted from land. Cormorant nest counts since 1990 have been conducted from the water.

Black Oystercatcher Trends. Numbers of Black Oystercatchers reported nesting have varied from one to seven pairs. Much of the difference among years likely relates to the thoroughness of the surveys and there is no evidence of population change. Oystercatchers have been confirmed nesting on Great Chain Island and on islets #1, 15, and 18, and have been suspected nesting on islets #7, 9, and 16. Ted White reported four pairs nesting in 1943 and found one nest with three eggs. In 1945, he saw three pairs and found a nest with two eggs on Great Chain Island; his observations in 1943 may also have been on Great Chain Island. Stirling's observations of four pairs in 1960 were also on Great Chain

Island. In 1973, three pairs were recorded on Great Chain Island on 3 June, and three nests with eggs were found there on 22 June (Figure 583); a fourth nesting pair with two small chicks was seen on islet #15. On 25 July 1973, nesting was not confirmed, but several pairs of excited adults were seen on islet #18, and young were likely present. In 1974, two nests with eggs (see Figure 583) were found and another pair was suspected nesting on Great Chain Island, one nest with three eggs was found on one of the group of islets #12-15 (probably #15), and one pair was suspected nesting on islet #18. In 1975, seven nests, only two of which held eggs, were found around Great Chain Island (1, 1, 1, and 4 nests on the north, west, south, and east sides of the island, respectively) in early June, and one nest with two eggs and a newly hatched chick was found on islet #15 on 5 July. Nests were again found on Great Chain Island (3 nests; only 1 of which held eggs) and islet #15 (1 nest with 2 eggs) in 1976. In 1977, observers reported three pairs nesting on Great Chain Island and three pairs on the smaller islets. In 1978, four pairs were suspected nesting on Great Chain Island (1 nest with 3 eggs and 1 empty nest were found), nests with eggs were found on islets #15 and 18, and one empty nests was found on islet #9. In 1979, nesting was reported on Great Chain Island (2 nests with eggs), islet #15 (1 empty nest), and islet #18 (1 pair suspected nesting). Locations of nest sites were not specified in 1980: six pairs were suspected nesting and one nest with two eggs was found. In 1981, nests with eggs were found on islets #1 (2 nests) and #16, and a pair was suspected nesting on islet #7. Four oystercatcher nests were reported on two islets in 1987. In 2005, four pairs were suspected nesting and two empty scrapes were found on islet #9. Most recently, two pairs of oystercatchers, one with two and one with three recently fledged young were recorded on the islet (#1) just east of Great Chain Island in 2014. We considered the survey results from 2005 to be the best current population estimate for the entire colony.

Figure 583. Black Oystercatcher nests of shells and pebbles found on Great Chain Island in 1973 (left) and 1974. *Photos by R. Wayne Campbell, 22 June 1973 and 11 June 1974.*

Pelagic Cormorant Trends. The abundance and distribution of nesting Pelagic Cormorants have changed dramatically since Meugens reported at least 15 pairs nesting on one of the "lesser" Chain Islets in 1924. In 1943, Ted White reported a small colony of 14 nests with eggs on 24 June, and noted about 75 adults on nests and 14 large young still in nests on Great Chain Island on 6 September. The 1943 observation is the only record of Pelagic Cormorants nesting on Great Chain Island prior to the 1970s. Two years later, White recorded about 40 nests, each containing one to four eggs, on three unspecified islets, but did not report nests on Great Chain Island. Guiguet also reported Pelagic Cormorants nesting on three islets between 1948 and 1960, and specifically stated that there were no nests on Great Chain Island. The 14 Pelagic Cormorant nests inspected in 1950 were located on one of the islets directly north of Great Chain Island, likely islet #18. On 19 June 1960, Gornall tallied 70 nests on the rock (#1) just southeast of Great Chain Island, but only eight contained eggs or small young. On the same date, Guiguet recorded 2-4 pairs nesting on islet #18 (Table GI-890.1).

The size of the Pelagic Cormorant nesting population increased dramatically between 1960 and 1983 and then declined (Table GI-890.1). In 1968, Drent counted 129 nests, most of which were empty, and estimated a total of 140 nests in the colony. Cormorants were nesting on five of the smaller islets by 1968, and nests were found on seven islets in 1970; no nests were found on Great Chain Island in

those years. Great Chain Island was re-colonized in 1971 and numbers nesting there increased more than tenfold over the next two decades, peaking at 340 nests in 1983.[72] Concomitantly, the number of nests on the smaller islets was highest in 1970 and, with considerable inter-annual fluctuation, decreased to only 21% of this maximum by 1983. Numbers of islets used for nesting also decreased over that period: nests were found on four of the smaller islets in 1971 and 1973 (Figure 584), and on only two of those islets from 1974 to 1983, except for one isolated nest found on a third islet in 1977. After 1983, Pelagic Cormorants were not recorded nesting on the smaller islets again until 2023. Numbers nesting on Great Chain Island decreased after 1983 and especially after 1990, and nesting was last recorded there in 2007.

Figure 584. The size of the Pelagic Cormorant breeding population on Chain Islets/Great Chain Island increased rapidly through the 1970s and early 1980s. In 1973, Pelagic Cormorants were nesting on Great Chain Island and on four of the Chain Islets. Nests held eggs on 22 June (top two photos) and a mix of eggs and young by 19 July 1973. *Photos by R. Wayne Campbell.*

After a 40-year hiatus, Pelagic Cormorants were confirmed nesting again on islet #5 by several observers in 2023. On 9 July, 23 observers, including Daniel Dönnecke, Liam Ragan, and Jacques Sirois photographed at least three nests with adults on the nests (Figure 585). On 1 September, Marilyn Lambert, Geoffrey Newell, Marie O'Shaughnessy, and Jacques Sirois documented five nests with large young.

The distribution of Pelagic Cormorant nests on Great Chain Island changed over the years that detailed records were kept. In 1971, 19 nests were located on the northwest side of the island and seven were on the south side. In 1973, nests were located in three clusters on the northwest portion of the island, with, in clockwise order, 76, 32, and 38 nests (total of 146 nests) on 22 June and 74, 46, and 34 nests (total of 154 nests) on 25 July, respectively; no nests were recorded on the south side of the island. Another count of all three clusters combined made on 19 July 1973 tallied 157 nests. In 1976, most nests were found in the northwest area, but nests were also located on the southwest (16 nests) and south (19 nests) sides of the island. Overall numbers decreased on Great Chain Island in 1977, but 11 nests were found in a new nesting location on the

northeast side of the island. Four sub-colonies were mapped on Great Chain Island in 1978, located on the northwest (87 nests), southwest (17 nests), southeast (11 nests), and northeast (21 nests) parts of the island. Those four locations, respectively, had 158, 19, 19, and 64 nests in 1979 and 99, 59, 62, and 120 nests in August 1983. Counts have not been separated by location in subsequent years.

Figure 585. In 2023, Pelagic Cormorants were discovered nesting on the Chain Islets/Great Chain Island colony for the first time since 1983. Three of the five nests seen are visible in this photo. *Photo by Liam Ragan, 9 July 2023.*

Most Pelagic Cormorant nests in the Chain Islets/Great Chain Island colony have been located on ledges on steep rocky areas around the islets, but many have been placed in more level areas, often mixed with Glaucous-winged Gull and later Double-crested Cormorant nests. A few Pelagic Cormorant nests built on driftlogs and planks were reported in 1968 and 1973 (Figure 586). In 1960, Gornall noted that some Pelagic Cormorant nests were occupied by gulls. On 23 June 1973, two of the gull nests counted on islet #13 held three gull eggs and a single Pelagic Cormorant egg (Figure 587); all four eggs were being incubated by gulls in each nest. Pelagic Cormorant eggs were also found in several gull nests in 1980.

Figure 586. An unusual nesting location for Pelagic Cormorants was seen on the Chain Islets/Great Chain Island colony in 1968 and 1973. A few nests were built on top of driftlogs along the shore. *Photo by R. Wayne Campbell, 22 June 1973.*

Table GI-890.1. Pelagic Cormorant nest counts on separate islets in the Chain Islets/Great Chain Island colony between 1960 and 1984 (total number of nests followed by number of nests with eggs or young in brackets). Islet numbers refer to those on Figure 581. A dash indicates that no data were reported for that islet.

	Year[a]														
Islet	**19 Jun 1960**	**4 June 1968**	**17 Jul 1970**	**18 Jun 1971[b]**	**22-23 Jun 1973**	**19, 25 Jul 1973**	**11 Jun 1974**	**31 Jul 1974**	**30 Jun 1976**	**20 Jun 1977**	**9 Jun 1978**	**28 Jun, 26-30 Jul 1979[c]**	**12 Jul 1981**	**3 Aug 1983**	**11 Jul 1984**
Great Chain Island	0	0	0	26	146[139]	157[155]	148[49]	127[96]	196[160]	127[92]	136[71]	260[226]	276[220]	340[291]	163[121]
1	70[8]	42[25]	40[40]	-	0	0	0	0	0	0	0	0	0	0	0
5	0	9[0]	20[20]	37	30[30]	30[27]	14[0]	18[6]	31[19]	33[22]	20[0]	29[21]	72[18]	8[5]	0
10	0	-	1[d]	0	0	0	0	0	0	0	0	0	0	0	0
12		27[2]	29[29]	47	35[31]	42[32]	23[6]	31[18]	54[50]	74[53]	59[24]	82[65]	19[4]	33[19]	0
14	0[e]	-	9[9][d]	11	0	0	0	0	0		0	0	0	0	0
15		26[5]	63[63]	-	3[3]	6[3]	0	0	0	1[f]	0	0	0	0	0
18	2-4	25[1]	26[26]	30[g]	6[2]	10[9]	0	0	0		0	0	0	0	0
Total on smaller islets	*72-74*	*129[33]*	*188[188]*	*125*	*74[66]*	*88[71]*	*37[6]*	*49[24]*	*85[69]*	*108[76]*	*79[24]*	*111[86]*	*91[22]*	*41[24]*	*0*
Total	**72-74**	**129[33]**	**188[188]**	**151**	**220[205]**	**245[226]**	**185[55]**	**176[120]**	**281[229]**	**235[168]**	**215[95]**	**371[312]**	**367[242]**	**381[315]**	**163[121]**

[a] For sources see Table WV-930.
[b] Nests contents were not reported and islets #1 and 15 were not checked in 1971; some nests may have been missed.
[c] In 1979, nests were counted on Great Chain Island on 28 June and on the smaller islets on 26-30 July.
[d] These nests found in 1970 were likely on islets #10 and 14, but there was some uncertainty in determining which islets were indicated in the original field notes.
[e] Guiguet in 1960 reported no nests on a third nesting location to the northeast of Great Chain Island, which likely referred to one of these islets.
[f] Islet location for this isolated nest found in 1977 was not specified but was likely one of these islets.
[g] Counted from the water.

Figure 587. Pelagic Cormorants had laid an egg in two Glaucous-winged Gull nests located on islet #3 of the Chain Islets in 1973. The gull nests also contained full clutches of gull eggs and the adult gulls were incubating all four eggs in each nest. *Photos by R. Wayne Campbell, 23 June 1973.*

Double-crested Cormorant Trends. Double-crested Cormorants were first documented nesting in 1976 when two nests with four eggs each were found on islet #12. The species nested only on islet #12 until 1981 when Great Chain Island was first colonized. In 1981, no Double-crested Cormorant nests were seen on Great Chain Island on 5 June, but 59 nests had been built there by 12 July (Figure 588). Twenty nests were counted on islet #12 in 1981, and eight nests were seen there in August 1983, but that islet was abandoned by 1984, and nesting occurred only on Great Chain Island in subsequent years. In August 1983, Double-crested Cormorants were nesting in association with Pelagic Cormorants in three of the four areas on Great Chain Island where Pelagic Cormorants were nesting (there were 133, 6, and 24 Double-crested Cormorant nests in the areas where there were 99, 59, and 62 Pelagic Cormorant nests, respectively) and in a separate, fourth cluster of 19 nests located in the centre of the island. The nesting population on Great Chain Island increased tremendously after 1981, reaching a maximum size of 702 nests in 1990 (see footnote to Table GI-890). The population then declined through the 1990s, and, as with Pelagic Cormorants, was extirpated by about 2010 (Figure 589). Adults with young at nests were reported on Great Chain Island in 2008 and on 8 August 2009; about 50 birds were recorded in 2008 and 40 birds in 2009. Different reports were made for 2009: Adkins and Roby [1] reported no nests; Lambert [244] recorded about 16 nests towers still present in 2009 through to 2012, but stated that no eggs or chicks were seen in those years. Lambert noted no attempts at breeding in 2012, and no nests were recorded in 2013 and 2014, or from 2021 to 2023, although remains of long-abandoned nests were still visible in 2021.[524]

Figure 588. Double-crested Cormorants were first recorded nesting on the Chain Islets/Great Chain Island colony in 1976 when two nests were found on islet #12. They colonized Great Chain Island in 1981; there were no nests there on 5 June, but 59 nests had been built by 12 July. Pelagic Cormorants were also nesting in most of the areas on Great Chain Island where Double-crested Cormorants built their nests. This photo shows a mix of Pelagic (bottom right) and Double-crested cormorant nests. Eggs are visible in the Double-crested Cormorant nest at the bottom left and in the Pelagic Cormorant nests. *Photo by R. Wayne Campbell, 12 July 1981.*

Figure 589. The Double-crested Cormorant colony on Chain Islets/Great Chain Island reached a maximum size of 702 nests in 1990. By 1994 when this photo was taken, the population had decreased to 444 nests. All nests were located on the top of Great Chain Island at that time. Numbers nesting continued to decrease, and the colony was extirpated by about 2010. *Photo by R. Wayne Campbell, 1994.*

Glaucous-winged Gull Trends. Glaucous-winged Gulls have been recorded nesting on Great Chain Island and 17 of the smaller islets, with the majority nesting on Great Chain Island (Table GI-890.2; Figure 590). David Stirling first estimated the size of the nesting population at 1,000 pairs in 1955 (he did not specify location, but we suspect he was referring to the entire group). On 29 May 1960, on Great Chain Island, Stirling inspected 78 nests (68 contained eggs and 10 were empty) and estimated totals of 200 nests and 700 pairs of gulls present. Later, on 19 June 1960, Gornall inspected 45 nests with eggs or small young, noted many empty nests, and estimated over 500 nests in total on Great Chain Island. He also counted 25 nests (3 empty) on islet #1 (rock just southeast of Great Chain Island), and inspected 10 and 36 nests with eggs, and estimated 12 and 50 nests in total, on two of the other islets, respectively. Gornall made an overall estimate of 700-1,000 pairs nesting in the entire colony. In 1968, Drent conducted the first thorough nest count, stating that, "Great Chain [Island was] worked over thoroughly, 2 observers, 3 hours; outlying islets were visited subsequently." In total, Drent counted 754 nests on Great Chain Island and 60 nests on five of the smaller islets (Table GI-890.2). He gave estimates of 900 and 100 gulls present on Great Chain Island and the smaller islets, respectively, but we assumed that the thorough nest count, especially on Great Chain Island, was an accurate estimate of the breeding population in 1968.

Figure 590. Glaucous-winged Gulls nest on almost all the islets in the Chain Islets/Great Chain Island colony. Nests are distributed over most of the higher rocky and grassy habitat on the islets. *Photos by R. Wayne Campbell, 22 June 1973.*

Gull populations increased dramatically after 1968. The next complete count of nests conducted by the BCPM in 1973 (Figure 591) tallied almost twice as many nests as Drent had found in 1968. Except for a low count in 1980, numbers continued to increase through to 1986, when Vermeer and Devito counted 2,432 nests, representing a tripling of the population since 1968 and a 57% increase since 1973. The low count in 1980 may be an underestimate as no empty nests were recorded that

year. After 1986, a full census of gulls was not conducted again until Blight's study in 2009. The number of nests counted in 2009 indicated a 15% decrease since 1986, but was still larger than any counts prior to 1986. A large proportion (32%) of nests were empty in 2009, especially on Great Chain Island; 39% of nests on Great Chain Island were empty compared to 12% of nests that were empty on the smaller islets (Table GI-890.2). The much greater proportion of empty nests on Great Chain Island may suggest some disturbance on that island prior to the survey. In other years, up to 20% of nests have been empty.

Figure 591. Numbers of Glaucous-winged Gulls nesting on Chain Islets/Great Chain Island increased rapidly from 814 nests in 1968 to a peak of 2,432 nests in 1986. Chicks were just hatching when the survey in 1973 tallied 1,548 nests. Over 2,000 nests were counted during the last complete survey of the colony in 2009, making Chain Islets/Great Chain Island the second largest Glaucous-winged Gull colony in BC. *Photos by R. Wayne Campbell, 22 June 1973.*

Table GI-890.2. Glaucous-winged Gull nest counts on separate islets in the Chain Islets/Great Chain Island colony between 1974 and 2009 (total number of nests followed by number of nests with eggs or young in brackets). Islet numbers refer to those on Figure 581. Slashes indicate that counts were not separated by islet. A dash indicates that no data were reported for that islet.

Islet	Year[a]										
	4 June 1968	22-23 Jun 1973	11 Jun 1974	5 Jul 1975	30 Jun 1976	20 Jun 1977	9 Jun 1978	28 Jun, 26-30 Jul 1979[b]	5 Jun 1981	Jun 1986[c]	19 Jun 2009
Great Chain Island	754[709]	1,284[1,232]	1,458[1,397]	-	1,599[1,415]	1,514[1,474]	1,706[1,577]	1,834[1,683]	1,587[1,355]	1,876	1,539[946]
1	12	15[13]	33[30]	35[35]	40[38]	/	24[17]	32	35[23]	66	/
2	-	0	-	1	-	/	0[d]	-	1[e]	-	/
3	-	1	-	2[2]	-	/	0	-	1[0]	-	/
4	-	0	-	5[5]	-	/	0	-	1[e]	-	/
5	10	73[73]	108[95]	67[67]	33[32]	/	42[26]	41	53[30]	133	/
6	-	0		21[21]		/	6[5]	9	5[1]	17	/
7	-	1	6[5]	-	-	/	1[0]	-	1[0]	-	/
8	-	0		5[5]	-	/	1	-	6[2]	8	/
9	-	3[3]	43[35]	-	-	/	3[1]	-	6[0]	24[f]	/
10	-	22[22]		1	25[22]	/	20[17]	24	18[8]	31	/
11	-	3[3]	-	-	-	/	0	-	15[9]	2	/
12	15	62[62]		76[76]	55[51]	/	48[40]	54	74[33]	109	/
13	-	0	89[75]	23[23]	2[2]	/	8[8]	8	-	-	/
14	-	9[9]		-	-	/	14[14]	17	13[5]	25	/
15	10	42[39]		32[32]	35[32]	/	45[33]	23	30[20]	85	/
16	-	0	-	-	-	/	0	-	2[0]	-	/
17	-	-	-	-	-	/	0	-	-	-	/
18	13	33[30][g]	27[22]	34[32]	36[32]	/	38[26]	38	32[20]	56	/
Total on smaller islets	*60*	*264[256]*	*306[262]*	*303[301]*	*226[209]*	*324[315]*	*250[188]*	*246*	*293[153]*	*556*	*527[464]*
Total	**814**	**1,548[1,488]**	**1,764[1,659]**	**n/a**	**1,825[1,624]**	**1,838[1,789]**	**1,956[1,765]**	**2,080**	**1,880[1,508]**	**2,432**	**2,066[1,410]**

[a] For sources see Table WV-930.
[b] Nests were counted on Great Chain Island on 28 June and on the smaller islets on 26-30 July; most nests were empty on the smaller islets because young were large and wandering away from nests.
[c] Nest contents were not reported in 1986.
[d] Two old nests were seen.
[e] One depredated egg was seen.
[f] Location was interpreted from Figure 1 in Vermeer and Devito; [420] we assumed that their islets #5 and 7 corresponded to the north and south parts of islet #9, as identified in previous surveys by the BCPM.
[g] Nest count was listed for islet #17 in the original records; [523] we assumed that was a mistake as no nests have been found on that islet in other years.

We have no complete nest counts since 2009. Large gull chicks with adults were visible at nests on 24 July 2011, 24 July 2012, and 28 July 2013. In 2019, Lalach et al.[596] conducted a drone survey of the colony and, from photographs, obtained a total count of visible adults that appeared to be sitting on nests on Great Chain Island; imagery of the other islets in the colony was not clear enough to obtain nest counts. The count of apparently incubating adults obtained in 2019 was likely most comparable to counts of nests with eggs from previous years, as empty nests are unlikely to have adults sitting, would be less visible on drone imagery, and were not counted in 2019. The 2019 count of 1,012 apparently incubating adults on Great Chain Island suggested a slight increase in numbers from the 946 nests with eggs counted on that island in 2009 (Table GI-890.2). The increase may have been greater than indicated, as counts of incubating adults may underestimate numbers of nests with eggs because clutches, especially partial clutches, are sometimes unattended, and full incubation does not begin until the clutch is complete.[410, 412] Applying an adjustment factor to the drone counts, Rodway et al.[602] estimated a range of between 1,612 and 2,169 pairs nesting on the Chain Islets/Great Chain Island colony in 2019.

In 2021, during a circumnavigation of all the islets by kayak on 19 June and then again on 19 August, Sirois counted 1,215 and 2,170 adult gulls, including about 800 and 1,550 on Great Chain Island, on those two dates, respectively.[524] He noted that at least 10 islets had nesting gulls. Dönnecke estimated about 2,000 gulls present in July 2022. In 2023, Lambert counted 2,550 and 819 gulls on Great Chain Island and Chain Islets, respectively on 15 May 2023.[524] The count included many variable Glaucous-winged x Western gull hybrids (Olympic Gulls). Many chicks were seen on 9 July. With decreased numbers of gulls found nesting on Mitlenatch Island in 2022 (see Mitlenatch Island account), the Chain Islets/Great Chain Island colony is now the second largest Glaucous-winged Gull colony in the BC Salish Sea; only Mandarte Island currently has a larger estimated nesting population.

Pigeon Guillemot Trends. Pigeon Guillemot nests have been found on a number of islets in rock cavities, under boulders, under driftwood, and in holes in cliffs. Nesting has been confirmed on Great Chain Island and on islets #1, 5, 12, 15, and 18. Data are not adequate to detect trends in guillemot numbers. Ted White recorded 10 pairs, found two nests with eggs under boulders, and saw other adults coming out of rock crevices in 1943 and found three nests with eggs in rock crevices in 1945. Drent and Guiguet reported guillemots nesting on the southeast side of Great Chain Island each year from 1950 to 1953. In 1955, Stirling observed adults feeding young and counted 20 guillemots around Great Chain Island and 25 around the smaller islets. Estimates in 1960, 1968, and on 3 June 1973 applied only to Great Chain Island and were based on the number of adults seen around the island. In 1971, guillemots were seen around Great Chain Island (11 birds) and islet #18 (40 birds). On 22-23 June 1973, observers found: four nests with eggs under driftlogs and one nest with two eggs located in a pool of water in a flooded rock crevice on Great Chain Island (38-40 adults were counted around the island); three adults on the water around islet #5; one nest with two eggs on islet #15; and two nests with eggs under driftlogs on islet #18 (Figure 592). On 25 July 1973, nests found that contained eggs or young included: two under driftlogs on Great Chain Island; one under a rock on islet #1; one under driftlogs and one in a rock crevice with a driftlog "roof" on islet #5; two under boulders and one in a rock crevice on islet #12; one under a boulder on islet #15; and three under driftlogs on islet #18. In 1974, about 25 pairs were seen around Great Chain Island, and four pairs were seen in the vicinity of islets #5 and 12; one flew out from under a rock on islet #5. Nests with eggs were found on islets #15 and 18 in July 1975 and on islet #1 in 1976. In 1978, observers saw 14 birds around Great Chain Island and six birds around the smaller islets; one flew out from under driftwood on Great Chain Island. In 1980, a nest with two eggs was found in a crevice and a total of six adults were seen on Great Chain Island, and about 24 birds were seen around the smaller islets. In 1981, 55 guillemots were counted on and around Great Chain Island and 2-3 pairs were noted around islet #5 on 5 June, and a nest with one egg was found under wooden debris on islet #12 on 12 July. One nest with a single, large young was found under logs on Great Chain Island on 3 August 1983. In 2021, Sirois reported Pigeon Guillemots nesting on several islets and saw adults going in and out from under logs and rocks. A maximum of 172 were tallied around the colony during the most recent count by Lambert in 2023; other high counts were 74 in 1987 and 67 in 2021.

Remarks: Tsartlip First Nation people harvest seaweed from the waters surrounding Great Chain Island and harvest Glaucous-winged Gull eggs from throughout the Chain Islets/Great Chain Island colony.[397] The Songhees First Nation also used to harvest gull eggs on the islands.[481]

Figure 592. Two Pigeon Guillemot nests with two eggs each found in rock crevices in June and a downy chick found in July on Chain Islets/Great Chain Island in 1973. *Photos by R. Wayne Campbell, 22 June and 25 July 1973.*

Glaucous-winged Gulls have been blamed for most predation on cormorant eggs over the years. Crows were likely preying on cormorant eggs in 1950,[11] and some predation by crows was noted in 1984, but predation by crows was not reported in other years, even though crows nest in the shrubby areas on Great Chain Island. As on other colonies, human and Bald Eagle disturbance has facilitated predation of cormorant nests.

Visitor disturbance was considered responsible for the large number of empty Pelagic Cormorant nests in 1960 and 1968. Severe egg predation, likely following disturbance, was also blamed for the large numbers of empty Pelagic Cormorant nests seen in 1980; remains of depredated eggs were seen scattered around the nests. Volunteer warden Marilyn Lambert [244] described the level of disturbance from boat traffic in the area:

> *"This area, off the Victoria waterfront, is popular with local boaters. Within 4 km of the IBA there are approx. 800 boats moored at the Oak Bay Marina and the Royal Victoria Yacht Club. Over 30 whale watching boats operate out of Victoria Harbour and many stop by Great Chain Island to view birds nesting there. The Whale Watching industry guidelines state that their boats should stay 100 m away from bird colonies. Kayakers galore launch their boats at nearby beaches and the Chain Islets are an easy paddle. The boat launch area of Cattle Point is often full of trailers in the summer. There is a sign posted on Great Chain Island advising boaters of the Ecological Reserve, but you have to get out of your boat to read it. Whenever I am in the area and I see boats in too close, I advise them of the sensitive nature of the islands."*

Disturbance from surveyors has also been responsible for some predation. In 1970, observers witnessed a small amount of predation by gulls on Pelagic Cormorant eggs and small chicks. No evidence of egg predation by gulls was seen in 1973 (Figure 593), and observers noted that, in contrast to what they had seen on other cormorant colonies, birds in the Chain Islets/Great Chain Island colony returned very quickly to their nests after being disturbed. However, in 1978, much gull predation of Pelagic Cormorant eggs was reported on Great Chain Island, and nesting birds in some areas took 10-15 minutes to return to their nests after being disturbed. In 1981, gulls were seen taking Double-crested Cormorant eggs from two nests, and freshly broken Double-crested Cormorant (4) and Pelagic

Cormorant (16) eggs were seen outside of nests. In 1983, surveyors witnessed gulls take two eggs and five young from Double-crested Cormorant nests and one young from a Pelagic Cormorant nest; three broken Double-crested Cormorant eggs and five broken Pelagic Cormorant eggs were found in nests, and six dead Double-crested Cormorant chicks were found outside nests. Eight broken Pelagic Cormorant eggs were found outside of nests in 1984.

Figure 593. When disturbed, Glaucous-winged Gull chicks will hide away from the nest. These two large gull chicks found on opportune place to hide in a Pelagic Cormorant nest. *Photo by R. Wayne Campbell, 25 July 1973.*

Signs of mink were seen on islet #3 on 23 June 1973; carcasses of Pelagic Cormorant, Black Oystercatcher, and Glaucous-winged Gull were found at a feeding platform. A mink (Figure 594) was seen at that location two days later; most scats inspected at that time were composed mainly of crab shell. On 25 July, the mink was seen again and most scats were composed of bird feathers, likely of young gulls. Many young gulls were found eviscerated on islet #18 on 25 July 1973; observers suspected mink were responsible. Eleven adults and 18 young gulls were found dead on Great Chain Island also in July 1973, but the cause of death was unknown. A river otter was seen in the water near shore on 29 August 2021 (Figure 595),[524] but no evidence of predation by river otters has been reported.

Disturbance and predation by Bald Eagles has impacted nesting populations. Double-crested Cormorants failed to raise any chicks in 1995, 1998, and 1999.[266] On 27 July 1999, Ian Moul observed one adult and two juvenile Bald Eagles perched on Double-crested Cormorant nests on Great Chain Island. No chicks were seen in the nests and adults (about 100) were rafted offshore about 200 m from the colony.[266] Immature Bald Eagles were perched on the top of Great Chain Island, displacing nearby nesting cormorants on 30 May 1993.[524] In 2010, Lambert [244] reported Bald Eagles sitting on top of Double-crested Cormorant nests on Great Chain Island. Bald Eagles were seen preying on cormorants on Great Chain Island in 2014.[101] Sirois saw two Bald Eagles during his circumnavigation of the islets on 19 June 2021.

Figure 594. An American Mink and evidence of predation on nesting seabirds by mink were seen on the Chain Islets in 1973. This is one of the only records of mink predation on nesting seabirds at colonies in the BC Salish Sea. *Photo by Paula Courteau, 18 May 2018.*

Figure 595. A river otter was seen swimming near shore in the Chain Islets/Great Chain Island in 2021, but no evidence of predation on nesting seabirds by river otters has been reported for this colony. *Photo by Paula Courteau.*

Eggs were collected from Great Chain Island for DDT analyses in 1971: five Pelagic Cormorant eggs from three nests on the south side; two Black Oystercatcher eggs from a nest on the northeast shore; and five Glaucous-winged Gull eggs.[523] In 1974, 42 gull eggs were collected from Great Chain Island for egg protein analyses. Ten three-egg gull clutches were collected in 1975 for the BCPM oological collection.

Keeping Track When Counting Gull Nests

Determining the numbers of Glaucous-winged Gulls nesting on a colony seems straightforward – walk around the colony and count every nest you see. In reality, it is surprisingly difficult to do well, especially on large colonies with thousands of nesting pairs. There are many challenges. Just landing on a colony can be an ordeal in rough weather or at low tides. Once on the colony, you must constantly contend with all the upset adults that are unrepentantly screeching, diving, and defecating on you – makes it hard to concentrate. You have to be careful where you walk to avoid stepping on eggs in nests or on small chicks that commonly hide in the grass around their nests. Walking around can also be hazardous if the terrain is dissected with cliffs, crevices, tidal channels, and other obstacles. Finding nests is not always simple; although most nests are readily visible, some are hidden amongst vegetation, logs, and rocks, and require a careful search to find. But these are not the most difficult challenges.

The most challenging part of counting gull nests on large colonies is keeping track of which nests you have already counted and which areas you have already explored. If you lose track, you cannot be sure that you have found all nests or that you haven't counted some nests twice. And, if you are exploring on your own, no matter how careful you try to be, the task is surprisingly difficult. Surveyors have come up with a variety of imaginative techniques to help them keep track.

One way to help keep track when surveying gull colonies is to have multiple observers working in unison. During the BCPM survey on Great Chain Island in 1973, seven observers spaced about 10 ft (3.0 m) apart, walked in a line across the island and called nests to a recorder in the middle of the line.[523] *Six swaths were required to cover the entire area. In 1974, five observers held a string marked at 15 ft (4.6 m) intervals and walked in swaths across the island. Swaths were marked by a flag at each end. In 1986* [420] *and 2009/2010,*[453] *the large colonies on Mitlenatch Island, Mandarte Island, and Chain Islets/Great Chain Island were surveyed by groups of four to six observers. Counts were conducted in strips marked by stakes and string to prevent double-counting of nests or missing colony sections. During surveys conducted in 1997 and 1999* [377] *and in 2009/2010, surveyors also used jelly beans to mark nests as they were counted. On Mitlenatch Island in 2015 and 2022, the MIST volunteers cut up many pounds of carrots before the survey, and then dropped a piece of carrot into each nest as they counted it* (Figure 596).[343, 360] *These latter techniques had the benefit of leaving a small treat for the parents when they returned to their nests, although I'm sure it was small compensation for the disturbance they had suffered. Of course you have to be sure that you have completed an area before the adults return to their nests or your markers will be gone!*

Figure 596. To keep track of which nests had been counted, volunteers conducting Glaucous-winged Gull nest counts on Mitlenatch Island dropped pre-cut pieces of carrot at each gull nest as it was tallied. *Photo by Connie Miller-Retzer, 19 June 2022.*

Breault collected cormorant eggs for a UBC project in 1990.[43] On 28 June, 97 eggs were collected from a sub-colony of 30 Pelagic and 75 Double-crested cormorant nests on the northwest side of Great Chain Island. All eggs were removed from 30 of the Double-crested Cormorant nests. Remaining nests in that sub-colony were preyed on by Glaucous-winged Gulls during the disturbance. Thirty-four eggs were collected on a second visit to the same area on 11 July. Other eggs were covered during the latter visit to prevent predation. Overall nesting success sampled on 8 August indicated that young were produced in about 90% of Double-crested Cormorant nests and <61% of Pelagic Cormorant nests. During the productivity check, 19 broken Pelagic Cormorant eggs and four dead Pelagic Cormorant chicks, and 60 broken Double-crested Cormorant eggs and 41 dead Double-crested Cormorant chicks, were found.

Banding programs have been conducted on Chain Islets/Great Chain Island by crews from the BCPM led by Wayne Campbell and Michael Shepard (Figure 597). In 1973, a total of 2,227 gull

chicks were banded on Great Chain Island on 19, 20, and 25 July, 165 gull chicks were banded on the smaller islets on 25 July, and 161 Pelagic Cormorant chicks were banded on the smaller islets on 25 July and 2 August. On 31 July 1974, 160 Pelagic Cormorant chicks were banded on Great Chain Island. On 26-30 July 1979, totals of 760 and 354 gull chicks were banded on Great Chain Island and the smaller islets, respectively. A major effort to band Double-crested Cormorants was undertaken in 1990 (Figure 598).

Stirling found a Mallard (*Anas platyrhynchos*) nest with nine eggs and saw a Mallard brood of six young on Great Chain Island on 29 May 1960. A Mallard nest with nine eggs was also found on 23 June 1980 under rose bushes. On 3 June 1975, we found two large, pure blue eggs in a gull nest near the Pelagic Cormorant colony; we suspected they may have been Great Blue Heron eggs. A gull was still incubating the eggs on 6 June.

Figure 597. Many people have participated in survey and banding programs conducted on Chain Islets/Great Chain Island. Most of those programs during the 1970s and 1980s were led by Wayne Campbell and Michael Shepard from the BCPM. Shown here (clockwise from top left) are: **1)** Marilyn Paul (now Lambert) and **2)** Bern Keating photographing Glaucous-winged Gull chicks in 1973; **3)** Jim McCammon exploring the gull colony in 1973; and **4)** Tessa Campbell holding a young gull chick in 1981. *Photos by R. Wayne Campbell.*

Figure 598 (next page)**.** Large numbers of pre-fledging Double-crested Cormorants were banded in 1990. Nets were set up across the colony and young were herded into the enclosures. People involved in the effort included Andre Breault, Robert Byers, Wayne Campbell, and John Cooper. Byers, Cooper, and Breault are seen (left to right) in the top left photo (next page), and also in the top right photo. *Photos by R. Wayne Campbell, August 1990.*

GI-900 TRIAL ISLANDS

Location: *48°23'50"N 123°18'20"W; 92 B/6.*
South of McMicking Point, south of Oak Bay, at the eastern end of Juan de Fuca Strait.

Description: *19 ha; 24 m high; Grassy rock; Cliffs.*
Trial Islands are composed of a 3 ha northern island and 16 ha southern island, locally known as Lesser and Greater Trial islands, respectively. The low north island is irregularly shaped. Beaches occur around much of the perimeter between rocky points, and grasses and shrubs carpet higher areas. Bare rocky knobs are tidally connected to the north and south sides of the island. The larger south island has a mostly rocky shore with some beach habitat towards the north end, especially on the east side. Rocky bluffs occur along the west side towards the south end, and higher areas are grassy with patches of shrubs.

A lighthouse was built on the southeast point of the south island in 1906 and is still manned today. The original light was replaced by the present concrete light tower in 1970. The light tower, along with eight associated building, was designated a Heritage Lighthouse in 2015. Four 58 m-tall radio antenna towers were erected on the south island in 1967 to increase the broadcasting power for the C-FAX radio station in Victoria. In 2012-2013, the original towers were removed and replaced with the present towers.

The northern island and parts of the southern island were set aside as an Ecological Reserve with a total area of 14 ha in 1990. The reserve was created primarily to protect rare plant species. The entire area lies within the Victoria Harbour Migratory Bird Sanctuary established by Environment Canada in 1923. There are several First Nations burial mounds on the islands.

Historical summary: Pelagic Cormorants, Black Oystercatchers, and Glaucous-winged Gulls have been recorded nesting on Trial Islands (Table GI-900). Only the latter two species still nest. Pigeon Guillemots have never been reported nesting on the islands, and Guiguet saw none in 1953, but there have been frequent sightings of small numbers of birds around the islands in recent years and Louise Blight suspected nesting in 2019.

Guiguet first reported Glaucous-winged Gulls nesting in 1948. He estimated 50 pairs nesting in 1953, and lightkeeper Doug Franklin also reported about 50 pairs nesting in 1959. Miss June Franklin monitored the fate through to hatching of 46 gull nests in 1960, and she and her sister Rae Franklin monitored 27 and 12 nests, respectively in 1961. June Franklin gave the location of monitored nests as along the grassy cliff top or cliff sides. Sometime before the BCPM survey in 1974, the gull population collapsed; no nests were recorded that year, and only two empty nests attended by adults were found on the north island in 1978. The nesting population subsequently recovered and increased: lightkeeper Meredith Dickman made a rough estimate of 100 pairs nesting in 2010, and Blight counted 105 pairs on territories from the lighthouse tower in 2011. Records since 2011 indicate that gulls continue to nest successfully on Trial Islands: large gull chicks were visible on 28 July 2013; a total of 93 adults were counted on 23 April 2017, including birds at 44 nests or territories visible from the lighthouse porch; and some birds were on nests and a total of about 250 gulls were counted on 26 May 2018 (Figure 599). Blight surveyed the colony from the light tower again in 2019 and estimated 90 nests. Warden Jacques Sirois counted 58 nests in 2020 and 72 nests in 2021. A complete count was not conducted in 2022, but from the water Sirois could see at least 50 adults sitting on nests and estimated a total of 200-250 gulls present. In 2023, Sirois estimated 200 gulls on the colony on 3 June and 250 on nesting sites on 3 July. Many if not most of the gulls appeared to be hybrid Olympic Gulls. Except for the two empty nests recorded on the north island in 1978, most nesting records have likely referred to the south island, although the locations of nests have often not been specified.

Five years after Guiguet confirmed Glaucous-winged Gulls nesting he found one empty Black Oystercatcher scrape and noted agitated adults indicating young nearby. One or two pairs have been reported nesting during most surveys since. Adults were seen in 1974, but no nests were found. In 1978, Harry Carter sighted five oystercatchers on the south island and four on the north island. He noted that the four birds on the north island were probably nesting and that the others around the south island were possibly nesting. Nesting was confirmed in 1981 when Mike McNall found a nest with two eggs; he also recorded a second pair on the islands. A pair with an adult on a nest was seen in 2002, and courting birds were seen in 2013 and 2014. Twelve birds were present in 2014. Two pairs and active-looking nests were reported in 2018. In 2020, Sirois confirmed two nests on the northern island, one on the western portion of the tidally-separated rock at the north end of the island, and one on the pebble beach just south of those rocks. He stated that

nesting had occurred at those locations in most years in the previous decade. In 2021, Sirois saw four oystercatchers in June and two in July but reported no sign of successful nesting. On 7 May 2022, Sirois found one nest with three eggs on the east beach of the south island, and a second pair was suspected nesting near the lighthouse. Eight adults were seen during a careful circumnavigation of both islands in July; no chicks were seen but Sirois noted that they may have been present.

Table GI-900. Seabird nesting records for Trial Islands. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
1948			x		144
11 Jun 1953	0	1S	50e	(0)	144, 474, 523
22 Jul 1955			x		300
1956	x				144
1959	50e		50e		144
19 Jun 1960	107[96]		[46]+		144, 523
May-Jul 1961			[39]+		523
17 Jul 1970	0				523
12 Jun 1974	0	S	0[a]		70, 523
14 Jun 1978	0	2eS	2S		523
7 Jun 1981		2e			523
29 May-13 Jun 1983	0				421
5-23 Jun 1987	0	0		(0)	158, 427, 428
2000	0				114
10 May 2002		1		(6)	524
14 Jun 2005		0			529
2006	0				522
2007	0				522
13-20 Jun 2010			100e		30, 453
16 Apr 2011				(8)	524
2011			105e		30, 453
2013	0				522
28 July 2013		1eS	x		524
2014	0				101, 522
11 May 2014		1eS			524
25 Aug 2014				(5)	524
24 May 2015				(4)	524
5 Apr 2016				(12)	524
23 Apr 2017			44S+	(1)	524
11 May 2017				(8)	524
26 May 2018		2[2]	x	(6)	524
28 Jun 2019			90e	S(12)	453, 524
9 Jul 2020	0	2	58[54]		505, 524
21 Jun 2021	0		72	(1)	505, 524
22 Jul 2021		0	x		524
7 May, 6 Jul 2022	0	2e	50+		505, 524
3 Jun, 3 Jul 2023			x		524

[a] Blight [30] mistakenly reported two nests in 1973 and three nests in 1974 for Trial Islands; those nests were actually recorded on Trail Islands.

Pelagic Cormorants were first confirmed breeding by Guiguet in 1955. Guiguet noted that Pelagic Cormorants had been previously reported nesting but he had found no sign of nesting in 1953. The nesting population increased rapidly between 1955 and 1960, and then collapsed. Lightkeeper Doug Franklin reported about 50 nests in 1959 and counted 107 nests on the cliffs of the south island in 1960. Although eggs were laid in most nests in 1960, few chicks hatched; only 12 chicks were produced from at least 327 eggs that were laid. Cormorants have not been recorded nesting since 1960.

Figure 599. The breeding population of Glaucous-winged Gulls on Trial Islands has an atypical history. At a time when population sizes were increasing on most colonies in the BC Salish, the nesting population on Trial Islands collapsed. About 50 pairs were nesting on the islands in the 1950s and early 1960s, but the colony was abandoned in 1974. About 40 years later, gulls were again nesting and at even greater numbers than in the 1950s. Between 2010 and the present, numbers have remained fairly stable at around 50 to 100 pairs. *Photos by David Thomson (top left) and Marlene Graham.*

Louise Blight suspected Rhinoceros Auklets nesting on 28 June 2019.[453, 524] She detected what she was confident was the smell of Rhinoceros Auklets emanating from a thicket of low shrubs on the south island. She was unable to locate a burrow or find any other signs of nesting. Sirois reported no evidence of Rhinoceros Auklets nesting in 2022. Thorough searches on the island may reveal nesting in the future.

Remarks: During the years 1957-1962 that the Franklins were lightkeepers, there was a large vegetable garden on one side of the south island, and gulls were nesting on the other side of the island.[258] Previous keepers kept animals on site and there was a small barn.

Breeding failure of Pelagic Cormorants in 1960 was likely due to gull predation on cormorant eggs during disturbances from many visitors to the islands, according to lightkeeper Douglas Franklin who was monitoring nests that year. Abandonment of the Pelagic Cormorant colony after 1960 was attributed to disturbance from lighthouse activities and pets.[421] Phil Nott and Keith Taylor from the BCPM reported three people and three dogs on the south island in 1974. They also noted that spring storms had been pounding on the cliffs where Pelagic Cormorants usually nest. In 1978, Harry Carter noted that lightkeeper Robert Nagel had a dog and a cat on the south island in 1978, and in 2011, Louise Blight reported that lightkeeper Meredith Dickman had two dogs that she let run around the

island. In addition, Dickman reported that two immature Bald Eagles were visiting the island and preying on gull eggs most days in 2011.[453] Visitor disturbance is likely greater now than was observed by Franklin in 1960 and may account for the continued lack of nesting by Pelagic Cormorants.

Crows preyed on eggs in two of 46 and one of 39 gull nests monitored by June Franklin in 1960 and 1961, respectively.[523] Many river otter scats were seen on the north island in 1978.

Canada Geese (Figure 600) have been reported nesting on Trial Islands since 2002. The nesting population on the south island increased dramatically after 2002, and major impacts to the vegetation were observed.[125] In 2012, lightkeeper Meredith Dickman counted 104 adults and found 25 nests. Canada Goose egg addling permits have been approved for Trial Islands each year since 2013. Since then very few goslings have been reported from Trial Islands; however, the islands continue to be used by adult geese throughout the year and the area damaged by geese continues to expand. Sirois reported 56 confirmed nests plus five pairs with goslings on the islands in 2021 [524] and noted that more than 65 nests, including up to 39 nests on the north island, have been found in some years.[505] Management of Canada Geese on Trial Islands is complicated by the inclusion of the area within the Victoria Harbour Migratory Bird Sanctuary.

Figure 600. Canada Geese nest on many seabird colony islands in the BC Salish Sea. They have become overabundant and have impacted the vegetation community on Trial Islands. *Photo by Paula Courteau, Hornby Island, BC, 14 April 2018.*

Construction, maintenance, and operational activities associated with the C-FAX communications towers and the lighthouse have likely impacted nesting seabirds and rare plant communities on the south island.

Tsartlip First Nation people harvest seaweed from the waters surrounding Trial Islands.[397]

GI-905 OGDEN POINT - PORT

Location: *48°24'54"N 123°23'23"W* (Pier A)*; 92 B/6.*
Extending west from Ogden Point on the east side of the entrance to Victoria Harbour. Colony includes the Ogden Point Breakwater and the deep water port facilities it protects, including the cruise ship dock and associated buildings (Figure 601).

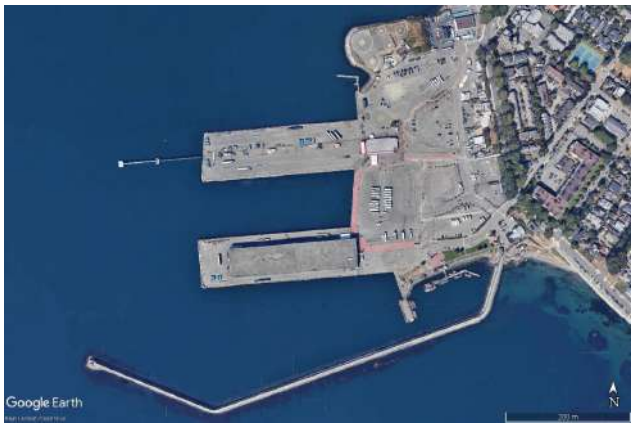


Figure 601. The Ogden Point – Port colony includes the deep water port facilities, including the cruise ship dock and associated buildings, and the breakwater that protects the port on the south side. *Image from Google Earth, 2024.*

Description: *Rock and cement breakwater, Port structures including piers, buildings, and offshore dolphins.*
The Ogden Point breakwater extends 0.75 km from shore and has an automated lighthouse at its end. The breakwater has a base constructed of large granite blocks quarried from Hardy Island at the mouth of Jervis Inlet, capped with a large concrete wall. It was completed in 1916. The top of the breakwater is a popular walking path. The original piers were completed in 1918 and have since been expanded. In 2010 and 2019, offshore dolphins were erected to extend the piers and increase the capacity of the port to handle large cruise ships. The port waters lie within the Victoria Harbour Migratory Bird Sanctuary established by Environment Canada in 1923.

Historical summary: Records of Glaucous-winged Gulls nesting on rooftops at the port date from 2008 (Table GI-905). In 2018, Blight et al.[32] reported 102 pairs of Glaucous-winged Gulls nesting on a warehouse roof at the cruise ship terminal Pier A, located north of the Ogden Point Breakwater. The population was reduced to 34 pairs in 2019 due to the installation of deterrence netting over the roof.

Numbers nesting increased somewhat over the next two years; it appeared that gulls were learning how to nest under the netting.[505] A total of 54 birds and many nests were reported on the warehouse roof in 2022.

Fledgling Glaucous-winged Gulls were reported on the breakwater on 28 August 2018, but it was not clear whether gulls had actually nested there.[524]

Table GI-905. Seabird nesting records for Ogden Point - Port. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
25 Jun 2008		x		45
9 Aug 2008			S(12)	524
2 May 2014			S(8)	524
6 May 2016	1eS			524
30 Jul 2016			x(8)	524
11 Aug 2017			(10)	524
14 Jun 2018		102		32
1 Aug 2018	1			524
27 Aug 2018			x(2)	524
Jun 2019		34		32, 505
10 Jul 2020		49	25e(58)	505, 524
16-17 Jun 2021		57	x(37)	505, 524
9 Jul 2022		many		524

Pigeon Guillemots were seen on the water and sitting on the breakwater where breeding was suspected in 2008, and a pair was seen mating on the breakwater in 2014. Large young were seen in 2016, and adults carrying food (Figure 602) were seen in 2018. In 2020, Sirois estimated possibly more than 25 pairs nesting in various cavities around Piers A and B at the cruise ship terminal. He counted 37 birds in 2021, mostly around Pier A, and again reported birds nesting in cavities in the docks.

Figure 602. About 25 pairs of Pigeon Guillemots have been estimated nesting around the piers at the Ogden Point Port. Guillemots also likely nest in cavities along the breakwater. *Photo by Paula Courteau.*

One pair of Black Oystercatchers was suspected nesting on the breakwater in 2016. Adults were seen feeding a large young in 2018.

Remarks: A fake tree was erected on the terminal rooftop in 2018 in an attempt to attract nesting Bald Eagles and hopefully discourage nesting gulls.[130] It was considered ineffective and was dismantled in 2019. As an alternative attempt to deter nesting, wire cables were then stretched a couple of metres apart down the length of the building, a couple of metres above the rooftop, in total covering 97,500 square feet.[453, 505] An adult gull was killed by flying into the cables shortly after they were installed. One eagle was perched on a platform installed on top of a pole near Pier A warehouse in 2021 (Figure 603).

Figure 603. Various deterrent measures have been installed at the Ogden Point Terminal in attempts to discourage rooftop nesting by Glaucous-winged Gulls. Shown here (this page, top to bottom, and next page): a fake tree was erected on the terminal rooftop in 2018 in an attempt to attract nesting Bald Eagles; wire cables were stretched a couple of metres apart down the length of the building above the rooftop in 2019; and a platform to attract raptors was installed on top of a pole near Pier A warehouse in 2021. *Photos by Jacques Sirois.*

In 2019, Greater Victoria Harbour Authority installed six pole nesting boxes designed for Pigeon Guillemots, but they were destroyed shortly after they were erected when a Canadian Coast Guard vessel crashed into the breakwater. Plans were to rebuild the nest boxes.

GI-910 HARRISON ISLAND

Location: *48°25'04"N 123°24'08"W; 92 B/6.*
Between McLoughlin Point and Macaulay Point on the southern shore of Esquimalt, west of the entrance to Victoria Harbour.

Description: *0.3 ha; 3 m high; Grassy rock.*
This dissected rock has some small pockets of vegetation in higher crevices. It is within the Victoria Harbour Migratory Bird Sanctuary.

Historical summary: One Glaucous-winged Gull nest with three eggs was found by Richard Kool in 1980 (Table GI-910). We have no records since.

Table GI-910. Seabird nesting records (nests) for Harrison Island.

DATE	GWGU	SOURCE
11 Jun 1980	1	523

GI-915 BERENS ISLAND

Location: *48°25'27"N 123°23'36"W; 92 B/6.*
West side of Victoria Harbour, east of Work Point, south of West Bay.

Description: *0.3 ha; 5 m high; Grassy rock.*
Berens Island is an irregularly-shaped rock with grassy and shrubby areas on higher sections. A manned lightstation was built here and went into operation in 1876. The light and attached dwelling occupied most of the northern half of the island. The light was automated in 1965; the old light was demolished and replaced with a pole light on the east side of the island. The island is within the Victoria Harbour Migratory Bird Sanctuary.

Historical summary: A pair of Black Oystercatchers defending a small chick was seen here in 2014 by Daniel Dönnecke (Table GI-915).

Table GI-915. Seabird nesting records (nests) for Berens Island.

DATE	BLOY	SOURCE
19 Jun 2014	1	524

GI-920 COLVILE ISLAND

Location: *48°25'37"N 123°23'18"W; 92 B/6.*
Along the north shore of Victoria Harbour south of Coffin Island Point, east of West Bay. Spelled Colville Island from 1862 to 1973. This island has been confused with Colville Island in the San Juan Islands, which is about 40 km away and is a major Glaucous-winged Gull colony in Washington.

Description: *0.2 ha; 2 m high; Grassy rock.*
Colvile Island is mostly bare rock, with small pockets of vegetation in rock crevices on top. It is within the Victoria Harbour Migratory Bird Sanctuary.

Historical summary: Two adult Black Oystercatchers with three very young offspring were seen by Victoria birder Mary Robichaud in 2017 (Table GI-920). Victoria resident Gordon Hart viewed the island from the Songhees Walkway and reported a pair present at an occupied nest in 2020.

Table GI-920. Seabird nesting records for Colvile Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
13 Jun 2017	1	524
4 May 2020	1S	524

GI-925 PELLY ISLAND

Location: *48°25'32"N 123°23'03"W; 92 B/6.*
Victoria Harbour south of Lime Bay, west of Songhees Point.

Description: *0.04 ha; 2 m high; Bare rock.*
Pelly Island is a small bare rock sitting in the main

channel of the busy inner harbour of Victoria. The rock is crowded with a navigational beacon, seaplane alert strobe lights, a windsock, and a solar powered weather station. The island lies within the Victoria Harbour Migratory Bird Sanctuary.

Historical summary: Two pairs of Black Oystercatchers and one nest with eggs were recorded on 16 May 2015 (Table GI-925). Gordon Hart viewed the island from the Songhees Walkway and reported a pair present at an occupied nest in 2020.

Table GI-925. Seabird nesting records for Pelly Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
16 May 2015	1	524
4 May 2020	1S	524

Remarks: Human activity around this colony is intense but is apparently tolerated by nesting oystercatchers. Sirois [505] reports that oystercatchers copulate and raise chicks while seaplanes land and take off on both sides of the island.

GI-930 VICTORIA

Location: *48°25'30"N 123°22'10"W* (east shore of Inner Harbour)*; 92 B/6.*

We have defined the Victoria colony to include the southeastern portion of Greater Victoria (Figure 604). Colony includes the entire City of Victoria, the Township of Esquimalt, and the District Municipality of Oak Bay (except we have excluded the half of the University of Victoria grounds that officially lie within the Oak Bay municipality). The colony also includes the eastern portion of the Town of View Royal, on the east side of Esquimalt Harbour, and the south end of the District Municipality of Saanich. Through the Municipality of Saanich, we have placed the northern border of the Victoria colony from the north end of Cadboro Bay along Cedar Hill Cross Road to McKenzie Avenue to Quadra Street to the Patricia Bay Highway (Highway 17), then west along Mann Avenue and across to the border of Francis King Regional Park. The western colony boundary aligns with the eastern boundaries of Francis King and

Figure 604. Colony of Victoria showing the political boundaries referenced in the text, including the City of Victoria, the Township of Esquimalt, most of the District Municipality of Oak Bay, the eastern portion of the Town of View Royal, and the south end of the District Municipality of Saanich. *Base map image from Google Earth.*

Thetis Lake regional parks and then south to the head of Esquimalt Harbour in the Town of View Royal. Colony includes all urban habitats along the shoreline and buildings away from the shore, except for the port and breakwater at Ogden Point which we have designated a separate colony (see above).

At present we have records of nesting in the town of Sidney but not in other urban areas of Greater Victoria outside of the designated Victoria colony. However, urban nesting will most probably be recorded in other areas in the near future. For future considerations, we suggest designating four additional colonies: Colwood-Langford (Cities of Colwood and Langford), Saanich (the rest of District Municipality of Saanich not included in the Victoria colony), Central Saanich (District Municipality), and Northern Saanich (District Municipality).

Description: *Rooftops, Pilings, Derricks, Water tower.*

The designated Victoria colony area extends along about 54 km of urban shoreline, if we include from Oak Bay to View Royal and the convoluted shorelines of Victoria Harbour (Figure 605), Portage Inlet, and the east side of Esquimalt Harbour. Much of the shoreline habitat is residential buildings with some parklands and private marinas; downtown Victoria within the Inner Harbour is mostly commercial buildings, with some industrial properties and government buildings. The colony includes the Canadian Forces Base and Dockyard in Esquimalt. The waters of Victoria Harbour and Portage Inlet and shoreline areas from the harbour to Oak Bay are part of the Victoria Harbour Migratory Bird Sanctuary.

Figure 605. View of the Victoria Inner Harbour showing the Empress Hotel (upper left), the Royal British Columbia Museum (upper middle), and the parliament buildings (upper, right of middle). *Photo by Jacques Sirois, 2 June 2021.*

Historical summary: The first record of seabirds nesting in Greater Victoria was of one pair of Glaucous-winged Gulls nesting 70 feet (21 m) up on a derrick in the Esquimalt naval yard in 1958 (Table GI-930), the same year that nesting was first reported in Greater Vancouver. Since 1958, there have been several incidental records of gulls nesting in Greater Victoria. Hooper [219] uncovered 13 records dating to 1985 of Glaucous-winged Gulls nesting in Victoria. Most records have been around the Inner Harbour within the City of Victoria, but some have been within the District Municipalities of Oak Bay

and Saanich as well as in the Township of Esquimalt. During the intensive study by Hooper in 1986,[218] nests were also found in the town of View Royal.

Gulls have been recorded nesting within the boundaries of the City of Victoria since 1971. In 1971, Ralph Fryer reported three nests on a shed roof of a machinery depot at the west end of Dallas Road, and Aleda Johnstone observed a nest with two young on 20 July on the roof of the Bapco Paint factory, which was on the waterfront at Laurel Point in the Inner Harbour. In 1972, Stuart Johnstone saw six nests with young on the roofs of wharf buildings on Huron Street. Wayne Campbell and Andy Stewart monitored two pairs of gulls nesting for several years in the early 1990s on the roof of the Fish and Wildlife Branch office at 780 Blanshard Street (Figure 606). In 2015, two adults and five nestlings were recorded at 345 Quebec Street on 10 July. In 2017, gulls were observed nesting at 734 Fort Street; birds on nests were recorded on 12 May, when 18 birds were present, and 16 June, when five birds were present (observers did not state how many nests were observed). Paired and courting adults were also seen and suspected nesting at 751 Fairfield Road on 13 May and 10 June 2017, and nests with young were seen at the Victoria Bus Station on 6 August 2017. Nests with young were seen along the Songhees Walkway on 31 July 2018. Many recently fledged juveniles were seen in the Inner Harbour on 22 August 2015, and a total of 27 fledglings were recorded in the Inner Harbour on 10 August 2018.[524] In 2019, a pair was nesting on the roof of the synagogue at Blanshard Street and Pandora Avenue (an adult with 3 chicks was seen during the first week in July), and a bird on a nest was seen at 21 Erie Street on 28 July. On 3 July 2020, a nest with eggs attended by very agitated adults was reported on top of the Centennial Square Parkade on Fisgard Street. Gulls have been reported nesting in recent years on window ledges and sixth-floor and third-floor rooftops of the provincial courthouse building located at 850 Burdett Avenue.[141] They have also been nesting on other provincial government buildings in the downtown area. On 11 July 2021, Susanna Solecki, who lives on Howe Street near Clover Point, observed a nest with a recently-hatched chick on the roof of a house on Linden Avenue that was visible from her back yard. She noted that 2021 was the second year that she had seen nesting at that location. In 2022, she monitored a nest at the same location from 13 June to 26 August; three chicks were full-sized but not yet fledged on the latter date. Also in 2021, Keith Taylor[512] reported a pair successfully nesting on the roof of his house on Glasgow Avenue for at least the last six years. That nest location is almost 2 km from the nearest salt water in the Inner Harbour. In 2022, local birder Morna Tudor monitored a nest through June and July on a house on Alma Place, just south of Michigan Street, and eBirders Neil MacLeod and Andrea MacLeod observed a pair with two fledglings on a rooftop at 433 Montreal Street on 28 July. On 5 August 2023, Liam Ragan saw at least five nesting pairs with large young on the roofs of houses on Dallas Road facing Clover Point.

Figure 606. A pair of Glaucous-winged Gulls nested at this location on the roof of the BC Fish and Wildlife Branch office at 780 Blanshard Street in Victoria for several years in the early 1990s. *Photo by R. Wayne Campbell, 29 June 1993*.

Gulls have also been recorded nesting on the eastern side of Victoria within Oak Bay District Municipality. In 1976, Mrs. E.G. Hart recorded a nest on a house roof at 291 King George Terrace on the west side of McNeill Bay, with two small young on 28 July and two nearly fledged young on 9 August. About four pairs nested on the roof of the

Oak Bay Marina in 2015; a maximum of eight downy chicks with a minimum of eight adults were sighted on several occasions in July and August. Evidence of nesting has been seen on the marina roof each year since: two adults incubating eggs on seaweed nests on the roof of the Marina Restaurant on 25 June 2016; an adult sitting on one nest and a pair building another nest on 8 June 2017; two adults sitting on nests on 2 July, three chicks plus adults on 23 July, and a maximum of 12 young in August 2018; young on 31 July 2019; five small chicks and seven adults on 19 July 2020; and a single young on 1 August 2021. Large young were noted at Cattle Point on 19 July 2017, but it was unclear whether birds had actually nested in that area.[524] Jody Wells photographed two large chicks at a nest on a rooftop at Harling Point on 2 August 2022.

Table GI-930. Seabird nesting records for Victoria. See Appendix 2 for codes.

DATE	GWGU	SOURCE
1958	1	144
20 Jul 1971	4	382, 523
13 Jul 1972	6[6]	131, 383
29 Jul 1976	x2	523
May-Aug 1986	110[a]	218, 220
1992-1994	x2	335, 457
Apr-Aug 2015	x6	524
Apr-Aug 2016	x3	524
May-Aug 2017	x6	524
Jun-Aug 2018	x4	524
25 Jun 2017, 14 Jun 2018	336-356[b]	32
Apr-Aug 2019	x3	524
Apr-Aug 2020	550-700e[c]	453
3-24 Jul 2020	x7	524
Jul-Aug 2021	x4	512, 524
Jun-Jul 2022	x6	524
5 Aug 2023	x5	494, 524

[a] Hooper [220] reported a total 114 nests but four of those nests were found in Sidney [218] (see colony account GI-740).
[b] This is a partial count of the Victoria area.
[c] This estimate is an educated guess for the total current nesting population based on the results of the 2017/2018 study [32] and recent observations [453] of nesting gulls in other parts of Greater Victoria (see text).

There are other incidental records of gulls nesting within the Township of Esquimalt since the first nest was found there in 1958. In 1976, Ms. A. Patton recorded two young in a nest on 29 July and 6 August; the nest was located on the roof of a building in the CFB Dockyard. In 2016, Louise Blight observed a nesting pair through the season at 944 Dunsmuir Road; adults were seen carrying nesting materials on 9 April, sitting on a nest on 16 June, and accompanying large young on 12 August. Birds were nesting again at the same address each year from 2017 to 2021. At the nearby apartment building at 831 Dunsmuir Road, a former building manager told local resident Don Kramer [479] that gulls had nested on the roof in recent years. Kramer was able to inspect the roof on 16 June 2021 and found one nest with two eggs in a sheltered spot adjacent to a chimney. Jody Wells from Brentwood Bay reported at least one pair and perhaps two with nestlings on a pitched roof at Macaulay Point on 3 August 2018; the one visible nest was built on the upslope side of a chimney. Wells inspected the roof again on 20 July 2020 and saw four nests (chicks were visible in 2 nests). In 2022, he saw broods of two and three large chicks at two nests and suspected two additional nests in the same area on 5 August.

In the town of View Royal, Hooper in 1986 reported 6-10 nests on buildings along Christie Point at the head of Portage Inlet.[218, 219] We have no other records of nests in that area.

An adult gull on a nest was seen by eBirders Daniel Dönnecke and Warren Lee on 1 April 2015 at Panama Flats, which are within the southern end of Saanich District Municipality. That location is about 2 km from the nearest salt water at the head of Portage Inlet. Dönnecke found the nest abandoned and one of two eggs broken a few days later.

Two comprehensive studies have been conducted of Glaucous-winged Gull populations nesting in urban habitats in Victoria. The first was conducted by Tracy Hooper from 12 May to 29 August 1986.[218, 220] The area surveyed most thoroughly during her study was at the Canadian Forces Base Esquimalt Dockyard, but records of nesting in other parts of the city were also collected. In the Esquimalt Dockyard, only a small proportion of the rooftops surveyed were used by nesting gulls. Nesting was confirmed for 79 nests and suspected for 31 others. About half the nests were found in the Esquimalt Harbour area; 6-10 nests were located on Christie Point to the north in Portage Inlet within the town of View Royal, a few were found in southern parts of the City of Victoria towards Dallas Road, and the rest were located at a number of locations around the shoreline of Victoria Inner Harbour (Figure 607). Most nests were located in sheltered nooks on flat rooftops, but nests were also found on pitched roofs, marine pilings, building ledges, the control house of a moving crane, a platform on the top of a water tower, and a drydock. Nests were located 0-500 m from shore. Hooper suspected that the number of nesting pairs found was a minimum estimate of the urban breeding population.

More recently, Blight et al.[32] surveyed rooftop nesting gulls in 2017/2018 in two study areas in

downtown Victoria using unmanned drones with mounted cameras. Using drones was an effective survey method for those urban habitats and occupied nests were readily distinguishable on photographs. Agreement among observers was high for the number of nests counted from photographs: estimated totals were 336-356 nests, with a mean of 346 nests. Estimates in the two study areas were: 230 nests in 70 ha of the downtown core; and 116 nests in 250 ha of urban habitat to the northwest of the downtown core. Those results provide the only reliable estimates of nesting density within urban habitats in BC, although they were likely underestimates because, "some nests may have been obscured by shading or features of roof topography, and because we only counted nests with incubating adults we were unable to account for nests that failed prior to our survey." [32] The 2017/2018 survey area partially overlapped that of Hooper's in 1986 but did not include Hooper's main study area in Esquimalt as permission could not be obtained to fly drones in that restricted airspace. In the downtown study areas surveyed by Blight et al.[32] in 2017/2018, Hooper [218] had found about 30 pairs nesting in 1986. Numbers of gull nests counted in the downtown core thus increased over tenfold in the 30 years between those two studies. Whether that rate of increase has occurred in other areas of Victoria is unknown. In 2017/2018, gull nests were found throughout the downtown study areas, which extended as far as 1 km from the closest marine waters in Victoria Harbour.

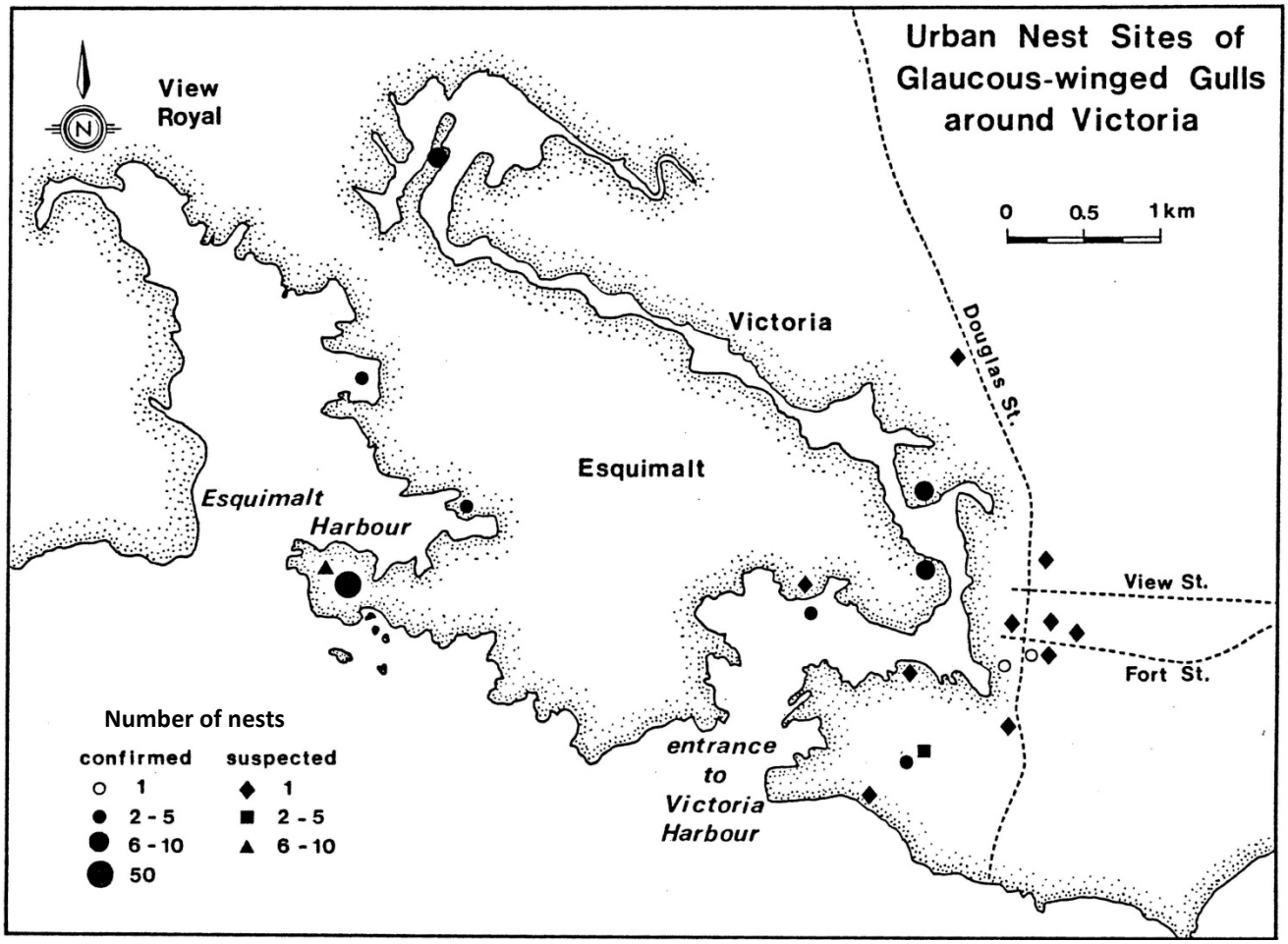


Figure 607. Locations of Glaucous-winged Gull nests observed around Victoria by Tracey Hooper in 1986. *Map reproduced from Hooper.*[218]

Available data are not adequate to accurately estimate total breeding populations of Glaucous-winged Gulls in the Greater Victoria colony area (Figure 608). However, we can attempt to derive rough estimates of the gull nesting population in two ways. First, we can compare results of the 1986 and 2017/2018 studies. If the tenfold increase documented between 1986 and 2017/2018 in the numbers of gulls nesting in the downtown study areas surveyed by Blight et al.[32] was representative of the entire area surveyed by Hooper [218, 220] in 1986, then there would now be 1,100 pairs nesting where

Hooper counted 110 pairs in 1986. However, surveys by Hooper in downtown Victoria in 1986 were less thorough than the coverage provided by drone surveys in 2017/2018, and the tenfold increase in the downtown nesting population may be an exaggeration. At the same time, Hooper's study included only a portion of the total urban habitat in Greater Victoria and, as stated in the Hooper study, the count of 110 nests likely underestimated the total nesting population. Thus, balancing these two considerations suggests that the derived estimate of 1,100 pairs could be a reasonable estimate of the current breeding population of Glaucous-winged Gulls in the Victoria colony area.

Figure 608. Accurate estimates of Glaucous-winged Gull breeding population sizes in urban centres around the BC Salish Sea are not available. Nesting pairs are widely distributed across urban landscapes in often difficult-to-access locations, making comprehensive surveys a daunting proposition. *Photos by Edward Kroc.*

A second method to derive a rough population estimate is to extrapolate from the results of the 2017/2018 study by Blight et al.[32] That study encompassed about one sixth of the 19.5 km^2 area of the City of Victoria, and less than 10% of the area over which gulls have been reported nesting within the designated Victoria colony area. The main habitats sampled were flat-topped industrial, commercial, and multi-unit residential buildings, and all but six of the 346 nests detected were on those types of rooftop habitats. It is likely that similar nesting densities occur on those habitats outside the study area. Based on Google Earth imagery, compared to the area surveyed in 2017/2018,[32] there is about twice as much area within a kilometre of the shoreline in the Victoria colony with those types of rooftop habitats. This suggests a nesting population on those kinds of habitats of about double what was counted in 2017/2018, or about 700 nests. A small proportion of the area surveyed in 2017/2018 sampled single-family residential buildings with gable roofs. Six nests were seen on those types of sloped roofs within about 20 city blocks surveyed, covering an area of about 18 ha.[32] Although the nesting density was low, there is a large area of the Victoria colony with that kind of rooftop habitat.

Again based on rough measurements from Google Earth imagery, within a kilometre of shore, there is about 100 to 150 times as much area occupied by single-family residential buildings with gable roofs as that surveyed in 2017/2018. That constitutes a conservative estimate of the amount of that type of rooftop habitat that may be used by gulls, given that there are records of nesting up to 2 km from the nearest salt water. At a similar nesting density as that found in 2017/2018, and limiting consideration to habitats with a kilometre of marine shores, this would suggest about 600 to 900 nests on residential buildings throughout the Victoria colony, and a total of about 1,300 to 1,600 nests for the entire colony.

Observations by Blight [453] suggest that the above estimates may be too high. Blight [453] has recently explored much of the urban area and her observations indicate much lower nesting densities elsewhere in Greater Victoria than in the downtown study area surveyed in 2017/2018. Also, there no longer seems to be a concentration of nesting gulls at the Esquimalt Canadian Forces Base like that documented by Hooper [220] in 1986. Based on her observations up to 2022, Blight [453] estimated a total nesting population of about 450-500 pairs in the downtown core and other parts of the City of Victoria, and about 100-200 pairs in the rest of Greater Victoria, for an overall estimate of 550-700 pairs.

We think Blight's estimate is conservative based on the above derivations. However, because we have no data on the densities of nests outside the 2017/2018 study areas to support the above extrapolations, we have accepted her estimate as the best available for the current Glaucous-winged Gull breeding population in the Victoria colony area. To simplify tabulation, we have used 700 pairs as the current estimate for the total breeding population in this colony.

Remarks: In 1986, to protect the roofing material, gull nests were repeatedly removed from one building at the Esquimalt Dockyard.[218, 220] About 16 pairs attempted to nest on the rooftop. Nests were removed seven times during the season and were rebuilt an average of about five times per pair. In 2019, a program was initiated to deter gulls from frequenting seven government buildings in downtown Victoria by repeatedly flying Harris's Hawks over the buildings.[141, 354]

In 1986, crows preyed on some eggs and chicks from the rooftop nests, and some chicks that likely fell of the roofs were found dead on the ground.[218, 220] In 2022, Morna Tudor suspected that owls had preyed on two large but still flightless chicks that disappeared from the nest on Alma Street on 20 July.

Two Glaucous-winged Gull egg specimens were collected on 2 and 5 June 1986 at the Esquimalt dockyard.[536ah]

GI-938 GILLINGHAM ISLANDS

Location: *48°25'11"N 123°24'57"W; 92 B/6.*
Off the mouth of Fleming Bay between Macaulay Point and Saxe Point in Esquimalt.

Description: *0.1 ha; 7 m high; Bare rock.*
Gillingham Islands are comprised of two small rocks lying about 140 m off the Esquimalt shoreline.

Historical summary: Richard Kool from the BCPM found a Black Oystercatcher nest with one egg on these rocks in 1980 (Table GI-938). We have no other records for this site.

Table GI-938. Seabird nesting records (nests) for Gillingham Islands.

DATE	BLOY	SOURCE
11 Jun 1980	1	523

GI-940 BROTHERS ISLANDS

Location: *48°25'31"N 123°26'03"W; 92 B/6.*
Off the southwest shore of Esquimalt, southwest of Signal Hill, west of Saxe Point. Known as Deadman's Island in the second half of the 1800s when it was the location of a cemetery for the Royal Navy at Esquimalt.[21]

Description: *1.8 ha; 17 m high; Forested; Bare rock.*
Brothers Islands are composed of three islands. The largest, west island has a forested crown and an extensive rocky shoreline, with small pocket beaches on the north and south sides. A small, northeast rock and a larger southeast rock are bare (Figure 609). In 1878, a three-gun battery called the Barbette Battery, a supporting magazine, and artillery stores were installed on the west island as part of a new coastal defence scheme.[21] The area is Department of National Defence property and access is restricted.

Historical summary: This important colony has been neglected during most surveys. We only have records from 1981 and 2021. In 1981, Doug Bertram and Mike McNall from the BCPM documented

Pelagic Cormorants, Black Oystercatchers, and Glaucous-winged Gulls nesting on the southeast rock (Table GI-940). Cormorant nests were located on a west-facing bluff in the centre of the rock; four nests contained clutches of one to three eggs. Most gull nests contained full clutches of three eggs; many were pipping.

Figure 609. Views of Brothers Islands, including the largest, west island (top) and the southeastern rock. *Photos by Jacques Sirois, 10 June 2021.*

In 2021, Louise Blight viewed the islands from the nearby shore on Vancouver Island in May, and Jacques Sirois boated around the islands in June. There was no evidence of nesting by cormorants or gulls. In June, a pair of oystercatchers was present and may have been nesting on the west island, although no nest was found during a quick search of its southern beach. No Pigeon Guillemots were seen around the islands.

Table GI-940. Seabird nesting records for Brothers Islands. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	SOURCE
24 Jun 1981	7[4]	2[2]	143[133]	523, 525
May 2021	0		0	453
10 Jun 2021	0	1S	0	505

Remarks: Two depredated gull eggs were found in 1981. Observers reported evidence that gulls were feeding on garbage.

GI-950 COBURG PENINSULA

Location: *48°25'30"N 123°27'50"W; 92 B/6.*
Southwest of Esquimalt Harbour, west of Fisgard Lighthouse National Historic Site.

Description: *Sandy spit.*
Coburg Peninsula is an almost 2 km-long spit that encloses Esquimalt Lagoon. There is a narrow channel from the lagoon to the open ocean at the northeast end of the spit. A road, Ocean Boulevard, runs down the centre of the spit and across a bridge over the channel. The southeast side of the spit facing the open ocean is an extensive sandy beach with much accumulated driftwood. Inner sections of the spit on either side of the road are grassy. Esquimalt Lagoon was established as a Migratory Bird Sanctuary in 1931.

Historical summary: One Black Oystercatcher young was seen at a nest in 1976 (Table GI-950). Three oystercatchers were seen and one pair was suspected nesting in 2017.

Table GI-950. Seabird nesting records for Coburg Peninsula. See Appendix 2 for codes.

DATE	BLOY	SOURCE
21 Aug 1976	1	523
23 May 2017	1eS	524

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Haida Gwaii
West Coast Moresby Island: Laurie Wilson and Bruce Whittington.

East Coast Moresby Island: Jesse Beaubier, Richard Cannings, Rian Dickson, Anthony (Tony) J. Gaston, D.V. George, Andrew Jacobs, Jake Pattison, Peter Sinkins, Bruce Whittington, and Laurie Wilson.

Outer Coast
Northern Mainland Coast: Kaiden Bosch, Guy L. Monty, Liam Ragan, and Bernard Schroeder.

Queen Charlotte and Johnstone straits: Gordon Curry.

Scott Islands: Liam Ragan.

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Drever has represented CWS interests during more recent cormorant surveys. Trudy Chatwin led provincial government surveys under the MOELP banner and later Jenna Cragg assumed those responsibilities as the Ecosystems Biologist at FLNRD. Harry Carter also partnered with Trudy and contributed some of his own resources to conduct some recent cormorant surveys.

Thanks to Rob Butler, Tony Gaston, Jean-Pierre Savard, and Steve Wetmore for making helpful comments at various stages in the preparation of parts of the document written in the 1980s, and to Heidi Regehr (Figure 610) for her careful review of the entire finished manuscript and for her superb editorial skills throughout the production of the final document. Dennis A. Demarchi and Patricia Huet reviewed large sections of a draft manuscript. We thank all reviewers for their knowledgeable comments and helpful recommendations that improved the presentation.

Figure 610. Heidi Regehr spent many hours reviewing the entire manuscript and made many helpful suggestions that improved the quality of this work. She is shown here geared up for winter waterbird surveys in the northern Strait of Georgia as part of her doctoral studies on the movement patterns and population structure of Harlequin Ducks.[320] To survey some of the extensive shallow reefs in the northern Strait of Georgia, Heidi often perched with her telescope on tiny, offshore, tidal rocks so she could scan the great distances over which birds were distributed. *Photos by Michael S. Rodway, 4 January 2003.*

Winter Survey Challenges

This book is focused on seabird breeding colonies, which are surveyed during the summer. However, surveys are also important for determining distribution, abundance, and key foraging areas of marine birds in winter. Typical winter marine bird surveys, such as the British Columbia Coastal Waterbird Survey (initiated by Birds Canada in 1999), [163] *are conducted from accessible vantage points along the shoreline. During such surveys, surveyors usually spend a few hours counting birds on a day selected for its amenable weather, after which they can return home to hot cups of tea. However, the Strait of Georgia contains large stretches of inaccessible shoreline, and a more detailed, thorough survey of marine birds requires boating to remote areas. This is much more challenging in winter than summer: weather is wetter, stormier, and colder along the coast in winter than in the summer, and days are short, making the surveys themselves, as well as camping along the way, much more difficult.*

In the winter of 1999/2000, Michael Rodway and I conducted winter waterbird surveys, covering shoreline areas over a large portion of the northern Strait of Georgia. We were based on the Oyster River at Black Creek (north-central Vancouver Island) and used a zodiac to exhaustively survey all shorelines from Parksville and the Thormanby Islands in the south, to the Thurlow Islands in the north. The zodiac allowed us to access shallow areas that would be inaccessible in a larger, more comfortable craft. We frequently had to camp along the way, given that many areas that we surveyed were too distant to allow commuting from Black Creek. During

those winter surveys, staying dry and warm enough to work from an open boat was an extreme challenge, given that winds were often blowing spray across and into the boat and temperatures were often near or below freezing. Gearing up for the task involved dressing in a large number and variety of layers: multiple warm layers of polypropylene on the inside, a full floater-coat and rubber gloves on the outside, and fully waterproof raingear under the floater-coat because the floater-coat alone was not waterproof enough to keep us dry. On occasion, even this was not enough protection from the cold and wet conditions because water draining off of our rain-pants would wick inside our snow-boots (which are warmer than rubber boots but less waterproof). Sometimes large, plastic bags worn over our boots and tucked up under the legs of our rain-pants were the only way we could keep our feet both warm and dry in the boat or at camp (see Figure 610)*. Camping required a good tent, warm bedding, shelter from the weather, and ideally a site conducive to a campfire to provide an external source of warmth and a way to dry out wet gear. However, on some of the small islands that were available to us at the end of a survey day, a fire was not possible, in which case we settled for hot soup and an early retreat to our tent and sleeping bags, which were our haven from the long, cold winter nights.*

During the 1999/2000 northern Strait of Georgia winter survey, we documented the presence of all waterbirds within viewing distance of the shorelines, as well as the presence of individually marked birds when possible (several hundred Harlequin Ducks were marked at that time with coloured leg bands and some were marked with nasal discs as part of studies on survival, movement, and behaviour [320, 340]*). We also classified individuals by sex and age for some species (i.e., for sexually dimorphic birds and those with sub-adult plumages). Reefs were especially challenging to survey, such as the shallow reefs extending far to the south of both Savary and Hernando islands, which in winter support large numbers of foraging birds that are dispersed over extensive areas. To adequately survey such reefs, we often used precarious perches on tiny, offshore, tidal rocks on which we set up a spotting scope so that we could scan the great distances over which birds were distributed* (see Figure 610)*.*

Windy weather made it more difficult to identify and count birds - with your spotting scope shaking in the breeze and birds continually bobbing in and out of view in the waves - and many days were simply not suitable for surveys. Thus, we relied heavily on marine weather forecasts and had to pick our survey areas in relation to wind directions and speed. We had to take full advantage of any windows of calm weather, sometimes making crossings in tumultuous seas in anticipation of forecasted calmer weather upon arrival at our survey area. There were also other difficulties, some of which were harder to predict. One unexpected turn of events particularly stands out in my memory. One morning we left Black Creek at first light with high hopes of great accomplishments for the day owing to a stellar weather forecast. We travelled for two hours crossing the strait to our intended survey area on the Sunshine Coast (north of Powell River). Arriving at our destination in glassy, smooth water, without even a ripple to hamper the viewing of birds, we were most disappointed to find that a thick fog entirely engulfed the shoreline. We could not see a thing and thus were unable to conduct any surveys on that otherwise perfect day!

(contributed by Heidi Regehr)

Major thanks go to Louise Blight for contributing unpublished data from her 2009/2010 Glaucous-winged Gull surveys conducted for her Ph.D. thesis that greatly assisted in our interpretation of population changes. She also generously contributed unpublished observations of other nesting species recorded during those surveys and has helped gather more recent data on nesting birds in the Victoria area. Louise reviewed the final manuscript section on population trends for Glaucous-winged Gulls and the entire section on *Identifying and Addressing Issues with the Historical Data* and provided comments that greatly improved our presentation. Thanks also to Louise and especially to UBC Assistant Professor Edward Kroc (Figure 611) for providing as-yet-unpublished results

Figure 611. UBC Assistant Professor Edward Kroc has been conducting surveys and studies of Glaucous-winged Gulls nesting on rooftop structures in Vancouver since 2015. He is shown here while he was happily surveying gulls near YVR airport in 2021. *Photo by Edward Kroc, 15 September 2021.*

and raw data from a habitat-modelling study of Glaucous-winged Gull nesting populations in Vancouver.[242] Ed also generously reworked his predictive model from that study to generate individual estimates of gull nesting populations for our four designated colonies within the City of Vancouver study area.

We are very grateful to Trudy Chatwin, Harry Carter, Mark Drever, and Marilyn Lambert (Figure 612) for providing details of cormorant surveys from 2000 to 2023 and other unpublished data that helped us to present historical records accurately and better interpret historical trends. Thanks to Kees Vermeer for clarifying Glaucous-winged Gull survey methodology from 1986 and to Ken Morgan for helping to interpret data from surveys he conducted in the Strait of Georgia in 1987. Rob Butler kindly provided added details on many observations that are summarized in his publications and breeding bird atlas records, and also extracted from his notebooks many unpublished records that helped update numerous colony accounts and identify new colony sites. Rob also contributed a great anecdote about his early experiences on Mitlenatch Island. Macus Ong (Figure 613), Rachel Stapleton, and Rose Wilkin, under the supervision of Ruth Joy at SFU, have generously shared data they gathered during their M.Sc. studies on nesting cormorants conducted in 2020-2022. Ph.D. candidate Mason King has also kindly shared data from cormorant surveys he helped conduct in 2019. Terry Sullivan helped interpret data from his 1993-1994 cormorant studies and his 1997/1999 Glaucous-winged Gull surveys. Greg McClelland at CWS kindly shared the data report from Louise Blight on surveys of the gull colonies on Mitlenatch and Arbutus islands in 2023.

Figure 612. Marilyn Lambert has been involved in surveys of nesting seabirds since she participated in the inaugural surveys by the BCPM in the 1970s. As director of the Friends of Ecological Reserves and a volunteer warden for the Oak Bay Islands Ecological Reserve, Marilyn has continued to monitor nesting populations at colonies near Victoria. She also conducts annual surveys of the cormorant colony on Mandarte Island. She is shown here on Colville Island in the San Juan Islands in the Washington portion of the Salish Sea. *Photo by R. Wayne Campbell, 22 July 1978.*

Figure 613. Macus Ong collected data on Double-crested and Pelagic cormorants nesting on Vancouver bridges and on the cliffs at Gabriola Island as part of his M.Sc studies out of SFU in 2020-2021. He enthusiastically shared that data as well as many of his lovely photographs for use in this book. *Photo by Deepugh Saba, Jasper, AB, 2019.*

Many thanks to Morgan Davies, Sibylla Helms, and Kalina Hunter, who, with the support of Pippi Lawn and Molly Clarkson at Parks Canada, kindly made available unpublished data from Black

Oystercatcher surveys and other seabird observations conducted since 2005 in the area of the Gulf Islands National Park Reserve. Thanks also to Sibylla Helms for her help in setting up a formal data-sharing agreement between Parks Canada and Michael Rodway. Todd Golumbia reviewed and helped clarify some of the Parks Canada data collected during 2005/2006 oystercatcher surveys. Peggy Sowden (Figure 614), who until 2020 was leader of the MIST volunteers on Mitlenatch Island, contributed recent data from surveys on Mitlenatch Island and also wrote an anecdote about her experiences on the island. Susan Rybar assumed that position after Peggy and kindly contributed the results of the Glaucous-winged Gull survey conducted by MIST volunteers in 2022. We are very grateful for the help of other MIST volunteers, especially Connie Miller-Retzer, Anne Holcroft-Weerstra, Rod Mitchell, Tony Rybar, Daphne Taylor, Genevieve Singleton, and David Thomson, to accurately describe vegetation changes on Mitlenatch Island. Thanks also to Alison Watt and Nancy Baron for providing results of recent Mitlenatch Island cormorant surveys. Peter Arcese at UBC provided unpublished observations of Rhinoceros Auklets and other species nesting on Mandarte Island. Many thanks to Stephen Rogers, Collection Manager at the Carnegie Museum of Natural History for personally inspecting and confirming the details of a Rhinoceros Auklet egg specimen [532e] collected in 1876 on Mandarte Island.

We also thank David Currie, Helena Trajic, Allison Dempsey, and Adrian Hou, engineers with the City of Vancouver, for making available unpublished assessment reports and survey data related to seabirds nesting on the Burrard and Granville bridges in Vancouver as well as providing information on the use of avian exclusion netting on those bridges. Thanks to Joanne Letkeman, Regional Manager Environmental Services, and Virginia Dragan, Environmental Coordinator, at the BC Ministry of Transportation and Infrastructure, for providing assessment reports related to nesting seabirds on the Ironworkers Memorial Bridge. James Bellavance at the UBC Building Ops-Service Centre kindly provided information on gulls nesting on campus buildings. We are very grateful to David Bradbeer, Wildlife Program Coordinator for Airside Operations at the Vancouver Airport, for providing detailed records of nesting gulls at the airport and a description of control measures used to manage gull populations. Thanks also to Aaron Ritchie from YVR for permission to use one of his nest photos.

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Team eBird provided access to eBird data. We thank many eBird contributors who have responded to our inquiries and requests for added information. Cathy Carlson from Deep Bay sent us photos documenting the first nesting of Arctic Terns on Sisters Islets in 2023. Daniel Dönnecke and Brian Avent kindly provided more details and precise locations for their 2022 nesting records at “Steamer” Island and Fulford Harbour, respectively. David Fraser assisted by reviewing his original notes and extracting added details relating to gulls nesting on Ada and Maude islands in 1995. Thanks to Pierre Geoffray from Powell River for reviewing his previous eBird record of Brandt’s Cormorants nesting on Mitlenatch Island in 2011 and clarifying that breeding was not confirmed. Agnes Lynn responded to our inquiry about Double-crested Cormorants nesting on Arbutus Island. Liam Ragan

Figure 614. Peggy Sowden has been committed to the protection of Mitlenatch Island for decades and until 2020 served as a leader of the Mitlenatch Island Stewardship Team. A renowned artist, she is also a member of the international Artists for Conservation organization. *Photo by David Thomson, 8 April 2012.*

patiently answered many inquiries and contributed supporting photos about some of his eBird records and other observations of seabirds in the Salish Sea and on the Outer Coast. L. “Islandgirl” Smith contributed photos of an unusual Black Oystercatcher nesting location at the Tsawwassen ferry terminal. Abby Walter from Washington, DC kindly sent us photos confirming the first report of nesting by Glaucous-winged Gulls in Surrey in 2023.

We also thank the BC Breeding Bird Atlas for supplying data, and specifically thank the following partners: Birds Canada, Canadian Wildlife Service, British Columbia Ministry of Environment, BC Nature, BC Field Ornithologists, Biodiversity Centre for Wildlife Studies, Louisiana Pacific, and the Pacific Wildlife Foundation, as well as all of the volunteer participants who gathered data for the project. We are grateful to Catherine Jardine at Birds Canada for approving and helping with access to the NatureCounts colonial bird dataset.

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Figure 615. Anna Smith has a keen interest in the marine environment and volunteered, along with her father, Richard Smith, and other enthusiastic residents of the area, to collect data on nesting seabirds in the vicinity of her home on Lasqueti Island specifically for this volume. Anna also contributed many photographs of the colonies they visited. *Photo by Trudi Smith, 3 October 2015.*

As with the previous volumes, wildlife and landscape artist Mark Hobson (Coastline Art Inc.; art@ markhobson.com) enthusiastically donated images of his coastal artwork that appear at the beginning of this volume. The inclusion of Mark’s paintings has elevated the quality of the entire endeavour. We also thank Rob Butler who contributed wonderful drawings that he created specifically for this work. Those drawings are displayed in Figure 95 and are placed to complement the layout at various places throughout the text. Rob also contributed some of his lovely watercolour and

ink paintings of Mitlenatch and Mandarte islands. Some of the seabird drawings so kindly contributed by Keith Taylor for use in the first volume of this series have also been used to complement the layout in this volume.

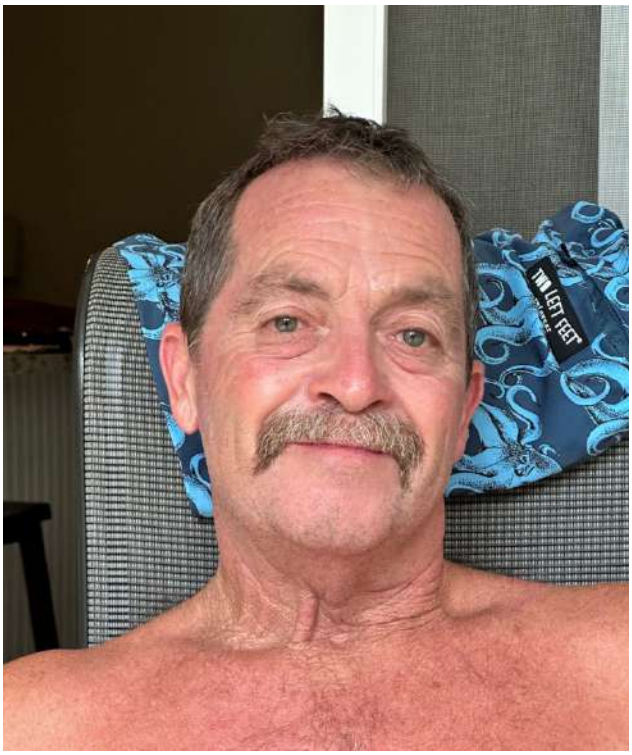

Figure 616. Ed Jordan works as a fisherman and a charter guide out of Quadra Island and spends much of his time on the water. He is also a keen birdwatcher. During his explorations of the convoluted waterways at the north end of the Strait of Georgia he has documented previously unreported seabird nesting sites and made observations at other colonies. He is shown here enjoying some Hawaiian sun between excursions to check out Hawaiian birds. *Photo by Peggy Whittington, 24 March 2023.*

Most photographs are by the authors, especially Wayne Campbell, but many have been contributed by others. For Wayne's photos, we thank Eileen Campbell for easing the arduous process of finding and selecting appropriate photographs by sorting and organizing the multitude of pictures collected by Wayne over many years of seabird work. Many wonderful photographs have been contributed by others, especially Louise Blight, Paula Courteau (Figure 618), Marlene Graham, Sheila Harrington, Ed Jordan, Ed Kroc, Connie Miller-Retzer, Rod Mitchell, Macus Ong, Jake Pattison, Liam Ragan, Heidi Regehr, Tony Rybar, Anna Smith, Peggy Sowden, David Thomson, and Alan D. Wilson. Photographers are acknowledged in each figure caption and we thank all contributors. Moira Lemon prepared the black and white maps. Colour maps on the inside front and back covers were prepared by HR GISolutions Inc., Victoria, BC, through the patient efforts of Dan Horth and Diana Brizan.

Figure 617. Jacques Sirois enthusiastically contributed seabird observations he has made throughout the area of the Victoria Harbour Migratory Bird Sanctuary and the Oak Bay Islands Ecological Reserve near his home in Victoria. He is shown here holding a dead Rhinoceros Auklet that he found on the shore at Harling Point in Oak Bay. *Photo by Michel Sirois, 22 May 2016.*

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Figure 618. Paula Courteau is a long-time resident of Hornby Island, where she has worked with BC Ferries and as a firefighter for decades. She is an avid naturalist, kayaker, and an exceptional wildlife photographer. She gathered seabird nesting records for us at colonies around Hornby Island and contributed many wonderful photographs of nesting seabirds and colony habitats in that area. As she prefers to remain behind the camera, there were few photos of Paula available. This portrait was taken by professional photographer Don Peterson to provide an official photograph of Paula for the Hornby Island fire hall. *Photo courtesy of Don Peterson Photography, 2022.*

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Figure 619. As a student, Doug Bertram joined Moira Lemon and Michael Rodway to help conduct seabird surveys in Haida Gwaii in the summer of 1983. After completing his studies, Doug went on to become a prominent research scientist and has made major contributions to our knowledge of breeding seabirds on the BC coast. He is shown here on lookout in the crow's nest of the MV *Bajo Point* that was used to transport seabird crews in Haida Gwaii in the 1980s. *Photo by Moira J.F. Lemon, 26 May 1983.*

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Figure 620. Robert and Sharon Butler are talented artists as well as naturalists. Sharon was inspired to create this incredible "seabird" quilt (next page) by her experiences on Mitlenatch Island with Rob in the 1970s. Rob's ink and watercolour paintings (following page) capture the many moods of coastal islands. *Photo and artwork by Robert W. Butler.*


Mitlenatch
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MANDARTE ISLAND
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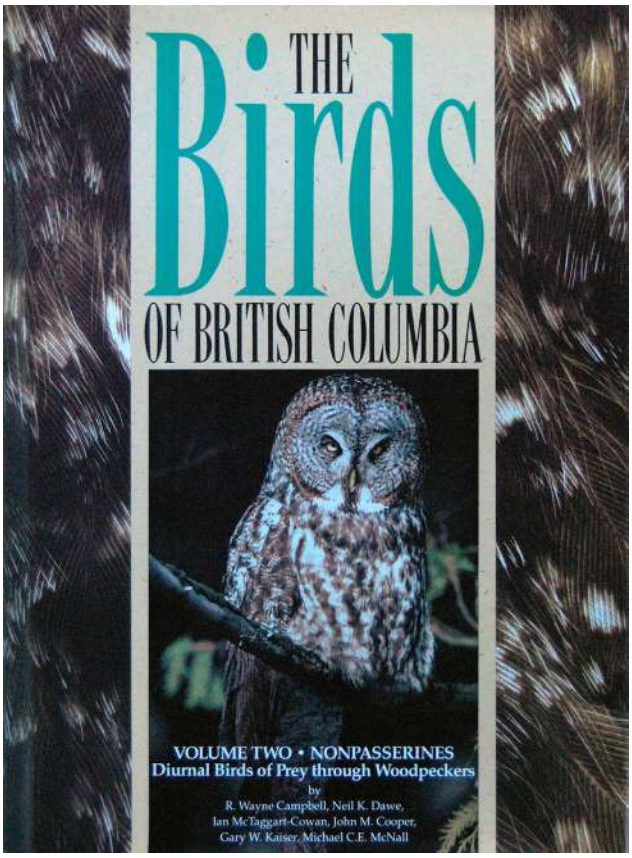

Figure 621. The four-volume work on the birds of British Columbia by Wayne Campbell and coauthors remains an essential source of information about all bird species that occur in the province.

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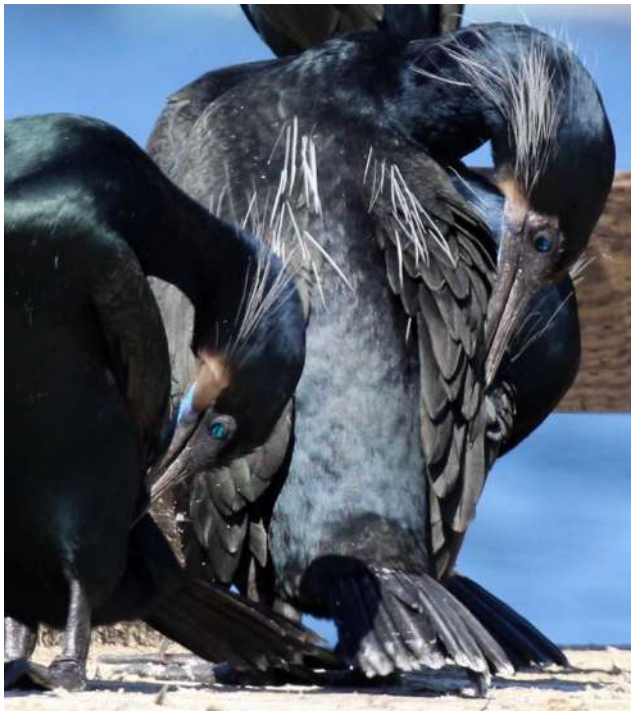

Figure 622. Harry Carter, Marilyn Lambert, and Daniel Dönnecke documented the first breeding by Brandt's Cormorants in the Salish Sea in over six decades. *Photo by Paula Courteau.*

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Figure 623. Trudy Chatwin (née Carson) has spent most of her professional career responsible for the protection and management of endangered species and ecosystems in BC. Many of her conservation efforts have focused on breeding seabirds, especially cormorants and Marbled Murrelets, and she has made major contributions to our knowledge of seabirds in the BC Salish Sea. She is shown here with Moira Lemon (left) during their studies on Ancient Murrelets on Frederick Island in Haida Gwaii in 1980. *Photographer unknown, May 1980.*

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Figure 624. Tony Gaston is a world-renowned seabird scientist. He has spent many years conducting in-depth studies of murres nesting in the Canadian Arctic and Ancient Murrelets nesting in Haida Gwaii. He has been a constant supporter of the decades of work that has culminated in this four-volume treatise on the seabird colonies of British Columbia. The intrepid biologist is seen here scanning for seabirds on the shores of Iceland in 2009. *Photo by Anne-Marie Gaston.*

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Figure 625. Valuable data are contained in reports by consulting companies hired to conduct monitoring studies of nesting seabirds on places like the Ironworkers Memorial Bridge, now home to the largest Double-crested Cormorant colony in BC. *Photo by Edward Kroc, 22 June 2015.*

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Figure 626. Ed Kroc's research interests focus on urban ecology, especially the ecology of urban-nesting Glaucous-winged Gulls. His predictive modeling studies of gulls nesting in the City of Vancouver have provided the most informed estimates of total nesting populations in the city. *Photo by Edward Kroc.*

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Figure 627. Most seabird species breeding in BC are protected by legislation under the *Federal Migratory Bird Convention Act*. Cormorants are an exception, but they are protected provincially by the BC *Wildlife Act*. Although all other seabird species are also protected under the BC *Wildlife Act*, provincial ministries are particularly responsible for the conservation and management of cormorant species, like these Double-crested Cormorants nesting on Mandarte Island. *Photo by Marilyn Lambert, 26 August 2023.*

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Figure 628. Heidi Regehr has a wide range of experience with waterbirds, from studying the breeding performance of Black-legged Kittiwakes in Newfoundland for her Master's degree to studying the movement patterns of Harlequin Ducks for her doctoral work on the Pacific coast. She is seen here preparing a dinner on the shores of Atlin Lake during a two-month kayaking adventure. *Photos by Michael S. Rodway, 5 October 2019 (top) and Paula Courteau, Hornby Island, BC, 21 January 2022.*

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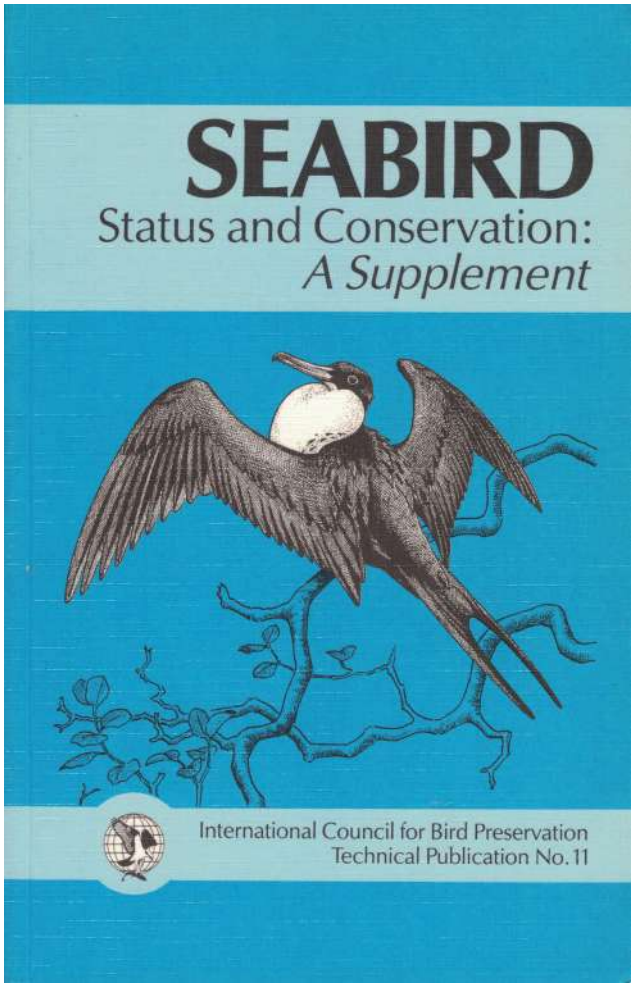

Figure 629. In the 1980s, Michael Rodway began his efforts to compile and organize all available historical knowledge on breeding seabirds in BC in anticipation of producing an updated seabird catalogue for the province. An invitation to contribute an updated account on the status and conservation of breeding seabirds in BC to the 1991 publication on the global status and conservation of seabirds by the International Council for Bird Preservation was a major impetus to bring those efforts to fruition. Though the 1991 publication was a valuable first step, it took another 33 years to ultimately finish this present four-volume treatise on seabird colonies in BC.

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Figure 630. Through his graduate work on the biology of Double-crested Cormorants and his surveys of Glaucous-winged Gulls, Terry Sullivan has contributed greatly to our knowledge of seabird species nesting in the BC Salish Sea. In this picture he is attaching siding to the small cabin on Sidney Island, the site of CWS research on Great Blue Herons and migrating Western and Least (*Calidris minutilla*) sandpipers. *Photo by Moira J.F. Lemon, July 1997.*

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Figure 631. Kees Vermeer made a monumental contribution to seabird science on the Pacific coast of Canada during his illustrious career with the Canadian Wildlife Service. He was a prolific author of more than 150 publications, leaving an unmatched legacy of knowledge about the biology and population status of breeding seabird species in BC. *Photographer unknown.*

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Personal Communications and Unpublished Data

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[451]Steven Baillie, Fisheries and Oceans Canada, Pacific Biological Station, Nanaimo.
[452]James Bellavance, UBC Building Ops-Service Centre.
[453]Louise Blight, Principal, Procellaria Research & Consulting, Salt Spring Island, BC and Adjunct Associate Professor, School of Environmental Studies, University of Victoria.
[454]David Bradbeer, Vancouver Airport Authority.
[455]Andre Breault, Canadian Wildlife Service, Environment and Climate Change Canada (retired).
[456]Rob Butler, Pacific Wildlife Foundation, Port Moody.
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[458]Harry Carter (deceased), unpublished data provided by Trudy Chatwin.
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[462]Jenna Cragg, BC Ministry of Forests, Lands, Natural Resource Operations & Rural Development.
[463]David Currie, City of Vancouver.
[464]Rian Dickson, Laskeek Bay Conservation Society.
[465]Daniel Dönnecke, Camosun College, Victoria.
[466]Mark Drever, Canadian Wildlife Service, Environment and Climate Change Canada.
[467]Gillian and Gary Fast, Cortes Island.
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[469]Al Gaensbauer, warden of Lasqueti Island Ecological Reserve.
[470]Anthony J. Gaston, Canadian Wildlife Service, Environment and Climate Change Canada (retired).
[471]Pierre Geoffray, Powell River.
[472]Todd Golumbia, Parks Canada.
[473]Christian Gronau, Cortes Island.
[474]Charles Guiguet (deceased), unpublished field notes housed at the Biodiversity Centre for Wildlife Studies.
[475]Connie Haist, former resident of Lasqueti Island, now at Yellow Point south of Nanaimo.
[476]Sheila Harrington, Lasqueti Island.
[477]Ed Jordan, Quadra Island.
[478]Mason King, Ph.D. candidate, Simon Fraser University.
[479]Donald Kramer, Victoria (Professor Emeritus, McGill University).
[480]Edward Kroc, University of British Columbia.
[481]Marilyn Lambert, Friends of Ecological Reserves.
[482]Lasqueti Island survey crew 17 June 2021, including Doane Grinnell, Connie Haist, Sheila Harrington, and Sheila (Izzy) Ray.
[483]Lasqueti Island survey crew 24 June 2021, including Connie Haist and Anna and Richard Smith.
[484]Moira Lemon, Canadian Wildlife Service, Environment and Climate Change Canada (retired).
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[486]Sabina Leader Mense, Friends of Cortes Island Society.
[487]Agnes Lynn, Victoria.
[488]Walter Maguire (deceased), unpublished field notes transcribed by Hilary Maguire and made available by Hilary Maguire and Rob Butler.

[489]Connie Miller-Retzer, BC Ministry of Forests, Lands, Natural Resource Operations & Rural Development.
[490]Ken Morgan, Canadian Wildlife Service, Environment and Climate Change Canada (retired).
[491]Mike Morrell, Denman Island.
[492]Macus Ong, M.Sc. student, Simon Fraser University.
[493]Theed Pearse (deceased), unpublished field notes housed at the Biodiversity Centre for Wildlife Studies.
[494]Liam Ragan, Important Bird and Biodiversity Areas, Victoria.
[495]Bev Ramey, resident at Winter Cove at the north end of Saturna Island.
[496]Sheila Ray, Lasqueti Island.
[497]John Reynolds, Simon Fraser University.
[498]Daniel Rodway, air conditioning specialist (retired), Delta.
[499]Donald Rodway (deceased), verbal account of visit to Annette Inlet.
[500]Michael Rodway, Wildwing Environmental Research.
[501]Michael Rodway and Heidi Regehr, Wildwing Environmental Research.
[502]Susan Rybar, Mitlenatch Island Stewardship Team coordinator.
[503]Peter Sinkins, Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site.
[504]George Sirk, Cortes Island.
[505]Jacques Sirois, Friends of Victoria Harbour Migratory Bird Sanctuary.
[506]Anna Smith, Lasqueti Island.
[507]Peggy Sowden, Mitlenatch Island Stewardship Team coordinator (until 2020).
[508]Rachel Stapleton, M.Sc. student, Simon Fraser University.
[509]Julie Steciw, BC Forest, Land and Natural Resources Operations, Fish and Wildlife.
[510]David Stirling, unpublished field notes housed at the Biodiversity Centre for Wildlife Studies.
[511]Terry Sullivan, San Rafael Research Aviary.
[512]Keith Taylor, Royal British Columbia Museum (retired).
[513]Kees Vermeer, Canadian Wildlife Service, Environment and Climate Change Canada (retired).
[514]Bryan Vroom, BC Ministry of Environment and Climate Change Strategy.
[515]Robin Weber, Prince Rupert.
[516]Dan White, Valdes Island.
[517]Phil Whitehead, Canadian Wildlife Service, Environment and Climate Change Canada (retired).
[518]Doug Wilson, BC Fish and Wildlife.
[519]Laurie Wilson, Canadian Wildlife Service, Environment and Climate Change Canada.
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Museum Specimens

[531]American Museum of Natural History (AMNH):
a – PECO egg specimen No. 6371 (old No. 872-2); this specimen was a clutch of four eggs collected for John Fannin and originally in the P.B. Phillipp Collection; the specimen is no longer on record at the AMNH, but a copy of the original specimen card is on file in the BCNRS.[523]
b – PIGU egg specimen No. 6042.

[532]Carnegie Museum of Natural History (CM):
a – GWGU egg specimen No. E3120-3123.
b – PECO egg specimen No. E4567-4569.
c – GWGU egg specimen No. E6213-6222.
d – PIGU egg specimen No. E6677-6683.
e – RHAU egg specimen No. E4186.

[533]Humboldt State University (HSU):
a – TBMU egg specimen No. 2871.

[534]James R. Slater Museum of Natural History (PSM):
a – GWGU egg specimen No. 14252.
b – GWGU egg specimen No. 14253.
c – TUPU egg specimen No. 14791.

[535]Museum of Vertebrate Zoology at Berkley (MVZ):
a – PECO egg specimen No. 4438.
b – PECO egg specimen No. 4439.
c – PIGU egg specimen No. 3722.

[536]Royal British Columbia Museum (RBCM; formerly BC Provincial Museum):
a – GWGU egg specimen No. E1599, E1603.
b – PIGU egg specimen No. E0231, E1154.
c – TUPU egg specimen No. E0249.
d – PECO egg specimen No. E0044.
e – GWGU egg specimen No. E0212, E1810.
f – PIGU egg specimen No. E1905.
g - GWGU egg specimen No. E1588.
h – PECO egg specimen No. E1388.
i – PIGU egg specimen No. E1545.
j – GWGU egg specimen No. E1391.
k – PIGU egg specimen No. E1662, E1664.
l – PECO egg specimen No. E1523.
m – PIGU egg specimen No. E1661.
n – PECO egg specimen No. E1358.
o – PIGU egg specimen No. E1360.
p – PIGU egg specimen No. E1663.
q – PIGU egg specimen No. E0810.
r – PECO egg specimen No. E1524.
s – GWGU egg specimen No. E1746.
t – GWGU egg specimen No. E2178, E2179.
u – TUPU egg specimen No. E0248, E1242.
v – GWGU egg specimen No. E0207, E1588-1593, E1595-1598, E1600-1602, E1604-1611, E1619-1620, E1622, E1623-1624, E1626, and E1657.
w – DCCO egg specimen No. E0037.
x – PECO egg specimen No. E2095.
y – GWGU egg specimen No. E1621.
z – BLOY egg specimen No. E0183.
aa – PIGU egg specimen No. E1438, E1544.
ab – DCCO egg specimen No. E0038.
ac – PIGU egg specimen No. E0235.
ad – GWGU egg specimen No. E1674.
ae – BLOY egg specimen No. E1668.
af – BLOY egg specimen No. E1165.
ag – BLOY egg specimen No. E1265.
ah – GWGU egg specimen No. E2207, E2208.

[537]Royal Ontario Museum (ROM):
a – PIGU egg specimen No. 1992.
b – PIGU egg specimen No. 3283; this record was not retrieved in an online search through VertNet but a copy of the original specimen card is on file in the BCNRS.[523]

[538]Sam Noble Oklahoma Museum of Natural History (OMNH):
a - DCCO egg specimen No. E0095.

[539]University of British Columbia Beaty Biodiversity Museum (UBCBBM):
a – BRCO egg specimen No. B020151.
b – GWGU egg specimen No. B020653, B020654.
c – GWGU egg specimen No. B020657.
d – GWGU egg specimen No. B020664-665.
e – GWGU egg specimen No. B020666-667.
f – PECO egg specimen No. B020158.
g – GWGU egg specimen No. B020669-671.
h – GWGU egg specimen No. B020672.
i – GWGU egg specimen No. B020679.
j – GWGU egg specimen No. B020673-681.
k – GWGU egg specimen No. B020683-690.
l – GWGU egg specimen No. B020659-663.
m – BRCO egg specimen No. B020151.
n – PECO egg specimen No. B020154.
o – PIGU egg specimen No. B020813.
p – GWGU egg specimen No. B020652.
q – GWGU egg specimen No. B020696, B020697, B020704.
r – PIGU egg specimen No. B020823-824.

[540]Western Foundation of Vertebrate Zoology (WFVZ):
a – PECO egg specimen No. 157884.
b – GWGU egg specimen No. 186137.
c – GWGU egg specimen No. 28402.
d – GWGU egg specimen No. 28401.
e – GWGU egg specimen No. 148566.
f – GWGU egg specimen No. 148565.
g – PECO egg specimen No. 88359.
h – PIGU egg specimen No. 11817, 16851.

i – PIGU egg specimen No. 16850.
j – GWGU egg specimen No. 28403.
k – GWGU egg specimen No. 39693.
l – RHAU egg specimen No. 76175.
m – PECO egg specimen No. 81319.
n – PECO egg specimen No. 28664.
o – GWGU egg specimen No. 90259, 131836, 163566.
p – PIGU egg specimen No. 192782.
q – PECO egg specimen No. 95541.
r – PIGU egg specimen No. 160087.

Last Minute Additions

Some information was obtained or inserted after the body of the manuscript, including all the superscript reference numbers, was already formatted for publication. We list those last-minute data sources here in the order they were inserted.

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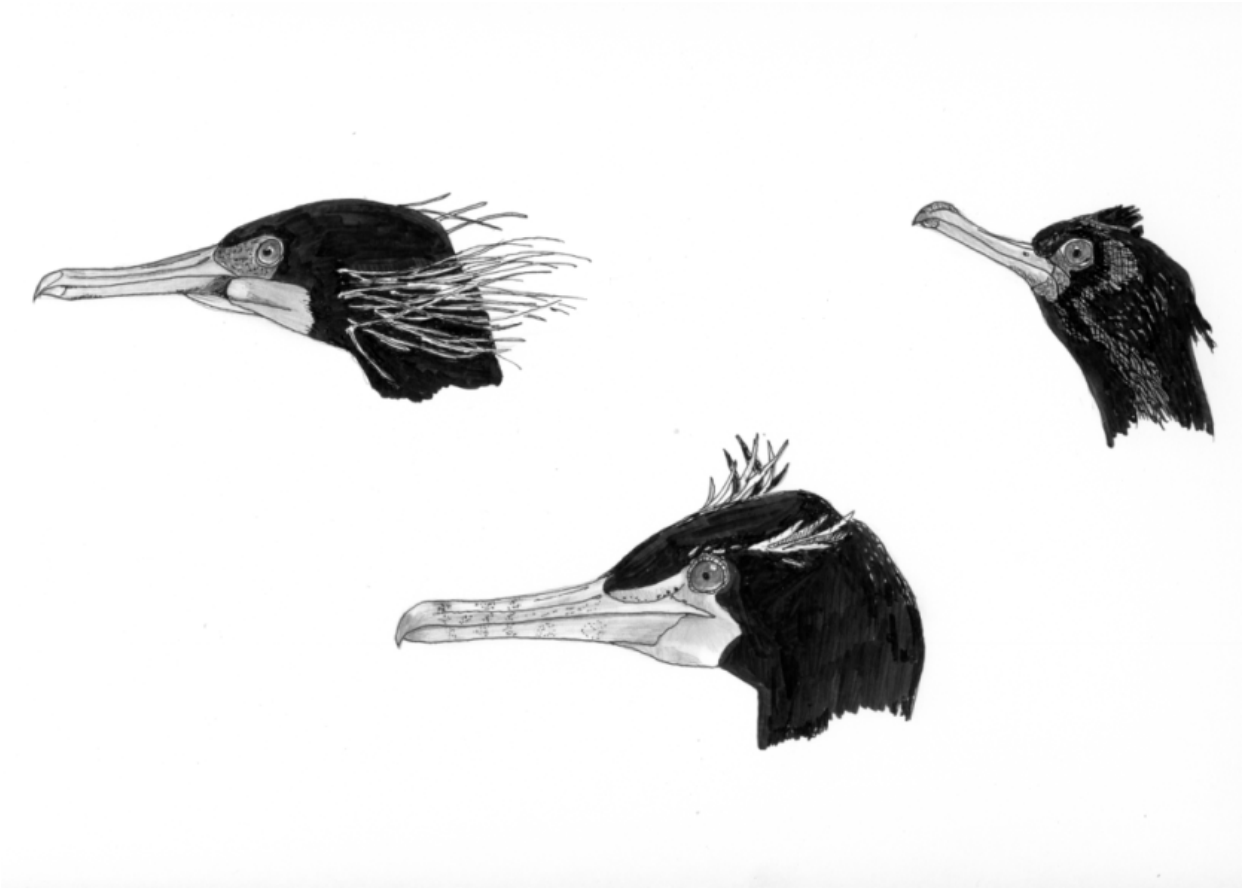


APPENDIX 1. SEABIRD BREEDING POPULATIONS IN BC AS OF 2023

In the first volume of this work published in 2018,[335] we summarized seabird breeding population estimates for all of coastal BC using data available as of 1990 (see summary Tables 3-5 in Part 1, pages 63-65). In the second and third volumes dealing with colonies in Haida Gwaii [336] and the BC Outer Coast,[337] respectively, we also summarized population estimates as of 1990. In appendices to those volumes, we presented any post-1990 records that we were aware of, but we did not incorporate those into regional population estimates. We used a different approach in this fourth and final volume, and have updated population estimates for the BC Salish Sea with data available as of 2023 (see Table 1 on page 92). Updated estimates for this area differ substantially from the 1990 estimates provided in volume 1. We thus thought it useful as an epilogue to the entire treatise to present updated tables summarizing seabird breeding populations for all of coastal BC.

In the sections and tables below, we have incorporated all post-1990 data that we know about as of 2023 for all parts of the BC coast. First, in Tables A1-1 to A1-3, we list any post-1990 data for colonies in Haida Gwaii and on the BC Outer Coast that we have obtained since the publication of those volumes in 2020 and 2022, respectively [336, 337] (note that for the BC Outer Coast, all post-1990 records through 2022 that we had were compiled in Appendix 1 of that volume, [337] but data from 2022 surveys by Parks Canada in Pacific Rim National Park Reserve were not available at that time). We then list, in Tables A1-4 and Table A1-5, updated, current populations estimates (as of 2023) for every known seabird nesting site Haida Gwaii and on the BC Outer Coast, respectively. In those tables, we include all post-1990 data presented in appendices to the Haida Gwaii and BC Outer Coast volumes and any additional data listed here in Tables A1-1 to A1-3. Tables A1-4 and A1-5 thus update all the regional tables in the Haida Gwaii [336] and Outer Coast [337] volumes. For both those areas, we have not revised counts for Pigeon Guillemots or Tufted and Horned puffins with post-1990 data unless post-1990 counts were higher than previous estimates. This was because of the variability in count data for those species and because we generally could not determine how complete post-1990 counts were. Finally, we compile in Tables A1-6 to A1-9, all current population data to summarize total breeding populations in BC as of 2023 (updating Tables 3-6 in Part 1,[335] pages 63-67). In compiling Tables A1-6 and A1-7, we have used a different approach to generate total storm-petrel population estimates than we used in Part 1 [335] to provide more useable estimates of total breeding populations for each storm-petrel species (see below and Table A1-10). As an aid to identifying and mapping colony locations, we also provide updated geographical coordinates for all known historical and current seabird colony sites in BC as of 2023 (Table A1-11).

Seabird Nesting Records (except for Black Oystercatcher monitoring data) at Colonies in Haida Gwaii and on the BC Outer Coast Obtained since the Publication of those Volumes

Haida Gwaii

Known post-1990 changes in seabird breeding population estimates at colonies in Haida Gwaii were described in Appendix 1 of the Haida Gwaii volume [336] of this seabird colony catalogue. That volume was published in 2020 and addressed known changes through 2019. At that time, major declines in populations of burrow-nesting species, related to further impacts of introduced rats and raccoons, had occurred at some colonies, especially in Englefield Bay on the west coast of Moresby Island and on Kunghit, Lyell, and Limestone islands on the east coast of Moresby Island. Increases in breeding populations were also documented at some colonies, including increases of Ancient Murrelets and Cassin's Auklets on Lihou Island in Englefield Bay and of Ancient Murrelets on George, East Copper, Ramsay, and Reef islands on the east coast of Moresby Island, although, on Reef Island, documented increases may have been offset by a subsequent windfall event that decimated a large swath of nesting habitat.[336] Several new storm-petrel and Black Oystercatcher colony sites were documented.

Some transect surveys were conducted at colonies in Englefield Bay in 2016 and on East Limestone Island in 2017, but population estimates from those surveys were not available when the Haida Gwaii volume was published. Data from those surveys are still being analyzed; however population estimates from those surveys are now available for Ancient Murrelets on Carswell and Lihou islands in Englefield Bay and on East Limestone Island.[519, 607] Those estimates are listed in Tables A1-1 and A1-4.

Impacts of introduced rats and raccoons are ongoing at colonies in Haida Gwaii (Figure 633).

The large colony on Ramsay Island is of great concern since rats were detected on the island in 2019.[336] Also, a Black Bear was seen feeding along the shoreline on Ramsay Island on 28 and 29 June 2015.[293] If bears have persisted on the island, they may pose an additional threat to nesting seabirds. Management action is required to eradicate rats on that island before seabird populations are decimated. This is a daunting task that would require a broad-scale approach. Genetic work in Gwaii Haanas has confirmed that Norway Rats are moving freely from Lyell Island to all islands in the area, including Ramsay, Agglomerate, Tar, Murchison, Faraday, House, and Hotspring islands.[503] The rats are apparently swimming stretches as wide as 1.2 km, perhaps a little further. This means that an eradication program for Ramsay Island would need to include Lyell Island and the entire complex of islands around it. Otherwise, the rats would simply re-invade. An eradication program on that scale would have a multi-million dollar price tag. At present, that kind of funding is not available. Efforts at present are to control rats on smaller stepping-stone islands and hopefully prevent their spread to other major colonies like Bolkus and Copper islands.[503]

Figure 633. Introduced Northern Raccoons and rats, especially Norway Rats, continue to impact seabird breeding populations in Haida Gwaii. Norway Rats reached the large Ancient Murrelet and Cassin's Auklet colony on Ramsay Island in 2019. Without a massive effort to eliminate rats from the island as well as from all nearby sources of rat dispersal, the demise of that colony is likely inevitable. *Photos by R. Wayne Campbell.*

Frederick Island on the west coast of Graham Island was revisited by a CWS crew in 2022 to resurvey permanent monitoring plots that were established on the island in 2015.[440] Thirteen of 15 established Ancient Murrelet plots and 12 of 14 established Cassin's Auklet plots were resurveyed: numbers of burrows in the 13 surveyed Ancient Murrelet plots increased slightly from 534 in 2015 to 572 in 2022; and numbers of burrows in the 12 surveyed Cassin's Auklet plots decreased slightly from 454 in 2015 to 398 in 2022. Burrow occupancy rates were also determined in 2022 in samples of burrows outside permanent plots. Rates were lower than median rates in both Ancient Murrelet (29%, n = 49) and Cassin's Auklet burrows (53%, n = 30). Particularly low occupancy, as well as some evidence of extended egg neglect by some breeding birds, suggested poor oceanographic conditions for Ancient Murrelets in 2022.[440] Due to weather and time constraints, CWS crews were unable to establish additional permanent plots that had been planned for both species. No surveys of permanent plots on other monitored colonies in Haida Gwaii have been conducted since 2019.

In Table A1-1 we have compiled known seabird nesting records (except Black Oystercatcher data at monitored colonies) at colonies in Haida Gwaii obtained since the publication of that volume, through 2023. There have been some noteworthy changes: several new or re-established Pelagic Cormorant colonies have been reported on the west and east coasts of Moresby Island; Rhinoceros Auklets were found nesting on Reef Island again in 2022; and hundreds of Fork-tailed Storm-Petrels may now nest on East Limestone Island.

Monitoring of Black Oystercatcher populations on the east coast of Moresby Island by Gwaii Haanas and Laskeek Bay Conservation Society (LBCS) and surveys of Glaucous-winged Gull colonies in Laskeek Bay by LBCS have been ongoing. We have tabulated results of oystercatcher surveys conducted at 33 regularly monitored colony areas between 2005 and 2023 in Table A1-2 (data from 2005 and 2018 were previously presented in Table A1-6 in the

Haida Gwaii volume [336]). Numbers of oystercatchers found nesting at monitored colonies have increased through 2023. At the five regularly monitored gull colonies in Laskeek Bay (see Table A1-7 in the Haida Gwaii volume [336]), totals of 226, 218, and 225 nests were counted in 2020, 2021, and 2023, respectively (surveys were incomplete in 2022). At the five monitored colonies in those years, gulls were nesting only on Lost Islands and Kingsway Rock, except for one nest found on Low Island in 2020 (see Table A1-1 for detailed results for each colony). Total nests counted were similar to numbers counted in 2018 and 2019, but still depressed compared to average counts from the previous two decades.[336]

BC Outer Coast

Post-1990 records through 2022 for the BC Outer Coast were compiled in Appendix 1 of that volume,[337] but data from 2022 surveys by Parks Canada in Pacific Rim National Park Reserve were not available at that time. Data from 2022 and 2023 are thus summarized here in Tables A1-1 and A1-3. Most data collected by Parks Canada in 2022 and 2023 were associated with continued monitoring of Black Oystercatcher populations in the park.[530]

One note-worthy record from Parks Canada surveys in 2022 was the confirmation of breeding by at least one pair of Cassin's Auklets on Seabird Rocks,[520] the first since 1998.[337] In 2023, Pelagic Cormorants were also found nesting again on Seabird Rocks,[520] the first record of nesting since 2003.[337] Some incidental observations of Glaucous-winged Gull nests were also recorded during oystercatcher surveys; those observations are listed in Table A1-1. Results of Black Oystercatcher monitoring surveys are presented in Table A1-3 and are discussed below.

Just after the Outer Coast volume [337] was published, we received documentation of a new colony of Double-crested Cormorants on Gull Rocks (MC-160) on the northern mainland coast.[544] This is the first evidence of breeding by that species on the BC coast outside of the Salish Sea. The colony was photographed in 2014 by Canadian Coast Guard personnel servicing the automated light on the rocks (see below).

Observations in the Scott Islands in June 2023 by Liam Ragan and other observers from the Important Bird Area Program documented Common Murres attending nesting areas on Castle Rock, Triangle Island and on the western cliffs of Sartine Island.[524] Last reports of murres attending those historical nesting locations are from 1989 and 1975, respectively.[337]

Table A1-1. Recent and newly-discovered historical nesting records for seabird colonies in Haida Gwaii and the BC Outer Coast obtained since the publication of those volumes in 2020 and 2022[a], respectively,[336, 337] except see Tables A1-2 and A1-3 for results of Black Oystercatcher surveys conducted by Gwaii Haanas and Laskeek Bay Conservation Society on the east coast of Moresby Island and by Pacific Rim National Park Reserve on the west coast of Vancouver Island.

Species	Recent Records and Newly-discovered Historical Nesting Records
HAIDA GWAII	
West Coast Moresby Island	
WM-050 Carswell Island	
ANMU	Data from a transect survey conducted in 2016 have recently been analyzed.[519, 607] Twenty-one quadrats along four transects were surveyed, giving an average density estimate of 1,240 burrows/ha. Colony area was estimated to be 8.2 ha. Eight of 24 burrows explored were occupied. Breeding population estimates were calculated from these parameter estimates using the method that has been traditionally used during previous CWS inventory work [339] and using a statistical approach involving Bayesian hierarchical analyses.[607] Both calculations gave a total population estimate of 3,400 breeding pairs in 2016. This is higher than previous population estimates, but the 2016 survey was the first complete transect survey of the colony and comparisons with past total population estimates are unreliable. The burrow occupancy rate was much higher in 2016 than when it was last determined in 2011,[180] suggesting that the low occupancy rate seen in 2011 reflected a poor reproductive year for Ancient Murrelets rather than a decrease in the breeding population.
WM-080 Lihou Island	
ANMU	Data from a transect survey conducted in 2016 have now been analyzed.[519, 607] Burrows were counted in 87 quadrats along 13 transects, giving an average density estimate of 820 burrows/ha. Colony area was estimated to be 35.5 ha. Twenty-six of 76 burrows explored were occupied, giving an occupancy rate of 34%. Calculating a breeding population estimate using the traditional method and a Bayesian hierarchical analysis, as described above for Carswell Island, gave population estimates of 9,700 and 10,000 pairs, respectively, in 2016. We have

	used the latter estimate in our summary tables (see Table A1-4) because that is the estimate presented by the authors of that study.[607] As was seen on Carswell Island, the burrow occupancy rate was much higher in 2016 than when it was last determined in 2011,[180] suggesting that the low occupancy rate seen in 2011 reflected a poor reproductive year for Ancient Murrelets rather than a decrease in the breeding population. Burrow density in 2016 was higher than in 1986 but similar to that determined in 1993,[180] while the occupancy rate was somewhat lower in 2016 than in 1993 (a reliable occupancy rate was not determined in 1986). Overall, data suggest an increase in the breeding population between 1986 and 1993 and a relatively stable population since.
WM-290 Flatrock Island	
PECO	At least 10 nests with adults present were seen along the southeast and southwest shore in 2009.[45] The last record of nesting was in 1977.
WM-300 Gordon Islands	
PECO	A new nesting site for Pelagic Cormorants was reported in 2019. Bruce Whittington saw at least 96 apparent nests, many occupied, with some birds carrying nest material, on 21 June. Nests were on a cliff face south of the narrow central isthmus, on the west side of the island.[524]
East Coast Moresby Island	
EM-310 Howay Island	
PECO	Bruce Whittington reported at least 80 apparent nests, some occupied, on 22 June 2019.[524] This is the largest number of nests ever reported at this colony.
EM-420 Arichika Island	
PECO	This is a new nesting site for Pelagic Cormorants. Successful nesting was reported in 2014: 2 nests, one with chicks, were seen on a cliff on the south side of the island on 30 June.[292] One nest was seen but no cormorants were present on 31 May 2015.[293] No birds were present on 5 June 2016 [294] or on 3 June 2018.[295] In 2021, eight nests were seen on 6 June; nests were abandoned on 1 July.[296] A much larger colony was observed in 2023: a total of 32 nests attended by 56 adults were seen on 5 June and 30+ nests were recorded on 2 July.[599] No obvious chicks were seen in nests on 2 July.
GWGU	This is a new nesting site for gulls: 1 nest with 3 eggs was found on 6 June 2021.[296]
EM-460 Tatsung Rock	
GWGU	Observers in 2021 counted 34 nests (32 with eggs or chicks) on 1 July.[296] They called it an approximate count.
EM-470 Ramsay Island	
PECO	There was no sign of nesting at historical nesting locations along the south side of the island in 2021 or 2023.[464]
GWGU	In 2023, 1 nest with 2 eggs was found on 4 June and 2 large chicks were seen on 4 July on one of the small rocks along the northwest side of the island, between Andrew Point and Ramsay Point.[599] We have no previous records of gulls nesting on those rocks. This adds a fourth nesting location for gulls around Ramsay Island (see Rodway et al.[336]).
EM-480 Ramsay Rocks	
GWGU	This colony appears to have been abandoned since Carita Bergman reported many gulls nesting in 2017.[336] About 22 adults and some nests under construction were seen on 4 June 2018; [295] 6 adults were present but no nests were found on 6 June 2021.[296]
EM-490 Bischof Islands	
GWGU	This is a new nesting site for gulls: 23 nests (16 with eggs) were counted on two of the eastern rocks on 5 June 2021.[296] Gulls continued to nest in 2023. Survey crews from LBCS and Gwaii Haanas estimated 20+ nests, most with 3 eggs, some empty, and some with 2 eggs, on 6 June.[599]
EM-510 House Island	
BLOY	Richard Cannings found a nest with 1 egg on 14 June 1988,[523] a record we previously missed.
EM-530 Murchison Island	
PECO	Nesting has been observed on the northeast cliffs in recent years, but the colony has not become well established. No evidence of nesting was seen on 27 June 2010,[288] 5 June 2011,[289] 5 June 2012,[290] 2 June 2013,[291] and 1 July 2014.[292] Since then, 12 nests and 45 adults were seen on the cliffs on 6 June and 25 nests were reported on 6 July 2016,[294] 7 nests but no adults were seen on 4 June 2018,[295] and in 2021, 4-5 unattended nests were recorded on 3 June and 1 nest was recorded on 2 July.[296] Increased numbers of Pelagic Cormorants were observed nesting in 2023. Survey crews from LBCS and Gwaii Haanas counted 54 nests on the east end cliffs on 3 and 4 June (Figure 634).[599] Seventy adults were present on 4 June. Nesting appeared to be unsuccessful, however, as no cormorants were present on 4 July, although nests were still intact with lots of guano.
GWGU	Six nests (4 with eggs) and 22 adults were counted on the southeast rocks on 3 June 2021.[296]
EM-540 Agglomerate Island	
GWGU	Twenty nests (15 with eggs or chicks) were counted on the south rocks on 2 July 2021.[296]

EM-560 Tar Islands	
PECO	On 2 June 2018, 17 nests and about 60 cormorants were seen on the west side of island #2 [295] where we saw nests being built in 1982.[336] In 2021, 6 abandoned nests were seen on 2 June and 5 recently built and 3 old nests were visible on 5 July; no adults were present.[296] No cormorants were nesting on the west side cliffs on 1 July 2023.[599]
EM-591 Shuttle Island	
GWGU	An empty nest was found on the small north rock but nesting was not confirmed in 1977.[336] On 26 July 2021, Bruce Wittington confirmed a new nesting site for gulls when he observed an adult with a large young on the north rock.[524]
EM-630 Kelo Rocks	
GWGU	Three empty nests were seen on 6 July 2023.[599] No chicks were observed.
EM-635 Tanu Island	
BLOY	Richard Cannings found a nest with 3 eggs on 8 June 1987 and a nest with 1 egg on 15 June 1988 on the rocky point at the Tanu village site.[523] We were previously unaware of these earlier nesting records at this site.
EM-650 Lost Islands	
PECO	This is a new nesting site for Pelagic Cormorants. Active nests were observed in several years between 2012 and 2021, but the colony appeared to be abandoned in 2023. Nests have been seen at three locations near the east end of the islands (on the predominantly rocky areas east of the main forested island): #1) on the southwest side of the southern-most point of the islands; #2) on the south tip of the southern-most point of the islands; and #3) on the north side of the eastern point of the islands. On 9 June 2012, observers reported 1 nest at location #1.[290] On 5 June 2013, 16 nests and about 25 adults were visible at location #3.[291] On 4 June 2014, 6 nests and 20 adults were recorded, we think at location #3.[292] On 3 June 2015, 17 nests were counted at location #2.[293] On 20 June 2021, 8 nests and 11 adults were recorded at location #3, and nests with chicks were seen at location #1.[296] A nest count was not made at location #1 in 2021; we thus estimated a total of 10 nests for the colony in 2021. No cormorants were seen nesting on 8 June 2023.[464]
GWGU	Surveys by LBCS documented 177 nests (145 with eggs or chicks) on 14 June 2020, [309] 153 nests (125 with eggs or chicks) on 20 June 2021,[437, 527] and 151 nests (125 with eggs) on 21 June 2023.[464] The islands were not surveyed by LBCS in 2022.[464]
EM-680 Kingsway Rock	
GWGU	Surveys by LBCS documented 48 nests (43 with eggs) on 17 June 2020,[309] 65 nests (55 with eggs or chicks) on 20 June 2021,[437, 527] and 55 nests (53 with eggs or chicks) on 21 June 2022,[527] and 74 nests (68 with eggs, 2 of which also had 2 hatched chicks each) on 20 June 2023.[464]
EM-690 Reef Island	
PECO	No evidence of nesting was seen in 2021, 2022, or 2023.[464]
GWGU	LBCS did not conduct a full survey for gulls in 2022, but did locate one nest with two chicks on the south side of the island, near the west end, on 4 July 2022.[527] Three adults were observed near the nest. No evidence of nesting was found during surveys conducted on 29 May and 9 July 2023.[464]
PIGU	A count by LBCS on 30 June 2022 tallied a total of 461 guillemots around the island, including 117 around the east end, 107 on the south side, and 237 around the west end of the island.[524] Adults were seen carrying food.
RHAU	Last found nesting in 1977, when 100 pairs were estimated nesting amongst Cassin's Auklet burrows in two areas on the south side of the island,[336] Rhinoceros Auklets were again found nesting in 2022, this time on the north side.[464, 598] During Black Oystercatcher surveys along the north coast of Reef Island on 5 July 2022, some very large seabird burrows were detected from the boat. On 6 July, a party, including Tony Gaston, Jake Pattison, and Jesse Beaubier, landed and investigated the burrows. They counted just over 500 burrows of a size and in situations indicative of Rhinoceros Auklets. Two Rhinoceros Auklets were seen in burrows. No evidence of other auks was found in the area, although it had previously held small patches of Cassin's Auklet burrows in 1983. Most of the burrows looked active with many signs of digging and soil excavation. Burrows were located in an open stand of spruce with very little ground cover (Figure 635). Large numbers ("hundreds") of Rhinoceros Auklets were seen in Laskeek Bay on several occasions over the two previous weeks.[464, 470, 527] We have used the count of just over 500 burrows and the median BC occupancy rate of 77% [339] to generate a current population estimate of 400 pairs.
EM-710 Louise Island,Vertical Point and Breaker Bay	
PECO	No signs of nesting cormorants were seen at Vertical Point in 2021, 2022, or 2023.[464]
EM-720 Limestone Islands	
FTSP	Investigations on East Limestone island in June 2022 revealed "hundreds" of Fork-tailed Storm Petrels making nighttime visits to parts of the south coast. Breeding by small numbers was confirmed in previous years; observations in 2022 suggest that the nesting population may now number in the 100s.[464, 527] We have used an estimate of 100 pairs as the current breeding population estimate.

ANMU	Data from a transect survey of East Limestone Island conducted in 2017 have recently been analyzed and indicate continued decline in the breeding population.[519, 607] Forty-nine quadrats along 11 transects were surveyed, giving an average density estimate of 200 burrows/ha. Colony area was estimated to be 15.2 ha, although that included areas of severe and moderate blowdowns that have occurred in recent years. Only one of 20 burrows explored was occupied. Two different methods were used to calculate breeding population estimates from these parameter estimates. The method that has been traditionally used during previous CWS inventory work [339] gave an estimate of about 150 breeding pairs. Using a more up-to-date statistical approach involving Bayesian hierarchical analyses gave a total population estimate of 400 breeding pairs. We have used the latter estimate in our summary tables (see Table A1-4) because that is the estimate presented by the authors of that study,[607] although there was a suggestion that the former estimate may have been more accurate.[519] A small remnant population was also indicated by results of the ongoing camera monitoring of chick departures: only 11 departing chicks were detected in 2022 [598] compared to 350 in 1990.[607]
EM-730 Low Island	
PECO	No signs of nesting cormorants were seen in 2021, 2022, or 2023.[464]
GWGU	LBCS found 1 nest with a single egg in June 2020; [309] no nests were seen in June 2021 [437] or 2022, although a pair was repeatedly seen near the navigation light at the north end of the island in both 2021 and 2022.[464] No evidence of nesting was found during surveys conducted on 12 June and 11 July 2023.[464]
PIGU	LBCS counted 73 guillemots around the island on 30 June 2022.[524] Adults were seen carrying food.
EM-740 Skedans Islands	
PECO	No signs of nesting cormorants were seen in 2021, 2022, or 2023.[464]
GWGU	No nests were found by LBCS in 2020 [309] or 2021,[437] no gulls were seen from the water in 2022,[464] and no evidence of nesting was found during surveys conducted on 31 May and 4 July 2023.[464]
EM-770 Oliver Island	
PIGU	Victoria birder Andrew Jacobs counted 40 guillemots around the island on 1 July 2022.[524]
EM-775 "Moresby Camp" Island	
BLOY	We had a nesting record from 1996 for this site,[336] but recently uncovered an earlier record: Mary Morris found a nest with 1 egg on 18 June 1979.[523] At the end of June, she found the egg broken and the oystercatchers gone.
EM-790 Cumshewa Island	
GWGU	No nests were found by LBCS in 2020,[309] no gulls were seen from the water in 2021,[437] and no evidence of nesting was found in 2022 or 2023.[464]
***EM-800 Gray Bay** This is a newly designated colony site located north of Cumshewa Head on Moresby Island.	
BLOY	We were previously unaware of nesting records at this site.[336] In 1982, D.V. George, from Terrace, BC, found a nest on a rocky promontory cut off by high tides. He inspected the nest with 2 eggs on 17, 21, and 23 July; adults were incubating.[523]
BC OUTER COAST	
Northern Mainland Coast	
MC-160 Gull Rocks	
DCCO	A photograph sent to Laurie Wilson [519] at CWS by Robin Connelly [544] at DFO on 20 February 2023 documented breeding by Double-crested Cormorants at this site in 2014. No other information was available, but six, well-constructed nests, or portions thereof, and two or three adults and possibly one juvenile are visible in the photograph taken by Canadian Coast Guard personnel on 12 September 2014 (Figure 636). There were likely other nests that are not visible. This is the first evidence of breeding by this species on the BC coast outside of the Salish Sea. Other photos taken by Canadian Coast Guard personnel in 2006 [544] showed no evidence of breeding by Double-crested Cormorants at that time, so the site was likely colonized sometime between 2006 and 2014.
***MC-395 Pidwell Reef** (52.4423; -128.5712) This is a new colony site designated in 2023 located off the southwest shore of Swindle Island at the north end of Milbanke Sound, east of Price Island.	
BLOY	Liam Ragan and Kaiden Bosch recorded from 11 to 20 oystercatchers present during visits on 3 April, 17 April, and 28 July 2023.[524] Nesting was suspected although no evidence was obtained to confirm breeding.[494]
GWGU	Nesting was confirmed at this new colony site in 2023. Liam Ragan and Kaiden Bosch saw what they thought were about 5 old, unattended gull nests on 3 April 2023. About 200 Glaucous-winged Gulls were present. Bosch returned on 28 July and observed 90 gulls including several large young. He estimated about 15 pairs nesting.[600]
PIGU	Six guillemots were seen around the reef on 3 April 2023.[524]

***MC-535 Lone Island** This is a new colony site designated in 2023 located off the north side of Penrose Island, west of Bosquet Point at the mouth of Rivers Inlet.	
BLOY	A new nesting site was documented by Guy L. Monty and Bernard Schroeder who observed a pair of oystercatchers with a large chick on 11 July 2023.[524] No nesting seabirds were previously reported at this site.[337]
Queen Charlotte and Johnstone straits	
QS-190 Numas Islands	
GWGU	Gordon Curry from Sointula photographed adults with large young on the island on 26 August 2023.[524]
Scott Islands	
SC-010 Triangle Island	
PECO	Liam Ragan photographed birds on nests on 24 June 2023.[524] A total of 450 individuals were recorded.
GWGU	Adults on nests were photographed on 24 June 2023.[524] A total of 900 individuals were recorded.
COMU	Several eBird records documented large numbers of murres on their nesting slopes on Puffin Rock in 2023.[524] Small groups were also seen in nesting habitat on Castle Rock on 24 June (Figure 637). Nesting was suspected but not confirmed; observers could not detect eggs or chicks from their offshore vantage. Estimates of total numbers of individuals on nesting slopes and on the water included 7,500 on 24 June, 7,500 on 1 July, and 8,000 on 4 September.[500]
HOPU	Thirteen adults, in groups of 1, 1, 2, 2, and 7, were counted around the island by a tour group on 4 September 2023.[524]
SC-020 Sartine Island	
BRCO	Adults carrying nesting materials were seen by Liam Ragan and other observers from the Important Bird Area Program on 24 June 2023 (Figure 638).[524] No nests were actually seen. Observers estimated 100 birds present.
PECO	Liam Ragan photographed birds on nests on 24 June 2023.[524] Sixty individuals were recorded.
BLOY	One pair was seen on the rocks and was suspected nesting on 24 June 2023.[524]
PIGU	Liam Ragan and other observers from the Important Bird Area Program estimated a minimum of 500 guillemots on 24 June 2023.[524] They noted that they were "absolutely prolific in and around the island." This is the maximum number of guillemots ever recorded around the island. Adults were seen flying into probable nesting locations.
COMU	An estimated 1,500 murres were recorded on 24 June 2023.[524] Many were on the rocks in likely nesting locations on the mid-west side of the main island and nesting was suspected (Figure 639). This is the maximum number of murres ever recorded around the island.
HOPU	Three were seen around the island on 24 June 2023.[524]
West coast Vancouver Island	
WV-420 La Croix Group	
GWGU	One nest with one egg was seen on Wilf Rock on 4 June 2010.[530] Nesting had last been confirmed in 1975.[337]
WV-550 Starlight Reef	
BLOY	Folks from the Raincoast Education Society, including Alan Burger, Ken Wright, and Karyssa Arnett counted 24 oystercatchers, including recently fledged young on 24 August 2023.[524]
GWGU	Observers from the Raincoast Education Society reported at least 300 gulls including many recently fledged young on 24 August 2023.[524]
WV-850 Seabird Rocks	
PECO	In 2023, Yuri Zharikov found Pelagic Cormorants nesting for the first time since he started monitoring the colony in 2011.[520] There were a total of 17 active nests with eggs or chicks. At least 6 of the 17 nests contained from 1 to 3 chicks on 29 August. Pelagic Cormorants were last reported nesting in 2003.[337]
GWGU	Maxima of 142 and 204 gulls were counted in 2022 and 2023, respectively.[520] Yuri Zharikov observed at least 55 fledging/just fledged young on 29 August 2023.
PIGU	Maxima of 256 and 204 guillemots were counted in 2022 and 2023, respectively.[520]
CAAU	Yuri Zharikov reported at least one pair provisioning chicks in 2022.[520] This was the first confirmation of nesting since 1998.
RHAU	No Rhinoceros Auklets were observed during visits in 2022 or 2023.[520]
WV-930 Race Rocks	
GWGU	Gulls nested successfully again 2023. Ann Nightingale counted 332 adults and 237 flightless young on 2 August.[524] She noted that it was not a complete count.

[a] Note that for the BC Outer Coast, post-1990 records through 2022 were compiled in Appendix 1 of that volume,[337] but data from 2022 surveys conducted by Parks Canada in Pacific Rim National Park Reserve were not available at that time.

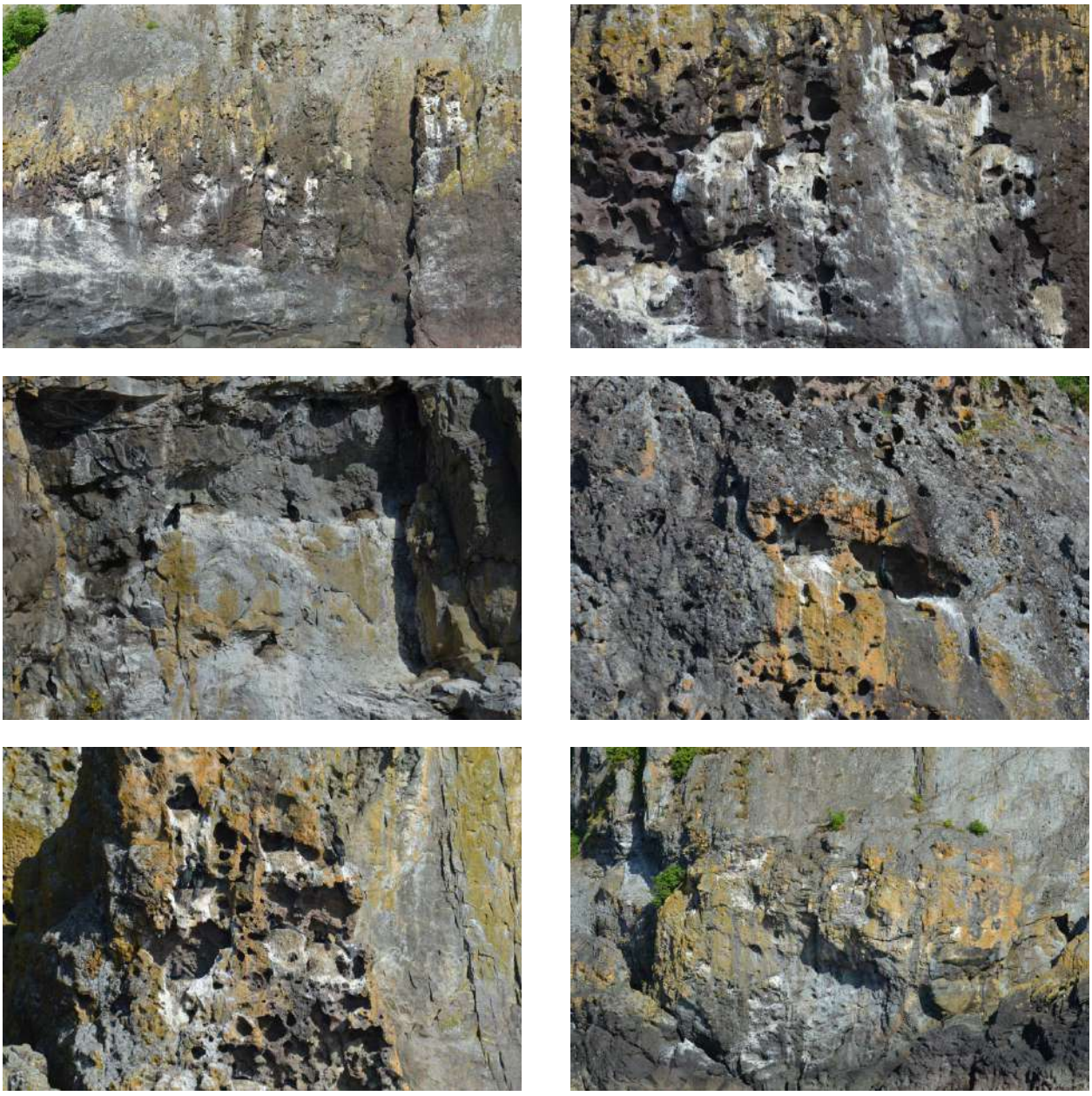


Figure 634. In 1971, the Pelagic Cormorant colony on the cliffs along the northeast side of Murchison Island was the largest on the east coast of Moresby Island, with about 100 nests. Subsequently, cormorants nested only intermittently in small numbers and the site has been unused in most years when observations were made. During recent surveys to monitor Black Oystercatcher populations at colonies along the east coast of Moresby Island, personnel from Laskeek Bay Conservation Society and Gwaii Haanas National Park Reserve documented a few cormorants nesting again in 2016. Only one nest was seen in 2021, but in 2023 (shown here) the colony had increased to 54 nests. Unfortunately, nests were abandoned in early July. *Photos by Jake Pattison, 4 June 2023.*

Figure 635. Rhinoceros Auklets were found nesting on the north side of Reef Island in Haida Gwaii in 2022. Over 500 burrows were located above the steep rocky shoreline in an open stand of Sitka spruce with very little ground cover (photos on this page and next page). Rhinoceros Auklets were last observed nesting on Reef Island in 1977.[336] At that time they were nesting on the south side of the island. Right photo on next page shows Jake Pattison trying to reach the end of a burrow. *Photos by Anthony J. Gaston, 6 July 2022.*

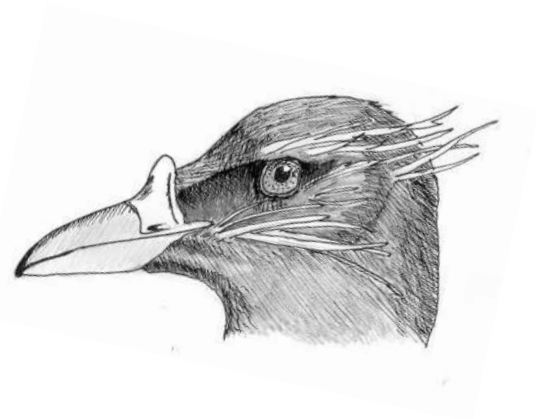


Figure 636. This photo taken by Canadian Coast Guard personnel who were servicing the automated light on Gull Rocks on the northern mainland coast in 2014 provides the first documentation of nesting by Double-crested Cormorants on the BC coast outside the Salish Sea. Six, well-constructed nests, or portions thereof, and two or three adults and possibly one juvenile are visible in the photograph. *Photo courtesy of the Canadian Coast Guard, 12 September 2014.*

Figure 637. On Triangle Island, large numbers of Common Murres were occupying nesting slopes on Puffin Rock (top) in June 2023. Small groups were also present on Castle Rock. Nesting was suspected but not confirmed. *Photos by Liam Ragan, 24 June 2023.*

Figure 638. Brandt's Cormorants were seen carrying nesting materials at Sartine Island in 2023. Nesting seemed likely, although no nests were actually seen. *Photos by Liam Ragan, 24 June 2023.*

Figure 639. Common Murres were occupying likely nesting areas on the mid-west side of Sartine Island in 2023. *Photos by Liam Ragan, 24 June 2023.*

Black Oystercatcher Surveys conducted from 2004 to 2023 on the east coast of Moresby Island by Gwaii Haanas (Parks Canada) and Laskeek Bay Conservation Society (LBCS)

Gwaii Haanas and LBCS have continued to conduct biannual surveys of 33 colony sites in 2021 and 2023 as part of their ongoing monitoring of Black Oystercatcher populations on the east coast of Moresby Island, Haida Gwaii.[296, 599] The number of nests at those 33 sites increased to the maximum ever recorded in 2023 (Table A1-2), suggesting continued stable or increasing trends for oystercatchers in that region. LBCS also continued their annual monitoring at nine sites in Laskeek Bay in 2022.[464, 527] In Table A1-2, we have compiled data for all years that surveys have been conducted from 2004 to 2023. We previously presented data from 2005 and 2018 in the Haida Gwaii volume;[336] we now present a complete data series for all years that the monitoring program has been established.

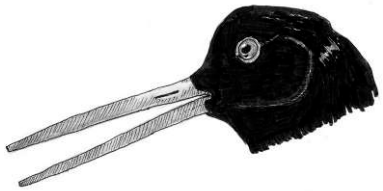


Table A1-2. Numbers of Black Oystercatcher nests counted at 33 colony areas surveyed on the east coast of Moresby Island by Gwaii Haanas and Laskeek Bay Conservation Society between 2004 and 2023.[288 to 296, 464, 484, 525, 527] Data from 2005 and 2018 were previously reported in the Haida Gwaii volume.[336] An asterisk indicates new nesting locations discovered since 1990. New colony numbers assigned since 1990 are in bold. A dash indicates sites that were not surveyed.

		Nests or breeding pairs[a]														
Site code	**Site name**	**2004**	**2005**	**2006[b]**	**2007**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2018**	**2021**	**2022**	**2023**
EM-400	Alder Island	-	4	-	-	4[4]	7[7]	6[6]	7[6]	6[5]	6[5]	6[4]	5[4]	5[5]	-	7[7]
EM-420	Arichika Island	-	1	-	-	1[1]	2[2]	2[2]	3[3]	3[2]	3[3]	3[3]	4[4]	4[4]	-	4[4]
EM-460[c]	Tatsung Rock	1	-	-	-	4[4]	5[4]	5[3]	6[5]	6[5]	6[4]	6[4]	6[5]	6[4]	-	6[5]
EM-470[d]	Ramsay Island	6	10	10	-	10[10]	12[12]	8[8]	10[10]	14[11]	9[8]	12[12]	12[12]	10[10]	-	11[11]
EM-480	Ramsay Rocks	2	2	2	-	2[2]	1[1]	1[1]	1[1]	2[1]	2[1]	2[0]	0	0	-	0
EM-490	Bischof Islands	7	9	10	-	11[11]	10[10]	12[12]	13[13]	13[13]	13[10]	13[12]	14[13]	10[9]	-	14[14]
EM-500	Hotspring Island	2	1	1	-	2[2]	2[2]	2[2]	2[2]	3[3]	2[2]	3[1]	2[2]	2[2]	-	2[2]
EM-510	House Island	1	1	1	-	2[2]	2[2]	3[2]	2[2]	3[3]	3[3]	4[2]	3[3]	2[2]	-	3[3]
EM-520[e]	Kloo Rock	-	0	-	-	0	0	0	0	0	0	0	0	0	-	0
EM-530	Murchison Island	5	5	6	-	8[8]	9[9]	9[8]	8[8]	8[8]	10[10]	10[10]	10[10]	10[9]	-	11[11]
EM-535*	Faraday Island	2	1	1	-	3[3]	3[3]	4[4]	3[3]	3[3]	4[2]	4[3]	4[4]	2[1]	-	5[5]
EM-540	Agglomerate Island	2	2	3	-	5[4]	5[4]	4[4]	4[4]	5[5]	5[4]	5[4]	4[3]	5[5]	-	5[5]
EM-550	Kawas Islets	4	4	4	-	6[5]	6[6]	6[6]	6[6]	6[5]	6[5]	5[5]	6[6]	7[7]	-	6[6]
EM-560	Tar Islands	7	5	7	-	11[10]	13[13]	15[14]	14[13]	15[11]	15[14]	14[11]	14[13]	14[14]	-	13[13]
EM-570	Tuft Islets	-	0	-	-	0	0	0	0	0	0	0	1[1]	0	-	1[1]
EM-580	Lyell Island – Dodge Pt.	4	4	3	-	3[3]	2[2]	2[2]	2[2]	2[2]	2[2]	2[2]	1[1]	2[2]	-	2[2]
EM-610*	Dog Island	1	1	1	-	1[1]	2[2]	1[0]	2[1]	2[1]	1[1]	1[0]	1[1]	2[2]	-	2[2]
EM-615*	Stansung Islets	2	1	1	-	0	0	0	0	0	0	0	0	0	-	0
EM-620	Kul Rocks	-	4	2	-	5[5]	5[5]	5[5]	5[5]	5[5]	5[5]	5[5]	5[5]	6[6]	-	7[7]
EM-630	Kelo Rocks	2	2	2	-	2[2]	2[2]	2[1]	2[2]	2[2]	2[2]	1[1]	2[2]	3[3]	-	4[4]
EM-631*	Kunga Island[f]	-	0	-	-	0	1[1]	0	1[1]	1[1]	1[1]	1[1]	1[1]	2[2]	-	2[2]
EM-640	Titul Island	1	1	1	-	1[1]	1[1]	0	1[1]	1[0]	1[1]	0	0	1[1]	-	1[1]
EM-650	Lost Islands	4	8	4	5	5[3]	6[5]	8[6]	7[5]	8[7]	8[5]	8[6]	6[4]	9[7]	-	9[9]
EM-678*	Haswell Island	-	0	-	-	1[0][g]	-	0	0	0	0	0	0	0	0	0
EM-680	Kingsway Rock	3	2	2	3	4[4]	-	4[4]	5[5]	6[6]	6[5]	6[6]	7[6]	7[5]	8[7]	8[8]
EM-690	Reef Island	6	7	9	9	5[3]	-	8[5]	10[6]	12[10]	11[9]	11[11]	13[11]	13[11]	10[10]	12[10]
EM-700	South Low Island	3	5	4	3	3[3]	-	3[3]	2[2]	4[4]	2[2]	3[3]	2[2]	5[5]	4[2]	7[6]
EM-710*	Louise Island - Breaker Bay (including Nelson Point and point to west)	-	2	2	2	1[1]	-	0	0	0	0	0	0	1[1]	0[h]	0
EM-720	Limestone Islands – East	1	4	3	3	1[0]	-	1[1]	2[1]	2[2]	2[2]	2[2]	2[2]	2[2]	2[2]	2[2]
	Limestone Islands – West	-	0	-	-	0	-	0	1[1]	0	1[1]	1[1]	1[1]	1[1]	1[1]	1[1]
EM-730	Low Island	2	2	2	3	3[3]	-	3[2]	3[2]	3[3]	3[1]	3[3]	3[3]	4[3]	4[3]	3[3]
EM-740	Skedans Islands	4	6	6	6	5[4]	-	6[6]	7[6]	6[5]	8[8]	10[9]	8[8]	8[8]	10[10]	11[10]
EM-790	Cumshewa Island	2	3	3	3	2[1]	-	-	3[1]	4[3]	-	3[1]	3[1]	2[2]	4[3]	4[4]
Total nests		**n/a**	**97**	**n/a**	**n/a**	**111[100]**	**n/a**	**120[107]**	**132[117]**	**145[126]**	**137[116]**	**144[122]**	**140[128]**	**145[133]**	**n/a**	**163[158]**
Total sites with nests (of the 33 sites surveyed)		**n/a**	**27[i]**	**n/a**	**n/a**	**28**	**n/a**	**24[j]**	**28**	**27**	**27[j]**	**27**	**27**	**27**	**n/a**	**28**

[a] Total nests followed, in brackets, by the number of nests with eggs or young, including depredated eggs or dead chicks.
[b] Three other sites were surveyed in 2006: EM-590 Topping Islands with 2 nests; EM-591 Shuttle Island with 2 nests; and EM-635 Tanu Island with 1 nest.
[c] Tatsung Rock was included in the survey segment for Ramsay Island and was coded EM-470-10 in Parks Canada reports.
[d] The survey route for Ramsay Island was modified in 2012 to exclude the eastern portion of the island but to include the entire shoreline from Tatsung Rock to Kloo Rock. The route has been consistent since then.
[e] Kloo Rock was included in the survey segment for Ramsay Island (labelled EM-470) in Parks Canada reports.
[f] Kunga Island was included in the survey segment for Kelo Rocks and was coded EM-630-2 in Parks Canada reports. The survey route has included only the east side of Kunga Island.
[g] One active nest was found on Haswell Island in 2009. A raccoon was seen in 2010 and signs of raccoon were seen in other years.
[h] A pair was present on 21 June and a single adult was present on 6 July, but they were not territorial. Two old scrapes were found.
[i] Note that Tatsung Rock was not surveyed in 2005; only 32 colony areas were surveyed in that year.
[j] Note that Cumshewa Island was not surveyed in 2012 and 2015; only 32 colony areas were surveyed in those years.

Black Oystercatcher Surveys conducted from 2008 to 2023 in Pacific Rim National Park Reserve by Parks Canada

In Table A1-6 of the Outer Coast volume,[337] we summarized Black Oystercatcher nest counts at monitored colonies in Pacific Rim National Park Reserve up to 2018. Data collected since 2018 were not presented because Parks Canada has not counted nests and has only counted birds present at monitored colonies since 2018.[520] Counts of birds in 2019 to 2021 often included unspecified numbers of non-breeding individuals and thus there were no comparable data on actual nesting populations at monitored colonies in those years. In 2022 and 2023, observers specified the number of breeding oystercatchers present; those counts could be used to estimate numbers of nesting pairs.[520] Data from those years thus provided current estimates of breeding populations at monitored colonies, although in all cases nests were not counted and breeding was not confirmed. In Table A1-3, we summarize results of 2022 and 2023 counts and, for comparison, also include all counts of birds and nests at monitored colonies made by Parks Canada from 2008 to 2023.

Nest counts at colonies monitored by Parks Canada indicated marked increases in oystercatcher breeding populations since 1989, especially up to 2013, although some of the increase was due to more thorough nest searches on land in 2008-2013.[337] After increasing between 2008 and 2013, numbers of nests decreased at surveyed colonies and remained low through to 2018 when nest counts ceased; on colonies surveyed in each year, about half as many nests were counted in 2018 compared to 2013, though numbers in 2018 were still greater than in 1989. Counts of breeding birds in 2022 gave an estimate of 113 pairs for the total breeding population at monitored colonies, very similar to the 112 nests counted on those colonies in 2013. Although the lack of actual nest counts in 2022 weakened the comparison, those results suggest relatively stable breeding populations over the last decade, in spite of lower nest counts at some colonies during the intervening years, and an overall increasing trend over the last three decades.

Current Seabird Breeding Population Estimates at all Known Colonies in Haida Gwaii and on the BC Outer Coast as of 2023

Seabird breeding population estimates as of 1990 at colonies in Haida Gwaii and on the BC Outer Coast were listed in Tables 4, 5, 6, 8, 10, and 12 in the Haida Gwaii volume [336] and Tables 4, 5, 6, and 7 in the Outer Coast volume.[337] Those estimates have been updated here in Tables A1-4 and A1-5 with all known population data collected since 1990 and are current to 2022. Current estimates include all the post-1990 data presented in appendices to the Haida Gwaii and BC Outer Coast volumes and any additional data acquired since the publication of those volumes (listed above in Tables A1-1, A1-2, and A1-3). All known current and historical colony sites are included.

Relatively few colonies outside the BC Salish Sea have been re-surveyed since 1990 and breeding population estimates at most colonies have not changed from those presented in the Haida Gwaii [336] and BC Outer Coast [337] volumes. Post-1990 surveys have been conducted at several colonies of burrow-nesting species in Haida Gwaii. Changes in population estimates based on those surveys likely indicate real changes in population sizes, except for Ancient Murrelets and Cassin's Auklets on Frederick Island on the west coast of Graham Island and for Cassin's Auklets on George Island on the east coast of Moresby Island. Changes in population estimates for Ancient Murrelets and Cassin's Auklets on Frederick Island and for Cassin's Auklets on George Island were likely due to changes in survey methodology (see Appendix 1 of the Haida Gwaii volume [336]). Most changes since 1990 are from surveys of Black Oystercatcher, Glaucous-winged Gull, and some cormorant colonies that have been conducted since 1990 in Haida Gwaii, especially on the east coast of Moresby Island, in Skidegate Inlet, and in Masset and Juskatla inlets, and on the BC Outer Coast, especially on the west coast of Vancouver Island. All post-1990 data are indicated in bold in Tables A1-4 and A1-5.

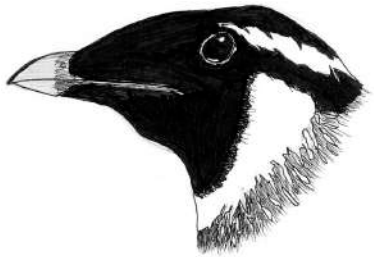


Table A1-3. Results of annual surveys of Black Oystercatcher nesting populations at monitored colonies within Pacific Rim National Park Reserve in 2008-2023 [520, 530] (note that this table replicates some of the data presented in Table A1-6 in the Outer Coast volume [337]). Surveys were conducted primarily during the end of May and beginning of June. An asterisk indicates new nesting locations discovered since 1990. New colony numbers assigned since 1990 are in bold. Sites not surveyed are indicated by a dash. Numbers outside of brackets are numbers of nests counted. Nests were counted on most monitored colonies between 2008 and 2018 but not since 2018. When the contents of all nests were determined, the number of nests that contained eggs or young is indicated in square brackets. An "S" indicates that breeding was not confirmed (i.e., no eggs or young were seen; see Appendix 2). An "e" indicates that the number of nesting pairs was estimated from counts of apparently breeding adults. Numbers of adult oystercatchers present (in parentheses) were counted in all years. However, counts of adults often included unspecified numbers of non-breeding birds. In 2022 and 2023, observers specified the number of apparently breeding oystercatchers present; those counts could be used to estimate numbers of nesting pairs and provide current estimates of breeding populations at these colonies.[520]

Colony	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
WV-420 La Croix Group *- "Wilf Dome" (N of Wilf Rock; E rock)	1(2)	1(2)	2[1](4)	2[1](5)	2[2](4)	1(4)	(6)	(5)	(6)	3[3](8)	2[2](8)	(6)	-	(6)	2eS(4)	3eS(6)
*- "Wilf Plateau" (N of Wilf Rock; large W rock)	5[5](14)	7[7](16)	7[5](14)	7[5](14)	8[8](18)	8[6](16)	2[2](14)	(14)	1(12)	2[2](14)	2[2](14)	(12)	-	(28)	7eS(14)	8eS(16)
*- "Wilf Seal Haulout (W side of large W rock)	1(2)	1(2)	1(2)	1S(2)	0(0)	1S(2)	1(2)	(4)	(4)	(4)	(4)	(4)	-	(4)	2eS(4)	2eS(4)
*- Wilf Rock (N knob)[a]	2[2](4)	2[2](6)	2[2](4)	3[2](6)	2[1](6)	2[2](6)	3[3](10)	(2)	2[2](4)	(4)	2S(4)	(6)	-	(6)	3eS(6)	3eS(6)
- Wilf Rock (S rock)	6[6](12)	7[6](14)	7[6](14)	7[2](12)	6[4](12)	6[3](12)	-	1(12)	6[4](12)	1(8)	5[5](10)	(12)	-	(10)	5eS(10)	6eS(12)
WV-435* "MacKenzie" It. (off Mackenzie Beach)	2[2](4)	3[1](12)	3[2](7)	4[4](6)	5[4](10)	2[2](12)	2[2](8)	(10)	(10)	2[1](10)	2[2](6)	(8)	-	(10)	3eS(6)	3eS(6)
WV-440 Gowlland Rocks	5[5](10)	5[5](10)	5[4](10)	7[5](14)	9[9](16)	9[8](18)	4[4](18)	4[4](22)	(20)	4[4](18)	4[3](28)	(30)	(34)	(46)	13eS(26)	14eS(28)
WV-450 "Portland" Rocks	1(2)	1(2)	1(2)	1(2)	1(2)	1(2)	(2)	(2)	(2)	(2)	1(2)	(2)	-	(2)	1eS(2)	1eS(2)
WV-460 "White" Island	2[1](4)	3[3](6)	1(2)	3[2](6)	4[4](8)	3[3](6)	3[3](6)	(6)	3[2](8)	2[2](6)	2[1](6)	(6)	(4)	(6)	3eS(10)	4eS(8)
WV-490 Green Point	1(2)	1(2)	1(2)	1(2)	1(2)	1(2)	1(4)	2[2](4)	2[2](4)	2[2](6)	-	(4)	(4)	(5)	2eS(4)	2eS(4)[b]
WV-500 Sea Lion Rocks	1S(2)	1(4)	1(4)	3[3](6)	1S(2)	2S(4)	2[2](4)	2[1](4)	(4)	(4)	1S(4)	(6)	(4)	(4)	1eS(2)	2eS(4)
WV-504* "Lismore" Rk.[c]	2[2](2)	1(2)	1(2)	2[2] (2)	1(2)	1(2)	1(4)	3[3](6)[d]	(6)	(6)	4[2](4)	(6)	(6)	(6)	2eS(6)	2eS(4)
WV-508 "Quisitis" Rocks[e]	1(9)	1(2)	1(2)	1(9)	2[1](4)	1(5)	1(2)	1(2)	-	1(3)	1(4)	(4)	-	(0)	1eS(2)	1eS(2)
WV-510 "Cormorant" Rk.[f]	1(4)	2[2](4)	1S(2)	1S(4)	2[2](4)	2[2](9)	2[2](6)	1(4)	-	(10)	1(4)	(8)	(6)	(6)	4eS(8)	2eS(10)
WV-520 Florencia Islet	11[9](24)	10[10](35)	14[9](32)	14[11](34)	14[10](28)	20[13](31)	6[5](34)	14[7](34)	8[6](42)	1(42)	8[6](45)	(22)	(27)	(29)	13eS(26)	13eS(26)
WV-575 Pinder Rock	5[5](10)	5[5](10)	2[2](6)	4[2](14)	5[2](10)	5[4](12)	(10)	3[3](10)	4[4](10)	3[3](10)	1(12)	(10)	(12)	(8)	4eS(8)	4eS(8)
WV-602* Nantes Island	1(2)	1(4)	1(3)	1(2)	0(0)	1(2)	(2)	1(2)	1(2)	(2)	(2)	(2)	-	(2)	1eS(2)	1eS(2)
WV-650 Village Reef	4[3](8)	3[3](6)	2[2](7)	5[4](10)	2[2](8)	5[4](10)	x2(10)	(8)	5[5](10)	2[2](8)	2[2](14)	(8)	(8)	(12)	6eS(12)	5eS(10)
WV-660 Faber Islets - main	3[3](6)	4[4](8)	1(8)	3[3](6)	4[4](8)	2[2](6)	4[4](8)	1(8)	-	4[4](12)	(12)	(13)	(14)	(10)	6eS(12)	7eS(14)
- north	1(2)	1S(2)	1S(2)	1(2)	1(2)	1(2)	(2)	1(2)	-	(2)	(2)	(2)	(2)	(2)	1eS(2)	1eS(2)
- west	2[2](4)	2[2](4)	1S(4)	3[3](6)	3[3](7)	3[3](6)	1(6)	3[3](6)	-	(10)	2S(8)	(12)	(8)	(6)	5eS(10)	6eS(12)
WV-690 Swale Rock	-	-	2[2](4)	2[2](6)	3[3](6)	4[3](6)	(6)	2[1](6)	1(8)	2[2](6)	3[1](6)	(8)	(8)	(8)	4eS(8)	4eS(8)
WV-780 Wizard Islet	5[5](15)	(10)	6[4](12)	6[4](12)	3[3](12)	7[6](14)	(14)	3[2](18)	5[5](14)	3[3](24)	3[3](24)	(36)	(55)	(32)	12eS(24)	19eS(38)[h]
WV-850 Seabird Rks.	12[12](24)	(28)	10[8](26)	14[12](26)	13[13](34)	24[14](30)	7[7](32)	8[8](28)	9[9](28)	5[5](49)	4[4](42)	(44)	(46)	(36)	12eS(24)	19eS(76)
Total numbers of birds counted and total nesting populations at sites monitored by Parks Canada in 2008-2022 (n/a indicates that surveys were incomplete)																
Number of birds counted [g]	168[h]	191[h]	175	208	205	219	210[h]	219	n/a	268	265	271	n/a	284	232	308
Number of nests counted or estimated [i]	**75[h]**	**n/a**	**74**	**96**	**92**	**112**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**113eS**	**132eS**
Number of nests with known contents	74		71	94	91	109									0	0
Number of nests containing eggs or young	70		56	72	79	82										

[a] Called Wilf Reef in PRNPR database.
[b] Count on Green Point in 2023 included one pair on the south rock and one pair on the main rock.
[c] "Lismore" Rock is at the south end of Long Beach.
[d] Count on "Lismore" Rock in 2015 included two pairs on rock and one pair on the adjacent Vancouver Island shore.
[e] Called "Petroglyph" Islet or "Petroglyph" Rock in PRNPR database.
[f] Called "Petroglyph" Reef in PRNPR database.
[g] Includes non-breeding birds.
[h] Counts included all but one colony; total is thus slightly underestimated.
[i] Totals in 2022 and 2023 were estimated from the numbers of apparently breeding birds counted.

Table A1-4. Estimates of seabird breeding populations at all known colonies in Haida Gwaii as of 2023.[a] Estimates are numbers of breeding pairs except for numbers in parentheses and totals in the "All species" column, which are numbers of individuals. Numbers in parentheses, given mainly for Pigeon Guillemots, are numbers of birds counted around colonies, likely include non-breeding birds, and thus are not reliable estimates of actual breeding populations. All post-1990 data and new colony numbers assigned since 1990 are in bold. We have not revised counts for Pigeon Guillemots or Tufted and Horned puffins with post-1990 data unless post-1990 counts were higher than previous estimates. This was because of the variability in count data for those species and because we generally could not determine how complete post-1990 counts were. Note that when there were confirmed (x) or suspected (S) breeding records but no estimates of numbers nesting for a species at a colony, we tallied one nesting pair for that species to derive total numbers nesting at the colony. See Appendix 2 on pages 655-656 for an explanation of the letter codes used to qualify population estimates and for species names.

SITE CODE	SITE NAME	FTSP and/or LSPE[b]	FTSP	LSPE	PECO	BLOY	GWGU	COMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[c]
West Coast Graham Island																
WG-010	Langara Island		E		52	6	73		x(187)	**24,000t**	**S**	E	**(25)**		**48,476**	1981, 1986, 1988, 2004, 2007
WG-020	Cox Island		E	E	0	1	2eS		**S(120)**	E	E	E	S(23)		**149**	1981, 1986, 1988, 2016
WG-030	Lucy Island				0				(0)	E			E		0	1981
WG-040	"Knox" Cliffs				26		0								52	1986
WG-050	"Lepas" Islet		3,500e	4,500e		1S	4e		x5(173)		200e				16,583	1977, 1986
WG-060	"Sialun" Rock				0		3eS								6	1986
WG-070	"Beresford" Islet					1									2	1986
WG-080	"Grassy" Islet					16	12		x(69)						125	1986
WG-090	"Wooded" Islet		100e			1			(3)						205	1977, 1980
WG-100	Frederick Island	**x**	**S**	**S**		10e	**5**		x4(73)	**70,300t**	**60,600t**				**261,907**	1980, 1986, 1998, 2005
WG-110	"Ingraham" Cliffs				4		4S		x3(21)						37	1977
WG-120	Tian Islets		E	E	0	10	212		x4(27)		100e				671	1986, 1988
WG-130	Solide Islands		800e	800e		2	2eS		x(110)		950e				5,218	1977, 1986
WG-140	Queen Island		E	E		1									2	1977
WG-150	Pip Islets					5	6								22	1986, 1988
WG-160	Ogilvie Island		E	E					(1)						1	1977
WG-170	McKenzie Island			E					x(1)						2	1977
WG-180	Brock Islands				0	1			3(3)						8	1977, 1986
WG-190	"Kiokathli" Islets		300e	500e		5	8S		S(18)		300e				2,244	1977, 1986
WG-195	"Buttercup" Rock					1									2	1977
WG-200	"Hosu" Islets					3	2eS		(0)						10	1977, 1986
WG-210	Barry Island		500e	200e		1eS			(1)		100e				1,603	1977
WG-212	"Barry" Cave				1										2	1977
WG-220	Salvesen Island					1S	5								12	1986
WG-230	Hippa Island		10,900t	12,800t	15	4	68		S(43)	40,000t	12,500t		S(40)		152,657	1977, 1983, 1986
WG-240	Sadler Island				16	10	114		x(28)						308	1986
WG-250	"Seal Point" Islet		1,500e	1,500e		2			S(1)						6,005	1977
WG-260	"Tartu" Rock					4			(9)						17	1976
WG-270	Gospel Island					1			**(24)**						**26**	1977, 2014
WG-280	"Kindakun" Islet						7		S(1)						15	1977
WG-290	Hunter Point					1			(2)						4	1977
WG-300	"Gudal Bay" Rocks					2			x(9)						13	1977
WG-310	Stiu Rock				2	2S	40eS[d]		5(5)						98	1977, 1986

Table A1-4. cont'd

SITE CODE	SITE NAME	FTSP and/or LSPE[b]	FTSP	LSPE	PECO	BLOY	GWGU	COMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[c]
WG-320	Gagi Rock						43eS		S(2)						88	1986
WG-330	Marble Island				0	2eS	19eS		20e(23)	1,000e	5,000e	200e	300e(350)	S(5)	13,087	1977, 1986
West Coast Moresby Island																
WM-010	"Buck Channel" Island		S	250e					S(≥1)						501	1977
WM-012	Chaatl Island - Cliffs				x										2+	1977
WM-020	Saunders Island					5e	7eS		S(8)	**E**	E	E			**32**	1986, 1993
WM-030	Helgesen Island		180t			1eS			(0)	**600t**	**5S**	**1**	0		**1,574**	1986, 2011, 2016
WM-040	Willie Island		E	E		0			S(25)	10eS	170tS	80tS			545	1986
WM-050	Carswell Island	**270e**	x[e]			1eS			(0)	**3,400t**	**180e**	20eS			7,742	1986, 2011, 2016
WM-060	"Inskip" Cave				5										10	1977
WM-070	Instructor Island	1,600t	x			1			S(17)	**E**		**E**			**3,219**	1986, 1993
WM-080	Lihou Island	**13,500t**	x	x	0	1			S(80)	**10,000t**	**13,100t**	**2,800t**	S(27)		**78,909**	1986, 1993, 2016
WM-090	Bone Point				0	1eS	18eS		S(29)				S(12)		79	1986
WM-100	Luxmoore Island	5,700t	x	x					S(2)	1,000tS	380t	300tS			14,762	1986
WM-110	Rogers Island	28,700t	x	x		1S			x(20)	1,700tS	40eS	20eS			60,942	1986
WM-120	Cape Kuper									10	120	10S			280	1986
WM-130	Moresby Islets					1eS	1eS		(1)		80e	40eS			245	1986
WM-140	Ariel Rock					1S									2	1977
WM-150	Lomgon Islets					2	34		x4(14)						86	1977
WM-160	Horn Rock						3								6	1977
WM-170	"Mike" Rock						7eS								14	1977
WM-180	"Cone" Islet							S(40)	S(8)				S(60)		108	1977
WM-190	"Between" Islet						6eS		2+eS(4)		100eS		(1)		217	1977
WM-200	"Goski Bay" Islets					2+	1		x(5)						11	1977
WM-210	"East Nangwai" Group		2			3	1		S(8)						20	1977
WM-220	Gowdas Islands					1S	21		10e(20)						64	1977
WM-230	"Lower Victoria" Rock						19eS		S(3)						41	1986
WM-240	"Keyhole" Rock						11eS						S(26)		48	1986
WM-250	"McLean Fraser" Pinnacle						5eS		S(2)						12	1986
WM-260	"Louscoone" Rocks					3									6	1986
WM-270	Adam Rocks					3	48		**S(40)**				**S(34)**		**176**	1986, 2016
WM-280	SGang Gwaay (Anthony Island)		2,100t	8,600t	7	11	352		S(395)	200e	24,700t	13,800t	20eS(32)	S(20)	99,995	1985,1986
WM-290	Flatrock Island				**10**	2	145		x5(78)				11(16)	**x(6)**	**420**	1986, 2009, 2016, 2017
WM-300	Gordon Islands		**S**	**x**	**96**	0	1S		S(26)		**580e**	**130e**	**(3)**		**1,647**	1985-86, 1993, 2016, 2019
WM-310	St. James Island				6	2eS	76e		S(16)		0		100e(30)	S(1)	385	1986
WM-320	Kerouard Islands				0	0	76eS	**x(377)**	S(68)		78,000t		600e(900)	S(3)	**157,800**	1986, 1989, 2004

Table A1-4. cont'd

SITE CODE	SITE NAME	FTSP and/or LSPE[b]	FTSP	LSPE	PECO	BLOY	GWGU	COMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[c]
East Coast Moresby Island																
EM-010	Kunghit Island				22	7	29e		S(155)	**E**	50eS	2,500e	250e(323)	S(3)	**5,697**	1986-87, 2004, 2005
EM-020	Marshall Island					**0**			17(27)						**34**	1986, 2005
EM-030	Gull Islet					**2**	**3**		x(8)						**18**	1986, 2005
EM-040	Rainy Islands	100eS	S			**5**	**19**		x6(20)						**268**	1986, 2005
EM-050	High Island								**S(32)**	0		10eS	(1)		**53**	1985, 1993
EM-060	Haydon Rock					**1**	**0**								**2**	2005
EM-070	Charles Islands		**120e**	**x**		**1**			**x(25)**		0	**90e**	(1)		**448**	1986, 1993, 2005
EM-080	Annette Island								x(16)		0	20S			56	1985-86
EM-090	Garcin Rocks					**2**	**116**		**S(54)**						**290**	2005, 2017
EM-100	Langtry Island	12,300t	x	x		**4**			**S(10)**		0				**24,618**	1985, 2016
EM-103	**"Koya Bay" Islet**					**2**									**4**	2005
EM-105	**"South Cove" Islet**					**1**									**2**	2005
EM-107	**"Carpenter" Islets**					**3**									**6**	2005
EM-110	Samuel Rock					**2**	**2**		S(13)						**21**	1977, 2005
EM-120	Rankine Islands		2,000t	12,300t		**5**	**66**		S(12)	**26,000t**	26,000t				**132,754**	1984-86, 2000, 2005
EM-130	Marion Rock					**2**	**0**								**4**	2005
EM-138	**"Collison Bay" Islet**					**1**	**1**								**4**	2005
EM-140	Nest Islets					**5**	**1**		S(25)						**37**	1986, 2005
EM-150	Inner Low Rock					**1**	**1**								**4**	2005
EM-160	Joyce Rocks					**2**	**209**		S(9)						**431**	1986, 2005
EM-170	Sea Pigeon Island								S(5)	E					5	1985
EM-180	Boulder Island								(0)	E					0	1985
EM-190	Green Rock					**3**	**0**		x5(21)						**27**	1986, 2005
EM-200	"Jedway" Islets					**1**			(4)						**6**	1977, 2005
EM-210	Bush Rock					**1**	**1**		S(1)						**5**	1986, 2005
EM-220	Bolkus Islands	230eS	S			**6**	**0**		S(41)	9,900t	960e	20eS			**22,273**	1985-86, 2005
EM-230	Swan Islands					**5**	**1**		S(4)						**16**	1986, 2005
EM-240	"Pelican" Rock					**1**	**0**								**2**	2005
EM-250	Slug Islet					**2**	**0**		x(18)						**22**	1986, 2005
EM-260	Rock Islet		4,400t	12,600t		**4**	**1**		x2(6)	0	5,100t				44,216	1985-86, 2005
EM-270	Skincuttle Island	4,300t	x	x		**4**			(0)	2,200t	1,000t				**15,008**	1985-86, 2005
EM-280	George Island		**S**	**400t**		**2**			(1)	**17,400t**	**4,300t**				**44,205**	1985, 1996, 2005
EM-290	Jeffrey Island					**2**			(0)	1,000t	2,700t				**7,404**	1985, 2005
EM-300	East Copper Island		20eS	20eS		**2**			S(30)	**6,100t**	**10,600t**				**33,514**	1985, 2003, 2005
EM-310	Howay Island		10eS		**80**	**3**	**11**		**S(30)**	300e	250eS				**1,338**	1985, 2005, 2007, 2019

Table A1-4. cont'd

SITE CODE	SITE NAME	FTSP and/or LSPE[b]	FTSP	LSPE	PECO	BLOY	GWGU	COMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[c]
EM-315	**"Poole Inlet" Islet**					**1**									**2**	2005
EM-320	"Island Bay" Group					**7**	0		(2)						**16**	1986, 2005
EM-330	"Kat" Rocks					**5**	**4**		x10(28)						**46**	1986, 2005
EM-335	**"Skaat Harbour" Islets**					**4**									**8**	2005
EM-340	Centre Islet								10e(10)						20	1986
EM-350	Wanderer Island					**1S**			S(35)						37	1986. 2005
EM-360	Sels Islet		0			**3**			S(40)						**46**	1986, 2005
EM-370	Park Island					**0**			S(27)						**27**	1986, 2005
EM-378	**Section Island**					**1S**									**2**	2005
EM-380	Koga Islet								S(36)						36	1986
EM-390	Nakons Islet					**1**			(0)						2	1985, 2005
EM-400	Alder Island	60S				**7**	**0**		**S(30)**	14,400t	3,200t				**35,364**	1985, 2005, 2018, 2023
EM-410	Huxley Island					2			S(29)						33	1977
EM-420	Arichika Island		**S**	**S**	**32**	**4**	**1**		**x(40)**	**S**	**S**				**122**	2013, 2018, 2021, 2023
EM-422	**All Alone Stone**					**1**									**2**	2005
EM-430	Marco Rock					**4**	**4**		x8(30)						**46**	1986, 2005
EM-440	Hutton Island					**3**			10e(11)						**26**	1977, 2005
EM-444	**"Haswell Bay" Islet**						**2**								**4**	2005
EM-448	**Sivart Island**					**1**									**2**	2005
EM-450	Hoskins Islets		E			**1**			x9(92)						94	1986, 2005
EM-460	Tatsung Rock					**6**	**34**		(0)						**80**	1986, 2021, 2023
EM-470	Ramsay Island				**0**	**11**	16e		S(29)	18,200t	12,900t				**62,283**	1984, 1986, 2023
EM-480	Ramsay Rocks					**0**	**0**								**0**	2021, 2023
EM-490	Bischof Islands	50eS	**S**	**S**		**14**	**23**		S(24)	**S**	**S**				**202**	1985, 2013, 2021, 2023
EM-500	Hotspring Island	900e	x	S		**2**			15e(24)	6e	10eS				**1,866**	1984, 1986, 2023
EM-510	House Island					**3**			S(10)	2,600t	40eS				**5,296**	1984, 2023
EM-520	Kloo Rock					**0**	0		(0)						**0**	1984, 2023
EM-530	Murchison Island				**54**[f]	**11**	**6**		S(28)	20e	50eS				**310**	1984, 2021, 2023
EM-535	**Faraday Island**					**5**									**10**	2023
EM-540	Agglomerate Island	5,500t	x	S		**5**	**20**		x2(14)	2,200t	200eS				**15,864**	1985-86, 2021, 2023
EM-550	Kawas Islets	700e	x			**6**	11		x4(7)		200e				**1,842**	1984-86, 2023
EM-560	Tar Islands	330e	x	x	**0**	**13**	32e		x2(46)	0	120eS				**1,036**	1985-86, 2023
EM-570	Tuft Islets					**1**	1eS		S(1)		0		E		**5**	1982, 2023
EM-580	Lyell Island, Dodge Point and Lyell Point				1	**2**			S(4)	**E**					**10**	1982, 1986, 2016, 2023
EM-590	Topping Islands					**2**			15+e						**34**	1977, 2006
EM-591	**Shuttle Island**					**2**	**1**								**6**	2006, 2021

Table A1-4. cont'd

SITE CODE	SITE NAME	FTSP and/or LSPE[b]	FTSP	LSPE	PECO	BLOY	GWGU	COMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[c]
EM-600	Gil Islet					1eS			1(1)						4	1977
EM-610	Dog Island					**2**			6+e(37)						**41**	1977, 2023
EM-615	**Stansung Islets**					**0**									**0**	2023
EM-620	Kul Rocks					**7**	0		S(1)						**15**	1986, 2023
EM-630	Kelo Rocks					**4**	**3**		x(13+)						**27**	1971, 2023
EM-631	**Kunga Island**					**2**									**4**	2023
EM-635	**Tanu Island**					**1**									**2**	2006
EM-640	Titul Island					**1**			S(114)		170				**456**	1983, 2023
EM-650	Lost Islands		80	x	**0**	**9**	**151**		**S(130)**		210				**1,030**	1983, 1985, 2016, 2023
EM-660	Helmet Island				0	0			S(19)						19	1983
EM-670	Procter Rocks					1			(3)						5	1977
EM-678	**Haswell Island**					**0**									**0**	2023
EM-680	Kingsway Rock					**8**	**74**		x3(72)						**236**	1986, 2023
EM-690	Reef Island	140e	x		**0**	**12**	**0**		**x(461)**	**6,600t**	1,700e	**400e**			**18,165**	1983, 1985, 1987, 1995, 2022, 2023
EM-700	South Low Island					**7**	0		S(18)						**32**	1986, 2023
EM-710	Louise Island, Vertical Point and Breaker Bay				**0**	**0**			S(7)						**7**	1983, 2023
EM-720	Limestone Islands		**100e**			**3**			x2(65)	**400t**	**91**	2S			**1,457**	1983, 2017, 2019, 2022, 2023
EM-730	Low Island	160	x		**0**	**3**	**0**		x2(115)		30				**501**	1983, 2023
EM-740	Skedans Islands		1,100e		**0**	**11**	**0**		x7(136)	E	100				**2,558**	1983, 2023
EM-745	**"Lagoon" Islet**					**2**									**4**	2010
EM-750	Mabbs Islet								27(60)						60	1977
EM-760	Nedden Island					2			(174)						178	1977
EM-770	Oliver Islet					1			**(40)**						**42**	1977, 2022
EM-775	**"Moresby Camp" Island**					**1**									**2**	1996
EM-780	Kingui Island		0			1			S(4)						6	1977
EM-790	Cumshewa Island					**4**	**0**		x2(62)						**70**	1986, 2023
EM-800	**Gray Bay**					**1**									**2**	1982
Skidegate Inlet																
SI-005	**Spit Point**					**1**									**2**	2005
SI-010	Sandspit Wharf								8e						16	1977
SI-020	Gillatt Island					**4**	80		x(72)						**240**	1990, 2005
SI-030	Torrens Island					**0**			x(516)						516	1990, 2005
SI-040	Jewell Island					**0**[g]			x(311)						311	1990, 2005
SI-045	Skidegate Ferry Dock, *M.V. Kwuna*						**1**		**x(35)**						**37**	2001, 2008, 2018
SI-050	Flowery Islet						22		**(1)**						**45**	1990, 2009
SI-060	"Kwuna" Rocks					**1S**	20		x(21)						63	1990, 2005
SI-070	"Alliford" Islets					**4**	0		x(61)						**69**	1990, 2005
SI-080	Bush Island					**3**	30		x(62)						128	1990, 2005
SI-085	Robber Island					1									2	1990

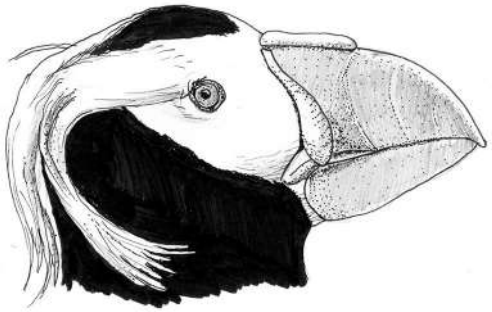
Table A1-4. cont'd

SITE CODE	SITE NAME	FTSP and/or LSPE[b]	FTSP	LSPE	PECO	BLOY	GWGU	COMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[c]
SI-088	**Transit Island**					**1**									**2**	2005
SI-090	Lillihorn Island					**1S**	7e		x(590)						**606**	1990, 2005
SI-100	Sandilands Island					**2**	2		x(66)						**74**	1990, 2005
SI-105	**Deena Creek**					**1**									**2**	2005
SI-110	Maude Island					**1**	0		x(1)						**3**	1990, 2005
SI-120	Maple Island					**3**	7e		x(151)						**171**	1990, 2005
SI-130	Gooden Island					**1**	0		x(169)						171	1990, 2005
SI-140	Queen Charlotte City Wharf								x(6)						6	1990
SI-150	Robertson Island					1									2	1990
SI-160	Roderick Island					0			(0)						0	1990
SI-170	Balch Islands					1	4		x(38)						48	1990
SI-180	Tree Islet					**1S**	1		x(82)						86	1990, 2005
SI-190	Angle Island					1	1		x(191)						195	1990
SI-200	Claudet Island					3	1		x(160)						168	1990
SI-210	Burnt Island					3	2e		x(264)						274	1990
SI-218	Weed Rock					4	2								12	1990
SI-220	"Dyer Point" Rocks					3	0								6	1990
SI-230	Meyer Island					**1**	1		x(50)						54	1990, 2009
SI-235	Legace Island								x(6)						6	1990
SI-240	Treble Island								x(10)						10	1990
SI-250	"Slatechuck" Islets					1									2	1990
SI-260	Hallet Island					4	1								10	1990
SI-270	Scalus Island								(0)						0	1990
SI-275	Anthracite Point								x(0)[h]						0[f]	1990
SI-280	Sandstone Islands					1	0		x(110)						112	1990
SI-285	Gust Island								x(2)						2	1990
SI-290	Berry Islands					4	1								10	1990
SI-300	"Josette" Islet								x(3)						3	1990
Masset and Juskatla Inlets																
MI-010	Sloop Islet					1	2S		x3(7)						13	1986
MI-020	Ship Kieta Island								(0)						0	1986
MI-030	Dawson Islands					**3**	32		x6(11)						**82**	1986, 2006
MI-040	Kwaikans Island					**6**	6		S(2)						**26**	1986, 2006
MI-050	McCreight Island					**0**	4		x10(52)						**60**	1986, 2006
MI-060	Wathus Island					**0**			(0)						**0**	1986, 2006
MI-070	Mutus Island					**9**	1		S(3)						**23**	1986, 2006
MI-080	Learmonth Island					**0**	0		x(3)						**3**	1986, 2006
MI-090	Ross Islets					**1S**			x(2)						4	1986, 2006
MI-100	Powell Island					**0**	12		x2(4)						28	1986, 2006
MI-110	Cowley Islands					**0**	19		32e(17)						**102**	1986, 2006
MI-120	Ohala Islets					**0**	1S		x2(2)						**6**	1986, 2007
MI-130	Steilta Islets					**1**	1		x9(131)						**135**	1986, 2007
MI-140	Seegay Islets					**2**	0		x(2)						**6**	1986, 2007
MI-150	Modeets Islands					**2**	1		S(2)						8	1986, 2007

Table A1-4. cont'd

SITE CODE	SITE NAME	FTSP and/or LSPE[b]	FTSP	LSPE	PECO	BLOY	GWGU	COMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[c]
MI-160	Mamin Islets					**1**	0		x(1)						**4**	1986, 2007
MI-170	Harrison Islands					1S	2		x(29)						35	1986
North Coast Graham Island																
NG-010	Yakan Point					0									0	1978
NG-015	Skonun Point					1									2	1988
NG-020	"Westacott" Rock					0									0	1986
NG-025	Wiah Point					0									0	1986
NG-030	"Naden" Rocks					15	110		x17(142)						392	1986
NG-040	"Klashwun" Rocks					2	3		x7(33)						43	1986

[a] Excluding Marbled Murrelet.
[b] Total number of storm-petrel burrows was known and population estimates were derived using the BC median occupancy rate for storm-petrels [233] but the proportion of burrows occupied by each of the two storm-petrel species was not determined (see Rodway et al.[336]).
[c] For data sources see Haida Gwaii volume [336] and Table A1-1.
[d] This estimate from 1986 for Glaucous-winged Gulls on Stiu Rock was accidently omitted on previous summary tables.[336]
[e] Incubating storm-petrels were found on Carswell Island on 18 May 2011.[180] Adults were not extracted from burrows to confirm species but given the date they were most likely Fork-tailed Storm-Petrels. Depredated remains of that species were also found.
[f] Adults were attending nests on Murchison Island on 4 June but the colony was abandoned on 4 July 2023.
[g] This record from 2005 for Black Oystercatchers on Jewell Island was accidently omitted on previous summary tables.[336]
[h] Pigeon Guillemots were present at Anthracite Point on other surveys conducted in 1990 (see colony account in Haida Gwaii volume.[336]



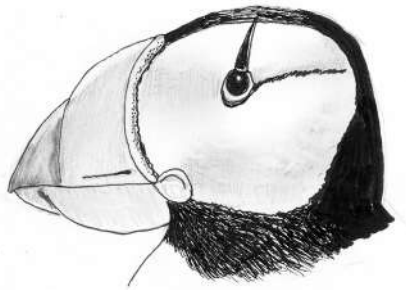


Table A1-5. Estimates of seabird breeding populations at all known colonies along the BC Outer Coast as of 2023.[a] Estimates are numbers of breeding pairs except for numbers in parentheses and totals in the "All species" column, which are numbers of individuals. Numbers in parentheses, given mainly for Pigeon Guillemots, are numbers of birds counted around colonies, likely include non-breeding birds, and thus are not reliable estimates of actual breeding populations. All post-1990 data and new colony numbers assigned since 1990 are in bold. We have not revised counts for Pigeon Guillemots or Tufted and Horned puffins with post-1990 data unless post-1990 counts were higher than previous estimates. This was because of the variability in count data for those species and because we generally could not determine how complete post-1990 counts were. Note that when there were confirmed (x) or suspected (S) breeding records but no estimates of numbers nesting for a species at a colony, we tallied one nesting pair for that species to derive total numbers nesting at the colony. See Appendix 2 on pages 655-656 for an explanation of the letter codes used to qualify population estimates and for species names.

SITE CODE	SITE NAME	FTSP	LSPE	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[b]
Northern Mainland Coast																			
MC-010	Zayas Island							1				(3)						5	1976
MC-020	"Dundas" Rocks							7										14	1976
MC-030	Grey Islet						2	108				x						222	1988
MC-040	Green Island					**45**	2	248				S(35)						**625**	1988, 2015
MC-050	"Prince Leboo" Rocks							59										118	1976
MC-060	Chearnley Islet						1					(6)						8	1976
MC-070	"Baron" Cliffs											x(55)						55	1987
MC-080	Connel Islands						1	0				S(12)			0			14	1987
MC-090	"Simpson" Rocks						1eS	178				S(25)						383	1988
MC-100	Lucy Islands						**3**	59				**x(243)**			25,300t			**50,967**	1983, 1988, 2015
MC-105	Prince Rupert											3						6	1976
MC-110	Tree Nob Group					22	0	60e				(0)						164	1988
MC-120	Roland Rocks							88				(0)						176	1988
MC-130	Rachael Islands						3	25				S(42)			300S			698	1987, 1988
MC-140	Greentop Islet						2eS	6				S(12)						28	1979
MC-150	Holland Rock						1	8	**54**			x(10)						**136**	1979, 2021
MC-152	Kitson Island						1											2	1978
MC-160	Gull Rocks			**6e**				39eS				S(6)						**96**	1987, 2014
MC-170	Lawyer Islands						4	0										8	1987
MC-175	Porcher Island - North						x	x				x						6	1921
MC-180	Northwest Rocks						1	36				x4(47)						121	1976
MC-190	North Rock						1eS	27				x3(29)						85	1976
MC-200	Joseph Island						2eS	245				S(75)					(0)	569	1988
MC-203	**Marble Rock**						**1**	**15eS**				**(25)**						**57**	2022
MC-205	**Coste Rocks**						**1**	**2S**				**S(135)**						**141**	2020, 2022
MC-210	MacDonald Island						1eS	6				S(4)						18	1988
MC-220	"Porter" Rocks						0	12										24	1988
MC-230	Glide Islands						1	12				S(2)						28	1988
MC-240	Dupont Island	50eS	50eS				3S								0			206	1988
MC-250	Beaven Islands						1											2	1976
MC-260	Anderson Islands						0											0	1988
MC-270	Wells Rocks	0					7	83				x4(19)			0	0(0)		199	1988
MC-280	Isnor Rock						1	1S				x2(18)						22	1988
MC-290	Moore Islands	8,900t	6,000t				21e	150				x2(187)	0	400eS	40,500t	3(6)		112,135	1988
MC-300	McKenney Islands	1,500t	2,900t				8e	92				x(14)		40eS	130eS			9,354	1988
MC-310	Whitmore Islands	340t	230t				5	19				x(60)			12,400t			26,048	1988
MC-320	"Lone" Rock						1eS	20										42	1988
MC-330	Bowden Islands						0	18										36	1988
MC-340	Byers Islands	E	E				10	112				x4(88)		18,800t	37,900t	3(6)	(1)	113,739	1988
MC-350	Sinnett Islets	19,200t	11,200t				7	93				x3(43)		2,100t		1S(1)	(0)	65,245	1988
MC-360	Conroy Island		75e				7	208				x2(148)		450eS	500eS	8(6)	1S(2)	2,646	1988
MC-370	Harvey Islands	100eS	100eS				12	93				x2(24)		710e	160eS			2,374	1988
MC-380	Rogerson Rock						1	52				x2(6)						112	1988
MC-390	Steele Rock					0	1eS	0				S(3)						5	1988
MC-395	**Pidwell Reef**						**6eS**	**15e**				**S(6)**						**48**	2023
MC-400	"Price" Rocks						1	82				(0)						166	1988
MC-405	**Troup Narrows**											**x(6)**						**6**	2013
MC-410	"Limit" Rocks						1S	1				x3(14)						18	1988

Table A1-5. cont'd

SITE CODE	SITE NAME	FTSP	LSPE	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[b]
MC-420	Fingal Island	E					3	48				x2(25)						127	1988
MC-430	Guano Rocks						0	11				x2(4)						26	1988
MC-440	"Fitzmelon" Rock							3										6	1988
MC-450	Goose Group						2					(4)						8	1988
MC-460	Gosling Rocks						9	83				x7(31)						215	1988
MC-470	Currie Islet						3eS	32				S(4)						74	1988
MC-480	Mosquito Islets							0				(0)						0	1976
MC-490	"Triquet" Rock						2	1eS				x(3)						9	1988
MC-500	Blenheim Island					17	1eS	68				x3(15)						187	1988
MC-510	Airacobra Rock							6										12	1988
MC-520	North Pointers Rocks					0	0	119				S(8)						246	1988
MC-522	**Breaker Group**											**x(8)**						**8**	2017
MC-526	**Calvert Island - Northwest**						**1**											**2**	2018
MC-530	Upward Rock						2eS	29				S(17)						79	1988
MC-535	**Lone Island**						**1**											**2**	2023
MC-540	Major Brown Rock					0	5	319				S(1)						649	1988
MC-550	Dugout Rocks					**4**	3S	141				S(17)						**313**	1988, 2014
MC-560	Ruby Rocks					**0**	3	69				S(28)						**172**	1988, 2014
MC-570	Ann Island											x(40-50)						40	1937
MC-580	Armstrong Rock						8	8				(4)						36	1976
MC-590	Egg Island						0	2				x3(18)		5S	90			212	1988
MC-600	Egg Rocks						6e	140				x(18)						310	1988
Queen Charlotte-Johnstone Strait																			
QS-010	Bremner Islet					**0**		144				x6(29)						**317**	1982, 2014
QS-015	**Turret Rock**											**x4(17)**						**17**	2014
QS-020	McEwan Rock					14		44										116	1982
QS-030	Storm Islands	50,800t	191,000t			**0**	18e	61				x(111)		300eS	72,000t	E		628,469	1987, 2014
QS-040	Naiad Islets						1	54				S(13)						123	1987
QS-050	Reid Islets		11,500t			**0**	1S	36				S(13)		260t				23,607	1987, 2014
QS-060	Emily Group						1					1(2)						4	1982
QS-070	Rogers Islands						2	138				S(2)						282	1982
QS-080	Harris Island						2	28				S(2)						62	1982
QS-090	Annie Rocks						1	7S										16	1982
QS-100	Tree Islets	8,300t	47,000t			**0**	1	59				x3(38)		250e	100e			111,458	1986, 2014
QS-110	Pine Island		100eS			**1**	1					**S(160)**		E	89,500t	E		**179,364**	1975, 1985, 2014, 2016
QS-120	Buckle Group	900t	27,000t			**0**	2e	65				S(68)		5,900t				**67,802**	1987, 2014
QS-130	Joan Island						0	0										0	1982
QS-140	Deserters Island						1S	0										2	1982
QS-150	Barry Islet						0	0										0	1982
QS-160	Bleach Rock						1	0										2	1975, 1982
QS-170	Crane Islands							0										0	1982
QS-180	"Doyle" Rocks							0										0	1982
QS-185	Port Hardy											1						2	1975
QS-190	Numas Islands						5	65				x9(41)			550			1,281	1982
QS-200	Staples Islet						1eS	5										12	1982
QS-210	Deep Sea Bluff					0		0				(0)						0	1982
QS-220	Foster Island						2	3				x(28)						38	1982
QS-230	Twin Islets						3e	5				S(5)						21	1982
QS-240	Penfold Islet						1S	53										108	1982
QS-250	Coach Islets						1					(0)						2	1982
QS-260	Green Rock						1	32				1(1)						68	1982
QS-270	"Seabreeze" Rock						1S	1										4	1982
QS-280	"Ridge" Rocks						1	11										24	1982
QS-290	White Cliff Islets						1											2	1982
QS-300	Surge Islands							1										2	1982
QS-309	**Stubbs Island**							**4e**										**8**	2006
QS-310	Plumper Islands											x(7)						7	1982
QS-320	Stephenson Islet						3	25				S(26)						82	1982

Table A1-5. cont'd

SITE CODE	SITE NAME	FTSP	LSPE	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[b]
QS-330	Fulmore Lake							1										2	1982
QS-340	"Goat" Island							6				x2(8)						20	1982
Scott Islands																			
SC-010	Triangle Island	100e	200e			**335**	25	577e		4,100	**S(2)**	x(331)		548,000t	41,700t	26,400t	**S(5)**	**1,243,212**	1989, 2010, 2019
SC-020	Sartine Island				39	168	**1eS**	390e		**S(1,500)**		**x(500)**		376,000t		6,400t	S(6)	**768,002**	1987, 1989, 2004, 2023
SC-030	Beresford Island	2,900t	12,500t			6	3eS	110e				x(267)		66,000t		2,100t	S(7)	167,512	1987, 1989
SC-040	Lanz Island					56[c]						S(28)		0	0			140	1987
SC-050	Cox Island					78[c]								0				156	1987
West Coast Vancouver Island																			
WV-008	**Cape Parkins**					**92**[c]												**184**	2012, 2021
WV-010	Gillam Islands	42,000t	72,000t			**0**	13	477				**x(150)**				S(3)		**229,133**	1988, 1989, 2009, 2012
WV-020	Rowley Reefs					0	2											4	1988, 1989
WV-030	Rugged Islands						1	2				S(6)						12	1988, 1989
WV-040	Gould Rock						4	0										8	1988, 1989
WV-050	Clerke Islet						3	12eS				x2(13)						43	1988, 1989
WV-060	Hackett Island							0				S(2)						2	1989
WV-070	Guilliams Island						2											4	1975
WV-080	Solander Island	0t	70,000t			67eS	1	530eS				x(107)		34,000t		3,100t	S(6)	215,509	1989
WV-090	Yule Rock							0				(0)						0	1988, 1989
WV-100	O'Leary Islets					10eS	1	92eS				x4(5)						214	1988, 1989
WV-110	Cuttle Islets						1	0				S(2)						4	1975, 1988, 1989
WV-118	**"Mahope" Rocks**						**1**											**2**	1991
WV-120	Skirmish Islets						1											2	1988
WV-130	Bunsby Islands						7	105eS										224	1988, 1989
WV-140	Clara Islet						4	53				x3(29)						143	1988, 1989
WV-150	Thomas Island	0t	7,300t				10	1eS				S(16)						14,638	1988, 1989
WV-160	"St. Pauls" Islets						3	0				(0)						6	1975, 1988, 1989
WV-170	"Favourite" Islets						1	0										2	1975, 1988, 1989
WV-180	"Amos" Reefs					0						(0)						0	1989
WV-190	Hohoae Island					**140**												**280**	1991
WV-200	White Cliff Head					0						(0)						0	1989
WV-210	Moos Islet		E			0	17	79[d]				S(5)				(0)		197[d]	1988, 1989
WV-220	Thornton Islands	S	700t			39	13	523				x(19)				S(4)		2,573	1988, 1989
WV-230	"Mimulus" Islets						5	[d]										10[d]	1988, 1989
WV-240	"Crag" Rocks					0	3	[d]										6[d]	1988, 1989
WV-250	Munsie Rocks					0	9	119[d]				S(3)						259[d]	1988, 1989
WV-260	Nipple Rocks					0	3	72				S(2)						152	1988, 1989
WV-270	Volcanic Islets		50e			72	6	155				x(38)				2(2)		608	1988, 1989
WV-280	Diver Islet						5	11				(0)						32	1988, 1989
WV-290	"Calm" Rocks						6	1eS				S(4)						18	1988, 1989
WV-300	Grassy Island		0				16	73				S(23)						201	1988, 1989
WV-310	Clark Island					0	5	7				x3(29)				S(5)		58	1988, 1989
WV-320	McQuarrie Islets					0	37	62eS				x3(18)				(0)		216	1988, 1989
WV-326	High Rocks						1											2	1975
WV-330	White Rock						1											2	1975
WV-340	Ensanada Islet						1	0				S(10)						12	1975, 1989
WV-350	Cameron Rocks						1											2	1975
WV-360	Justice Rock						2											4	1975
WV-370	"Kanim" Coast					24+						S(49)						97	1982
WV-374	Kutcous Islets						2S	0				S(1)						5	1989
WV-376	Tibbs Islet						**1S**	10eS										22	1989, 2005
WV-378	Shot Islets						2S					S(6)						10	1989
WV-380	Monks Islet						1	35eS				S(1)						73	1982, 1989
WV-385	Whaler Islets						**1**					S(1)						3	1989, 2019

Table A1-5. cont'd

SITE CODE	SITE NAME	FTSP	LSPE	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[b]
WV-390	Leeke Islets						1					S(1)						3	1975, 1989
WV-394	Burgess Islet						**1**											2	2005
WV-396	Hobbs Islet						**1**											2	2005
WV-400	Plover Reefs						2eS	0				S(4)						8	1989
WV-410	Cleland Island	700t	5,700t				**32**	**1,356**		**S(15)**		**S(385)**		800t	1,000t	**S(17)**		**19,593**	1988, 2004, 2005, 2017, 2018, 2022
WV-418	**"Ahous" Rocks**						**5S**											**10**	2004
WV-419	Foam Reefs						**1**											2	2005
WV-420	La Croix Group						**22eS**	**1**										**46**	2010, 2023
WV-430	"Clayoquot" Spit						1											2	1980
WV-435	**"MacKenzie" Islet**						**3eS**											**6**	2023
WV-440	Gowlland Rocks						**14eS**	0				(0)						**28**	1989, 2023
WV-445	**"Radar" Rocks**						**3**											**6**	2003
WV-450	"Portland" Rocks						**1eS**											2	2023
WV-460	"White" Island				**0**	**1**	**4eS**	**39**				(0)						**88**	1989, 2003, 2012, 2013, 2023
WV-470	"Schooner" Island						**1**	0				(0)						2	1989, 2011
WV-480	Lovekin Rock						**1**	0										**2**	1989, 2000
WV-490	Green Point						**2eS**											**4**	2023
WV-500	Sea Lion Rocks				**0**	4eS	**2eS**	**110**										**232**	1989, 2012, 2013, 2023
WV-504	**"Lismore" Rock**						**2eS**											**4**	2023
WV-508	"Quisitis" Rocks						**1eS**											2	2023
WV-510	"Cormorant" Rock					0	**2eS**											**4**	1989, 2023
WV-520	Florencia Islet					0	**13eS**	**302**		**0**		S(10)				S(1)		**641**	1982, 1989, 2004, 2013, 2023
WV-530	"Fletcher's" Beach					6eS						S(3)						15	1989
WV-535	Ucluelet											1						2	1970
WV-536	**"Big Beach" Cliffs**											**x(14)**						**14**	2017
WV-540	George Fraser Islands						**1S**	0										**2**	1989, 2005
WV-542	Janson Island						**2S**	1				S(1)						7	1989, 2005
WV-544	Humphries Reef						**1S**	1										4	1989, 2005
WV-550	Starlight Reef				**0**		**6**	320		**0**		S(11)						**663**	1988, 1989, 2001, 2004, 2012
WV-560	Great Bear Rock				**0**	**0**	**4**	175				S(2)						360	1989, 2001, 2007, 2012
WV-570	Alley Rock					**0**	**2S**	5eS				S(2)						**16**	1989, 2001, 2007
WV-575	Pinder Rock						**4eS**	9				S(1)						**27**	1989, 2023
WV-580	Hankin Island					**2**						(0)						**4**	1989, 2006
WV-590	Willis Island						0											0	1989
WV-600	Turtle Island						0	0				S(1)						1	1989
WV-602	**Nantes Island**						**1eS**											**2**	2023
WV-605	Sail Rock							0										0	1989
WV-610	Wouwer Island							0				(0)						0	1989
WV-620	Cree Island											(0)						0	1989
WV-630	Austin Island					**0**						S(3)						3	1989, 2007
WV-640	Effingham Island					**0**												0	2007
WV-650	Village Reef						**5eS**											**10**	2023
WV-660	Faber Islets						**14eS**	0										**28**	1989, 2023
WV-665	**Wiebe Island**						**2**											**4**	2001
WV-670	Dempster Island					**0**												0	2007
WV-680	Gibraltar Island					**0**												0	2007
WV-690	Swale Rock						**4eS**											**8**	2023
WV-692	Mahk Rock						**0**											**0**	2005
WV-700	Rutley Islands					**0**	1S	1										4	1989, 2006
WV-710	Baeria Rocks					**0**	**8**	130				(0)						**276**	1989, 2005, 2018

Table A1-5. cont'd

SITE CODE	SITE NAME	FTSP	LSPE	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES	SURVEY YEAR(S)[b]
WV-715	Boyson Islands						1S	1										4	1989
WV-720	Weld Island					**0**												0	2006
WV-722	Stud Islets						**1S**											2	2005
WV-728	Meade Islets						**0**											**0**	2005
WV-730	Swiss Boy Island					**0**						S(2)						**2**	1989, 2006
WV-740	Tzartus Island						**0**					**x(22)**						**22**	2005, 2022
WV-750	Hosie Islands					**0**						S(2)						2	1989, 2006
WV-760	San Jose Islets						1eS	3eS										8	1975, 1989
WV-770	Fleming Island					**0**						S(1)						1	1989, 2006
WV-775	**Sandford Island**					**7+**												**14**	2005
WV-780	Wizard Islet						**19eS**	0										**38**	1989, 2023
WV-789	Leach Islet											**x(100)[e]**						**100[e]**	1989, 2013
WV-790	Folger Island					**1eS**	2eS	0				**x(130)[e]**						**136[e]**	1975, 1989, 2007, 2013
WV-800	Edward King Island					**3**												**6**	2007
WV-810	Bordelais Islets					**0**	12S	0				S(2)						26	1970, 1989, 2006
WV-820	"Execution" Rock					**0**												0	2007
WV-830	Lawton Point					**4**												**8**	2007
WV-840	Cape Beale					**0**												0	2006
WV-844	**"Deadman" Cave**					**5**												**10**	2007
WV-850	Seabird Rocks	**x[f]**	**x[f]**			**17**	**19eS**	**132**				**S(256)**		**1+**	**E**	**E**		**598**	2011, 2014, 2021, 2022, 2023
WV-855	"Klanawa" Cliffs					12eS												24	1989
WV-860	Whyac					3eS												6	1989
WV-865	**"Walbran" Cliffs**											**x(6)**						**6**	2018
WV-870	"Parkinson" Cliff					15e												30	1973
WV-875	**"Sombrio" Bluffs**											**x(2)**						**2**	2019
WV-880	San Simon Point					0												0	1989
WV-890	"Sooke Bay" Islets							0										0	1989
WV-900	Argyle Islet							0										0	1989
WV-910	Bedford Islands						1	28										58	1978, 1989
WV-920	Church Island						1	0				S(2)						4	1978, 1989
WV-930	Race Rocks				**0**	**0**	**9**	**115**				**x(215)**				**(2)**		**465**	2009, 2012, 2014, 2016, 2021, 2022

[a] Excluding Marbled Murrelet.
[b] For data sources see Outer Coast volume [337] and Table A1-1.
[c] Breeding by Pelagic Cormorants was confirmed early in the season on Lanz and Cox islands and at Cape Parkins but all nests were abandoned later in the season.
[d] Tallies for WV-210 Moos Islet and WV-250 Munsie Rocks in 1989 likely included WV-230 "Mimulus" Islets and WV-240 "Crag" Rocks (see colony accounts in Outer Coast volume [337]).
[e] A total of 230 Pigeon Guillemots were tallied around Leach Islet and Folger Island in 2013; we arbitrarily divided them between the two sites.
[f] Small, remnant populations of Fork-tailed and Leach's storm-petrels continued to nest on Seabird Rocks through 2021.

Summary of Current Seabird Breeding Populations in BC as of 2023

Tables A1-6 to A1-9 update Tables 3-6 in the first volume [335] of this work (pages 63-67) and provide revised estimates of total seabird breeding populations on the BC coast as of 2023. In total, over 5.5 million individuals of 18 seabird species are now estimated breeding at 649 colony sites on the BC coast. In 2022, Caspian and Arctic terns were not recorded breeding on the BC coast, but they were confirmed breeding at new sites in 2023. Population estimates for Pigeon Guillemots are based on numbers of birds counted around colonies and are not reliable estimates of breeding populations. Small proportions of the total population estimates for murres and puffins are also based on counts of birds around colonies where numbers of breeding birds were not determined. Marbled Murrelets have been excluded from the total seabird breeding population estimates given here. That non-colonial species has a dispersed nesting distribution through inland habitats along the BC coast and was not considered in the colony accounts in this work. An estimated 99,100 Marbled Murrelets currently nest in BC, representing 28% of the global population of about 357,900 individuals.[610]

As discussed in previous volumes,[336, 337] changes in population estimates since 1990 are sometimes difficult to interpret because, except in the BC Salish Sea, relatively few colonies have been resurveyed. For burrow-nesting species, data from surveys conducted by CWS during the 1980s, when all major colonies were surveyed with robust survey methods, provide the only estimates at metapopulation scales. In Haida Gwaii, surveys since 1990 have documented substantial changes at some colonies, but possible changes at other unsurveyed colonies are unknown. Undetected changes are likely at other recently unsurveyed colonies, especially those impacted by invasive rats and raccoons. Revising overall population estimates with data from only a few colonies that have been resurveyed may thus lead to biased estimates of total populations. On the BC Outer Coast, there have been no population surveys of burrow-nesting species since 1990, except at Seabird Rocks where most species have been extirpated. This means that most population data for burrow-nesting species in BC are 30-40 years out of date, and even data from "recent" surveys in Haida Gwaii are mostly about 20 years old. Data for surface-nesting species are also 30-40 years old in most regions of Haida Gwaii and the BC Outer Coast. Thus, current overall population sizes in those areas are poorly known. Nevertheless, it is important to document known changes, especially where species populations are in decline. Comprehensive surveys of all colonies, as were conducted by CWS in the 1980s, are unlikely to be repeated in the near future. Thus, despite the limitations of recent survey data, the population estimates presented in Table A1-6 can be accepted as our best working estimates of regional and provincial population sizes as of 2023, although a caveat is needed for population estimates of Cassin's Auklets in the Scott Islands.

Major declines of Cassin's Auklets, perhaps by about 40% and representing more than 20% of the world's breeding population, have likely occurred at the centre of their world breeding population at colonies in the Scott Islands, based on indicators from permanent monitoring plots,[334] partial surveys,[211] and reproductive and survival studies [24, 203] (see Outer Coast volume [337]). However, those population changes are not reflected in Table A1-6 because surveys to generate revised population estimates have not been conducted since 1989.

Comparing current data (Tables A1-6 to A1-9) with 1990 data (Tables 3-6 in Part 1 [335]) reveals some changes in regional population estimates for most species. Substantial changes in the abundance and distribution of nesting species in the BC Salish Sea, including the addition of two new species, Caspian and Arctic terns, to the list of breeding seabirds on the BC coast, have been discussed in detail in this volume. Brandt's Cormorants have also been newly discovered breeding in the BC Salish Sea. Changes have also been documented at colonies in Haida Gwaii and the BC Outer Coast, including the addition of a third new species for BC, Black-legged Kittiwake, that was confirmed nesting at one colony on the BC Outer Coast in 1997, and the addition of Double-crested Cormorant to the list of species breeding on the BC Outer Coast after evidence surfaced in February 2023 of nesting on Gull Rocks on the northern mainland coast in 2014. Post-1990 changes up to 2023 in Haida Gwaii and the BC Outer Coast were described in detail in Appendix 1 of the respective volumes [336, 337] for those areas and above in the section *Seabird Nesting Records at Colonies in Haida Gwaii and on the BC Outer Coast Obtained Since the Publication of those Volumes*. We provide a brief overview here of major changes in breeding population estimates that have occurred since 1990.

Since 1990, estimates of total seabird breeding populations in Haida Gwaii have decreased by about 120,000 individuals, mostly Ancient Murrelets (about 20,000 birds), Cassin's Auklets (about 66,000 birds, only about half of which likely represented

real population change and half was likely an artifact of changing survey methods on Frederick and George islands), and Rhinoceros Auklets (about 34,000 birds). Population declines have been associated with continued impacts and expansion of introduced rats and raccoons to colony islands, most apparent in Englefield Bay on the west coast of Moresby Island, and from Kunghit Island to Limestone Islands on the east coast of Moresby Island. On the BC Outer Coast, total estimated breeding populations have decreased by about 4,000 birds, mostly storm-petrels (about 2,000 birds) and Glaucous-winged Gulls (about 2,000 birds). The decline in storm-petrel numbers is due to the near extirpation of all burrow-nesting species on Seabird Rocks on the west coast of Vancouver Island. Decreased numbers of Glaucous-winged Gulls were found nesting at surveyed colonies within Pacific Rim National Park Reserve. Several, previously occupied Pelagic Cormorant colonies on the BC Outer Coast were unused when last surveyed, but new colony sites have also been documented and total population estimates from 1990 and 2023 were similar. All Brandt's Cormorant colonies on the west coast of Vancouver Island were unused when last visited.

Increases in estimated breeding populations since 1990 have occurred for Pelagic Cormorants in Haida Gwaii and for Black Oystercatchers in both Haida Gwaii and the BC Outer Coast. Total numbers of Pigeon Guillemots counted around colonies has also increased. Recent estimates for Pelagic Cormorants in Haida Gwaii are more than double 1990 values due to the new or re-established Pelagic Cormorant colonies that have been recently reported on the west and east coasts of Moresby Island (see above section *Seabird Nesting Records at Colonies in Haida Gwaii and on the BC Outer Coast Obtained Since the Publication of those Volumes*). Increases in numbers of breeding birds and nesting sites for Black Oystercatchers are partially due to increased survey efforts, especially on the east coast of Moresby Island in Haida Gwaii and on the west coast of Vancouver Island on the BC Outer Coast, but there is also good evidence for increasing breeding populations at colonies monitored in Gwaii Haanas and Pacific Rim National Park Reserve by Parks Canada through to 2023 (see above). For Pigeon Guillemots, greater total numbers tallied in Haida Gwaii and the BC Outer Coast since 1990 is an inevitable artifact of our decision to include post-1990 counts at individual colonies only if they were higher than previous estimates (see above).

New, confirmed or suspected colony sites have been reported since 1990 for: storm-petrels (3 in Haida Gwaii), Double-crested Cormorant (1 on Outer Coast), Brandt's Cormorant (1 on Outer Coast; recently abandoned), Pelagic Cormorant (3 in Haida Gwaii; 4 on Outer Coast), Black Oystercatcher (30 in Haida Gwaii; 15 on Outer Coast), Glaucous-winged Gull (9 in Haida Gwaii; 5 on Outer Coast), Pigeon Guillemot (1 in Haida Gwaii; 12 on Outer Coast), and Cassin's Auklet (2 in Haida Gwaii). Horned Puffins were confirmed nesting at a second site in Haida Gwaii since 1990.

There have been changes in the proportional abundance of some species in the different regions of BC. Decreases in Pelagic Cormorant populations in the BC Salish Sea since 1990, along with recent increases seen in Haida Gwaii, has resulted in a greater proportion of the provincial population currently nesting in Haida Gwaii and a lower proportion nesting in the BC Salish Sea: percent of the provincial population nesting in the BC Salish Sea decreased from 58%, estimated as of 1990 (Table 4 in Part 1 [335]), to 45% as of 2023 (Table A1-7). The proportion of the provincial Glaucous-winged Gull population nesting in the BC Salish Sea has also decreased, from 50% as of 1990 to 45% as of 2023. In contrast, the many new nesting sites for Black Oystercatchers found in the BC Salish Sea since 1990 has increased the percent of the provincial population nesting in the BC Salish Sea from 9% as of 1990 to 16% as of 2023.

For storm-petrels, small numbers have been documented nesting at five new or re-established colonies in Haida Gwaii, but total population estimates in the different regions of the BC coast have changed little since 1990. However, we were dissatisfied with our presentation of population estimates for storm-petrels in the first volume [335] and have changed our approach here. In Table 3 in the first volume (page 63),[335] we presented separate estimates for Fork-tailed and Leach's storm-petrels at most colonies, but we also presented combined estimates for the two storm-petrel species at 17 colonies on the west and east coasts of Moresby Island in Haida Gwaii (see Table A1-4 above) where the proportion of burrows occupied by each of the two storm-petrel species was not determined during CWS surveys (total numbers of storm-petrel burrows were determined with reliable transect survey methods, but the proportions of burrows containing Fork-tailed or Leach's storm-petrels were not determined, generally because surveys at those colonies were conducted early in the season before all Leach's Storm-Petrels were nesting). Presenting

combined estimates for the two species at those 17 colonies resulted in cumbersome and incomplete total estimates for the individual storm-petrel species. We have used a different approach here to present more useable estimates of total breeding populations for each storm-petrel species.

Here, in Table A1-6, we have recalculated overall estimates of Fork-tailed and Leach's storm-petrels on the west and east coasts of Moresby Island by assuming that the overall proportion of each storm-petrel species at the 17 colonies where proportions were not determined was the same as the overall proportion at all other colonies in BC where proportions were determined (Table A1-10). This is a reasonable assumption and is an extension of our method of estimating breeding populations for burrow-nesting species at colonies where occupancy rates were not determined by using median burrow occupancy rates from all surveyed colonies where occupancy rates were determined (see *Overview of Survey Methods* in Part 1 [335]). We thus think that this is a better approach than we used previously.[335] Note, however, that we used this approach only at a regional scale to obtain estimates of total numbers nesting at colonies on the west and east coasts of Moresby Island and did not use it to calculate estimates at each of the 17 colonies where proportions of the two storm-petrel species were not determined (see Table A1-4 above). This was because of the known variability in species proportions among colonies where proportions were determined, which ranged from 14% to 100% Fork-tailed Storm-Petrels at colonies in Haida Gwaii, and from 37% to 100% Leach's Storm-Petrels at colonies on the BC Outer Coast. Proportions of each species at each of the 17 colonies in question likely vary as much as at colonies with known proportions. Applying an overall proportion to those colonies individually would thus, in many cases, provide inaccurate estimates of breeding populations of each storm-petrel species at each colony. However, overall proportions of each species at regional scales were less variable (Table A1-10), and the overall proportion of each storm-petrel species at the 17 colonies in question combined was likely similar to the overall proportion at all other colonies in BC where proportions were determined. Details of the recalculation are as follows.

To obtain overall proportions of each storm-petrel species at colonies in BC, we used data from colonies where occupancy rates were determined when both species were nesting (end of June to beginning of August [424]), and from colonies where occupancy rates were determined only for Fork-tailed Storm-Petrels because surveys were conducted before many Leach's Storm-Petrels were nesting. In the latter cases, we calculated proportions of each species by using the median storm-petrel occupancy rate for BC (91%) [335, 339] to calculate the total number of storm-petrels nesting, and derived the number of Leach's Storm-Petrels by subtracting the number of Fork-tailed Storm-Petrels from the total. In Table A1-10, we list the proportion of Fork-tailed Storm-Petrels at all colonies in BC where it was determined. Proportions varied from 0% to 100% among sampled colonies, and from 18% to 60% among different coastal regions, with the highest proportions of Fork-tailed Storm-Petrels occurring in the Northern Mainland Coast and West Coast Graham Island regions. At all colonies in BC where proportions were determined, the overall proportion of Fork-tailed Storm-Petrels was 24%, thus giving an overall proportion for Leach's Storm-Petrels of 76%. If we assume the same proportions at the 17 colonies on the west and east coasts of Moresby Island where proportions were not determined, then we can derive total breeding population estimates for each species. There were an estimated 99,540 and 49,540 individual storm-petrels nesting at colonies where the proportions of each storm-petrel species were not determined on the west and east coasts of Moresby Island, respectively (see Table 3 in the first volume,[335] page 63). We have now used the proportions of 24% Fork-tailed Storm-Petrels and 76% Leach's Storm-Petrels to allocate those estimates to each species. Because we were applying these proportions to recalculate species estimates only at the regional scale and not for individual colonies, we used the overall proportions at all sampled colonies rather than the median proportion at individual colonies, although the median proportion (26%) of Fork-tailed Storm-Petrels at the sampled colonies was similar to the overall proportion (Table A1-10), giving us added confidence that our approach was reasonable.

Recalculated estimates for storm-petrels are presented in Table A1-6. Resultant changes in estimates for each storm-petrel species on the west and east coasts of Moresby Island affected the summed totals for the numbers and proportions of those two species nesting in Haida Gwaii and all of BC. Revised estimates better characterize our knowledge of the abundance and distribution of Fork-tailed and Leach's storm-petrels breeding in BC, with 25% of the Fork-tailed and 19% of the Leach's storm-petrels nesting in Haida Gwaii and the rest nesting on the BC Outer Coast (Table A1-7).

Table A1-6. Summary of seabird breeding populations in British Columbia as of 2023.[a,b] Estimates are of total breeding birds.[c]

REGION	FTSP	LSPE	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	CATE	ARTE	COMU	TBMU	PIGU[c]	ANMU	CAAU	RHAU	TUPU	HOPU	All Species
Haida Gwaii																			
West Coast Graham Island	35,202	40,602			232	188	1,258						980	270,600	159,502	400	688	5	509,657
West Coast Moresby Island	28,331[d]	93,477[d]			250	84	1,664				417		870	33,840	234,910	34,402	1,625	30	429,900
East Coast Moresby Island	27,489[d]	88,355[d]			378	590	1,688						2,760	214,656	139,966	6,084	325	3	482,294
Skidegate Inlet						104	366						2,995						3,465
Masset and Juskatla Inlet						54	162						319						535
North Coast Graham Island						36	226						175						437
Total Haida Gwaii	***91,022***	***222,434***	***0***	***0***	***860***	***1,056***	***5,364***	***0***	***0***	***0***	***417***	***0***	***8,099***	***519,096***	***534,378***	***40,886***	***2,638***	***38***	***1,426,288***
BC Outer Coast																			
Northern Mainland Coast	60,180	41,110	12		176	344	6,720	108					1,662	0	45,010	234,560	30	3	389,915
Queen Charlotte and Johnstone straits	120,000	553,200			30	104	1,696						574		13,420	324,300	0	0	1,013,324
Scott Islands	6,000	25,400		78	1,286	58	2,154				9,700	2	1,126		1,980,000	83,400	69,800	18	2,179,022
West Coast Vancouver Island	85,402	311,502		0	1,048	858	10,296				15		1,722		69,602	2,000	6,236	6	488,687
Total BC Outer Coast	***271,582***	***931,212***	***12***	***78***	***2,540***	***1,364***	***20,866***	***108***	***0***	***0***	***9,715***	***2***	***5,084***	***0***	***2,108,032***	***644,260***	***76,066***	***27***	***4,070,948***
BC Salish Sea																			
Northern Strait of Georgia			1,100		1,198	280	9,724		56	2			1,112			4			13,476
Gulf Islands			1,108	24	1,622	198	11,906						1,265			30	0		16,153
Total BC Salish Sea	***0***	***0***	***2,208***	***24***	***2,820***	***478***	***21,630***	***0***	***56***	***2***	***0***	***0***	***2,377***	***0***	***0***	***34***	***0***	***0***	***29,629***
BRITISH COLUMBIA TOTAL	**362,604**	**1,153,646**	**2,220**	**102**	**6,220**	**2,898**	**47,860**	**108**	**56**	**2**	**10,132**	**2**	**15,560**	**519,096**	**2,642,410**	**685,180**	**78,704**	**65**	**5,526,865**
Percent of all species	7	21	0	0	0	0	1	0	0	0	0	0	0	9	48	12	1	0	100

[a] Excluding Marbled Murrelet (see text).
[b] See Appendix 2 for species acronyms.
[c] Note that estimated totals for Pigeon Guillemots refer to the numbers of birds counted around colonies and are not estimates of actual breeding populations (see text).
[d] Estimates of Fork-tailed and Leach's storm-petrels on the west and east coasts of Moresby Island have been recalculated from those previously presented [335] by assuming that the proportion of each storm-petrel species at colonies where proportions were not determined was the same as that at all other colonies in BC where proportions were determined (see text).

Table A1-7. Percentage of species populations breeding in each geographic region of British Columbia as of 2023.

REGION	FTSP	LSPE	Total Storm-Petrels	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	CATE	ARTE	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	All Species
Haida Gwaii																				
West Coast Graham Island	10	4	5			4	6	3						6	52	6	0	1	8	9
West Coast Moresby Island	8	8	8			4	3	3				4		6	7	9	5	2	46	8
East Coast Moresby Island	8	8	8			6	20	4						18	41	5	1	0	5	9
Skidegate Inlet							4	1						19						0
Masset and Juskatla Inlet							2	0						2						0
North Coast Graham Island							1	0						1						0
Total Haida Gwaii	***25***	***19***	***21***			***14***	***36***	***11***				***4***		***52***	***100***	***20***	***6***	***3***	***58***	***26***
BC Outer Coast																				
Northern Mainland Coast	17	4	7	1		3	12	14	100					11	0	2	34	0	5	7
Queen Charlotte and Johnstone straits	33	48	44			0	4	4						4		1	47	0		18
Scott Islands	2	2	2		76	21	2	5				96	100	7		75	12	89	28	39
West Coast Vancouver Island	24	27	26		0	17	30	22				0		11		3	0	8	9	9
Total BC Outer Coast	***75***	***81***	***79***	***1***	***76***	***41***	***47***	***44***	***100***			***96***	***100***	***33***	***0***	***80***	***94***	***97***	***42***	***74***
BC Salish Sea																				
Northern Strait of Georgia				50		19	10	20		100	100			7			0			0
Gulf Islands				50	24	26	7	25						8			0	0		0
Total BC Salish Sea				***99***	***24***	***45***	***16***	***45***		***100***	***100***			***15***			***0***	***0***		***1***

Table A1-8. Number of current seabird breeding sites[a] in British Columbia as of 2023.

REGION	FTSP	LSPE	Total Storm-Petrels	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	CATE	ARTE	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	All Species
Haida Gwaii																				
West Coast Graham Island	8	7	8			7	26	19						25	4	9	1	4	1	34
West Coast Moresby Island	10	6	10			6	18	19				2		23	8	12	10	11	4	33
East Coast Moresby Island	22	14	22			5	82	30						68	17	25	7	3	1	93
Skidegate Inlet							26	17						27						37
Masset and Juskatla Inlet							10	11						15						15
North Coast Graham Island							3	2						2						3
Total Haida Gwaii	***40***	***27***	***40***			***18***	***165***	***98***				***2***		***160***	***29***	***46***	***18***	***18***	***6***	***215***
BC Outer Coast																				
Northern Mainland Coast	6	7	7	1		4	50	53	1					52	0	7	9	4	2	68
Queen Charlotte and Johnstone straits	3	5	5			2	23	23						19		4	4	0		32
Scott Islands	2	2	2		1	5	3	3				2	1	4		3	1	3	3	5
West Coast Vancouver Island	4	7	7		0	20	84	40				1		50		3	1	8	1	108
Total BC Outer Coast	**15**	**21**	**21**	**1**	**1**	**31**	**160**	**119**	**1**			**3**	**1**	**125**	**0**	**17**	**15**	**15**	**6**	**213**
BC Salish Sea																				
Northern Strait of Georgia				3		14	60	65		1	1			46			1			116
Gulf Islands				3	1	12	54	62						51			1	0		105
Total BC Salish Sea				**6**	**1**	**26**	**114**	**127**		**1**	**1**			**97**			**2**	**0**		**221**
BRITISH COLUMBIA TOTAL	**55**	**48**	**61**	**7**	**2**	**75**	**439**	**344**	**1**	**1**	**1**	**5**	**1**	**382**	**29**	**63**	**35**	**33**	**12**	**649**
Confirmed on any survey [b]	44	41	56	7	2	74	395	320	1	1	1	4	1	286	26	55	22	21	2	627
Unconfirmed [b]	11	7	5	0	0	1	44	24	0	0	0	1	0	96	3	8	13	12	10	22

[a] Number of breeding sites indicates the number of colonies where a particular species has been found nesting.
[b] See Appendix 2 for definitions of confirmed and unconfirmed breeding sites.

Table A1-9. Total number of historically used seabird breeding sites[a] in British Columbia, and numbers of those historical sites that were abandoned as of 2023.

REGION	FTSP	LSPE	Total Storm-Petrels	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	CATE	ARTE	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	All Species
TOTAL HISTORICALLY USED BREEDING SITES																				
Haida Gwaii																				
West Coast Graham Island	13	12	14			13	26	20						27	6	10	3	5	1	35
West Coast Moresby Island	11	7	11			9	21	19				2		25	10	14	12	12	4	33
East Coast Moresby Island	25	14	25			13	90	46						74	25	29	7	4	1	98
Skidegate Inlet							29	22						29						39
Masset and Juskatla Inlet							16	14						17						17
North Coast Graham Island							6	2						2						6
Total Haida Gwaii	***49***	***33***	***50***			***35***	***188***	***123***				***2***		***174***	***41***	***53***	***22***	***21***	***6***	***228***
BC Outer Coast																				
Northern Mainland Coast	9	8	10	1		8	57	57	1					56	1	7	12	5	4	70
Queen Charlotte and Johnstone straits	3	5	5			8	25	30						21		5	4	2		37
Scott Islands	2	2	2		1	5	3	3				2	1	4		5	2	3	3	5
West Coast Vancouver Island	6	9	9		5	49	89	63				3		62		3	2	11	1	126
Total BC Outer Coast	***20***	***24***	***26***	***1***	***6***	***70***	***174***	***153***	***1***			***5***	***1***	***143***	***1***	***20***	***20***	***21***	***8***	***238***
BC Salish Sea																				
Northern Strait of Georgia				12		25	64	86		3	2			52			1			133
Gulf Islands				18	1	33	75	81						65			1	1		128
Total BC Salish Sea				***30***	***1***	***58***	***139***	***167***		***3***	***2***			***117***			***2***	***1***		***261***
BRITISH COLUMBIA TOTAL	**69**	**57**	**76**	**31**	**7**	**163**	**501**	**443**	**1**	**3**	**2**	**7**	**1**	**434**	**42**	**73**	**44**	**43**	**14**	**727**
Confirmed on any survey [b]	54	50	68	30	7	161	451	406	1	3	2	6	1	315	36	58	27	28	2	704
Unconfirmed [b]	15	7	8	1	0	2	50	37	0	0	0	1	0	119	6	15	17	15	12	23

[a] Number of breeding sites indicates the number of colonies where a particular species has been found nesting.
[b] See Appendix 2 for definitions of confirmed and unconfirmed breeding sites.

Table A1-9. (cont'd)

REGION	FTSP	LSPE	Total Storm-Petrels	DCCO	BRCO	PECO	BLOY	GWGU	BLKI	CATE	ARTE	COMU	TBMU	PIGU	ANMU	CAAU	RHAU	TUPU	HOPU	All Species
									NUMBER OF HISTORICAL BREEDING SITES THAT WERE ABANDONED AS OF 2023											
Haida Gwaii																				
West Coast Graham Island	5	5	6			6	0	1						2	2	1	2	1	0	1
West Coast Moresby Island	1	1	1			3	3	0				0		2	2	2	2	1	0	0
East Coast Moresby Island	3	0	3			8	8	16						6	8	4	0	1	0	5
Skidegate Inlet							3	5						2						2
Masset and Juskatla Inlet							6	3						2						2
North Coast Graham Island							3	0						0						3
Total Haida Gwaii	***9***	***6***	***10***			***17***	***23***	***25***				***0***		***14***	***12***	***7***	***4***	***3***	***0***	***13***
BC Outer Coast																				
Northern Mainland Coast	3	1	3	0		4	7	4	0					4	1	0	3	1	2	2
Queen Charlotte and Johnstone straits	0	0	0			6	2	7						2		1	0	2		5
Scott Islands	0	0	0		0	0[a]	0	0				0	0	0		2	1	0	0	0[a]
West Coast Vancouver Island	2	2	2		5	29	5	23				2		12		0	1	3	0	18
Total BC Outer Coast	***5***	***3***	***5***	***0***	***5***	***39***	***14***	***34***	***0***	***0***	***0***	***2***	***0***	***18***	***1***	***3***	***5***	***6***	***2***	***25***
BC Salish Sea																				
Northern Strait of Georgia				9		11	4	21		2	1			6			0			17
Gulf Islands				15	0	21	21	19						14			0	1		23
Total BC Salish Sea				***24***	***0***	***32***	***25***	***40***		***2***	***1***			***20***			***0***	***1***		***40***
BRITISH COLUMBIA TOTAL	**14**	**9**	**15**	**24**	**5**	**88**	**62**	**99**	**0**	**2**	**1**	**2**	**0**	**52**	**13**	**10**	**9**	**10**	**2**	**78**
Confirmed on any survey	10	9	12	23	5	87	56	86		2	1	2		29	10	3	5	7	0	77
Unconfirmed	4	0	3	1	0	1	6	13		0	0	0		23	3	7	4	3	2	1
Percent of total historical sites that were abandoned as of 2023	**20**	**16**	**20**	**77**	**71**	**54**	**12**	**22**	**0**	**67**	**50**	**29**	**0**	**12**	**31**	**14**	**20**	**23**	**14**	**11**
Percent of total confirmed historical sites that were abandoned as of 2023	**19**	**18**	**18**	**77**	**71**	**54**	**12**	**21**	**0**	**67**	**50**	**33**	**0**	**9**	**28**	**5**	**19**	**25**	**0**	**11**

[a] Nests were freshly built and breeding was confirmed during the most recent survey (1987) on Lanz and Cox islands in the Scott Islands but all nests were abandoned later that season at those two colonies.

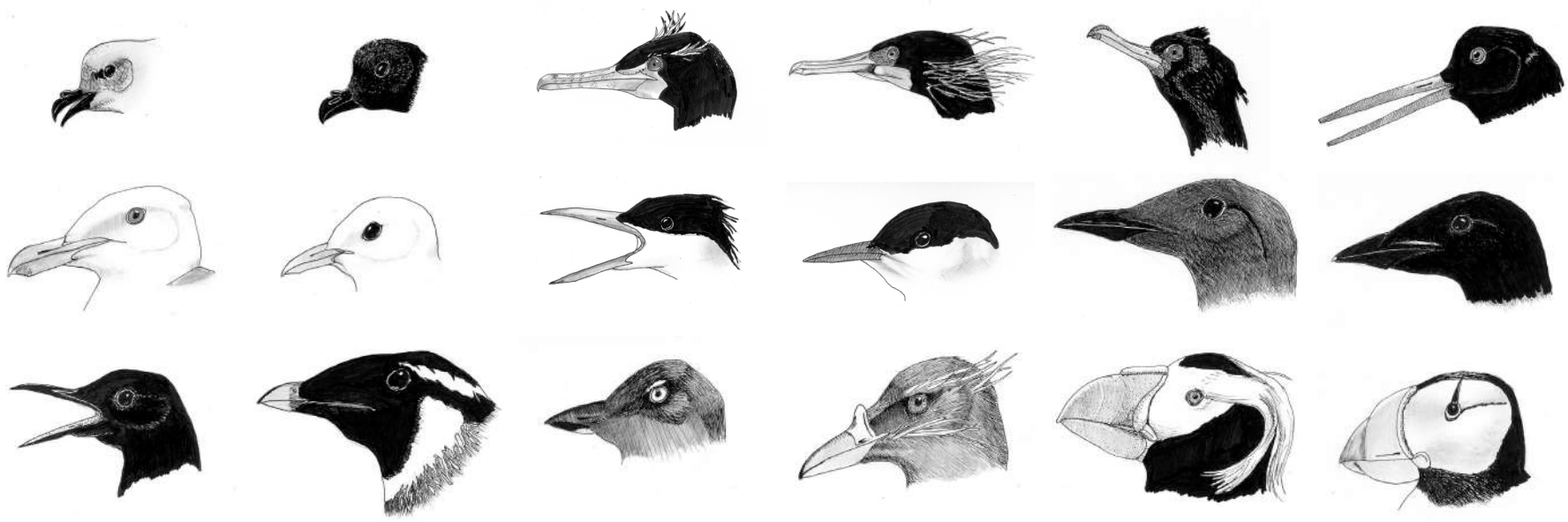
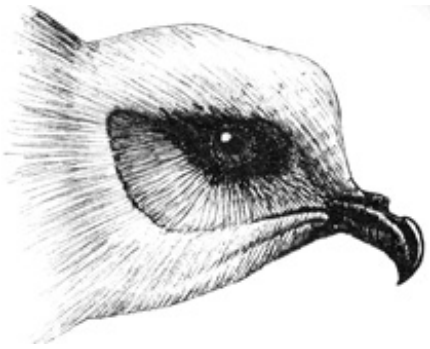


Table A1-10. Storm-Petrel colonies in BC where the proportion of Fork-tailed Storm-Petrels was determined during surveys. Table includes data from colonies where occupancy rates were determined when both species were nesting, and from colonies where occupancy rates were determined only for Fork-tailed Storm-Petrels because surveys were conducted before many Leach's Storm-Petrels were nesting (see text).

Site code	Site name	Total storm-petrels (individuals)	Percent FTSP	Total number of burrows sampled for occupancy	Survey year
Haida Gwaii					
West Coast Graham Island					
WG-050	"Lepas" Islet	16,000	29[a]	53	1977
WG-130	Solide Islands	3,200	27[a]	21	1977
WG-210	Barry Island	1,400	90[a]	10	1977
WG-230	Hippa Island	47,400	46	91	1983
WG-250	"Seal Point" Islet	6,000	63[a]	19	1977
Total		***74,000***	***46***		
West Coast Moresby Island					
WM-280	SGang Gwaay (Anthony Island)	21,400	20	14	1985
Total		***21,400***	***20***		
East Coast Moresby Island					
EM-120	Rankine Islands	28,600	14	25	1986
EM-260	Rock Islet	34,000	26	30	1986
EM-740	Skedans Islands	2,200	100	20	1983
Total		***64,800***	***23***		
Outer Coast					
Northern Mainland Coast					
MC-290	Moore Islands	29,800	60	27	1988
MC-300	McKenney Islands	8,800	34	12	1988
MC-310	Whitmore Islands	1,140	60	27[b]	1988
MC-350	Sinnett Islets	60,800	63	52	1988
Total		***100,540***	***60***		
Queen Charlotte and Johnstone straits					
QS-030	Storm Islands	483,600	21	52	1987
QS-050	Reid Islets	23,000	0	11	1987
QS-100	Tree Islets	110,600	15	39	1986
QS-120	Buckle Group	55,800	3	31	1987
Total		***673,000***	***18***		
Scott Islands					
SC-030	Beresford Island	30,800	19	21	1987
Total		***30,800***	***19***		
West Coast Vancouver Island					
WV-010	Gillam Islands	228,000	37	44	1988
WV-080	Solander Island	140,000	0	76	1988
WV-150	Thomas Island	14,600	0	26	1988
WV-410	Cleland Island	12,800	11	12	1988
Total		***395,400***	***22***		
TOTAL		**1,359,940**	**24**		
Median			**26**		

[a] Proportion of FTSP for colonies surveyed in 1977 is based on burrows that were sampled for occupancy and differs from the relative proportion that was estimated nesting in 1977 by Campbell and Garrioch [75] and that is listed in Table A1-4.
[b] Same sample as Moore Islands; not included in calculation of median percent.



Geographical Coordinates for all Known Seabird Colony Sites in BC as of 2023

As an aid to identifying and mapping colony locations, Table A1-11 provides geographical coordinates for every known current and historical seabird breeding colony site on the BC coast as of 2023. Colony names and coordinates were reviewed and revised through mapping exercises by Barbara Sobota at ECCC, in consultation with Laurie Wilson at ECCC and Michael Rodway, based on data provided by Michael Rodway from this and previous volumes of the seabird colony catalogue.[336, 337]

Table A1-11. Geographic coordinates of all seabird colonies known as of 2023 on the BC coast, including Haida Gwaii, the Outer Coast, and the BC Salish Sea. Colony names and coordinates have been reviewed and revised through mapping exercises by Barbara Sobota at ECCC, in consultation with Laurie Wilson at ECCC and Michael Rodway, based on data provided by Michael Rodway from this and previous volumes of the seabird colony catalogue.[336, 337]

SITE CODE	SITE NAME	LATITUDE (decimal degrees)	LONGITUDE (decimal degrees)
HAIDA GWAII			
West Coast Graham Island			
WG-010	Langara Island	54.2333	133.0167
WG-020	Cox Island	54.2053	133.0142
WG-030	Lucy Island	54.1828	132.9844
WG-040	"Knox" Cliffs	54.1731	133.0611
WG-050	"Lepas" Islet	54.1717	133.0472
WG-060	"Sialun" Rock	54.0989	133.0833
WG-070	"Beresford" Islet	54.0422	133.0603
WG-080	"Grassy" Islet	53.9811	133.1353
WG-090	"Wooded" Islet	53.9703	133.1272
WG-100	Frederick Island	53.9292	133.1792
WG-110	"Ingraham" Cliffs	53.8353	133.1056
WG-120	Tian Islets	53.7539	133.0861
WG-130	Solide Islands	53.7006	132.9897
WG-140	Queen Island	53.7011	132.9603
WG-150	Pip Islets	53.6911	132.9525
WG-160	Ogilvie Island	53.6906	132.9883
WG-170	McKenzie Island	53.6869	132.9950
WG-180	Brock Islands	53.6922	132.9981
WG-190	"Kiokathli" Islets	53.6967	133.0142
WG-195	"Buttercup" Rock	53.6631	132.9939
WG-200	"Hosu" Islets	53.6575	132.9661
WG-210	Barry Island	53.6231	132.9422
WG-212	"Barry" Cave	53.6225	132.9328
WG-220	Salvesen Island	53.6022	132.9944
WG-230	Hippa Island	53.5333	132.9750
WG-240	Sadler Island	53.4994	132.9014
WG-250	"Seal Point" Islet	53.4694	132.7708
WG-260	"Tartu" Rock	53.4686	132.6714
WG-270	Gospel Island	53.3881	132.5919
WG-280	"Kindakun" Islet	53.3153	132.7722
WG-290	Hunter Point	53.2542	132.7153
WG-300	"Gudal Bay" Rocks	53.2269	132.5769
WG-310	Stiu Rock	53.2181	132.6086
WG-320	Gagi Rock	53.2086	132.6408
WG-330	Marble Island	53.2017	132.6608
West Coast Moresby Island			
WM-010	"Buck Channel" Island	53.1056	132.5525
WM-012	Chaatl Island - Cliffs	53.1067	132.5472
WM-020	Saunders Island	53.0292	132.4667
WM-030	Helgesen Island	53.0289	132.4394
WM-040	Willie Island	53.0200	132.4639
WM-050	Carswell Island	53.0217	132.4219
WM-060	"Inskip" Cave	53.0256	132.4078
WM-070	Instructor Island	53.0225	132.3231
WM-080	Lihou Island	53.0064	132.4175
WM-090	Bone Point	53.0039	132.3819
WM-100	Luxmoore Island	52.9783	132.3506
WM-110	Rogers Island	52.9767	132.3361
WM-120	Cape Kuper	52.9708	132.3403
WM-130	Moresby Islets	52.9681	132.3542
WM-140	Ariel Rock	52.8003	132.0483
WM-150	Lomgon Islets	52.7761	132.0875
WM-160	Horn Rock	52.7750	132.0414
WM-170	"Mike" Rock	52.5283	131.7894
WM-180	"Cone" Islet	52.4925	131.7408
WM-190	"Between" Islet	52.4722	131.6667
WM-200	Goski Islet	52.4292	131.5561
WM-210	"East Nangwai" Group	52.4139	131.5972
WM-220	Gowdas Islands	52.3947	131.6008
WM-230	"Lower Victoria" Rock	52.2722	131.4642
WM-240	"Keyhole" Rock	52.2339	131.4331
WM-250	"McLean Fraser" Pinnacle	52.2156	131.4225
WM-260	"Louscoone" Rocks	52.1436	131.2408
WM-270	Adam Rocks	52.1142	131.2278
WM-280	SGang Gwaay (Anthony Island)	52.0958	131.2194
WM-290	Flatrock Island	52.1075	131.1689
WM-300	Gordon Islands	52.0961	131.1450
WM-310	St. James Island	51.9372	131.0175
WM-320	Kerouard Islands	51.9292	131.0028
East Coast Moresby Island			
EM-010	Kunghit Island	52.0833	131.0833
EM-020	Marshall Island	52.1006	130.9672
EM-030	Gull Islet	52.1078	130.9528
EM-040	Rainy Islands	52.1169	130.9850
EM-050	High Island	52.1272	131.0117
EM-060	Haydon Rock	52.1439	131.0358
EM-070	Charles Islands	52.1547	131.0625
EM-080	Annette Island	52.1561	131.0742
EM-090	Garcin Rocks	52.2083	130.9667
EM-100	Langtry Island	52.2311	131.0072
EM-103	"Koya Bay" Islet	52.2239	131.0875
EM-105	"South Cove" Islet	52.2275	131.1239
EM-107	"Carpenter" Islets	52.2358	131.1569
EM-110	Samuel Rock	52.2422	131.1272
EM-120	Rankine Islands	52.2583	131.0611
EM-130	Marion Rock	52.2906	131.1092
EM-138	"Collison Bay" Islet	52.2911	131.1336
EM-140	Nest Islets	52.2939	131.1258
EM-150	Inner Low Rock	52.3222	131.1442
EM-160	Joyce Rocks	52.3361	131.1397
EM-170	Sea Pigeon Island	52.2853	131.2861
EM-180	Boulder Island	52.2917	131.2961
EM-190	Green Rock	52.2922	131.2861
EM-200	"Jedway" Islets	52.3000	131.2750
EM-210	Bush Rock	52.3039	131.2778
EM-220	Bolkus Islands	52.3236	131.2833
EM-230	Swan Islands	52.3350	131.2894
EM-240	"Pelican" Rock	52.3444	131.2569
EM-250	Slug Islet	52.3383	131.2194
EM-260	Rock Islet	52.3447	131.2375
EM-270	Skincuttle Island	52.3478	131.2261
EM-280	George Island	52.3500	131.2083
EM-290	Jeffrey Island	52.3569	131.1917
EM-300	East Copper Island	52.3569	131.1767
EM-310	Howay Island	52.3900	131.2631
EM-315	"Poole Inlet" Islet	52.3667	131.3006
EM-320	"Island Bay" Group	52.3725	131.3744
EM-330	"Kat" Rocks	52.3936	131.3833
EM-335	"Skaat Harbour" Islets	52.3931	131.4347
EM-340	Centre Islet	52.4178	131.3947
EM-350	Wanderer Island	52.4222	131.4042
EM-360	Sels Islet	52.4242	131.4133
EM-370	Park Island	52.4361	131.4092
EM-378	Section Island	52.4217	131.3728
EM-380	Koga Islet	52.4294	131.3803
EM-390	Nakons Islet	52.4336	131.3542
EM-400	Alder Island	52.4472	131.3211
EM-410	Huxley Island	52.4500	131.3750
EM-420	Arichika Island	52.4722	131.3414
EM-422	All Alone Stone	52.4844	131.4006
EM-430	Marco Rock	52.5183	131.4942
EM-440	Hutton Island	52.5192	131.5336
EM-444	"Haswell Bay" Islet	52.5242	131.6106
EM-448	Sivart Island	52.5372	131.5911
EM-450	Hoskins Islets	52.5400	131.5503
EM-460	Tatsung Rock	52.5453	131.3478
EM-470	Ramsay Island	52.5611	131.3778
EM-480	Ramsay Rocks	52.5672	131.4650

SITE CODE	SITE NAME	LATITUDE (decimal degrees)	LONGITUDE (decimal degrees)
EM-490	Bischof Islands	52.5806	131.5667
EM-500	Hotspring Island	52.5764	131.4400
EM-510	House Island	52.5800	131.4239
EM-520	Kloo Rock	52.5881	131.3706
EM-530	Murchison Island	52.5950	131.4539
EM-535	Faraday Island	52.6056	131.4875
EM-540	Agglomerate Island	52.6278	131.4233
EM-550	Kawas Islets	52.6450	131.4114
EM-560	Tar Islands	52.6769	131.4119
EM-570	Tuft Islets	52.7019	131.4119
EM-580	Lyell Island, Dodge Point and Lyell Point	52.7333	131.4917
EM-590	Topping Islands	52.6625	131.6792
EM-591	Shuttle Island	52.6583	131.7000
EM-600	Gil Islet	52.7125	131.7775
EM-610	Dog Island	52.7367	131.6281
EM-615	Stansung Islets	52.7336	131.6117
EM-620	Kul Rocks	52.7356	131.6039
EM-630	Kelo Rocks	52.7492	131.5681
EM-631	Kunga Island	52.7639	131.5736
EM-635	Tanu Island	52.7664	131.6152
EM-640	Titul Island	52.7822	131.5753
EM-650	Lost Islands	52.8036	131.4875
EM-660	Helmet Island	52.8172	131.6608
EM-670	Procter Rocks	52.8611	131.7461
EM-678	Haswell Island	52.8622	131.6875
EM-680	Kingsway Rock	52.8622	131.6722
EM-690	Reef Island	52.8722	131.5167
EM-700	South Low Island	52.8939	131.5736
EM-710	Louise Island, Vertical Point and Breaker Bay	52.9011	131.6250
EM-720	Limestone Islands	52.9078	131.6133
EM-730	Low Island	52.9089	131.5358
EM-740	Skedans Islands	52.9567	131.5789
EM-745	“Lagoon” Islet	52.9322	131.9403
EM-750	Mabbs Islet	53.0119	131.9361
EM-760	Nedden Island	53.0264	131.9458
EM-770	Oliver Islet	53.0375	131.9356
EM-775	"Moresby Camp" Island	53.0519	132.0197
EM-780	Kingui Island	53.0244	131.6300
EM-790	Cumshewa Island	53.0300	131.6014
EM-800	Gray Bay	53.1185	131.6956
Skidegate Inlet			
SI-005	Spit Point	53.2600	131.8225
SI-010	Sandspit - Wharf	53.2542	131.8231
SI-020	Gillatt Island	53.2444	131.8992
SI-030	Torrens Island	53.2569	131.9769
SI-040	Jewell Island	53.2481	131.9864
SI-045	Skidegate - Ferry Dock	53.2467	132.0092
SI-050	Flowery Islet	53.2219	132.0072
SI-060	"Kwuna" Rocks	53.2197	132.0014
SI-070	"Alliford" Islets	53.2122	131.9928
SI-080	Bush Island	53.2147	132.0061
SI-085	Robber Island	53.2178	132.0275
SI-088	Transit Island	53.2031	132.0167
SI-090	Lillihorn Island	53.1897	132.0325
SI-100	Sandilands Island	53.1750	132.1083
SI-105	Deena Creek	53.1444	132.1344
SI-110	Maude Island	53.2083	132.0667
SI-120	Maple Island	53.2450	132.0564
SI-130	Gooden Island	53.2436	132.0692
SI-140	Queen Charlotte City - Wharf	53.2533	132.0725
SI-150	Robertson Island	53.2486	132.0875
SI-160	Roderick Island	53.2436	132.0886
SI-170	Balch Islands	53.2272	132.0822
SI-180	Tree Islet	53.2025	132.1375
SI-190	Angle Island	53.2081	132.1472
SI-200	Claudet Island	53.2117	132.1561
SI-210	Burnt Island	53.2189	132.1667
SI-218	Weed Rock	53.2300	132.1553
SI-220	"Dyer Point" Rocks	53.2314	132.1614
SI-230	Meyer Island	53.2314	132.1792
SI-235	Legace Island	53.2133	132.2028
SI-240	Treble Island	53.2183	132.2197
SI-250	"Slatechuck" Islets	53.2267	132.2225
SI-260	Hallet Island	53.2150	132.2397
SI-270	Scalus Island	53.2025	132.2253
SI-275	Anthracite Point	53.2014	132.2383
SI-280	Sandstone Islands	53.1917	132.2458
SI-285	Gust Island	53.1967	132.2539
SI-290	Berry Islands	53.1950	132.2769
SI-300	“Josette” Islet	53.1997	132.2681
Masset and Juskatla Inlets			
MI-010	Sloop Islet	53.7578	132.2450
MI-020	Ship Kieta Island	53.7556	132.2697
MI-030	Dawson Islands	53.7186	132.3467
MI-040	Kwaikans Island	53.7167	132.4111
MI-050	McCreight Island	53.7033	132.4556
MI-060	Wathus Island	53.6806	132.4833
MI-070	Mutus Island	53.6875	132.5903
MI-080	Learmonth Island	53.6753	132.4539
MI-090	Ross Islets	53.6753	132.3986
MI-100	Powell Island	53.6856	132.3756
MI-110	Cowley Islands	53.6925	132.3686
MI-120	Ohala Islets	53.6525	132.3811
MI-130	Steilta Islets	53.6356	132.3953
MI-140	Seegay Islets	53.6231	132.4156
MI-150	Modeets Islands	53.6011	132.4583
MI-160	Mamin Islets	53.6283	132.3189
MI-170	Harrison Islands	53.6361	132.3736
North Coast Graham Island			
NG-010	Yakan Point	54.0703	131.8356
NG-015	Skonun Point	54.0317	132.0586
NG-020	"Westacott" Rock	54.0694	132.2378
NG-025	Wiah Point	54.1144	132.3183
NG-030	"Naden" Rocks	54.1214	132.5797
NG-040	"Klashwun" Rocks	54.1556	132.6706
OUTER COAST			
Northern Mainland Coast			
MC-010	Zayas Island	54.6083	131.0750
MC-020	"Dundas" Rocks	54.5367	130.9792
MC-030	Grey Islet	54.5803	130.6972
MC-040	Green Island	54.5686	130.7078
MC-050	"Prince Leboo" Rocks	54.4708	130.9931
MC-060	Chearnley Islet	54.4414	130.9861
MC-070	"Baron" Cliffs	54.4511	130.8614
MC-080	Connel Islands	54.4050	130.9208
MC-090	"Simpson" Rocks	54.3500	130.7836
MC-100	Lucy Islands	54.2944	130.6139
MC-105	Prince Rupert	54.2975	130.3539
MC-110	Tree Nob Group	54.2872	130.8811
MC-120	Roland Rocks	54.1694	130.8425
MC-130	Rachael Islands	54.2000	130.5542
MC-140	Greentop Islet	54.1772	130.4111
MC-150	Holland Rock	54.1706	130.3497
MC-152	Kitson Island	54.1756	130.3164
MC-160	Gull Rocks	54.1322	130.5214
MC-170	Lawyer Islands	54.1119	130.3417
MC-175	Porcher Island - North	54.0569	130.5528
MC-180	Northwest Rocks	53.5478	130.6353
MC-190	North Rock	53.5122	130.6106
MC-200	Joseph Island	53.1444	130.0417
MC-203	Marble Rock	53.1780	129.5588
MC-205	Coste Rocks	53.8059	128.7885
MC-210	MacDonald Island	52.9792	129.6936
MC-220	"Porter" Rocks	52.9453	129.5719
MC-230	Glide Islands	52.9642	129.4817
MC-240	Dupont Island	52.9397	129.4394
MC-250	Beaven Islands	52.7917	129.3903
MC-260	Anderson Islands	52.7833	129.3500
MC-270	Wells Rocks	52.7517	129.4697
MC-280	Isnor Rock	52.7358	129.5281
MC-290	Moore Islands	52.6794	129.4189
MC-300	McKenney Islands	52.6508	129.4822
MC-310	Whitmore Islands	52.6442	129.4422
MC-320	"Lone" Rock	52.5683	129.3428
MC-330	Bowden Islands	52.5644	129.2167
MC-340	Byers Islands	52.5617	129.4081
MC-350	Sinnett Islets	52.5408	129.3361
MC-360	Conroy Island	52.5250	129.4083
MC-370	Harvey Islands	52.5183	129.3183
MC-380	Rogerson Rock	52.4881	129.0953
MC-390	Steele Rock	52.4642	129.3697
MC-395	Pidwell Reef	52.4423	128.5712
MC-400	"Price" Rocks	52.3022	128.7350
MC-405	Troup Narrows	52.2850	128.0013
MC-410	"Limit" Rocks	52.1125	128.4828
MC-420	Fingal Island	52.0786	128.4475
MC-430	Guano Rocks	52.0483	128.3597
MC-440	"Fitzmelon" Rock	52.0378	128.2900
MC-450	Goose Group	51.9667	128.4333
MC-460	Gosling Rocks	51.8703	128.4597
MC-470	Currie Islet	51.8511	128.4572
MC-480	Mosquito Islets	51.8347	128.1636

SITE CODE	SITE NAME	LATITUDE (decimal degrees)	LONGITUDE (decimal degrees)
MC-490	"Triquet" Rock	51.7989	128.2239
MC-500	Blenheim Island	51.7806	128.2528
MC-510	Airacobra Rock	51.7597	128.2200
MC-520	North Pointers Rocks	51.7231	128.1311
MC-522	Breaker Group	51.7317	128.0900
MC-526	Calvert Island - Northwest	51.6561	128.1403
MC-530	Upward Rock	51.4500	128.0158
MC-535	Lone Island	51.5087	127.7475
MC-540	Major Brown Rock	51.4239	127.6997
MC-550	Dugout Rocks	51.3669	127.8078
MC-560	Ruby Rocks	51.3067	127.8214
MC-570	Ann Island	51.2739	127.8103
MC-580	Armstrong Rock	51.2675	127.8169
MC-590	Egg Island	51.2500	127.8342
MC-600	Egg Rocks	51.2425	127.8342
Queen Charlotte and Johnstone Straits			
QS-010	Bremner Islet	51.0978	127.6900
QS-015	Turret Rock	51.0967	127.5031
QS-020	McEwan Rock	51.0586	127.6317
QS-030	Storm Islands	51.0261	127.7250
QS-040	Naiad Islets	51.0250	127.6897
QS-050	Reid Islets	51.0183	127.6922
QS-060	Emily Group	51.0289	127.5667
QS-070	Rogers Islands	51.0183	127.5833
QS-080	Harris Island	51.0003	127.5636
QS-090	Annie Rocks	50.9786	127.4986
QS-100	Tree Islets	50.9831	127.7119
QS-110	Pine Island	50.9769	127.7242
QS-120	Buckle Group	50.9414	127.6572
QS-130	Joan Island	50.9256	127.5506
QS-140	Deserters Island	50.8750	127.4689
QS-150	Barry Islet	50.8864	127.4278
QS-160	Bleach Rock	50.8686	127.5067
QS-170	Crane Islands	50.8425	127.5214
QS-180	"Doyle" Rocks	50.8078	127.4750
QS-185	Port Hardy	50.7222	127.4883
QS-190	Numas Islands	50.7694	127.1000
QS-200	Staples Islet	50.7689	127.1203
QS-210	Deep Sea Bluff	50.8144	126.4867
QS-220	Foster Island	50.7056	126.8444
QS-230	Twin Islets	50.6989	126.8456
QS-240	Penfold Islet	50.6892	126.8092
QS-250	Coach Islets	50.7150	126.7111
QS-260	Green Rock	50.6700	126.6744
QS-270	"Seabreeze" Rock	50.6714	126.6258
QS-280	"Ridge" Rocks	50.6539	126.6081
QS-290	White Cliff Islets	50.6525	126.7281
QS-300	Surge Islands	50.6400	126.7144
QS-309	Stubbs Island	50.6040	126.8171
QS-310	Plumper Islands	50.5939	126.7911
QS-320	Stephenson Islet	50.5747	126.8267
QS-330	Fulmore Lake	50.5850	125.9706
QS-340	"Goat" Island	50.4011	125.8622
Scott Islands			
SC-010	Triangle Island	50.8639	129.0833
SC-020	Sartine Island	50.8194	128.9067
SC-030	Beresford Island	50.7903	128.7731
SC-040	Lanz Island	50.8167	128.6833
SC-050	Cox Island	50.8000	128.6083
West Coast Vancouver Island			
WV-008	Cape Parkins	50.4458	128.0400
WV-010	Gillam Islands	50.4472	127.9700
WV-020	Rowley Reefs	50.3989	127.9758
WV-030	Rugged Islands	50.3139	127.9175
WV-040	Gould Rock	50.2519	127.8289
WV-050	Clerke Islet	50.2069	127.8331
WV-060	Hackett Island	50.1842	127.8617
WV-070	Guilliams Island	50.1775	127.8531
WV-080	Solander Island	50.1111	127.9400
WV-090	Yule Rock	50.1122	127.6486
WV-100	O'Leary Islets	50.1017	127.6422
WV-110	Cuttle Islets	50.0972	127.6017
WV-118	"Mahope" Rocks	50.1194	127.5839
WV-120	Skirmish Islets	50.1128	127.5722
WV-130	Bunsby Islands	50.0706	127.5553
WV-140	Clara Islet	50.0725	127.5875
WV-150	Thomas Island	50.0594	127.4836
WV-160	"St. Pauls" Islets	50.0575	127.4581
WV-170	"Favourite" Islets	49.9950	127.3989
WV-180	"Amos" Reefs	50.0092	127.3417
WV-190	Hohoae Island	50.0361	127.2306
WV-200	White Cliff Head	49.9733	127.2817
WV-210	Moos Islet	49.9744	127.3200
WV-220	Thornton Islands	49.9681	127.3433
WV-230	"Mimulus" Islets	49.9631	127.3231
WV-240	"Crag" Rocks	49.9600	127.3181
WV-250	Munsie Rocks	49.9636	127.3022
WV-260	Nipple Rocks	49.9522	127.2622
WV-270	Volcanic Islets	49.9433	127.2622
WV-280	Diver Islet	49.9289	127.2494
WV-290	"Calm" Rocks	49.9258	127.2464
WV-300	Grassy Island	49.9236	127.2547
WV-310	Clark Island	49.9225	127.2408
WV-320	McQuarrie Islets	49.9014	127.2250
WV-326	High Rocks	49.8464	127.1172
WV-330	White Rock	49.8503	127.0769
WV-340	Ensanada Islet	49.7878	126.9619
WV-350	Cameron Rocks	49.7781	126.9222
WV-360	Justice Rock	49.7689	126.9294
WV-370	"Kanim" Coast	49.3917	126.3428
WV-374	Kutcous Islets	49.2461	126.0753
WV-376	Tibbs Islet	49.2294	126.1086
WV-378	Shot Islets	49.2333	126.0517
WV-380	Monks Islet	49.2319	126.0161
WV-385	Whaler Islets	49.2261	126.0667
WV-390	Leeke Islets	49.2256	126.0500
WV-394	Burgess Islet	49.2142	126.0308
WV-396	Hobbs Islet	49.2072	126.0425
WV-400	Plover Reefs	49.1814	126.0847
WV-410	Cleland Island	49.1711	126.0911
WV-418	"Ahous" Rocks	49.1664	126.0247
WV-419	Foam Reefs	49.1617	126.0386
WV-420	La Croix Group	49.1564	126.0281
WV-430	"Clayoquot" Spit	49.1611	125.9275
WV-435	"MacKenzie" Islet	49.1267	125.9114
WV-440	Gowlland Rocks	49.0711	125.8569
WV-445	"Radar" Rocks	49.0694	125.8397
WV-450	"Portland" Rocks	49.0642	125.8339
WV-460	"White" Island	49.0569	125.8189
WV-470	"Schooner" Island	49.0578	125.8086
WV-480	Lovekin Rock	49.0667	125.7578
WV-490	Green Point	49.0517	125.7222
WV-500	Sea Lion Rocks	49.0383	125.7197
WV-504	"Lismore" Rock	49.0122	125.6794
WV-508	"Quisitis" Rocks	48.9956	125.6572
WV-510	"Cormorant" Rock	48.9919	125.6669
WV-520	Florencia Islet	48.9789	125.6433
WV-530	"Fletcher's" Beach	48.9717	125.6131
WV-535	Ucluelet	48.9381	125.5364
WV-536	"Big Beach" Cliffs	48.9367	125.5522
WV-540	George Fraser Islands	48.9061	125.5136
WV-542	Janson Island	48.9011	125.5106
WV-544	Humphries Reef	48.8986	125.5119
WV-550	Starlight Reef	48.8814	125.4853
WV-560	Great Bear Rock	48.8922	125.4550
WV-570	Alley Rock	48.8975	125.4336
WV-575	Pinder Rock	48.9258	125.3800
WV-580	Hankin Island	48.9208	125.3683
WV-590	Willis Island	48.9150	125.3417
WV-600	Turtle Island	48.9097	125.3208
WV-602	Nantes Island	48.9000	125.3539
WV-605	Sail Rock	48.8806	125.3950
WV-610	Wouwer Island	48.8625	125.3600
WV-620	Cree Island	48.8517	125.3306
WV-630	Austin Island	48.8625	125.3147
WV-640	Effingham Island	48.8708	125.3042
WV-650	Village Reef	48.8872	125.2889
WV-660	Faber Islets	48.8914	125.3008
WV-665	Wiebe Island	48.8961	125.2833
WV-670	Dempster Island	48.9083	125.2681
WV-680	Gibraltar Island	48.9139	125.2528
WV-690	Swale Rock	48.9256	125.2222
WV-692	Mahk Rock	48.9417	125.2144
WV-700	Rutley Islands	48.9747	125.1594
WV-710	Baeria Rocks	48.9544	125.1528
WV-715	Boyson Islands	48.9700	125.0347
WV-720	Weld Island	48.9492	125.0903
WV-722	Stud Islets	48.9431	125.0928
WV-728	Meade Islets	48.9258	125.1206
WV-730	Swiss Boy Island	48.9172	125.1314
WV-740	Tzartus Island	48.9231	125.0803
WV-750	Hosie Islands	48.9083	125.0375
WV-760	San Jose Islets	48.9011	125.0572
WV-770	Fleming Island	48.8872	125.1333
WV-775	Sandford Island	48.8683	125.1675
WV-780	Wizard Islet	48.8581	125.1594

SITE CODE	SITE NAME	LATITUDE (decimal degrees)	LONGITUDE (decimal degrees)
WV-789	Leach Islet	48.8306	125.2408
WV-790	Folger Island	48.8283	125.2481
WV-800	Edward King Island	48.8286	125.2147
WV-810	Bordelais Islets	48.8175	125.2314
WV-820	"Execution" Rock	48.8142	125.1781
WV-830	Lawton Point	48.8008	125.1911
WV-840	Cape Beale	48.7861	125.2164
WV-844	"Deadman" Cave	48.7833	125.1942
WV-850	Seabird Rocks	48.7492	125.1544
WV-855	"Klanawa" Cliffs	48.7064	125.0000
WV-860	Whyac	48.6669	124.8486
WV-865	"Walbran" Cliffs	48.5778	124.6522
WV-870	"Parkinson" Cliff	48.5106	124.3736
WV-875	"Sombrio" Bluffs	48.4919	124.2931
WV-880	San Simon Point	48.4339	124.1094
WV-890	"Sooke Bay" Islets	48.3678	123.7728
WV-900	Argyle Islet	48.3208	123.6019
WV-910	Bedford Islands	48.3161	123.6069
WV-920	Church Island	48.3081	123.5881
WV-930	Race Rocks	48.2981	123.5317
SALISH SEA			
Northern Strait of Georgia			
SG-003	Gorges Islands	50.2672	124.7988
SG-005	Sheer Point	50.1989	125.1292
SG-008	“Deepwater” Bluffs	50.1928	125.3425
SG-010	"Brown" Bluffs	50.1703	125.3703
SG-012	“Steamer” Island	50.1584	125.0949
SG-014	Hoskyn Rock	50.1389	125.1592
SG-015	Breton Islands	50.1289	125.1769
SG-017	Centre Islet	50.1250	125.0911
SG-018	“Plunger” Rock	50.1194	125.0692
SG-020	Copper Cliffs	50.0994	125.2711
SG-022	“Quathiaski” Cliffs	50.0533	125.2328
SG-024	“Whaletown” Rock	50.1041	125.0537
SG-026	"Fast" Rock	50.0917	125.0344
SG-030	Guide Islets	50.0808	125.0178
SG-034	“Mansons” Rock	50.0761	124.9897
SG-038	“Frabjious” Rock	50.0628	124.9119
SG-040	Three Islets	50.0539	124.9131
SG-044	Twin Islands	50.0428	124.9472
SG-048	“Sirk” Beach	50.0392	124.9678
SG-050	Little Rock	50.0361	124.9575
SG-055	Ray Rock	50.1108	124.7228
SG-056	"Tenedos" Rock	50.1183	124.7096
SG-060	Powell Islets	50.0417	124.8531
SG-068	Copeland Islands	50.0236	124.8247
SG-070	Major Islet	49.9894	124.8161
SG-080	Keefer Rock	49.9681	124.8772
SG-090	Mitlenatch Island	49.9500	125.0042
SG-100	Powell River	49.8667	124.5528
SG-110	Vivian Island	49.8406	124.7014
SG-120	Rebecca Rock	49.8136	124.6597
SG-130	McRae Islet	49.7436	124.2925
SG-135	Deserted Bay - Dock	50.0868	123.7439
SG-140	"Blind" Islets	49.7147	124.2175
SG-145	“Cockburn” Islets	49.6681	124.1847
SG-148	“Trafalgar” Rock	49.6514	124.1164
SG-150	Fearney Point	49.6481	124.0894
SG-160	Hodgson Islands	49.6375	124.0914
SG-170	Daniel Point	49.6375	124.0722
SG-175	Whitestone Islands	49.5961	124.0447
SG-180	Mouat Islands	49.6331	124.4625
SG-190	"Davie" Islet	49.6003	124.3964
SG-200	Denman Island - West Dock	49.5347	124.8236
SG-210	Denman Island - East Dock	49.4939	124.7089
SG-212	Hornby Island - West Dock	49.5117	124.7044
SG-220	St. John Point	49.5167	124.5861
SG-221	Flora Islet	49.5175	124.5772
SG-230	Norris Rocks	49.4836	124.6475
SG-239	Boyle Point	49.4783	124.6853
SG-240	Chrome Island	49.4719	124.6844
SG-250	Sisters Islets	49.4867	124.4350
SG-260	Finnerty Islands	49.4989	124.3953
SG-270	Fegen Islets	49.5300	124.3806
SG-276	“Heron” Rock	49.5017	124.2524
SG-278	“Sabine” Islets	49.5128	124.2594
SG-280	Jervis Island	49.5125	124.2417
SG-284	Boho Island	49.5000	124.2297
SG-286	“Connie” Rock	49.4917	124.2203
SG-290	"Upwood" Islet	49.4886	124.1342
SG-300	Sheer Island	49.4869	124.1714
SG-301	Bull Island	49.4850	124.1969
SG-302	Rabbit Island	49.4786	124.1750
SG-305	“Windy” Rock	49.4658	124.1725
SG-308	“Jenkins” Cliffs	49.4597	124.3019
SG-310	Sea Egg Rocks	49.4522	124.3111
SG-320	Sangster Island	49.4261	124.1989
SG-330	"Priestland" Rocks	49.5078	123.9128
SG-340	"Jeddah" Rocks	49.5019	123.9467
SG-350	Bertha Island	49.4650	123.9611
SG-360	Franklin Island	49.4667	123.9192
SG-370	Merry Island	49.4692	123.9189
SG-380	Porpoise Bay	49.4836	123.7617
SG-390	Trail Islands	49.4544	123.8150
SG-400	White Islets	49.4181	123.7119
SG-410	Popham Island	49.3617	123.4881
SG-414	Pasley Island	49.3544	123.4631
SG-416	“Onion” Rock	49.3556	123.4247
SG-420	Ragged Island	49.3772	123.4503
SG-424	“Galbraith” Rock	49.4025	123.3786
SG-426	Grace Islands	49.4308	123.4469
SG-428	Mariners’ Rest	49.4717	123.4600
SG-430	Christie Islet	49.4994	123.3017
SG-440	Pam Rock	49.4878	123.2994
SG-444	Squamish Harbour	49.6822	123.1742
SG-446	“Britannia” Rock	49.6314	123.2119
SG-450	Bowyer Island	49.4264	123.2689
SG-460	"Sunset Beach" Cliffs	49.4000	123.2506
SG-470	"Bay" Rock	49.3803	123.2733
SG-475	Horseshoe Bay - Ferry Terminal	49.3756	123.2719
SG-480	Lookout Point	49.3767	123.2900
SG-490	Whyte Islet	49.3700	123.2919
SG-500	Bird Islet	49.3633	123.2911
SG-505	Kettle Point	49.3622	123.2867
SG-510	Batchelor Point	49.3575	123.2844
SG-520	"Eagle" Rocks	49.3544	123.2789
SG-530	Passage Island	49.3431	123.3056
SG-540	Grebe Islets	49.3408	123.2756
SG-550	Point Atkinson	49.3297	123.2650
SG-555	Capilano Lake	49.3639	123.1097
SG-560	Wigwam Inn	49.4619	122.8858
SG-562	Croker Island - Cliffs	49.4319	122.8672
SG-565	“Buntzen” Cliffs	49.3528	122.8872
SG-568	Port Moody	49.2978	122.8911
SG-570	Barnet	49.2922	122.9367
SG-580	Second Narrows	49.2950	123.0261
SG-590	North Vancouver	49.3083	123.0786
SG-595	West Vancouver	49.3294	123.1694
SG-600	Vancouver Harbour	49.2861	123.0992
SG-610	Lions Gate Bridge	49.3153	123.1386
SG-620	Prospect Point	49.3136	123.1419
SG-630	Siwash Rock	49.3089	123.1567
SG-640	Burrard Bridge	49.2753	123.1375
SG-650	Granville Bridge	49.2719	123.1339
SG-660	False Creek	49.2717	123.1083
SG-661	Point Grey	49.2650	123.2528
SG-664	Oak Street Bridge	49.2000	123.1258
SG-665	Mitchell Island	49.2025	123.0897
SG-666	Knight Street Bridge	49.2031	123.0775
SG-667	South Vancouver	49.2026	123.1278
SG-670	Queens Reach to North Arm	49.2217	122.8367
SG-672	Pattullo Bridges	49.2075	122.8944
SG-674	Annacis Island	49.1706	122.9444
SG-675	Lulu Island - North	49.2000	123.0767
SG-677	Sea Island	49.1969	123.1739
SG-678	Iona Island	49.2056	123.2641
SG-679	Lulu Island - South	49.1250	123.1869
SG-680	Westham Island	49.0983	123.1786
SG-680	Surrey - North	49.1904	122.8491
SG-690	Sand Heads	49.1056	123.3033
SG-700	Roberts Bank - Superport	49.0194	123.1619
SG-705	Roberts Bank - Foreshore	49.0333	123.1000
SG-710	Tsawwassen - Ferry Terminal	49.0158	123.1167
SG-720	Tsawwassen - Breakwater	49.0033	123.1256
SG-730	White Rock	49.0231	122.7978
Gulf Islands			
GI-010	Ballenas Islands	49.3464	124.1581

SITE CODE	SITE NAME	LATITUDE (decimal degrees)	LONGITUDE (decimal degrees)
GI-012	Mistaken Island	49.3224	124.2186
GI-015	Yeo Islands	49.3053	124.1350
GI-020	Ada Islands	49.2853	124.0939
GI-040	Maude Island	49.2706	124.0819
GI-045	Long Lake	49.2111	124.0208
GI-050	Five Finger Island	49.2311	123.9158
GI-060	Hudson Rocks	49.2258	123.9250
GI-070	Snake Island	49.2156	123.8906
GI-074	Entrance Island	49.2089	123.8092
GI-076	Brandon Islands	49.2069	123.9569
GI-080	Newcastle Island - East Dock	49.1803	123.9289
GI-085	Nanaimo Harbour	49.1628	123.9314
GI-089	Descanso Bay	49.1781	123.8583
GI-090	Gabriola Island - West Cliffs	49.1558	123.8569
GI-095	Harmac - Mill	49.1375	123.8575
GI-100	Gabriola Island - East Cliffs	49.1608	123.7278
GI-110	Carlos Island	49.1592	123.6969
GI-112	Breakwater Island	49.1361	123.6825
GI-120	Mudge Island	49.1281	123.7875
GI-130	Round Island	49.1147	123.7956
GI-140	Link Island	49.1161	123.7636
GI-150	De Courcy Island	49.0983	123.7458
GI-160	Valdes Island - West Cliffs	49.1056	123.7028
GI-170	Ruxton Island	49.0758	123.7064
GI-171	Whaleboat Island	49.0739	123.6925
GI-180	Tree Island	49.0608	123.6978
GI-190	Miami Islet	49.0372	123.7094
GI-195	Ladysmith Harbour	49.0031	123.8194
GI-200	Ragged Islets	49.0264	123.6961
GI-210	Rose Islets	49.0081	123.6439
GI-220	Canoe Islet	49.0281	123.5886
GI-230	Galiano Island - North Cliffs	48.9725	123.5631
GI-238	Scott Island	48.9756	123.6942
GI-240	"Preedy" Rock	48.9675	123.6756
GI-250	Augustus Point	48.9450	123.6528
GI-258	Jackscrew Island	48.9533	123.5875
GI-260	Wallace Island	48.9386	123.5500
GI-270	Tent Island	48.9250	123.6303
GI-280	Bare Point	48.9278	123.7064
GI-285	Chemainus - Harbour	48.9256	123.7144
GI-290	Shoal Islands	48.9000	123.6667
GI-292	Crofton - Mill	48.8792	123.6497
GI-300	Cowichan Lake	48.8667	124.2333
GI-310	Vesuvius Bay	48.8811	123.5733
GI-320	Ballingall Islets	48.9072	123.4594
GI-330	Galiano Island - Central Cliffs	48.9119	123.4314
GI-340	"Wise" Rock	48.8978	123.4389
GI-350	Charles Island	48.9014	123.4350
GI-360	Parker Island - Cliffs	48.8825	123.4139
GI-370	Galiano Island - South Cliffs	48.8694	123.3897
GI-380	Lion Islets	48.9003	123.3350
GI-390	“Gossip” Rock	48.8925	123.3292
GI-400	Galiano Island - Active Pass Cliffs	48.8625	123.3306
GI-408	Clamshell Islet	48.8519	123.4414
GI-410	“Long Harbour” Islet	48.8453	123.4264
GI-420	Chain Islands	48.8375	123.4539
GI-424	Hawkins Island	48.8403	123.3717
GI-426	Portlock Point	48.8278	123.3525
GI-430	Annette Inlet	48.8258	123.3911
GI-440	Red Islets	48.8161	123.3561
GI-450	Prevost Island - South Cliffs	48.8128	123.3750
GI-460	Channel Islands	48.7994	123.3842
GI-465	“Grainger” Rocks	48.8343	123.2349
GI-470	Belle Chain Islets	48.8244	123.1842
GI-480	"Minx" Rocks	48.8111	123.2042
GI-490	Pine Islet	48.8003	123.0953
GI-500	Cabbage Island	48.7981	123.0869
GI-510	East Point - Cliffs	48.7817	123.0469
GI-520	Lyall Harbour - Cliffs	48.8017	123.1892
GI-530	Elliot Bluff	48.7892	123.2122
GI-535	Razor Point - Cliffs	48.7755	123.2445
GI-540	"Croker" Rock	48.7731	123.1961
GI-550	Java Islets	48.7597	123.1097
GI-560	Blunden Islet	48.7442	123.1681
GI-570	Oaks Bluff	48.7481	123.2675
GI-580	"Peter" Rock	48.7381	123.2311
GI-588	“Kingfisher” Rocks	48.7561	123.4092
GI-590	Jackson Rock	48.7539	123.4283
GI-595	Fulford Harbour	48.7622	123.4380
GI-600	Isabella Island	48.7289	123.4306
GI-610	Pellow Islets	48.7247	123.3575
GI-620	Tortoise Islets	48.7161	123.3686
GI-630	Arbutus Island	48.7061	123.4353
GI-640	Hatch Point - Wharf	48.6969	123.5406
GI-650	Pym Island	48.7000	123.3892
GI-656	Swartz Bay - Ferry Terminal	48.6892	123.4114
GI-660	"Swartz Head" Rocks	48.6864	123.4000
GI-665	Point Fairfax	48.6992	123.2986
GI-670	Imrie Island	48.6944	123.3331
GI-680	Reay Island	48.6833	123.3292
GI-690	Greig Island	48.6781	123.3392
GI-700	"Killer Whale" Rocks	48.6772	123.3836
GI-710	Little Group	48.6717	123.3575
GI-720	Rubly Island	48.6653	123.3125
GI-725	Gooch Island	48.6631	123.2908
GI-726	Rum Island	48.6628	123.2778
GI-730	Forrest Island	48.6617	123.3347
GI-735	Sidney Spit	48.6419	123.3306
GI-740	Sidney	48.6433	123.3969
GI-750	Mandarte Island	48.6333	123.2867
GI-760	Halibut Island	48.6203	123.2728
GI-765	James Island - West Dock	48.5967	123.3536
GI-770	Sallas Rocks	48.5847	123.2903
GI-780	Little D'Arcy Island	48.5703	123.2667
GI-782	Unit Rocks	48.5647	123.2644
GI-790	Gordon Head	48.4956	123.3069
GI-800	Ten Mile Point	48.4553	123.2653
GI-810	Flower Island	48.4489	123.2792
GI-820	Jemmy Jones Island	48.4444	123.2728
GI-825	Chatham Islands	48.4375	123.2486
GI-830	Discovery Island	48.4256	123.2375
GI-840	Fiddle Reef	48.4294	123.2839
GI-850	Mary Tod Island	48.4275	123.2986
GI-860	Emily Islet	48.4269	123.2933
GI-870	Lewis Reef	48.4253	123.2797
GI-880	Harris Island	48.4231	123.2897
GI-890	Chain Islets/Great Chain Island	48.4206	123.2753
GI-900	Trial Islands	48.3972	123.3056
GI-905	Ogden Point - Port	48.4150	123.3897
GI-910	Harrison Island	48.4178	123.4022
GI-915	Berens Island	48.4242	123.3933
GI-920	Colvile Island	48.4269	123.3883
GI-925	Pelly Island	48.4256	123.3842
GI-930	Victoria	48.4250	123.3694
GI-938	Gillingham Islands	48.4197	123.4158
GI-940	Brothers Islands	48.4253	123.4342
GI-950	Coburg Peninsula	48.4250	123.4639

APPENDIX 2. DATA CODES USED ON SUMMARY TABLES

See Key to Summary Tables in Part 1 (pages 53-56) [335] for a more detailed explanation of codes.

x: Breeding confirmed by at least one pair but no population estimated. When followed by a number (e.g., **x**3) it indicates the number of nests where breeding was confirmed and does not indicate a population estimate. For all species, breeding is confirmed by the presence of eggs in a burrow, nest, or on a nesting ledge, or unfledged young in or near a nest, including recently hatched or broken eggshells or dead young. These are the only criteria

accepted for Black Oystercatchers and Glaucous-winged Gulls, except for gulls nesting in inaccessible locations such as cliffs or bridges. For cormorant species and gulls in inaccessible locations, adults sitting in nests apparently incubating or brooding is also considered confirmation even if nest contents have not been determined. For gulls, this represents a slight change in our criteria from that used in previous volumes which we made to accommodate the greater frequency of gulls nesting on difficult-to-access sites like bridges in the Salish Sea area. For Pigeon Guillemots, Rhinoceros Auklets, and Tufted Puffins nesting in burrows, crevices, or other obscured locations, adults in those types of locations, including adults flying in or out of those locations, is also considered confirmation.

S: Breeding suspected. Used when no confirmation of breeding has been obtained, but because of other evidence observed, breeding is suspected.

e: Estimated population in pairs. Indicates a total population estimate, but not comparable to other estimates because methods were not reliable or replicable. Often based on numbers of birds seen when nests were not found. If no confirmation has been obtained, an "S" accompanies it. When used alone following a number, it means that breeding of at least one pair was confirmed (see "**x**" above). We have included partial counts under this category because it is often difficult to determine what portion of a colony was counted, making precise replication impossible.

Number with no code or followed by a code, e.g., 213 or 200eS: Population estimates. Numbers presented without a letter code (e.g., **213**) indicate that a total count of all nests or burrows was conducted and breeding was confirmed. One or more letter codes (**e or S**) following a number qualify the population estimate as indicated above.

Number in square brackets, e.g., [12]: Number of nests that contained eggs or young. Used only for surface-nesting species and when the contents of all nests have been determined. Always associated with a total count population estimate.

Number in parentheses (i.e., round brackets), e.g., (12): Number of birds in breeding plumage counted on or near the colony. Used for Pigeon Guillemots and sometimes murres and puffins when numbers of breeding birds were not determined.

E: Extirpated. Used only for burrowing species for which previous nesting at a site had been confirmed, and a thorough search has revealed no current activity. Zero is used for abandoned sites of surface-nesting species like cormorants, and for previously suspected, but unconfirmed colonies of burrow-nesting species.

Species Codes Used On Tables

Codes for species names follow Campbell and Harcombe.[77]

FTSP: Fork-tailed Storm-Petrel *Oceanodroma furcata*

LSPE: Leach's Storm-Petrel *O. leucorhoa*

DCCO: Double-crested Cormorant *Phalacrocorax auritus* (*Nannopterum auritum* [222])

BRCO: Brandt's Cormorant *P. penicillatus* (*Urile penicillatus* [222])

PECO: Pelagic Cormorant *P. pelagicus* (*Urile pelagicus* [222])

BLOY: Black Oystercatcher *Haematopus bachmani*

GWGU: Glaucous-winged Gull *Larus glaucescens*

BLKI: Black-legged Kittiwake *Rissa tridactyla*

CATE: Caspian Tern *Hydroprogne caspia*

ARTE: Arctic Tern *Sterna paradisaea*

COMU: Common Murre *Uria aalge*

TBMU: Thick-billed Murre *U. lomvia*

PIGU: Pigeon Guillemot *Cepphus columba*

ANMU: Ancient Murrelet *Synthliboramphus antiquus*

CAAU: Cassin's Auklet *Ptychoramphus aleuticus*

RHAU: Rhinoceros Auklet *Cerorhinca monocerata*

TUPU: Tufted Puffin *Fratercula cirrhata*

HOPU: Horned Puffin *Fratercula corniculata*

APPENDIX 3. ISLANDS SURVEYED WITH NO RECORD OF BREEDING BY SEABIRDS

During the course of seabird surveys, many islands have been explored on which seabirds were not found breeding (Figure 640). Information on those sites is valuable for monitoring future colonizations, as well as indicating where past effort has been spent. Table A3-1 lists all recorded visits to such sites by surveyors searching for nesting seabirds in the BC Salish Sea. It does not include the numerous observations made at many sites and reported on eBird [524] or elsewhere by birdwatchers that were not specifically searching for nesting seabirds unless those observations provide some suggestion that nesting may occur. Several sites without historical evidence of nesting have been included in the Parks Canada Black Oystercatcher monitoring program conducted since 2005, including: Bright Islet off Diver Bay on the southeast side of Prevost Island; "Dinner Point" Rock off Dinner Point at the southwest corner of Mayne Island, Roe Islet in Otter Bay on the west side of North Pender Island, "Higgs" Rock off Higgs Point at the southeast end of South Pender Island, and "Tilly" Rock off Tilly Point at the south end of South Pender Island. Records for those sites are listed here in Table A3-1.

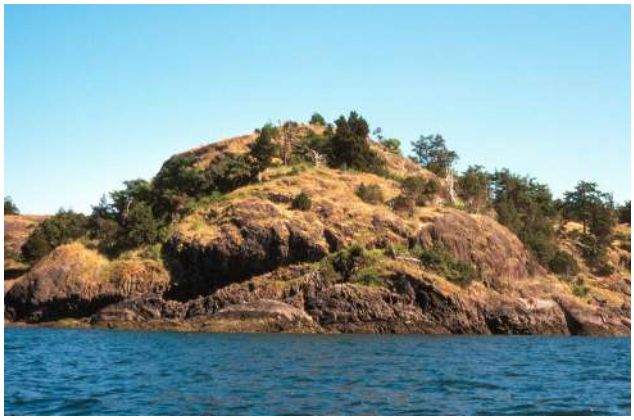
The extent of exploration undertaken at a particular site was often difficult to evaluate because notes by observers were brief, but, unless otherwise indicated, we assume that survey parties landed and examined all of a rocky islet and at least the perimeter and part of the central area of a forested island. If observations were made from the water only, or if only a portion of an island was explored, this is noted. Sites are grouped in the same regional categories used for nesting colonies and are listed in the same geographic sequence within each map grid in those regions. All unnamed islands have been given names (in quotations) and their locations have been described to avoid a confusing list of unnamed sites.

Sightings of seabirds are listed for each site, and unless otherwise indicated, birds are assumed to be roosting, feeding, or sitting on the water. Any evidence suggesting breeding is noted. Sightings and signs of predators are also noted. Breeding has been suspected at some sites and future investigations may confirm breeding at those locations, but possible current nesting populations at those sites are small in relation to provincial totals. Most records refer to only a few birds, typically one or two pairs of Black Oystercatchers, Glaucous-winged Gulls, or Pigeon Guillemots observed at a site.

Figure 640. Numerous islands have been explored during the course of seabird surveys in the BC Salish Sea where seabirds were not found nesting. Many of those islands have habitats that seem suitable for nesting and it is likely that breeding will be confirmed on some of those islands in the future. Photos here provide some examples, showing (clockwise from top left on this and each of the next two pages): **1)** southern of the Chained Islands in Kanish Bay at the northwestern end of Quadra Island; **2)** Yellow Island off the mid-west coast of Quadra Island; **3)** Mace Point at the eastern tip of Savary Island; **4)** Dinner Rock along the mainland shore east of Savary Island; **5)** the islet south of Oyster Island off the west end of Hardy Island; 6**)** Circle Island off the southeastern tip of Jedediah Island; **7)** Jenkins Island off the southwest side of Lasqueti Island; **8)** "Redroofs" Islets along east side of Halfmoon Bay; **9)** Home Island (also known as Salmon Rock) off the southwest tip of Keats Island **10)** west side of Gerald Island to the east of Nuttal Bay on Vancouver Island; **11)** Douglas Island to the east of Gerald Island; **12)** Amelia Island to the southeast of Gerald Island; **13)** Ruth Island west of Ada Islands off Nanoose Harbour; **14)** Bird Rock just off Chemainus; **15)** Sandstone Rocks off the south end of Tent Island; and **16)** Idol Island south of Stone Cutters Bay at the north end of Saltspring Island. *Photos by R. Wayne Campbell, 10 June 1976 (1-2), June 1981 (3-9), July 1974 (10-14), and 22 June 1974 (15-16).*





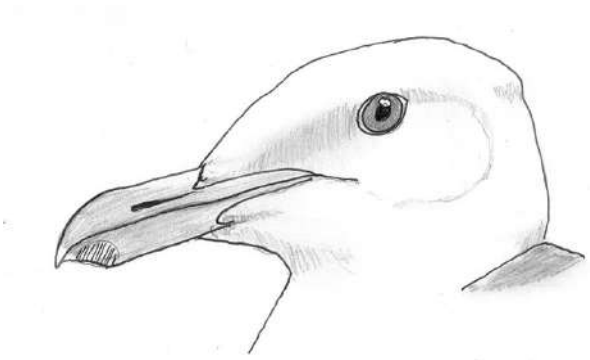


Table A3-1. Islands surveyed in the BC Salish Sea with no record of breeding by seabirds. Any adult seabirds, possible evidence of nesting, or mammalian predators observed at these sites are noted.

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Northern Strait of Georgia					
Metcalf Islands	92 K/6	50°16'59"N	125°22'07"W	11 Jun 1976	(523)
Chained Islands (see Figure 640)	92 K/3	50°15'02"N	125°21'16"W	10 Jun 1976	(523)
Yellow Island (see Figure 640)	92 K/3	50°07'49"N	125°19'41"W	10 Jun 1976	(523)
Bee Islets	92 K/3	50°05'39"N	125°01'00"W	1980-2010	(473)
"Cat" Island	92 K/2	50°04'21"N	124°59'26"W	1980-2010	off Mansons Landing on Cortes Island (473)
"Kitten" Island	92 K/2	50°04'24"N	124°59'18"W	1980-2010	off Mansons Landing on Cortes Island (473)
Campbell River	92 K/3	50°01'42"N	125°14'32"W	10 Jun 1976	6 PIGU swimming near wharf; suspected nesting (71)
Townley Islands	92 K/2	50°01'28"N	124°50'26"W	19 Jun 1981	(523)
Hernando Island	92 F/15	49°59'N	124°55'W	19 Jun 1981	18 GWGU, 1 PIGU flying (523)
Savary Island (see Figure 640)	92 F/15	49°56'20"N	124°48'50"W	19 Jun 1981	56 GWGU feeding, 1 PIGU flying; no seabirds seen at Mace Point though habitat looked suitable (523)
Dinner Rock (see Figure 640)	92 F/15	49°56'47"N	124°43'23"W	2 Jul 1974	(523)
				31 May 1978	(523)
				19 Jun 1981	1 GWGU flushed by BAEA (523)
				2006	2 GWGU (30, 456)
Ahgykson (Harwood) Island	92 F/15	49°51'40"N	124°39'W	13 Jun 1981	1 PIGU, 2 GWGU on rock along southwest side (523)
Myrtle Rocks	92 F/16	49°47'26"N	124°28'29"W	13 Jun 1981	(523)
				6 Apr 2007	2 PIGU (524)
				23 Apr 2009	1 PIGU (524)
				21 May 2018	1 PIGU (524)
				2018-2021	many sightings of 1-6 BLOY (524)
				29 Apr 2021	2 BLOY appear to be at nest (524)
Texada Island	92 F/9, 10	49°40'N	124°25W	22 Jun 1981	circumnavigated by boat; all islets around the shore were also checked; 47 GWGU feeding (523)
				3 Aug 2016	only data for Sabine Channel; 15 PIGU flying onto cliff ledge on shore of Texada opposite the north end of Jedediah Island (524)
NW Davis Bay, Texada Island	92 F/10	49°43'14"N	124°36'39"W	14 Jul 2014	8 PIGU on cliffs (94)
Dick Island	92 F/9	49°39'03"N	124°28'12"W	23 Jun 1981	(523)
"Scotch Fir" Islets	92 F/9	49°44'29"N	124°16'50"W	13 Jun 1981	4 islets NW of Scotch Fir Point; 5 GWGU roosting (523)
Oyster Island (see Figure 640)	92 F/9	49°43'23"N	124°13'03"W	13 Jun 1981	including south islet; 1 GWGU (523)
Clio Island	92 F/9	49°43'08"N	124°11'23"W	13 Jun 1981	including islands to W (523)
Sims Islet	92 F/9	49°43'21"N	124°11'13"W	13 Jun 1981	(523)
Watt Islet	92 F/9	49°43'17"N	124°11'05"W	13 Jun 1981	including island to NE (523)
Routh Islet	92 F/9	49°43'13"N	124°10'59"W	13 Jun 1981	including island to N (523)
Marr Island	92 F/9	49°43'16"N	124°10'49"W	13 Jun 1981	(523)
Carlsen Islet	92 F/9	49°43'15"N	124°10'32"W	13 Jun 1981	including island to NW (523)
Berge Islet	92 F/9	49°43'16"N	124°10'25"W	13 Jun 1981	(523)
Kelly Island	92 F/9	49°42'30"N	124°12'36"W	13 Jun 1981	including island to E (523)
Nelson Island	92 F/9	49°42'N	124°07W	12-13 Jun 1981	circumnavigated by boat; all offshore islands checked as well (523)
Strawberry Islet	92 F/9	49°41'25"N	124°12'21"W	13 Jun 1981	2 GWGU (523)
"Cockburn Bay" Islets	92 F/9	49°41'02"N	124°12'10"W	13 Jun 1981	N of Cockburn Bay; 2 GWGU (523)
Miller Islet	92 G/13	49°47'15"N	123°56'43"W	12 Jun 1981	1 GWGU (523)
Captain Island	92 G/13	49°47'03"N	123°59'08"W	12 Jun 1981	(523)
Caldwell Island	92 G/13	49°44'37"N	124°02'42"W	12 Jun 1981	(523)
Pearson Island	92 F/9	49°37'48"N	124°04'50"W	12 Jun 1981	1 PIGU flying by (523)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Williams Island	92 F/9	49°37'44"N	124°03'35"W	12 Jun 1981	(523)
Skardon Islands	92 F/9	49°37'48"N	124°03'10"W	12 Jun 1981	(523)
Martin Island	92 F/9	49°37'30"N	124°04'15"W	12 Jun 1981	(523)
Charles Island	92 F/9	49°37'35"N	124°03'36"W	12 Jun 1981	(523)
Calder Island	92 F/9	49°37'30"N	124°02'15"W	12 Jun 1981	(523)
Mary Island	92 F/9	49°37'34"N	124°02'02"W	12 Jun 1981	(523)
Dusenbury Island	92 F/9	49°37'19"N	124°02'19"W	12 Jun 1981	(523)
Edgecombe Island	92 F/9	49°36'15"N	124°01'52"W	12 Jun 1981	including two islets to SE; 1 PIGU offshore SW islet (523)
Harness Island	92 F/9	49°35'30"N	124°01'11"W	12 Jun 1981	(523)
Seal Islets (northern)	92 F/10	49°37'50"N	124°51'38"W	1 Jun 1981	7 GWGU (523)
Sandy Island	92 F/10	49°37'08"N	124°51'02"W	17 Jul 2004	frequent reports of BLOY between 2003 and 2021; 3 BLOY and nesting reported without confirmation on 17 July 2004 (524)
Toby Island	92 F/7	49°29'23"N	124°39'51"W	16 Jun 2010	1 pair GWGU suspected nesting (453)
Lasqueti Island	92 F/8	49°29'N	124°17'W	24 Jun 1981	(523)
Jelina Island	92 F/9	49°30'47"N	124°18'24"W	24 Jun 1981	1 PIGU (523)
"Jervis" Islets	92 F/9	49°31'06"N	124°15'39"W	3 Jun 1978	NW of Jervis Island; few GWGU (523)
Paul Island	92 F/9	49°30'26"N	124°13'11"W	24 Jun 1981	(523)
Jedediah Island	92 F/8	49°29'53"N	124°12'06"W	24 Jun 1981	2 goats (523)
				24 Jun 2021	only small rock off Home Bay and rock along the northeast side of the island were inspected by boat (483)
Circle Island (see Figure 640)	92 F/8	49°29'26"N	124°10'47"W	24 Jun 1981	(523)
				24 Jun 2021	(483)
Olsen Island	92 F/8	49°29'35"N	124°22'31"W	24 Jun 1981	1 GWGU (523)
Higgins Island	92 F/8	49°29'39"N	124°21'55"W	24 Jun 1981	(523)
Heath Islet	92 F/8	49°28'48"N	124°22'06"W	24 Jun 1981	2 GWGU (523)
Jenkins Island (see Figure 640)	92 F/8	49°27'07"N	124°17'40"W	24 Jun 1981	(523)
Seal Reef	92 F/8	49°26'17"N	124°14'03"W	24 Jun 1981	1 PECO, 2 GWGU (523)
North Thormanby Island	92 F/9	49°30'N	124°00'W	11 Jun 1981	(523)
Grant Island	92 G/12	49°30'41"N	123°58'08"W	11 Jun 1981	(523)
Surrey Islands	92 G/12	49°30'10"N	123°59'01"W	11 Jun 1981	(523)
South Thormanby Island	92 G/5	49°29'N	123°58'W	11 Jun 1981	(523)
"Lemberg" Rocks	92 G/5	49°29'25"N	123°57'18"W	11 Jun 1981	south of Lemberg Point on South Thormanby Island; 1 empty, well-constructed GWGU nest (523)
"Seafield" Rock	92 G/5	49°29'06"N	123°57'05"W	11 Jun 1981	east of Mt. Seafield on South Thormanby Island, south of Egerton Rock (523)
"Redroofs" Islets (see Figure 640)	92 G/12	49°30'16"N	123°54'37"W	11 Jun 1981	small islets close to shore along east side of Halfmoon Bay; 2 GWGU (523)
Sutton Islets	92 G/13	49°45'45"N	123°56'17"W	12 Jun 1981	(523)
Sechelt Islets	92 G/12	49°44'25"N	123°53'52"W	9 Jun 1981	all islets in Skookumchuck Narrows (523)
Kunechin Islets	92 G/12	49°37'19"N	123°48'19"W	9 Jun 1981	(523)
Halfway Islet	92 G/12	49°36'14"N	123°49'19"W	9 Jun 1981	(523)
Poise Island	92 G/5	49°29'51"N	123°45'45"W	9 Jun 1981	(523)
Woodfiber ferry landing	92 G/11	49°40'05"N	123°10'09"W	31 May 2021	abandoned terminal just south of Darrell Bay (500)
Porteau Cove	92 G/11	49°33'36"N	123°14'09"W	31 May 2021	3 PECO roosting (500)
Woolridge Island	92 G/11	49°30'47"N	124°27'26"W	8 Jun 1981	(523)
Gambier Island	92 G/6	49°29'30"N	123°24'W	8 Jun 1981	(523)
"Gambier" Rock	92 G/6	49°27'19"N	123°18'53"W	22 Jun 2015	E side of Gambier Island. (62)
Finisterre Island	92 G/6	49°25'04"N	123°18'33"W	8 Jul 1974	(523)
				8 Jun 1981	(523)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Hutt Island	92 G/6	49°24'31"N	123°22'59"W	8 Jul 1974	(523)
				23 Jun 1981	suitable PECO habitat on south cliffs but no birds (523)
Keats Island	92 G/6	49°24'N	123°27'W	8 Jul 1974	(523)
				23 Jun 1981	(523)
Home Island (aka Salmon Rock; see Figure 640)	92 G/6	49°22'56"N	123°29'44"W	8 Jul 1974	(523)
				23 Jun 1981	(523)
Preston Island	92 G/6	49°23'08"N	123°28'37"W	8 Jul 1974	(523)
				23 Jun 1981	(523)
Mickey Island	92 G/6	49°22'17"N	123°27'07"W	23 Jun 1981	(523)
Hermit Island	92 G/6	49°22'14"N	123°28'25"W	23 Jun 1981	(523)
				22 Jun 2015	2 BLOY (62)
Little Popham Island	92 G/6	49°21'56"N	123°29'00"W	23 Jun 1981	(523)
Worlcombe Island	92 G/6	49°20'58"N	123°27'56"W	8 Jul 1974	(523)
				23 Jun 1981	(523)
				22 Jun 2015	one unattended BLOY nest on W rocks (62)
Eagle Island	92 G/6	49°21'12"N	123°16'26"W	6 Jun 1981	(523)
Burnaby Shoal light	92 G/6	49°17'55"N	123°06'33"W	1 Aug 1981	east of Brockton Point; 2 complete but empty GWGU nests on light; may have been used and depredated (523)
Cambie Street Bridge	92 G/6	49°16'18"N	123°06'53"W	May-Aug 2017	visual inspections from ground north and south side; no viable GWGU nesting sites due to bridge design (480)
Port Mann Bridge	92 G/2	49°13'24"N	122°48'53"W	3 Jun 2021	viewed from Maquabeak Park and the west end of Traboulay PoCo Trail on the north shore of the Fraser River (501)
Essondale Islet	92 G/2	49°13'28"N	122°47'57"W	3 Jun 2021	viewed from the west end of the Traboulay PoCo Trail on the north shore of the Fraser River (501)
Queensborough Bridge	92 G/2	49°11'46"N	122°56'49"W	5 Jun 2021	viewed east side of bridge from River Drive on the north shore of the river and the west side from the shore of Lulu Island. PEFA pair feeding 2 visible young at nest under bridge deck in middle of the river span (501)
North Delta	92 G/2	49°09'15"N	122°58'32"W	11, 13 Jul 2022	explored Fraser River shoreline area from the boundary of South Westminster in Surrey to the west end of Tilbury Island; viewed rooftops from River Road and from roads on Tilbury Island north of River Road; 6 GWGU on river, rooftops, pilings, and flying around Gunderson Slough and 1 GWGU on piling west of Alex Fraser Bridge; 3 BAEA (501)
Alex Fraser Bridge	92 G/2	49°09'36"N	122°56'34"W	5 Jun 2021	viewed only west side of bridge from shore of Annacis Island (501)
Albion Dyke No. 2	92 G/3	49°07'18"N	123°12'41"W	2 Jun 1981	(523)
Gulf Islands					
Gerald Island (see Figure 640)	92 F/8	49°18'41"N	124°09'44"W	4 Jul 1974	(523)
Douglas Island (see Figure 640)	92 F/8	49°18'39"N	124°09'10"W	4 Jul 1974	(523)

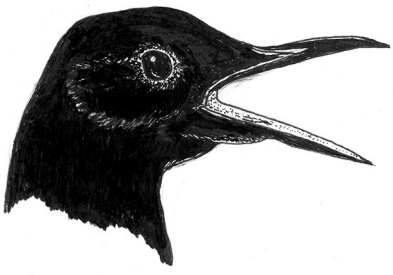
Table A3-1. cont'd

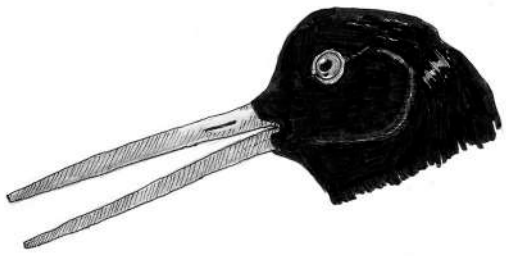
SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Amelia Island (see Figure 640)	92 F/8	49°18'11"N	124°09'09"W	4 Jul 1974	(523)
Winchelsea Islands	92 F/8	49°17'28"N	124°04'41"W	4 Jul 1974	(523)
Ruth Island (see Figure 640)	92 F/8	49°16'55"N	124°06'48"W	4 Jul 1974	(523)
Southey Island	92 F/8	49°16'34"N	124°06'11"W	4 Jul 1974	(523)
Inskip Rock	92 G/4	49°12'30"N	123°57'12"W	3 Jun 1999	2 GWGU, 1 DCCO (484)
Pylades Island	92 G/4	49°04'00"N	123°41'28"W	16 Jun 1977	332, (523)
Flat Top Islands (except GI-110 Carlos Island)	92 G/4	49°09'06"N	123°41'19"W	10 Jul 1974	(523)
"East Valdes" Rock	92 G/4	49°06'34"N	123°40'01"W	21 Jun 1978	1.5 m-high rock on east side of Valdes Island 3.3 km SE of Cordero Point; 2 GWGU nests - one almost complete with 2 adults nearby and one just started and probably abandoned; 8 adults roosting; 1 ad. BAEA (523)
Reid Island	92 B/13	49°00'00"N	123°37'21"W	13 Jul 1974	(523)
Dayman Island	92 B/13	48°58'21"N	123°41'20"W	13 Jul 1974	(523)
Hudson Island	92 B/13	48°57'50"N	123°40'42"W	13 Jul 1974	(523)
Bird Rock (see Figure 640)	92 B/13	48°55'51"N	123°43'05"W	13 Jul 1974	(523)
Sandstone Rocks (see Figure 640)	92 B/13	48°55'14"N	123°37'22"W	22 Jun 1974	2 GWGU in grass (523)
Idol Island (see Figure 640)	92 B/13	48°55'09"N	123°35'43"W	22 Jun 1974	2 PIGU on water near island (note that Campbell [70] listed Idol Island as a breeding site based on this observation, but no actual evidence of nesting has been recorded) (523)
				8 Jun 1976	(523)
				27 Jun 1980	1 PIGU off island (523)
				5-23 Jun 1987	(158)
North Reef	92 B/13	48°54'51"N	123°37'36"W	22 Jun 1974	(523)
Burial Islet	92 B/13	48°46'09"N	123°33'47"W	8 Jun 1976	(523)
Prevost I. – James Bay	92 B/14	48°50'30"N	123°24'10"W	18 Apr 2016	10 PIGU (524)
"Dinner Point" Rock	92 B/14	48°50'00"N	123°19'46"W	27 Jun 2014	Off Dinner Point on Mayne Island (529)
				2 Jun 2015	BAEA nest on Dinner Point (529)
				25 May 2016	BAEA nest on Dinner Point (529)
				7 Jun 2018	(529)
				3 Jun 2019	(529)
				9 Jul 2020	2 BLOY (529)
				25 May 2021	(529)
				2 Jun 2022	from water only (529)
				12 Jun 2023	from water only (529)
Bright Islet	92 B/14	48°49'13"N	123°21'09"W	20 Jun 1977	(332)
				18 Jun 1978	(500)
				14 Jun 2011	(529)
				27 Jun 2014	(529)
				2 Jun 2015	(529)
				25 May 2016	(529)
				7 Jun 2018	6 BLOY (529)
				3 Jun 2019	1 BAEA (529)
				9 Jul 2020	(529)
				25 May 2021	1 BLOY (529)
				1 Jun 2022	from water only; 2 BLOY (529)
				12 Jun 2023	from water only (529)
Acland Islands	92 B/14	48°48'48"N	123°22'52"W	20 Jun 1977	2 GWGU, 1 empty nest (523)
"Samuel" Rock	92 B/14	48°49'40"N	123°12'08"W	21 May 2014	Small unnamed rock between Samuel Island and Belle Chain Islets; 2 BLOY (529)
				2 Jun 2015	(529)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
"Samuel" Rock (cont'd)				13 Jun 2016	(529)
				5 Jun 2018	1 BLOY (529)
				10 Jun 2019	(529)
				30 Jun 2020	(529)
				31 May 2021	(529)
				6 Jun 2022	(529)
King Islets	92 B/14	48°48'21"N	123°12'19"W	21 Jun 1977	(332)
				25 May 2021	(529)
Roe Islet	92 B/14	48°47'44"N	123°18'29"W	27 May 2015	(529)
				1 Jun 2016	(529)
				26 May 2021	(529)
				2 Jun 2022	from water only (529)
				12 Jun 2023	from water only (529)
"Higgs" Rock	92 B/11	48°44'23"N	123°10'48"W	22 Jun 1977	off Higgs Point (332)
				22 May 2014	2 BLOY but no obvious nest (529)
				26 May 2015	2 BLOY, no nest (529)
				1 Jun 2016	(529)
				8 Jun 2018	(529)
				4 Jun 2019	(529)
				14 Jul 2020	(529)
				25 May 2021	(529)
				2 Jun 2022	from water only (529)
				13 Jun 2023	from water only (529)
Tilly Point	92 B/11	48°43'57"N	123°12'20"W	22 Jun 1977	8 PIGU along cliffs (523)
				17 Jun 1978	6 PIGU along cliffs (523)
"Tilly" Rock	92 B/11	48°43'56"N	123°12'07"W	22 Jun 1977	just east of Tilly Point (332)
				22 May 2014	(529)
				26 May 2015	(529)
				1 Jun 2016	(529)
				8 Jun 2018	(529)
				4 Jun 2019	(529)
				14 Jul 2020	(529)
				25 May 2021	(529)
				2 Jun 2022	from water only (529)
				13 Jun 2023	from water only (529)
Brethour Island	92 B/11	48°40'33"N	123°18'46"W	13 Jun 1978	rocks at SE end; 2 BLOY and 2 empty scrapes; 5 GWGU and 1 empty gull nest (523)
Domville Island	92 B/11	48°40'00"N	123°18'53"W	13 Jun 1978	small rocks and point at SE end; 2 BLOY, 7 GWGU, 1 empty gull nest (523)
D'Arcy Island	92 B/11	48°34'00"N	123°16'45"W	15 Jun 2003	12 PIGU (524)
Tod Rock	92 B/6	48°25'53"N	123°17'15"W	13-20 Jun 2009	(453)
Witty's Lagoon, "Tower Point"	92 B/5	48°23'05"N	123°30'25"W	7, 14 Jun 2017	4 BLOY; agitated, suspected nesting (524)

[a] Data sources are given in parentheses; numbers refer to entries in *Literature Cited* and *Other Sources of Information*.





APPENDIX 4. SURVEY METHODS FOR SEABIRD COLONIES IN THE BC SALISH SEA

The material presented here is designed as a stand-alone document that can be used independently by those conducting surveys in the BC Salish Sea. It thus repeats some of the content contained in the rest of this work. The detailed presentation here is designed to complement established provincial protocols [322] and other published survey methods.

Objectives and Scope:

Obtaining reliable, quantitative data on the distribution and abundance of nesting seabirds is essential for determining population trends and for the conservation and management of breeding species. To allow valid comparisons to be made among surveys, and to minimize biases that can result from multiple observers, it is important to collect data using standardized protocols. However, because conducting surveys can have negative impacts on nesting birds, a balance must be struck between data quality and survey invasiveness. The objective of this document [a] is to outline key components of survey methods which take into consideration data quality, surveyor impacts, and surveyor safety.

Qualifications or training of survey crews and logistical elements such as authorizations required for visiting seabird colonies are outside the scope of this document. Suffice to say that colony surveys should be led by at least one person with ample knowledge and previous experience. Also, visits to seabird colonies should only be made as part of planned survey or research programs. All nesting seabirds are protected under the federal *Migratory Birds Convention Act* and the provincial *Wildlife Act*. Many seabird colonies in the BC Salish Sea have protected status as Provincial Ecological Reserves or as part of the Gulf Islands National Park Reserve; special permission is required to access those sites.

Breeding seabird surveys in the BC Salish Sea over the last several decades have mainly addressed single species or species groups (e.g., cormorants). As a result, estimates of total breeding populations at colonies are fragmentary, often derived from data collected many years apart. Fragmentary data for different nesting species limit our ability to interpret overall changes, to understand interactions among nesting species, and to detect and manage impacts at colony sites. Methods presented here are intended for surveys designed to locate all known and previously unknown seabird colonies in an area and to provide complete population estimates of all seabird species breeding at each colony. They synthesize and complement established provincial protocols [b] and other published survey methods, which tend to focus on single species or species groups.

Seabird Species Nesting in the BC Salish Sea:

There are five breeding seabird species that are the main target for surveys in the BC Salish Sea: Double-crested Cormorant, Pelagic Cormorant, Black Oystercatcher, Glaucous-winged Gull, and Pigeon Guillemot. Five additional species have been confirmed nesting in the area but are rare: Brandt's Cormorant, Caspian Tern, Arctic Tern, Rhinoceros Auklet, and Tufted Puffin. These latter five species have each been confirmed nesting at only one or two sites in the BC Salish Sea. Survey methods presented in this document focus on the five common species, but surveyors should be alert to the possible discovery of the other five nesting species.

Minimizing Surveyor Impacts:

Conducting surveys can cause disturbance to nesting seabirds that can impact their breeding success and survival. The goal of conducting surveys is to obtain accurate estimates of breeding populations while minimizing disturbance impacts. In general, thorough surveys can be conducted without causing damage if surveyors are alert for the presence of predators such as crows and gulls that will steal eggs or small young when nesting birds are flushed from their nests. An initial circumnavigation of the colony by boat at a distance of at least 50 m from shore is recommended so that risks to the colony from surveyor disturbance can be assessed and the survey approach planned.

Cormorant eggs and small chicks are highly vulnerable to predation when adults are flushed off nests. Particular care needs to be taken to prevent such surveyor-disturbance impacts to cormorant species. Nest counts for cormorants, especially Pelagic Cormorants that mostly nest on cliffs, are often best conducted from the water from where the risk of flushing nesting birds is lowest. However, sometimes not all cormorant nests are visible from the water and additional counts from land are needed to obtain complete counts. Double-crested Cormorants often nest on more level ground above cliffs. They will also nest in trees and snags. Their

nests can often be counted from the water but some nests may be more visible from vantage points on land. Efforts should be made to view nests without flushing nesting birds.

Nest counts for Black Oystercatchers and Glaucous-winged Gulls are best conducted from land. Disturbance to nesting oystercatchers and gulls is inevitable during such surveys but generally has little lasting impact to nesting birds if surveys are conducted during their incubation periods. After gull chicks hatch and become mobile they can be injured or killed if they are scared from their nests into territories of neighbouring birds.

If cormorants are nesting on the same colonies as oystercatchers and gulls, it is usually possible to carefully count oystercatcher and gull nests without flushing nesting cormorants. The locations of nesting cormorants will have been determined on the initial circumnavigation of the colony and surveyors on land can prevent disturbance to cormorants by approaching those locations carefully and either keeping out of sight of nesting cormorants or only viewing cormorant nests from a vantage point at a safe distance. If cormorants are disturbed, move quickly to complete counts and withdraw so that birds can return to their nests. If crows or other predators are present and begin to prey on cormorant nests, then surveyors should withdraw immediately. In such cases, if nest counts have not been completed, then observers should estimate the numbers of nests that were not counted based on the number of adults seen and record that the count was truncated and why.

Safety:

It is assumed that surveyors are familiar with safe boating practices and general safety measures associated with any field work. For visits to seabird colonies, observers must constantly judge weather and sea conditions and decide whether travelling to, or landing on, islands is safe. On colonies, nesting Glaucous-winged Gulls can be aggressive towards intruders and can inflict head wounds by diving on unsuspecting observers. Gulls tend to be more aggressive when chicks are present. When surveying gull colonies, it is prudent to wear a protective head covering or to hold a stick above your head to ward off dive-bombing gulls. You may still get "splattered." Surveyors should also be aware that accumulated gull and cormorant feces can harbour fungus that causes Aspergillosis (a fungal infection of the lungs). The fungus is common in many environments and generally affects only those with weakened immune systems or lung diseases. Extended exposure to dust from dry guano should be avoided.

Timing:

- Seabird colony surveys in the BC Salish Sea are best conducted around the middle to the end of June when Glaucous-winged Gulls have mostly full clutches but few chicks have hatched (boat-based surveys focused on cormorant species are often conducted later in July when cormorant chicks are partially grown but provide less complete data for the colony and may miss nesting birds that initiated breeding but failed earlier in the season).
- The best time to count Pigeon Guillemots is in the morning when attendance at the colony is highest. Generally, it is not practical to survey every colony in the morning, but surveyors should take advantage of opportunities to conduct morning counts of guillemots around colonies if they happen to be passing by a known colony en route to other survey sites.

Survey Overview:

- If time permits, circumnavigate all islands/rocks in the survey area by boat. Otherwise, circumnavigate known colony sites plus any other suitable-looking habitats like small rocky islets and cliffs to the extent that time permits.
- Record all observations of seabirds and potential seabird predators such as Bald Eagles, crows, river otters, mink, etc. Detections should be recorded to species if possible; otherwise to the lowest taxonomic level possible (e.g., "cormorant" if not certain of species). Separate age classes (adult or immature) for seabirds and eagles.
- Negative data are important to record so be sure to note islands that were explored but no evidence of nesting by seabirds was found.
- Count the number of Pigeon Guillemots on the water or on land around an island.
- Identify and record/map the locations of cormorant nesting areas and count all nests. Also assess and record whether all cormorant nests are likely visible from the water or whether cormorants may be

nesting in crevices or inland-facing cliffs that are not viewable from the water. Observers on land should also look for such nesting areas that would not be visible from the water.

- Land and search for nests on any accessible rocky island or point where Black Oystercatchers or Glaucous-winged Gulls are seen (unless there are safety concerns or concerns related to surveyor disturbance, such as described for cormorants above).
- Nesting oystercatchers and sometimes gulls are not always visible from the water, so, if time permits, land on rocky islands or points with apparently suitable habitat to look for nesting birds even if none are seen from the water. Oystercatcher nests can be a challenge to find; nest locations can sometimes be pinpointed if observers keep a watch ahead when approaching areas so they can spot where birds flush from.

General Data and Photographs:

- For each survey, record date, time (start and end), weather, and full names of observers.
- For each island or portion of a larger island surveyed, record:
    - Island name (unless the site is unnamed);
    - Location (on map or provide GPS coordinates as well as a general description);
    - Time of the survey (start and end);
    - Details of survey methods (e.g., circumnavigated by boat; nests counted from water using binoculars; complete nest count on land);
    - General habitat features (e.g., forested; mostly bare rock with a few small grassy patches; 30 m-high cliff running 100 m along south shore of island);
    - Signs of human development and activity on an island that may disturb or deter nesting seabirds.
- Keep a photographic record for each island surveyed; take and record locations of pictures documenting island habitats and any nesting seabirds found. Photos showing overviews of nesting areas and habitats as well as close-ups showing details of individual nests and nesting birds are useful. A further consideration that should be kept in mind when taking photos is that nest counts can be obtained from good photos if there is complete photo coverage of nesting areas.

Quantitative Data and Breeding Records:

- Total nest counts are made for Double-crested and Pelagic cormorants, Black Oystercatchers, and Glaucous-winged Gulls, unless nests are inaccessible and cannot be seen.
- For Pigeon Guillemots, total numbers of individuals seen on land or in the water around colonies are counted. Any guillemots seen entering or leaving likely nest locations are recorded. Contents of any guillemot nests found are recorded.
    - Likely Pigeon Guillemot nest locations include: in rock crevices or cavities on cliffs; under boulders or logs; or in burrows at the edge of the vegetation (guillemot burrows are often located at the top of cliffs at the edge of grassy or forested areas).
- Counts of Black Oystercatchers and Glaucous-winged Gulls visible from the water are also useful, especially if a nest count on land is not possible due to weather or other constraints. Separately record numbers of gulls and oystercatchers that are present on apparent nesting territories on higher portions of an island versus those that are likely just roosting or feeding on lower, tidal rocks.
    - The number of birds present on apparent nesting territories can be used to roughly estimate nesting populations if nest counts are not available. However, rough population estimates from numbers of birds present are not comparable to actual nest counts and must be clearly distinguished in the data records so that they can be treated appropriately in data summaries and comparisons.
- For each cormorant nest counted, identify the species and record whether and how many adults are present and whether adults are sitting in or standing at each nest. Record nest contents if visible but do not flush birds off nests for the purpose of determining nest contents. Contents of some nests can often be seen from vantage points on land without disturbing birds. Nests of the different cormorant species are usually easy to distinguish.

    - Double-crested Cormorant nests are large, bulky stick nests generally placed on higher and more level areas, often above Pelagic Cormorant nesting cliffs.
    - The more common Pelagic Cormorant nests are smaller, compact bowls made of seaweeds, grasses, and feathers, generally cemented together with guano, and built on ledges or in cavities on steep cliffs.
    - Brandt's Cormorant nests are rare in the Salish Sea and have been confirmed only on Mandarte Island, but it is always worth keeping an eye out for possible new nesting sites. Their nests are large bowls of grasses and seaweeds typically placed on higher and more level rocky areas where Double-crested Cormorants may also nest.
    - Sightings of adults sitting in nests also help to identify nests to species. However, adults and immatures of all three cormorant species will commonly roost in typical nesting habitat and just observing birds on the colony is insufficient evidence to confirm nesting. It is thus important to observe characteristics of the nest and of individuals apparently incubating or brooding in the nest to confirm species identification.
    - Large young visible in a nest can help to identify nesting species later in the season.
- Record the contents of every Black Oystercatcher and Glaucous-winged Gull nest counted. All empty nests, including partially-built nests, are included in counts.
    - For gulls, a partially-built nest is defined as any nest whose sides are partially built up. Partially-built nests are called "starts." All nests counted, including empty nests and starts, are tallied to derive population estimates. An area that has apparently been scratched bare by gulls in preparation for nest building but that has little or no accumulated nesting material (called a "scrape") is not counted as a nest unless it contains eggs, which sometimes occurs. Although counting scrapes only when they contain eggs can introduce a slight bias into nest counts, because Glaucous-winged Gull pairs sometimes start several nest scrapes in their territory, and because it is often difficult to reliably identify scrapes when no eggs have been laid, the least subjective and most consistent and comparable survey data are obtained by excluding possible empty scrapes from nest counts. Though not counted, it is important to note such empty scrapes, especially at sites where adult gulls are seen but have not been confirmed nesting.
    - For oystercatchers, an empty nest is any obvious bowl with accumulated shells, rocks, or other nesting materials. The relative locations of all nests should be recorded because a single pair of oystercatchers will sometimes make multiple nest scrapes within their territory. Thus, empty nests within a few meters of each other usually belong to one pair. Numbers of territorial birds observed in an area should be recorded to provide clues as to whether one or more pairs are nesting in the area. If three nests are found close together but only one pair of oystercatchers is present, then there is likely only one pair nesting. Keep a record of all nests seen and any conclusions made about how many pairs are nesting.
- If nests cannot be counted in some areas, either because those areas are not safely accessible or because accessing those areas would cause too much disturbance to nesting cormorants, then numbers nesting in those areas should be estimated based on numbers of adults present on likely territories. This applies mainly to gulls. Identify such locations, record the numbers of adults counted, and note any limitations associated with those counts (e.g., if some nesting gulls were likely not visible due to the topography), clearly distinguishing counts of adults on likely territories from actual nest counts.
- Record the behaviour of birds at nests. This is especially important for Black Oystercatchers that may have small chicks hidden near a nest. Aggressive behaviour, alarm calling, and feigning injury to distract intruders are signs that chicks may be nearby.
- Unless there are only a few nests at a colony, create lists of nest types and contents that can be filled in with tally marks as nests are counted. If there are multiple observers it is often efficient to have one recorder that tallies all the nests.
    - For Glaucous-winged Gulls, a list may look like (E for egg; Y for young):
        - Start –
        - Empty –
        - 1E –
        - 2E –
        - 3E –

        - 2E1Y –
    - For Pelagic or Double-crested cormorant (keep separate lists for each species), a list may look like (A for adult):
        - Unattended –
        - 1A sit –
        - 1A stand –
        - 1A sit, 1A stand –
        - 2A stand –

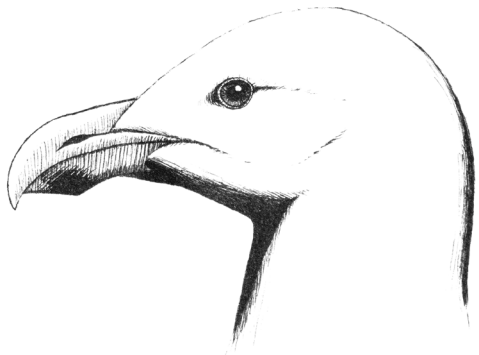
      Add categories, as described for Glaucous-winged Gulls, if nest contents can be seen. Later in the season, tallies for cormorant nests would include numbers of young visible in nests.
- When counting gull nests on larger colonies, it is sometimes difficult to keep track of which areas have been searched and which nests have been counted. Most gull nests are easily visible but some can be placed in tall grasses and shrubbery and are more difficult to find. Multiple observers can work together to make sure that all areas are explored, all nests are counted, and no nests are counted more than once. Partitioning nest counts into obvious subsections of an island is helpful. It is useful to map and keep separate tallies for different subsections of a colony if they can be readily identified by all observers (e.g., if there are rocky knobs separated by gullies, crevices, or tidal areas). Marks can also be made to help identify areas that have been covered. Some surveyors mark counted nests by dropping a biodegradable item, like a piece of carrot, into each nest as they count it.
- Counting cormorant nests on larger colonies can be facilitated by dividing nesting areas into easily recognizable sections and counting nests in each section. Map and keep separate tallies for different subsections if they can be defined for future surveyors. This allows more detailed monitoring of changes within a colony.

Final Word:

Good note-taking is the one of the most important components of conducting surveys. Record all observations in the field; do not rely on memory. Make sure observations and counts are clearly recorded and provide enough details in the notes so that outside parties can interpret the results of the surveys without ambiguity.

[a] This document is extracted from, "Rodway, M.S., R.W. Campbell, and M.J.F. Lemon. 2024. Seabird colonies of British Columbia, Part 4: Salish Sea. Wildlife Afield 18(1&2):1-676.

[b] Resources Inventory Committee. 1997. Inventory Methods for seabirds: cormorants, gulls, murres, storm-petrels, Ancient Murrelet, auklets, puffins, and Pigeon Guillemot. Standards for Components of British Columbia's Biodiversity No. 13. British Columbia Ministry of Environment, Lands and Parks Resources Inventory Branch for the Terrestrial Ecosystems Task Force. Victoria, BC. 54 pp.



About the Authors

Michael's childhood home was at the end of a small gravel road in the remote village of Coquitlam, 24 km from downtown Vancouver. The property sat on the edge of miles and miles of wild forest that was a wonderful playground for small boys growing up. However, the idyllic rural existence wasn't to last long. Coquitlam turned out to be one of the fastest growing suburbs of Vancouver and Michael witnessed throughout his childhood the rapid transformation of treasured wild places into paved-over suburbia.

After leaving home at seventeen, and working, travelling, and taking some college courses, Michael ventured back into the wilderness and began homesteading for several years in Port Neville, a small fiord on the BC mainland coast north of Campbell River. Michael's passion for seabirds was ignited in 1975 when he met Wayne Campbell while they were both taking courses at the University of Victoria. After participating in some course projects together, Wayne invited Michael to join him for the upcoming summer in the first provincial survey of seabird colonies that Wayne had initiated through the BCPM. That was one of those moments where your life changes.

Seabird surveys with the BCPM lasted four amazing years, during which Michael got to visit almost every island and rock along the outer coast of BC, learned how to maneuver inflatable zodiacs through rough seas and to land on rocky shores off the crests of large waves, and most of all became addicted to the wonder and intensity of life on seabird colonies that are like no other place on earth. Those experiences cemented a life-long friendship with Wayne, who continues to inspire Michael with his passion and commitment today.

After that exhilarating four years, Michael decided to try his hand at teaching. That wasn't a good fit, and during his first year of teaching Michael found that he was spending more time than his pupils gazing out the window dreaming about outdoor adventures. So it wasn't a difficult decision when in 1981 Kees Vermeer from Canadian Wildlife Service (CWS) phoned and asked Michael if he would be willing to survey the seabird colony on Langara Island at the northwest tip of the Queen Charlotte Islands (now Haida Gwaii). It meant leaving before the school year was out, but Michael managed to find a replacement teacher approved by the local school board, packed away his school curriculum books, and headed off to begin the second phase of his seabird career.

In the second year of conducting seabird surveys under contract with CWS, Michael was partnered with Moira Lemon. They formed a dynamic duo. Over a period of 10 years, and with the help of many summer students, they conducted rigorous surveys of almost all colonies of burrow-nesting seabirds in BC, re-counted almost all colonies of surface-nesting species in northern BC, assessed the immediate seabird mortality and subsequent impact of the *Nestucca* oil spill, and conducted some of the first studies on Marbled Murrelets in the Queen Charlotte Islands. They also formed a life-long friendship, and continue to share the passion for wilderness and a fascination with seabirds today.

Michael at the base of the old lighthouse on Triangle Island, BC, during surveys of seabird monitoring plots in 2009. *Photo by Heidi M. Regehr, 29 July 2009.*

Wayne retired in 2000, having spent most of his professional life as a curator of vertebrates with the Cowan Vertebrate Museum at the University of British Columbia in Vancouver and Provincial Museum (now Royal British Columbia Museum) in Victoria. He finished the last few years of his career as a senior research scientist with the British Columbia Ministry of Environment in Victoria, completing the four-volume set *The Birds of British Columbia* as lead author.

He is an award-winning writer and has authored, co-authored, or contributed chapters to over 45 books and has penned an additional 560 articles on molluscs, echinoderms, amphibians, reptiles, birds, and mammals. He has been honored for his work with many awards including the Award of Excellence in Biology (now the Ian McTaggart-Cowan Award) from the Association of Professional Biologists of British Columbia (1989), the Order of British Columbia (1992), and two Commemorative Medals of Canada. He also received a Lifetime Achievement Award from the Federation of BC Naturalists (now Nature BC) and is an Honorary Life Member of the Vancouver Natural History Society.

He is co-founder of the non-profit organization *Biodiversity Centre for Wildlife Studies* (www.wildlifebc.org) and has served as associate editor of its bi-annual journal *Wildlife Afield* since its inception in 2004. This latest work, *Seabird Colonies of British Columbia*, a four-volume, co-operative undertaking with Michael Rodway and Moira Lemon, has been a four-decade project.

Fifty years after surveying his first seabird colony on Christie Island in Howe Sound, Wayne is still monitoring and counting nesting seabirds off southern Vancouver Island. In this photo, Wayne has just located a Black Oystercatcher nest with two eggs (bottom centre). *Photo by Ronald D. Jakimchuk, Arbutus Island, BC, 31 May 2014*.

Moira grew up in the West Point Grey area of Vancouver with the trails of Pacific Spirit Park (then known as the University of BC Endowment Lands) and the surrounding beaches as a "backyard" playground. Summer holidays at Roberts Creek on the Sechelt Peninsula further instilled a keen interest in the natural world, with many happy hours spent investigating tide pools and watching the daily activities of the marine birds that frequented the area. The view from the beach of the White Islets, a seabird colony, was perhaps the first glimpse of the places where a future career would take her.

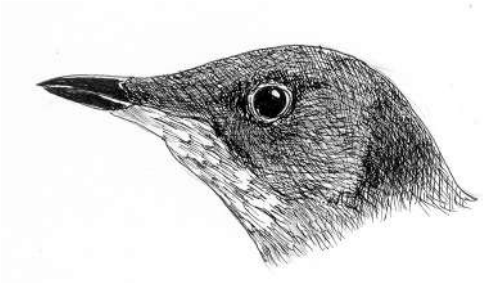
She graduated with a Bachelor of Science degree in Zoology from the University of British Columbia (UBC) in 1975. Outdoor skills and experiences gained while an active member of the Varsity Outdoor Club at UBC led to a career as a wildlife technician with the Canadian Wildlife Service (CWS) of Environment Canada beginning as a casual employee in 1977. In the early years, projects included waterfowl surveys in the Yukon and the lower mainland, and Caribou behaviour studies in the north.

Once on permanent status, from 1980 onwards, her main project was surveying seabird colonies in the remote areas of the coast, a demanding but very rewarding experience. Her introduction to seabirds began with Ancient Murrelets and Cassin's Auklets of Frederick Island in Haida Gwaii, when she and Trudy Chatwin (Carson), a veteran of the Provincial Museum seabird program, worked on a project there for CWS research scientist, Kees Vermeer. This then led into the 1980s CWS survey and monitoring program of all BC seabird colonies which she and co-leader Michael Rodway conducted with a team of eager students. Participation in some of the inaugural surveys of Marbled Murrelets in BC, sandpiper migration studies on the Fraser River delta and the sand spit on Sidney Island, and continuing a monitoring program on selected seabird colonies were the focus of the rest of her career with CWS.

Moira retired in 2014 after more than 34 years. She remains in close contact with the CWS seabird team and accompanies them on a few of their surveys most field seasons. Over the course of several decades, the passage of time is evident, particularly when visiting colony areas that were once majestic forests but are now fallen victims of intense storms, or seeing areas that were a tangle of windfall in the 1980s, but are now transformed into impenetrable jungles of thick regenerating saplings and small trees.

Currently living in Ladner with husband, Chris McNeill, hiking, sailing, skiing, and traveling take up much of their time, often sharing these adventures with Michael Rodway, (a friendship forged through the shared experiences exploring those seabird islands), and his wife Heidi.

Moira hiking to the next permanent seabird monitoring plot on Triangle Island, BC, during surveys in 2009. Strapped to her pack are extra aluminum poles to replace those that mark the corners of monitoring plots and that may have been lost since the last survey five years previously. *Photo by Michael S. Rodway, 6 August 2009.*



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[a] Names are official,[88] except for names in quotations, which we have assigned to unnamed sites.

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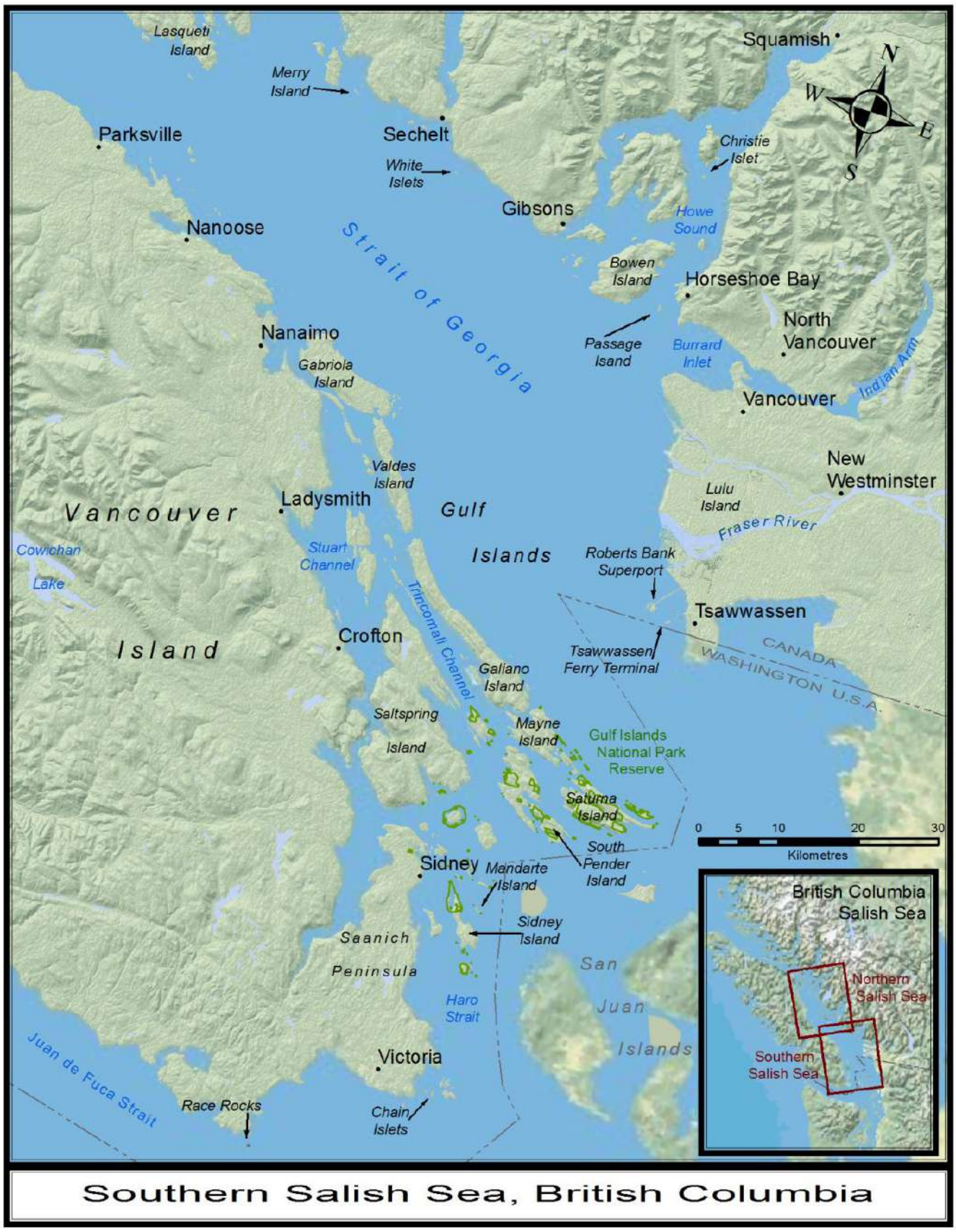
Sponsorship funding provided by

Double-crested Cormorant colony on Ballingall Islets in 1976. *Photo by R. Wayne Campbell.*

Overleaf: Glaucous-winged Gull. *Photo by Alan D. Wilson.*



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