Seabird Colonies of British Columbia
Haida Gwaii

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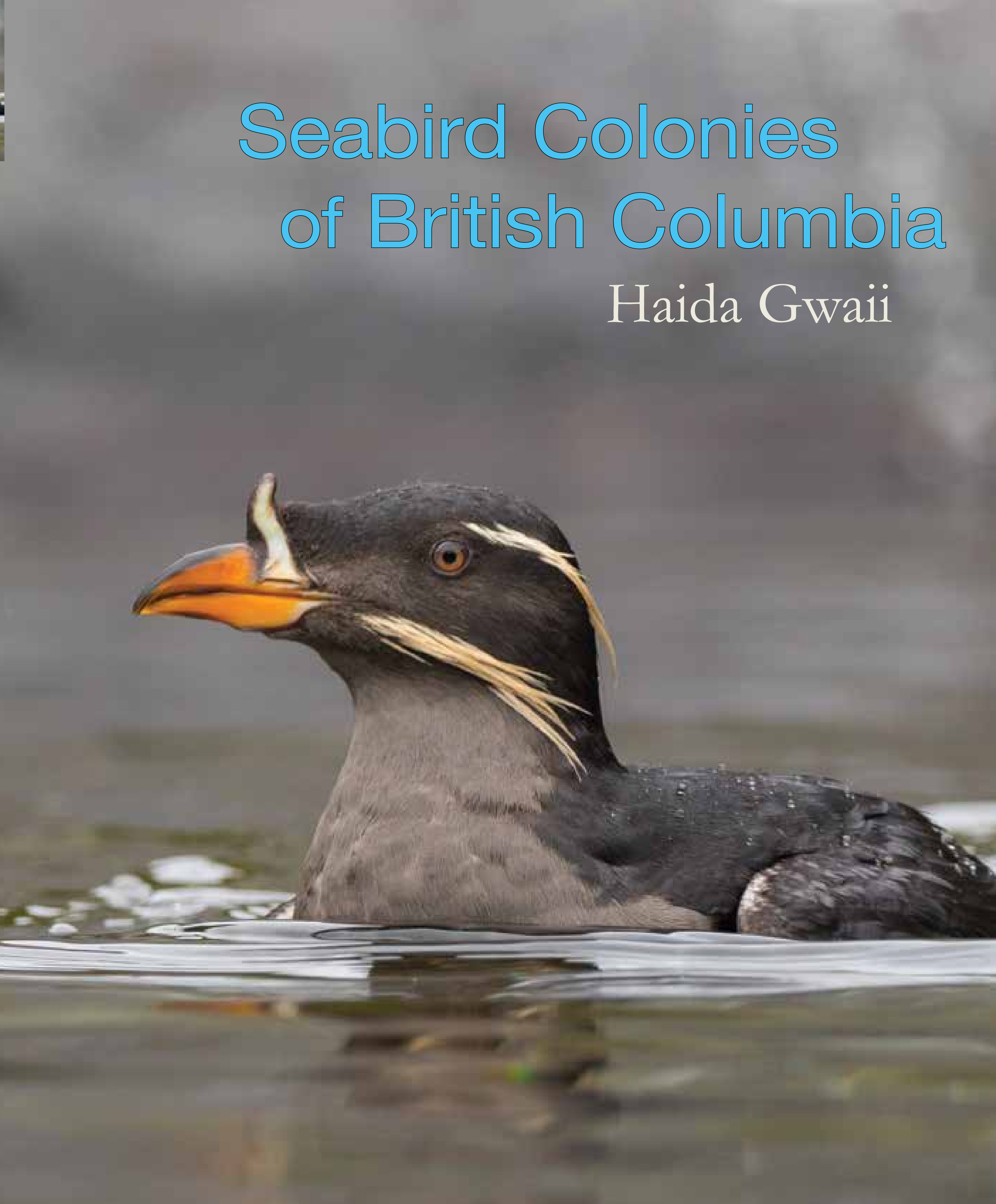
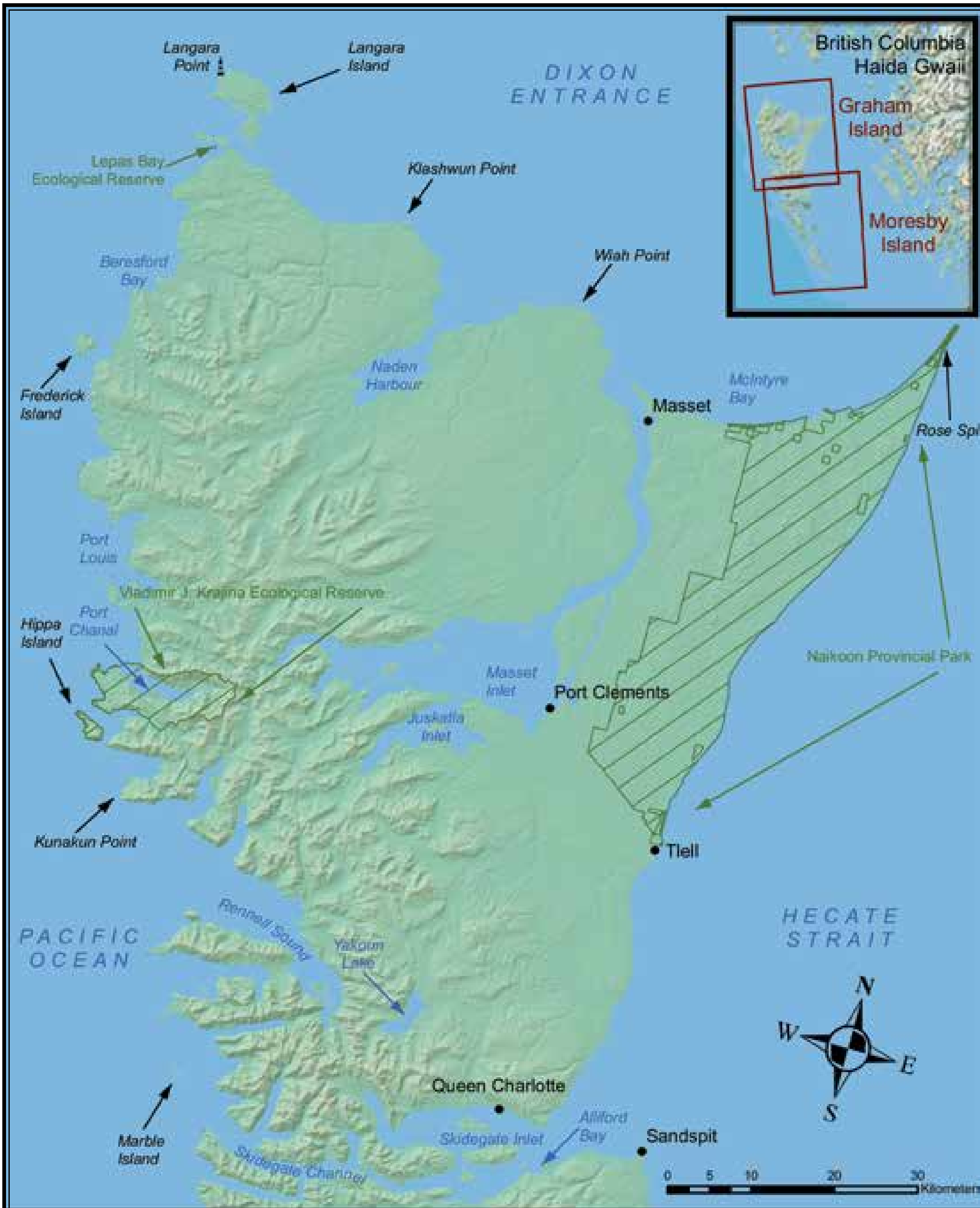


# Seabird Colonies of British Columbia

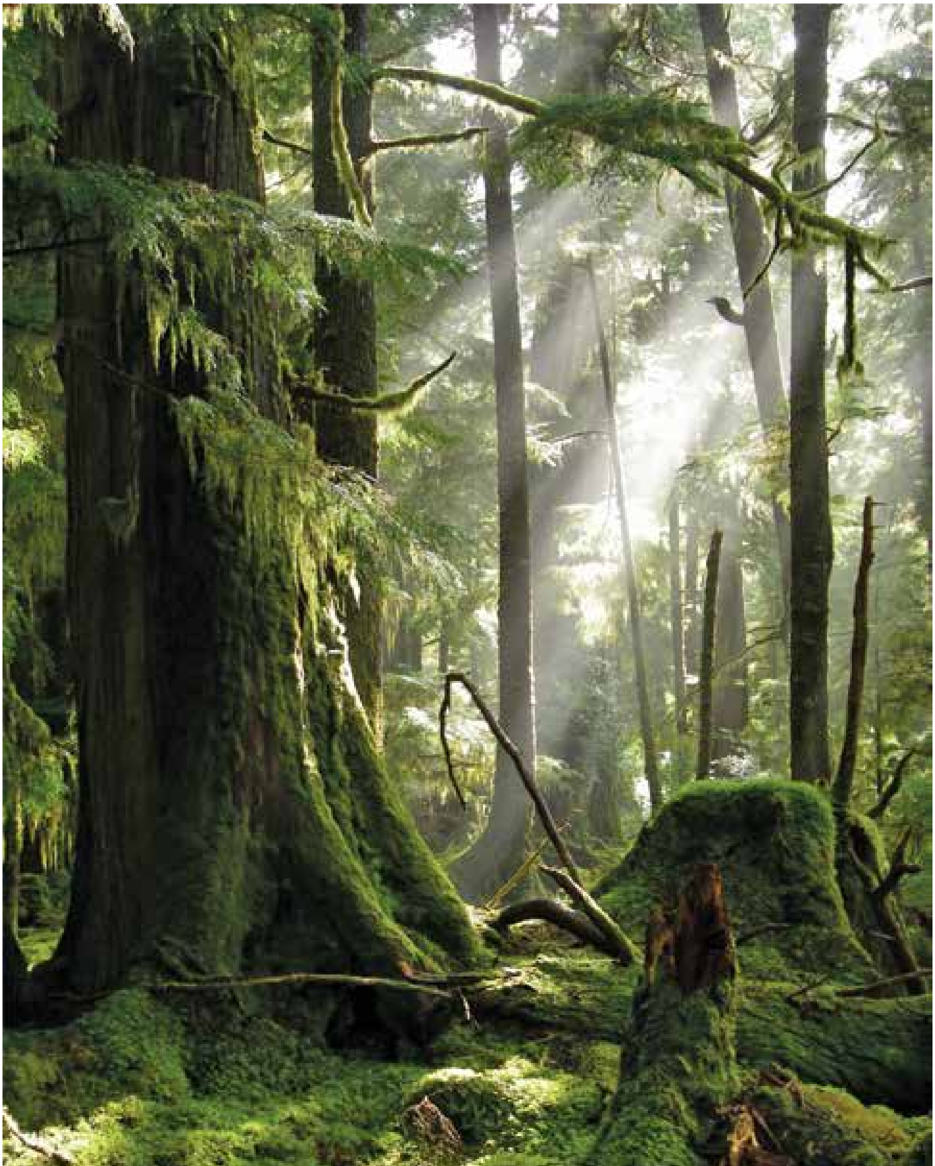
## Haida Gwaii




Graham Island, British Columbia

# Seabird Colonies of British Columbia
# Haida Gwaii

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



The over half a million Ancient Murrelets breeding in Haida Gwaii secret their nests away at the ends of burrows under old-growth forest that they visit only under the cover of darkness. In total, 99% of the over 1.5 million colonial seabirds breeding in Haida Gwaii nest in burrows in forested or grassy habitats. *Photo by Moira J.F. Lemon, Rankine Islands, BC, 23 June 2010.*

# The Legacy of Rudolf (Rudi) Herman Drent

Field biologist, naturalist, teacher, and communicator

(1937-2008)

Rudi Drent was a field biologist and naturalist with an international reputation as an evolutionary ecologist. He was intelligent and friendly, and mentored many aspiring ornithologists. While a Master's student at the University of British Columbia, Rudi developed a passionate concern for nesting seabirds and compiled the first catalogue of BC seabird colonies, which was published in 1961.[94] Rudi's concern for nesting seabirds in BC provided impetus and inspiration for this current work, which we consider part of Rudi's lasting legacy. *Photo by R. Wayne Campbell, Byers Island, BC, 2 June 1970.*

Rudi's father was a Dutch sea captain from Groningen and his mother was from Germany. They had moved to Los Angeles where Rudi was born. After his father's retirement, the family moved to Vancouver, BC, where Rudi began his university education. [278] As a child, Rudi enjoyed observing animals, especially birds, and was particularly fascinated with the daily and seasonal movements of the birds he saw.

### Undergraduate and Master's degrees at the University of British Columbia

In 1954, Rudi enrolled as an undergraduate at the University of British Columbia (UBC) in Vancouver. Although biology was his preferred field of study, he also considered forestry, teaching, and even medicine. A prerequisite for first-year science students was Zoology 105, which was being taught by Dr. Ian McTaggart-Cowan, Head of the Department of Zoology. Part way through one lecture, Cowan noticed that some students were fidgety and obviously uncomfortable with the subject – reproduction in animals. Without changing his composure, Cowan mentioned that frogs vocalize to lure a mate and for frogs there is no "first kiss", the Praying Mantis devours its mate after copulation, bighorn sheep males endure head-butting battles for a female, and human courtship is an equally elaborate affair. He followed up with, "Courting can be awkward and silly but always respect the person you are with." Rudi was impressed by Cowan's ability to share unique perspectives on animal behaviour and so inspire his students. It was a defining moment for Rudi – the faculties of forestry and medicine lost a potential forester or doctor and biology gained a remarkable student.

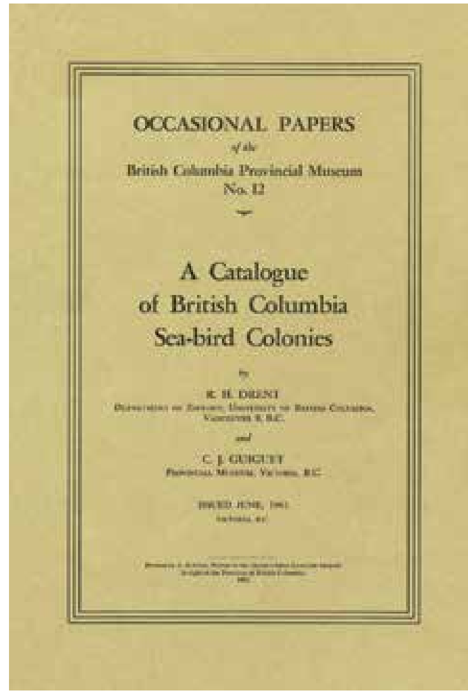
Two professors at UBC stimulated the career path Rudi chose. The first was Dr. Lars von Haartman, a Swedish ornithologist at the University of Helsinki, who spent a sabbatical year at UBC in 1958 and 1959. He and Rudi talked frequently about Darwin and unique island animals, bird migration, territoriality, and the biology of coastal birds. Island populations fascinated Rudi, and von Haartman was the first to suggest ornithology as a career.

The second was Dr. Miklos Udvardy, a Hungarian ornithologist and biogeographer. He arrived as an Assistant Professor in the Department of Zoology at UBC in 1952 and lectured in comparative anatomy and ornithology until 1966. His studies on the distribution of species focused on the question of how animals fit into their environment and how they coexist with other species. [275] The idea that species must have slightly different niches to coexist was formulated by Joseph Grinnell [139] in 1904; this idea was later termed "competitive exclusion" by ecologists.[149, 274] Udvardy was interested in how adaptations in feeding and breeding behaviour allowed seabird species to coexist on the same breeding colony.

● Dr. Miklos Udvardy, a professor in the Department of Zoology at UBC, suggested that Rudi Drent study the breeding biology of the Pigeon Guillemot for his graduate research,[91] to contribute to our understanding of how different species of seabirds co-exist on islands. *Photo by R. Wayne Campbell, Cleland Island, BC, August, 1974.*

The topic fascinated Rudi who, now as a Master's student at UBC, was looking for a research topic. Udvardy suggested he study the breeding biology of the Pigeon Guillemot. This was a perfect fit as Rudi was becoming increasingly interested in seabirds on islands in BC. His Pigeon Guillemot research was conducted from early May to early September on Mandarte Island, off southern Vancouver Island, in 1959 and 1960.[91]

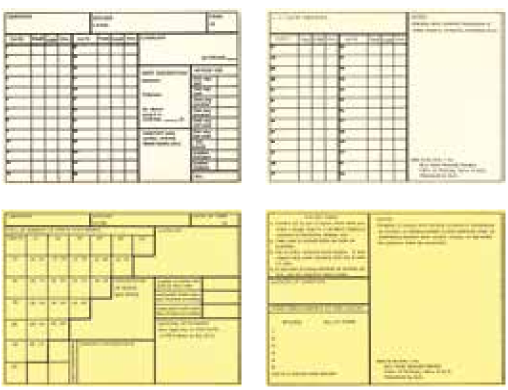
Most successful graduate students focus their efforts on courses and research on their thesis topic. Rudi was an exception. He became aware of the increasing threats to island-nesting seabirds in BC and started bringing together information for a book on seabird colonies in BC to promote conservation efforts for these vulnerable species. Little information was available and the task was onerous. Research was slow and time-consuming. Rudi corresponded regularly with numerous people; interacted with biologists and government personnel; maintained outreach programs with fellow students and naturalists; requested information on nesting seabirds from lighthouse keepers in remote locations, then patiently waited for replies; made frequent visits to libraries to find published information and to museums to inspect specimens and confirm identifications; and reviewed summaries from bird-banders and breeding records from the BC Nest Record Scheme. Part way through the project, Rudi enlisted the help of Charles Guiguet, curator of Birds and Mammals at the BC Provincial Museum. Guiguet had an interest in seabirds and had gathered information on seabird colonies during many museum collecting expeditions along the coast [142, 145] and during his graduate work on the Goose Island Group.[143] Guiguet sent Rudi a copy of his coastal field notes from 1948 to 1960. As work progressed on the seabird catalogue, Rudi uncovered new information on nesting seabirds and published the findings.[88, 90] Rudi's envisioned seabird catalogue was finally published in June 1961.[94]




● Rudi Drent's compilation and publication of the first catalogue of British Columbia seabird colonies in 1961 motivated future surveys on the distribution and abundance of nesting seabirds in BC and was the direct inspiration for this four-volume treatise. We continue his legacy of passionate interest and concern for the breeding seabirds of BC.

As a graduate student Rudi was mindful of his own research but was always thinking of the bigger picture. He suggested to three classmates that if they worked together they would have a unique opportunity to unravel issues concerning the co-existence of breeding birds on Mandarte Island. Gerald van Tets compared the reproductive behaviour of three species of cormorants,[277] Kees Vermeer was the first to look at the breeding ecology of the Glaucous-winged Gull in the province,[279] and Frank Tompa went on to study factors determining numbers of Song Sparrows on the island.[271] Drent later spearheaded a paper highlighting their years of research, including his own work on Pigeon Guillemots, that was published in the *Canadian Field-Naturalist*.[96]

During his busy graduate years at UBC, Rudi also participated in naturalist's activities, including annual Christmas Bird Counts in Ladner, and for two years coordinated the BC Nest Record Scheme,[199] the oldest co-operative ornithological data program in BC. The BC Nest Record Scheme was first announced in April, 1955 by Dr. Udvardy in the Department of Zoology at UBC.[273] It was modelled after the nest-card scheme started in Finland by Dr. von Haartman in the mid-1940s, itself modified from the British Trust for Ornithology's successful program.[180] Rudi assumed responsibility for the BC scheme in 1959. He modified the nest card developed by von Haartman [260] for use in BC and developed a new card for reporting colonial-nesting seabirds that could also be used for other colonial-nesting species such as swallows and blackbirds. Rudi had the BC seabird catalogue in mind. He compiled the 1959 and 1960 reports for the nest-record scheme [87, 89] and encouraged others studying on Mandarte Island to submit their nest records. Sixty-four years later, the BC Nest Record Scheme is the largest regional program for any province, territory, or state in North America.[51]



● Rudi managed the BC Nest Record Scheme in 1959 and 1960 and developed a new card format for colonial-nesting species like seabirds, grebes, swallows, and blackbirds.

**Doctoral Dissertation at the University of Groningen**

From 1962 to 1967, Rudi was enrolled at the University of Groningen in the Netherlands in a Ph.D. program. He was part of a group studying the incubation behaviour of the Herring Gull. Rudi had developed a keen interest in incubation behavior and physiology during his Master's thesis work on Pigeon Guillemots. His dissertation was titled *Functional Aspects of Incubation in the Herring Gull (*Larus argentatus *Pont.)*. He determined, through observation, measurements, and experiments how the parents contribute to providing and maintaining conditions optimal for the development of the embryo.[92]

● One aspect of Rudi's Ph.D. thesis showed that when Herring Gulls are incubating they do not turn the eggs. The asymmetry and weight of each egg settles it so the developing embryo is in the warmest part of the egg, in an optimal orientation for gas exchange within the egg; when the chick pips the upper, exposed part of the egg it is able to breathe.[92] *Photo by R. Wayne Campbell.*

## Return to University of British Columbia

Rudi returned to BC as an Assistant Professor in the Department of Zoology at UBC in 1967 and quickly resumed work on Pigeon Guillemots on Mandarte Island. Rudi was friendly and interacted easily with faculty, students, and university staff and developed life-time relationships with colleagues like Dr. John Krebs whose classic work on Great Tits showed that breeding numbers were limited by territorial behaviour, not by food supply.[182] New professors had heavy teaching loads and administrative responsibilities. They were encouraged to participate in outreach programs, yet still had to conduct their own research, apply for research grants, and supervise graduate students. Rudi supervised five graduate students at UBC – Ian Robertson (reproductive success in cormorants, 1971),[224] Anthony F. Koelink (growth in Pigeon Guillemots, 1972),[181] Wayne C. Weber (birds in cities, 1972),[293] Bryan A. Henderson (parental feeding in Glaucous-winged Gulls, 1972),[161] and John G. Ward (reproductive success and food supply in Glaucous-winged Gulls, 1973).[291]

Rudi excelled as a teacher and his students benefitted. While in BC, he organized field work to augment theses, including surveys of European Starling roosts, Glaucous-winged Gull roosts, and Dunlin foraging sites. As part of his ornithology courses he arranged early morning bird walks and occasionally field trips to band Glaucous-winged Gulls and longer trips to a major seabird colony, such as the Farallon Islands off California. Wayne Weber recalls two trips that almost lured him into a career as a seabird biologist:

● While in BC, Rudi was best known for his interest in seabirds, but he was broadly interested in all birds and especially the impacts humans have on them. For Wayne Weber's thesis, Rudi organized counts of major European Starling evening roosts in Greater Vancouver. *Photo by R. Wayne Campbell.*

*On one occasion, I embarked with Rudi on a Glaucous-winged Gull banding trip to Christie Islet in Howe Sound near Vancouver on his family's boat* Ilse. *Three of us: Wendy, my wife-to-be, Kelly, her younger sister and undergraduate biology student, and I welcomed the chance for exposure to some real-life biological research. On the island we would pick up a gull chick and take it to Rudi for banding, then return it to the point of capture. We were warned to wear hats and old clothing as adult gulls would dive-bomb us from behind and deliberately hit us with their feet. It was a shock the first couple of times it happened. We also learned quickly to hold baby gulls away from clothing!*

*Some extended trips required a lot of logistical preparations by Rudi. He was teaching a directed studies graduate course at UBC on the breeding biology of seabirds and took his students to the Farallon Islands off San Francisco. The islands are home to thousands of Western Gulls, Common Murres, Cassin's Auklets, Ashy Storm-Petrels, and other species. The plan was to be taken to Southeast Farallon Island by Coast Guard, stay overnight, and return the next day with Point Reyes Bird Observatory staff. On the island, Rudi introduced his students to hands-on seabird research by providing assistance to David Manuwal and Steven Speich who were studying Cassin's Auklets. As Cassin's Auklets visit their nest burrows only at night they are easily caught in mist nets. The UBC crew helped catch and band scores of Cassin's Auklets as well as scores of Ashy Storm-Petrels.*

*Rudi Drent was a gentle and thoughtful man, as well as a scholar. He guided his students with a gentle hand and showed the way by example as much as by any other method.*

(contributed by Wayne C. Weber)

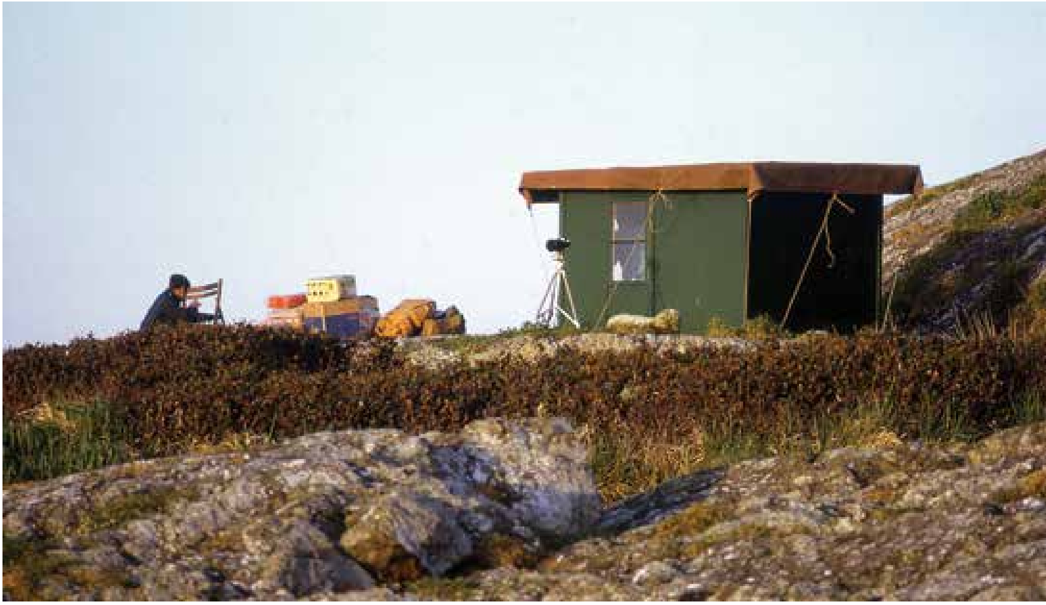
First impressions are lasting and meeting Rudi for the first time was inspiring. He was attentive and his voice was gentle, but he spoke with conviction. His demeanor radiated sincerity which attracted people. At a post-count gathering of the Ladner Christmas Bird Count, hosted by Werner and Hilde Hesse in the early 1960s, Rudi struck up a conversation with Werner and learned that Werner had immigrated to Canada from Germany in 1952, became interested in birds soon after, and had enrolled in an evening course in ornithology at UBC being taught by Dr. Udvardy.[37] Wayne Campbell, a high-school graduate, witnessed their exchanges. Rudi emphasized the importance and benefits of keeping field notes and encouraged Werner to start because, "Memories fade quickly and good field notes will be your only link to the past." Rudi also suggested that Werner publish his more noteworthy observations and stated that, "The future is unpredictable and written works are a vital record of ornithological history." That chance meeting motivated Werner and Wayne to become serious bird watchers. After listening to the exchange between Rudi and Werner, Wayne started keeping detailed field notes and publishing his observations.

When Rudi returned from the Netherlands to UBC with a Ph.D. in 1967, he invited the Hesse's to Mandarte Island to participate in his seabird research. The impact of that experience was so profound that five decades later the Hesse's willed their estate to UBC to advance ornithological research in the province. In addition, they entrusted their large library, bird reports, artwork, and daily field diaries to Wayne Campbell at the Biodiversity Centre for Wildlife Studies.

Over the years, Wayne was the beneficiary of Rudi's academic reputation, trust of people, and good judgement. As a high-school graduate with a passion for birds and field work, Wayne spent nearly five years with Rudi between 1968 and 1972. At that time, Wayne was the Chairman of the Ornithology Section with the Vancouver Natural History Society. He co-operated on surveys of evening-roosting Glaucous-winged Gulls and European Starlings and documented winter Dunlin movements. Rudi was in the process of updating his BC seabird catalogue [94] and Wayne participated in surveys and bird-banding on many islands. Many hours were spent looking at gull legs for bands. Rudi designed a new elongated band that could be viewed by telescope in its entirety in two different positions on the bird's leg. This innovative idea led to significant papers on the movement of California Gulls in late summer from breeding colonies on the Canadian Prairies west to the southwest coast of BC,[206] the mortality and dispersal of Glaucous-winged Gulls,[28] and a longevity record (37 years, 2 months, 11 days old) for Glaucous-winged Gull.[38]

● Large leg bands developed by Rudi to more easily read bands on Glaucous-winged Gulls were adopted for banding studies of other species. Frank Oldaker [206] was able to read bands on California Gulls and determine an autumn migration route from the Canadian Prairies to the southwest coast of BC. *Photo by R. Wayne Campbell, Clover Point, BC, 29 July 2009.*

Rudi also designed two permanent structures that could be transported in manageable panels, for his research. Wayne (and friends) helped build both. A large observation platform was erected in a Great Blue Heron colony on the University Endowment Lands at UBC to study heron behaviour. It was also used by Dr. John Krebs and many university students. The second structure was much larger, could accommodate two students, and was weather proof for west coast storms. It was set up on Cleland Island, a small but dense seabird colony, located about 11 km west of Tofino.[42]



● A small cabin, designed by Rudi in manageable panels, was transported to Cleland Island by a local fisherman and assembled as a permanent research facility. *Photo by R. Wayne Campbell, 15 May 1968*

The Cleland cabin was used by Rudi's graduate students,[291] other graduate students from UBC,[141, 156] and others interested in seabird research.[264] In addition, hundreds of the incidental bird observations gathered from that research station were incorporated into a major reference book on birds of the west coast.[86]

Rudi influenced many people and if you were enthusiastic and focused he always made time to help. Wayne requested his help on several occasions. Rudi never protested, but in retrospect, it is clear that Wayne did not fully appreciate the amount of time Rudi spent. On one occasion, Wayne asked Rudi to review his manuscript on the summer birds of Richter Pass. It was 90 typed pages, over two years in the making, and took a substantial amount of time to review. A week later they met for about an hour and Rudi suggested in his unassuming fashion, "The manuscript needed a few changes." In fact, the draft had to be completely rewritten! To help Wayne identify the problems with the manuscript, they discussed the purpose of the article, the importance of habitats for birds, the presentation of data, and the format of the article. Many months later, after final comments from Rudi were incorporated, it was sent to *Syesis*, the scientific journal of the BC Provincial Museum, for publication.[41]

Rudi was involved in two other significant publications by Wayne that, with Rudi's help, resulted in a major shift in conventional thinking on bird records. Wayne had just completed the first annual bird report for Vancouver and asked Rudi for comments. Rudi suggested it should be sent to a scientific journal as a baseline for future studies. The draft was revised and submitted to *Syesis*, but it was rejected because records of rare and uncommon species needed to be supported by specimens. Rudi decided to resubmit the manuscript, including photographs of unusual birds and summaries of unpublished data from his local surveys. It was later published and represents the first link between birdwatchers and museum collectors.[50] As a follow-up, Rudi helped develop a program to document the occurrence of rare vertebrates in the province with photographs using the same criteria as for museum tags. It now meant that rare animals did not have to be killed to be documented.[43] To date, nearly 5,000 photographs have been catalogued and are archived at the Biodiversity Centre for Wildlife Studies.

Wayne and Rudi also shared time further afield exploring groups of coastal islands in BC and tundra habitats in the Canadian Arctic. Rudi's father had bought a boat, *Ilsa*, in the Netherlands and Rudi later freighted it to BC so it was available for transportation to seabird colonies and other research sites. In June 1970, aboard *Ilsa*, Wayne and Rudi surveyed the Moore, Conroy, Byers, Harvey, and Sinnett islands west of Aristazabal Island on the central mainland coast. On this isolated group of islands they found nesting seabirds, unusually dark Song and Fox sparrows, many pairs of nesting Bald Eagles, and the only known location in the province where Peregrine Falcons nest in trees.[49] When Rudi returned to Vancouver he recommended to BC Parks that the islands be protected, and in 1971 the Moore/McKenney/Whitmore Islands Ecological Reserve was established.

In summer 1972, before Rudi returned to the Netherlands to live, he and Wayne had time together exploring part of the Canadian Arctic. They found Black Guillemots and Common Eiders nesting on Herschel Island in the Yukon, Peregrine Falcons along river canyons, Long-tailed Ducks nesting on tundra wetlands, Tundra Swans and Sandhill Cranes along the Mackenzie Delta, and shorebirds everywhere. Rudi was particularly fascinated by Arctic waterfowl and he began formulating ideas for future research. Rudi went on to become an expert on the biology and conservation of wild geese, especially those breeding in the High Arctic.

Rudi was instrumental in supporting Wayne's early employment as a seasonal naturalist with BC Parks on Mitlenatch Island and at Wickaninnish Park, as Curator of the Cowan Vertebrate Museum at UBC, and in his career at the Provincial Museum in Victoria. At all times, Rudi inspired Wayne to continue surveys of seabird colonies for Rudi's vision of an updated seabird catalogue to follow his 1961 publication. We are finally realizing Rudi's vision in this publication.

During his short period of teaching at UBC, Rudi was promoted to Associate Professor and had established research and conservation programs for seabirds as well as passerines. He encouraged co-operative research among colleagues and students,[96] participation of amateurs in research activities,[50] and mentoring for those passionate about birds.[264] When he left BC, Rudi took these educational attitudes to Groningen where he continued a remarkable career.

● Seasoned field biologists expect the unexpected. A sense of humour in the face of adversity is also a useful trait. Here, Rudi takes it in stride to try and dislodge a small aircraft that became mired in shallow water on Hooper Island in the Beaufort Sea. Afterwards, he dons a shed Caribou antler found on the tundra. *Photos by R. Wayne Campbell, July, 1971.*

## Return to University of Groningen

In autumn 1972, Rudi was invited by Gerard Baerends, Professor of Zoology, to come to the University of Groningen. Rudi accepted and spent the rest of his career there as a Lector in Animal Ecology (1972-1984) and Professor of Animal Ecology (1984-2008). When he arrived, Rudi immediately became involved with students already studying Barnacle Geese and initiated monthly waterbird counts near Groningen in Lauwersmeer, a man-made lake, and the Dollard, a bay in the Wadden Sea. He and his students marked individuals, quantified food supply, and scored female body condition with what Rudi called the "Rubens index", referring to the voluptuous and plump women Peter Paul Rubens was fond of depicting in his paintings. Rudi became widely recognized for his studies of geese that wintered in the Wadden Sea islands in the Netherlands and nested during the summer in the Russian tundra or the Norwegian Svalbard Archilpelago.[97, 189, 218] During his academic career, Rudi supervised 66 Ph.D. and four M.Sc. graduate students.

In the late 1970s, Rudi and colleague Serge Daan collaborated on an article on the role of energy in the lives of birds. It discussed avian energetics in an ecological and life-history context. The authors' paper, *The Prudent Parent: Energetic Adjustments in Avian Breeding*,[93] provided insights into the energetics of reproduction in birds. Joost Tinbergen [270] wrote, "This paper became a classic work and has been very influential in subsequent ornithological studies." Since its publication in 1980, the article has been cited more than 50 times annually.[278]

In the Netherlands, Rudi's research interests spanned a wide-range of topics, including conservation. Studies on the migrations of geese led to research into shorebird breeding and migration energetics, waterbird distribution and ecology, and songbird migration. In areas close to the university, his students studied the ecological energetics of Long-eared Owls,[294] Oystercatchers as predators on clams,[166] and the hunting sites and caloric value of prey of Starlings.[269] Rudi encouraged his students to present results of their research at symposiums for practice in public speaking and responding to questions from the audience.

The respect, admiration, and appreciation for Rudi were shown when his first 40 Ph.D. students presented him with a compilation of their research. The book was in Dutch, titled *De onvrije natuur*, and edited by his former students J.M. Tinbergen, J.P. Bakker, and T. Piersma. Its main purpose was to

● On the nesting grounds, the Barnacle Goose endures a harsh life. Arctic temperatures, severe weather, and predation are constant threats. The evolved strategy of nesting on high cliffs helps protect breeding birds from predatory foxes. Within 24 hours of hatching, the goslings must tumble to the ground, sometimes hundreds of feet, to join their parents and feed. The goslings are light and fluffy and about 90% survive the fall. *Photo by Allan Hopkins.*

● Rudi and his students frequently combined efforts to provide a historical perspective on declines (or increases) in breeding populations of birds and presented their results at symposiums. One example was on the decline in the breeding population of Common Eiders in the Netherlands since 1906.[178] *Photo by R. Wayne Campbell, Herchel Island, YT, 18 July 1972.*

bridge the gap between amateur and professional ornithologists in the Norwegian Ornithologists' Union.[270] The book was popular and Rudi translated it into English, incorporating new chapters from his students, and republished it as *Seeking Nature's Limits, Ecologists in the Field*.[95] The book is an inspiring collection of ecological stories.

It is remarkable that Rudi had time to become involved in administrative activities at the University of Groningen in addition to his demanding research programs. He led: his own Animal Ecology Group for 30 years (1972-2002); a behavioural biology group in the Faculty of Biology for two years (1984-1986); and the Centre for Ecological and Evolutionary Studies for nine years (1993-2002).

He was an active member of the Netherlands Ornithologist's Union and continued monthly bird counts for 36 years (1972-2008). Rudi was also a participating member of many working groups and committees such as the Dutch Organisation of Scientific Research, the Netherlands Arctic and Antarctic Programme, the Research School of Functional Ecology, and the Board of the Netherlands Flemish Ecological Association which organized the 38$^{th}$ annual symposium of the British Ecological Society in the Netherlands.[207, 270]

In 1975, Wayne received a long letter from Rudi indicating he had settled in Groningen and would not be returning to BC. Rudi's participation in seabird studies in BC had ended but his influence did not wane. He encouraged Wayne to include summary information on seabirds in the forthcoming book on BC birds to highlight their vulnerability. His encouragement inspired the first survey of seabird colonies of the entire coast orchestrated by Wayne from 1975-1977, the inclusion of available data on seabird breeding populations in Wayne's opus works on *The Birds of British Columbia*,[45, 46] and through Wayne, infected Michael Rodway with a passion and concern for seabirds that led to this four-volume treatise on the seabird colonies of BC. Rudi's legacy lives on.

**Epilogue**

Rudi was born in Los Angeles in 1937 and died on 9 September 2008, aged 71 years. In his memorial for Rudi,[270] Joost M. Tinbergen, a colleague, wrote, "*Sailing without the captain; we are ship-shape thanks to his legacy. Thinking back about the importance of Rudi Drent to ornithology: Rudi's influence was enormous.*"

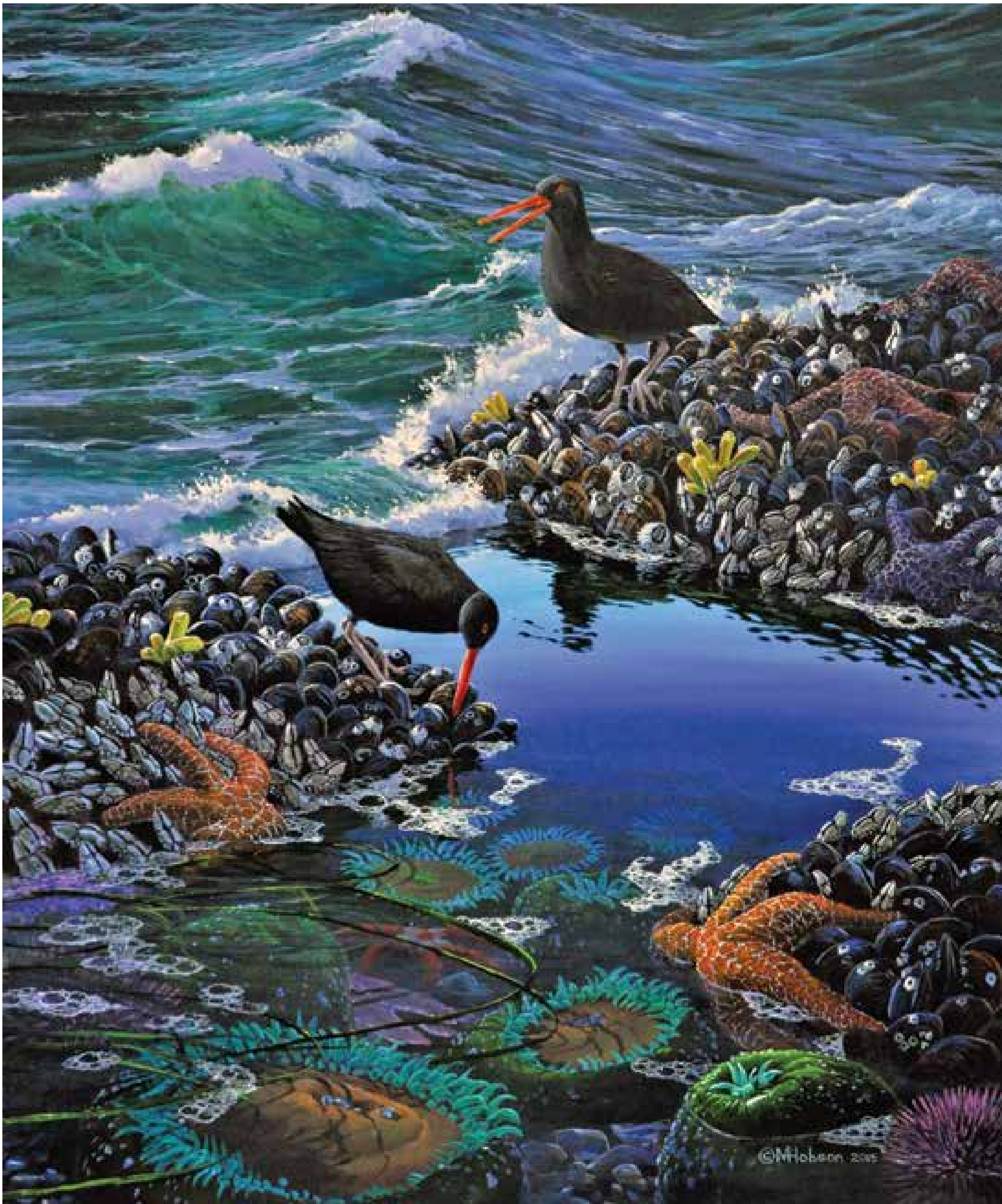
(Note: superscript numbers in the text refer to entries in the Literature Cited that begins on page 400)

● Throughout his career, Rudi was a "hands-on" field ornithologist who taught by example. *Photo by R. Wayne Campbell, Lucy Island, BC, 7 July, 1970.*

# CONTENTS

**On The Covers**
**Front:** Rhinoceros Auklet. *Photo by Jared Hobbs.*
**Back:** Collection of Japanese glass fishing floats. *Photo by Moira J.F. Lemon.*
**Inside covers:** Maps prepared by HR GISolutions Inc., Victoria, B.C.
**Title page**: Ancient Murrelet. *Photo by Carita Bergman.*

Over 1.5 million individuals of 12 different seabird species nest at 198 sites along the wild coastline of Haida Gwaii (Queen Charlotte Islands). [Paintings "Big Beach: Break in the Storm" (top) and "Glaucous-winged Gulls: Sunset Breeze" *courtesy Mark Hobson, Coastline Art Inc.*]



Black Oystercatchers are included as a seabird species because they depend on marine habitats year round. Over a third of their breeding population in British Columbia nests in Haida Gwaii. [Painting "Oystercatchers Between Surges" *courtesy Mark Hobson, Coastline Art Inc.*]

Bald Eagles are major predators of nesting seabirds. They also prey on larger waterbirds like Brant. American Black Bears are uncommon on seabird colonies but they have reached and decimated a few small near-shore colonies on the west coast of Graham Island. [Paintings "Surprise at First Light" (top) and "Black Bear: Tranquil River" *courtesy Mark Hobson, Coastline Art Inc.*]

The survival of seabirds and many other marine species requires healthy and productive ocean habitats safe from the impacts of human industrial civilization. [Paintings “Common Mergansers at the Tideline” (top) and “Seiner: Leslie Ellen at South Moresby Haida Gwaii” *courtesy Mark Hobson, Coastline Art Inc.*]

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# SEABIRD COLONIES OF BRITISH COLUMBIA: A HISTORY TO 1990 (with appended data to 2019)

# PART 2: HAIDA GWAII - including West Coast Graham Island, West Coast Moresby Island, East Coast Moresby Island, Skidegate Inlet, Masset and Juskatla inlets, and North Coast Graham Island

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## PREFACE

This is the second in the four-part series of publications that present the history of British Columbia (BC) seabird colonies. In this part we begin the presentation of individual colony accounts and regional summaries. Part 1 included the background and introduction to the entire document, and a review of provincial seabird populations and trends (Figure 1).[231] In Parts 2-4, we present detailed accounts of every known seabird nesting site identified in BC as of 1990 and summarize populations within 12 designated regions of the coast (see Figure 58 on page 58 in Part 1 [231]) to provide specific information required to manage local impacts and proposed developments. Here, we consider all known seabird colonies in Haida Gwaii (formerly Queen Charlotte Islands). Haida Gwaii includes six of the 12 regions that we have designated to divide the BC coast. Part 3 will include all colonies in four regions along the outer coast from the Alaska border to the south tip of Vancouver Island. Part 4 will address all BC colonies in two regions in the inner waters of the Salish Sea. For each colony, information on the status and trends in breeding populations is presented and past impacts and future threats are identified, as conservation of these vulnerable populations often requires management actions that are site specific.

Seabird breeding populations in BC and elsewhere around the world are threatened by numerous direct and indirect effects of a burgeoning and industrialized human society. Main threats in BC include introduced mammalian predators, loss of old-growth forest habitat, human disturbance at nesting and staging sites, oil and chemical spills, gill-net drowning and other commercial and sports fisheries interactions, and changes in food supply due to anthropogenic climate change. We have reviewed these threats and the management issues around them in Part 1 of this series.[231]

Some threats, such as greenhouse gas emissions responsible for climate change or plastic pollution

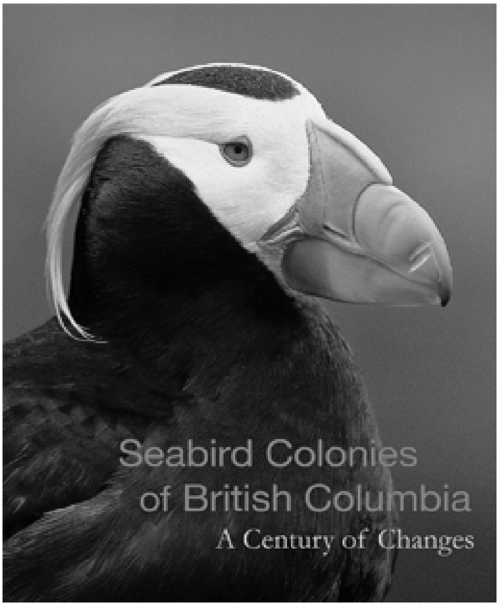



**Figure 1.** The first of four books covering the breeding seabirds of BC, including their threats and conservation measures, was published in 2018.[231] The present volume and the remaining two volumes provide seabird colony histories for Haida Gwaii (Queen Charlotte Islands), Northern Mainland Coast/ West Coast of Vancouver Island, and the Salish Sea (Strait of Georgia). Data on colonies and populations have been updated through 2019 and current threats and conservation concerns are discussed.

in the ocean, are spread globally by atmospheric and oceanographic circulation patterns and require concerted international action to address. Others, that present the greatest risk to seabird populations in BC right now, are local and require reliable information on the distribution and abundance of breeding populations in specific areas where threats are present. Effective management responses to these threats depend on knowledge of seabird and other wildlife populations that may be affected. Similarly, knowledge of local seabird breeding populations is prerequisite for appropriate management decisions about the impacts of numerous established or proposed developments along the BC coast for oil exploration, tanker traffic, mariculture, offshore wind farms, sports fishing resorts, and ecotourism (Figure 2). We have thus organized our accounts geographically so that information about seabird breeding populations on specific colonies and in different regions of the BC coast is readily accessible. We also hope that this organization is useful to those conducting research, inventory, or monitoring of breeding seabirds in BC, as well as to persons interested in the natural history of the coast.

The Queen Charlotte Islands were officially renamed Haida Gwaii in 2010 and we use the latter name throughout. English names are still official for most colony sites but many places within Haida Gwaii are now also known by their Haida names and we have tried to acknowledge both names where locations are first mentioned. The Haida name for Anthony Island, SGang Gwaay, has been commonly

**Figure 2.** Land managers on Haida Gwaii are facing a dilemma. More and more people are searching for locations to experience pristine nature and learn about traditional cultures, but the influx of people threatens those same special features of Haida Gwaii that tourists come to experience. Ensuring that tourism is sustainable is becoming increasingly important and only experienced tour guides should venture onto seabird breeding islands. *Photo by R. Wayne Campbell, Thurston Harbour, BC, 29 May 1996.*

used to refer to the island for several years. We follow that practice, although officially, on the list of BC geographical names,[135] SGang Gwaay refers to the village site of Ninstints on the east side of the island that was designated as a UNESCO World Heritage Site in 1981 (Figure 3).

**Figure 3.** The village of Ninstints, on Anthony Island, was designated a United Nations Educational, Scientific, and Cultural Organization World Heritage Site in 1981. The current Haida name is SGang Gwaay. *Photo by R. Wayne Campbell, Ninstints, BC, (now SGang Gwaay), June 2000.*

The rationale for summarizing our colony histories only up to 1990 was presented in Part 1.[231] The main reasons were: 1) 1990 was the last year of the focused Canadian Wildlife Service (CWS) surveys that provided comprehensive population estimates for the entire province; and 2) the number of individuals and agencies collecting information on breeding populations increased dramatically after 1990 so that some data were not available or known to us and we were not confident that our post-1990 records would be complete or accurate. Compiling all survey data to maintain an up-to-date account of breeding population estimates for individual colonies would require the participation of all parties that collect population data.

Data collected up to 1990 provide our best baseline population estimates for the province. For most colonies of burrow-nesting species and for surface nesting species in a number of coastal regions, survey data from 1990 and earlier are still the most current data available that address seabird trends at a metapopulation scale. Except for region-wide surveys of cormorants [64] and Glaucous-winged Gulls (*Larus glaucescens*) [15] in the Strait of Georgia, the few surveys since 1990 have mostly addressed individual colonies or small subsets of colonies in different areas.[58, 59, 120, 185, 186, 187, 188, 222] Incorporating data from such partial surveys into regional and provincial population estimates may not improve overall estimates and may in some cases distort them. Recent surveys of some Ancient Murrelet (*Synthliboramphus antiquus*) colonies along the east coast of Moresby Island are a good example. Population declines were apparent at colonies impacted by introduced predators, but those declines were offset by increases at other colonies surveyed that were free of introduced predators (see Appendix 1). This suggested some movement of breeding populations among colonies but, because other colonies in the area were not surveyed, we do not know what the overall change in breeding populations in the region (and thus in the province) might be.

Incorporating partial data may positively or negatively distort overall regional estimates and population trends, depending on which colonies are selected for repeat surveys. Although partial surveys on the east coast of Moresby Island suggested that declines at some colonies may have been offset by increases at others, the data could just as easily mask a more serious conservation problem if there are declining colonies that have not been re-surveyed. Just such a problem was identified with the permanent monitoring program that over a

25-year period failed to detect declines in Ancient Murrelet populations because colonies that had been impacted by introduced predators were not included in the monitoring scheme.[230] Similarly, permanent plots indicated increases in Rhinoceros Auklets (*Cerorhinca monocerata*) at the monitored colony on SGang Gwaay, but those increases may have been offset by declining populations on nearby, rat-infested Kunghit Island, which was not included in the monitoring scheme. The need to survey all colonies over broad geographic regions to obtain reliable and comparative estimates of breeding populations has been best identified for Pelagic Cormorants (*Phalacrocorax pelagicus*) that frequently change nesting sites and use nest sites intermittently,[60, 240] but applies to all species (Figure 4). A reliable update

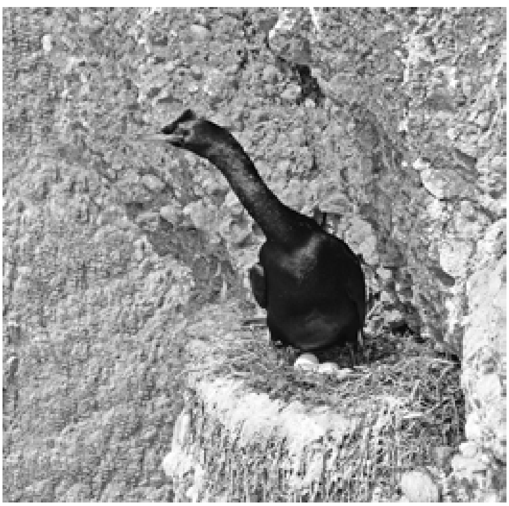


**Figure 4.** Many smaller colonies of Pelagic Cormorants are often ephemeral in nature and may change locations from year-to-year. Use of nesting sites also changes within and between larger colonies, resulting in contrary population trends among colonies in the same area. Breeding populations of other seabird species may also show contrary trends among colonies due to population movements. This means that comprehensive surveys over broad geographic regions are required to provide reliable population status and trend information for nesting seabirds. *Photo by Mark Nyhof, Arbutus Island, BC, 2 June 2018.*

to overall breeding population estimates in BC will require repeating the exhaustive province-wide surveys that were conducted by CWS in the 1980s.

We do not suggest that partial surveys and monitoring efforts are not valuable. It would require a major commitment of resources to repeat the CWS surveys of the 1980s. The CWS permanent monitoring program is a cost-effective means to detect overall population trends, with the caveat that additional colonies need to be added to the scheme to insure adequate representation, and that colonies susceptible to introduced predators need to be kept under constant surveillance.[230] Ongoing monitoring of colonies in Haida Gwaii that are vulnerable to introduced rats (*Rattus* spp.) and Northern Raccoons (*Procyon lotor*) is vital and control measures need to be in place to protect nesting seabirds.

In the main colony accounts presented here, information as of 1990 was considered current and no attempt has been made to include data collected since then. However, we have summarized more recent data known to us in Appendix 1. Post-1990 data that we were aware of were also summarized and discussed in the Species Accounts section in Part 1. Those species accounts should be consulted for information on changes since 1990 as they relate to each species, although in Appendix 1 we have incorporated a substantial amount of new data that have become available to us since Part 1 was completed. In Appendix 1, we have re-organized post-1990 data regionally and generally by colony to indicate where our colony histories are incomplete. This also provides a synopsis of known changes that should be useful for those involved in research or management of seabird populations in each area. More recent data are also discussed in some of the inserted anecdotes in the main text.

In Part 1 [231] 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. During surveys, many sites were explored where no evidence of nesting by seabirds was found. Appendix 3 lists such sites in Haida Gwaii.

## INTRODUCTION

Part 1 of this work [231] provided an introduction to the coastal environment of BC in relation to the breeding requirements of seabirds, including nesting habitats and oceanographic conditions for foraging. It also included a detailed review of threats to breeding seabirds and conservation measures in place or recommended to address those threats. In the past, characteristics of Haida Gwaii made this archipelago attractive for breeding seabirds, in particular because its isolation was associated with an absence of mammalian predators that limit seabird nesting populations in other areas. However, there are now many threats that compromise the quality of breeding habitat for seabirds in Haida Gwaii, the most serious of which is the introduction of alien predators that imminently threaten the survival of nesting seabirds (Figure 5). We detail the impacts of numerous threats to the seabirds of Haida Gwaii in sections to follow. Here, we summarize the geological history that created the isolated archipelago, with its suitable breeding habitat and absence of predators, as well as the history of invasions of introduced predators that now threaten seabird populations.

**Figure 5.** Seabirds breed on islands to avoid predators. When alien animals are accidentally or intentionally introduced to nesting colonies the results can be devastating. On Haida Gwaii, three mammals introduced intentionally by humans, Norway Rat, Northern Raccoon, and Sitka Black-tailed Deer, threaten large proportions of the world populations of Ancient Murrelets, Cassin's Auklets, and Rhinoceros Auklets. *Photo by Mark Nyhof.*

### The Canadian Galapagos

Haida Gwaii is the most isolated large group of islands associated with the North American continent; it is separated by a greater unbroken distance across ocean waters than Newfoundland or any other large island group.[106] The archipelago lies 50 to 130 km from the nearest mainland islands of BC on the outer margin of the continent with only a narrow band of continental shelf along its western side. These islands are truly "islands at the edge." [168] Isolation has resulted in a restricted flora and fauna compared with mainland habitats and led to the evolution of many endemic species and unique ecological communities. The "astonishing array of unusual plants and animals" has led to an apt comparison of Haida Gwaii with the more famous Galapagos Islands of South America.[109]

The size and shape of the Haida Gwaii landmass has changed dramatically in recent geological time due to changing sea levels, especially since the retreat of ice after the most recent Wisconsin Glacial Episode that peaked in the area about 21,000 to 16,000 years ago. Lowered sea levels at the end of that glaciation exposed large banks in Hecate Strait, resulting in a landmass almost twice the size that it is today.[184] Evidence of long-established and endemic plant species has suggested the existence of unglaciated refugia on the islands through the Wisconsin ice age, but despite over 40 years of research, critical evidence for such refugia on the islands has not yet been found. Recent research suggests that the best possibility of a continuous refugium is on the now-submerged continental shelf in Hecate Strait, east of north Moresby Island and Graham Island.[105] Continental shelf areas that were emergent during the last glaciation have been dubbed the "Lost World" and may have played an important role in the persistence of biological communities and their recolonization of post-glacial Haida Gwaii. These now-submerged areas may have also provided a migration corridor for humans who were present in the area at least 10,500 years ago [184, 223] and potentially 13,000-14,000 years ago.[190, 193]

Following Cordilleran Ice Sheet retreat, terrestrial habitats on Haida Gwaii likely became available to potential nesting seabirds sometime after 15,000 years ago. Tundra vegetation communities developed between 15,000 to 13,000 years ago and forest habitats became established between 12,500 to 10,000 years ago, dominated first by lodgepole pine (*Pinus contorta*), then Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*).[184] Suitable habitat for burrow-nesting seabirds may thus have been available around 10,000 years ago. The dearth of mammalian predators common on the mainland coast of BC made such habitats on Haida Gwaii particularly attractive for nesting seabirds. Unfortunately, introductions of alien plant and animal species to these islands have irrevocably altered indigenous wildlife communities and threaten the survival of nesting seabirds.

**Native and Introduced Mammals and their Management in Haida Gwaii**

Haida Gwaii was historically free of most terrestrial mammalian predators except Pacific Marten (*Martes caurina nesophila*) (Figure 6), which occupied only very large islands;[108] Haida Ermine (*Mustela erminea haidarum*) (Figure 7), which has a small and sparsely distributed population on Graham, Moresby, Louise, and Burnaby islands;[157] two subspecies of Northwestern Deermouse or Keen's Mouse (*Peromyscus keeni keeni* on the large islands and *P. keeni prevostensis* on the smaller outer islands);[200] and Northern River Otter (*Lontra canadensis periclyzomae*), which is ubiquitous in coastal areas and is the most common indigenous mammalian predator present on seabird colony islands (Figure 8). American Black Bear (*Ursus americanus carlottae*) is also native to Haida Gwaii and mostly inhabits larger islands, although signs of bear were reported on three small islands along the west coast of Graham Island in the 1940s,[94] and numerous bear scats were seen on Jewell Island at the mouth of Skidegate Inlet in 1974. Along the east coast of Moresby Island, evidence of bear was reported in 1977 on High Island and bears have been sighted in recent years on Ramsay, Bischof, Murchison, and Faraday islands.[317]

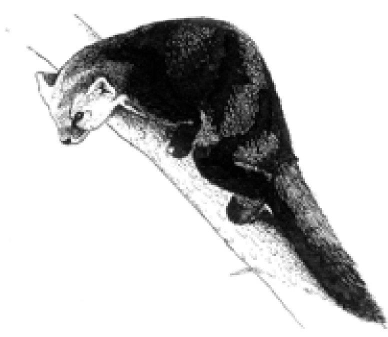


**Figure 6.** The endemic subspecies of Pacific Marten in Haida Gwaii is the largest of the four subspecies of marten found in BC. The Pacific Marten is primarily nocturnal and feeds in terrestrial habitats on small mammals and birds, although Cassin's Auklet and some intertidal invertebrates have been recorded in its diet in winter.[157] *Drawing by Keith Taylor.*

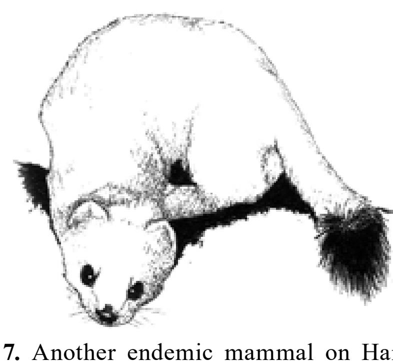


**Figure 7.** Another endemic mammal on Haida Gwaii is the Haida Ermine. Historically, this small weasel was distributed over most of Graham and Moresby islands. There is concern among biologists, however, that competition with marten for limited food resources may impact ermine populations. This subspecies is all-white in winter.[157] *Drawing by Keith Taylor.*

**Figure 8.** The Northern River Otter occurs year-round in BC and is common on offshore islands where it sometimes preys on burrow-nesting seabirds. *Photo by Alan D. Wilson.*

As on virtually all island groups in the world, humans have intentionally or accidentally imported alien plant and animal species that have altered indigenous ecological communities.[124] Introduced rats, raccoon, and Sitka Black-tailed Deer (*Odocoileus hemionus sitkensis*) have the greatest potential to impact nesting seabirds on Haida Gwaii. Introduced Red Squirrels (*Tamiasciurus hudsonicus anuginosus*) are major predators of songbird nests and are a concern for native songbird populations in Haida Gwaii.[192] However, Red Squirrels are not known to prey on seabird nests and they are not currently considered a threat to breeding seabirds. Red Squirrels were released in Queen Charlotte City in 1950 and have since spread to many parts of Haida Gwaii.[134, 249] They may also have been released in Masset and on a number of remote islands such Lyell, Talunkwan, and Limestone islands. Their ability to disperse over open water is likely poor and they are absent from most seabird colony islands. [134, 227, 233, 234, 235, 249]

With the arrival of European trading ships and whaling vessels came the Black Rat (*Rattus rattus*) and, more recently, the Norway Rat (*R. norvegicus*).[10] Introductions likely occurred at the former whaling station in Rose Harbour on Kunghit Island; the light station on St. James Island; well-used anchorages at Langara Island (Kusgwai); the communities of Queen Charlotte City, Sandspit, and Masset, and other locations that were frequently visited by trading, fishing, and supply boats; and Lyell and Talunkwan islands at the onset of industrial logging (Figure 9). A program managed by CWS successfully eradicated rats on Langara, Cox, and Lucy islands in 1995-1997 [177, 267] and Parks Canada removed rats from St. James Island in 1998.[133]

**Figure 9.** Norway Rats likely arrived on Haida Gwaii from trading ships, whaling vessels, boats servicing light stations on outposts like St. James Island, and other vessels stopping at harbours and safe anchorages around the archipelago. *Photo by R. Wayne Campbell.*

Rats have now spread to many smaller islands in Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site (Gwaii Haanas).[297] One of the main targets of the recent management plan for Gwaii Haanas is to increase seabird abundance through successful eradication of invasive rats and continued biosecurity.[73] Camera monitoring in Gwaii Haanas since 2011 [317] has confirmed rats on 24 designated seabird colonies (including nesting sites of Black Oystercatcher (*Haematopus bachmani*) and Glaucous-winged Gull discovered and designated as colonies since 1990) and a number of non-colony sites (Appendix 1). In a project known as "Night Birds Returning," eradication programs were initiated in Gwaii Haanas on Arichika and Bischof islands in 2011 and on Murchison and Faraday islands in 2013.[220] Acoustic monitoring was used to measure seabird responses before and after rats were eliminated.[147] Programs were initially declared successful, but rats were again found on Bischof, Murchison, and Faraday islands in 2017.[164, 317] On Murchison and Faraday islands, Black Rats were exterminated but Norway Rats reinvaded, raising concern that removing Black Rats actually facilitated the successful establishment of Norway Rats.[301] However, the successful displacement of Black Rats by Norway Rats on Langara Island in the 1980s,[10] and the recent spread of Norway Rats more than Black Rats to many islands in Gwaii Haanas (Appendix 1), suggests that Norway Rats have greater dispersal capabilities than Black Rats. Norway Rats were newly detected on Hotspring and House islands in late July 2018, were eradicated in November 2018, and had reinvaded the islands by January 2019.[317] The situation worsened further through 2019 when Norway Rats were detected on four more seabird colonies: Tar Islands, Kawas Islets, Agglomerate Island, and worst of all, Ramsay Island,[317] which is one of the largest colonies of Ancient Murrelets and Cassin's Auklets in Gwaii Haanas. The rate of invasions and reinvasions is alarming and a major proportion of the breeding seabird population in Gwaii Haanas is now in jeopardy (Figure 10).

Rats are capable swimmers and are not completely dependent on vessels for transportation. Norway Rats will disperse by swimming more than 1 km over water and recently may have swum more

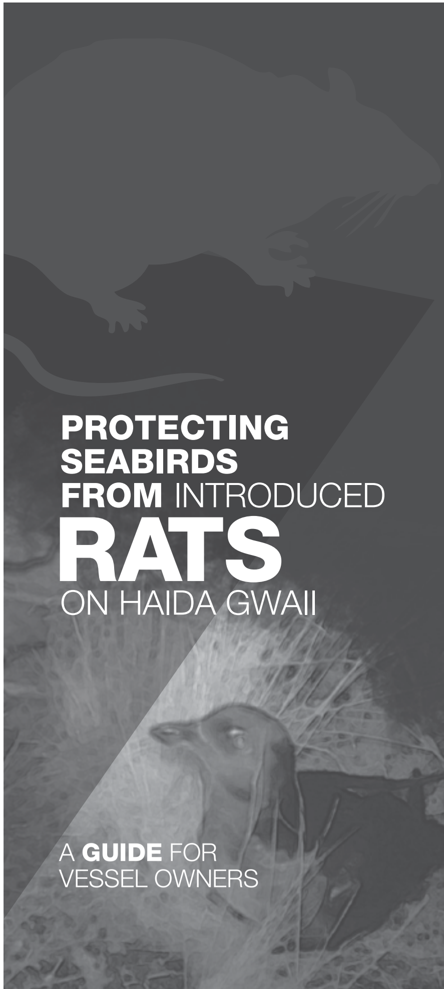
**Figure 10.** Norway Rats eat a wide variety of plants and animals. On Langara Island, stomachs examined by Mark Drever contained 34 types of foods including fruits, seeds, plant shoots, fungi, terrestrial and marine invertebrates, fish, and birds and their eggs.[98] Drever estimated that rats living near the Ancient Murrelet colony consumed one adult Ancient Murrelet every 2.4 days. Rats typically forage within a few hundred meters of their burrows; however, it was determined that some individuals on Langara Island had ventured at least 500 m from their burrows based on their locations and the marine amphipods found in their stomachs. Norway Rats may breed year-round in BC. [200] *Photo by R. Wayne Campbell.*

**Figure 11.** Norway Rats are good swimmers and can easily get aboard anchored boats by climbing anchor lines. *Photo by R. Wayne Campbell, Thurston Harbour, BC, 29 May 1996.*

than 2 km to reach Agglomerate Island from the likely source population on Lyell Island.[301] However, in addition to swimming from island to island, rats commonly swim to boats at anchor, often climbing anchor lines to get aboard. They can leave a boat the same way (Figure 11). Once on board, rats will take shelter in any cubbyhole, including in kayaks and dinghies, and can be inadvertently transported among islands. Rats also likely inspect beached kayaks, so that parties of kayaks that move from island to island may also serve as vectors for rats. Thus, boats not only bring rats to the Haida Gwaii archipelago, they likely also assist in the dispersal of rats from island to island within the archipelago. The burgeoning recreational and commercial boat tourist traffic drawn to these islands poses ever greater risks of rat introductions to seabird colonies.

Gwaii Haanas has a public education program to address the problem of rat introductions. It provides management recommendations for residents, visitors, and staff about how to best manage for rats on boats, and encourages visitors travelling by boat to take measures to eradicate rats on board their own vessels. Boaters receive a free rat kit and information brochure (*Protecting Seabirds from Introduced Rats on Haida Gwaii*) asking them to proactively bait for rats aboard (Figure 12).[75, 301] Even with educational programs in place, we think it is inevitable that the large and increasing number of boats visiting the area will increase introductions and spread of rats to seabird colony islands. More severe management actions may be required. One possibility may be a quarantine program that detains incoming boats for a period of time until they can be certified rat free, although that would not solve the problem of rats hitching rides on boats travelling among islands within the park. A quarantine program could be associated with the compulsory orientation session that visitors are now required to attend in Skidegate. A more extreme measure would be to restrict the entry of all private and commercial vessels into Gwaii Haanas. In Denali Park in Alaska, public vehicles are prohibited from entering the park and transportation within the park is provided by park-sponsored buses. Such public marine transport could be instituted in Gwaii Haanas and measures could be taken to ensure such transport is rat free. At a minimum, year-round restrictions on anchoring or landing anywhere in the vicinity of seabird colony islands should be implemented. These kind of restrictive measures are obviously laden with logistical problems but may be worth considering as preventative measures, at least until eradication programs can address all infested islands and studies can determine the roles of independent swimming and boat-assisted travel in rat dispersal among islands. The apparently accelerating rate of rat invasions of seabird islands and the rapid reinvasions of rats on islands where eradication programs have been successful has revealed the need for constant vigilance and for a wide-scale control program for introduced predators in Haida Gwaii. Gwaii Haanas staff are currently soliciting expert opinion, reviewing management options, and attempting to formulate a comprehensive defense strategy (Figure 13).[301]

**Figure 13.** Human activities have affected the survival and dispersal of introduced species in Haida Gwaii. In the past, human refuse provided food and attracted introduced rats and raccoons to garbage dumps located near communities. In the mid-1970s, household garbage, yard and building wastes, and other materials were burned on a bog near Sandspit. Better waste management with transfer stations scattered throughout Haida Gwaii reduced the abundance of rats and raccoons around towns but did not curb their dispersal throughout the archipelago or reduce their impacts to nesting seabirds. *Photo by R. Wayne Campbell, Sandspit, BC, 16 July 1974.*



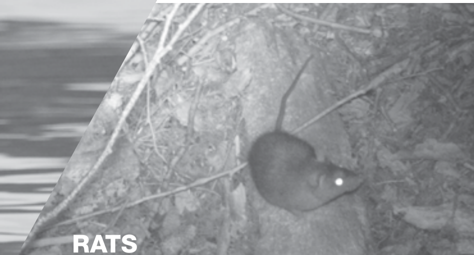

## HAIDA GWAII:
## A SPECIAL PLACE FOR SEABIRDS

Haida Gwaii provides critical nesting habitat for marine birds of the northeast Pacific Ocean, making these islands globally significant.

Several seabird breeding colonies on Haida Gwaii are internationally recognized as Important Bird Areas (www.ibacanada.ca).

Because seabirds evolved in the absence of rats, they are especially vulnerable to predation.

Rats are extremely aggressive predators of seabirds, eggs, land and shore birds, and native small animals.



## RATS
## ON HAIDA GWAII

Black rats were introduced to Haida Gwaii in the 1700's, most likely by trading ships; the first official detection was in 1908. Norway rats were first recorded on Haida Gwaii in 1901. The Norway rat is larger, potentially more destructive, and is displacing the Black rat.

Rats are considered an invasive alien species (IAS). IAS are responsible for the extinction of more native species on islands than any other cause (65% of all island extinctions globally) and are the greatest threat to seabird populations on Haida Gwaii.

## ERADICATING RATS

Several rat eradications have occurred on Haida Gwaii to restore seabird breeding habitat, including St. James Island (1996); Langara, Lucy, and Cox Islands (1997); Arichika Island (2011); and Murchison and Faraday Islands (2013).


**Figure 12.** As part of an outreach program for boaters visiting Haida Gwaii, a brochure is being distributed by Gwaii Haanas National Park Reserve to alert people to the potential for spreading rats to seabird colonies.

Northern Raccoons were introduced to Haida Gwaii in the 1940s and have since spread the entire length of the archipelago from Kunghit Island in the south to the northwest tip of Graham Island (Figure 14).[265] They are abundant in many areas, such as Thurston Harbour on Talunkwan Island, where Tony Gaston [303] saw at least 20 in family groups on the beach in May 1986. Evidence of raccoon presence has been reported on 24 seabird colonies.[115, 120, 155, 233, 265, 276, 286, 317] In 1994, representatives from the BC Ministry of Environment, Lands and Parks, CWS, the Archipelago Management Board (Parks Canada and Council of the Haida Nations), and the Laskeek Bay Conservation Society developed a monitoring and control protocol for raccoons.[133] Responsibility for annual monitoring and control was assumed by Parks Canada within Gwaii Haanas, BC Parks within ecological reserves, and CWS and BC Wildlife Branch in all other areas.[152] Thirty-one seabird colony islands were initially selected for monitoring, including nine with previous evidence of raccoon presence; eight that were considered less vulnerable were dropped and six other islands that may serve as stepping stones were added by 1999. The most successful control method has been hunting at night from a small boat, using a spotlight to scan the shoreline and then shooting any animals detected. This method is most effective outside seabird breeding seasons when raccoons spend more time foraging in intertidal areas. Overall, monitoring and control programs were deemed successful,[133] but repeated invasions on East Limestone Island in 1993-1995, 2001, 2007, and 2009 [23] and on Helgesen Island sometime after 2006 [131] and the intermittent presence of raccoons on Alder Island between 1989 and 2017 [152, 155, 317] reveal the challenge of this perennial problem.

**Figure 14.** Northern Raccoons, which were introduced to Haida Gwaii in the 1940s, have dispersed over land and water along the entire length of the archipelago, a minimum distance of about 150 km from where they were released. *Photo by R. Wayne Campbell.*

Sitka Deer were first introduced to Haida Gwaii around 1878.[134] In the absence of large predators they proliferated and now occur on all but a few vegetated islands in the area (Figure 15). We found no sign of deer on St. James Island; Golumbia et al.[134] reported that only Tar, Lost, Low, and South Low islands were known to be free of deer; and Carita Bergman [297] found no sign of deer on Adam Rocks, Langtry Island, and Howay Island. Considerable research has been conducted on the extent to which invasive deer have modified vegetation and associated invertebrate community structure on these islands. [1, 82, 130, 148, 216, 282] In addition to potential impacts to seabird breeding habitat, removal of vegetation by deer may also increase the vulnerability of native birds to predation by corvids and other species.[134] Between 1997 and 2001, an experimental deer cull was undertaken on Reef Island and SGang Gwaay. Reestablishment of herb and shrub layers was evident in only one growing season after deer were removed.[130, 133] A program to eradicate deer from Ramsay, Murchison, Bischof, Faraday, House, and Hotspring islands in Juan Perez Sound was initiated in 2017. The Parks Canada program has a budget of $5.7 million and is using bait stations to attract deer and New Zealand sharpshooters to hunt them from helicopters, boats, and on the ground with tracking dogs.[219] Keeping islands free of deer will require constant surveillance and elimination of dispersing individuals, given the ubiquity of deer in the archipelago (Figure 16).[134]

**Figure 15.** Sitka Deer have spread to most vegetated islands in Haida Gwaii since being introduced about 140 years ago. Thirty-nine animals were released by European settlers between 1878 and 1925. Over the decades, deer have changed the vegetation structure on the islands. These changes have been associated with a reduction in insect abundance and songbird abundance and diversity.[1, 192] Browsing and trampling by deer may also impact nesting seabirds. *Photo by R. Wayne Campbell, Lawn Point, Graham Island, BC, 4 June 2000.*

Additional to the work carried out by Parks Canada within Gwaii Haanas, Birds Canada has an Invasive Alien Species project within three Important Bird Areas outside Gwaii Haanas (Engelfield Bay, Langara Island, and Laskeek Bay).[14] Along with Parks Canada, BC Parks, and Coastal Conservation, Birds Canada has developed biosecurity management plans and recommendations that are given to stakeholders in the area.

**Figure 16.** Sitka Deer are capable swimmers and may be seen crossing wide inlets. In this photo taken on the east coast of Moresby Island, a deer is crossing Skincuttle Inlet towards Jedway, where there is a lush forest of Sitka spruce, western redcedar, and western hemlock. *Photo by R. Wayne, Campbell, 6 June 1977.*

***Tracking Introduced Mammals – A New Approach***

*Remotely triggered wildlife cameras have opened wide the door to rapidly and accurately determining whole mammal communities on remote island archipelagos. Since 2011, Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve and Haida Heritage Site (Gwaii Haanas), has been employing such technology to better understand incursions and invasions of introduced (and native) mammals to islands in the protected area.[6] One revelation from this work has been that Moresby Island, at least the portion in Gwaii Haanas, is not a source for introduced rats, but rather a sink. In the past, it was assumed that because rats occurred in human communities on Graham and Moresby Islands, that these islands were rife with rats. Now we understand that rats are predominantly limited to areas of human disturbance and overlap little with marten distribution.*

*Within Gwaii Haanas, the native Pacific Marten inhabits only Moresby Island, but periodically use smaller islands that are well connected to Moresby Island at low tide. None of the smaller, distant islands (including all with colonial seabirds) have marten. This distributional pattern explains how marten and seabirds have managed to co-exist for millennia, and supports the hypothesis that seabirds select islands that minimize predation. The negative relationship between* *rat and marten presence is so strong, that is appears marten effectively keep rats at bay, preventing their establishment and spread in areas outside of human disturbance – a valuable ecosystem service that has yet to be recognized. Further, while Lyell and Kunghit Islands, well separated from Moresby Island with deep channels, are infested with rats (and do not contain marten), Burnaby Island – connected to Moresby at low tide – remains a sink for rats. Rats are very infrequently detected at the south end of Burnaby Island in Swan Bay Rediscovery Camp, where a small channel separating the rat-infested Swan Islands from Burnaby Island allows rat movement to and from Burnaby Island. Water appears to be a more significant barrier to marten than to rats, perhaps because this mustelid species evolved as an interior forest specialist in sympatry with the more aquatic mink. Experiments are currently underway to investigate whether a sterile population of marten might be used to eliminate rats from colony islands and help restore breeding seabird communities. Such an approach has been tried once before in the Aleutian Islands by Edward Bailey, who successfully eradicated introduced Arctic Fox* (Vulpes lagopus) *with a sterile population of Red Fox* (V. vulpes) *on two islands.*[2]

*A second discovery was that rats and raccoons do not occur together on islands in Gwaii Haanas – except on one! This was surprising because both species disperse across water, with rats occurring on about 30%, and raccoons on 20% of islands in Gwaii Haanas (Appendix 1). In fact, we have no islands in Gwaii Haanas with both Norway Rats and raccoons; the only island with Black Rats and raccoons is Swan Islands! It appears that islands containing rats tend to be further away from Moresby Island, whereas raccoons are limited to islands within a few hundred metres of Moresby Island* (Figure 17). *This raises some interesting questions: Are rats simply that much better than raccoons at dispersing across water? If rats are better dispersers than raccoons, rats would surely inhabit all the raccoon-infested islands if Moresby Island were a rat source (and not a sink, as we speculate). Alternatively, perhaps raccoon predation is preventing rat establishment? In 2018, we discovered rat hair in raccoon latrines on the Swan Islands, and also possible predation by raccoons on rats there (from radio tracking of rats). The mystery deepens.*

*(contributed by Carita Bergman)*

**Figure 17.** Recent research on the distributions of Norway Rats and Northern Raccoons by Park Canada staff in Gwaii Haanas, in southernmost Haida Gwaii, showed surprising results.[317] Norway Rats occurred on 30% of islands and Northern Raccoons on 20% but, with one exception, it was found that the two predators did not coexist on the same islands. Both species are capable swimmers, but contrary to expectations, islands with rats tended to be further away from Moresby Island than those with raccoons, suggesting that Norway Rats are better dispersers over water than raccoons. Norway Rats have recently reached islands separated by over 2 km of water from the nearest source population. *Photo by R. Wayne Campbell.*

## HISTORY OF SEABIRD COLONY SURVEYS IN HAIDA GWAII

An oral tradition on the use of seabirds by the Haida extends back generations,[101] but the earliest documentation of nesting seabirds in Haida Gwaii comes from explorers and collectors that were drawn to the unique biota and possible discovery of new species on this remote and relatively unknown archipelago. Interestingly, the first record of seabirds nesting in Haida Gwaii came not from early naturalists like Archibald Menzies on the voyage of Captain George Vancouver, nor from early ornithologists visiting the area, but from geologist George M. Dawson during his explorations of the islands for the Geological Survey of Canada.[83] Dawson described Black Oystercatchers nesting on islands in Skincuttle Inlet on 21 June 1878.[55, 66] Since then, information on nesting seabirds has been gathered by numerous institutions, independent observers, graduate students, and wildlife consultants.

### Expeditions from Outside the Province (1878-1901)

Two decades after Dawson's explorations of the islands in 1878 for the Geological Survey of Canada,[83] Wilfred H. Osgood, accompanied by Edmund Heller, from the United States Bureau of Biological Survey, visited a number of seabird colonies along the east coast of Moresby Island between 13 June and 18 July 1900 (Figure 18). The purpose of the expedition was to study bird distributions in BC.[45] Osgood produced one of the first treatises on the natural history of Haida Gwaii and provided an annotated list of 98 species of birds.[208] Osgood personally observed many of those species; for others he relied on the extensive field notes of Reverend John H. Keen, who had resided in in Masset from 1890 to 1898 (see below).

Between 29 April and 3 May 1901, Charles F. Newcombe collected native artifacts for the American Museum of Natural History from Moresby Island at or near the Haida villages of Skedans and Cumshewa,[57] at which time he visited Limestone Islands where he

**Figure 18.** Breeding seabirds observed by Wilfred H. Osgood during his 35-day expedition to Haida Gwaii in 1900 included Pelagic Cormorant, Black Oystercatcher, Glaucous-winged Gull, Pigeon Guillemot, and Tufted Puffin.[208] Describing Black Oystercatchers, Osgood noted that the bird's "shrill call can be heard day or night" and "nearly every outlying rocky islet was occupied by a pair." *Photo by Alan D. Wilson.*

collected seabird specimens, including a purported Marbled Murrelet (*Brachyramphus marmoratus*) egg.[54] Although collecting for the American Museum, Newcombe was a BC resident and one of the founding members of the Natural History Society of British Columbia. A physician, naturalist, and anthropologist, he had been a well-respected collector of Haida artifacts and natural history specimens in Haida Gwaii for the BC Provincial Museum and other major museums since at least 1895.[54]

William Spreadborough worked for the Geological Survey of Canada as a field assistant during many early expeditions to collect bird specimens in BC. He collected in Skidegate Inlet in 1910.[314]

**Independent Collectors and Observers (1890-1971)**

Several independent ornithologists and private collectors have investigated and contributed data on nesting seabirds in Haida Gwaii over the last century, in some cases providing the earliest records of breeding at some colonies. Some of these dedicated individuals resided in Haida Gwaii for extended periods; others mobilized their own resources to journey to the islands from elsewhere in the province. Northern Graham Island and the vicinity of Langara Island were known as areas with large numbers of bird species and were chosen destinations for many of the early visits (Figure 19).

Reverend John H. Keen served as a missionary at the Haida village of Massett (spelled Masset since 1948) between 1890 and 1898. In his spare time Keen was a tireless observer of nature and a prodigious collector of plants, marine invertebrates, mammals, and insects that were then deposited in museums in North America and England.[251] Many collected specimens were identified as new taxa (e.g., Keen's Mouse). Keen did not observe nesting seabirds but did record Black Oystercatchers, Leach's Storm-Petrels (*Oceanodroma leucorhoa*), Tufted Puffins (*Fratercula cirrhata*), and Horned Puffins (*F. corniculata*) in the area. His records for the latter three species were from birds washed ashore during the winter of 1890/1981. His observation of Horned Puffins is the first recorded occurrence for the species in BC.[251] Osgood incorporated some of Keen's records for his report on the natural history of the Queen Charlotte Islands.[208]


**Figure 19.** Since at least the early 1900s, Langara Island has attracted bird collectors and ornithologists, many searching for the first nest of the elusive Marbled Murrelet. Charles de Blois Green, Allan C. Brooks, Reverend C.J. Young, Solomon J. Darcus, Robert A. Cumming, Charles J. Guiguet, and Frank L. Beebe were especially motivated. Although nest-fugitive young had been found in forests, and a broken eggshell and an adult were found at Masset after a tree was felled, the first confirmed nest site for the province was in the Lower Mainland. *Drawing by Glenn R. Ryder, near Elk Creek, BC, 12 June 1955.*

Allan C. Brooks was a long-time resident in Chilliwack where he arrived with his family in 1887. He began collecting birds with his father William E. Brooks and maintained a passion for studying the birds of BC throughout his life. Alan was a talented naturalist, painter, and sportsman and made much of his living painting birds (Figure 20). He and fellow naturalist and sportsman Charles de Blois Green, a rancher and land surveyor who lived in the Osoyoos area since 1888, were likely the most knowledgeable naturalists regarding the distribution of birds in southern BC in the early 20th century.[54] Green [137] visited Langara Island in 1915 and Brooks and Green spent time together in the Langara Island area in 1920, searching for the first nest of the elusive Marbled Murrelet [20] and recording information on other birds nesting there. Brooks wrote a memorial to his colleague in 1930.[21] Brooks noted that he had first planned to begin searching for the nest of the Marbled Murrelet before World War I but had to postpone that until after the war.[20] Data that he collected around Langara Island after the war contributed to his long-awaited book *A Distributional List of the Birds of British Columbia* [22] completed in collaboration with Harry S. Swarth, who he had met in 1910 while Swarth was conducting surveys around Vancouver Island.

Reverend C. J. Young, who moved to BC in 1924 after visiting from Ontario, spent most of May and June 1926 bird watching around Massett and along the northeast portion of Graham Island, with a short visit to Langara Island in June.[296] During most of that time he was accompanied by his friend Solomon J. Darcus. Darcus was a fruit grower from Penticton who spent much of his spare time searching for and collecting birds' nests and eggs. He spent more time around Langara Island in 1926 (9 June to about 24 June) than his companion Reverend Young. Darcus returned the following year, with his friend from Penticton, Wesley E. Burtch, spending 10 April to 13 July 1927 collecting and observing birds at Langara Island and along the west coast of Graham Island. Subsequently, Young apparently visited Skidegate Inlet at the end of May 1930 and collected a Black Oystercatcher egg from Jewell Island. Darcus collected bird and egg specimens in the Langara Island area from 22 April to 20 May 1936. During his visits, Darcus searched extensively for the nest and eggs of the Marbled Murrelet and made many observations of other species in the Langara Island area.[80, 295] He found 25 Peregrine Falcon (*Falco peregrinus*) eyries around Langara Island and the northern part of Graham Island in 1927 [81] and collected numerous clutches of falcon eggs in 1927 and 1936 (Figure 21).[321a, 328a] A Peregrine Falcon egg specimen dated 28 June 1953,[328b] listing Darcus as the collector, suggests that Darcus visited Langara Island again, but we have no other information on a trip by Darcus that year. Darcus may have accompanied Beebe during his

**Figure 20.** Allan C. Brooks, who would become a world-famous naturalist and artist, published 122 papers on BC birds, including a major treatise on the province's birds in 1925.[22] *Photo No. 18329 courtesy Greater Vernon Museum & Archives.*

**Figure 21.** Between 1926 and 1953, Solomon J. Darcus collected over 22 clutches of Peregrine Falcon eggs from eyries on Langara Island. Variations in eggshell patterns within a clutch were preferred and increased the eggs' trading or sale value. *Photo by R. Wayne Campbell.*

studies, or acquired the eggs from him, but Beebe visited Langara Island in 1952 and each year from 1955 through 1958, but not in 1953.[4]

Robert A. Cumming, while making his living as a carpenter, amassed a large collection of bird specimens and published several papers on birds in BC. He observed nesting seabirds on and around Langara Island during a visit in 1930.[76]

Albert Peevey resided on Langara Island from the 1920s to early 1950s and although we have no seabird nesting records from him, he was reported as a bird collector in this area from September to October 1937. He sometimes assisted visitors like Brooks in making seabird observations,[56] and he reported a large die-off of Horned Puffins in winter around Langara Island in the early 1940s.[256]

Ronald M. Stewart and Walter S. Maquire assisted Charles J. Guiguet (see below) for brief periods during Guiguet's visits to Langara Island (Stewart in 1946 and Maquire in 1947). Stewart had worked for the BC Forest Service and as a game warden. He was stationed in Massett for the last two years of his career and retired there in 1938. He contributed many ornithological records and amassed a large collection of bird specimens. Maquire was an avid oologist outside his duties as Director of the YMCA in New Westminster, and collected hundreds of egg-sets, including many of Glaucous-winged Gulls and Pelagic Cormorants from Howe Sound in the Strait of Georgia (Figure 22).

The emphasis on and passion for bird collecting that dominated many of the early independent visits waned over the second half of the 20th century. Greater focus was placed on observation and quantitative estimates of nesting populations. Most surveys of breeding populations in the latter part of the 20th century were conducted under the auspices of the BC Provincial Museum or the Canadian Wildlife Service, but one personally-funded expedition stands out during this period. In Part 1 of this publication,[231] we profiled Ken Summers and his survey of seabird colonies along the east coast of Moresby Island in 1971, assisted by David Ellis.[262] Ken's objective on that survey was simply to increase our knowledge of seabird nesting populations in, at that time, a relatively unexplored region of the BC coast. That the trip was a great adventure was a bonus. Others like Wayne Campbell, Wayne Nelson, and Michael Rodway, who independently funded survey work in Haida Gwaii, are discussed in sections below.

**Figure 22.** Walter S. Maguire was an avid oologist and for a short time collected Pelagic Cormorant and Glaucous-winged Gull eggs commercially in Howe Sound near Vancouver. His egg collection includes over 500 clutches of 119 species and is housed in the Beaty Biodiversity Museum at UBC. *Photo by K.C. Smith, Port Coquitlam, BC, 1939.*

**BC Provincial Museum Expeditions (1895-1978)**

The Provincial Museum in BC was founded in 1886 with John Fannin as its first director. The museum was initially called the Provincial Museum of Natural History and Anthropology, then the British Columbia Provincial Museum (BCPM), and recently the Royal British Columbia Museum (RBCM). Much of our knowledge of nesting seabirds in Haida Gwaii (and BC generally) prior to the 1980s was gathered under the auspices of the museum. Early visits to Haida Gwaii were primarily anthropological but some records and specimens of nesting seabirds were gathered. A keen ornithologist, Fannin produced the first check-list of BC birds in 1891 [104] but made no personal observations of seabirds in Haida Gwaii. The check-list incorporated information for Haida Gwaii provided by Reverend Keen. Francis Kermode, who succeeded Fannin as curator and produced the updated *Catalogue of British Columbia Birds* in 1904,[179] had previously observed Black Oystercatchers and Pigeon Guillemots (*Cepphus columba*) in Skidegate Inlet in 1895. E.M. Anderson, an avid collector for the museum who worked with Kermode, made one of the first visits to Langara Island in 1910.

James A. Munro began collecting for the Provincial Museum in 1915 and 1916, but little biological work was conducted by the BCPM during the rest of the First World War and in the years afterward. It was not until 1935 that natural history work resumed with the appointment of Ian McTaggart-Cowan as museum biologist. However, neither Munro nor Cowan, during the latter's tenure at the museum from 1935 to 1940, collected information on nesting seabirds in Haida Gwaii. Not until 1946, when he was an assistant professor at the University of British Columbia (UBC), did Cowan visit Haida Gwaii, making numerous observations of nesting seabirds at colonies along the east coast of Moresby Island. He was accompanied on that expedition by Charles Guiguet, then an undergraduate at UBC. Those observations contributed to the new treatise on BC birds *A Review of the Bird Fauna of British Columbia* produced by Munro and Cowan in 1947.[198]

Kermode retired in 1940 after 36 years as director, and was succeeded by G. Clifford Carl who served in that capacity for a similar stint of 30 years. Carl's direct involvement in seabird studies focused primarily on his important baseline studies in the Scott Islands off Vancouver Island,[52] but it was under Carl that first Frank L. Beebe and later Charles J. Guiguet were hired, both of whom made major contributions to our historical knowledge of seabirds in Haida Gwaii. Beebe was hired as a biological assistant and later as an illustrator and technical assistant. Between 1952 and 1958, he studied Peregrine Falcons and made observations related to nesting seabirds on Langara Island and environs, which culminated in his seminal paper on the marine peregrines of the Northwest Pacific coast (Figure 23).[4]

**Figure 23.** Frank Beebe was hired by the BC Provincial Museum as a biological assistant and later became the museum's illustrator. His classic paper on marine peregrines [4] received numerous accolades from ornithologists. *Photo by J. Bristol Foster, west coast Moresby Island, Haida Gwaii, BC, June 1965.*

Guiguet joined the museum staff in 1948 and served until 1980 as the Curator of Birds and Mammals (Figure 24). Guiguet was an ardent outdoorsman, field ornithologist, and collector. He visited many remote and relatively unexplored regions of the BC coast, including many areas in Haida Gwaii, vastly increasing our knowledge of seabird breeding distribution and abundance. Data gathered by Guiguet provided much of the basis for the first *Catalogue of British Columbia Seabird Colonies* compiled by Rudi Drent [94] that provided impetus and inspiration for subsequent seabird work and the production of this present treatise.

A qualitative leap in our knowledge of the distribution and abundance of breeding seabirds in BC occurred in the 1970s. J. Bristol Foster became director of the museum in 1970 and R. Wayne Campbell joined the staff in 1973 as assistant curator of Birds and Mammals under Guiguet. Although Campbell had been conducting seabird surveys on his own in various parts of the BC coast for many years, including a trip to Langara Island in 1966 to band Ancient Murrelets,[31, 32, 33] it was during his time at the BCPM that our knowledge of BC seabird colonies took a leap forward. Campbell brought to the BCPM

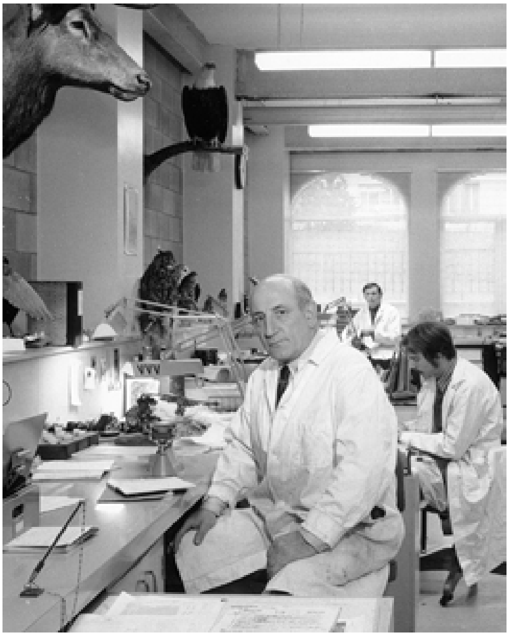


**Figure 24.** During his 32 years as Curator of the Birds and Mammals Division at the BC Provincial Museum (later renamed the Royal BC Museum), Charles J. Guiguet (foreground) had a close affinity with the province's marine birds. His extensive field notes were copied and sent to Rudi Drent for inclusion in the first catalogue of BC seabird colonies published in 1961.[94] *British Columbia government photo.*

as reference the BC Nest Record Scheme, which had been initiated in the Department of Zoology at UBC in 1955, [199] the BC Photo-Records File, launched at UBC in 1970,[43] the start of a seabird colony file, and an extensive library on BC birds. He had a vision for an updated book on BC birds which turned into the four-volume *Birds of British Columbia*.[45, 46, 47, 48] As part of that vision, and with the support of Bristol Foster and the Ecological Reserves Unit and many others, Campbell orchestrated a complete survey of the entire BC coast for seabird breeding colonies. The goal of that project, conducted from 1974 to 1977, was to identify all colonies, provide total counts for all surface-nesting species, and obtain approximate population estimates for burrow-nesting species. Surveys in Haida Gwaii were completed in 1977 by an experienced crew, including Ray Billings, Wayne Campbell, Trudy Chatwin, Harry Carter, Bristol Foster, Heather Garrioch, Susan Guiguet, David Hatler, Martin Lee, Michael Rodway, Anne Stewart, and Ken Summers, many of whom had participated in the surveys conducted in previous years in other regions of the coast (Figure 25). Two full surveys of the islands were conducted by separate crews; the first focused on Ancient Murrelets that move their precocial young away from the colonies before many other species are nesting, and the second addressed all other species. Data from those surveys were instrumental in promoting the conservation of seabird populations and the protection of breeding colonies; these data helped with the designation of some colonies as Ecological Reserves and later the formation of Gwaii Haanas National Park Reserve.

**Figure 25.** Fuel depots are not available on remote parts of Moresby Island so prearranged fuel drops were necessary during the BC Provincial Museum surveys in 1977. The calm waters surrounding Rose Harbour provided an ideal location for fuel drops. Some of the seabird survey crew included, shown here from front to back, Harry Carter, Susan Guiguet, Martin Lee, Anne Stewart, and Heather Garrioch. *Photo by R. Wayne Campbell, Rose Harbour, BC, 5 July 1977.*

***Six Weeks in a Rubber Boat***

*Conducting seabird surveys in Haida Gwaii is more difficult than elsewhere in BC, especially if the goal is to survey all nesting species in one breeding season, as was the case during the BCPM surveys of the 1970s. Logistics are more complicated because of the remoteness of the archipelago, but also because nesting chronologies of some species hardly overlap, so it is not possible to survey all species at one time - Ancient Murrelets have already taken their chicks to sea before Glaucous-winged Gulls start laying eggs. It is thus necessary to survey the entire area twice during one season.*

*During the BCPM survey of 1977, crews had to be split up to cover the extensive area of Haida Gwaii, especially to survey the entire area twice. For the early survey in May, focused on Ancient Murrelets, the mothership "Ted-mac," skippered by Harry Carter, was sent to the Moresby Island area with the largest crew complement and one zodiac. Trudy Carson (now Chatwin) and I (Michael) took on the task of surveying around Graham Island in the other rubber zodiac that we had available. Trudy and I began our survey at Masset, on the north side of the island, where we loaded up six fuel tanks, six weeks of provisions, our camping and survey gear, and a set of marine charts into our 14-foot Zodiac MK2, and set out around the island, ending at Queen Charlotte City on the inner south side of the island (Figure 26). Our main survey stops were Langara, Frederick, and Hippa Islands, but we explored all islands and headlands along the outer west coast. What an adventure! Boating through open Pacific swells, finding ways to land on surf-swept rocks and beaches, discovering secrets of majestic forests, watching the sun set into the sea on many starry nights because the weather was mostly glorious – it was an amazing and successful trip. And we had to patch holes in our rubber boat only once or twice to keep from sinking.*

*Incredibly, I got to repeat the adventure in 1986. Burrow-nesters, especially Ancient Murrelets, were the main focus of the CWS surveys in Haida Gwaii during the 1980s; thus, most years we were too early to conduct surveys of cormorants and gulls. A later survey was therefore conducted in 1986. It was a faster-paced survey than in 1977 because it was just addressing those species. Covering the west coast of Graham Island took only about 10 days, and I don't think we put any holes in our trusty rubber boat that time.*

**Figure 26.** Weather is always a determining factor in surveying seabirds on Haida Gwaii. Soft landings and calm waters are the exception. In the 1970s, Michael Rodway (shown) and Trudy Carson (now Chatwin) had to pack supplies for the six weeks that it took to conduct the survey around Graham Island. *Photo by Moira J.F. Lemon, House Island, BC, 31 May 1982.*

**Peregrine Falcon Expeditions (1952-2013)**

Seabird observations have been made during Peregrine Falcon surveys conducted in various parts of Haida Gwaii (Figure 27), beginning with those of Green in 1915 [137] and Darcus in 1927,[81] but mainly since Beebe's work in 1952-58.[4] We have discussed contributions by Frank Beebe and Wayne Nelson in other sections above and below, respectively. Others surveying falcons included wildlife consultants Donald A. Blood and David Hancock. The BC Fish and Wildlife Branch or the BC Ministry of Water, Land and Air Protection also conducted peregrine surveys and contributed seabird data. Staff included Michael J. Chutter, Bryan R. Gates, D. Ray Halladay, Ian Hatter, David F. Hatler, Keith Hodson, Ian D. Smith, and Neil S. Trenholme.[16, 65]

**Graduate Student Research (1960-2011)**

Bristol Foster visited many colonies and recorded nesting seabirds in all regions of Haida Gwaii in 1960 and 1961 while he was conducting research for his doctoral dissertation at UBC on the evolution of mammals in Haida Gwaii.[108] He also visited some colonies in 1969, 1972, and 1977 (see below).

In 2013, R. Wayne Nelson made his 43rd and last visit to Langara Island as part of his long-term study on the breeding biology, population, and productivity of Peregrine Falcons on the island (Figure 28). His ambitions for his falcon studies extended well into the future but his health failed and he died in 2017, leaving a tremendous legacy of work.[107] The life history of the falcons on Langara Island is inextricably entwined with the nesting seabirds,

**Figure 27.** The concentration of Peregrine Falcons breeding in Haida Gwaii is directly related to the numbers of nesting seabirds. The falcons have attracted collectors and researchers since the early 1900s. In this photo, an adult female Peregrine Falcon is attending her brood of three young. *Photo by Ervio Sian.*

particularly Ancient Murrelets. Nelson's studies provided important insights into the abundance and productivity of seabirds nesting in the area. He began his studies in 1968 as a Master's student at the University of Calgary,[202] following up Beebe's earlier work in the 1950s. Continuing his falcon studies, he earned a Doctorate degree from the University of Calgary in 1977,[203] and then carried on independently. Almost all his work on Langara Island was personally financed.

**Figure 28.** Wayne Nelson maintained a remarkable personal commitment to annually monitor the breeding population of Peregrine Falcons on Langara Island for 43 years. His incidental observations of nesting seabirds contributed to this publication. *Photographer unknown.*

Spencer G. Sealy conducted inaugural studies on the breeding biology of Ancient and Marbled murrelets on Langara Island in 1970 and 1971 for his Ph.D. dissertation at the University of Michigan.[242] Publications from his thesis work, that continue to emerge,[243-250] and other records kept by Sealy have been essential references for subsequent work on those species. His work furthered our understanding of the status of nesting seabirds in the Langara Island area and complemented Nelson's on the nesting Peregrine Falcons.

John G. Ward investigated three colonies on the east coast of Moresby Island (Kingsway Rock, Low Island, and the eastern of the Skedans Islands) for his doctoral dissertation at UBC on Glaucous-winged Gulls.[291] He visited the colonies from 23 June to 30 July 1972 and, assisted by Chris Shepherd, kept records of all nesting seabirds.

A crucial study in relation to the conservation of nesting seabirds in Haida Gwaii was conducted in 1989 and 1990 by Lisa Hartman for her M.Sc. thesis at the University of Victoria.[154] Her study on the ecology of introduced raccoons and their impact on burrow-nesting seabirds confirmed previous suspicions [228, 265] of the dire threat raccoons posed for breeding seabirds in Haida Gwaii (Figure 29).

**Figure 29.** Along the coast of BC, Northern Raccoon feeds primarily on small crabs but will readily prey on nesting seabird if they are available. When animals are intentionally introduced on remote islands, like Haida Gwaii, the results can be disastrous for local wildlife. Graduate student Lisa Hartman confirmed that raccoons introduced to Haida Gwaii pose a dire threat to seabirds, especially burrow-nesting species.[155] *Photo by R. Wayne Campbell.*

An important study on the ecology of introduced Norway Rats on Langara Island was conducted by Mark C. Drever in 1995 for his M.Sc. thesis at UBC (see Figure 10).[98] The study was conducted in association with the Langara Island seabird habitat recovery project.[177]

Three theses focusing on seabird vocalizations have been conducted in Haida Gwaii, all of which have important implications for seabird management. For his M.Sc. thesis at the University of Toronto, Ian Jones studied vocalizations and colony departure behaviour of Ancient Murrelet family groups on Reef Island in 1984 and 1985.[169] In 2007, Heather Major, for her doctoral studies at Simon Fraser University (SFU), investigated the use of call playbacks to enhance recruitment and recovery of Ancient Murrelets on Langara Island.[191] Luke Halpin, using automated acoustic recording units, compared activity by burrow-nesting seabirds on rat-infested (Arichika and Bischof islands) and rat-free (Alder, Ramsay, and Hotspring islands) islands in 2010 and 2011 for his M.Sc. thesis at SFU.[147]

**British Columbia Fish and Wildlife Branch (1975-1979)**

In addition to conducting Peregrine Falcon surveys (see above), the provincial Fish and Wildlife Branch undertook some seabird surveys in response to proposed logging on islands in Haida Gwaii: on Lyell Island by Ian Hatter and David Bustard in 1975 and 1976; [158] and in Skidegate, Masset, and Juskatla inlets by Ian Hatter and Linda Stordeur in May 1977.[159] A follow-up survey related to logging plans was conducted in 1979 on Lyell Island by Donald A. Blood (Figure 30) and Associates,[17] funded by Rayonier Canada.

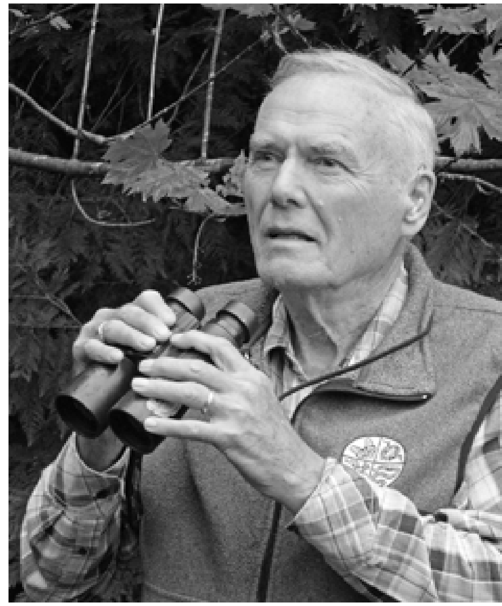


**Figure 30.** In 1979, the Ancient Murrelet colony on Dodge Point (Lyell Island) was surveyed by Don Blood and Associates. They estimated that the colony extended along 7 km of coastline and occupied about 170 ha. An estimated 10,400 breeding pairs were present and most were found on 68 ha considered to have "high" to "moderate" densities of burrows. Nesting habitat was dominated by old-growth western hemlock, western redcedar, and Sitka spruce. Logging was the main concern for this colony and predation by rats or raccoons was not considered a threat at that time. The colony has since likely been extirpated by introduced rats.[317] *Photo by Bryan Blood, Lantzville, BC, 10 May 2014.*

**British Columbia Ecological Reserves (1977)**

The Ecological Reserves Act of BC was legislated and the first reserve, on Cleland Island, was established in 1971. Bristol Foster resigned his post as director of the BCPM to become the first full-time coordinator of the Ecological Reserves Unit in 1974. In that capacity, Foster provided moral and financial support for the comprehensive seabird survey program launched by Wayne Campbell out of the BCPM that year and he participated in the surveys in Haida Gwaii in 1977 (Figure 31).

**Figure 31.** Bristol Foster supported and participated in the inaugural seabird surveys conducted by the BC Provincial Museum. In 1974 he left the Provincial Museum as its Director to lead the province's Ecological Reserves Program. He retained his interest in marine birds and always combined work-related matters with seabird surveys. His combined objectives of this trip to Solander Island were to post signs on the reserve and to count seabirds with Wayne Campbell. *Photo by R. Wayne Campbell, 6 May 1978.*

**Canadian Wildlife Service Seabird Colony Inventory and Monitoring Program (1980-2018)**

Prior to 1980, census data for burrow-nesting seabirds in Haida Gwaii were largely descriptive. From the BCPM surveys of the 1970s, presence or absence of nesting species, relative abundance, and locations of colony areas were known for most islands in the archipelago, but accurate estimates of population sizes for burrow-nesting species were lacking. CWS initiated intensive surveys using statistically robust methods in 1980, when Kees Vermeer sent Moira Lemon and Trudy Carson (now Chatwin) to Frederick Island (Susk Gwaii), and in 1981, when he hired Michael Rodway, Lin Langley, and Nancy Hillis to survey Langara Island (Kusgwai). Those two surveys began a decade of seabird colony inventories conducted by Moira Lemon and Michael Rodway (Figure 32), with the help of many paid student and volunteer assistants, including Doug Bertram, Mike Biro, Andrew Eisenhauer, Don Garnier, Dick Grinnell, Heather Hay, Norm Holmes, Eric Lofroth, David Powell, Damian Power, Leo Rankine, Randy Reusch, Tony Robichaud, Christine Rodway, Joy Ann Rodway, and Yves Turcotte. The program was supervised first by Kees Vermeer and later Gary Kaiser. Over 73 km of transects were run during the initial seven years of the inventory program to provide baseline population data for the main colonies of burrow-nesting seabirds in Haida Gwaii.

**Figure 32.** Michael Rodway was part of the original Provincial Museum group that surveyed the entire BC coast for nesting seabirds. In 1981, he was contracted by Canadian Wildlife Service to lead an intensive survey of Langara Island. In 1982, he teamed up with CWS technician Moira Lemon. From 1982 to 1990, they conducted rigorous surveys of colonies throughout coastal BC. *Photo by Chris Harris, Hippa Island, BC, 1983.*

Surface-nesting species at most colonies in Haida Gwaii were also surveyed during the 1980s,[227] and an intensive study of Black Oystercatcher, Glaucous-winged Gull, and Pigeon Guillemot breeding populations in Skidegate Inlet was conducted by Ken Morgan (Figure 33) under Vermeer's supervision in 1990.[285, 286, 287]

**Figure 33.** Ken Morgan has conducted a number of studies and surveyed many colonies of breeding seabirds in several regions of BC, but he has dedicated most of his career with CWS to studies on the distribution, abundance, and conservation of the many more species of seabird, like this Northern Fulmar, that inhabit BC pelagic waters during different times of year.[195, 196, 197, 290] Ken's generous help with the data from his 1990 surveys in Skidegate Inlet immensely improved our colony accounts for that region. *Photo by R. Wayne Campbell.*

The schedule of the 1980s CWS surveys of colonies in Haida Gwaii was as follows: [227, 233, 234, 235]

1980 - West Coast Graham Island (Frederick Island).

1981 - West Coast Graham Island (Langara Island).

1982 - East Coast Moresby Island (Lyell Island).

1983 - West Coast Graham Island (Hippa Island).
- East Coast Moresby Island (northern; Titul to Skedans island).

1984 - East Coast Moresby Island (central; West Rankine, Ramsay, Hotspring, House, Murchison islands).

1985 - West Coast Moresby Island (southern; SGang Gwaay, Gordon Islands);
- East Coast Moresby Island (central; East Rankine Island, Sea Pigeon to Arichika island, Bischof Islands, Reef Island).

1986 - West Coast Moresby Island (northern; Englefield Bay);
- East Coast Moresby Island (southern; Kunghit to Langtry island);
- Skidegate Inlet, Masset and Juskatla Inlets, North Coast Graham Island, and all other areas except central West Coast Moresby Island (surveys of surface-nesting species).

1988 - West Coast Graham Island (resurvey of Langara Island).[8]

1989 - East Coast Moresby Island (resurvey of Reef and Limestone islands).[126, 188]

1990 - Skidegate Inlet (all colonies).[285, 286, 287]

During the seabird colony inventory program, a permanent monitoring scheme was designed and implemented on selected colonies.[230] In Haida Gwaii, we set up long-term burrow-monitoring plots in main colonies of Ancient Murrelets (Rankine, George, and Ramsay islands), Cassin's Auklets (*Ptychoramphus aleuticus*; Rankine, East Copper (Figure 34), and Ramsay islands), and Rhinoceros Auklets (SGang Gwaay). The original design also allocated plots for Ancient Murrelets and Cassin's Auklets on Langara, Frederick and Hippa islands, but those plots were not established at that time. In 2015, monitoring plots for Ancient Murrelet and Cassin's Auklet were established on Frederick Island, but Langara and Hippa islands have yet to be included in the monitoring scheme. Storm-petrels and surface-nesting species have also not yet been included in the CWS monitoring scheme. The initial design proposed monitoring of storm-petrels on "Lepas" Islet, Hippa Island ("Petrel" Islet), Rogers Island, Langtry Island, Rankine Islands (east island), and Rock Islet to represent both the west and east coasts of Haida Gwaii.[310] Complete surveys of selected colonies were proposed for surface-nesting species. Full-colony surveys are also likely preferable to monitoring plots for storm-petrels because most of their major colonies are on small islands that can be resurveyed relatively quickly. In 2019, CWS began a pilot study on Rock Islet [313] to compare methods using sample quadrats along line transects with recently developed distance sampling for surveying storm-petrels on colonies selected for long-term monitoring as part of the Government of Canada's Oceans Protection Plan.[272]

CWS continues to survey established plots on a regular 5-year rotational schedule. In addition, resurveys of a number of selected burrow-nesting seabird colonies have been conducted in concert with that monitoring program.[230, 313] Moira Lemon was responsible for carrying out the program and surveyed monitoring plots until she retired in 2014, at which time Laurie Wilson assumed management of the program.

***The Establishment of Permanent Monitoring Plots to Detect Population Trends in BC***

*Mike Rodway and Moira Lemon taught me first-hand how to conduct field research on colonial burrow-nesting seabirds on rugged and remote islands in Haida Gwaii. The technique involved pulling a "chain" along transects perpendicular to shore and stopping at intervals to measure all of the seabird burrows in a square plot. Moira taught me how to determine what is a seabird burrow and whether it was used by a particular species during the survey year, or in a previous breeding season. I was to look for feathers, signs of wear underfoot, new or old egg membrane or eggshell fragments, feces, evidence of regurgitations, whole fish, eggs, chicks, and adults. The survey work was often hard because we were hiking over windfall, through dense spruce regeneration or thick salal* (Gaultheria shallon)*, up steep slopes and down through deep gullies, in rain, wind, and cold.*

*We knew that it would be very difficult to repeat*

**Figure 34.** A permanent monitoring program was established on selected colonies in Haida Gwaii to determine long-term changes in nesting seabird numbers. This plot on East Copper Island was set up specifically for Cassin's Auklet. *Photo by Moira J.F. Lemon, 9 June 1985.*

*those whole-island transect surveys to determine future trends in seabird populations. As a practical surrogate, we had discussed the use of permanent monitoring plots prior to our surveys but did not have full buy-in from management before we left. Undeterred, Moira and Mike brought aluminum stakes into the field and after surveying an island we erected permanent plots throughout the seabird colony to facilitate future monitoring. The large scale colony surveys have not been repeated but the permanent plots have since formed the basis for rigorous trend detection through an ongoing five-year monitoring plan for major seabird colonies in BC.*

*(contributed by Doug Bertram)*

Other seabird research was conducted by CWS during the 1980s. In 1983, Kees Vermeer studied the breeding biology of storm-petrels nesting on Hippa Island.[281, 283] In 1984, Anthony (Tony) J. Gaston began a long-term study of Ancient Murrelets on Reef Island [114] that involved several graduate students and carried on to form the basis for subsequent research conducted by the Laskeek Bay Conservation Society (see below). An intensive study investigating seasonal activity patterns of Marbled Murrelets inland, at sea, and in relation to forest habitat on southern Graham Island was conducted in 1990.[236, 237, 238, 239]

Introduced predators were recognized as an immediate threat to nesting seabirds on several colonies in Haida Gwaii by the end of the 1980s [8, 265] and rat control and seabird restoration became a focus of CWS seabird work in the 1990s. Control methods were researched [7, 110] and rat eradication on selected colonies became feasible when funds became available from litigation settlements following the 1988-1989 *Nestucca* oil spill. Working with experts from New Zealand, a multi-year program was initiated in 1995 to eradicate rats from Langara and nearby Cox and Lucy islands. [177, 267] Surveys were conducted of the Langara Island Ancient Murrelet colony before [150] and after [99, 222] rat eradication. Results were initially discouraging but optimistic signs of recovery were apparent by 2004 (Figure 35).[222]

**Figure 35.** Rats were obviously impacting nesting Ancient Murrelets on Langara Island in 1977, although the severity of the threat was not recognized until several years later.[9] This photo shows Ancient Murrelet eggshells gathered on the ground from a 3 x 5 ft. (1.4 $m^2$) area on the northeast corner of Langara Island in 1977. Following a program of rat eradication in 1995-1997,[177, 267] the Ancient Murrelet population showed optimistic signs of recovery by 2004.[222] *Photo by Michael S. Rodway, McPherson Point, Langara Island, BC, 16 May 1977.*

In the 1990s, studies shifted from colony surveys to research on aspects of seabird ecology that influence reproductive success and population dynamics. One example is the multi-year time series investigating how nestling growth rate of Cassin's Auklets at colonies in different oceanographic current systems (Triangle Island off the northwest tip of Vancouver Island in the California current, and Frederick Island in the Gulf of Alaska system) varied with timing of peak copepod prey availability.[11] Results of such studies on foraging ecology and reproductive success are important in understanding and predicting how ocean regime changes that accompany climate change may impact breeding seabirds.

The marine habitat requirements of seabirds breeding in BC during breeding and non-breeding seasons have been a focus of recent research conducted by CWS and the Wildlife Research Division of Environment and Climate Change Canada. Obtaining distributional information is vital for conservation efforts, environmental assessments, and establishment of Marine Protected Areas. This kind of information was previously difficult to obtain, particularly in winter, and was generally acquired through observations from ships, or from infrequent recoveries of banded birds. Advances in tracking technology opened a host of possibilities for understanding seabird ecology over the annual cycle. Radio telemetry has been used to follow tagged birds from their colonies to determine foraging ranges and map feeding grounds.[18] GPS tags, which record daily movements through satellite connections, have also helped to define the foraging range of Cassin's Auklets from their colonies. These tags have been deployed on birds from colonies in Haida Gwaii and from Triangle Island. GLS (Geolocator) data logger tags record ambient sunlight levels from which geographic locations can be determined. These have been placed on Ancient Murrelets from several colonies in Haida Gwaii to determine post-breeding dispersal and subsequent migratory movements from the breeding colonies (Figure 36).[125]

***Safety and Communications***

*Safety is a priority when conducting any field work, particularly in remote locations where assistance can be many hours or even days away. Vigilance, self-reliance, and preparedness have always been the main tools that field crews must rely on to keep themselves safe. There was often little in the way of a safety net for seabird surveyors during the BCPM surveys of 1970s. When there was a mother ship, ship-to-shore communications using onboard VHF radios were available. Other than that, crews were pretty much on their own, sometimes for weeks at a time. Since then, better training and developing technologies have improved our ability to keep crews safe.*

*In the 1980s, all of our CWS crews had at least a basic level of first aid training. Initially, the only first aid training available focused on situations in industrial work place or home and city settings. Then in the early*

**Figure 36.** Advances in tracking technology are allowing researchers to answer questions about seabird movements that were previously difficult to address. For example, geolocators placed on Ancient Murrelets at colonies along the east and west coasts of Haida Gwaii revealed complex movements of adults and young. After adults departed the colonies with their chicks, those from the east coast moved east and south towards Queen Charlotte Sound but families from west coast colonies moved steadily north and west towards Alaska. After chicks were grown, all adults from both east and west coast colonies migrated north to western Alaska and the Bering Sea, where they likely molted. Subsequently, some birds moved further west towards Japan and China and others moved back south to winter off North America.[125] *Photo by Jared Hobbs.*

*1980s the outdoor community saw a need for first aid knowledge and skills more suited to a wilderness setting. The Wilderness First Aid training that was developed taught improvisation techniques and accident handling for remote settings. From that time on, we ensured that our crews obtained this more intensive and relevant training.*

*Communications and navigation have also changed immensely over the years. Up until the 1990s we used maps, compasses, and marine charts to navigate, and had air photos that provided more topographic details of the islands that we were exploring. Although maps are still required, now GPS units provide precise locations and can track progress over the course of the day.*

*During those CWS surveys in the 1980s, now nearly four decades ago, communications were not always straight forward. Marine VHF radios were the main method of communication with other boats, light stations, and the Coast Guard. A series of repeater stations up and down the coast linked this marine VHF radio system into the regular landline communication network through a marine telephone operator, and that provided the means to contact the outside world. Conversations were one-way and open for anyone along the coast to listen to (this of course provided some nefarious entertainment since we were able to listen in on other people's conversations as well!). Since the signals between the radio and the repeater had to be line-of-sight, we needed to place the antenna for our main radio up as high as possible in a tree at our base camp. Sometimes these camps were on islands where we were unable to get the antenna high enough, and the signal from our radio could not reach the repeater. For those eventualities, we often had a single-sideband radio generally used in remote land-based situations, which operated on UHF channels. The antenna, a long thin wire stretching nearly 30 meters, was rather a cumbersome affair to string up between trees, but at least the radio was reliable most of the time. This of course was not very practical if we were frequently moving camp.*

*We always carried handheld marine VHF radios with us during our daily explorations which, as well as being a necessary safety precaution, enabled us to liaison with the rest of our two-person crews who were often on another island. The marine radios also broadcast marine weather forecasts, which was crucial when planning trips further afield from our camps. Reception on the handheld radios was also not guaranteed and there was an art to finding a "hot spot" where you could receive a signal.*

*Although the marine VHF radios are still indispensable for anyone travelling along the coast, now satellite phones have supplanted the role that VHF radios played in communications back to land. These did go through some growing pains – the first satellite phones were the size of a small suitcase, and for many years, the satellites that they communicated with were situated low on the horizon from the perspective of our northern latitude, and could not always be triggered. Now of course, satellite phones are of a respectably small size, and the network of satellites has expanded, ensuring their use just about everywhere along the coast. In areas of the coast close to urbanization, the ubiquitous cell phone has now replaced the need for satellite phones.*

*In the 1980s, as a back-up in case communication was poor, we would always leave detailed travel plans and expected destinations with our supervisors back at the office. Of course weather conditions and unexpected delays would often necessitate changes to the schedule. Weekly phone calls would update them to our location and progress, and if we expected any visitors we would post a map of our daily location and expected return at our field camp. Now crews carry Personal Locator Beacons such as SPOTS which provide constant GPS location data through a satellite-computer network to designated recipients as well as the option to send messages or contact emergency rescue centers.*

*Despite the vast technological improvements over the years that now provide communication and precise whereabouts of crews at all times, people on seabird surveys are often working in remote locations where help can be a long way away. Thus, it is still essential to know the basics of navigation, be able to read a map and chart, use a compass, and to be prepared for any eventuality.*

**Laskeek Bay Conservation Society (1990-2019)**

Since its formation in 1990,[112] Laskeek Bay Conservation Society (LBCS) has conducted regular surveys of nesting Black Oystercatchers and Glaucous-winged Gulls as well as other seabirds in the Laskeek Bay area and sometimes farther south along the east coast of Moresby Island. LBCS also carries out research and banding programs on Ancient Murrelets, Cassin's Auklets, Pigeon Guillemots, and Black Oystercatchers nesting on East Limestone Island, where their base of operations is located, and elsewhere in Laskeek Bay. This grass-roots, non-profit society based in Haida Gwaii is dedicated to research and long term monitoring of marine and terrestrial wildlife populations in the Laskeek Bay area, and to the promotion of ecological awareness through publications and public education. It collaborates with Parks Canada, Environment and Climate Change Canada, and other organizations in the pursuit of shared goals for the conservation of ecosystems in the coastal environment. A board of directors, a scientific advisory committee, and a small staff run the organization, while the research work is made possible by the involvement of many volunteers.

The genesis of the society began years before its formation in 1990. For six years during the 1980s, Tony Gaston (Figure 37), then of the Canadian Wildlife Service of Environment Canada, ran an intensive research program on the biology of the Ancient Murrelet on Reef Island in the central part of Laskeek Bay. LBCS was initially conceived as a way to carry on that research. Subsequently, the vision for the society expanded to one of actively involving local residents and students from Haida Gwaii, as well as off-island volunteers, to help conduct the work and in the process gain knowledge, skills, and a hands-on understanding and appreciation of the marine environment.

Laskeek Bay is situated on the east coast of Moresby Island in the K'uuna Gwaay Conservancy, north of Gwaii Haanas. East Limestone Island is located off the southeastern coast of Louise Island and just west of Reef Island (see inside back cover map). A small cabin built by volunteers in 1990 provides accommodation and a network of trails leads to various study sites. Research topics investigated by the society are wide-ranging, including various aspects of the marine and terrestrial ecology of Haida Gwaii, particularly in the Laskeek Bay area. The initial focus of research was monitoring of the Ancient Murrelet colony (Figure 38), but research

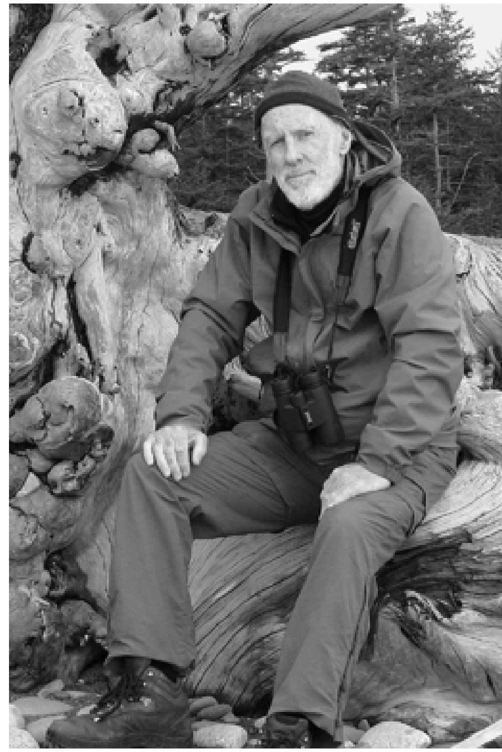


**Figure 37.** Tony Gaston's early experiences studying seabirds involved rappelling down cliff faces to access Thick-billed Murre (*Uria lomvia*) nests at colonies in Lancaster Sound in the Canadian Arctic.[121] It was a little surprising for him when he turned his attention to Ancient Murrelets nesting on Reef Island in Haida Gwaii. No longer was there a raucous of birds on cliff faces during the day; instead the colony was quiet, all nesting birds secreted away in their underground burrows in the forest. Only at night did the colony come alive. Undeterred, Tony adapted his research methods and carried on to give us a greater understanding of the breeding biology of this more diminutive alcid.[114] *Photo by Anne-Marie Gaston, Tlell, 16 May 2010.*

**Figure 38.** The Laskeek Bay Conservation Society conducts research on many seabird species including Ancient Murrelets. In this photo, a funnel has been set up to catch murrelets so that researchers can count, measure, and band adults and young. *Photo by R. Wayne Campbell, Reef Island, BC, 29 May 1996.*

has expanded to include Cassin's Auklets and Pigeon Guillemots, which also nest on East Limestone Island. In addition to colony surveys of Black Oystercatchers and Glaucous-winged Gulls, LBCS also conducts at-sea surveys of marine birds and mammals in the Laskeek Bay area as part of their annual long term monitoring. Other examples of their diverse array of activities include surveys of cavity nesting forest birds, inventories of vascular and non-vascular plants, and monitoring the impact of introduced species on East Limestone Island.

The society also supports a school program. This program is a rare opportunity for local students to participate in biological research close to home yet in a remote and natural setting. Exposing youth to this ecologically rich and vulnerable area hopefully promotes greater understanding and appreciation of the value of conservation.

**Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site (Gwaii Haanas)(2004-2019)**

Gwaii Haanas is a landmark accomplishment in the protection of wilderness ecosystems and is unique in encompassing natural habitats from mountaintop to sea bottom. The establishment of Gwaii Haanas began in 1974 when Haida from the Skidegate Band Council and members of the general public, organized as the Islands Protection Society, launched protests and petitions to halt rapacious logging of ancestral old-growth forests in the southern Moresby Island area. Petitions were delivered to the BC Provincial Legislature in 1975 requesting a moratorium on all logging in what was called the *South Moresby Wilderness Proposal*. During the same period, Parks Canada was soliciting natural history reviews of much of the BC coast [217, 229, 263, 268] to identify critical marine bird and mammal habitats and areas with high wilderness values that might warrant protection under their mandate. Results of the BCPM seabird surveys constituted the main components of those reviews and contributed greatly to the identification of important areas. By 1977, Parks Canada had a proposal in hand for the protection of South Moresby, which they called a "natural area of Canadian significance" (Figure 39).

Despite petitions and park proposals, logging continued in the face of public controversy and protest from the Haida Nation until 1987. One of the main areas of continued logging was on Lyell Island which, after the mapping of a large nesting colony of Ancient Murrelets in 1975-1979, became the focus of a heated conflict between loggers and First Nations and environmentalists. In 1984, the Islands Protection Society published their influential book *Islands at the Edge* [168] to support the wilderness proposal (Figure 40), although they recognized the inherent conflict in publicizing an area to protect it.[162] Protests continued

**Figure 39.** SGang Gwaay Llanagaay (Ninstints) is the most southern village site of the Haida people. It is now part of the Gwaii Haanas National Park Reserve and Haida Heritage Site. It has the largest stand of original Haida totem poles that are being allowed to decay naturally. *Photo by Moira J.F. Lemon, 9 July 2006.*

and came to a head in November 1985, when a road blockade was set up on Lyell Island by a group of Haida. Seventy-two people were arrested over a two-week period. Finally, on 11 July 1987, the federal and provincial governments signed a memorandum of agreement and in 1988 created the 1,495 $km^2$ South Moresby National Park Reserve. In 1993, the reserve became the cooperatively managed Gwaii Haanas National Park Reserve and Haida Heritage Site. In 2010, after continued negotiations to protect marine ecosystems around the islands, it became the nearly 5,000 $km^2$ Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site. A cooperative management plan was completed in 2018.[73]

Although Gwaii Haanas personnel generally keep a watchful eye on seabird colonies within the park, actual breeding seabird surveys have focused primarily on Black Oystercatchers. Regular surveys of oystercatcher nesting sites within the park have been conducted since 2004 in conjunction with Laskeek Bay Conservation Society and CWS.

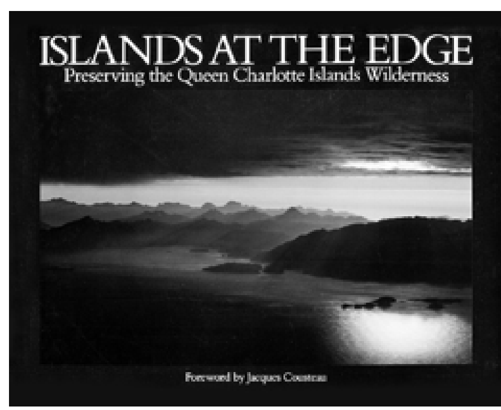



**Figure 40.** An important contribution to the preservation of the South Moresby Wilderness Area was a coffee table book *Islands at the Edge: Preserving the Queen Charlotte Islands Wilderness.* Seven authors contributed chapters including Bristol Foster and Wayne Campbell, both of whom participated in the BC Provincial Museum seabird surveys in the 1970s.

## SEABIRD BREEDING POPULATIONS IN HAIDA GWAII

### Status of Seabird Breeding Populations as of 1990

Table 1 summarizes estimates of seabird breeding populations and numbers of known colony sites in the six regions of Haida Gwaii using data available as of 1990. Data for Haida Gwaii in this table were largely extracted from Tables 3-5 in Part 1 of this work (pages 63-65)[231] but some revisions have been required. We have corrected an error found in the number of Pigeon Guillemots given for Masset and Juskatla inlets in Table 3 in Part 1, and amended the numbers of Pigeon Guillemots for West Coast Moresby Island, based on a higher count of Pigeon Guillemots at Flatrock Island in 1986 that we recently extracted from eBird.[315] We also added historical Black Oystercatcher nesting records in the North Coast Graham Island region uncovered since Part 1 was published. Although most of the data in Table 1 replicate those in Tables 3-5 in Part 1, we have included them here for ease of reference.

Haida Gwaii is a major centre for seabirds nesting in BC and, excluding Marbled Murrelets, as of 1990 supports over 1.5 million seabirds of 12 species (Figure 41) breeding at 198 sites (Table 1). Cassin's Auklet is the most numerous nesting species, followed closely by Ancient Murrelet, together making up 74% of the entire nesting seabird population in Haida Gwaii. Virtually all of the Ancient Murrelet population in BC breeds in this archipelago, along with large percentages of the Fork-tailed (*Oceanodroma furcata*) and Leach's storm-petrel, Black Oystercatcher, Pigeon Guillemot, Cassin's Auklet, and Horned Puffin populations (see Table 4 on page 64 in Part 1 [231]). Smaller proportions of Pelagic Cormorant, Glaucous-winged Gull, Common Murre (*Uria aalge*), Rhinoceros Auklet, and Tufted Puffin populations also nest in Haida Gwaii. Haida Gwaii is also an important breeding area for Marbled Murrelets (Figure 41), but this non-colonial, inland-nesting species is considered in our seabird colony accounts only where large numbers have been observed. Recent population estimates for Marbled Murrelets in Haida Gwaii range between 8,500 and 25,000 birds, comprising 12-20% of the estimated total BC population.[69]

There are differences in the relative abundance of nesting species in the different regions of Haida Gwaii (Table 1). Burrow-nesting species and Pelagic Cormorants breed only along the west coast of Graham Island and the west and east coasts of Moresby Island. Proportions of storm-petrel and Cassin's Auklet populations are somewhat similar in these three regions. Most Ancient Murrelets breed along the west coast of Graham Island and the east coast of Moresby Island, with a smaller proportion along the west coast of Moresby Island. In contrast, most Rhinoceros Auklets and Tufted Puffins in Haida Gwaii nest along the west coast of Moresby Island. Common Murres in Haida Gwaii nest only on the west coast of Moresby Island. Black Oystercatchers, Glaucous-winged Gulls (Figure 42), and Pigeon Guillemots nest in all six regions of Haida Gwaii. Of all regions in Haida Gwaii and in BC, the greatest number of Pigeon Guillemots has been counted at colonies in Skidegate Inlet. However, this is the only region in BC where Pigeon Guillemots have been properly surveyed.[286] Dedicated surveys there in 1990 provided reliable estimates of numbers of birds present, but likely overestimated the relative importance of the area to provincial populations because less dedicated surveys would have underestimated numbers in other regions.

**Figure 42.** As expected, the ubiquitous Glaucous-winged Gull nests in all six regions of Haida Gwaii, even at the ferry landing in Skidegate. *Photo by Moira J.F. Lemon, Skidegate, BC, 24 June 2008.*

**Table 1.** Summary of seabird breeding populations in Haida Gwaii as of 1990.[a,b]

| REGION | FTSP and/or LSPE[c] | FTSP[d] | LSPE[e] | Total Storm-Petrels | PECO[f] | BLOY[g] | GWGU[h] | COMU[i] | PIGU[j] | ANMU[k] | CAAU[l] | RHAU[m] | TUPU[n] | HOPU[o] | ALL SPECIES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Number of breeding seabirds (individuals) at colonies in Haida Gwaii as of 1990** | | | | | | | | | | | | | | | |
| West Coast Graham Island | | 35,200 | 40,600 | 75,800 | 232 | 188 | 1,234 | | 861 | 266,000 | 218,300 | 400 | 663 | 5 | 563,683 |
| West Coast Moresby Island | 99,940 | 4,564+ | 17,700+ | 122,204 | 36 | 84 | 1,664 | 158 | 854 | 39,260 | 238,740 | 69,000 | 1,593 | 26 | 473,619 |
| East Coast Moresby Island | 49,540 | 15,420+ | 49,840+ | 114,800 | 82 | 290 | 1,648 | | 2,339 | 235,052 | 143,660 | 5,364 | 323 | 3 | 503,561 |
| Skidegate Inlet | | | | | | 106 | 364 | | 2,975 | | | | | | 3,445 |
| Masset and Juskatla Inlet | | | | | | 74 | 162 | | 319 | | | | | | 555 |
| North Coast Graham Island | | | | | | 36 | 226 | | 175 | | | | | | 437 |
| ***Haida Gwaii Total*** | ***149,480*** | ***55,184+[p]*** | ***108,140+[p]*** | ***312,804[p]*** | ***350*** | ***778*** | ***5,298*** | ***158*** | ***7,523*** | ***540,312*** | ***600,700*** | ***74,764*** | ***2,579*** | ***34*** | ***1,545,300*** |
| ***Percent of all nesting seabirds in Haida Gwaii*** | **10** | **4** | **7** | **20** | **0** | **0** | **0** | **0** | **0** | **35** | **39** | **5** | **0** | **0** | **100** |
| **Percentage of the total Haida Gwaii seabird population breeding in each geographic region of Haida Gwaii as of 1990** | | | | | | | | | | | | | | | |
| West Coast Graham Island | | 64 | 38 | 24 | 66 | 24 | 23 | | 11 | 49 | 36 | 1 | 26 | 15 | 36 |
| West Coast Moresby Island | 67 | 8 | 16 | 39 | 10 | 11 | 31 | 100 | 11 | 7 | 40 | 92 | 62 | 76 | 31 |
| East Coast Moresby Island | 33 | 28 | 46 | 37 | 23 | 37 | 31 | | 31 | 44 | 24 | 7 | 13 | 9 | 33 |
| Skidegate Inlet | | | | | | 14 | 7 | | 40 | | | | | | 0 |
| Masset and Juskatla Inlet | | | | | | 10 | 3 | | 4 | | | | | | 0 |
| North Coast Graham Island | | | | | | 5 | 4 | | 2 | | | | | | 0 |
| **Number of current seabird breeding sites[q] in Haida Gwaii as of 1990** | | | | | | | | | | | | | | | |
| West Coast Graham Island | | 7 | 6 | 7 | 7 | 26 | 19 | | 25 | 4 | 8 | 1 | 3 | 1 | 34 |
| West Coast Moresby Island | 5 | 8+ | 5+ | 9 | 4 | 18 | 19 | 2 | 23 | 10 | 12 | 11 | 11 | 4 | 33 |
| East Coast Moresby Island | 12 | 17+ | 9+ | 19 | 4 | 61 | 34 | | 68 | 17 | 23 | 6 | 1 | 1 | 78 |
| Skidegate Inlet | | | | | | 22 | 16 | | 26 | | | | | | 34 |
| Masset and Juskatla Inlet | | | | | | 15 | 11 | | 15 | | | | | | 16 |
| North Coast Graham Island | | | | | | 3 | 2 | | 2 | | | | | | 3 |
| ***Haida Gwaii Total*** | ***17*** | ***32+*** | ***20+*** | ***35*** | ***15*** | ***145*** | ***101*** | ***2*** | ***159*** | ***31*** | ***43*** | ***18*** | ***15*** | ***6*** | ***198*** |

[a] Excluding Marbled Murrelet.

[b] Data in this table were extracted from Tables 3-5 in Part 1 (pages 63-65),[231] except we corrected an error found in Table 3 in Part 1 and added historical nesting records uncovered since Part 1 was published. (see text).

[c] 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 text).

[d-o] Species acronyms as follows: [d]FTSP–Fork-tailed Storm-Petrel, [e]LSPE– Leach's Storm-Petrel, [f]PECO–Pelagic Cormorant, [g]BLOY–Black Oystercatcher, [h]GWGU–Glaucous-winged Gull, [i]COMU–Common Murre, [j]PIGU–Pigeon Guillemot, [k]ANMU–Ancient Murrelet, [l]CAAU–Cassin's Auklet, [m]RHAU–Rhinoceros Auklet, [n]TUPU–Tufted Puffin, and [o]HOPU–Horned Puffin.

[p] If we assume 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 Haida Gwaii, then we derive total breeding population estimates of 105,690 individuals (52,845 pairs) of Fork-tailed and 207,114 individuals (103,557 pairs) of Leach's storm-petrels in Haida Gwaii as of 1990.

[q] Number of current breeding sites indicates the number of colonies where a particular species has been found nesting.

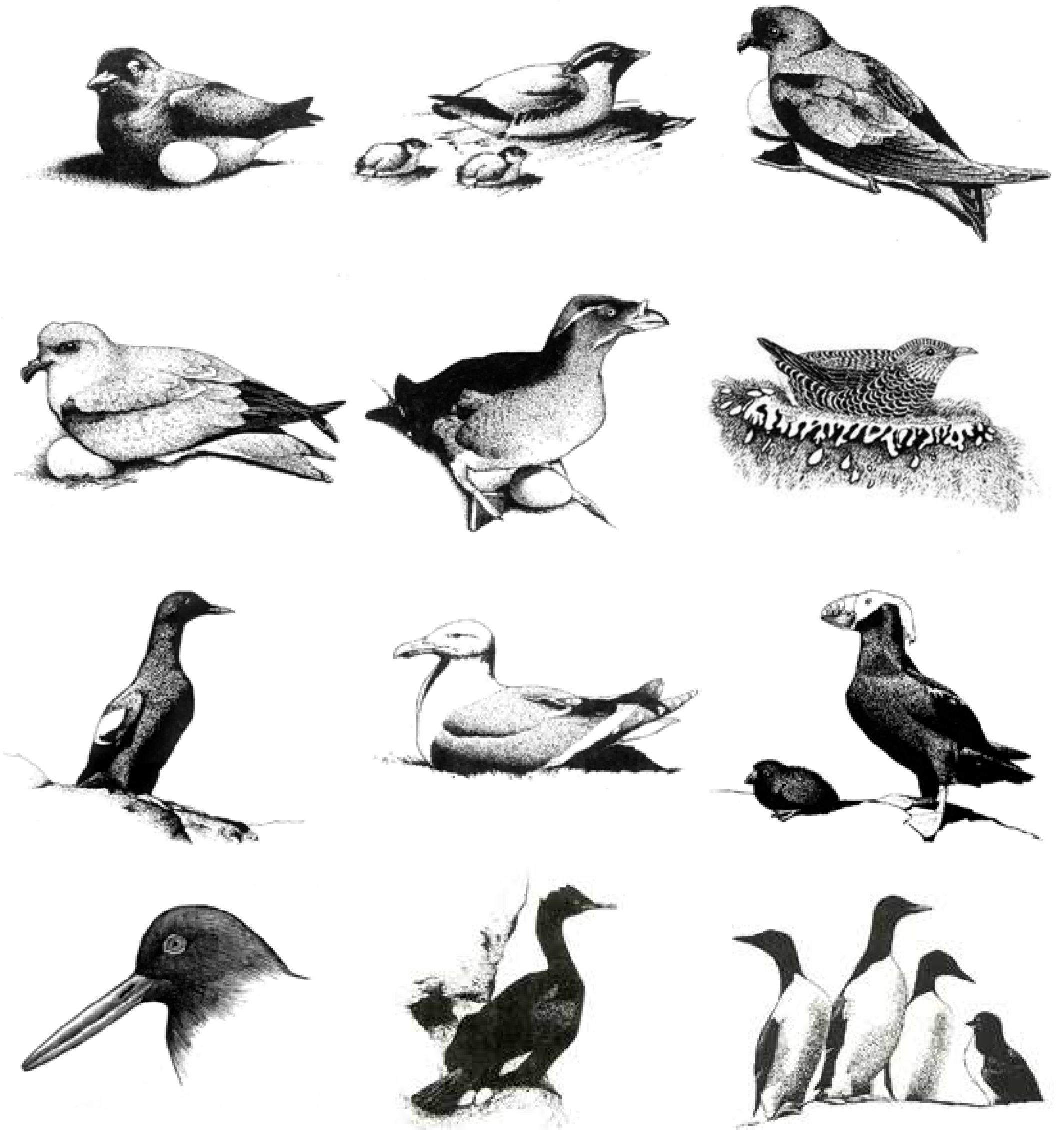


**Figure 41.** Twelve colonial-nesting seabird species breed at 198 sites around the coast of Haida Gwaii. In addition, the non-colonial Marbled Murrelet nests in old-growth forest habitat at inland sites. The most numerous nesting species is Cassin's Auklet, followed by Ancient Murrelet, Leach's Storm-Petrel, Fork-tailed Storm-Petrel, Rhinoceros Auklet, Marbled Murrelet, Pigeon Guillemot, Glaucous-winged Gull, Tufted Puffin, Black Oystercatcher, Pelagic Cormorant, Common Murre, and Horned Puffin (not shown) (see Table 1 and text for numbers). *Artwork by Mark Nyhof (Black Oystercatcher), Glenn Ryder (Marbled Murrelet), and Keith Taylor (all other species).*

Surveys by CWS in the 1980s provided robust population estimates for most colonies in Haida Gwaii, but some small colonies along the west coasts of Graham and Moresby islands were last surveyed in 1977 by the BCPM. On the west coast of Graham Island, the three major colonies of burrow-nesting seabirds on Langara, Frederick, and Hippa islands and most colonies of surface-nesting species were surveyed in the 1980s; however, we have only rough estimates from the 1977 BCPM survey for smaller colonies of burrow-nesting species.[227, 235] A few small colonies of surface-nesting species along the central west coast of Moresby Island, south of Englefield Bay, were also omitted from the CWS surveys in the 1980s and were last visited by the BCPM in 1977.[234] The Ancient Murrelet colony on Kunghit Island at the south end of Moresby Island was explored and the colony area was mapped during the 1980s but transects were not completed due to time constraints.[233] That colony was surveyed with transects in 1993 [150] (see Appendix 1).

Population estimates for the two storm-petrel species are incomplete. Although total numbers of storm-petrel burrows were reliably estimated using line transects or partial counts, the proportions of Fork-tailed and Leach's storm-petrels at 17 colonies on the east and west coasts of Moresby Island were not determined during the CWS 1980s surveys because they occurred early in the season before all Leach's Storm-Petrels were present. If we assume that the proportion of each storm-petrel species at colonies where proportions were not determined was the same as that determined at all other colonies in Haida Gwaii, then we derive total breeding population estimates (numbers of individuals) of 105,690 Fork-tailed and 207,114 Leach's storm-petrels in Haida Gwaii as of 1990. Incorporating those derived estimates into total estimates for BC, indicates that Haida Gwaii supports 28% and 18%, respectively, of 377,910 Fork-tailed and 1,139,764 Leach's storm-petrels breeding in BC as of 1990.

Proportions of the two storm-petrel species need to be assessed at the appropriate time of year (June-July) to complete baseline population estimates. Colonies where estimates of the proportion of the two species are needed include Instructor, Lihou, Luxmoore, and Rogers islands off the west coast of Moresby Island, and Rainy, Charles, Langtry, Bolkus, Skincuttle, Howay, Hotspring (Figures 43 and 44), Agglomerate, Kawas, Tar, Lost, Reef, and Low islands along the east coast of Moresby Island. CWS began pilot studies in 2019 to address the need for more robust baseline data for storm-petrels as part of the Government of Canada's Oceans Protection Plan.[272]

**Figure 43.** A popular destination for tourists visiting Haida Gwaii is <u>G</u>andll K'in Gwaay.yaay (Hotspring Island) with its soothing hot pools. The freshwater hot springs are fed by least 26 small vents with temperatures ranging from 32° to 77° Celsius (89° to 170° F). *Photo by R. Wayne Campbell, Hotspring Island, BC, 28 May 1996.*

**Figure 44.** Storm-petrels nest on the forested islets at the northeast end of Hotspring Island. CWS surveys in 1986 estimated the total number of storm-petrels nesting on Hotspring Island, but the colony is one of 17 storm-petrel colonies on the west and east coasts of Moresby Island where the proportions of Fork-tailed and Leach's storm-petrels have not been determined. *Photo by R. Wayne Campbell, Hotspring Island, BC, 28 May 1996.*

As noted above, Table 1 revises total breeding population estimates and the number of known breeding sites in Haida Gwaii presented in Tables 3 and 5 in Part 1 (pages 63 and 65).[231] Revisions were required partly because we uncovered two nesting sites for Black Oystercatchers that were previously unknown to us and were not included in our tabulation of current and historical nesting sites in Part 1 (see Tables 5-6 on pages 65-67 in Part 1 [231]). Both sites are located on the north shore of Graham Island. We found two egg specimen records from 1947, collected by W.S. Maguire, from Wiah Point on the north coast of Graham Island, west of Masset Inlet. There are no records of nesting since 1947 and we assume that the site was abandoned as of 1990. At a second site, Skonun Point along the North Beach area east of Masset, one nesting pair was monitored between 1984 and 1988.[72] We have included colony accounts for these sites in this volume. These records added one to the number of current breeding sites, two to the total number of historical breeding sites, and one to the number of abandoned sites as of 1990 for Black Oystercatchers that were presented in Tables 5 and 6 in Part 1 (pages 65-67).[231]

**Trends in Seabird Breeding Populations to 1990**

Native predators and other natural hazards such as inclement weather, windfalls, and normal fluctuations in food supply constantly stress seabird populations. Seabirds have evolved life history strategies to cope with these factors. However, additional stressors from anthropogenic sources often push birds beyond their ability to cope. Seabirds nesting in Haida Gwaii are presently under many stresses and populations of most species were likely larger in the past. Glaucous-winged Gulls are an exception and showed an archipelago-wide increase of 35% between 1977 and 1986.[227] Data for Black Oystercatcher, Pigeon Guillemot, and Horned Puffin (Figure 45) are inadequate to infer overall trends.[231]. For burrow-nesting species, historical records are not precise enough to define trends at most colonies, nor to establish changes in total breeding populations, but they are adequate to identify major changes, extinctions, or colonizations at specific sites. The present data set is biased towards identifying abandoned or contracted colonies as opposed to new or expanding colonies, but no colonies of burrow-nesting species have been discovered at sites previously known to be unoccupied. All reported new or expanded colonies have been in areas previously unexplored by survey crews. Many previously confirmed colonies have been abandoned; for example, over 20% of historical Ancient Murrelet colonies are now abandoned (see Table 6 on pages 66-67 in Part 1 [231]).

**Figure 45.** A few Horned Puffins breed in Haida Gwaii at scattered colonies. They have only twice been confirmed breeding [44, 297] and data are insufficient to infer population trends. *Photo by Alan D. Wilson.*

Historically, burrow-nesting seabirds (excluding Pigeon Guillemots) have been confirmed nesting at 65 sites in Haida Gwaii. At 27 of those sites (42%), one or more species have either abandoned the site or shown declines in population and/or colony extent as of 1990 (78% of the total incidence of species nesting at those 27 sites; Table 2; Figure 46). Of these, ten sites have been abandoned by all burrowing species that were previously recorded nesting. For all occurrences of confirmed breeding by individual species at the 65 colonies, in 21% of occurrences, the species in question has abandoned the colony (33 abandonments of 160 occurrences). There are eight additional cases where species that have been reported historically nesting at specific sites are not currently present. Breeding was never confirmed in those cases, and they have been excluded from the above analysis. They include Fork-tailed Storm-Petrels on East Copper Island, Sels Islet, and Arichika Island (Figure 47), Leach's Storm-Petrels on Arichika Island, Ancient Murrelets on High Island and Rock Island, Cassin's Auklets on St. James Island, Annette Island, Charles Islands, and Langtry Island, and Tufted Puffins on Gordon Islands (see individual colony accounts). In addition, there are other colonies ("Wooded" Islet, Brock Islands, Mabbs Island) and a number of sites (Nangwai Islands, Ellen Island, "Huston" Islet, Poole Point, Kat Island, Stansung Islets, and Kilmington Point) that were not designated colonies as of 1990 (see Appendix 3) where breeding by burrow-nesting species was never reported, but unoccupied burrows and other evidence were found that suggest past nesting and current abandonment. Data that suggest changes at some of these sites are insufficient for us to be confident that changes have actually occurred but at many sites the suggested declines or abandonments are likely real (see specific colony accounts). Most but not all declines indicate impacts by introduced predators or other anthropogenic causes. Native predators have been responsible for some declines and at some colonies one species may have declined because it was displaced by another (e.g., Charles Island). Since 1990, impacts from rats and raccoons have continued, especially at colonies in Englefield Bay, on Kunghit Island, and on Lyell Island (see Appendix 1).

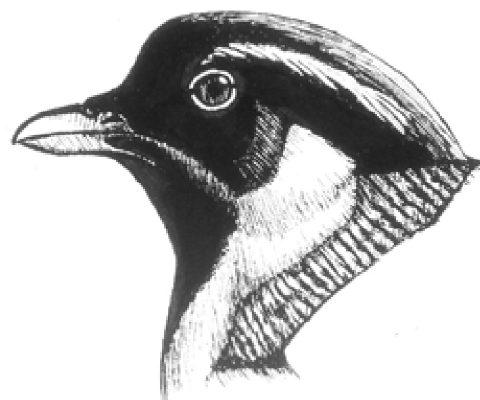


**Figure 46.** Historically, Ancient Murrelets have been documented breeding at 18 colonies in Haida Gwaii. Of those, seven colonies have been abandoned, populations at seven colonies have declined, and at four colonies there has been no apparent change in numbers as of 1990. *Drawing by Keith Taylor.*

**Table 2.** Colonies of burrow-nesting seabirds in Haida Gwaii with known declines or extirpation of at least one species as of 1990. Only species that have been confirmed breeding at a colony are considered.

| | Species | | | |
|---|---|---|---|---|
| Colony | Historically Nesting | Abandoned | Declined | No apparent change |
| WG-010 Langara I. | FTSP, ANMU, CAAU, RHAU, TUPU | FTSP, CAAU, RHAU, TUPU | ANMU | |
| WG-020 Cox I. | FTSP, LSPE, ANMU, CAAU, RHAU, TUPU | FTSP, LSPE, ANMU, CAAU, RHAU | | TUPU |
| WG-030 Lucy I. | ANMU, TUPU | ANMU, TUPU | | |
| WG-120 Tian Its. | FTSP, LSPE, CAAU | FTSP, LSPE | | CAAU |
| WG-140 Queen I. | FTSP, LSPE | FTSP, LSPE | | |
| WG-160 Ogilvie I. | FTSP, LSPE | FTSP, LSPE | | |
| WG-170 McKenzie I. | LSPE | LSPE | | |
| WM-020 Saunders I. | ANMU, CAAU, RHAU | CAAU, RHAU | ANMU | |
| WM-030 Helgesen I.[a] | FTSP, ANMU, CAAU, RHAU | | ANMU, CAAU, RHAU | FTSP |
| WM-040 Willie I. | FTSP, LSPE, CAAU | FTSP, LSPE | | CAAU |
| WM-070 Instructor I. | FTSP, ANMU, RHAU | | FTSP, ANMU, RHAU[b] | |
| WM-310 St. James I. | TUPU | | TUPU | |
| EM-010 Kunghit I. (Moore Head) | RHAU | RHAU | | |
| EM-170 Sea Pigeon I. | ANMU | ANMU | | |
| EM-180 Boulder I. | ANMU | ANMU | | |
| EM-280 George I. | LSPE, ANMU, CAAU | LSPE[c] | | ANMU, CAAU |
| EM-300 E. Copper I. | LSPE, ANMU, CAAU | | LSPE | ANMU, CAAU |
| EM-420 Arichika I. | ANMU, CAAU | ANMU, CAAU | | |
| EM-450 Hoskins Its. | FTSP | FTSP | | |
| EM-490 Bischof Is. | FTSP, ANMU | ANMU | FTSP | |
| EM-500 Hotspring I. | FTSP, ANMU, CAAU | | CAAU | FTSP, ANMU |
| EM-530 Murchison I. | ANMU, CAAU | | ANMU, CAAU | |
| EM-570 Tuft It. | TUPU | TUPU | | |
| EM-580 Lyell I. | ANMU | | ANMU[d] | |
| EM-690 Reef I. | FTSP, ANMU, CAAU, RHAU | RHAU | | FTSP, ANMU, CAAU |
| EM-720 Limestone Is. | ANMU, CAAU | | ANMU | CAAU |
| EM-740 Skedans Is. | FTSP, ANMU, CAAU | ANMU | FTSP, CAAU | |

**Summary of Trends for Species Nesting at the Above 27 Affected Colony Sites**

| | Number of Colony Sites (of the 27 affected colony sites) | | | |
|---|---|---|---|---|
| Species | Historically nesting | Abandoned | Declined | No apparent change |
| FTSP | 13 | 7 | 3 | 3 |
| LSPE | 8 | 7 | 1 | 0 |
| ANMU | 18 | 7 | 7 | 4 |
| CAAU | 14 | 4 | 4 | 6 |
| RHAU | 7 | 5 | 2 | 0 |
| TUPU | 5 | 3 | 1 | 1 |
| **Total Occurrence[e]** | **65** | **33** | **18** | **14** |
| **Percent Occurrence[f]** | 100% | 51% | 28% | 22% |

[a] Declines were not detected during the survey in 1986 but likely began shortly after that as raccoon were present in 1989-1990 [155] and major impacts to seabird populations were observed by 1993.[120]
[b] Ancient Murrelets and Rhinoceros Auklets may have been extirpated by 1993 (see Appendix 1).
[c] Leach's Storm-Petrels were again found nesting in 1996 and may have been missed in 1985 when we found no sign of them.
[d] Ancient Murrelets may have been extirpated by 2016 (see Appendix 1).
[e] Occurrence refers to a confirmed nesting species on one of the 27 affected colony sites. It is a coincidence that there is the same number (65) of species occurrences at the 27 affected colony sites as there are sites in all of Haida Gwaii where any burrowing species (excluding Pigeon Guillemots) have been confirmed nesting.
[f] Percent occurrence is the proportion of the 65 total occurrences of species confirmed nesting at the 27 affected colony sites.

**Figure 47.** Historical data for seabird colonies in Haida Gwaii are adequate to confirm that in 21% of cases where a seabird species used to nest on a colony, they are now absent. However, the proportion of colonies where breeding species have been extirpated in Haida Gwaii is undoubtedly greater than 21% because this estimate did not include cases where breeding was historically suspected but never confirmed. For example, there are three colonies where Fork-tailed Storm-Petrels were previously suspected to be nesting but are no longer present. *Photo by R. Wayne Campbell.*

Nesting along the shorelines of the large islands of Haida Gwaii may have been more widespread in the past. Evidence for this includes: 18 Black Oystercatchers nests (Figure 48) found by Maguire in 1947 along a 1/4 mile of shore at Wiah Point on the north shore of Graham Island, where none have been seen recently (see north coast Graham Island section); and more abundant nesting by Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots along the western Graham Island shore in the 1920s than on the most recent surveys in the 1970s and 1980s (see west coast Graham Island section). However, many portions of the Graham and Moresby island shorelines have not been well explored for nesting seabirds. Nesting by one pair of Black Oystercatchers at Skonun Point during the 1980s, and by a few Pelagic Cormorants, Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots along the west coasts of Graham and Moresby islands in the 1970s, indicates that nesting still may occur on the larger islands, especially in cliff and cave sites that are protected from native and introduced mammalian predators.

**Figure 48.** Black Oystercatchers nest on many smaller islands and also along the shores of the larger islands in Haida Gwaii. Nesting on the shores of Graham and Moresby islands may have been more widespread in the past. Finding oystercatcher nests often requires careful searches and is always rewarding. A nest with two eggs is shown in the bottom centre of this photo. *Photo by R. Wayne Campbell, Slug Islet, BC, 25 May 1996.*

**Impacts from Native Predators**

Seabirds are important prey for Bald Eagles (*Haliaeetus leucocephalus*) (Figure 49) and Peregrine Falcons and suffer high mortality from these raptors at most major colonies in Haida Gwaii. Common Ravens (*Corvus corax*), Northwestern Crows (*Corvus caurinus*), and Northern Saw-whet Owls (*Aegolius acadicus*) also take some nesting seabirds and their eggs and chicks. One family of Peregrine Falcons was estimated to consume about 1,000 Ancient Murrelets per season at Langara Island.[205] Although Peregrine Falcons do not rely entirely on seabird prey, the population of falcons nesting in Haida Gwaii, which was estimated at 71 pairs in 1995,[65] likely harvests many tens of thousands of seabirds annually. At seabird colonies, Peregrine Falcons take most prey on the wing over the ocean and leave prey remains at their eyries or other feeding perches, whereas Bald Eagles often hunt at night (see below) and leave prey remains in forested areas. Eagles pounce on Ancient Murrelets as they scuttle across the forest floor to and from their burrows. Eagles leave characteristic prey remains of plucked feather piles and are responsible for most predation evidence found on the ground within colonies, especially of Ancient Murrelets.

During CWS surveys, numbers of feather piles, wings, carcasses, and depredated eggshells found in sample quadrats along transects allowed us to estimate minimum numbers of Ancient Murrelet adults and eggs that had been preyed upon within colony areas that season up to the time of our survey. Most adult prey remains were in the form of feather piles typical of Bald Eagle predation (Figure 50), although wings and partially eaten carcasses (sometimes decapitated) that may have been preyed on by falcons, ravens, river otters, or rats were found on some colonies (see below). Eggs that have been preyed upon are broken inwards, generally show no signs of incubation, and are easily distinguished from those that have hatched and been dragged out of burrows when birds depart.[114] Estimates of predation at individual colonies had large standard

**Figure 49.** The seasonal diet of Bald Eagles on Haida Gwaii is varied and dependent on hunting preferences of individual birds. While fishes are a staple, some eagles have learned to exploit abalone at low tides, hunt pelagic birds offshore, scavenge beached mammals, and feed on exposed intertidal animals. They also take flying seabirds and prey on seabirds on breeding colonies. *Photo by Alan D. Wilson.*

errors but likely provide a realistic indication of overall predation levels at Ancient Murrelet colonies in Haida Gwaii. On 19 colonies (housing over 94% of the total Ancient Murrelet breeding population in Haida Gwaii) where estimates of predation were made during the 1980s CWS surveys, we estimated almost 30,000 birds and over 24,000 eggs preyed on per season (Table 3). This represented 5.6% of the total estimated Ancient Murrelet breeding population on those colonies and 4.8% of the numbers of eggs that would have been laid by that population. Loss of eggs likely results in reduced clutch sizes and fewer chicks hatched as there is no evidence that Ancient Murrelets will lay replacement clutches.[114] Some of the prey remains were likely of non-breeding birds that begin visiting the colony in large numbers by mid-May,[114] which would reduce the estimated proportion of breeding birds consumed. Also, at large colonies there may be an unknown number of damaged or non-viable eggs that may be scavenged rather than depredated.[297] In total, the number of breeding and non-breeding Ancient Murrelets taken by Peregrine Falcons and Bald Eagles is likely equivalent to about 10% of the overall breeding population at colonies in Haida Gwaii.

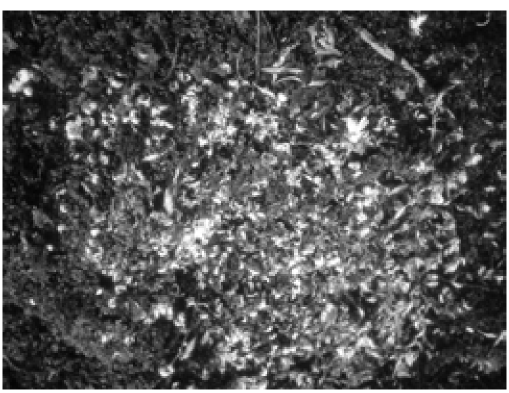


**Figure 50.** Although Bald Eagles cough up pellets with prey remains like other raptors, they also leave behind other tell-tale signs. This pile of Ancient Murrelet feathers is typical of an eagle kill. The Ancient Murrelet was caught at night on the colony likely as it was scurrying to or from its burrow. *Photo by Michael S. Rodway, Coho Point, Langara Island, BC, 3 June 1981.*

The large number of eggs found during surveys that had been preyed on was surprising and remains unexplained (Figure 51). Possible explanations include: 1) egg-laden females may be more vulnerable to being caught by eagles – we have found murrelet carcasses still containing an eggshell within the skeleton; 2) egg-bearing females may drop an egg as a defense or escape strategy when they are attacked; and 3) some females may lay and abandon eggs on the ground outside burrows, as has been seen in large numbers in Greater Shearwaters (*Puffinus gravis*) [241] and Wedge-tailed Shearwaters (*Puffinus pacificus*).[29, 140] We have never observed whole Ancient Murrelet eggs on the ground outside burrows but eggs laid or dropped would be readily preyed on by eagles, corvids, mice, or other scavengers. In his more intensive studies, Gaston found a few eggs laid on the surface every year.[114] He speculated that they may have been laid by females unable to find their burrow. Future study involving intensive nocturnal observations will be required to reveal the source of depredated eggshells found on Ancient Murrelet colonies in Haida Gwaii.

**Figure 51.** Large numbers of depredated Ancient Murrelet eggs are commonly found on the ground in colonies. Numbers of depredated eggs on colonies were estimated during transect surveys in the 1980s. Estimates were as high as 5,882 eggs preyed on in a single season on Langara Island, representing over 12% of the eggs that would have been laid on that colony that year (Table 3). Many of the eggs on Langara Island were likely preyed on by rats, but on most colonies, the source of depredated eggs remains conjecture. *Photo by Michael S. Rodway, McPherson Point, Langara Island, BC, 16 May 1977.*

**Table 3.** Summary of predation estimates from 1980s transect surveys of Ancient Murrelet colonies. Data from Rodway et al.[233, 234, 235] and Gaston et al. [126]

| Colony | Year | Survey date | Nesting pairs | Adult remains estimate | Percent of breeding population | Egg remains estimate | Percent of eggs laid |
|---|---|---|---|---|---|---|---|
| WG-010 Langara Island | 1981 | 6 May-7 June | 24,059 | 4,104 | 8.5 | 5,882 | 12.2 |
| WG-100 Frederick Island | 1980 | May-July | 68,407 | 1,231 | 0.9 | | |
| WG-230 Hippa Island | 1983 | 27 May-25 June | 40,094 | 924 | 1.2 | 885 | 1.1 |
| WM-030 Helgesen Island | 1986 | 10-20 May | 7,657 | 1,186 | 7.7 | 385 | 2.5 |
| WM-080 Lihou Island | 1986 | 8-27 May | 6,452 | 910 | 7.1 | | |
| EM-120 Rankine Is. - West | 1984 | 29 May-8 June | 26,180 | 8,085 | 15.4 | 3,782 | 7.2 |
| EM-220 Bolkus Island | 1985 | 14-17 May | 9,892 | 917 | 4.6 | 297 | 1.5 |
| EM-270 Skincuttle Island | 1985 | 04-May | 2,182 | 355 | 8.1 | 178 | 4.1 |
| EM-280 George Island | 1985 | 29-30 April | 11,614 | 1,843 | 7.9 | 1,813 | 7.8 |
| EM-290 Jeffrey Island | 1985 | 18-May | 1,028 | 700 | 34.0 | 350 | 17.0 |
| EM-300 East Copper Island | 1985 | 28 April-11 May | 4,365 | 587 | 6.7 | 940 | 10.8 |
| EM-400 Alder Island | 1985 | 18-21 April | 14,388 | 958 | 3.3 | 1,917 | 6.7 |
| EM-470 Ramsay Island | 1984 | 19 April-28 May | 18,161 | 3,188 | 8.8 | 2,869 | 7.9 |
| EM-510 House Island | 1984 | 16-18 April | 2,646 | 673 | 12.7 | 881 | 16.6 |
| EM-540 Agglomerate Island | 1985 | 15-June | 2,155 | 378 | 8.8 | | |
| EM-580 Lyell Island | 1982 | 20 April-9 June | 10,663 | 1,594 | 7.5 | 3,648 | 17.1 |
| EM-690 Reef Island | 1989 | 12 April-5 June | 3,576 | 563 | 7.9 | | |
| EM-720 Limestone Is. - East | 1983 | 28 April-7 May | 1,449 | 242 | 8.4 | 486 | 16.8 |
| Limestone Is. - West | 1983 | 29 Apr-7 May | 106 | 194 | 91.5 | 106 | 50.0 |
| **Total** | | | **255,074** | **28,632** | **5.6** | **24,419** | **4.8** |

Eagles and falcons take large numbers of seabird species other than Ancient Murrelet but estimates of the numbers harvested were not as easily derived on most colonies. However, prey remains of storm-petrels, Cassin's Auklets, and Rhinoceros Auklets were abundant enough on some colonies to provide estimates. Remains of Cassin's and Rhinoceros auklets were primarily feather piles characteristic of Bald Eagle predation, but for storm-petrels, wings of adults and remains of chicks, sometimes associated with dug up burrows, were often prevalent and likely due to river otter predation (see below). We estimated 111 and 101 Cassin's Auklets killed within colony areas on Frederick Island in 1980 and Hippa Island in 1983, respectively, representing less than 1% of the breeding populations on each colony.[235] On Helgesen Island in 1986, about 690 Rhinoceros Auklets, representing about 2% of the breeding population, were preyed on within that colony.[234]

Nesting seabirds also suffer some impacts from indigenous, mammalian predators. Keen's mice occasionally will prey on small Ancient Murrelet chicks [114] but likely have minimal impact on nesting populations (interestingly, Carita Bergman,[297] from her camera monitoring work, has abundant photos of both mice and shrews sitting beside adult Ancient Murrelets in burrow entrances with no sign of defensive behaviour by the Ancient Murrelets towards them). American Black Bear have been implicated in the decimation of three nearshore colonies on small islands along the west coast of Graham Island.[94] River otters are primarily piscivorous but do prey on seabirds, especially storm-petrels (Figure 52), on some colonies (e.g., Hippa, Luxmoore, Rogers, Charles, Langtry, and Agglomerate islands), and may have contributed to the abandonment of some small petrel colonies (e.g., Tian and Hoskins islets). On Luxmoore Island we estimated predation in 1986 of 507 Fork-tailed Storm-Petrels and 340 Leach's Storm-Petrels, mostly by river otters. This represented 7% of the total storm-petrel breeding population. On nearby Rogers Island, an estimated 1,452 storm-petrels (2.5% of breeding population), mostly Fork-tailed Storm-Petrels, had been depredated. Again some burrows had been dug up and some river otter scats contained feathers.[234] Fork-tailed Storm-Petrel prey remains found in surveyed quadrats on Agglomerate Island in 1985 gave an estimate of 757 birds (7% of breeding population) that had been preyed on, although more feather piles than wings were found in this case.[233] Carita Bergman observed a river otter preying on an adult Ancient Murrelet on Ramsay Island in 2018.[297]

**Figure 52**. Northern River Otters frequent near-shore marine waters along the entire BC coast. While fishes are the predominant food, river otters will prey on nesting seabirds. Predation is generally incidental, but occasionally, river otter predation can substantially impact seabird nesting populations, especially storm-petrels, which river otters will dig from their burrows. In this photo, Martin Lee (left) and Heather Garrioch are counting Leach's Storm-Petrel wings from river otter predation on Rogers Island. *Photo by R. Wayne Campbell, 21 June 1977.*

**Impacts from Anthropogenic Sources**

Anthropogenic changes, especially introduced rats and raccoons (Figures 53 and 54), are the most serious threats to nesting seabirds in Haida Gwaii.

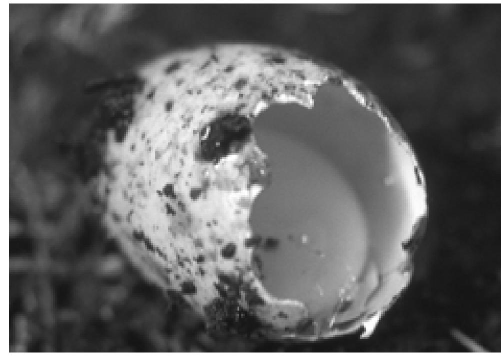


**Figure 53.** This freshly eaten Ancient Murrelet egg was extracted from a burrow on Langara Island. It was likely eaten by a rat. *Photo by Michael S. Rodway, south of Egeria Bay, BC, 11 May 1977.*

**Figure 54.** The Northern Raccoon is an opportunistic omnivore eating a wide variety of plants and animals as well as carrion and human garbage. On Haida Gwaii, it feeds mainly on intertidal invertebrates but it also eats seabirds. Raccoons have been responsible for major declines or extirpation of nesting seabirds on at least seven colonies. Studies in Englefield Bay on the west coast of Moresby Island found decreases of 80-95% in nesting populations of burrow-nesting alcids between 1986 and 1993 on islands where raccoons were present. Numbers of nesting seabirds remained steady or increased on nearby colonies where raccoons were absent.[120] *Photo by R. Wayne Campbell.*

Black Rat and, more recently, the Norway Rat have contributed to declines of nesting populations on Langara, Kunghit, St. James, Murchison, and Lyell islands (data collected since 1990 suggest that rats also contributed to declines on Arichika, Bischof, and High islands; see Appendix 1). They have likely also impacted nesting seabirds on other islands that lack historical data to confirm seabird declines. Rats, especially Norway Rats, have been found to be more capable swimmers than we previously suspected and they continue to spread to islands that support extant seabird nesting populations.[297] Raccoons have been implicated in the abandonment or decline of nesting species on at least seven colonies (Saunders, Helgesen, Instructor, Sea Pigeon, Boulder, and Limestone islands and Sels Islet).[115, 120, 265] They have also been reported on Langara, Kunghit, Swan, Rock, Skincuttle, George, "Island Bay", Centre, Wanderer, Alder, Huxley, Hutton, Louise, Skedans, "Alliford", Sandilands, Balch,[155, 276, 286] and possibly Bischof[233] islands (raccoon presence on Ramsay Island was reported by Harfenist et al.,[152] citing Hartman,[154] but Hartman[155] specifically stated that raccoons were not detected on Ramsay Island). Proficient swimmers, raccoons are known to have crossed channels of water wider than those isolating most seabird colony islands and at least 80% of seabird nesting populations in Haida Gwaii is at risk from them.[155] The spread of raccoons throughout Graham and Moresby islands since their introduction in the 1940s may also have contributed to the decrease or disappearance of nesting Black Oystercatchers at sites like Wiah Point on the north shore of Graham Island, where 18 nests were found in 1947. Raccoons frequently forage in intertidal areas and may pose a greater threat to shoreline-nesting Black Oystercatchers or other species than native marten, which more commonly forage in forested habitats.[157]

The continued dispersion of rats and raccoons is the most immediate threat to nesting seabird populations throughout the archipelago. Continuing extermination campaigns for rats and monitoring and control programs for raccoons (see Introduction) will hopefully reduce further impacts of these introduced species on nesting seabirds and lead to recovery of impacted populations, although continued invasion of colony islands will be a constant problem until these predators are removed from the entire Haida Gwaii archipelago and effective measures are in place to prevent further accidental importation of rats on visiting vessels.

In the 1920s, marten were taken from Graham Island and introduced to Lucy Island,[76, 79] and have been reported on Langara Island (see Langara Island account). They may have contributed to the extirpation of the Lucy Island colony and the decline on Langara Island (see colony accounts).

The impact of introduced Sitka deer on nesting seabirds is difficult to assess. On storm-petrel colonies with luxuriant, herbaceous vegetation and fragile soil, browsing and trampling by deer may reduce available nesting habitat. In other areas where deer have severely browsed and removed thick shrub cover, they may enhance the habitat for burrowing birds (Figure 55).

**Figure 55.** Sitka Deer, successfully introduced to Haida Gwaii in the 1920s, now occupy almost all of the larger islands in the archipelago. The potential threat to nesting seabirds is unknown but is assumed to be minor. *Photo by R. Wayne Campbell, near Tow Hill, 21 km east of Masset, BC, 2 June 2000.*

Haida people traditionally harvested seabirds for food and ornaments.[101] "Night-birds", such as Ancient Murrelets, were taken in large numbers, but there is no means to evaluate the impact to overall breeding populations. Haida remember many small colonies of Tufted Puffins along the coast, and larger colonies at Hippa Island and in the Cape St. James area. The puffin population on Hippa Island was apparently devastated by an oil spill that occurred about 1925.[101] The puffins never recovered (Figure 56).

**Figure 56.** According to the Haida, many small colonies of Tufted Puffins used to be scattered along the west coast of Graham and Moresby islands.[101] The Haida traditionally harvested Tufted Puffins on Hippa Island. They reported that an oil spill near the island in the mid-1920s decimated that colony. *Photo by Alan D. Wilson.*

The recent, burgeoning recreational traffic drawn to the beauty of these islands (Figure 57) is a stress on surface-nesting species like Pelagic Cormorants, Black Oystercatchers, Glaucous-winged Gulls, and Common Murres. Tufted Puffins that are diurnal on their colonies are also easily disturbed. Ancient Murrelets and Rhinoceros Auklets are primarily nocturnal and less easily disturbed on their colonies. However, they are vulnerable to disturbance by boats traveling through their staging areas on the water around their colonies, where they gather to socialize during daylight hours. Additionally, groups of people walking through densely burrowed colonies can collapse burrows and disturb nesting birds. Repeated surveys indicated that Pelagic Cormorant numbers on the east and west coasts of Moresby Island declined between 1971 and 1986,[227] although some cave-nesting sites were likely missed during those surveys and counts were incomplete, especially along the west coast of Moresby Island.[300] On the west coast of Graham Island, the large colony on Tian Islets with 98 nests in 1986 was abandoned in 1988. Whether those declines were related to human disturbance is unknown.

Proposed oil exploration and possible tanker traffic in Hecate Strait pose a serious threat to seabirds in the area, although that threat has recently been ameliorated by the passage through the Canadian Senate on 20 June 2019 of Bill C-48, the Oil Tanker Moratorium Act. That act will formalize a ban on oil tankers that hold over 12,500 metric tons of oil, excluding them from northern BC waters in the area from the north tip of Vancouver Island to the province's border with Alaska. Fisheries-related impacts have been best documented around Langara Island but likely occur wherever commercial or sports fishing activities overlap with concentrations of nesting seabirds. According to local residents, many alcids, especially Ancient Murrelets have been caught in gill-nets.[259]

***What About the Birds?***

*In recent years remote fishing resorts have proliferated on the outer BC coast. The rugged west coast of Haida Gwaii has become a favoured location and to date floating resorts have been established at Langara Island, in Naden Harbour just east of Langara Island, in Nesto Inlet on the border of the Vladimir J. Krajina (Port Chanal) Ecological Reserve that protects Hippa Island, and in Englefield Bay. A land-based resort has also been built on the south end of Langara Island. For clients, these resorts are great adventures. But all these resorts put large numbers of people near major concentrations of nesting seabirds. Impacts of these resorts on breeding seabirds have not been investigated. Resorts are large, brilliantly lit structures that can*


**Figure 57.** Many people visit Haida Gwaii for a wilderness experience. This might include visiting abandoned native village sites, learning about Haida culture, observing wildlife in a wild and natural setting, or just exploring new places. Here are some examples: an unexpected pod of Killer Whales caused a commotion for these enthusiasts near Murchison Island on 23 May 1990 (top left); one visitor captured their experience on canvas with this watercolour of Lyman Point (Kunghit Island) in 1998 (top right); sea kayakers observed a Black Oystercatcher nest in Anna Inlet (Moresby Island) on 4 June 1990 (bottom left); and some visitors went birdwatching in Kootenay Inlet (Moresby Island) on 24 May 1990. *All photos by R. Wayne Campbell***.**

*attract and disorient breeding seabirds, including Marbled Murrelets flying inland and Ancient Murrelet parents shepherding their small chicks to sea. Some mortality of birds through direct collisions with lighted structures seems likely. Disturbance to large numbers of Ancient Murrelets staging around their colonies on Langara and Hippa islands from the many small boats that take clients out fishing from these resorts is also a major concern. Other likely impacts that need investigating include seabird by-catch in the sports fishery and potential oil-related mortality due to spills from fueling boats. There is also an increased risk that boats travelling to fishing lodges will transport and accidentally release rats to colony islands. Control of light pollution from these resorts and avoidance of Ancient Murrelet staging areas by resort fishing boats would help reduce potential conflicts between this lucrative sports fishery and the conservation of globally threatened seabird breeding populations.*

### Protective Status for Seabird Colonies in Haida Gwaii

Most seabird colonies in Haida Gwaii have some protective status as Ecological Reserves, as part of Gwaii Haanas, or as Heritage Site/Conservancy areas. These are established by orders-in-council and generally allow some recreational activity and research. Some areas are also recognized as Important Bird Areas. Legal protection deters most development activities on the colonies themselves but offers minimal protection for staging and feeding birds in the waters around colonies (Figure 58). The Gwaii Haanas Reserve includes marine waters around the islands and guidelines are in place to minimize and in some cases prohibit encroachment, but restrictions can be difficult to enforce. In all areas, colonies are vulnerable to disturbance from increasing tourist traffic and recreational sports fishing activities, and to continued invasions by introduced rats and raccoons. Protective status for colony islands also has little consequence for other wide-scale human impacts such as oil spills, commercial fisheries interactions, plastic pollution, and climate change, which affect seabirds worldwide.

**Figure 58.** Although the Gwaii Haanas Reserve, Heritage Site/Conservancy areas, and Important Bird Areas include marine waters around many seabird colony islands in Haida Gwaii, they effect minimal protection of important staging and feeding areas for birds like Common Murre and other species that gather on the waters around their colonies. *Photo by R. Wayne Campbell.*

***BC Parks and Ecological Reserves.***

The only seabird colonies in Haida Gwaii that are protected as Ecological Reserves are Hippa Island and "Lepas" Islet on the west coast of Graham Island. Public access is restricted and landing on those seabird colonies requires special permission. Former Ecological Reserves on the east and west coasts of Moresby Island on the islets around SGang Gwaay, the Kerouard Islands, Rankine Islands, Jeffrey Island, and East Copper Island had that status revoked to allow their inclusion in Gwaii Haanas.

The Rose Spit and Tow Hill Ecological Reserves, as well as Naikoon Provincial Park on the north coast of Graham Island, protect shoreline habitat potentially suitable for nesting by Black Oystercatchers. We have no records of oystercatchers nesting within those reserves or Naikoon Provincial Park but they are known to nest on Yakan Point just outside the Tow Hill reserve.

***Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site (Gwaii Haanas).***

Gwaii Haanas includes almost half (48%) of the total seabird breeding population in Haida Gwaii and 13% of the total provincial population. Seabird colonies protected within Gwaii Haanas include: WM-170 "Mike" Rock to WM-320 Kerouard Islands along the west coast of Moresby Island; and EM-010 Kunghit Island to EM-650 Lost Islands along the east coast of Moresby Island.

Park management plans limit access to many colonies. Specific closures are posted every year. For example, in 2017, islands in Juan Perez Sound were closed to all access from March 15th – July 15th, with the exception of Hotspring Island (Gandll K'in Gwaay.yaay), which was closed from March 15th through May 14th. Haida Nation members, however, have the right to continue traditional use throughout Gwaii Haanas. Tourist activity is monitored by Haida Watchmen stationed at a number of sites.

***Haida Heritage Sites/Conservancy Areas.***

Many colonies that are not within Gwaii Haanas or protected as Ecological Reserves have been given some protected status as Heritage Sites/Conservancy Areas under the BC Parks system, jointly managed by the Council of the Haida Nation. The Duu Guusd Heritage Site/Conservancy includes Frederick Island, Langara Island, and most other previously unprotected seabird colonies along the west coast of Graham Island. Colonies from Rennell Sound south along the west coast of Graham plus all colonies from the Englefield Bay area south to Tasu Sound are within the Daawuuxusda Heritage Site/Conservancy. Three colonies north of the Gwaii Haanas park boundary, Reef Island, Limestone Islands, and Skedans Islands, are designated BC Wildlife Management Areas and fall within the K'uuna Gwaay Heritage Site/ Conservancy (Figure 59).

**Figure 59.** A Wildlife Management Area is an area of land designated under section 4(2) of the BC Wildlife Act for the benefit of regionally to internationally significant fish and wildlife species or their habitats. The additional designation as a Heritage Site further enhances safeguards for species like the endemic Northern Saw-whet Owl and protection for important habitats like these nesting cliffs for Peregrine Falcons on Reef Island. *Photo by R. Wayne Campbell, 5 June 2000.*

***Important Bird Areas.***

The designation of Important Bird Areas (IBAs) in BC is an international conservation initiative by Birds Canada and Nature Canada in partnership with BirdLife International. IBAs provide no legal protection. Within the Haida Gwaii archipelago, there are 15 IBAs designated for their breeding seabird populations, most of which are located within Gwaii Haanas. Outside of the park area, six identified IBAs encompass seabird colonies: Langara Island, Frederick Island, islands within Tian Bay and Port Louis, Hippa Island, Englefield Bay, and Laskeek Bay. In addition, the McIntyre Beach and Rose Spit IBA includes shoreline habitat where Black Oystercatchers may nest.

## COLONY ACCOUNTS AND REGIONAL SUMMARIES

### Data Presentation and Organization

We have divided Haida Gwaii into six geographic regions (Figure 60; also see Figure 58 on page 58 in Part 1 [231]). Regional summaries and individual colony accounts are presented for each region. Colony accounts for the archipelago are presented in counter-clockwise order, beginning at Langara Island at the northwest tip of Graham Island, following our previous numbering scheme.[227, 228, 233, 234, 235] Geographically-ordered colony identity numbers were assigned at intervals of 10 to allow future insertion of newly discovered colonies in geographic sequence. A few new identity numbers have been inserted where historical data have been found or reinterpreted after initial reports were published. Location names are from BC Geographical Names,[135] except for names in quotations, which we have assigned to avoid confusing lists of unnamed sites.

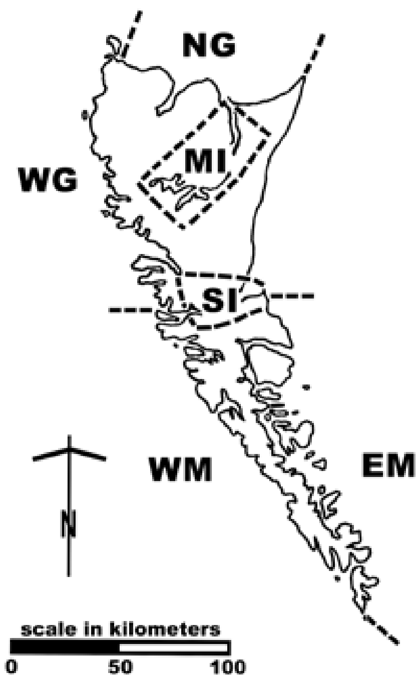



**Figure 60.** We have divided Haida Gwaii into six geographic regions used to summarize seabird breeding populations. In counter-clockwise order, these are: West Coast Graham Island (WG), West Coast Moresby Island (WM), East Coast Moresby Island (EM), Skidegate Inlet (SI), Masset and Juskatla Inlets (MI), and North Coast Graham Island (NG).

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 the term "location" 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. Except for unnamed sites, designated colonies generally correspond to gazetteered [135] locations, and may encompass a single island or an island group. For unnamed sites, we decided which island or group of islands would be included in the colony. Many named islands or island groups 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. 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.[201] Latitudes and longitudes previously given in CWS Technical Reports [233, 234, 235] were generally derived from marine charts that used the older NAD27 datum; those have all been updated here. Latitude and longitude is generally given for only one, specified main island for colonies that include multiple islands. Coordinates for more than one island are sometimes provided when the locations of different parts of a colony are difficult to describe.

Under *Description* we provide: the total area and maximum elevation of colony islands, if available; a dominant habitat category (e.g., Forested, Grassy rock, Bare rock, Cliffs); and a brief description of the site. Total areas given are those measured from air photos and detailed topographic maps during the 1980s CWS surveys [233, 234, 235] or 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.[201] 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 (Figure 61). 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 (Figure 62). "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 "Sea-cave" and "Wharf." 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, unless it lies within larger protected areas, such as Gwaii Haanas. Colonies within those larger protected areas are listed in the introductions to each region.

The *Historical Summary* section presents a table summarizing all historical records on seabird nesting populations up to 1990 and a discussion of the historical records, including specific nesting locations and an interpretation of population trends

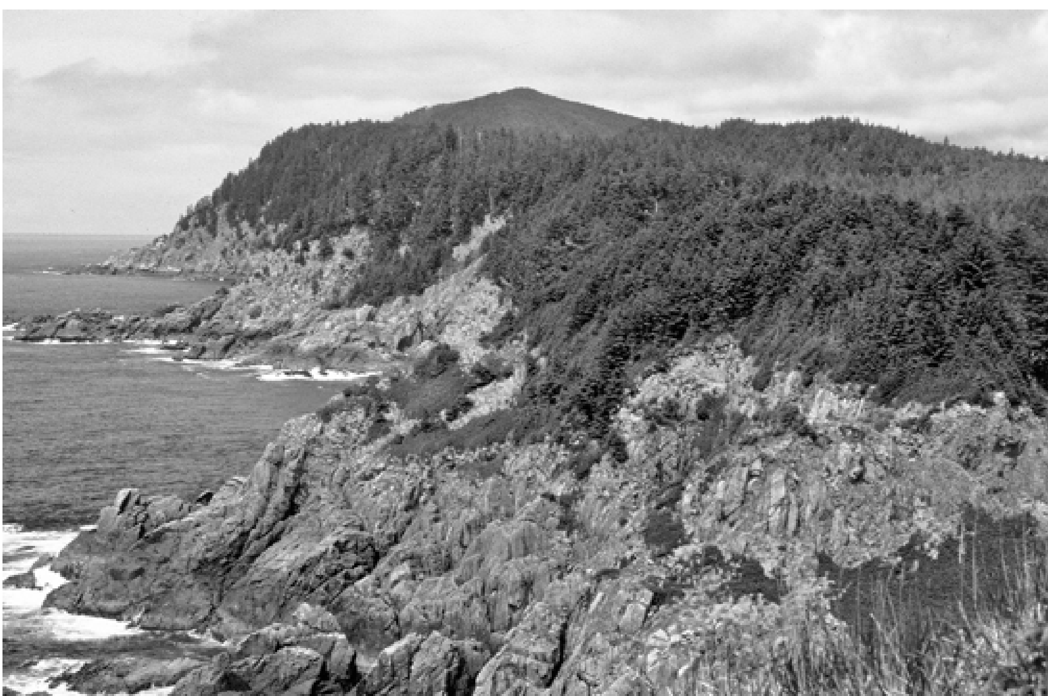


**Figure 61.** Forested seabird colony islands generally have rugged rocky shorelines and headlands. *Photo by Moira J.F. Lemon, looking north from St. James Island, BC, 10 June 1986.*

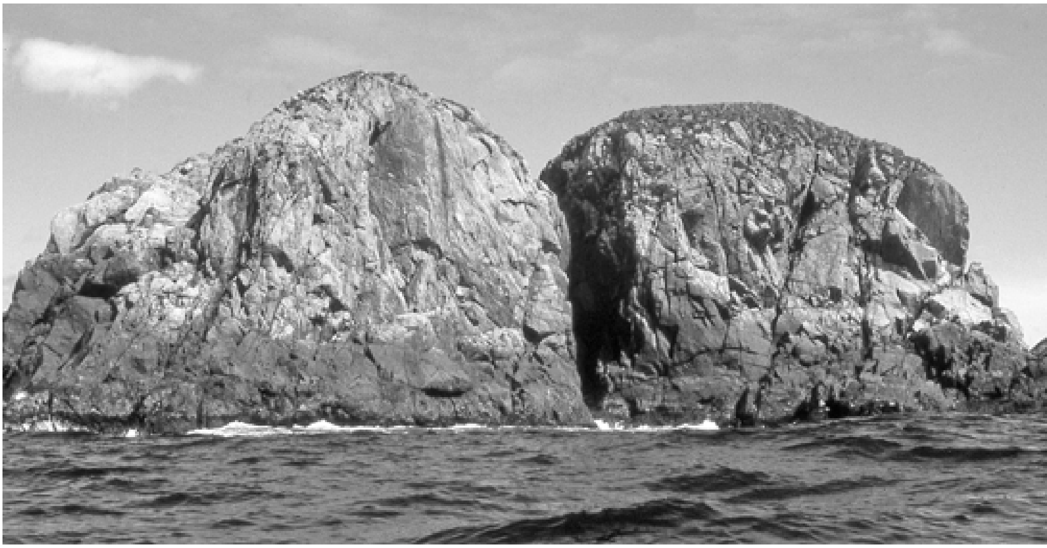


**Figure 62.** The wind-swept Kerouard Islands are examples of the "Grassy rock" habitat type. They are treeless and rocky but higher sections are covered with lush grasses and other herbaceous vegetation. *Photo by Michael S. Rodway, 10 June 1986.*

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 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 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 and Northwestern Crows (Figure 63), which are common on many BC seabird colonies, only if there is evidence that they have preyed on nesting seabirds at that colony.

Details of the sampling methods, including numbers of transects and quadrats, and estimates of the component measures of burrow density, burrow occupancy, and colony area used to estimate breeding populations of burrow-nesting seabirds during CWS surveys were presented in Part 1 in the species summary tables in the Species Accounts section.[231] Those details are not repeated in the colony accounts presented here. Several of our publications present more detail on the CWS surveys.[227, 233, 234, 235] Those reports are available online.

**Figure 63.** The Northwestern Crow is primarily an intertidal forager in Haida Gwaii but readily preys opportunistically on eggs of surface nesting seabirds like Pelagic Cormorant, Black Oystercatcher, and Glaucous-winged Gull. *Photo by R. Wayne Campbell.*

In some colony accounts we provide details about transects and quadrats sampled during the earlier BCPM surveys (Figure 64), especially when those details help to evaluate possible historical changes. Even though population estimates derived using transect data from BCPM surveys are not statistically comparable to those derived from the more systematic CWS surveys, data gathered along BCPM transects do provide reliable records of what was observed in the specific areas where transects were surveyed; these can be compared with more recent observations in those areas.

**Figure 64.** During the BCPM surveys in 1977, financial and time constraints prevented rigorous surveys of large colonies of burrow nesting species. However, during those surveys we often counted burrows in sample plots to help us make rough estimates of population size. In this photo, Anne Stewart is completing measurements for a plot on Hippa Island. *Photo by R. Wayne Campbell, 21 July 1977.*

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 and are used only for Pigeon Guillemots, Common Murres, and Tufted and Horned puffins, for which breeding population estimates are often difficult to obtain (see Part 1 [231]). However, 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 (Figure 65). Those were described in detail in Part 1 [231] 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 number in all colony tables; source numbers refer to entries in *Literature Cited* and *Other Sources of Information*.

**Figure 65.** The calling and crouching posture of this Black Oystercatcher suggests it is nesting. If we did not find a nest, based on this observation we would code this as "1S" to indicate that one pair was suspected nesting. *Photo by R. Wayne Campbell, Ramsay Island, BC, 6 June 2000.*

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 volume and past publications, including BCPM publications [34] and maps, [39] and CWS technical reports [227, 233, 234, 235] and other publications,[228, 285, 286, 287] the data here should be considered correct.

## WEST COAST GRAHAM ISLAND

Thirty-four sites along the west coast of Graham Island support over half a million nesting seabirds, 92% of which are concentrated on Langara, Frederick, and Hippa islands (Figure 66, Table 4). Ten species are known to breed, and one other, the Horned Puffin, is suspected of breeding. Common Murres were reported to have a large colony on the west coast of Graham Island,[22] but no other reference or observation of such a colony has been found. Darcus [81] reported one pair of Double-crested Cormorants (*Phalacrocorax auritus*) nesting amongst a colony of Pelagic Cormorants in the northern Graham Island area, but without confirmation, this record has not been accepted.[94] The region is the main centre for nesting Ancient Murrelets in the province, supporting 49% of the provincial population. It is also an important area for storm-petrels and Cassin's Auklets (Figure 67). The majority of the breeding Pelagic Cormorants on Haida Gwaii nest in this region, though the largest colony reported in 1986 on Tian Islets [227] was abandoned in 1988.

Historically, nesting populations of storm-petrels and alcids were much larger. Six species have been extirpated from colonies on Langara and the adjacent Cox and Lucy islands, and storm-petrels have disappeared from four colonies in the Port Louis area (Table 2, page 65). In 1927, Darcus found many Black Oystercatchers, Pigeon Guillemots, and Glaucous-winged Gulls nesting in suitable places along the shore of Graham Island.[81] He also noted Glaucous-winged Gulls nesting three miles inland on Graham Island in trees. Only a few Pelagic Cormorants, Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots are currently known to nest along the Graham Island shore. Glaucous-winged Gulls, which have increased in almost all areas of the province, have declined on Langara Island. Total historical populations of all species nesting around Langara Island likely rivaled those around the smaller Forrester Island, situated north of Langara in Alaskan waters, with an estimated nesting population of over one million birds.[261]

**Figure 67.** The west coast of Graham Island supports an estimated 218,300 Cassin's Auklets breeding at eight colonies. *Photo by R. Wayne Campbell.*

**Table 4.** Estimates of seabird breeding populations on the west coast of Graham Island as of 1990. Estimates are numbers of breeding pairs except for numbers in parentheses, totals in the "All species" column, and totals in the "Total breeding birds" row, which are numbers of individuals. See Appendix 2 on pages 467-468 for an explanation of the letter codes used to qualify population estimates.

| SITE CODE | SITE NAME | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | ALL SPECIES[a] | SURVEY YEAR(S)[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WG-010 | Langara Island | E | | 52 | 6 | 73 | x(187) | 24,000t | E | E | E | | 48,449 | 1981, 86, 88 |
| WG-020 | Cox Island | E | E | 0 | 1 | 2eS | S(23) | E | E | E | S(23) | | 52 | 1981, 86, 88 |
| 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, 86 |
| 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, 80 |
| WG-100 | Frederick Island | | | | 10e | 5 | x4(73) | 68,000t | 90,000t | | | | 316,103 | 1980, 86 |
| WG-110 | "Ingraham" Cliffs | | | 4 | | 4S | x3(21) | | | | | | 37 | 1977 |
| WG-120 | Tian Islets | E | E | 0 | 10 | 212 | x4(27) | | 100e | | | | 671 | 1986, 88 |
| WG-130 | Solide Islands | 800e | 800e | | 2 | 2eS | x(110) | | 950e | | | | 5,218 | 1977, 86 |
| WG-140 | Queen Island | E | E | | 1 | | | | | | | | 2 | 1977 |
| WG-150 | Pip Islets | | | | 5 | 6 | | | | | | | 22 | 1986, 88 |
| 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, 86 |
| WG-190 | "Kiokathli" Islets | 300e | 500e | | 5 | 8S | S(18) | | 300e | | | | 2,244 | 1977, 86 |
| WG-195 | "Buttercup" Rock | | | | 1 | | | | | | | | 2 | 1977 |
| WG-200 | "Hosu" Islets | | | | 3 | 2eS | (0) | | | | | | 10 | 1977, 86 |
| 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, 83, 86 |

**Table 4.** cont'd

| SITE CODE | SITE NAME | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | ALL SPECIES[a] | SURVEY YEAR(S)[b] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | (2) | | | | | | 4 | 1977 |
| 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 | 28 | 5(5) | | | | | | 74 | 1977 |
| 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, 86 |
| **TOTAL NESTING PAIRS** | | **17,600** | **20,300** | **116** | **94** | **617** | | **133,000** | **109,150** | **200** | | | | |
| **TOTAL BREEDING BIRDS** | | **35,200** | **40,600** | **232** | **188** | **1,234** | **861** | **266,000** | **218,300** | **400** | **663** | **5** | **563,683** | |
| **TOTAL CURRENT SITES** | | 7 | 6 | 7 | 26 | 19 | 25 | 4 | 8 | 1 | 3 | 1 | 34 | |
| ***Confirmed on last survey*** | | 7 | 6 | 7 | 21 | 11 | 13 | 4 | 8 | 1 | 1 | 0 | 31 | |
| ***Confirmed on any survey*** | | 7 | 6 | 7 | 21 | 15 | 15 | 4 | 8 | 1 | 2 | 0 | 34 | |
| ***Unconfirmed*** | | 0 | 0 | 0 | 5 | 4 | 10 | 0 | 0 | 0 | 1 | 1 | 0 | |
| **TOTAL HISTORICAL SITES** | | 12 | 11 | 13 | 26 | 20 | 27 | 6 | 10 | 3 | 5 | 1 | 35 | |
| ***Confirmed*** | | 12 | 11 | 13 | 21 | 15 | 16 | 6 | 10 | 3 | 4 | 0 | 35 | |
| ***Unconfirmed*** | | 0 | 0 | 0 | 5 | 5 | 11 | 0 | 0 | 0 | 1 | 1 | 0 | |
| **CURRENTLY ABAN-DONED SITES** | | 5 | 5 | 6 | 0 | 1 | 2 | 2 | 2 | 2 | 2 | 0 | 1 | |
| ***Previously confirmed*** | | 5 | 5 | 6 | | 0 | 1 | 2 | 2 | 2 | 2 | | 1 | |
| ***Previously unconfirmed*** | | 0 | 0 | 0 | | 1 | 1 | 0 | 0 | 0 | 0 | | 0 | |

[a] Number of individuals.

[b] For sources see individual island accounts.

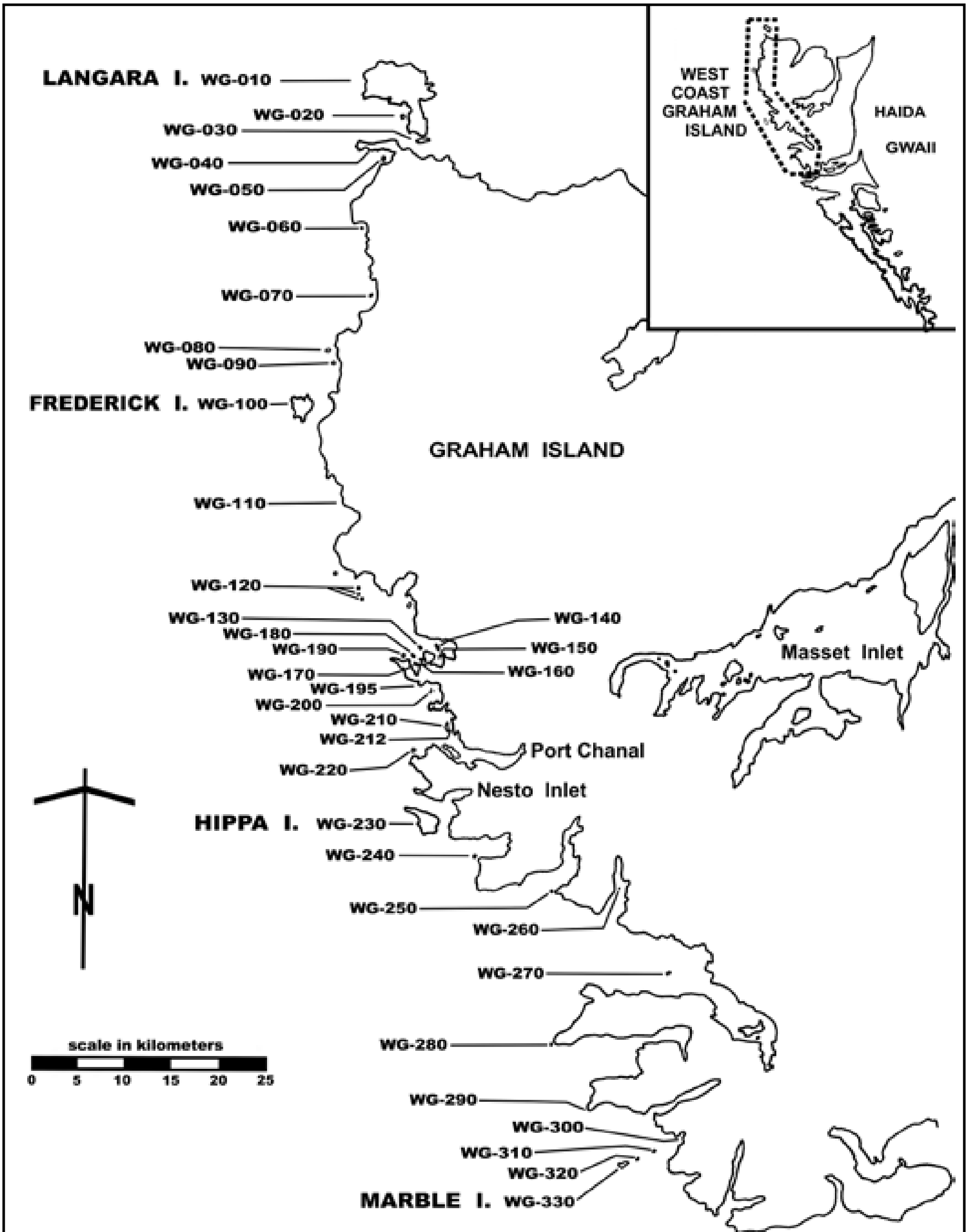



**Figure 66.** Locations of seabird colonies on the west coast of Graham Island (modified from Rodway et al.[235]).

Extirpations have been confined to the colonies off the northwest corner of Graham Island and in the Port Louis area. There is no evidence of decline at other colonies. Abandonment of storm-petrel colonies in the Port Louis area may have been associated with native predators. In 1947, Guiguet found the colonies on Queen Island, Olgivie Island, and MacKenzie Island had been ravaged by American Black Bears (Figure 68).[94] It appears the colonies never recovered, although they have not been re-surveyed since 1977. River otters may have contributed to the abandonment of the small petrel colony on Tian Islets. Introduced predators are associated with the much larger population impacts in the Langara Island area. Rats have been present on Langara Island for many years (rats were eliminated on Langara, Cox, and Lucy islands in 1995-1997; see Appendix 1), marten were introduced to Lucy Island in the 1920s,[76] and there are recent reports of marten and raccoon on Langara Island (see Langara Island account). There may be other factors contributing to the severe reductions of nesting populations in this area, but the presence of these introduced mammalian predators is likely sufficient cause.

Surveys of surface-nesting species were conducted in 1977 and 1986 and provide some trend data, but a number of colonies were not visited or adequately surveyed in 1986, and estimates of total nesting populations are incomplete, especially for Black Oystercatchers (only a small proportion of known nesting sites were visited in 1986).

All 13 known historical nesting sites used by Pelagic Cormorants (Table 4) were surveyed in 1977, when 191 nests were found at 12 sites. No cormorants were seen on Lucy Island in 1977 (or since) where Cumming [76] collected eggs in 1930. Seven of the 13 known nesting sites were surveyed in 1986. At those seven sites, numbers declined at two (Langara and

**Figure 68.** By examining scats and diggings, Charles Guiguet was able to determine that American Black Bears were preying on nesting storm-petrels on colonies in the Port Louis area in 1947. It seems likely that individual bears learned to exploit this seasonal food source. *Photo by R. Wayne Campbell.*

Sadler islands), increased at two ("Knox" Cliffs and Tian Islets), and three sites were abandoned in 1986. In spite of the abandonments, total number of nests at those seven colonies was greater in 1986 (192 nests at four sites) than 1977 (160 nests at seven sites), largely due to the increase from 28 to 98 nests on Tian Islets. Five colonies, with a total of 31 nests in 1977, were not surveyed due to bad weather in 1986, and total numbers for the entire region may also have been greater in 1986 than 1977. However, the colonies on Tian Islets as well as on Cox Island, which was not surveyed adequately in 1986, were abandoned two years later. The total population estimate of 116 pairs for the west coast Graham Island region (Table 4) based on the most recent surveys suggested a decline from the 191 pairs counted in 1977.

Decreases in Glaucous-winged Gull numbers on Langara Island, as well as on "Grassy" Islet, were offset by increases at other colonies. Overall numbers of gulls nesting along the west coast of Graham Island increased between 1977 and 1986, consistent with trends throughout Haida Gwaii (Figure 69).[227] All known gull colonies were visited in 1977; all but two ("Ingraham" Cliffs and "Kindakun" Islet) were surveyed in 1986. Counted or estimated numbers of nests at all visited colonies were 606 at 16 sites in 1977 and 692 at 17 sites in 1986 (note that numbers for 1986 have been revised from those previously presented [227]). Numbers were likely slightly higher than 692 in 1986 because two colonies were missed and because we could not access some colonies due to inclement weather and had to estimate numbers from the water. A greater proportion of empty nests was found in 1977 (66%) than in 1986 (15%); contents were determined in 572 nests (197 contained eggs or young) in 1977 and 576 nests (490 contained eggs or young) in 1986. Most nests were empty on the largest colony on Tian Islets in 1977, likely due to intense eagle predation. Surveys of Tian and Pip islets in 1988 revealed some decline since 1986, reducing the total population estimate to 617 pairs (Table 4).

**Figure 69.** Although decreases were seen at some colonies, the overall breeding population of Glaucous-winged Gulls on the west coast of Graham Island increased between 1977 and 1986, consistent with trends throughout Haida Gwaii. *Photo by R. Wayne Campbell.*

Further surveys are required to complete baseline population estimates for this region. The three largest colonies of burrow-nesting species have been surveyed with replicable line transect techniques,[235] but we have only rough estimates from 1977 for other colonies.[39] Some cormorant, gull, and oystercatcher colonies were not visited or were inaccessible due to rough weather in 1986,[227] and counts from 1977 are the most current for those colonies (Table 4).

As of 1990, the only colonies in this region with protected status were "Lepas" Islet and Hippa Island, which are provincial Ecological Reserves. More recently, some protection has been given to Frederick Island, Langara Island, and most other previously unprotected seabird colonies along the west coast of Graham Island as Heritage Site/Conservancy areas under the BC Parks system, jointly managed by the Council of the Haida Nation. Colonies north and south of Rennell Sound are within the Duu Guusd Heritage Site/Conservancy and the Daawuuxusda Heritage Site/Conservancy, respectively.

Major staging areas for Ancient Murrelets occur on the waters around the large colonies on Langara, Frederick, and Hippa islands. Restrictive measures are needed to protect staging birds in these areas from disturbance, especially given the increased frequency of high-speed boat traffic associated with the commercial fishing resorts that have proliferated in these areas.

## WG 010 LANGARA ISLAND (KUSGWAI)

**Location:** *54°14'N 133°01'W; 103 K/2,3,6,7.* Northwest tip of Graham Island. Also locally known as North Island.

**Description:** *3,105 ha; 160 m high; Forested.* Most of Langara Island has a rugged rocky shoreline with numerous steep bluffs and cliffs (Figures 70 and 71). There are sandy and rocky bays towards the south end and on the east side (Figure 72). The dominant trees in the mature forest exhibit a clear transition from spruce near shore to hemlock and then redcedar (*Thuja plicata*) in the interior. Many interior slopes are open and mossy with grass along the shore edges. Salal grows in areas with less forest canopy and is dense on the west side where large areas of the forest have been cut, blown down, or died. In the center of the island is a poorly drained plateau.

The vicinity of Langara Island was an important center for the Haida people.[79] There was a village site at Dadens (Figure 73) at the south end of the island and seasonal camps were established at various locations around other parts of the island. Henslung Cove provides a sheltered anchorage and is the main harbour for fish boats in the area. Fish camps, a store and restaurant, small dwellings, and a fishing resort have been established in the cove at various times. A lighthouse was built on Langara Point in 1913 and has been manned ever since (Figure 74). An emergency telephone line was erected between the lighthouse and Henslung Cove at that time. Langara housed a radar station during World War II and the corduroy roads and telegraph lines were still visible in 1981.

**Historical summary:** Langara Island has been one of the most frequently visited and intensively studied seabird colony sites in Haida Gwaii. As a result we have more historical information for Langara Island than for any other site in the area, and have a reliable picture of population change. Nesting seabirds on the island were first documented in 1910 when Anderson collected eggs of Ancient Murrelet and Black Oystercatcher (Table WG-010). Green also may have collected Black Oystercatcher eggs in

**Figure 70.** Most of Langara Island has a rugged shoreline with precipitous headlands, cliffs, and eroded rock formations. *Photo by R. Wayne Campbell, May 1966.*

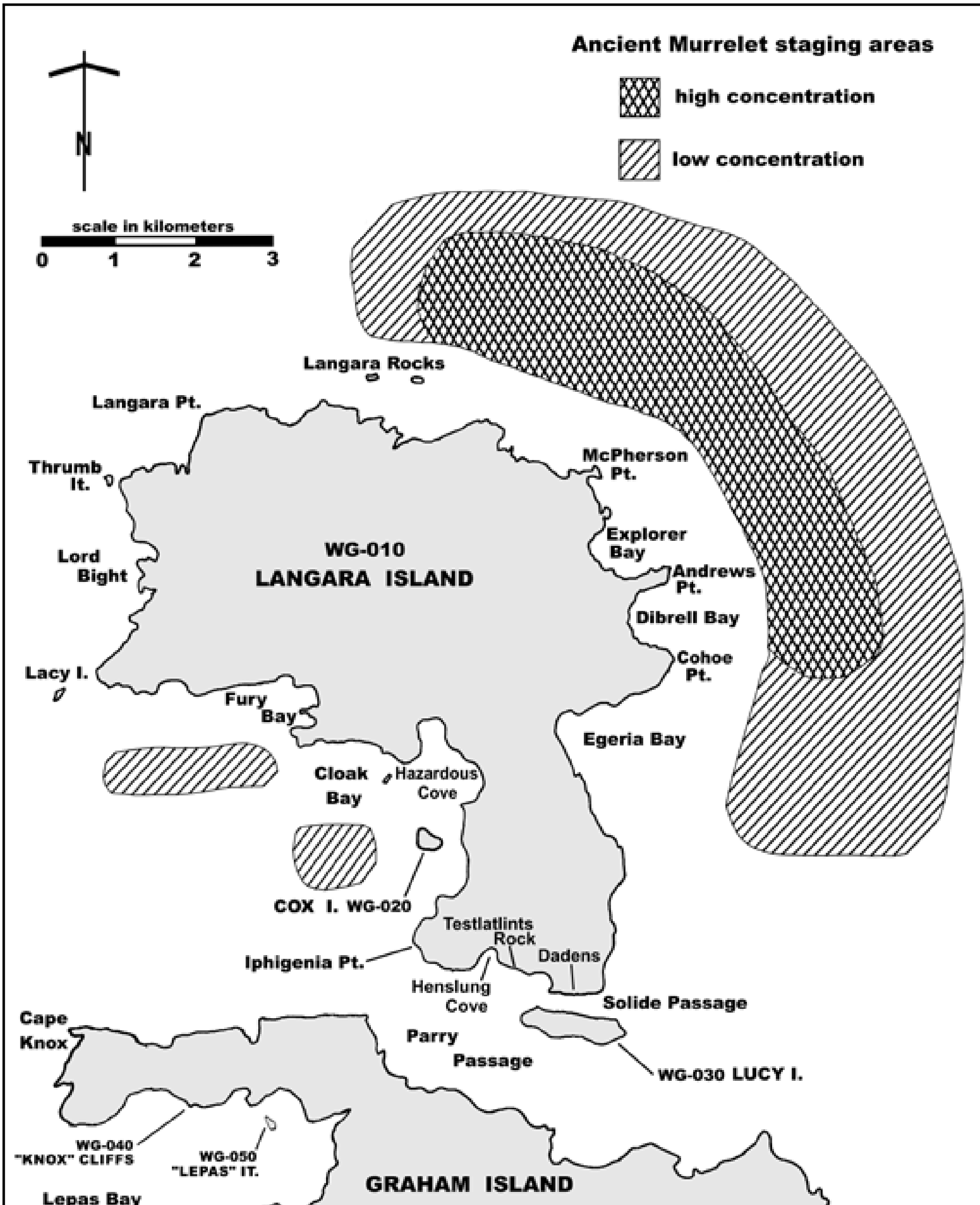



**Figure 71.** Locations mentioned in the text and Ancient Murrelet staging areas observed in 1981 around Langara Island, BC.

**Figure 72.** Between rocky headlands on Langara Island are a number of bays that collect windrows of kelp during storms. *Photo by R. Wayne Campbell, June 1988.*

**Figure 73.** The village site at Dadens on Langara Island was still being visited regularly by Haida people from Old Masset in the 1960s. *Photo by R. Wayne Campbell, May 1966.*

this area at this time, as there is a set of eggs [328c] collected on 3 June 1910 with the location listed as just Graham Island. Green, Brooks, Darcus, Young, and Cumming had all visited the island by 1930 and had recorded nesting by Pelagic Cormorants, Glaucous-winged Gulls, Pigeon Guillemots, Cassin's Auklets, and Tufted Puffins. Darcus reported one pair of Double-crested Cormorants nesting amongst the Pelagic Cormorants in 1927,[81] but this record was not substantiated and was not accepted by Drent and

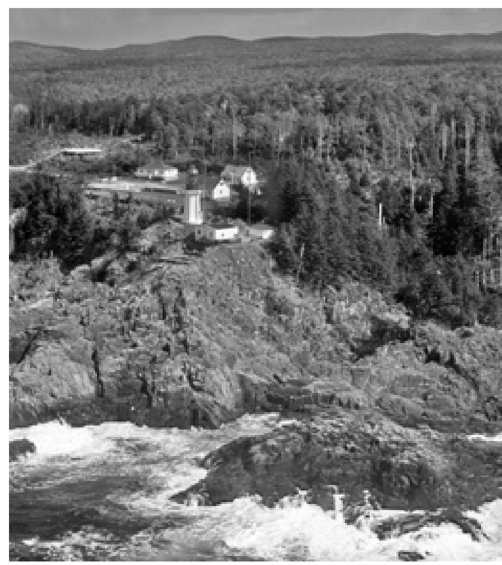


**Figure 74.** This lighthouse on Langara Point is one of two lightstations in Haida Gwaii. The second is at Cape St. James, at the south end of Haida Gwaii. Both stations were established in 1913. The Cape St. James lighthouse was automated in 1992 and the Langara lighthouse remains the only manned lightstation in Haida Gwaii. *Photo by Moira J.F. Lemon, 15 April 1980.*

Guiguet.[94] In 1930, Cumming examined a female Common Murre from Langara Island with a fully formed egg,[76] but nesting was not confirmed.[94] Other egg specimens from a location given as "north end of Graham Island" may also have been collected on Langara Island. These include three Tufted Puffin eggs collected from burrows by D. O'Brien on 19 June 1918 (these were in the collection of F. M. Carryl but we could not determine the present location of those eggs; Figure 75), and several clutches of Glaucous-winged Gull eggs collected by D. O'Brien and F. M. Carryl on 20 June 1918.[326a, 328d] This latter record is the earliest confirmation of Glaucous-winged Gulls nesting in the area.

It is unclear whether Rhinoceros Auklets were present on the island in the early part of the 20th century. Both Darcus [81] and Young [296] stated that there were no breeding colonies of Rhinoceros Auklet in the vicinity of Langara Island or on the west coast of Graham Island, and Brooks and Swarth [22] made no mention of colonies in the Queen Charlotte Islands. Carter and Sealy [57] inferred breeding during the years 1910-1915 from statements made by Green,[137] but Green only generally described the difficulty of excavating Rhinoceros Auklet burrows in the discussion of his 1915 visit to Langara; he did not mention them nesting on the island. Breeding was first confirmed in 1932, when Young collected a Rhinoceros Auklet egg from

**Table WG-010.** Seabird nesting records for Langara Island. See Appendix 2 for codes.

| DATE | FTSP | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|
| May-Jun 1910 | | | x | | | x | | | | 94, 255, 324a |
| 1 May 1914 | | | | | | x[a] | | | | 255, 322a |
| Apr-May 1915 | | | | | | 1,000's | | | x(100) | 137 |
| Jul 1920 | | x | x | | | x | | | x | 22, 19, 94 |
| Jun 1926 | | | | x | x | x | x | | x | 295, 296, 324b, 325a |
| Apr-Jul 1927 | | 500+e | x | | x | x | x | | x | 81, 324c, d |
| Jun-Jul 1930 | | x | | x | x | | x | | | 76 |
| 21 May 1932 | | | | | | | | x | | 94 |
| Apr-May 1936 | | | x | | | x | x | | | 94, 324e, 328e |
| May-Jul 1946 | | 200+e | | | x | x | x | x | x | 94, 314 |
| May-Jul 1947 | | 200-300e | x | x | x | x | x | x | x(150) | 94, 327a, 328f |
| 23 Apr 1948 | | | | | | | x | | | 94 |
| May 1952 | x | x | | x | x(30-50) | x | | x | x(50-60) | 94 |
| 1957 | | 250e | | 150e | | | | | | 94 |
| 1958 | | 150e | | 200e | | | | | | 94 |
| 1959 | | 75e | | 50e | | | | | | 94 |
| Jun 1960 | | | | | | 2,000+e | | | 15+e | 94 |
| 26 May 1961 | | | | | | x | | | | 314 |
| Apr-May 1966 | | | | | | x | | | | 31, 32, 33 |
| May-Jul 1968 | | | x | 158-168 | x | x | | | | 314 |
| May-Jun 1969 | | | 11[11] | | x | x | | | x(24) | 314 |
| May-Jul 1970 | | x | | | x(6) | x | E | | | 248, 252 |
| Jun-Aug 1971 | | 75-100e | x | 50e | x(60) | x[b] | E | | | 248, 252, 314 |
| May-Jul 1972 | | 180-200e | 3+ | 90-100e | x(71) | x | | | | 314 |
| May, Jul 1977 | E | 63[39] | 2[2] | 126[53] | 80e(157) | 25,000e | E | E | E | 39, 314 |
| May-Jun 1981 | E | S | 6[6] | 104e | x(160) | 26,000t | E | E | E | 232, 235 |
| 1 Jul 1986 | | 52[13][c] | x | 73[59][c] | x(3+) | x | | | | 227, 302 |
| May-Jun 1988 | | | | | x(187) | 24,000t | | | | 235, 314 |

[a] Sealy and Carter mistakenly gave a year of 1913 for this record.[255]
[b] Sealy made a retrospective estimate of 80,000-90,000 pairs at this time.[288]
[c] Contents of four cormorant and two gull nests were not determined in 1986.

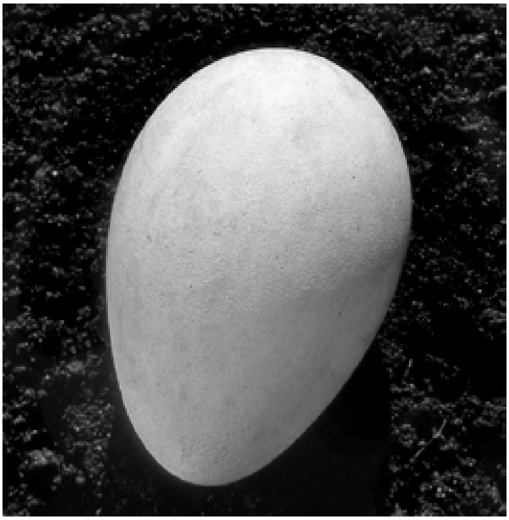


**Figure 75.** The Tufted Puffin lays a large, single white egg that is easy to identify. Problems with historical records arise however because some early egg collectors gave only approximate locations for where specimens were obtained. The location for three Tufted Puffin eggs collected in 1918 was recorded as "north end of Graham Island." They were likely collected on Langara Island. *Photo by R. Wayne Campbell.*

Langara Island, and dispersed nesting around the island was reported in the 1940s and 1950s.[94]

Green [137] also made no mention of nesting by Cassin's Auklets and we could find no other records that confirm nesting in the years 1910-1915 as indicated by Carter and Sealy.[56] Young [296] first reported breeding by Cassin's Auklets in 1926. Brooks [22] confirmed nesting by both Fork-tailed and Leach's storm-petrels on adjacent Cox Island in 1920, but it was not until 1952 that Guiguet documented nesting of Fork-tailed Storm-Petrels on Langara Island. Leach's Storm-Petrels have never been recorded nesting on the island.

The BCPM survey in 1977 was conducted from 10 to 22 May and on 27 and 28 July. The more detailed CWS census in 1981 was carried out from 6 May to 15 June. The Ancient Murrelet colony was resurveyed from 6 May to 6 June 1988 (and also in subsequent years; see Appendix 1).

***Rats in My Nightmares***

*I remember the time when we landed at Dadens on Langara Island in May 1977 and I saw rats running around the logs at the shore. I was horrified, as this is the only animal I have a distinct distaste and fear of. I remember being petrified of putting my hand down burrows to check for nesting Ancient Murrelets throughout the two-week period that we surveyed Langara Island. This fear was augmented by the headless corpses of Ancient Murrelets that we found on the ground outside burrows. It felt like a macabre scene out of a Hammer horror film, and when we camped out to monitor the nighttime activity of the murrelets, I was continually frightened that rats might run over me. I felt great relief when we left Langara Island to survey other rat-free colonies. I also remember the joy I felt on Lepas Bay Petrel Island, when I was able to overcome my fear of sticking my hand down dark holes, to feel two soft and gentle Fork-tailed Storm-Petrels courting in the burrow* (Figure 76).

*(contributed by Trudy Chatwin)*

**Figure 76.** Searching burrows for nesting seabirds was a rewarding experience for Trudy Carson (now Chatwin) on most colonies, like here on Frederick Island. On Langara Island however, the risk of encountering a rat made checking burrows a terrifying task. *Photo by Moira J.F. Lemon, 30 May 1980.*

Though we have few actual numbers from those early observations, it is clear that populations and colony areas were much larger than they are at present. Recent surveys indicate that four burrowing species have been extirpated: Fork-tailed Storm-Petrels, which in 1952 Guiguet found nesting in all grassy areas on Iphigenia Point; Cassin's Auklets, which Darcus called abundant in 1930, breeding all along the coast of the island; Rhinoceros Auklets, which were nesting in dispersed areas around Iphigenia Point, Lord Bight, and Langara Point; and Tufted Puffins, of which Brooks reported several colonies around the southwest corner in 1920 and Darcus noted a large colony west of Iphigenia Point in 1927. These four species were likely no longer nesting on the island by 1977. Sealy reported no active Rhinoceros Auklet burrows on Iphigenia Point or elsewhere in 1970-71, although he did observe one adult carrying fish in Cloak Bay on 4 Jul 1970 and another carrying fish in Egeria Bay on 27 Jul 1971, which suggested nesting by isolated pairs somewhere in the area.[252] He also counted 460 Rhinoceros Auklets around Langara Island, mostly in Cloak Bay, on 7 July 1971. Sealy found no evidence of Cassin's Auklets breeding in 1970 and 1971.[252] We saw four possible Cassin's Auklet burrows on the east side of Henslung Cove in 1977, but no other evidence of nesting by that species was found then or since (small numbers were suspected nesting again in 2004; see Appendix 1). We found no signs of nesting by storm-petrels, Rhinoceros Auklets, or Tufted Puffins in 1977.

A substantial population of Ancient Murrelets still breeds on Langara Island, but their numbers have drastically declined and large areas where they used to nest have been abandoned. Green reported that "the whole island is a warren of Ancient Murrelets."[137] Guiguet, in 1947 during the murrelet hatch, noted thousands of chicks heading down to the sea every night from the Henslung Cove area. Beebe described the numbers as "astronomical",[4] and in 1966, Campbell stated that the ground in the Dadens area was "riddled with burrows (Figure 77)."[33] By 1970, Sealy noted that the Dadens colony and nearby areas above Beal Cove and around and north of Holland Point were essentially abandoned.[205, 252] Retrospectively, Sealy estimated a total of 80,000-90,000 pairs nesting on Langara Island in 1971.[288] In 1977 there were few birds remaining in the Henslung Cove area where Sealy's study area A was located,[248] and by 1981 the colony area south of Egeria Bay (Sealy's study area B), which in 1977 had an estimated 6,000 pairs nesting, was completely deserted. In 1981 the only extensive concentration of burrows was around McPherson Point and those had an occupancy rate of only 26%.[235]

**Figure 77.** In 1966, the Ancient Murrelet colony near Dadens on Langara Island was "riddled with burrows." In 1970, the colony had been abandoned. *Photo by R. Wayne Campbell, May 1966.*

The Ancient Murrelet colony at McPherson Point was surveyed with line transects in 1981 and again in 1988. Between 1981 and 1988, the colony area contracted from 116.6 ha to 45.6 ha, though population estimates were similar in the two years.[235] Similar estimates resulted from a higher mean burrow density and occupancy rate in 1988 than in 1981, though t-tests revealed no significant differences in those values.[8] Higher mean density in 1988 appeared to result from abandonment of lower density areas and a concentration of nesting birds into a higher density core. Colony boundaries were located further inland in 1988 than in 1981. The 1988 occupancy rate (38%) was still much lower than the median rate (63%)[233] of all other colonies in Haida Gwaii. Large standard errors of population estimates in 1981 and 1988 meant that only a large change in nesting population could be detected.

Changes in numbers of Ancient Murrelets observed staging around Langara Island also indicate a major decline. Guiguet made a "conservative estimate" of 60,000 staging birds in a 300 m by 300 m area in Parry Passage in 1952.[205, 304] Such concentrations have not been observed since. A maximum of 7,857 birds were counted in Cloak Bay in 1972[205] and a total of 4,756 were tallied around the entire island in 1981.[232] No birds were seen in Parry Passage and only 1,420 were counted in Cloak Bay in 1981. The major staging area in 1981 was off McPherson Point on the northeast side of the island (Figure 71, page 86). In 1988, numbers staging off McPherson Point increased through May to a maximum of 4,620 birds counted there at the beginning of June.[8]

The magnitude of the population decline of Ancient Murrelets on Langara Island can be inferred from the known change in the extent of burrows. The 45.6 ha of colony in 1988 extended around 3.0 km of shoreline. In 1981, burrows extended around 7.1 km of the island and occupied 116.6 ha.[235] Beebe spent 94 days over five breeding seasons on Langara Island between 1952 and 1958.[4] He stated that "the entire fringe forest seems to be one continuous colony, extending to all parts of the island that I know, from Cloak Bay around to Langara Point." That is a perimeter distance of approximately 24 km, more than three times the colony extent in 1981, which we will assume represents 350 ha of colony. Using the average burrow density of 840 burrows/ha determined on Langara in 1981, and the median Haida Gwaii occupancy rate of 63%, we estimated there were 290,000 burrows and 190,000 pairs of Ancient Murrelets nesting on Langara Island in the mid-1950s. The Haida recollect that Langara Island had the highest density of burrows in Haida Gwaii, higher even than that on Rankine Island on the east coast of Moresby Island.[101] Based on the average density of 1,154 burrows/ha determined on Frederick Island in 1980 (which is higher than that on Rankine Island), we would suggest a past population in the order of 250,000 pairs, 98% of the current total estimate of Ancient Murrelets nesting in BC. Other authors have estimated similar[114] or even larger[204] historic numbers on Langara Island. It may have been the largest Ancient Murrelet colony in the world.[204]

Pelagic Cormorants have been recorded nesting at four locations on Langara Island: three at Langara Point (Figures 78 and 79), including the crevice directly north between the lightstation and the lighthouse keeper houses, a pair of gorges 300-400 m east of the lightstation, and the rocks directly below west of the lightstation; and one on the cliffs west of Iphigenia Point. Darcus reported two large colonies on Langara Island, one on the west side of the island and one at an unspecified location.[81] Cumming noted two unspecified nesting locations that he said were used in alternate years.[76] In 1946, Guiguet recorded nesting in the gorge east of the lightstation and at Iphegenia Point.[94] About 50 birds, some at nests, were seen at the Iphegenia cliffs in May and June that year. The following year, nesting cormorants at Langara Point moved after they were disturbed by marauding crows, ravens, and gulls. Guiguet saw 200-300 pairs building nests directly below the lightstation on 22 May. The birds subsequently abandoned that location and moved back to the gorge used in 1946. Guiguet saw no birds at Iphegenia Point in 1947 and cormorants have not been recorded nesting there since then. Since 1947, the use of the three locations around Langara Point has varied. Nests were built in the eastern gorge in 1952, the eastern gorge (100 pair) and on the west rocks below the lightstation (150 pair) in 1957, and below the lightstation in 1958.[94] Wayne Nelson found cormorants nesting in the western of the pair of gorges east of the lightstation in 1972; nests were located in the crevice north of the light (33) and on the west rocks (30) in 1977; and in 1986, they were nesting on both east and west sides (23 and 27 nests, respectively) of the crevice north of the lightstation and on the southwest corner of the west rocks (2 nests).

The main nesting location for Glaucous-winged Gulls is presently at Langara Point. However, early records suggest that, prior to about 1950, gulls were absent from this location and that only small numbers nested elsewhere around Langara Island. Cumming reported a few Glaucous-winged Gull nests on cliffs around the island and on mossy pads on spruce trees

**Figure 78.** Location of Pelagic Cormorant colony below lightstation at Langara Point in 1977. *Photo by Michael S. Rodway, 28 July 1977.*

**Figure 79.** Nest and eggs of Pelagic Cormorant at Langara Point in 1986. *Photo by Michael S. Rodway, 1 July 1986.*

in the centre of the island.[76] Darcus also reported a colony of Glaucous-winged Gulls nesting in trees a mile from the sea on Langara Island.[81] Central interior areas have not been surveyed for nesting gulls since then. In 1947, Guiguet recorded scattered pairs nesting on pinnacles along the southwest coast. Neither Cumming nor Guiguet mentioned nesting at Langara Point. Guiguet visited Langara Point in 1946, 1947, and 1952, where he recorded nesting by Pelagic Cormorants, and it is unlikely that he would have neglected to record nesting gulls if they were there. Lightkeeper E.A. Hart reported nesting at Langara Point during his stay from 1957-59 and there has been a good-sized colony recorded there on every visit since. The apparent absence of nesting prior to that is puzzling. From 1968 to 1986, all nests counted were at Langara Point, except for one pair nesting on a small islet west of Fury Bay and one pair on a cliff ledge west of Iphigenia Point in 1981, and two pairs nesting on the cliffs west of Iphigenia Point in 1986.

Black Oystercatcher nests have been found at various locations, mostly around the west side of the island from Iphegenia Point to Langara Point. Wayne Nelson found 10 nests along this stretch in 1969 and we found six nests in 1981. On the east side of the island, eggs were collected from two nests found around McPherson Point by Guiguet and Maquire in 1947, and single nests were found at Andrews Point by Wayne Nelson in 1969 and west of McPherson Point in 1977 (Figure 80). Pigeon Guillemots have been reported nesting in a number of areas around the island, especially around Iphigenia Point, headlands either side of Henslung Cove, Testlatlints Rock, Village Point, Egeria Bay, Andrew's Point, and Langara Point.

Pelagic Cormorants, Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots still nest on the island, but the population of cormorants appears to have declined since the 1920s. Nesting gull numbers have decreased in recent years, contrary to the trend at most other colonies in the region.[227]

**Remarks:** The decline of the seabird populations on Langara Island was paralleled on its two smaller neighbours, Cox Island and Lucy Island (see separate accounts). There is no evidence that populations have declined on colonies immediately south of Langara

**Figure 80.** Parts of Langara Island's rocky shoreline lack small shells and pebbles typically used by Black Oystercatchers for nesting material. Some oystercatcher nests were found on bare rock, such as this one at McPherson Point. *Photo by Michael S. Rodway, 17 May 1977.*

along the coast of Graham Island. There may be multiple causes for declines and extirpations of nesting seabirds in the Langara area but introduced rats are likely most responsible.

The Haida traditionally harvested Ancient Murrelets and probably other species at Langara Island. Green reported that they were taking thousands in 1915,[137] and Guiguet bought Ancient Murrelet adults and eggs from First Nations people digging burrows in 1946. Although subsistence hunting of seabirds is permitted under the federal Migratory Bird Convention Act, few Haida presently carry on this tradition. The impact of traditional harvesting on breeding populations is unknown.

Langara Island supports large numbers of Bald Eagles and Peregrine Falcons, both of which are major predators of Ancient Murrelets.[205, 232, 288] When Cassin's Auklets and storm-petrels nested in the area, they were also frequent prey.[4, 5] Between the early 1950s and the late 1960s, the falcon breeding population declined from 21-23 pairs to 5-6 pairs.[205]

Five Peregrine Falcon eyries were active in 1981. Nelson and Myres estimated that a family of falcons consumed 1,000 Ancient Murrelets in a season on Langara Island and they discussed the falcon decline in relation to that of the murrelets (Figure 81).[205] They postulated that either biocides or warm water currents may have affected the food chain. We suspect the cause is local because the declines are only in the Langara area.

**Figure 81.** The population decline of Peregrine Falcons breeding on Langara Island during the 1950s and 1960s paralleled the decline of their seabird prey base. *Photo by R. Wayne Campbell.*

In 1981 we counted 42 Bald Eagle nests, 31 of which had adults close by, including 11 with adults sitting in nests (Figure 82).[235] That year we observed Bald Eagles hunting Ancient Murrelets when they were active in the colony at night.[288] Eagles perched low in the forest and simply pounced on murrelets as they scurried across the forest floor. We observed that eagles often plucked captured murrelets on the forest floor, leaving behind distinctive circular feather piles (Figure 83). Eagle pellets containing murrelet feathers and radiating streaks of eagle feces were often seen in the vicinity of such feather piles. The frequency of these feather piles within sampled quadrats suggested that eagles were responsible for the predation of thousands of Ancient Murrelets during one breeding season (Table 3, page 68) and indicated that the impact of eagles as well as falcons on total populations was substantial.

**Figure 82.** During our seabird surveys we counted all Bald Eagle nests and considered a nest active if an adult was present and appeared to be incubating. *Photo by R. Wayne Campbell.*

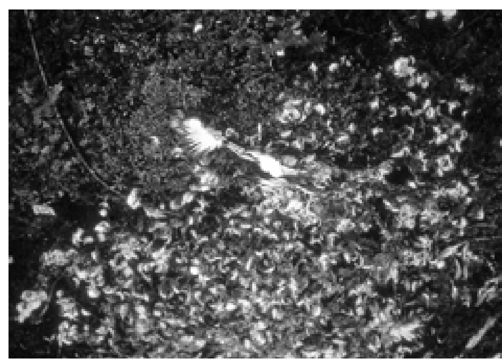


**Figure 83.** The circular pattern of remains of an Ancient Murrelet found at Cohoe Point on Langara Island is indicative of predation by a Bald Eagle. *Photo by Michael S. Rodway, 3 June 1981.*

Gill-net fisheries may have had an impact on seabird populations in the Langara Island area. C. Bellis (submission to the falcon enquiry)[259] suggested that more than 10,000 Ancient Murrelets may have died each season during the 1950s and 1960s by flying into anchor lights and striking guywires of anchored fishboats. In addition, as many as 500 murrelets (though usually fewer than 50 per boat) were caught in gill-nets during a single night's fishing. The large fleet with a maximum in 1963 of 452 vessels fishing around Langara may have contributed to the decline of Ancient Murrelets prior to the 1970s.[9]

River otters were common and their trails, dens, and scats were observed in 1977 and 1981. Scats indicated a diet of fish and crustaceans; only one of numerous scats examined in both years contained feathers. There is no indication that native river otters have contributed to the decimation of seabird populations on Langara Island.

Darcus noted that domestic cats had almost exterminated Sooty Grouse (*Dendragapus fuliginosus*) on the island.[81] Seabirds would also likely be prey. Wayne Nelson in July 1968 reported at least nine and five gull chicks killed on two separate days, respectively, at Langara Point by the lightkeeper's dog, and in 1972 found 10 adults in the colony that had been shot by the lightkeepers. Beebe mentioned a report of a raccoon sighted on Langara Island,[4] and the head lighthouse keeper in 1986, K. Brunn, reported seeing a raccoon track in the snow on the boardwalk south of the lighthouse.[298] He also reported two sightings of marten on the island: one in early November 1985, from a distance of 20 feet on the boardwalk east of the light, and one in February on the beach east of Cox Island. We recall seeing marten near the fish camp at Henslung Cove in 1966. The spread of marten to the island may stem from their introduction on Lucy Island by Al Peevey [79] (see Lucy Island account), although it is possible that Peevey, who lived in Henslung Cove for many years, also released marten on Langara Island. Such introduced predators may have contributed to seabird population decline and extinctions on the island.

Introduced Black Rats (*Rattus rattus*) were present on the island for many years and are known predators of unattended eggs and small young (Figure 84).[31, 167, 194, 252] They were first collected on Langara in 1946.[9] In 1977, at the ends of eight burrows, we found a dead adult Ancient Murrelet that had been chewed open on the neck and breast, suggesting rat predation. Five of these were found in the Henslung Cove area and rats were seen there below the colony. Carcasses with similar wounds were discovered in burrows in 1981 and 1988, and 29% of burrows explored to their

**Figure 84.** These Ancient Murrelet prey remains found on Langara Island on the slopes east of Cox Island were likely from rat predation. *Photo by Michael S. Rodway, 19 May 1977.*

**Figure 85.** Ancient Murrelet eggshells gathered from the grassy slopes in Henslung Cove in 1966 that had been depredated by rats. In 1966, only Black Rats were observed on Langara Island. The larger, more aggressive Norway Rats were first detected on the island in the early 1980s and subsequently displaced Black Rats. *Photo by R. Wayne Campbell, May 1966.*

ends contained murrelet bones in 1988.[8] Burrows with bones were most prevalent in abandoned colony areas. Rats likely have had a major impact on nesting populations, but their impact appears to have been gradual. Beebe stated that they were "somewhat predatory on the burrowing seabirds but not alarmingly so." [4] Campbell noted that predation was only evident in Ancient Murrelet burrows in the gentle sloping upper beach areas and not in the steeper heavily forested slopes (Figure 85).[31] Sealy, in his study plots, found two out of 114 nests destroyed by rats during incubation in 1971 and discovered six partially eaten chicks in burrows in 1970.[248] Such an insidious toll could have a major impact over the long term.[8] However, the larger Norway Rats (*R. norvegicus*), first confirmed in Haida Gwaii in 1981, may have displaced Black Rats on Langara Island and become a more serious threat to burrow-nesting seabirds in recent years.[10] Bertram discusses in detail the potential role of rats in the historical declines of seabird populations on Langara Island.[9] Storm-petrels and auklets that nest close to shore and leave their young unattended would likely suffer more from rat predation than Ancient Murrelets. The earlier abandonment by those species may have been the result.

Intensive research projects have been carried out on Langara Island by Sealy, who studied the breeding biology of Ancient Murrelets and the feeding ecology of Marbled and Ancient Murrelets during the 1970 and 1971 breeding seasons; [242-248, 250, 252, 257, 258] and by Nelson, who studied the behavioral ecology of Peregrine Falcons from 1968 to 1973, and has visited the island many times since.[202-205] Campbell banded Ancient Murrelets in 1966. [32, 33]

***Getting Rid of the Rats***

*One of the significant seabird conservation efforts of the 20th century was the elimination of rats from Langara and adjacent Cox and Lucy islands in an attempt to restore their seabird colonies.[177, 267] Before rats were incidentally introduced, these islands likely supported in excess of a million nesting seabirds. Spearheaded by Gary Kaiser of the Canadian Wildlife Service, a project to eliminate rats took advantage of mitigation funds made available through the litigation settlement following the Nestucca oil spill, which killed an estimated 56,000 seabirds in BC and Washington waters during the winter of 1988-1989.[24] The project adapted an approach that had been successfully used on smaller islands in New Zealand. An expert from New Zealand, Rowley Taylor, was recruited to conduct the initial feasibility study and help design the eradication methods to be used. A weather-resistant, wax block containing bait to attract rats and the anticoagulant poison brodifacoum had to be specially manufactured. A total of 30,577 bait stations were set out in a 100 m grid-like pattern across the islands. Bait was placed in the centre of a 0.5 m-long piece of bright orange, 100 mm diameter drainage pipe pinned to the ground at each station. These tubes were designed to minimize access by non-targeted wildlife. Access trails had to be built around Langara Island to facilitate the deployment and subsequent checking and rearming of bait stations at 48 h intervals, as well as the eventual removal of stations and all poison bait once the program was complete. The project involved 122 people, with as many as 30-70 field personnel stationed on Langara Island at one time during the main baiting campaign in summer 1995. Bait stations could not be checked during the winter but were checked again through the summer of 1996 and spring 1997. The islands* *were declared rat free in 1997 and all stations and other signs of the project were removed.*

*Monitoring of non-target species revealed some mortality of Common Ravens and Dusky Shrews (Sorex monticolus). Unfortunately, Common Ravens (Figure 86) learned to tamper with the stations to access the bait and 20 ravens, constituting about 50% of the island population, were found dead either from directly consuming the bait or from scavenging poisoned rats during the summers of 1995-1997. There was evidence of declines in the density of shrews during the campaign but populations appeared to recover within a year. There was no evidence of impacts to other wildlife species.*

*Have nesting seabirds recovered? Results of a follow-up survey in 1999 were discouraging and indicated continued decline in the remnant Ancient Murrelet population.[99] A subsequent survey in 2004, however, showed that the Ancient Murrelet colony area had expanded to twice its pre-eradication area, burrow occupancy rate had returned to that typically found on rat-free islands, and total estimated nesting population was almost double that found in 1999.[222] In addition, a small pocket of Cassin's Auklet burrows was found, indicating that other species were starting to recolonize the island. Although this was good news, prognosis for the future remained guarded. A land-based fishing lodge was built over former seabird nesting areas and another floating resort was established at Langara Island. Disturbance and light pollution from those lodges likely impacts birds on their offshore staging areas and when they are visiting the colony, and the risks of re-introductions of rats by ships visiting those resorts remain high.[177] In addition, tracks of a raccoon were seen on Langara Island in 1996. Establishment of raccoons on the island would herald the demise of all burrow-nesting seabirds. Thus, preventative measures and constant vigilance are required to protect a future for breeding seabirds on Langara Island and to vindicate the enormous effort and impact involved in eradicating rats from the island.*

**Figure 86.** Mortality of non-target species is always a concern for programs designed to eradicate introduced species. During the campaign to eradicate rats on Langara Island, about half of the Common Raven population on the island succumbed from consuming bait directly or eating poisoned rats. *Photo by R. Wayne Campbell.*

## WG-020 COX ISLAND

**Location:** *54°12'19"N 133°00'51"W; 103 K/3.*
In Cloak Bay on SW corner of Langara Island (see Figure 71 on p. 86).

**Description:** *10.6 ha; 114 m high; Forested.*
The perimeter of Cox Island consists of cliffs, steep grassy slopes, and rock pinnacles rising abruptly from the sea (Figure 87). On the plateau-like top is a predominantly spruce forest with an understory of grass around the edges and bare ground in the middle.

**Figure 87.** Cox Island is a dramatic looking island, with its cliffs, steep grassy slopes, and rock pinnacles topped with spruce trees. *Photo by Michael S. Rodway, 19 May 1977.*

**Historical summary:** Cox Island has a history of colony extirpation similar to that of its large neighbour, Langara Island. Five previously nesting burrowing species had abandoned the colony by 1971 and two surface nesters were absent in 1981 (Table WG-020).

Early visits were made to the island by Brooks, Green, Darcus, and Cumming. Carter and Sealy [54, 56] reviewed the earliest storm-petrel and Cassin's Auklet specimens collected by Brooks and Green in 1920. Guiguet spent considerable time on the island in 1946, 1947, and 1952, together with Stewart in 1946, and Beebe in 1952. Maguire was on the island in 1947. These observers documented nesting by Fork-tailed Storm-Petrel, Leach's Storm-Petrel, Pelagic Cormorant, Black Oystercatcher, Glaucous-winged Gull, Ancient Murrelet, Cassin's Auklet, and Tufted Puffin. Maguire reported seeing downy young, but no eggs, of Rhinoceros Auklet on 28 May 1947, an early date for young of this species and the only record of this species ever nesting on the island. Although Horned Puffins can be common in winter in this area,[256] one seen flying with Tufted Puffins near Cox Island on 31 July 1977 [44] is the only summer observation we have of this species in the vicinity of Langara and Cox islands. No evidence of nesting in this area by Horned Puffins has ever been recorded, which is surprising given the closer proximity of these colonies than other colonies in BC to their main breeding grounds in Alaska.

Green and Brooks collected an egg on Cox Island on 22 July 1920 that they considered to be Marbled Murrelet.[20] Several years later, Darcus reported a colony of about 20 pairs of Marbled Murrelets nesting in burrows on the steep, outer cliff faces on Cox Island.[80] He stated that on 14 May 1927 he "…secured three fresh eggs, one from each of three burrows, the birds being taken with the eggs." On the next day, Darcus obtained another egg from a deep crevice in the rock; the adult flew out to sea. These records were subsequently discounted and the eggs were thought likely to be Ancient Murrelet eggs,[94, 144, 198] although recently, Carter and Sealy reviewed these records and concluded that the 1920 record warrants further consideration.[54]

The early records are largely descriptive rather than quantitative: Darcus stated that the island was "honey-combed" with burrows of Ancient Murrelets, Cassin's Auklets, and Fork-tailed and Leach's Storm-Petrels in 1927.[80] Guiguet, in 1952, noted that the base and top of the island were perforated by burrows of Ancient Murrelets. He also noted a "good-sized" Pelagic Cormorant colony in 1952. Cormorants were nesting in chimney-like clefts in the cliffs.

Campbell visited the island in 1966 and

**Table WG-020.** Seabird nesting records for Cox Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 Jul 1920 | x | x | | | | | | x | | | 22, 54 |
| Apr-Jun 1927 | x | x | | | | | x | x | | x | 80, 198 |
| Jun-Jul 1930 | x | x | | | | | | | | x | 76, 319 |
| May 1936 | x[a] | | | x[a] | | | | | | | 314, 324f |
| May-Jul 1946 | x | x | | | 6e | x | x | x | | x | 94, 304 |
| May-Aug 1947 | x | x | S | | | | x | x | x[b] | x | 94, 314 |
| May-Jun 1952 | x | x | x | | | | x | x | | x(6-8) | 94 |
| 30 Apr 1966 | 20S | | | | | | | | | | 33 |
| 3 Jun 1971 | | | | | | | | | | S(25) | 252 |
| 2 Aug 1971 | E | E | x | | | | E | E | E | x | 314 |
| Jun-Jul 1972 | | | 3 | | 5 | 4e | | | | 20e | 314 |
| May, Jul 1977 | E | E | 9 | 1 | 0 | S(28) | E | E | E | 8e(14) | 39, 314 |
| 8 Jun 1981 | E | E | 0 | 1 | 1eS | S(23) | E | E | E | S(19) | 232 |
| 29 Jun 1986 | | | | | 2eS | | | | | S(23) | 227 |
| 7 Jun 1988 | | | 0 | | | | | | | | 299 |

[a] Darcus collected one FTSP egg on 11 May; the fate of this egg is unknown. He also collected a Black Oystercatcher egg on 19 May.[324f] The location for this latter record is given as "Cox Island, north end of Vancouver Island", but this is clearly an error as Darcus was collecting in the Langara Island area between 22 April and 20 May in 1936.

[b] This single RHAU nesting record from Maquire [314] is suspect; see text.

excavated about 20 storm-petrel burrows.[33] He found no evidence of nesting, but his visit occurred early in the season (30 April). Sealy observed a maximum of 25 Tufted Puffins around Cox Island in June 1971,[252] and in August 1971, Wayne Nelson and Ken Summers reported that Tufted Puffins were the only remaining burrow nesters on the island. They found many broken Pelagic Cormorant eggshells in 1971, and in 1972, Nelson reported that the majority of the colony had abandoned nests. A few cormorants were nesting in 1977, but none were observed in 1981 or 1988 (Figure 88). We found no Glaucous-winged Gulls nesting in 1977. Pairs were standing on rock pinnacles in 1981 and 1986, but we could not determine if they were nesting. Single pairs of Black Oystercatchers were found nesting in 1977 and 1981, and Tufted Puffins were still present in 1981 and 1986.

**Remarks:** Cox Island likely suffered the same invasions of introduced predators and other impacts as Langara Island. Although there are no historical observations of rats on Cox Island during these years, more recent work indicates that Norway rats were likely present in the years prior to 1990.[177]

We found a Bald Eagle nest and a Peregrine Falcon eyrie (Figure 89) on the island in 1981.

**Figure 88.** In 1977, the Pelagic Cormorant colony located on the north side of Cox Island had nine nests. The colony was abandoned in 1981. *Photo by Michael S. Rodway, 28 July 1977.*

**Figure 89.** In 1977, we suspected that there was a Peregrine Falcon eyrie on the south side of Cox Island (viewed in this photo from Langara Island). Nesting was confirmed there in 1981. *Photo by Michael S. Rodway, 18 May 1977.*

## WG-030 LUCY ISLAND

**Location:** *54°10'58"N 132°59'04"W; 103 K/2.*
South of Langara Island in Parry Passage (see Figure 71 on p. 86).

**Description:** *37.2 ha; 69 m high; Forested.*
Lucy Island is covered with a hemlock and spruce forest, with an understory of salal (Figure 90) opening into mossy slopes in the interior (Figure 91). Rock bluffs occur at the west end.

**Historical summary:** There are two sets of Tufted Puffin eggs in the RBCM collected on Lucy Island by Cumming. One is dated 7 July 1890,[324g] and the second is dated 5 July 1930.[324h] Cumming visited Haida Gwaii from the middle of June to the end of July 1930.[76] As he makes no reference to previous visits, we assume that both sets of puffin eggs were collected then, and the 1890 date was a transcribing error. There are no other records of Tufted Puffins nesting on Lucy Island. A set of Pelagic Cormorant eggs in the RBCM is recorded as collected by Cumming from Lucy Island on 12 April 1930.[324i] This date should probably read 12 July. This is the only record of cormorants nesting on Lucy Island.

Young found Ancient Murrelets and Pigeon Guillemots nesting in 1926 (Table WG-030). In 1946, Guiguet reported that the island was perforated with murrelet burrows. Foster noted at least 100 pairs of Ancient Murrelets nesting on the northwest corner of the island in 1960, but in 1971, Sealy found only old burrows and Ancient Murrelet bones. In 1977, we found four active-looking burrows in the interior forest at the west end of the island. Burrows had Ancient Murrelet breast feathers in the entrances. On our last visit on 25 May 1981, there was no sign of nesting. Sealy found one Pigeon Guillemot nest with an egg in 1971 and birds were present in 1977. Pigeon Guillemots may still nest around the west end of the island, where Guiguet and Foster had encountered them in 1946 and 1960, but none were seen in 1981.

**Table WG-030.** Seabird nesting records for Lucy Island. See Appendix 2 for codes.

| DATE | PECO | PIGU | ANMU | TUPU | SOURCE |
|---|---|---|---|---|---|
| Jun 1926 | | x | x | | 295 |
| Jul 1930 | x | x | x | x | 76, 324g-j |
| Jun 1946 | | S | x | | 94 |
| 17 May 1952 | | S(50-75) | | | 94 |
| 4 Jun 1960 | | 25e | 100+ | | 94, 314 |
| 11 Jun 1970 | | | E | | 252 |
| 26 Jun 1971 | | x(10) | E | | 252 |
| 12 May 1977 | 0 | S(14) | 4 | | 314 |
| 25 May 1981 | 0 | (0) | E | | 232 |

**Figure 90.** Vegetation cover on Lucy Island is predominantly mixed Sitka spruce and western hemlock forest with a thick salal understory, as shown in this view of the island's south shore. *Photo by Michael S. Rodway, 12 May 1977.*

**Figure 91.** In 1977, suitable burrowing habitat was found on the northwest end of Lucy Island in the forest on the interior slope facing Langara Island, but only four burrows were found. The colony was abandoned in 1981. *Photo by Michael S. Rodway, 12 May 1977.*

**Remarks:** In 1930, Cumming stated that marten had been introduced on Lucy Island a few years earlier.[76] According to Dalzell, Al Peevey, who lived in Henslung Cove on Langara Island for many years, released several pairs of marten in the hopes of starting a marten farm on Lucy Island, but the plan was unsuccessful.[79] Cumming found many deserted Ancient Murrelet eggs and suspected that the marten had been preying on the adults. If so, their effect on the murrelet population appeared to be minimal, as Guiguet found the island "perforated with burrows" in 1946. The records suggest a prolonged decline over a period of 20 to 30 years, similar to that of the Ancient Murrelet population on the adjacent Langara Island. As with Cox Island, the colony on Lucy Island has likely suffered similar impacts from introduced predators and gill-net fisheries as on Langara Island. Rats were not recorded on Lucy Island prior to 1990, but more recent work suggests that Norway rats were likely present during those years.[150, 177]

Abundant river otter sign (Figure 92) with no evidence of predation on birds was reported in 1977. There was one Bald Eagle nest on the island in 1981.

**Figure 92.** Signs of river otter presence include well-worn pathways, scats, temporary feeding sites, and permanent den sites. *Photo by R. Wayne Campbell.*

## WG 040 "KNOX" CLIFFS

**Location:** *54°10'23"N 133°03'40"W; 103 K/3.*
South side of Cape Knox on the northwest tip of Graham Island (see Figure 71 on p. 86).

**Description:** *100 m high; Cliffs.*
The south side of the Knox peninsula, on north side of Lepas Bay, is faced with high cliffs and crevices. There are small rocky beaches around Cape Knox.

**Historical summary:** Darcus collected Black Oystercatcher eggs from small beaches in the Cape Knox area on 25 June 1926.[314] Those eggs ended up in the collection of E.N. Harrison. There are no other records of nesting oystercatchers in the vicinity of these cliffs and, because of the uncertainty in the location given by Darcus, we have not counted this colony as an historical nesting site for this species.

In 1972, Wayne and Marilyn Nelson found Pelagic Cormorants nesting on cliffs in a high, narrow gorge midway along the series of high cliffs on the south side of the Knox Peninsula (Table WG-040). Adults were sitting on nests. In 1977, six breeding birds were building and sitting on nests on 23 May. On 26 July 1977, 15 nests were counted, but no adult cormorants were present. In 1986, nests were located on the cliffs and in the sea-cave of the large crevice below the 130 m-high hill, which is likely the same location referred to in 1972. All 26 nests had adults sitting on them; some nests had two adults attending.

Three Glaucous-winged Gulls were observed on cliff ledges on 23 May 1977. Nesting was suspected but no nests were seen.

**Table WG-040.** Seabird nesting records for "Knox" Cliffs. See Appendix 2 for codes.

| DATE | PECO | GWGU | SOURCE |
|---|---|---|---|
| 16 Jun 1972 | 6-8 | | 314 |
| May, Jul 1977 | 15[a] | S | 314 |
| 3 Jul 1986 | 26 | 0 | 227 |

[a] Nests were unattended (see text).

**Remarks:** A Peregrine Falcon was perched at the top of the cliffs in July 1977.

## WG-050 “LEPAS” ISLET

**Location:** *54°10'18'N 133°02'50"W; 103 K/3.*
Northeast corner of Lepas Bay (see Figure 71 on p. 86).

**Description:** *0.8 ha; 30 m high; Forested.*
This is a steep-sided, rocky island (Figure 93), with a lush covering of grass and forbs, and sparse clumps of spruce trees (Figure 94). The island is close to the shoreline of Graham Island, yet as of 1977 seemed to have had little impact from deer.

“Lepas” Islet was given Ecological Reserve status in 1978.

**Historical summary:** Darcus collected Fork-tailed Storm-Petrel specimens on the island in 1927 (Table WG-050). Young reported that Darcus found Rhinoceros Auklets breeding on an islet near Cape Knox,[295] which would most likely be this island, but Darcus stated that this species was not breeding in this vicinity.[81] There are no other records for Rhinoceros Auklets. A Pigeon Guillemot egg was collected in 1930, probably by Cumming, who was in the area during June and July. Carter and Sealy review the early records in this area.[56]

Spencer Sealy and Ken Summers reported nesting by Leach’s and Fork-tailed storm-petrels in

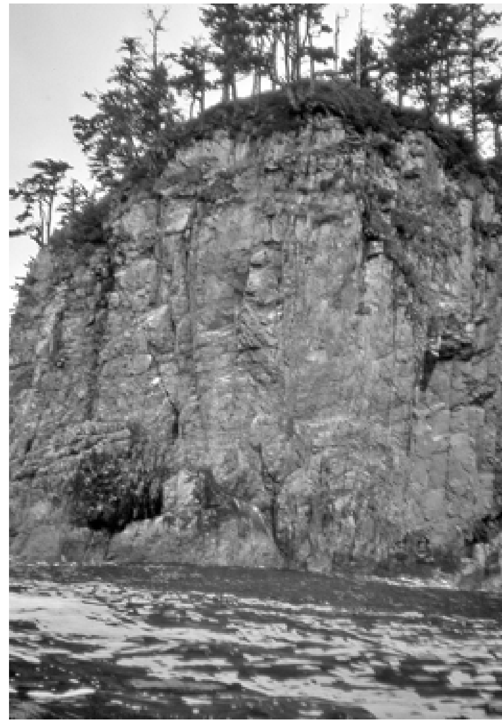


**Figure 94.** View of the north side of “Lepas” Islet showing cliffs and scattered Sitka spruce trees. *Photo by Michael S. Rodway, 23 May 1977.*

**Figure 93.** Distant view of “Lepas” Islet from the east. *Photo by Michael S. Rodway, 23 May 1977.*

1971. Wayne and Marilyn Nelson visited the island on 8 June and 7 August 1972 and first confirmed nesting by Cassin's Auklet, in addition to recording other species. Surveys by the BCPM were conducted on 23 May and 26 to 28 July 1977. Nelson called his estimates for storm-petrels "guesses" in 1972 and they are not comparable to the 1977 figures.

In 1977, storm-petrels were nesting at high density on the forested knolls with thick soil development (45 and 59 burrows in two 10x10 ft. [9.3 m$^2$] quadrats surveyed in the highest density areas in May; 72 to 88 burrows in five 20x20 ft. [37.2 m$^2$] quadrats surveyed in July) but were absent from areas of shallow soil (Figure 95). Of 25 burrows whose ends were reached in May, 12 held incubating Fork-tailed Storm-Petrels, two contained old, addled eggs, and 11 were empty. In July, 10 burrows contained Fork-tailed Storm-Petrel young and/or adults, 25 held Leach's Storm-Petrel young and/or adults, except one still with an egg, and 18 were empty. Breeding populations were estimated based on an approximate colony area of 54,540 sq. ft. (5,067 m$^2$) measured from air photos.

**Figure 95.** Storm-petrel nesting habitat on "Lepas" Islet in 1977 was on forested knolls where there was deep soil development (centre top). *Photo by Michael S. Rodway, 23 May 1977.*

**Figure 96.** Adult Black Oystercatchers near an empty nest scrape. The birds were not agitated, suggesting that there were no chicks hiding nearby. Likely the eggs had been depredated or no eggs had been laid. *Photo by R. Wayne Campbell.*

Cassin's Auklet burrows were located in grassy habitat around the outer edges of the vegetation, especially around the northern part of the island, in 1977. Breeding was confirmed in three burrows in May and four burrows in July.

Several counts of Pigeon Guillemots were made in 1977: 22 were seen off the southeast point in May, and 107, 8, and 218 were counted around the island on 26, 27, and 28 July, respectively. Many were seen flying from rock crevices all around the island on 28 July. One pair of Black Oystercatchers was attending an empty scrape on the west side of the island in May 1977, but this is the only record of them on the island and they have not been confirmed breeding as of 1990 (Figure 96). Glaucous-winged Gulls appear to have colonized the island since 1977. They were nesting at the south end of the islet at the edge of the

**Table WG-050.** Seabird nesting records for "Lepas" Islet. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | GWGU | PIGU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 6 Jun 1927 | x | | | | | | 314, 324k |
| 28 Jul 1930 | | | | | x | | 324l |
| 31 Jul 1971 | x | x | | | S(27) | | 252, 314 |
| Jun, Aug 1972 | 100-500e | 200-800e | | | 25-30e | x | 314 |
| May, Jul 1977 | 3,500e | 4,500e | 1S | 0 | 50e(218) | 200e | 39, 314 |
| 3 Jul 1986 | | | | 4e | x5(173) | | 227 |

vegetation in 1986. Only gulls and guillemots were surveyed in 1986.

**Remarks:** There was one Bald Eagle nest on the island in 1977. We saw no signs of predation in 1977.

***Be Prepared***

*Conducting surveys in remote regions of the BC coast requires personnel that are well prepared and self-reliant. This was especially true in the 1970s and even in the 1980s before satellite or cell phones were available to call for help. At that time and earlier, people on the coast developed a habit of looking out for and helping each other. This is common and commendable human behaviour in any situation where people must depend on their own resources to survive. During our surveys we frequently had help from others on the outer coast, especially lighthouse keepers and fishermen. In some instances we had chances to reciprocate or "pay forward" those favours.*

*During our surveys in 1977, Trudy and I (Michael) camped one night on the beautiful beach at Lepas Bay. While there we had an opportunity to assist a couple of schoolteachers that were on their school break. They had been dropped off on the north shore of Graham Island at the start of a lovely, short trail through the forest that led to the outer beach at Lepas Bay. They were to be picked up at the same location a few days later. Unfortunately, their adventuresome spirits were not matched by their wilderness survival skills and these two women had gotten themselves into a serious situation. They were staying in a nice little cabin, which had been built in Lepas Bay by Thom Henley, known locally as "Huckleberry", who had begun an outreach program for school children out of Masset. There was a little wood stove in the cabin and thus all the makings were there for a cozy, wild, west coast holiday. Except for one thing – the teachers did not know how to start a fire. Trudy found them huddled in the cabin, wet and almost hypothermic, using up their last match trying to set fire to a little pile of damp sticks that they had gathered off the beach. Trudy quickly showed them how to find a piece of red cedar driftwood and how to carve it into shavings that light instantly with just the touch of a match. We left them warm and grateful to safely enjoy the rest their holiday.*

## WG-060 "SIALUN" ROCK

**Location:** *54°05'56"N 133°05'00"W; 103 K/3.*
Sialun Bay, south of Sadler Point.

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

**Historical summary:** Eight Pelagic Cormorants, four in breeding plumage, were present in 1977. One nest had been built but was empty (Table WG-060). Twelve Glaucous-winged Gulls were present but no evidence of nesting was reported. We did not land in 1986 due to the size of ocean swells. Six adult gulls were standing on the top of the rock.

**Table WG-060.** Seabird nesting records for "Sialun" Rock. See Appendix 2 for codes.

| DATE | PECO | GWGU | SOURCE |
|---|---|---|---|
| 26 Jul 1977 | 1 | | 314 |
| 3 Jul 1986 | 0 | 3eS | 227 |

## WG-070 "BERESFORD" ISLET

**Location:** *54°02'32"N 133°03'37"W; 103 K/3.*
In Beresford Bay between Caswell Point and Beresford Creek.

**Description:** *0.4 ha; 10 m high; Forested.*
This islet is connected to Graham Island at low tide. It has an extensive rocky shoreline.

**Historical summary:** We found one Black Oystercatcher nest with three eggs on the outer west rocky area in 1986 (Table WG-070).

**Table WG-070.** Seabird nesting records for "Beresford" Islet (nests).

| DATE | BLOY | SOURCE |
|---|---|---|
| 6 Jul 1986 | 1 | 227 |

**Remarks:** There was one Bald Eagle nest in 1986.

## WG-080 "GRASSY" ISLET

**Location:** *53°58'52"N 133°08'07"W; 103 F/14.*
South of White Point, north of Frederick Island (see Figure 102 on p. 109).

**Description:** *1.3 ha; 2 m high; Grassy rock.*
This is a low grassy islet with a gravel beach around much of the perimeter. (Figures 97-99).

**Historical summary:** Edward Hodgson of Victoria, BC reported "great numbers" of Glaucous-winged Gulls nesting on "Grass Island" on the west coast of Graham Island in the 1920s [212] that Drent and Guiguet [94] identified as this islet. Numbers have decreased since to only 12 nests in 1986 (Table WG-080). Guiguet visited the area in 1946 and 1947 and BCPM crews surveyed the islet on 26 May and 26 July 1977. Most gull nests were located at the ends of

**Figure 97.** Aerial view of "Grassy" and "Wooded" islets looking south. *Photo by Moira J.F. Lemon, 15 April 1980.*

**Figure 98.** Beach and grassy habitat on "Grassy" Islet. *Photo by Moira J.F. Lemon, June 1981.*

**Figure 99.** Looking south from the beach on "Grassy" Islet with "Wooded" Islet and Frederick Island (right) in the distance. *Photo by Moira J.F. Lemon, 9 July 1980.*

long tunnels through the grass in 1977. There were large young at the time of the nest count on 26 July and some empty nests may have had associated young hiding in the grass (Figure 100). Forty-three adult gulls were present. Four gull nests with eggs were seen during a partial survey in 1981.

Black Oystercatcher nests were found all around the perimeter of the island on the edge of the gravel beach in 1977 and 1986. Only five of the sixteen nests held eggs and only 10 oystercatchers were counted around the island in May 1977, so it was likely that only five pairs were nesting, although 21 birds were present in July 1977 when three sets of young were found. Many oystercatchers were seen but nests were not searched for in 1981. Numbers of total nests and nests with eggs were similar in 1986 and 1977. However, the count was later in the season in 1986; we suspected that some of the empty nests found that year had associated young that were not discovered.

Pigeon Guillemots were nesting under driftlogs on the beach in 1947 and were seen flying out of the grass in 1986.

**Figure 100.** Large Glaucous-winged Gull young were wandering away from nests and some were likely hiding in the grass at the time of the survey of “Grassy” Islet in 1977. *Photo by R. Wayne Campbell, 26 July 1977.*

**Table WG-080.** Seabird nesting records for "Grassy" Islet. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 1920s | | x | | 212 |
| 21 Jun 1946 | | x | | 94 |
| 27 Jun 1947 | | 40e | x2 | 94 |
| May, Jul 1977 | 16[5] | 26[7] | x2(29) | 39, 314 |
| 9 June 1981 | S | x4 | | 235 |
| 6 Jul 1986 | 16[4] | 12[10] | x(69) | 227 |

**Remarks:** Two large young and one adult Glaucous-winged Gull were found dead at one nest in 1986. Cause of death was unknown.

## WG-090 "WOODED" ISLET

**Location:** *53°58'13"N 133°07'38"W; 103 F/14.*
Midway between White Pt. and Morgan Pt., north of Frederick Island (see Figure 102 on p. 109).

**Description:** *1.1 ha; 24 m high; Forested.*
This rocky islet is covered mostly with grass under scattered spruce.

**Historical summary:** During the surveys on 26 May and 26 July 1977, we found 20 old Cassin's Auklet-sized burrows, but no storm-petrel burrows (Table WG-090). In 1980, an adult Fork-tailed Storm-Petrel incubating an egg was discovered in one burrow, and a downy chick was found in another (Figure 101). Burrows were sparse. One Black Oystercatcher nest with two eggs was found in May 1977 and three Pigeon Guillemots were present on 26 July 1977.

**Figure 101.** A downy Fork-tailed Storm-Petrel chick was found on "Wooded" Islet in 1980. *Photo by R. Wayne Campbell.*

**Table WG-090.** Seabird nesting records for "Wooded" Islet. See Appendix 2 for codes.

| DATE | FTSP | BLOY | PIGU | SOURCE |
|---|---|---|---|---|
| May, Jul 1977 | 0 | 1 | S(3) | 314 |
| 9 Jul 1980 | 100e | | | 235 |

**Remarks:** There was one active Bald Eagle nest on the islet in 1977 and 1980. River otter trails and some scats with feathers were noted in 1977.

## WG-100 FREDERICK ISLAND (SUSK GWAII)

**Location:** *53°55'45"N 133°10'45"W; 103 F/14.*
Off Peril Bay just south of Morgan Point.

**Description:** *479 ha; 180 m high; Forested.*
The coastline of Frederick Island (Figure 102) is rocky with many abrupt knolls on the north, west, and south sides (Figure 103). Behind these knolls is a more uniform slope rising to the higher areas of the island. Isolated cliffs occur on some of the knolls and on the interior slopes. Towards the northwest end the slope levels into an interior bog forest of windswept redcedar and lodgepole pine, surrounding open areas of thick sphagnum moss (*Sphagnum* spp.) (Figure 104) and small pools of water. On the northeast side, south of Dalton Point, the main slope is closer to shore and rises steeply to the highest point on the island. Most of the knolls and perimeter slopes are grassy under a predominately spruce forest. Some of the knolls are mossy on top. Wet seepage areas occur between the knolls as well as on the steeper slopes. North of Ellis Point on the east side is an expansive flat, wet area, extending up to 160 m from shore. Around most of the island, from 30 to 60 m inland, the ground cover changes from grass to moss under a hemlock and spruce forest. Redcedar becomes more plentiful further from shore. There is very little shrub cover around Frederick Island, though salal occurs at higher elevations south of Dalton Point. Windfalls had occurred before 1977 on the ridge above Ellis Point, and along the west side north of Ellis Point. Off Dalton Point, there is a small, steep-sided, eroded limestone rock, with many sinkholes, arches, and crevices. We named it "Battleship Islet".

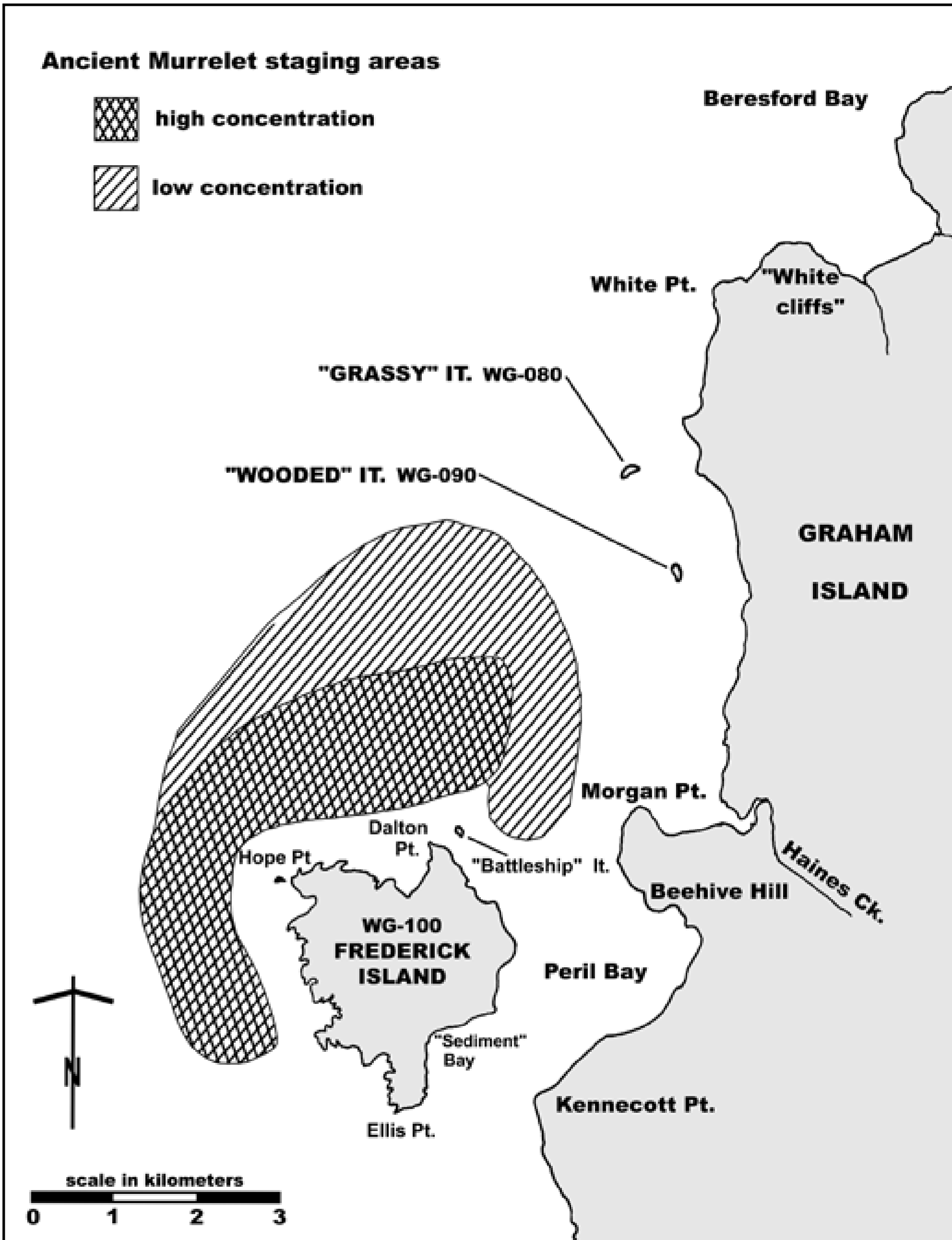



**Figure 102.** Locations mentioned in the text and Ancient Murrelet staging areas observed in 1981 around Frederick Island, BC.

**Figure 103.** Frederick Island has a rocky shoreline and knolls on the north, west, and south sides. Note the blowdown area northwest of Ellis Point. *Photo by R. Wayne Campbell, 24 July 1977.*

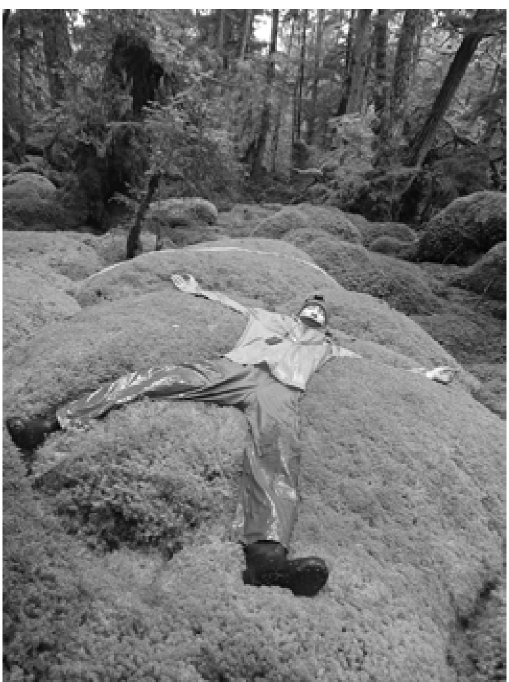


**Figure 104.** Glen Keddie sinks into the thick cover of sphagnum moss on the forest floor on Frederick Island. *Photo by Moira J.F. Lemon, 25 May 2014.*

A detachment of the No. 1 Coast Watch Unit RCAF, including a "woodsman", two radio operators and a man with "some cooking and camping ability", was established at Hope Point on Frederick Island in 1942.[79, 85] No trace of the cabin was found in 1980.

***Windows into the Past***

*When thoroughly searching and sampling remote islands to determine the distribution and abundance of nesting seabirds, we would often explore areas that are difficult to get to and that we wouldn't otherwise visit. Although getting to such areas can sometimes be a grueling test of endurance, there are often unexpected rewards.*

*Easy boat landing sites are rare on Frederick Island and we generally accessed the extensive Ancient Murrelet and Cassin's Auklet colonies on foot from our camp near Dalton Point at the north end of the island (Figure 102). That meant some very long work days when we had to hike all the way to the south end of the island, run as many transects as we had time for, and then hike for up to 3 hours to get back to camp. Occasionally, when the tide was right, we would take the zodiac down to what we called "Sediment Bay" near the south end on the east coast, but it was a brute to get the boat on or off the beach at anything except a high tide. The long tilted shelving layers of rock that extend far out into* the intertidal zone presented a formidable barrier to accessing the upper beach at a low tide.

"Sediment Bay" turned out to be one of those special finds with unexpected rewards and we didn't mind having to occasionally wait for the tide to get our zodiac off the beach. It gave us a chance to search for fossils! How surprised and excited we were to discover some long-ago creature fossilized into the rock (Figure 105). Little did we know at the time, that the wide rock shelves in "Sediment Bay" contain world-renowned fossil beds.

The sedimentary rock beds in "Sediment Bay" are a continuation of a rock formation of geologic importance that is exposed at Kennecott Point on the adjacent Graham Island shore, across the narrow and shallow portion of Peril Bay. Kennecott Point is one of only a few places in the world where the exposed rock formation spans the Triassic-Jurassic boundary. The site has provided valuable scientific data and insight into the mass extinction that occurred at that time.

The Triassic period, between 254 and 206 million years ago, marked the change between the first two of the three great eras of the Phanerozoic eon in geologic time. This time in our planets' history heralded the breakup of the supercontinent, Pangaea, into the southern continent of Gondwana (which would become present day South America, Africa, India, Antarctica and Australia) and the northern continent of Laurasia (present day North America and Eurasia). The Triassic/Jurassic mass extinction was one of the five great mass extinctions of the Phanerozoic, when upwards of 80% of marine organisms went extinct.

The importance of the Kennecott Point site, and others in Haida Gwaii, prompted Parks Canada in partnership with the Geologic Survey of Canada to develop guidelines and a management strategy to ensure that the limited fossil resources are not exploited, nor neglected scientifically.[146] In 1999, a survey team from the Geological Survey of Canada and researchers from a number of universities mounted an expedition to map, collect and measure the different stratigraphic layers in this Kennecott Point formation.[292] Their work had to be conducted during a period of low tides when the rocks were exposed, and they could gather the samples and measurements they needed. Thus, what was our bane for boat access during our seabird work turned out to be a boon to these paleontologists.

Researchers found that the lowest and oldest layers contained many fossils such as ammonites, as well as Monotis clams, conodonts (jawless chordates that looked like eels) and a profusion of microscopic creatures. Very few fossils were found in the highest (youngest) Triassic strata. The diversity of radiolaria (unicellular protozoans with intricate and varied mineral skeletons) dropped dramatically at the extinction boundary and the conodonts disappeared from the fossil record for all time, indicating a sudden and rapid event. Then, in the lower part of the Jurassic, came a "great explosion" of new types of creatures, such as ammonites of complex and multitudinous forms – the few species that survived the extinction event evolved to fill the vacated niches in the ocean environment.

Although some paleontological studies suggest that the extinction event was sudden, there is other evidence to suggest that it was prolonged and caused by several events. Proposed mechanisms include increases in volcanic activity associated with the break-up of Pangaea or impacts from extraterrestrial objects, both of which would have led to greenhouse warming, reductions in photosynthesis due to dimming of the atmosphere, and anoxic and stagnant oceans. Climatic oscillations and changes in sea levels may also have played a role.[3] In any case, it was globally catastrophic and set the stage for the age of dinosaurs and the subsequent evolution of the seabird species that now nest on Frederick Island.

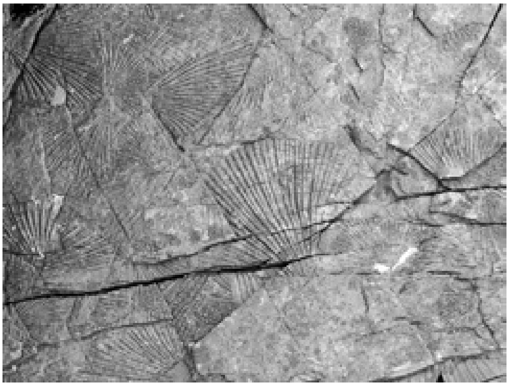


**Figure 105.** One of the surprises of surveying Frederick Island was finding fossilized marine bivalve mollusks in the intertidal zone in Sediment Bay. *Photo by Moira J.F. Lemon, 24 May 2014.*

**Historical summary:** Before 1960, the only recorded visit to the island was by Guiguet from 21 to 25 June 1946 (Table WG-100). However, Carter and Sealy suggest that Darcus may have visited the island in 1927 and confirmed nesting by Ancient Murrelets and Cassin's Auklets.[56] Brief visits were made by Foster in 1961 and by David Hancock in 1966. The BCPM surveyed the island in 1977 from 23 to 27 May, and revisited the bare rock off Dalton Point ("Battleship Islet") and the area around Hope Point on 24 and 25 July. CWS surveyed the island with transects from May to mid-June in 1980 and crews were present through much of the summer in 1980 and 1981 (Figure 106). Only "Battleship Islet" was surveyed in 1986.

**Figure 106.** Life in the field on Frederick Island (previous page, photos a-f clockwise from upper left). Frederick Island is where Moira Lemon (a) began her seabird career and it holds a special place in her heart. She spent much of the summers of 1980 and 1981 on the island, returning in 1998 and 2014, and she probably knows the island more intimately than any other person. During the first years, she learned firsthand about the trials, tribulations, and rewards of seabird work on remote colonies. For Moira, the rewards have always outweighed the difficulties and the thrill has never waned of finding Ancient Murrelet chicks (b) secreted away in a burrow under the old-growth forest or discovering an eroded sea stack on a wave-battered shore (c). The difficulties of field work are not trivial. It is often wet on the BC coast and just staying dry is a challenge. If it's not too windy, an umbrella is a handy portable shelter for keeping equipment and downy chicks dry. In this photo from 2014 (d), a CWS survey crew is setting up a GPS tracking system for Cassin's Auklets (from left to right: Laurie Wilson, Yuri Hashimoto (with umbrella), Dan Shervill, and Glen Keddie). Trudy Carson (now Chatwin) spent many days in full raingear to check burrows in 1980 (e). Her notebook lies nearby. Clothes and equipment hung out to dry becomes a constant feature of any extended field camp on these colonies. In this picture (f), Moira (right) and Laurie Wilson are enjoying the décor while indulging in a cup of hot tea. *Photos by Moira J.F. Lemon except upper left by Michael S. Rodway.*

In both 1977 and 1980, Ancient Murrelets (Figure 107) and Cassin's Auklets (Figure 108) were found nesting around most of the perimeter of the island except in the lowland areas along the southeast side. A few Leach's Storm-Petrels were heard calling around camp on the northeast corner of the island every night of our stay in 1977, and both Fork-tailed and Leach's storm-petrels were heard in 1980 and 1981. One storm-petrel egg was found on the ground on 12 May 1981, but no petrel burrows were found. They may nest here in small numbers. An estimated 25,000-30,000 Ancient Murrelets were staging off the north and west sides of the island on 17 and 20 June 1981 (Figure 102, page 109).

**Figure 107.** In 1977 and 1980, Ancient Murrelet and Cassin's Auklet burrows were found around much of Frederick Island. This photo show burrows around the roots of trees at the edge of the open western hemlock forest at the northeast corner, south of Dalton Point. Ancient Murrelets nested further inland than Cassin's Auklets in this habitat. *Photo by Michael S. Rodway, 24 May 1977.*

**Figure 108.** Although dense burrowing occurred in many parts of Frederick Island, in 1977 Cassin's Auklets were burrowing only sporadically in grass-covered blowdown areas on the west coast of the island north of Ellis Point. *Photo by Michael S. Rodway, 26 May 1977.*

**Table WG-100.** Seabird nesting records for Frederick Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|
| Jun 1946 | | | x | x | x | 94 |
| 28 May 1961 | | | | hundreds | hundreds | 314 |
| 5 Jun 1966 | | | | x | | 314 |
| May, Jul 1977 | 3[3] | 5e | 20e(16) | 30,000e | 60,000e | 39, 314 |
| May-Jul 1980 | 10e | 1 | x3(40) | 68,000t | 90,000t | 235, 282 |
| May-Aug 1981 | | x | x2 | x | x | 235, 282 |
| 7 Jul 1986 | 3S | 5[2] | x4(73) | | | 227 |

In 1980, four Black Oystercatcher nests with eggs or young were found on "Battleship Islet" and six pairs were recorded on rocky areas around and south of Hope Point. Three nests with eggs and three empty scrapes were found on "Battleship Islet" in 1977 (Figure 109) and 1986, respectively. The 1980 count was considered current for oystercatchers as the whole island was not surveyed in 1986. Glaucous-winged Gulls have been found nesting only on "Battleship Islet." In 1977, three gull nests with associated young were found and another two pairs were likely nesting.

**Figure 109.** Black Oystercatcher nest on "Battleship Islet" off the northeast corner of Frederick Island in 1977. *Photo by Michael S. Rodway, 26 May 1977.*

Guiguet reported Pigeon Guillemots nesting along all rocky shores in burrows under roots of conifers in 1946.[94] Recently, Pigeon Guillemots have been found nesting only on "Battleship Islet" where they were occupying holes in the limestone.

**Remarks:** In 1977 and 1980-81, signs of predation by Bald Eagles and Peregrine Falcons were evident but much less than that observed on Langara Island (Table 3, page 68). In 1980, Northwestern Crows learned to identify and open marked study burrows, and then prey on the birds within (Figure 110). Inconspicuous markers alleviated this problem. There were nine active Bald Eagle nests and three Peregrine Falcon eyries in 1980. River otters and their sign were seen around the island in 1977, 1980, and 1981. Some scats examined in 1977 contained feathers but most were composed of fish.

**Figure 110.** The clever Northwestern Crow is always alert to new sources of food. On Frederick Island in 1980, they learned to identify and open marked alcid burrows and in a few instances extract birds or eggs from within. *Photo by R. Wayne Campbell.*

Vermeer studied nesting habitats, reproductive success, and phytoplankton prey of Ancient Murrelets and Cassin's Auklets in 1980 and 1981.[280, 282, 284]

Currently, the largest nesting population of seabirds in Haida Gwaii is on Frederick Island. It has some of the most extensive, undisturbed, open forested habitat used by nesting Ancient Murrelets and Cassin's Auklets in the archipelago.

## WG-110 "INGRAHAM" CLIFFS

**Location:** *53°50'07"N 133°06'20"W; 103 F/14.*
On the coastline of Graham Island north of Ingraham Bay.

**Description:** *Cliffs, caves, and rocky shoreline.*

**Historical summary:** In 1977, Pelagic Cormorants were found nesting in two caves located on the north side of Ingraham Bay (Table WG-110). One cave had one nest and the other had three nests. Nest contents could not be determined. Thirty-nine Pelagic Cormorants were present, four in breeding plumage. Pigeon Guillemots were nesting on the cliffs on the north side of Ingraham Bay (5 birds; 1 flying from a cave) and on the cliffs along the shoreline south of Kennecott Point (16 birds; 2 holding fish and 1 flying from a crevice). Four empty Glaucous-winged Gull nests were recorded along this stretch of shoreline; 10 adults were present.

**Table WG-110.** Seabird nesting records for "Ingraham" Cliffs. See Appendix 2 for codes.

| DATE | PECO | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 24 Jul 1977 | 4 | 4S | x2(21) | 314 |

## WG-120 TIAN ISLETS

**Location:** *53°45'14"N 133°05'10"W* (southern islet); *103 F/14.*
West side of Tian Bay northwest of Port Louis.

**Description:** *18 ha; 28 m high; Grassy rock.*
This group consists of two main islets plus five small attached rocks. There are grassy areas, much dissected, bare rock, and gravel beaches. Sparse, windswept spruce trees grow on the highest areas.

**Historical summary:** Carter and Sealy contend that Darcus may have visited Tian Islets in 1927 and confirmed nesting by Fork-tailed and Leach's storm-petrels and Cassin's Auklets, though no definite records exist.[56] Guiguet visited these islets in 1947 and confirmed nesting by five species (Table WG-120). The islets were not visited again until the BCPM surveyed them on 28 May and 24 July 1977.

Records indicate that storm-petrels have abandoned the site and Cassin's Auklet numbers have decreased since 1947. Guiguet stated that Cassin's Auklets were nesting "in numbers" in 1947. We found ten old Cassin Auklet and six storm-petrel burrows but no evidence of active burrows in 1977. Active Cassin's Auklet burrows were found in the grass and under rocks and driftwood in 1986. We saw no sign of storm-petrels in 1986.

Tian Islets had the largest Pelagic Cormorant colony and second largest Glaucous-winged Gull colony in Haida Gwaii in 1986.[227] Cormorants were nesting only on the main south islet in 1977, but in 1986 they were nesting on east (37 nests), north (48 nests), and west (8 nests) side cliffs on the isolated ridge off the southwest side of the main south islet, as well as on the east side of the southern point of the main south islet (5 nests). The cormorant colony was abandoned in 1988, although 36 roosting cormorants in breeding plumage were present. Most nests were inaccessible in 1977 and 1986. Of 14 nests checked for contents in 1977, 12 contained eggs and two were empty. Only one of seven nests inspected in 1986 contained eggs.

Most gull nests were located around the south islet: 179 and 229 nests on the main south islet and 44 and 46 nests on the isolated ridge off the southwest side of the main south islet in 1977 (Figure 111) and 1986, respectively. Fourteen nests were found around the north islet and the rock at the south end of the north islet in 1977 and 1986.

**Figure 111.** Many Glaucous-winged Gull nests on Tian Islets in 1977 were sparse collections of marine debris, including bits of driftwood, grasses, and feathers. *Photo by R. Wayne Campbell.*

**Figure 112.** This Black Oystercatcher nest was found at the edge of a beach on northern Tian Islets in 1977. *Photo by Michael S. Rodway, 28 May 1977.*

**Table WG-120.** Seabird nesting records for Tian Islets. See Appendix 2 for codes.

| DATE | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 7 Jul 1947 | x | x | | | x | 25-30e | x | 94 |
| May, Jul 1977 | E | E | 28 | 31[12] | 237[38] | 50e(148) | 0 | 39, 314 |
| 7 Jul 1986 | E | E | 98 | 18[9] | 289[252] | x7(75) | 100e | 227 |
| 10 Jun 1988 | | | 0 | 10[10] | 212[187] | x4(27) | | 299 |

Black Oystercatchers and Pigeon Guillemots were nesting around much of the shoreline areas. Though total nests counted differed, the numbers of oystercatcher nests with eggs or young were similar in 1977 (Figure 112), 1986, and 1988. Chicks were suspected around two nests in 1986.

**Remarks:** In May 1977, one storm-petrel burrow had recently been dug up and two pairs of Leach's Storm-Petrel wings were found. River otter scats with feathers in them were nearby. Scats inspected in July 1977 contained only fish. Remains of Fork-tailed and Leach's storm-petrels and Rhinoceros Auklets were found at a Bald Eagle roost site in July 1977. All Bald Eagle pellets examined contained remains of young gulls, and eagle predation was thought to be mainly responsible for the large proportion of empty gull nests at that time. Nests were well used and most empty nests had signs of hatched young (eggshell fragments and areas of defecation). A thorough check in the vicinity for young outside their nests confirmed that few young remained. Some decapitated heads of young gulls and two intact carcasses were found. One adult and one immature Bald Eagle were present during the survey in July and one eagle flying over put most gulls in the air. Signs of predation were minimal in 1986; only six broken gull eggs and one broken oystercatcher egg were found.

## WG-130 SOLIDE ISLANDS

**Location:** *53°42'02"N 132°59'23"W* (south island); *103 F/10.*
South of Chanal Point, in the approach to Port Louis.

**Description:** *8.7 ha; 55 m high; Forested.*
The two large, south islands of the Solide Islands (Figure 113) have rocky shorelines with cliffs on the south sides. Salal covers much of the ground under a mature spruce forest, and grass, moss, and false lily of the valley (*Maianthemum dilatatum*) occur around the edges. The northern islet is half bare rock and half grass under a few spruce trees (Figure 114).

**Historical summary:** The islands were surveyed by the BCPM on 28-29 May and 22 July 1977 (Table WG-130). We only boated by the northern rock in 1986 and considered counts from 1977 current.

In 1977, storm-petrels were nesting through the grassy areas on the north island. They were also nesting around the perimeters of the southern two larger islands, with a few burrows on steeper interior slopes. Two burrows explored in May held incubating Fork-tailed Storm-Petrels and seven contained single or pairs of adult Leach's Storm-Petrels. Of 12 burrows excavated in July, two held Fork-tailed Storm-Petrel chicks, three contained incubating Leach's Storm-Petrels (Figure 115), one burrow identified as Leach's Storm-Petrel had a cold egg, and six were empty.

**Figure 113.** View of the two large, southern islands of the Solide Islands. *Photo by Michael S. Rodway, 28 May 1977.*

**Figure 114.** Much of the northern of the Solide Islands is bare rock. About half of the island is covered with grass and a few Sitka spruce trees. *Photo by R. Wayne Campbell, 22 July 1977.*

**Table WG-130.** Seabird nesting records for Solide Islands. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | GWGU | PIGU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| May, Jul 1977 | 800e | 800e | 2[2] | 0 | x(110) | 950e | 39, 314 |
| 7 Jul 1986 | | | 1eS | 2eS | x(1) | | 227 |

**Figure 115.** In BC, Leach's Storm-Petrels nest almost two months later than Fork-tailed Storm-Petrels. It is common to find Leach's Storm-Petrels incubating eggs while Fork-tailed Storm-Petrels already have large chicks. *Photo by R. Wayne Campbell.*

Cassin's Auklets were nesting in perimeter grassy areas on all three islands in 1977. An incubating adult confirmed breeding in one burrow in May. In 1977, one Ancient Murrelet eggshell was found in the forest on 29 May, and on 22 July the remains of a depredated Ancient Murrelet was encountered. No other evidence of nesting by this species was discovered, although 18 were sighted offshore in May. They are possibly breeding here in small numbers.

Pigeon Guillemots were gathered around the southern cliffs in 1977 and one was seen flying from a crevice nest site on the cliffs in both 1977 and 1986. Black Oystercatchers were nesting on the northwest rock in 1977 and 1986. We suspected Glaucous-winged Gulls nesting there as well in 1986; none were seen in 1977.

**Remarks:** A Bald Eagle nest was observed on the middle island in 1977. Predation was high on storm-petrels and Cassin's Auklets, and many Bald Eagle pellets contained storm-petrel feathers. Numerous storm-petrel and several Cassin's Auklet wings, plus a few decapitated or plucked carcasses, were found on both visits in 1977. River otter dens, trails and many scats were seen. We suspected that Bald Eagles were responsible for most predation.

## WG-140 QUEEN ISLAND

**Location:** *53°42'04"N 132°57'37"W; 103 F/10.*
At the entrance to Port Louis.

**Description:** *7.5 ha; 64 m high; Forested.*
In 1977, there were large spruce trees with some open areas in the middle of the island, and a small mossy patch on the northeast corner. The rest of the island was covered with thick saplings of spruce on the west side and hemlock on the east side.

**Historical summary:** Guiguet recorded storm-petrels nesting on the island in 1947 (Table WG-140). No active burrows were found when the BCPM visited the island on 28 May and 22 July 1977. There were a few old burrows overgrown with moss and lined with cobwebs on the northeast corner of the island. A Black Oystercatcher nest with three eggs was located on a rock on the west beach in 1977 (Figure 116). The island was not visited in 1986.

**Figure 116.** This Black Oystercatcher nest was found on a rock on the west beach of Queen Island in 1977. *Photo by R. Wayne Campbell, 28 May 1977.*

**Table WG-140.** Seabird nesting records for Queen Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | SOURCE |
|---|---|---|---|---|
| 8 Jul 1947 | x | x | | 94 |
| 28 May 1977 | E | E | 1 | 314 |

**Remarks:** In 1947, Guiguet called this a large colony of both species of storm-petrels, but said it had been 90% destroyed by bears. We found the unsightly remains of someone's long-established camp on the east side in 1977. There was one Bald Eagle nest and a river otter den and trails.

## WG-150 PIP ISLETS

**Location:** *53°41'28"N 132°57'09"W* (northwest islet); *103 F/10.*
In Port Louis at the mouth of Tingley Cove.

**Description:** *0.1 ha; 2 m high; Grassy rock.*

**Historical summary:** Two Black Oystercatcher nests with eggs or young were found in 1977 and 1988 (Table WG-150). Other nest scrapes found in 1988 and the two nests seen in 1986 were empty. There were 14, 10, and 11 adult oystercatchers present in 1977, 1986, and 1988, respectively (Figure 117). We suspected that young Glaucous-winged Gulls were hiding around some of the gull nests in 1986.

**Figure 117.** Small numbers of non-breeding Black Oystercatchers occasionally associate with breeding birds on rocky islets. *Photo by R. Wayne Campbell.*

**Table WG-150.** Seabird nesting records for Pip Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 22 Jul 1977 | 2[2] | 3[2] | 314 |
| 7 Jul 1986 | 2S | 10[6] | 227 |
| 10 Jun 1988 | 5[2] | 6[6] | 299 |

## WG-160 OGILVIE ISLAND

**Location:** *53°41'26"N 132°59'18"W; 103 F/10.*
South of the entrance to Port Louis, northeast of Kiokathli Inlet.

**Description:** *15 ha; 76 m high; Forested.*
This island is densely wooded with spruce and some hemlock trees. There are a few open mossy areas under the spruce and some grassy fringes on the south side. The perimeter is rocky with 50 m-high cliffs on the east side.

**Historical summary:** Guiguet observed storm-petrels nesting on the island in 1947, but none were found nesting by the BCPM on 29 May or 23 July 1977 (Table WG-160). Pigeon Guillemot was included on a list of species observed on 23 July 1977 but no count or other information was provided. The island was not visited during the 1986 CWS survey.

**Table WG-160.** Seabird nesting records for Ogilvie Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | PIGU | SOURCE |
|---|---|---|---|---|
| 7 Jul 1947 | x | x | | 94 |
| May, Jul 1977 | E | E | (≥1) | 314 |

**Remarks:** In 1947, Guiguet reported that this colony had been almost completely dug up by bears. There was one Bald Eagle nest and river otter scats and trails in 1977.

## WG-170 MACKENZIE ISLAND

**Location:** *53°41'13"N 132°59'42"W; 103 F/10.*
At the mouth of Kiokathli Inlet.

**Description:** *12.5 ha; 75 m high; Forested.*
This is a densely wooded island with a rocky shoreline. It is connected to Graham Island at low tide.

**Historical summary:** Guiguet observed a few Leach's Storm-Petrels nesting here in 1947 (Table WG-170). No storm-petrel burrows were found by the BCPM in 1977. One Pigeon Guillemot was seen flying from a burrow in 1977. The island was not surveyed in 1986.

**Table WG-170.** Seabird nesting records for MacKenzie Island. See Appendix 2 for codes.

| DATE | LSPE | PIGU | SOURCE |
|---|---|---|---|
| Jul 1947 | x | | 94 |
| 23 Jul 1977 | E | x(1) | 314 |

**Remarks:** When Guiguet visited the island he said that bears had just begun their predation on storm-petrels.

## WG-180 BROCK ISLANDS

**Location:** *53°41'32"N 132°59'53"W* (northwest rock); *103 F/10.*
North of the entrance to Kiokathli Inlet, west of Ogilvie Island.

**Description:** *1.6 ha; 75 m high; Forested; Bare rock.*
The main island is steep-sided with large spruce on top (Figure 118). In 1977, thick, young regenerating spruce trees were growing in the center, but the edges were open and grassy. The small, northwest island is rocky with cliffs.

**Figure 118.** View of the main Brock island in 1977 showing steep sides and Sitka spruce trees on top. *Photo by Michael S. Rodway, 29 May 1977.*

**Historical summary:** The BCPM surveyed the islands on 29 May and 23 July 1977 (Table WG-180). In 1986, we only boated by the islands in rough weather.

Storm-petrels and Cassin's Auklets may have previously nested on the island. Crews in 1977 discovered some storm-petrel-sized and some worn Cassin's Auklet-sized burrows, one cold storm-petrel egg on the ground, and one depredated Cassin's Auklet, with the skin inverted, below a falcon eyrie, but no birds were found in burrows.

Pelagic Cormorants nested unsuccessfully on the northwest rock in 1977 (Figure 119). Five Pelagic Cormorant nests had been built with 22 adults in attendance on 29 May, but only 18 empty nests, broken eggshells (Figure 120), and some immature birds were found on 23 July 1977. The colony was abandoned in 1986. Black Oystercatchers and Pigeon Guillemots were confirmed breeding in July 1977.

**Figure 119.** Pelagic Cormorants attempted nesting on cliffs on the northwest rock of the Brock Islands in 1977 but were unsuccessful. *Photo by R. Wayne Campbell, 24 July 1977.*

**Figure 120.** Broken eggshells found in July were all that remained of the nesting attempts by Pelagic Cormorants on the Brock Islands in 1977. *Photo by R. Wayne Campbell.*

**Table WG-180.** Seabird nesting records for Brock Islands. See Appendix 2 for codes.

| DATE | PECO | BLOY | PIGU | SOURCE |
|---|---|---|---|---|
| May, Jul 1977 | 18[a] | 1 | 3(3) | 39, 314 |
| 7 Jul 1986 | 0 | | (0) | 227 |

[a] Nests were abandoned in July.

**Remarks:** There was one Peregrine Falcon eyrie, many falcon pellets, river otter scats, and deer scats on the top of the island in 1977. We also found the remains of an old shelter on the south side.

## WG-190 "KIOKATHLI" ISLETS

**Location:** *53°41'48"N 133°00'51"W* (north islet); *103 F/11.*
Northwest of the entrance to Kiokathli Inlet, west of Brock Islands.

**Description:** *3.0 ha; 31 m high; Grassy rock; Bare rock.*
The higher north islet has a grassy crown with a few spruce trees. The rest of this islet and the other three islets are bare rock.

**Historical summary:** Surveyors from the BCPM visited these islets on 29 May and 22 and 23 July 1977 (Table WG-190). They found a high density of storm-petrel burrows throughout the grassy areas and Cassin's Auklet burrows around the perimeter on the north islet.

**Table WG-190.** Seabird nesting records for "Kiokathli" Islets. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | GWGU | PIGU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| May, Jul 1977 | 300e | 500e | 5[2] | 8S | S(4) | 300e | 39, 314 |
| 7 Jul 1986 | | | 1eS | 1eS | S(18) | | 227 |

Black Oystercatcher nests with eggs were found on the two largest islets in May 1977. Young were seen or suspected around two nests and three additional empty nests were found in July. Ten Glaucous-winged Gulls were present but no nests were found on the two largest islets in May 1977. Eight empty gull nests on the large north islet plus three on the adjacent rock that had been washed out by high waves were counted in July 1977. A total of 28 gulls were present. In 1986, we only boated around the islets and we considered the counts from 1977 current.

## WG-195 "BUTTERCUP" ROCK

**Location:** *53°39'47"N 132°59'38"W; 103 F/10.*
Northwest of Hosu Cove, south of 113 m high hill on Graham Island.

**Description:** *1.0 ha; Grassy rock.*
This islet is mostly bare rock with some grassy area and a few spruce trees on top.

**Historical summary:** Two Black Oystercatchers were attending a nest with three eggs in 1977 (Table WG-195). This record was overlooked in previous compilations.[235] Rough seas prevented close approach in 1986.

**Table WG-195.** Seabird nesting records for "Buttercup" Rock (nests).

| DATE | BLOY | SOURCE |
|---|---|---|
| 29 May 1977 | 1 | 314 |

## WG-200 "HOSU" ISLETS

**Location:** *53°39'27"N 132°57'58"W* (middle grassy islet); *103 F/10.*
All the islets in Hosu Cove in Athlow Bay.

**Description:** *Grassy rock; Bare rock.*
There are many small islets in Hosu Cove. The smallest ones are just rocks, the larger ones in the middle of the cove and at the extreme northwest corner of the cove have grassy crowns.

**Historical summary:** The BCPM visited on 29 May and 22 July 1977 (Table WG-200). Glaucous-winged Gull nests were found on the middle grassy islet. Black Oystercatchers were nesting on both grassy islets. Pigeon Guillemot was included on a list of species observed on 22 July 1977 but no other information was given. We did not land on the islets in 1986.

**Table WG-200.** Seabird nesting records for "Hosu" Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| May, Jul 1977 | 3[3] | 6[2] | (≥1) | 314 |
| 7 Jul 1986 | | 2eS | (0) | 227 |

## WG-212 "BARRY" CAVE

**Location:** *53°37'21"N 132°55'58"W; 103 F/10.*
Athlow Bay north of Port Chanal, just east of Barry Island on the shore of Graham Island.

**Description:** *Sea-cave.*
There are high cliffs at this location with sea caves at their base. This nesting site was formerly included with WG-210 Barry Island.[235]

**Historical summary:** Dalzell reports an observation made by G. Gray Hill of Duncan, BC of "a bridge of cormorant nests" in this cave, probably in the late 1960s.[79] The BCPM visited the area in 1977 (Table WG-212). One adult Pelagic Cormorant was flushed out of the cave. The nest was on a ledge about 15 m into the cave with a 1.5 m pile of old nesting material below it. Four other unattended cormorant nests were seen but also could not be reached. The site has not been surveyed since.

**Table WG-212.** Seabird nesting records for "Barry" Cave. See Appendix 2 for codes.

| DATE | PECO | SOURCE |
|---|---|---|
| 1960s | x | 79 |
| 30 May 1977 | 1 | 39 |

**Remarks:** A Peregrine Falcon was chasing a Bald Eagle from the cliffs in 1977. We suspected the falcons were nesting.

## WG-210 BARRY ISLAND

*Location: 53°37'23"N 132°56'32"W; 103 F/10.*
Athlow Bay north of Port Chanal.

**Description:** *15 ha; 78 m high; Forested.*
Much of the island was covered with thick young spruce under a sparse spruce forest in 1977. At the north end is an open grassy area where burrowing occurs. The island has steep rocky sides.

**Historical summary:** The BCPM visited the area on 30 May and 22 July 1977 (Table WG-210). Storm-petrels were nesting throughout the grassy areas and Cassin's Auklet burrows were found around the edge of the grass on the north end of the island. Some storm-petrels appeared to be nesting in old Cassin's Auklet burrows, digging smaller tunnels off the ends of the larger burrows. Eight incubating Fork-tailed Storm-Petrels, one adult Fork-tailed Storm-Petrel without an egg, one pair of courting Leach's Storm-Petrels, and one Cassin's Auklet chick were found in burrows explored in May. No burrows were checked in July.

A pair of Black Oystercatchers was suspected nesting on the northern rocks on 30 May but no nest was found. One Pigeon Guillemot was recorded present on 22 July 1977 but no other information was given.

**Table WG-210.** Seabird nesting records for Barry Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | PIGU | CAAU | SOURCE |
|---|---|---|---|---|---|---|
| May, Jul 1977 | 500e | 200e | 1eS | (1) | 100e | 39 |

**Remarks:** Many Fork-tailed Storm-Petrel and Cassin's Auklet wings and one dead Cassin's Auklet that had become tangled in the grass were found in May 1977. The contents of river otter scats were almost all feathers. A pair of Bald Eagles was nesting in the middle of the island.

## WG-220 SALVESEN ISLAND

**Location:** *53°36'08"N 132°59'40"W; 103 F/10.*
Southwest corner of Athlow Bay, north of Hippa Island (see Figure 122 on p. 125). Spelled Selvesen prior to 2000.

**Description:** *12.5 ha; Forested.*
Most of the island is bare rock, with a thick spruce forest on top.

**Historical summary:** BCPM crews visited the island on 30 May and 22 July 1977. No birds were seen on 30 May. Three pairs of Glaucous-winged Gulls, one with two large young, were observed on a rocky point on the west side of the island in July 1977 (Table WG-220). Gulls were nesting on the rocky area at the north end in 1986. Young were suspected around the empty Black Oystercatcher nest found in 1986.

**Table WG-220.** Seabird nesting records for Salvesen Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 22 Jul 1977 | | 3e | 314 |
| 9 Jul 1986 | 1S | 5[4] | 227 |

## WG-230 HIPPA ISLAND

**Location:** *53°32'N 132°58'30"W; 103 F/10,11.*
West of Nesto Inlet, north of Skelu Bay. Colony includes unnamed islets at the north end ("Petrel" Islet) and in the bay on the west side of the main island.

**Description:** *496 ha; 486 m high; Forested.*
When Captain Dixon anchored his vessel the *Queen Charlotte* behind the island in 1787 he observed fortified huts of the Haida that reminded him of the dwellings of the New Zealanders, called "hippahs." The island was thus bequeathed its English name.[79] The island has a massive dome-shaped southern end and a lower arm extending northward with an isolated islet at its tip (Figures 121-123). It is a rugged conglomerate of cliffs, rocky and grassy knolls, dissected rocky shoreline, low level forest behind recessed beaches, and steep forested slopes. The southwest side presents an imposing selection of topography and habitat, while the northeast side has a more uniform character. There is a sand dune at the east end of the southeast side. A shallow lake sits perched above the northwest arm of the island, lying in a cirque-like depression on the west side of the peak.

**Figure 121.** View of Hippa Island from the north showing the dome-shaped southern end and the lower northern arm. *Photo by Michael S. Rodway, 30 May 1977.*

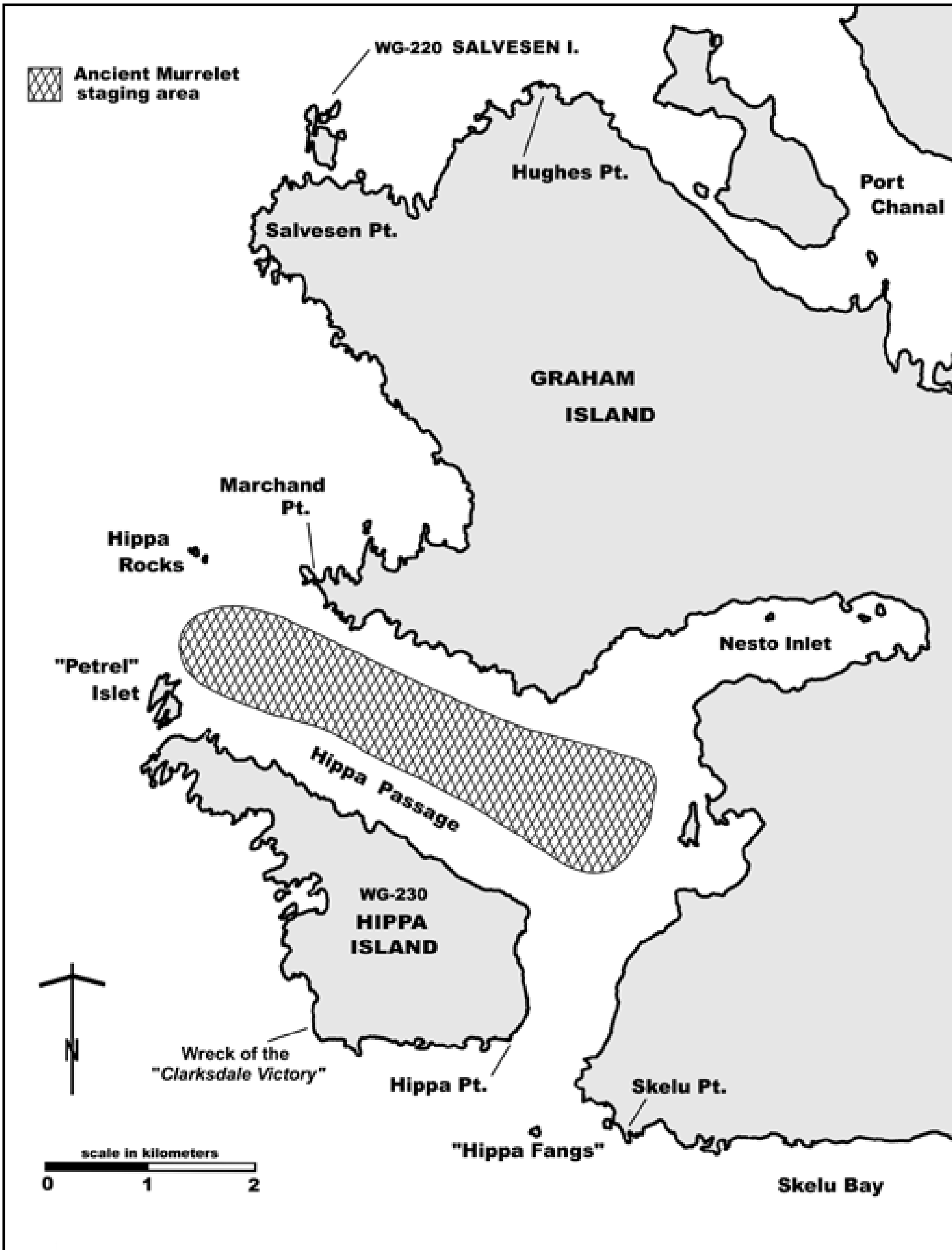



**Figure 122.** Locations mentioned in the text and Ancient Murrelet staging areas observed in 1983 around Hippa Island, BC.

**Figure 123.** Moira Lemon and Michael Rodway (shown) spent over four months on Hippa Island in 1983. Climbing into the alpine on the adjacent Graham Island gave them a broader perspective of their temporary island home. *Photo by Moira J.F. Lemon, 30 June 1983.*

***Ignorance is Not Bliss***

*The sand dune on the east side of Hippa Island is a unique formation on the west coast of Haida Gwaii. Sand dunes are more frequent along the east side of Graham Island where winds sweep the extensive shoreline sediments. In all areas, sand dunes are fragile habitats. Vegetation that stabilizes these habitats has a tenuous hold at best. Any foreign intrusion that erodes the vegetation can quickly destroy the stability and integrity of these rare ecosystems. Dune buggies quickly create havoc, but even foot traffic can inflict serious damage. Efforts are thus required to protect these areas from disturbance.*

*When we arrived to survey the seabird colony on Hippa Island in 1977, we found two university students camped on top of the sand dune. They were walking up and down the sand dune to access their camp. They were well-intentioned but were not aware that the formation was unique and vulnerable, nor of the damage they were causing. When informed, they immediately decided to relocate their camp and we were able to assist them with finding an alternative campsite and moving their gear.*

*We also helped them set up a more comfortable camp. In their original camp, the students had set up a tarp horizontally, strung low to the ground. When they invited us in to their camp, we had to stoop low and crawl in under the tarp. We couldn't stay long though. They had a fire going under the middle of the tarp, and because the tarp was so low, they had to keep the fire small and just smoldering. The tarp of course was trapping the smoke and within moments our eyes were stinging. They asked us whether our camps were as smoky as theirs. When we relocated their camp, we helped them set up a guyline to hold the tarp up in tent fashion and showed them how to set a fire just outside the high end of the tarp so the smoke could escape and they could have a cheery bright fire that could keep them warm under the tarp.*

The forests on Hippa Island have suffered from numerous slides and blowdowns (Figure 124). In 1983, the precipitous southern slopes were gashed by old and recent slides and large windfall swaths had occurred across lower slopes on the northern half of the island. Where the forests have not been

**Figure 124.** Seasonal storms batter the west coast of Hippa Island and blowdowns occur that can impact habitat for burrow-nesting seabirds. *Photo by R. Wayne Campbell, 21 July 1977.*

destroyed by slides or windfall, their composition follows the pattern of spruce dominating along the shore, hemlock becoming dominant within 150 m from shore, and redcedar more abundant further from shore and at higher elevations. Stunted forests of redcedar and hemlock grow on poorly drained slopes above 200 m elevation along the east side. Ground cover in the mature stands of forest is predominantly moss with grass occurring along the shore edges and on the more open knolls, especially along the north and west sides. An open spruce forest covers most of "Petrel" Islet at the north end (Figure 125).

A detachment of the No 1 Coast Watch Unit RCAF was established on the northwest corner of Hippa Island in 1942.[85] In 1947, the transport ship *Clarksdale Victory* was wrecked against west shore of the island and 49 of the 53 crew were lost.[79] The hull remains as a silent testament to the sea's fury. Hippa Island is part of the Vladimir J. Krajina (Port Chanal) Ecological Reserve established in 1973.

**Figure 125.** An open Sitka spruce forest covers the northern "Petrel" Islet where both species of storm-petrel were found nesting in 1977 and 1983. *Photo by Michael S. Rodway, Hippa Island, BC, 5 June 1977.*

**Table WG-230.** Seabird nesting records for Hippa Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | TUPU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|
| 1927 | | | | | | | x[a] | | | 81 |
| 10 Jul 1947 | | | | | | | x | | | 94 |
| 26 Jul 1961 | | | | | | | 100's | | | 314 |
| May, Jun 1977 | 5,000e | 3,000e | 15 | 4[3] | 20e | 10e | 20,000e | 10,000e | | 39, 314 |
| May-Jun 1983 | 10,900t | 12,800t | S | 4[4] | x | S(43) | 40,000t | 12,500t | S(45) | 235 |
| Jul 1986 | x | x | | 3S | 68[62] | | | | S(40) | 227 |

[a] Based on information given to Darcus by Haida people.[81]

**Historical summary:** The Haida traditionally harvested Ancient Murrelets and Tufted Puffins.[101] They remember Tufted Puffins being numerous at Hippa Island prior to 1925 when they were devastated by an oil spill. None were seen in 1977, but a few likely still nested on steep grassy ridges on the mid-south side of the island, where adults were observed through the summer in 1983 and again in 1986 (Table WG-230). Haida people informed Darcus that Ancient Murrelets were breeding on Hippa Island in 1927.[81] Both Guiguet in 1947 and Foster in 1961 documented nesting of this species. Storm-petrels, Pelagic Cormorants and Glaucous-winged Gulls were first reported nesting by the BCPM in 1977. The entire island was explored in 1977 from 30 May to 7 June, and the northern islet ("Petrel" Islet) was revisited on 20-21 July 1977. A more detailed survey was conducted by CWS from 27 May to 25 June and 5 July to 25 August 1983 (Figure 126). In 1986, we conducted a census of the gull colony at the north end and an inspection by boat of the southern end of the island where Pelagic Cormorants and Tufted Puffins nest.

Survey crews in both 1977 and 1983 documented Ancient Murrelets and Cassin's Auklets nesting around much of the main island (Figure 127), storm-petrels nesting primarily on the forested north islet (Figure 128), and a few Cassin's Auklets nesting around the perimeter of the north islet. A few Ancient Murrelet burrows were found on the north islets in 1983. In 1977, Cassin's Auklets and a few storm-petrels were also found nesting on the islet in the mid-west bay. Through an oversight, that islet was not explored in 1983. Separate crews in June and July each estimated about 800 Cassin's Auklet burrows on that islet in 1977. Adults and eggs were confirmed in burrows. In 1977, it was also estimated that 40 pairs of Leach's (one pair found in burrow) and 30 pairs of Fork-tailed (no birds were found in burrows but they were heard calling from the islet at night) storm-petrels were nesting on the islet. Estimates of storm-petrel populations from transects surveyed in 1983 on the north islets were recalculated from Vermeer et al.[283] using standardized methods.[235]

**Figure 126.** Life in the field on Hippa Island (photos a-f clockwise from upper left). Part of the lure of surveying islands for nesting seabirds is that you never know what you might find. Exploring and running transects through all parts of an island leads you to places you would not normally go. From their comfortable camps on first the main part of Hippa Island and later on "Petrel" Islet at the north end (a), Moira Lemon and Michael Rodway ventured forth into all areas of the island during their over four-month stay in 1983. Besides the nesting seabirds, like this nestling Leach's Storm-Petrel (b), special discoveries included: the wreck of the *Clarksdale Victory* storm-driven up onto the intertidal rock shelves on the west coast (c); bizarre moss formations on poorly-drained slopes high on the dome-shaped southern end of the island (d); a lake perched incongruously near the peak of the island (e); and the final resting place of a river otter that appears to have curled up for its last sleep (f). *Photos by Moira J.F. Lemon, May-September 1983.*

**Figure 127.** Cassin's Auklet nesting habitat along the mid-west coast of Hippa Island in 1977. *Photo by Michael S. Rodway, 3 June 1977.*

**Figure 128.** A Fork-tailed Storm-Petrel chick found in a burrow on "Petrel" Islet at the north end of Hippa Island in 1977. *Photo by R. Wayne Campbell, 21 July 1977.*

Ancient Murrelets stage through Hippa Passage (Figure 121, page 125), where a maximum of 53,000 birds was counted on 10 June 1983 at 08:00 hr. Large numbers of staging birds were present throughout the time we made observations in 1983, from the latter part of May until 10 June. On calm mornings, the chorusing multitude could be seen stretching in a continuous mass down the middle of the passage and could easily be heard from shore.

***Cabrera's Law***

*One of the many fascinating topics in biology is how organisms select habitats for breeding or foraging and how competing individuals or species partition useable habitats amongst themselves. The competitive exclusion principle, or what is sometimes but inappropriately referred to as Gause's Law, states that populations of two species that are competing for the same limited resource cannot remain stable over time – even a small competitive advantage will result in one species dominating over the long term. This principle is already implied in Darwin's theory of natural selection and was formulated more explicitly by Grinnell in 1904.[139] Also before Gause presented it in 1934,[132] Cabrera stated it a little differently: "In the same locality... directly related animal forms always occupy different habitats or ecological stations... Related animal forms are ecologically incompatible, and the incompatibility is the more profound the more directly they are related."[30] The concept has been worded more concisely: "two species with similar ecology cannot live together in the same place;" and Hardin worded it most succinctly: "complete competitors cannot coexist."[149] Grinnell was also one of the first to use the term "niche" to describe the unique ecological context of each species.[274]*

*The competitive exclusion principle sounds reasonable and tidy from an abstract species-level perspective, but it is not so apparent how it works in practice. How do individual animals make decisions that result in the successful partitioning of available habitat?*

*Seabird nesting islands are a limited resource for which there are multiple competitors. On Hippa Island, for example, four species of burrowing seabirds, Fork-tailed and Leach's storm-petrels, Ancient Murrelets, and Cassin's Auklets, inhabit perimeter forested areas where there is enough soil to support burrows. There are many puzzling questions about how these species use the limited burrowing habitat that is available. First off, it is unknown why there are no Rhinoceros Auklets nesting on Hippa Island – they used to nest to the north on Langara Island before populations were decimated by rats, they nest in abundance just to the south off the west coast of Moresby Island, and they are known to usurp nesting habitat from Cassin's Auklets. Thus there seems to be no reason for their exclusion from Hippa*

*Island or other nearby colonies like Frederick Island. Why haven't some Rhinoceros Auklet individuals decided to try nesting on Hippa Island?*

*Secondly, if the competitive exclusion principle is correct, why hasn't one species gained a competitive advantage and excluded other species from the area? Surely, diminutive storm-petrels cannot outcompete Ancient Murrelets or Cassin's Auklets. Perhaps this is the reason that storm-petrels are confined to the smaller islets off the north end and in the west bay of Hippa Island? The occupation of smaller peripheral islands by storm-petrels is a widespread pattern on BC seabird colonies. But if that is the case, why do the larger murrelets and auklets not also occupy these smaller islands (some do but not very many)? The soil is deep and there are plenty of tree roots to stabilize larger burrows. Could there be some other mechanism that storm-petrels use to carve out their portion of the island habitat? This is a completely uninvestigated question. Perhaps that strong musty odour that storm-petrels use in navigation, and that we find distinctive and appealing, acts as a deterrent to other species – as a sort of chemical defense that either confounds the senses of other species or that other species find distasteful?*

*Finally, why do the two storm-petrels overlap almost completely in their burrowing habitat, and why do Cassin's Auklets nest close to shore while Ancient Murrelets nest further inland? On Hippa Island, Fork-tailed Storm-Petrels tended to burrow more under roots and logs than Leach's Storm-Petrels,*[283] *suggesting some partitioning of the habitat at a fine scale, but for the most part, burrows of the two species were intermingled* (Figure 129). *Ancient Murrelets and Cassin's Auklets overlap in their habitat use, but Ancient Murrelets extend their burrowing further inland and tend to locate their burrows more in mossy habitat, whereas Cassin's Auklets often predominate closer to shore in grassy areas.*[282] *Vermeer and Lemon*[282] *speculated that habitat differences may be related to different chick-rearing strategies of the two species, but in fact, how that competitive balance is maintained is unknown. This is good news for budding biologists - the science of seabird nesting ecology is still in its infancy.*

**Figure 129.** Although both species of storm-petrel nested throughout the forested habitat on "Petrel" Islet at the north end of Hippa Island, the grey Fork-tailed Storm-Petrels (top) dug their burrows more under logs and among tree roots than did the dark Leach's Storm-Petrels. Leach's Storm-Petrel burrows were more frequently found in vegetated and grassy areas. *Photos by Michael S. Rodway, 5 June 1977.*

Pelagic Cormorants were observed nesting on 1 June 1977 on the landward side of rock pinnacles on the mid-south coast of the island. Nests were not visible from the water and could only be seen from shore. Contents of the 15 nests could not be determined but 17 adults in breeding plumage were present. That nesting site has not been adequately viewed since and its current status is unknown. From the water, birds (12 total; 3 in breeding plumage) were seen at those pinnacles in 1983 but not in 1986.

Black Oystercatchers have been found nesting at five locations around the island: "Petrel" Islet (1983); the gull rocks at the northwest corner of the main island (1977 and 1986); a rocky promontory just north of the protected west bay (1977 and 1983); near the shipwreck (1977); and just south of the shipwreck (1977; Figure 130). Young were suspected around three empty oystercatcher nests found on the northwest gull rock in 1986. Gulls were nesting on the rocks at the northwest corner, except two pairs were suspected nesting atop inaccessible rock bluffs at the south end of the island in 1977, and a single nest with eggs was found on the west side of "Petrel" Islet in 1983. In 1977, 11 empty nests were found, eight large young were running around, and a total of 18 pairs were estimated nesting on the northwest rocks. There were more gulls nesting in 1986 than in 1977. Pigeon Guillemots were present around the southeast coast in 1977 and 1983 where they were suspected nesting in crevices in the cliffs.

**Figure 130.** Black Oystercatcher nest with two eggs (centre) on bare rock on southwest corner of Hippa Island in 1977. *Photo by Michael S. Rodway, 6 June 1977.*

**Remarks:** Predation by Bald Eagles and Peregrine Falcons was moderate in 1977 and 1983 and occurred most on Ancient Murrelets (Table 3, page 68) and less on Cassin's Auklets. In 1977, we found five Bald Eagle nests and suspected nesting by two pairs of Pergrine Falcons. In 1983 we found seven active Bald Eagle nests and five Peregrine Falcon eyries (Figure 131). River otters were frequently seen and were preying on storm-petrels on the north islet in 1977 and 1983. River otter scats on the main island were composed mostly of fish, but many scats contained feathers on the north islet in both 1977 and 1983. Burrows had been dug up, especially later in the season, and remains of nearly fledged chicks were scattered about in 1983. We had the impression during our study in 1983 that otters were targeting burrows containing near-fledging chicks.

**Figure 131.** In 1977, Peregrine Falcons were suspected of breeding on a bare cliff on the west side of Hippa Island. Nesting in this location was confirmed in 1983. *Photo by Michael S. Rodway, 3 June 1977.*

Steve Parcells conducted preliminary studies on Ancient Murrelets on the northeast coast of Hippa Island in 1977 and 1978 (Figure 132), and Vermeer studied nesting and feeding biology of storm-petrels on the northern islet in 1983.[281, 283]

**Figure 132.** In 1977 and 1978, independent research on Ancient Murrelets was carried out on Hippa Island. This camp was home for Steve Parcells and crew for a few weeks. *Photo by R. Wayne Campbell, 21 July 1977.*

***Swallowed by the sea? or Dashed on the rocks?***

*Hippa Island lies off the outer west coast of Haida Gwaii, an area fully exposed to the furies of the open North Pacific. The rusting hull of the transport ship "Clarksdale Victory", which was wrecked against the island in 1947 with the loss of 49 lives, still lies torn and gaping on the southwest shore as a silent testimony to the ravages the sea can inflict on human endeavor. Just south of Hippa Island off the main shore of Graham Island lies the "Hippa Fangs", a set of jagged rock pinnacles lurching out of the sea like dragon's teeth ready to devour passing mariners. Currents and winds and rocks combine in this area to create a cauldron of tempestuous waters that require great respect and patience to navigate safely.*

*Moira and Michael led the CWS survey of seabird nesting populations, followed by studies of the breeding biology of storm-petrels on Hippa Island in 1983, and we had crews on the island from 27 May to 17 October. Our main crew and camp and our zodiacs were initially transported to the island on the "Bajo Point", a converted fishboat skippered by Art Babcock out of Queen Charlotte City. But a closer and cheaper access to the island was possible by having crews drive from Queen Charlotte City to the head of Rennell Sound, south of Hippa Island, where they could be picked up by zodiac from the island. This required boating in the zodiac just over 40 km each way. Timing had to be coordinated and weather conditions had to be amenable.*

*Good weather is a relative term on the outer west coast and anything less than gale force winds can be considered amenable. So, during an extended bout of inclement weather, on a day when winds were not quite gale force and forecasted winds were no worse, I (Michael) set out in an empty zodiac early one morning to pick up a crew in Rennell Sound. Gas tanks were securely tied forward to keep weight in the nose and prevent them from shifting. Not having to worry about the comfort of others in the boat, I could ride over the waves at a speed that matched only my own comfort zone. In a zodiac you sit almost at water level and it is exhilarating to plane over and around the waves on the open sea with just the wind and the salt spray for company.*

*I forged through moderate seas* (Figure 133) *past the Hippa Fangs and was making good time heading for the turn at Kunakun Point into Rennell Sound. Without incident I came abreast of the point, probably about 100 m offshore to stay outside the crashing surf zone, and, still making good time, made the turn into Rennell*

*Sound. Suddenly, and seemingly without warning, I found myself in huge waves, taller than my zodiac was long. Waves just inshore of my position were breaking in the shoaling water and all I could see were great plumes of spray being shot up as each monstrous wave crashed towards the shore. I was in immediate danger of being rolled over and thrown towards the shore rocks. I instantly put the bow into the oncoming waves to present the greatest resistance to being flipped over. As the first wave swept me up I found myself standing vertically on the transom on the back of the zodiac with my hands on the bow of the boat trying desperately to keep the nose of the zodiac from teetering over and tossing me to certain doom in the frothing waters...*

*Almost frozen in time, I felt the wave pass under me and the bow of the zodiac slowly fall over the back side of the wave. I was still upright in my boat. In those frozen moments my mind raced to make a plan. I couldn't keep going forward. A bit bigger wave would undoubtedly flip me. And that wave was certain to come. I had to go with the waves. But I was close to the shore where the monstrous waves were breaking. I would never survive that surf and the jagged shore. My only chance was to get back around Kunakun Point where I had come from. And the only way to get there was to go through the waves, literally.*

*Not feeling any fear, for that comes later, I took the only chance I could think of. In the trough between two giants I got the zodiac up to planing speed and angled myself back towards Kunakun Point. As the next wave lifted me up from behind I pointed the bow directly into the wall of green water below that was the back side of the wave in front. Wondering if the motor would keep running I gave it full throttle and ploughed into the green water. I went through the wave. Water flowed over my head and over the motor but I emerged on the other side of the wave still running at full throttle. I was in love with Evinrude. Water now completely filled the zodiac. Gas tanks were floating on their tethers but still secure at the front of the zodiac. I never let up on the throttle. Angling back towards Kunakun Point as much as possible and turning to drive through the waves whenever necessary, I repeated my plummet through wave after wave. Unbelievably the motor never quit. I emerged around the point and out of that cauldron of furies stirred up by some opposing combination of winds, waves, currents, and shoaling waters meeting at that corner of the ocean. I was even more exhilarated than before, having survived to tell the tale. I ran the water out of the zodiac, emptied my boots, and, drenched from head to foot with a salty taste in my mouth, headed back to base camp on Hippa Island. The crew didn't get picked up that day. But that's another story.*

**Figure 133.** The open ocean, especially in a small boat near the shore, is unrelenting and unforgiving. Tides, currents, waves, and winds all make travel risky. *Photo by R. Wayne Campbell.*

## WG-240 SADLER ISLAND

**Location:** *53°29'58"N 132°54'05"W; 103 F/7,10.*
Outer southwest corner of Skelu Bay.

**Description:** *6.7 ha; Grassy rock.*
This is a rocky island of dissected pinnacles (Figure 134) with cliffs on the edge and patches of vegetation on the higher portions (Figure 135).

**Historical summary:** Pelagic Cormorants were nesting on the cliffs at the north end of the island in 1977 and 1986 (Table WG-240). Of 11 nests that could be inspected in 1986, six held eggs and five were empty. Twenty-nine adult Black Oystercatchers were present in 1977. Only two nests were found but more were suspected. More Glaucous-winged Gulls were nesting in 1986 than 1977. There were many empty nests in 1977. Pigeon Guillemots were confirmed nesting when a nest with one young was found in 1986.

**Table WG-240.** Seabird nesting records for Sadler Island. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|---|
| 20 Jul 1977 | 19[16] | 2[2] | 67[36] | S(13) | 39, 314 |
| 8 Jul 1986 | 16 | 10[3] | 114[95] | x(28) | 227 |

**Figure 134.** Sadler Island is rocky with high pinnacles. *Photo by R. Wayne Campbell, 20 July 1977.*

**Figure 135.** Patches of vegetation are scattered on higher sections of Sadler Island. *Photo by Michael S. Rodway, 8 July 1986.*

## WG-250 "SEAL POINT" ISLAND

**Location:** *53°28'10"N 132°46'15"W; 103 F/7.*
Northeast of Seal Point at the mouth of Seal Inlet.

**Description:** *2.7 ha; 44 m high; Forested.*
The top of the island is covered with a dense spruce forest with no understory (Figure 136). There is grass on the edge of the forest and on some of the steep bluffs, and a rocky knob at the east end.

**Historical summary:** Storm-petrel burrows were found throughout forested and grassy areas on both visits by the BCPM in 1977 on 7 June and 20 July (Table WG-250). In June, one burrow explored contained an incubating Fork-tailed Storm-Petrel (Figure 137) and another burrow contained a pair of Leach's Storm-Petrels (Figure 138). Of 17 burrows checked in July, nine contained Fork-tailed Storm-Petrels (8 with young and 1 with egg), five held incubating Leach's Storm-Petrels, and three that observers identified as Leach's Storm-Petrel burrows were empty. Signs of recent burrowing activity were noted in July.

**Figure 137.** Fork-tailed Storm-Petrel extracted from a 1.2 m-long burrow in grass on "Seal Point" Island in 1977. *Photo by Michael S. Rodway, 7 June 1977.*

**Figure 136.** "Seal Point" Island is located northeast of Seal Point. It has a Sitka spruce forest with no understory and grasses at the edge. *Photo by Michael S. Rodway, 7 June 1977.*

**Figure 138.** Leach's Storm-Petrel found at the end of a 0.8 m-long burrow under spruce trees on "Seal Point" Island in 1977. *Photo by Michael S. Rodway, 7 June 1977.*

Two Black Oystercatcher nests with three eggs each were found on the rock at the east end of the island on 7 June 1977. The island was not surveyed by CWS in the 1980s.

**Table WG-250.** Seabird nesting records for "Seal Point" Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | PIGU | SOURCE |
|---|---|---|---|---|---|
| Jun, Jul 1977 | 1,500e | 1,500e | 2[2] | S(1) | 39, 314 |

**Remarks:** We found five pairs of Leach's and three pairs of Fork-tailed storm-petrel wings, and saw two burrows that we suspected had been dug up by river otter in June 1977. A river otter was seen in July. There was one Bald Eagle nest on the island.

## WG-260 "TARTU" ROCK

**Location:** *53°28'07"N 132°40'17"W; 103 F/7.*
Half way up Tartu Inlet on the west side.

**Description:** *0.1 ha; 5 m high; Bare rock.*

**Historical summary:** Lynne Bonner visited the island in 1976 and located four Black Oystercatcher nests with eggs and young (Table WG-260). Pigeon Guillemots were roosting on the west side but no evidence of nesting was found.

**Table WG-260.** Seabird nesting records for "Tartu" Rock. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 6 Jun 1976 | 4[4] | (9) | 314 |

## WG-270 GOSPEL ISLAND

**Location:** *53°23'17"N 132°35'31"W; 103 F/7.*
In Rennell Sound, northwest of Shields Bay.

**Description:** *10 ha; 55 m high; Forested.*
The entire interior of this island has a dense understory of salal and twinberry (*Lonicera involucrata*) shrubs under a spruce forest (Figure 139). False lily of the valley is abundant along the edges and red alder (*Alnus rubra*) overhangs the rocky shore.

**Figure 139.** Most of Gospel Island is covered by a Sitka spruce forest with a dense growth of salal and twinberry underneath. *Photo by R. Wayne Campbell, 20 July 1977.*

**Historical summary:** Visits were made to the island by Lynne Bonner in 1976 and by the BCPM on 7 June and 20 July 1977 (Table WG-270). Black Oystercatchers were found nesting in both years (Figure 140). The nest in 1976 was located on a small gravel patch among rocks on the south side of the island. Pigeon Guillemots were seen on both visits in 1977 but no evidence of nesting was reported.

**Figure 140.** Black Oystercatcher nest with two eggs on Gospel Island in 1977. *Photo by Michael S. Rodway, 7 June 1977.*

**Table WG-270.** Seabird nesting records for Gospel Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 6 Jun 1976 | 1 | | 314 |
| 7 Jun 1977 | 1 | (2) | 314 |

## WG-280 "KINDAKUN" ISLET

**Location:** *53°18'55"N 132°46'20"W; 103 F/7.*
Off Kindakun Point between Rennell Sound and Kano Inlet.

**Description:** *3.5 ha; Grassy rock.*
Most of the area of this islet is bare rock, but the higher parts are capped with grass and a few shrubs.

**Historical summary:** This islet was only visited in July 1977; Glaucous-winged Gulls were confirmed nesting (Table WG-280).

**Table WG-280.** Seabird nesting records for "Kindakun" Islet. See Appendix 2 for codes.

| DATE | GWGU | PIGU | SOURCE |
|---|---|---|---|
| 19 Jul 1977 | 7[5] | S(1) | 314 |

**Remarks:** One Bald Eagle was recorded in 1977.

## WG-290 HUNTER POINT

**Location:** *53°15'15"N 132°42'55"W; 103 F/7.*
Graham Island on north side of Cartwright Sound.

**Description:** *Rocky point.*

**Historical summary:** One Black Oystercatcher nest with two eggs (Figure 141) was found in 1977 (Table WG-290). Pigeon Guillemots were recorded but no other information was provided.

**Figure 141.** Black Oystercatcher nest with two eggs laid on bare rock on Hunter Point in 1977. *Photo by R. Wayne Campbell.*

**Table WG-290.** Seabird nesting records for Hunter Point. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 19 Jul 1977 | 1 | (2) | 314 |

## WG-300 "GUDAL BAY" ROCK

**Location:** *53°13'37"N 132°34'37"W; 103 F/2.*
On north side of Gudal Bay in Cartwright Sound.

**Description:** *0.5 ha; Bare rock.*

**Historical summary:** Black Oystercatcher and Pigeon Guillemot nests found in 1977 contained single young (Table WG-300).

**Table WG-300.** Seabird nesting records for "Gudal Bay" Rock. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 18 Jul 1977 | 2[2] | x(9) | 314 |

## WG-310 STIU ROCK

**Location:** *53°13'05"N 132°36'31"W; 103 F/2.*
West of Gudal Bay in Cartwright Sound.

**Description:** *2 ha; 21 m high; Bare rock.*

**Historical summary:** The BCPM crew confirmed nesting by Pelagic Cormorants, Glaucous-winged Gulls, and Pigeon Guillemots and suspected nesting by Black Oystercatchers (two empty nests were found) in 1977 (Table WG-310). Guillemots were nesting in burrows. A misshapen Common Murre egg was found on the rock in 1977 but no murres were seen. In 1986, rough weather prevented landing and we only boated by the island. Eight Pelagic Cormorants were present but we could not see if there were nests.

**Table WG-310.** Seabird nesting records for Stiu Rock. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|---|
| 18 Jul 1977 | 2[2] | 2S | 28[8] | 5(5) | 39, 314 |
| 11 Jul 1986 | | | 40eS | | 227 |

**Remarks:** The two cormorant and two gull nests contained broken eggs, and most empty gull nests had been damaged by high waves in 1977.

## WG-320 GAGI ROCK

**Location:** *53°12'31"N 132°38'27"W; 103 F/2.*
Northeast of Marble Island in Cartwright Sound.

**Description:** *2.5 ha; 13 m high; Bare rock.*

**Historical summary:** The BCPM crew counted Glaucous-winged Gull nests in 1977 (Table WG-320). Black Oystercatcher and Pigeon Guillemot were sighted but no evidence of nesting by these species was found. In 1986, rough weather prevented landing and we only boated around the island.

**Table WG-320.** Seabird nesting records for Gagi Rock. See Appendix 2 for codes.

| DATE | GWGU | PIGU | SOURCE |
|---|---|---|---|
| 19 Jul 1977 | 53[39] | (1) | 39, 314 |
| 11 Jul 1986 | 43eS | S(2) | 227 |

## WG-330 MARBLE ISLAND

**Location:** *53°12'06"N 132°39'39"W; 103 F/2.*
Northwest of the entrance to Skidegate Channel in Cartwright Sound.

**Description:** *45 ha; 142 m high; Forested.*
Marble Island (Figure 142) is a rugged island with cliffs, steep grassy slopes, and rocky knolls around much of its perimeter (Figure 143). There is a spruce forest on top. On the northern and eastern sides the trees are larger and there is little ground vegetation, while in the interior towards the west side, the old trees have been cut down and the vegetation is thick with regenerating spruce, salmonberry (*Rubus spectabilis*), twinberry, and salal. The area of cut trees was likely associated with the Coast Watch Unit and Radar station established in 1942-43.[85] Campers built a cabin from the remains of the radar station that had been left after the war, but little remains of it today.[79] There is a navigational beacon on the west end of the island.

**Historical summary:** On 2 May 1901, Newcombe collected an egg [324m] which he identified as Marbled Murrelet from Marble Island. The identity was recorded as "unsure". This is undoubtedly the egg referred to by Young,[296] and discussed by Drent and Guiguet (p. 118).[94] Upon examination, we suspected it to be an Ancient Murrelet egg. Carter and Sealy further investigated this record and concluded that "Marble" Island was a local name used by Newcombe to refer to one of the Limestone Islands off the east coast of Moresby Island, where he had been collecting at that time, and not to the Marble Island off the west coast of Graham Island (see EM-720 Limestone Islands for more detail on this record).[54]

Foster visited the island on 15 and 16 June 1961 and reported nesting by four species, the BCPM surveyed the colony on 7-9 June, 19-20 June, and 19

**Figure 142.** Shown here in silhouette, Marble Island rises to 142 m at one end and gently slopes downward towards the sea. *Photo by R. Wayne Campbell, 19 July 1977.*

**Figure 143.** Rocky knolls are found around the perimeter of Marble Island. The photo also shows Cassin's Auklet breeding habitat on the northeast side of the island. *Photo by Michael S. Rodway, 8 June 1977.*

**Figure 144.** This habitat on the west side of Marble Island, just above the navigational beacon, was heavily burrowed by Cassin's Auklets in 1977. *Photo by Michael S. Rodway, 8 June 1977.*

**Figure 145.** Cassin's Auklet burrow in herbaceous growth on the west side of Marble Island in 1977. *Photo by Michael S. Rodway, 8 June 1977.*

July 1977, and Tom Reimchen made observations in 1980 (Table WG-330). In 1986, rough weather prevented landing and we only boated around the island.

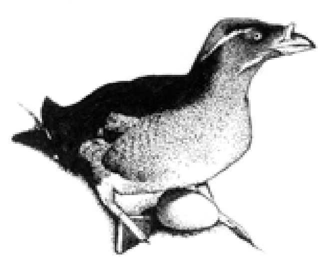
We heard a few Fork-tailed and Leach's Storm-Petrels calling during the nights we spent on the island in 1977, and found two sets of depredated wings of Leach's Storm-Petrel, but no burrows were located. They may nest under the thicker shrubs. We saw Pelagic Cormorants sitting on 16 nests on the south-side cliffs in June 1977. Nest contents were not determined. Two pairs of Black Oystercatchers were suspected nesting but no nests were found. Glaucous-winged Gulls were confirmed nesting (3 nests with eggs) on ledges on the steep grassy cliffs on the southwest side but most nests were inaccessible. Pigeon Guillemots were also nesting on the south-side cliffs. Sporadic burrowing by Ancient Murrelets was found on northern slopes extending almost to the high point of the island. Most burrows were in open ground cover but some were found under dense salmonberry. Cassin's Auklet burrows were found in perimeter grassy and herbaceous areas (Figures 144 and 145) and extending, at lower density, as much as 15m into areas covered with salmonberry, elderberry (*Sambucus* spp.), and ferns. Rhinoceros Auklets were suspected nesting above the western cliffs by two separate survey crews visiting on 19-20 June and 19 July 1977. Nesting was not confirmed and species identification was based on burrow characteristics, especially size. Observers on 19 July 1977 counted 300-400 Tufted Puffins flying to and from steep slopes on the southeast side and confirmed nesting in rock crevices and burrows (Figure 146). Horned Puffins were also seen in that area.

**Figure 146.** Tufted Puffin burrowing slope on the southeast side of Marble Island in 1977. *Photo by Michael S. Rodway, 9 June 1977.*

**Table WG-330.** Seabird nesting records for Marble Island. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|
| Jun 1961 | 20e | | | | S | 100's | | 12e | | 314 |
| Jun, Jul 1977 | 16 | 2eS | 13e | 20e(23) | 1,000e | 5,000e | 200eS | 300e(350) | S(5) | 39, 44, 314 |
| 9 Jun 1980 | | | | | x | | | | | 314 |
| 11 Jul 1986 | 0 | | 19eS | | | | | S(55) | (1) | 227 |

**Remarks:** There was a Peregrine Falcon eyrie and a river otter den on the island in 1977. Evidence of Bald Eagle and Peregrine Falcon predation on Cassin's Auklets and Ancient Murrelets were found in 1977: feather piles, eggshells, wings, and carcasses with the skin inverted. In 1986, one Common Murre was circling the cliffs.



## WEST COAST MORESBY ISLAND

All 12 species of seabirds known to breed in Haida Gwaii nest on the islands along the west coast of Moresby Island from Skidegate Channel south to the Kerouard Islands. As of 1990, this region supports almost half a million seabirds nesting at 33 sites (Figure 147; Table 5). It is the only area in Haida Gwaii where Common Murres are known to nest,[39] and is the only region in BC where Horned Puffins have been confirmed nesting.[44] The region supports 92% of the Rhinoceros Auklets nesting in Haida Gwaii (Figure 148), as well as major portions of the storm-petrel (39%), Cassin's Auklet (40%), and Tufted Puffin (62%) populations. Those seabird populations are concentrated in two clusters of colonies: one in Englefield Bay near the north end of Moresby Island, and one off the south end of Moresby Island around Kunghit Island. Between those two areas the coastline is precipitous with only a few small colonies.

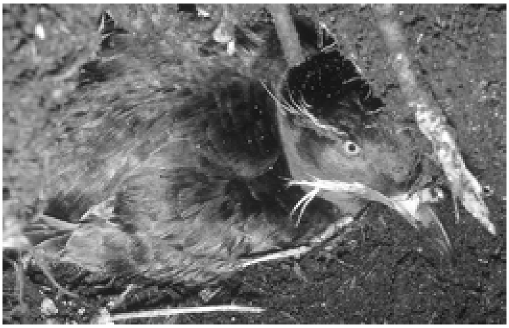


**Figure 148.** Over 90% of the Rhinoceros Auklet breeding population in Haida Gwaii nests at colonies along the west coast of Moresby Island. *Photo by R. Wayne Campbell.*

Haida traditionally harvested Ancient Murrelets from most colony sites in Englefield Bay, including Saunders, Helgesen, Carswell, Lihou, Luxmoore, and Rogers islands, as well as Cape Kuper and the southwest end of Hibben Island.[101] This suggests larger historical populations of Ancient Murrelets on Saunders Island and Cape Kuper where few now nest.

Population declines and colony abandonments by burrow-nesting species have occurred on Saunders, Helgesen, Willie, Instructor, and St. James islands (Table 2, page 65). Rats (Figure 149) were present on St. James Island for many years, and cats and dogs have often been pets of weather station personnel. Those introduced animals may have been responsible for the extirpation of Cassin's Auklets from the island and for the retreat of Tufted Puffins to inaccessible nesting ledges. Storm-petrels have disappeared from Willie Island, possibly because deer have impacted the vegetation and soil. Cassin's and Rhinoceros auklets are no longer present on Saunders Island and Instructor Island shows signs of declining populations. Marten were suspected on Saunders Island in 1986, and in 1987 a raccoon was sighted on the shore of Moresby Island across from Saunders Island. In 1988, tracks of three raccoons were observed on Saunders Island. Raccoons were confirmed present on Saunders, Helgesen, and Instructor islands in 1989-1990.[155] Population declines of seabirds on Helgesen Island, though not detected during our survey in 1986, likely began by 1990 as the declines were substantial by 1993.[120] These islands are close to the shore of Moresby Island and would be easily reached by mammalian predators. Control of raccoons in the Englefield Bay area will be required to conserve extant nesting populations and hopefully restore abandoned colonies.

**Figure 149.** Norway Rats, such as the young individual shown here, readily feed on food scraps as well as many plants and animals, including seabirds. Their introduction to St. James Island likely caused the extirpation of Cassin's Auklets from the island. Rats were exterminated from St. James Island in 1998 in an attempt to restore seabird nesting populations. *Photo by R. Wayne Campbell.*

**Table 5.** Estimates of seabird breeding populations on the west coast of Moresby Island as of 1990. Estimates are numbers of breeding pairs except for numbers in parentheses, totals in the "All species" column, and totals in the "Total breeding birds" row, which are numbers of individuals. See Appendix 2 on pages 467-468 for an explanation of the letter codes used to qualify population estimates.

| SITE CODE | SITE NAME | Total Storm-Petrels[a] | FTSP | LSPE | PECO | BLOY | GWGU | COMU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | ALL SPECIES[b] | SURVEY YEAR(S)[c] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WM-010 | "Buck Channel" Island | 250e | S | 250e | | | | | S(≥1) | | | | | | 501 | 1977 |
| WM-012 | Chaatl Island - Cliffs | | | | x | | | | | | | | | | - | 1977 |
| WM-020 | Saunders Island | | | | | 5e | 7eS | | S(8) | 50e | E | E | | | 132 | 1986 |
| WM-030 | Helgesen Island | 180t | 180t | | | 1eS | | | (0) | 7,700t | 3,700t | 16,600t | 0 | | 56,362 | 1986 |
| WM-040 | Willie Island | E | E | E | | 0 | | | S(25) | 10eS | 170tS | 80tS | | | 545 | 1986 |
| WM-050 | Carswell Island | 270eS | | | | 1eS | | | (0) | 1,700eS | 180eS | 20eS | | | 4,342 | 1986 |
| WM-060 | "Inskip" Cave | | | | 5 | | | | | | | | | | 10 | 1977 |
| WM-070 | Instructor Island | 1,600t | x | | | 1 | | | S(17) | 760tS | | 850tS | | | 6,439 | 1986 |
| WM-080 | Lihou Island | 13,700t | x | x | 0 | 1 | | | S(80) | 6,500t | 11,200t | 2,700t | S(27) | | 68,309 | 1986 |
| 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 Islet | | | | | 2+ | 1 | | x(5) | | | | | | 11 | 1977 |
| WM-210 | "East Nangwai" Group | 2 | 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 |

**Table 5.** cont'd.

| SITE CODE | SITE NAME | Total Storm-Petrels[a] | FTSP | LSPE | PECO | BLOY | GWGU | COMU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | ALL SPECIES[b] | SURVEY YEAR(S)[c] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WM-250 | “McLean Fraser” Pinnacle | | | | | | 5eS | | S(2) | | | | | | 12 | 1986 |
| WM-260 | “Louscoone” Rocks | | | | | 3 | | | | | | | | | 6 | 1986 |
| WM-270 | Adam Rocks | | | | | 3 | 48 | | S(24) | | | | S(4) | | 130 | 1986 |
| WM-280 | SGang Gwaay (Anthony Island) | 10,700t | 2,100t | 8,600t | 7 | 11 | 352 | | S(395) | 200e | 24,700t | 13,800t | 20eS(32) | S(20) | 99,995 | 1985,86 |
| WM-290 | Flatrock Island | | | | 0 | 2 | 145 | | x5(78)[d] | | | | 11(16) | S(2) | 396[d] | 1986,88 |
| WM-300 | Gordon Islands | | | | | 0 | 1S | | S(26) | | 700e | 80eS | (1) | | 1,589 | 1985,86 |
| 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(118) | S(68) | | 78,000t | | 600e(900) | S(3) | 157,541 | 1986,89 |
| **TOTAL NESTING PAIRS** | | **61,102** | **2,282+[e]** | **8,850+[e]** | **18** | **42** | **832** | | | **19,630** | **119,370** | **34,500** | | | | |
| **TOTAL BREEDING BIRDS** | | **122,204** | **4,564+[e]** | **17,700+[e]** | **36** | **84** | **1,664** | **158** | **854[d]** | **39,260** | **238,740** | **69,000** | **1,593** | **26** | **473,619[d]** | |
| **TOTAL CURRENT SITES** | | 9 | 8+ | 5+ | 4 | 18 | 19 | 2 | 23 | 10 | 12 | 11 | 11 | 4 | 33 | |
| ***Confirmed on last survey*** | | 8 | 7 | 5 | 4 | 10 | 9 | 1 | 5 | 5 | 8 | 3 | 3 | 0 | 23 | |
| ***Confirmed on any survey*** | | 8 | 7 | 5 | 4 | 13 | 12 | 1 | 11 | 5 | 10 | 3 | 5 | 1 | 26 | |
| ***Unconfirmed*** | | 1 | 1 | 0 | 0 | 5 | 7 | 1 | 12 | 5 | 2 | 8 | 6 | 3 | 7 | |
| **TOTAL HISTORICAL SITES** | | 10 | 9 | 6 | 8 | 21 | 19 | 2 | 25 | 10 | 13 | 12 | 12 | 4 | 33 | |
| ***Confirmed*** | | 9 | 8 | 6 | 8 | 15 | 12 | 1 | 12 | 5 | 11 | 4 | 3 | 1 | 26 | |
| ***Unconfirmed*** | | 1 | 1 | 0 | 0 | 6 | 7 | 1 | 13 | 5 | 2 | 8 | 9 | 3 | 7 | |
| **CURRENTLY ABANDONED SITES** | | 1 | 1 | 1 | 4 | 3 | 0 | 0 | 2 | 0 | 1 | 1 | 1 | 0 | 0 | |
| ***Previously confirmed*** | | 1 | 1 | 1 | 4 | 2 | | | 1 | | 1 | 1 | 0 | | | |
| ***Previously unconfirmed*** | | 0 | 0 | 0 | 0 | 1 | | | 1 | | 0 | 0 | 1 | | | |

[a] At some colonies, total number of breeding pairs was estimated but the proportion of burrows occupied by each of the two storm-petrel species was not determined.
[b] Number of individuals.
[c] For sources see individual island accounts.
[d] Totals have been revised from those presented on Table 3 in Part 1 (page 63) [231] due to a higher count of Pigeon Guillemots at Flatrock Island in 1986 that we recently extracted from eBird.[315]
[e] If we assume 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 Haida Gwaii, then we derive total breeding population estimates of 41,290 individuals (20,645 pairs) of Fork-tailed and 80,914 individuals (40,457 pairs) of Leach’s storm-petrels on the west coast of Moresby Island as of 1990.

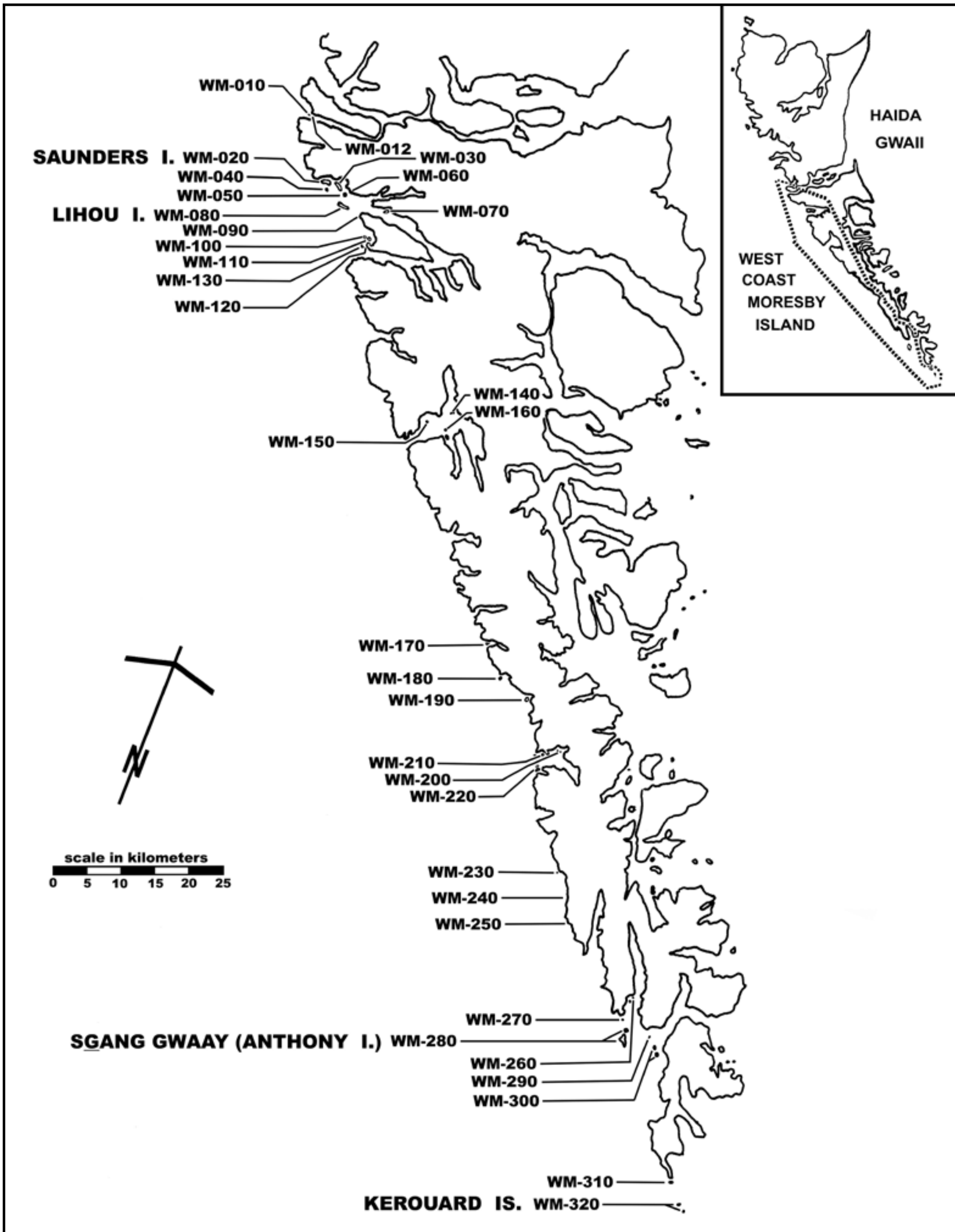



**Figure 147.** Locations of seabird colonies on the west coast of Moresby Island (modified from Rodway et al.[234]).

***The Moral Dilemma***

*Introduced species are a common threat to colonial-nesting seabirds and many other indigenous animal and plant groups around the world. When introduced species threaten the survival of native species, a decision has to be made to sacrifice individuals of one species to protect those of another. This presents a moral dilemma.*

*For some alien animals like rats, which are historically associated with pestilence and disease and have gained little esteem or sympathy in human culture, there is rarely public reaction to conservation programs aimed at their elimination. Also, rats usually spread through their own initiative in boarding ships or other materials that humans transport around the world. That makes it easier to consider them as invaders to pristine habitats.*

*Human sympathy is greater for other species, such as raccoons, which have earned reputations of being cute and entertaining, and thus there is greater public reaction to conservation programs to remove them* (Figure 150). *Often, species like raccoons have been purposely introduced and the resulting problem populations can more easily be considered innocent victims of human activity. Even more so because raccoons were generally introduced to be killed for a fur trade, which, because of evolving human attitudes towards animals, is now regarded as barbaric by much of the public. This engenders more sympathy for their fate than might otherwise exist. These factors make the moral dilemma and justification for removing raccoons or other fur-bearing animals from seabird colonies more severe.*

*Five or six raccoons were released at several locations along the east coast of Graham Island in the 1940s.*[134] *From that small seed population, raccoons spread the entire length of Haida Gwaii, crossing to Moresby Island sometime around 1958. They have demonstrated their ability to reach many islands where seabirds nest and have already eliminated burrow-nesting seabirds from several colonies. As of 1993, they have been responsible for the extirpation of about 80,000 Ancient Murrelets, Cassin's Auklets, and Rhinoceros Auklets from Saunders, Helgesen, and Instructor islands in Englefield Bay.*[120, 234] *This was likely the work of only a few individuals or perhaps one family of raccoons. The moral dilemma seems more easily resolved in the face of such a dramatic numerical trade-off – a handful of raccoons to save tens or, on some colonies, hundreds of thousands of adult murrelets, auklets, and their chicks – in combination with the fact that in BC we have stewardship responsibility for a majority of the world population for each of these seabird species. Also, seabird species have nowhere else to go – they depend on these isolated islands for nesting – whereas raccoons are widespread and successful in a variety of habitats, including urban areas. It is an ongoing problem and our seabirds will only be safe once raccoons are removed from the entire Haida Gwaii archipelago.*

**Figure 150.** Raccoons can thrive in a wide variety of habitats, including urban areas, where they are both loved and hated by humans. Their introduction to isolated seabird colonies can have disastrous consequences for nesting birds. *Photo by R. Wayne Campbell.*

Fewer Pelagic Cormorants were nesting in the region in 1986 (13 nests at two sites) than in 1977 (72 nests at seven sites), although one site ("Inskip" Cave) with five nests in 1977 was not checked in 1986. An additional 30 pairs estimated nesting on the west side of Kunghit Island was previously included in the 1977 tally for this region,[227] but all of Kunghit Island has been considered part of the East Coast Moresby Island region in subsequent compilations.[233] Four of seven sites used in 1977 were not used in 1986.[227] Some cave-nesting sites along the mid-west coast of Moresby Island may have been missed during those surveys, so that counts for the region are incomplete;[300] however, the consistent pattern of decline and abandonment at surveyed sites suggest that the decreasing trend observed at those sites between 1977 and 1986 was representative of the entire region.

Surveys for Black Oystercatchers and Glaucous-winged Gulls in 1977 and 1986 were also incomplete, especially in 1986, but partial comparisons of colonies surveyed in both years provide some trend data. Thirteen of the 21 sites where Black Oystercatchers have historically nested (Table 5) were surveyed in both 1977 and 1986. At those 13 sites, 37 pairs were estimated nesting in 1977 and 24 pairs in 1986 (31 and 18 nests were found at those 13 sites in 1977 and 1986, respectively), suggesting some decline between 1977 and 1986. However, we are not confident that changes reflected a real trend for the region, as a number of sites were not surveyed in both years and oystercatcher nests are difficult to find (Figure 151). Oystercatcher nesting sites on Saunders Island,

**Figure 151.** Black Oystercatcher nests are often difficult to find and the discovery of a nest, like this one on Ramsay Island, is always a treat for tourists visiting Haida Gwaii. Such incidental observations are rarely reported to seabird biologists. *Photo by R. Wayne Campbell, 6 June 2000.*

Instructor Island, and "Louscoone" Rocks were not surveyed in 1977 (there were 9 pairs nesting at those three sites in 1986), and five sites (with 9 nesting pairs in 1977) along the mid-west coast of Moresby Island were not surveyed in 1986 (Table 5).

Glaucous-winged Gulls were surveyed in 1977 and 1986 at eight colonies, where 588 pairs were estimated nesting in 1977 and 717 pairs in 1986. In 1977, an additional 73 nesting pairs were nesting at seven sites along the mid-west coast of Moresby Island that were not surveyed in 1986, making a total of 661 pairs estimated nesting at all colonies surveyed in 1977 (revised from Campbell and Garrioch [39]). However, in 1986 an estimated 35 pairs were nesting at three sites that were not surveyed in 1977, so actual totals in 1977 may have been slightly larger. As on the west coast of Graham Island, a greater proportion of empty nests was found in 1977 (37%) than in 1986 (13%); contents were determined in 618 nests in 1977 (391 with eggs or young) and 581 nests in 1986 (508 with eggs or young). However, unlike the situation on the west coast of Graham Island, there were no reports of excessive predation at colonies along the west coast of Moresby Island in 1977 to explain the difference. The eight colonies surveyed in both 1977 and 1986 included the majority of the total nesting population in the region (Table 5) and the 22% increase in numbers of nesting pairs at those sites was probably representative of the entire region (Figure 152).

**Figure 152.** The nesting population of Glaucous-winged Gulls on the west coast of Moresby Island increased between 1977 and 1986. *Photo by R. Wayne Campbell.*

All colonies south of Tasu Sound, from “Mike” Rock to the Kerouard Islands, are protected within Gwaii Haanas. The islets around SGang Gwaay and the Kerouard Islands were previously designated Ecological Reserves, but that status was revoked to allow their inclusion in Gwaii Haanas. All colonies from the Englefield Bay area south to Tasu Sound are within the Daawuuxusda Heritage Site/ Conservancy.

The area, especially around SGang Gwaay, receives increasing tourist traffic that may have already disturbed conspicuous nesting sites and affected small nesting populations of Pelagic Cormorants and Tufted Puffins. Guidelines for access to colony areas within Gwaii Haanas have been formulated and enforcement is required to protect sensitive species and sites.

## WM-010 “BUCK CHANNEL” ISLAND

**Location:** *53°06'20"N 132°33'09"W; 103 F/2.*
At the west entrance to Buck Channel just offshore of Chaatl Island.

**Description:** *1.2 ha; 30 m high; Forested.*
“Buck Channel” Island has an open forested habitat.

**Historical summary:** Both species of storm-petrels were suspected nesting on the west side of the island in 1977 but only Leach’s Storm-Petrels were found in burrows explored (Table WM-010). Observers recorded Black Oystercatcher and Pigeon Guillemot as present but no counts or evidence of nesting were given.

**Table WM-010.** Seabird nesting records for “Buck Channel” Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jul 1977 | S | 250e | S(≥1) | 39, 314 |

**Remarks:** Bald Eagle and river otter were noted in 1977.

## WM-012 CHAATL ISLAND - CLIFFS

**Location:** *53°06'24"N 132°32'50"W; 103 F/2.*
On the south side of Chaatl Island at the west entrance to Buck Channel.

**Description:** *Cliffs and crevices.*

**Historical summary:** Observers in 1977 reported Pelagic Cormorants nesting in a crevice on the cliffs (Table WM-012). A nest count was not obtained. This nesting record was formerly included with WM-010 “Buck Channel” Island.[234]

**Table WM-012.** Seabird nesting records for Chaatl Island - Cliffs. See Appendix 2 for codes.

| DATE | PECO | SOURCE |
|---|---|---|
| 18 Jul 1977 | x | 314 |

## WM-020 SAUNDERS ISLAND

**Location:** *53°01'45"N 132°28'W; 103 F/1.*
Northwest corner of Englefield Bay. Also known as Cliff Island. Colony includes the rocks off the west and east ends of the main island.

**Description:** *55 ha; 70 m high; Forested.*
Like most of the islands in Englefield Bay, Saunders Island has a perimeter of cliffs, crevices, and steep slopes (Figure 153). Substantial tidal shelves extend off the south side and there is a beach on the north side. The top of the island has a more gentle topography. Ground cover on points and slopes near shore is grassy under spruce (Figure 154), becoming mossy or bare further inland where hemlock and redcedar predominate. Thickets of young spruce and hemlock were common in 1986, especially on the north side. The north shore was once a Haida village site.[79] Two rocks off the west end and one off the east end are bare.

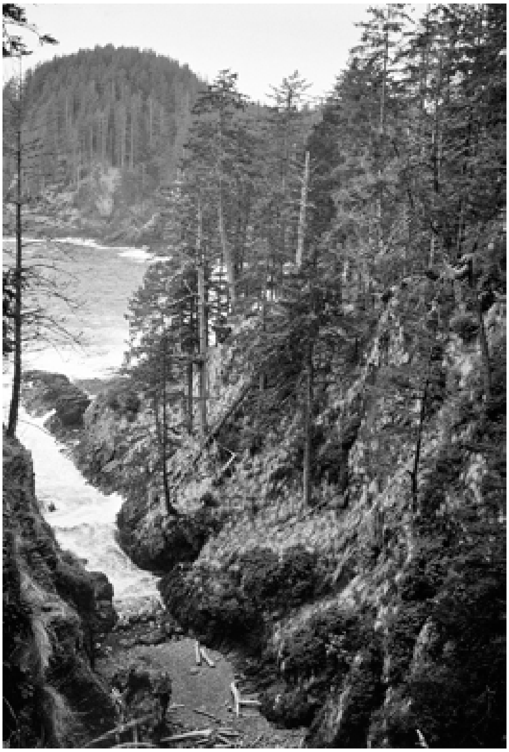


**Figure 153.** The shoreline of Saunders Island has steep slopes, cliffs, and crevices. *Photo by Moira J.F. Lemon, 25 May 1986.*

**Figure 154.** On Saunders Island, the slopes near shore have a ground cover of grass under a Sitka spruce forest. *Photo by Michael S. Rodway, 29 May 1986.*

**Historical summary:** The Haida traditionally harvested Ancient Murrelets on Saunders Island.[101] Guiguet first recorded this species nesting in 1959 (Table WM-020). Surveys were conducted on 3 and 21 June 1977 by the BCPM, and on 13, 25, and 29 May 1986 by CWS. Crews in 1977 observed Ancient Murrelets nesting on the west and east ends of the island and Cassin's Auklets on the west end. They may not have explored above the steep south side of the island, as no Rhinoceros Auklet burrows were reported. Rain and wind during the 1977 surveys also prevented exploration of the outer east and west rocks where Black Oystercatchers and Glaucous-winged Gulls were found nesting in 1986.

In 1986, we found almost 11,000 Cassin's Auklet burrows and 9,000 Rhinoceros Auklet burrows along the south side of the island (Figure 155), all of which we suspected had been abandoned in the last year or two, judging from the appearance of burrows and from eggshell remains found within burrows (Figure 156). Only a few Ancient Murrelet burrows were located, in the interior near the west end of the island.

**Figure 155.** Numbers of seabird burrows on Saunders Island were determined in 1986 by running line transects through burrowing habitat. This photo shows a transect on the east-facing slope of the island. *Photo by Michael S. Rodway, 29 May 1986.*

Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots were nesting on the west and east rocks in 1986. Three oystercatcher nests on the inner west rock and one on the east rock contained eggs. We were unable to land on the outer west rock to check for nests of one pair of oystercatchers and six pairs of gulls. One pair of gulls was building a nest on the east rock.

**Table WM-020.** Seabird nesting records for Saunders Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 14 Jun 1959 | | | | x | | | 94 |
| Jun 1977 | | | S(2) | 200+e | 40e | | 39, 314 |
| May 1986 | 5e | 7eS | S(8) | 50e | E | E | 234 |

**Figure 156.** Ancient Murrelet hatched egg membranes become darkly stained (left) after a winter in a burrow. Finding such egg remains in burrows on Saunders Island in 1986 revealed that the nesting colony had been abandoned in the last year or two. *Photo by Moira J.F. Lemon, 23 June 2005.*

**Remarks:** Depredated remains of several Ancient Murrelet adults and eggs and one Cassin's Auklet adult were found in 1977. In 1986, we found recent remains of a few Ancient Murrelets and older remains of Rhinoceros and Cassin's auklets, including several skulls, feather piles, and eggshells. Fifteen burrows had been obviously dug up by a mammalian predator within the previous year or two. There were river otter runs and dens around the island; a few river otter scats contained feathers but most contained only fish remains. The recent presence of marten was inferred from tracks seen on the north beach and the past presence of raccoon from an older pile of about 10 scats found under a root cavity in 1986. Some of these scats were whitish and contained shell remains of crabs and periwinkles and others contained feathers. No sign of nesting activity was observed during a brief visit on 20 June 1987. Tracks of three raccoons were observed on the north beach by Rick Hoar on 26 April 1988 [306] and raccoons were confirmed present in 1989-1990.[155]

A pair of Pelagic Cormorants in breeding plumage was roosting on the outer west rock on 29 May 1986. They flew into a cave on the adjacent Moresby Island shore where they may have been nesting.

There were two active Bald Eagle nests in 1986.

***Treasures from the Ocean***

*Japanese fishermen for years used glass balls as floats for their fishing nets. They were efficient and cheap to make and easily replaced. Larger ships employed their own glass blower that could produce replacement floats on demand. Early floats were handmade, often from leftover or recycled glass, especially old sake bottles. After being blown, floats were sealed with a "button" of melted glass. Glass floats have also been made in various other parts of the world, the first perhaps in Norway, but it is those used by the Japanese that we find on Pacific shores.*

*Something magic happens to these banal glass balls when they travel thousands of miles across the Pacific Ocean and land on our beaches* (Figure 157)*; some alchemist's secret that transforms the dross of recycled sake bottles into glittering jewels, treasured by every beachcomber along the BC west coast. Though no longer produced by fishermen, many are still floating around in the open Pacific. Once dislodged from their nets, glass balls travel with the currents and often end up trapped in the Alaska Gyre where they may circle the North Pacific for years. Many are still there. Balls accumulated in the gyre occasionally break free when storms or unusual tidal conditions disrupt the circulation and set them on course for our shores. When that happens, there can be a "boom" year for glass ball collectors.*

*Our survey year in Englefield Bay in 1986 was one such "boom" year. Several days of gale and storm force south-west winds had kept us camp bound on Helgesen Island. Finally, the winds abated, the clouds parted, and*

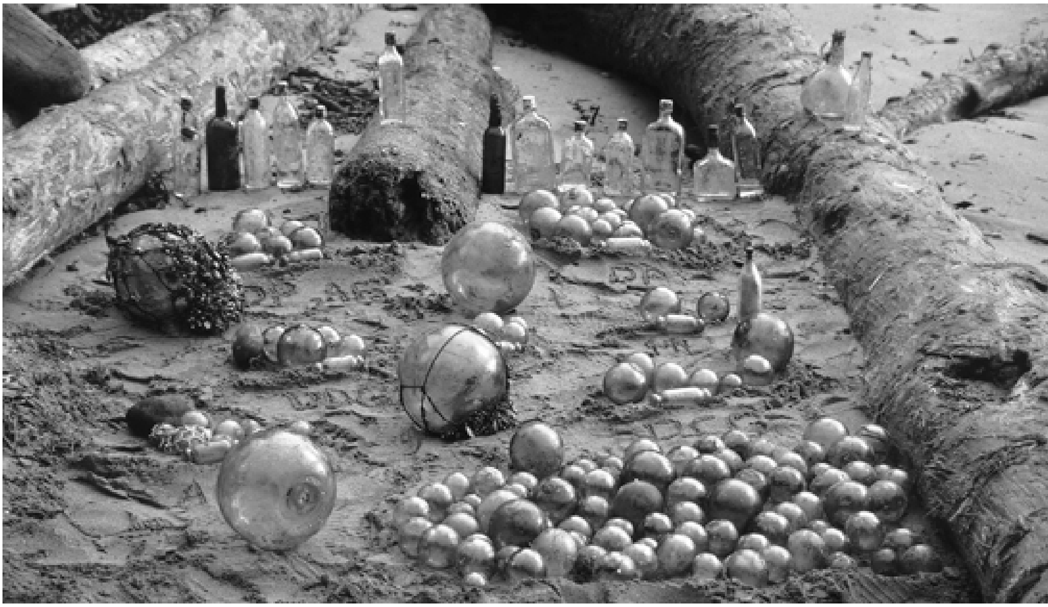


**Figure 157.** Japanese glass fishing floats may spend years floating around the North Pacific Ocean, trapped in the Alaska Gyre. Unusual storms or tides will break them free and send them eastward to wash ashore along the west coast of Haida Gwaii and other North Pacific shores, sometimes in great numbers. These ones were found in Englefield Bay during the 1986 field season, and were gathered together at the Helgesen Island camp. *Photo by Moira J.F. Lemon, 22 May 1986.*

*we could once again launch the boats. On 19 May, we started to see glass balls floating into Boomchain Bay, north of Helgesen Island. On 20 May, there were over a hundred in the water and washing up on shore. We scooped them out of the water and gathered them off the shore - we nearly filled the zodiac! Again on 21 May, we found 80-90 in the south bay of Lihou Island and found some very large ones north of Helgesen Island. We couldn't resist gathering them all of course! By 24 May, we had collected 321 glass balls and we still found a few more after that.*

*As during a goldrush, we had to be concerned that rivalries and envy would drive our crew into dispute. We devised an equitable plan that fortunately prevented any overt hostilities: the rare, largest balls belonged to those that found them; the rest were pooled and divided up through each person picking one at a time in rotation until all were distributed. People carefully packed their chosen treasures. That year we had a little more freight going out from camp than usual.*

## WM-030 HELGESEN ISLAND

**Location:** *53°01'44"N 132°26'22"W; 103 F/1.*
Northwest corner of Englefield Bay, east of Saunders Island. Colony includes the small island off the northeast side.

**Description:** *51 ha; 60 m high; Forested.*
The rugged shoreline of Helgesen Island is steep and cut by many chasms and narrow bays (Figure 158). One gorge cuts right across the island, effectively isolating north and south segments. There is one beach in the bay on the northeast corner. In 1986, extensive tracts of the island were thick with young regenerating spruce growing over old windfall swaths (Figure 159). Steep, open slopes near shore are grassy under stands of spruce, while interior areas of mature hemlock and redcedar forest have little understory vegetation. The little island on the northeast side is covered with moss under mature forest.

**Figure 158.** The shoreline of Helgesen Island is steep and rugged. *Photo by Moira J.F. Lemon, 7 May 1986.*

**Figure 159.** Some open slopes near shore on Helgesen Island are steep with regenerating Sitka spruce. *Photo by Michael S. Rodway, 20 May 1986.*

**Historical summary:** Ancient Murrelets were traditionally hunted on Helgesen Island.[101] Guiguet confirmed breeding by Pigeon Guillemots, Ancient Murrelets, and Rhinoceros Auklets in 1959 (Table WM-030). He also suspected that a pair of Tufted Puffins was nesting. Tufted Puffins have not been observed since. The remains of a Rhinoceros Auklet were found in 1977 but no burrows were reported, although burrows identified as Cassin's Auklet in one quadrat on the mid-southwest slope of the island were noted to have large (8") entrances. Rhinoceros Auklets were the most abundant nesting species observed in 1986 (Figures 160 and 161). Fork-tailed Storm-Petrels, first documented in 1986, were nesting primarily on the small island ("Little Helgesen") off the northeast side. Black Oystercatchers were observed on the west side rocky shore in 1977 and 1986.

**Figure 160.** Dick Grinnell at a seabird plot on the northwest side of Helgesen Island in 1986. *Photo by Michael S. Rodway, 10 May 1986.*

**Figure 161.** Rhinoceros Auklet burrow (bottom centre) among roots of Sitka spruce on Helgesen Island in 1986. *Photo by Michael S. Rodway, 20 May 1986.*

**Remarks:** Little evidence of predation was noted in 1977, but abundant depredated remains were observed in 1986, especially of Ancient Murrelets (Table 3, page 68). Almost 100 Ancient Murrelet feather piles were counted, likely left by Bald Eagles (Figure 162). Seven Bald Eagles and a Peregrine Falcon were seen in 1986, but no nests were located. We found 14 pairs of attached wings and 40 single wings of Ancient Murrelets as well as Rhinoceros Auklet remains and Northern Abalone (*Haliotis kamtschatkana*) shells at the site of a Common Raven nest on the northwest corner of the island. A raven was seen feeding on an Ancient Murrelet on 22 May. Three burrows had been dug up. There were signs of river otter on the main island and an active den on the small northeast island. Raccoons were persistently present in 1989-1990 [155] and major impacts to seabird populations were apparent by 1993 [120] (see Appendix 1).

**Table WM-030.** Seabird nesting records for Helgesen Island. See Appendix 2 for codes.

| DATE | FTSP | BLOY | PIGU | ANMU | CAAU | RHAU | TUPU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 13, 15 Jun 1959 | | | x | x | | x | S(2) | 94 |
| 3, 21 Jun 1977 | | 1 | S(3) | 150e | 2,500e | | 0 | 39, 314 |
| 7-29 May 1986 | 180t | 1eS | (0) | 7,700t | 3,700t | 16,600t | 0 | 234 |

**Figure 162.** Bald Eagles have learned to hunt at night to catch Ancient Murrelets on their breeding colonies. From a low perch, eagles pounce on Ancient Murrelets as they scuttle across the forest floor to and from their burrows. This scattered pile of Ancient Murrelet feathers is tell-tale evidence of eagle predation. *Photo by Moira J.F. Lemon.*

***Saved From the Tsunami***

*On 27 March 1964, a tsunami generated by North America's strongest earthquake of the 20$^{th}$ century swept down the BC coast and devastated the Vancouver Island coastal community of Port Alberni. The giant wave took 4½ hours to reach Port Alberni from its source off Anchorage, Alaska. Residents had no warning. Shortly afterwards, Canada became part of the Pacific Tsunami Warning Network which can issue alerts to all coastal nations within 20 minutes of an earthquake. The first official warning issued in Canada was on 7 May 1986 after a massive earthquake struck the Aleutian Islands. At that time, we were surveying seabirds in Englefield Bay and our crew of six was camped on a low-lying point on the northeast corner of Helgesen Island. Zodiacs were tied just above the beach and tents were sited only slightly above high water. Here, in an area exposed to the open Pacific, we would have been some of the earliest casualties of a tsunami travelling down the BC coast. Even a moderate-sized tsunami would have swept our camp clear. Without cell phones, satellite phones, radios, or any other form of contact with the outside world, we were oblivious to any impending danger.*

*Our first hint that something was up was when we heard a helicopter approach that proceeded to land on the beach by our camp. Out stepped our friend and constant source of help in our work in Haida Gwaii, Keith Moore* (Figure 163)*. Without delay, Keith informed the crew that an earthquake had struck at 3:47 PM our time and the forecast tsunami was expected to hit BC around 8 PM. Fortunately, the camp was backed by cliffs and steep slopes that rose to higher portions of the island, which provided a suitable evacuation haven. Around 7 PM, with the sound of the helicopter receding into the distance, I (Michael) and Dick Grinnell were working our way down the steep slopes from the nesting colony above, to find out what was happening. We met Keith, Moira, and the rest of the crew coming up with sleeping bags and supplies under their arms. After discussing the situation, and with only a short time to spare, some of us went back down and dragged the zodiacs up into the bush as high as we could get them* (Figure 164)*, quickly grabbed some provisions for the night, and scrambled back up the cliffs. We had time to make popcorn (just kidding) and found perches on the edge of the cliffs from which we could watch the anticipated devastation. The show was anticlimactic. Ocean sensors indicated that the tsunami that struck that area was about 1 cm high! Regardless, Keith was our potential saviour and we are forever in his debt for his concern, quick action, and willingness to put himself in harm's way to come and warn us.*

**Figure 163.** Keith Moore was a constant source of help during our surveys of nesting seabirds in Haida Gwaii. He selflessly came to the rescue of our survey crew camped on Helgesen Island during the tsunami warning of 1986. *Photo by Michael S. Rodway, Willie Island, BC, 18 May 1986.*

**Figure 164.** A massive earthquake struck the Aleutian Islands on 7 May 1986. At our base camp on Helgesen Island, in preparation for a possible tsunami hitting the west coast of Moresby Island following that quake, our two zodiacs and gas tanks were hastily moved into the edge of the forest and secured by a strong line. *Photo by Moira J.F. Lemon, 7 May 1986.*

## WM-040 WILLIE ISLAND

**Location:** *53°01'12"N 132 27'50"W; 103 F/1.* Northwest corner of Englefield Bay, south of Saunders Island.

**Description:** *5.4 ha; 45 m high; Forested.* Willie Island is dome-shaped, with precipitous sides and a cap of mature spruce (Figure 165). Lush grasses and forbs grow above the perimeter rock, changing to moss in the centre of the island. On the east end is a patch of young spruce forest with a bare litter floor.

**Historical summary:** BCPM crews in 1977 confirmed breeding by both species of storm-petrels and Cassin's Auklets and suspected nesting by Rhinoceros Auklets based on burrow size (Table WM-040). Cassin's Auklet burrows were found throughout the island where soil depth was sufficient. Storm-petrel burrows occurred sporadically amongst Cassin's Auklet burrows. About 12 suspected Rhinoceros Auklet burrows were found at the top of the island under spruce roots.

During our visit on 8 and 15 May 1986 we identified a few burrows as Ancient Murrelet and found obvious signs (droppings and regurgitated food at burrow entrances) of Cassin's and Rhinoceros auklets, although nesting was not confirmed for any species. No storm-petrel burrows were found. Pigeon Guillemots were seen mostly on the east side of the island.

**Figure 165.** Willie Island is dome-shaped, with steep sides and a stand of mature Sitka spruce trees on the rounded top. *Photo by Michael S. Rodway, 8 May 1986.*

**Table WM-040.** Seabird nesting records for Willie Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | PIGU | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 20 Jun 1977 | 50e | 50e | 2[1] | | | 300e | S | 39, 314 |
| May 1986 | E | E | 0 | S(25) | 10eS | 170tS | 80tS | 234 |

**Remarks:** Hundreds of Cassin's Auklet kills were noted in 1977. Some of the river otter scats observed contained feathers. In 1986, deer that were observed on the island had severely browsed and trampled the lush forb growth (Figures 166 and 167). This may have contributed to the disappearance of storm-petrels between 1977 and 1986. There was one active Bald Eagle nest on the island in both 1977 and 1986. One Ancient Murrelet and two Rhinoceros Auklet feather piles were found under the eagle nest in 1986.

**Figure 166.** In 1986, the northeast knob of Willie Island had been heavily trampled and browsed by deer. *Photo by Michael S. Rodway, 15 May 1986.*

**Figure 167.** Major predators of deer are absent from Haida Gwaii and this young fawn is relatively safe. Since being introduced, deer have proliferated and spread to most islands in Haida Gwaii where they have had major impacts on vegetation communities. *Photo by Michael S. Rodway.*

## WM-050 CARSWELL ISLAND

**Location:** *53°01'18"N 132°25'19"W; 103 F/1.*
On the north side of Englefield Bay, east of Helgesen Island.

**Description:** *17.4 ha; 60 m high; Forested.*
Carswell Island has a precipitous perimeter (Figures 168 and 169). The only walking access to the top is along the ridge on the northeast end (Figure 170). Grass and windswept spruce grow above the shore rock and salal covers most of the northeast knob. The interior spruce and hemlock forest has a mossy understory, with many rocky outcrops and seepage areas, especially on the east side. Much of the forest is young, cluttered with old windfall.

**Figure 168.** Steep slopes on the north side of Carswell Island. On 12 May 1986, the island was capped with snow. *Photo by Michael S. Rodway.*

**Figure 169.** The south side of Carswell Island features rocky outcroppings. *Photo by Michael S. Rodway, 8 May 1986.*

**Figure 170.** Hiking through wet forest was typical of most days spent surveying seabird islands in Englefield Bay in 1986. Almost daily, rubber boots, socks, and pages from notebooks had to be dried over a camp stove. *Photo by Moira J.F. Lemon.*

**Historical summary:** Ancient Murrelets were traditionally hunted on the island.[101] The area was visited on 3, 20, and 21 June 1977, and 7 and 11 May 1986 (Table WM-050). Burrow contents were difficult to determine in both years and confirmation of breeding was lacking for most species. Cassin's Auklets were confirmed breeding in 1977, and, although breeding was not confirmed, signs seen around burrows made us confident that storm-petrels, Ancient Murrelets, Cassin's Auklets, and Rhinoceros Auklets were nesting in 1986. A Black Oystercatcher nest with three eggs was found on the rocky knob on the southeast side in 1977 and one oystercatcher was seen there from the boat in 1986.

**Table WM-050.** Seabird nesting records for Carswell Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE[a] | BLOY | PIGU | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|
| Jun 1977 | <50S | 1 | 5eS(1) | S | 900e | | 39, 314 |
| May 1986 | 270eS | 1eS | (0) | 1,700eS | 180eS | 20eS | 234, 310 |

[a] Total number of storm-petrels was estimated but which species were nesting was not determined.

**Remarks:** Remains of six Ancient Murrelet eggs were found on 3 June 1977; evidence of predation on Cassin's Auklets, including three inverted skins, was noted on 21 June 1977. Ancient Murrelet feather piles and eggshells were found in 1986. There were two active Bald Eagle nests in 1986.

## WM-060 "INSKIP" CAVE

**Location:** *53°01'32"N 132°24'28"W; 103 F/1.*
On the shore of Moresby Island northeast of Carswell Island at the mouth of Inskip Channel.

**Description:** *Sea-cave.*

**Historical summary:** Pelagic Cormorant nests counted in 1977 were too high in the cave to allow observers to view contents (Table WM-060). This cormorant nest record was included with Carswell Island in Campbell and Garrioch.[39]

**Table WM-060.** Seabird nesting records for "Inskip" Cave (nests).

| DATE | PECO | SOURCE |
|---|---|---|
| 20 Jun 1977 | 5 | 314 |

## WM-070 INSTRUCTOR ISLAND

**Location:** *53°01'21"N 132°19'23"W; 103 F/1.*
In Baylee Bay on the north shore of Inskip Channel.

**Description:** *2.3 ha; 20 m high; Forested.*
Instructor is an undulating, oblong island covered with moss under a forest of spruce and hemlock (Figure 171).

**Figure 171.** Southeast side of Instructor Island showing the moss mantle under a forest of Sitka spruce and western hemlock. *Photo by Michael S. Rodway, 18 May 1986.*

**Historical summary:** Instructor Island was not visited by BCPM crews in 1977, but was surveyed on 18, 27, and 30 May 1986 (Table WM-070). Though most burrows appeared worn, other evidence of activity was sparse in 1986. Numbers of nesting pairs were estimated using median BC occupancy rates, but, due to few signs of activity, we suspected that these estimates were high. We confirmed one Fork-tailed Storm-Petrel incubating in a burrow. Past breeding by Ancient Murrelets and Rhinoceros Auklets was confirmed by eggshell remains found in burrows, but present confirmation was not obtained for these two species. Black Oystercatchers were nesting on the rock at the northeast end (Figure 172).

**Table WM-070.** Seabird nesting records for Instructor Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | BLOY | PIGU | ANMU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|
| May 1986 | 1,600t[a] | x | 1 | S(17) | 760tS | 850tS | 234 |

[a] Total number of breeding pairs was derived from transect surveys but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** We found no evidence of recent predation in 1986. Four old Rhinoceros Auklet feather piles and 21 burrows that had been dug up were encountered. River otter sign was abundant but scats contained no feathers. The apparent recent abandonment by much of the burrow-nesting population suggests invasion by an introduced predator. Instructor Island is close to the shore of Moresby Island and likely easily reachable by raccoons (Figure 173). Hartman and Eastman confirmed raccoons present in 1989-1990 [155] (none were detected in 1995-1999 [152] but Ancient Murrelets and Rhinoceros Auklets had abandoned the colony by then; [120] see Appendix 1).

**Figure 172.** Black Oystercatcher nest on the rock at the northeast end of Instructor Island in 1986. *Photo by Michael S. Rodway, 18 May 1986.*

**Figure 173.** Raccoons were likely responsible for Ancient Murrelets and Rhinoceros Auklets abandoning the colony on Instructor Island in the 1980s. *Photo by R. Wayne Campbell.*

## WM-080 LIHOU ISLAND

**Location:** *53°00'23"N 132°25'03"W; 103 F/1.*
North side of Englefield Bay, west of Hibben Island.

**Description:** *75 ha; 107 m high; Forested.*
Steep rock with cliffs, dissecting crevices, and deep gorges surround the island (Figures 174 and 175). There are two large sea-caves on the north and south sides, and a small semi-protected bay on the south side. Grass occurs on steep slopes above the shore rock and at the top of the cliffs (Figure 176), while the interior forest of spruce, hemlock, and redcedar has a mossy or bare litter understory. Formidable expanses of regenerating spruce and hemlock covered much of the higher, southern slopes of the island in 1986. There was a Haida village site on Lihou Island.[79]

**Historical summary:** Haida traditionally harvested Ancient Murrelets on Lihou Island.[101] Visits to the island were made by Guiguet in 1959, Foster in 1960, and BCPM crews on 3 and 21 June 1977 (Table WM-080). The survey by CWS was conducted on 7-10, 14, 20, 21, and 27 May 1986. Guiguet confirmed nesting by Ancient Murrelets and Rhinoceros Auklets and suspected nesting by a pair of Tufted Puffins. In 1977 and 1986, storm-petrels were found burrowing throughout the island in a variety of habitats as far as 200 m from shore. This colony is unusual in being one of the only sites on the BC coast where storm-petrels are nesting in the interior of a large forested island, and in association with Ancient Murrelets.

**Figure 174.** Steep cliffs with a mixed forest above are common around Lihou Island. *Photo by Michael S. Rodway, 8 May 1986.*

**Figure 175.** Rugged terrain typical of Lihou Island. *Photo by Moira J.F. Lemon, 7 May 1986.*

**Figure 176.** Grasses occur on the steep slopes at the top of cliffs on Lihou Island. *Photo by Michael S. Rodway, 14 May 1986.*

An adult was sitting on the single Pelagic Cormorant nest seen in 1977. In 1986, there were 24 unattended cormorant nests in the sea-arch on the north side. We saw no cormorants in this vicinity, but did find five eggshells from the previous season below the nests. Two Black Oystercatcher nests were found in 1977 (Figure 177) and two pairs were seen in 1986, one on the mid-south side and one on the mid-north side, but only one nest was found on the south side in 1986.

**Figure 177.** Black Oystercatcher nest with few nesting materials on Lihou Island in 1977. *Photo by R. Wayne Campbell, June 1977.*

**Table WM-080.** Seabird nesting records for Lihou Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | PECO | BLOY | PIGU | ANMU | CAAU | RHAU | TUPU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 Jun 1959 | | | | | | | x | | x | S(2) | 94 |
| 24 Aug 1960 | | | | | | | x | | | S | 94, 314 |
| Jun 1977 | | | 10,000e | 1 | 2[2] | 15e(7) | 10,000e | 1,000e | | 25eS | 39, 314 |
| May 1986 | 13,700t[a] | x | x | 0 | 1 | S(80) | 6,500t | 11,200t | 2,700t | S(27) | 234 |

[a] Total number of breeding pairs was derived from transect surveys but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

Over 700 Ancient Murrelets were observed staging off the northeast tip of the island at 06:30 hr on 22 June 1977, and about 800 were gathered in a line extending north of Bone Point to the east of Lihou Island at 09:00 hr on 30 May 1986.

**Remarks:** Signs of predation were evident but not abundant in 1977 and 1986 (Table 3, page 68). River otter dens and trails were seen, and there were three active Bald Eagle nests and a Common Raven nest (Figure 178) in 1986. Peregrine Falcons were sighted in 1977 and 1986.

**Figure 178.** Common Raven nest with young located on a cliff on Lihou Island in 1986. *Photo by Michael S. Rodway, 14 May 1986.*

## WM-090 BONE POINT

**Location:** *53°00'14"N 132°22'55"W; 103 F/1.*
Most westerly point of Hibben Island.

**Description:** *8.0 ha; 70 m high; Forested.*
Bone Point is an islet separated from the main part of Hibben Island by a narrow, cliff-bound channel. Bare rock and cliffs around the edges rise to grassy slopes under a spruce forest on top. Young spruce and hemlock grow on upper northern slopes.

**Historical summary:** Visits were made to Bone Point on 3 and 21 June 1977, and 15, 18, 25, and 30 May 1986 (Table WM-090). No signs of burrowing on the forested top of the islet were found in either year. Ten Pelagic Cormorant nests, five with eggs and five empty, were located on the cliffs on the north side on 21 June 1977. Glaucous-winged Gulls were nesting and one pair of Black Oystercatchers was sighted on the western rocky point in both years. Observers in 1977 did not record whether oystercatchers were suspected nesting or not. Campbell and Garrioch [39] indicated that Glaucous-winged Gulls were only suspected nesting in 1977, but 15 nests were inspected on 21 May 1977. Tufted Puffins were seen

***A Place of Your Own***

*There's nothing more romantic than two lovers who, fed up with the trappings of urban life, decide to sell everything, pull up roots, and venture into the wilderness to carve out a place of their own. When birds nest in dense concentrations like many seabird colonies, you have to wonder, is there ever a pair that wishes they could get away from it all?*

*On Lihou Island in 1986, we were very excited to find and explore a sea cave near the east end of the island. There are several large sea caves on Lihou Island and other islands in Englefield Bay, some that famously cut right through an island like the one on Luxmoore Island (also known as "Hole" Island), but this was a smaller cave that might hold some secrets. We scrambled up to the entrance and then down into the cave where we found an ancient and massive piece of driftwood that must have been driven into the cave during some forgotten high-tide storm surge. And peering under that gnarled relict, we discovered the biggest surprise – an Ancient Murrelet sitting on its eggs! All by themselves, this pair had obviously ventured away from the beaten path and found a home of their own!*

**Table WM-090.** Seabird nesting records for Bone Point. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | TUPU | SOURCE |
|---|---|---|---|---|---|---|
| Jun 1977 | 10[5] | | 15[14][a] | 5e(5) | | 39, 314 |
| May 1986 | 0 | 1eS | 18eS | S(29) | S(12) | 234 |

[a] Corrected from an error in Campbell & Garrioch.[39]

**Remarks:** Three Bald Eagles and two Peregrine Falcons were sighted, and a nest of each species was reported nearby on Hibben Island in 1977.

flying around on three separate days in 1986 and were suspected nesting on the nose of the ridge below the northwest corner of the treed area.

## WM-100 LUXMOORE ISLAND

**Location:** *52°58'42"N 132°21'02"W; 103 C/16.* Englefield Bay off the west side of Hibben Island.

**Description:** *9.4 ha; 50 m high; Forested.* Luxmoore Island has an abrupt, dissected shoreline, with one narrow crevice cutting through the island (Figures 179 and 180). A precipitous grassy ceiling to this crevice forms a bridge between the east and west sections of the island. The more rounded top is mostly moss under spruce with perimeter sections of small, regenerating spruce and hemlock or grass.

**Historical summary:** Ancient Murrelets were traditionally harvested on the island.[101] Four species found nesting in 1986 were not reported in 1977, but we are uncertain how much of the island was explored in 1977 (Table WM-100). In 1986, we surveyed the island on 15 and 28 May. Storm-petrels and Ancient Murrelets were burrowing over most vegetated areas. Cassin's Auklet burrows occurred along the

**Figure 179.** Luxmoore Island is forested on top with steep rocky cliffs around the perimeter. *Photo by Moira J.F. Lemon, 15 May 1986.*

**Table WM-100.** Seabird nesting records for Luxmoore Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | PIGU | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 3 Jun 1977 | | | | | | 200+e | | 39 |
| May 1986 | 5,700t[a] | x | x | S(2) | 1,000tS | 380t | 300tS | 234 |

[a] Total number of breeding pairs was derived from transect surveys but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

southern perimeter and Rhinoceros Auklets were found nesting in two disjunct pockets on the south and west sides. A Black Oystercatcher was heard calling in 1986.

**Remarks:** Depredated remains were abundant in 1986, mostly of storm-petrels and some of Ancient Murrelets and Cassin's Auklets. Many storm-petrel wings were found, and 13 storm-petrel burrows had been dug up. River otter dens and trails were present

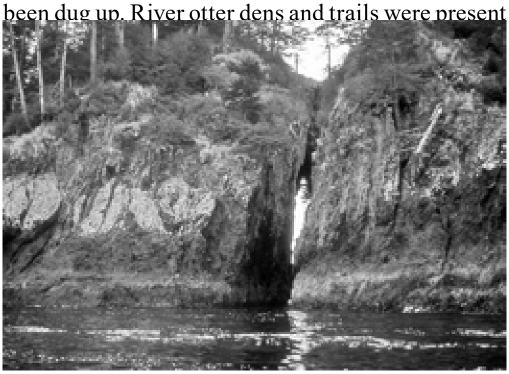


**Figure 181.** An active Bald Eagle nest in a mature Sitka spruce was located on Luxmore Island in 1986. *Photo by Michael S. Rodway, 15 May 1986.*

## WM-110 ROGERS ISLAND

**Location:** *52°58'36"N 132°20'10"W; 103 C/16.*
Englefield Bay off the west side of Hibben Island, east of Luxmoore Island. Colony includes the small islet connected to the east side.

**Description:** *8 ha; 60 m high; Forested.*
Low cliffs and crevices along the rocky shore of Rogers Island give way to an undulating interior, forested with scattered large spruce and hemlock surrounded by thick, young regenerating spruce. The perimeter is grassy and often wet.

**Historical summary:** Haida traditionally harvested Ancient Murrelets on the island.[101] Visits were made on 3 and 21 June 1977, and 15 and 28 May 1986 (Table WM-110). Note that Campbell and Garrioch [39] gave estimates of 9,000 pairs for each storm-petrel species, but field crews estimated 9,000 for total storm-petrels, 4,500 for each species. Proportions of each species nesting were not determined in 1986. From signs seen around burrows, we were confident that Ancient Murrelets, Cassin's Auklets, and Rhinoceros Auklets were nesting in 1986, although breeding was not confirmed for these species. BCPM crews did not report Ancient Murrelets or Rhinoceros Auklets nesting in 1977.

Black Oystercatchers were nesting on the small islet on the east side in 1977 and on the rocks at the

**Figure 182.** Many wings of Leach's Storm-Petrels were found on Rogers Island during surveys in 1977 and 1986. The storm-petrels were likely preyed on by river otters. *Photo by R. Wayne Campbell.*

**Table WM-110.** Seabird nesting records for Rogers Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | BLOY | PIGU | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|
| Jun 1977 | | 4,500e | 4,500e | 2[2] | | | S | | 314[a] |
| May 1986 | 28,700t[b] | x | x | 1S | x(20) | 1,700tS | 40eS | 20eS | 234 |

[a] Storm-petrel estimates were corrected from an error in Campbell & Garrioch.[39]

[b] Total number of breeding pairs was derived from transect surveys but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** Numerous wings of Fork-tailed and Leach's storm-petrels were found in 1977 and 1986 (Figure 182). Five storm-petrel burrows had been dug up in 1986. River otter runs and dens were seen and scats contained some feathers. There was one active Bald Eagle nest in 1986.

## WM-120 CAPE KUPER

**Location:** *52°58'15"N 132°20'25"W; 103 C/16.* At the southwest tip of Hibben Island.

**Description:** *20 ha; 70 m high; Forested.* Cape Kuper is separated from the main Hibben Island by a narrow tidal channel (Figure 183). Much of the shore is steep rock with deeply cut gorges. The western slopes near shore are grassy or covered with dense young thickets of spruce and hemlock. Scattered large spruce trees stand throughout these thickets. Mossy hemlock and spruce forests cover most of the higher interior and eastern areas.

**Figure 183.** North side of Cape Kuper. A narrow tidal channel runs between Cape Kuper and Hibben Island, which are connected at low tide. *Photo by Moira J.F. Lemon, 15 May 1986.*

**Historical summary:** Haida people remember harvesting Ancient Murrelets from Cape Kuper and the southwest end of Hibben Island.[101] No sign of nesting was reported in 1977 (Table WM-120). CWS crews explored the cape on 15 and 28 May 1986 and found scattered burrows of three species along the south and west sides. Eggshells in burrows confirmed nesting by Ancient Murrelets and Cassin's Auklets. Large size and distinctive feces at the entrance identified Rhinoceros Auklet burrows.

**Table WM-120.** Seabird nesting records for Cape Kuper. See Appendix 2 for codes.

| DATE | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|
| 3 Jun 1977 | 0 | 0 | 0 | 314 |
| May 1986 | 10 | 120 | 10S | 234 |

**Remarks:** One Rhinoceros Auklet feather pile was found in 1986. There were three active Bald Eagle nests. A river otter was seen swimming and river otter runs and dens were encountered. Scats were composed of fish.

## WM-130 MORESBY ISLETS

**Location:** *52°58'05"N 132°21'15"W* (south islet); *103 C/16.*
Englefield Bay off the southwest end of Hibben Island.

**Description:** *7.3 ha; 40 m high; Forested; Bare rock.*
Of the two islets that form Moresby Islets, the north islet is mostly bare rock. The south islet has grassy and forb covered slopes under mature spruce on the west and south sides, but little ground vegetation on the northern slopes where the spruce forest is much younger.

**Historical summary:** Crews in 1977 reported many Rhinoceros Auklet feathers around some large burrows but did not find evidence of nesting by Cassin's Auklets (Table WM-130). Cassin's Auklets and Rhinoceros Auklets were nesting in the same perimeter grassy areas in 1986. We found one possible Ancient Murrelet burrow on the northwest corner of the main island in 1986, but no other evidence of nesting by that species. One adult Ancient Murrelet was sighted on the water between the islets at 14:40 hr.

In 1986, there were two Black Oystercatchers on the northern rock, but no nest was found. A pair of Glaucous-winged Gulls appeared to be standing on a territory (Figure 184) and a possible nest start was found on the north rock. Pigeon Guillemots were seen on the water between the islets.

**Figure 184.** Field notes were kept of all wildlife observed, including numbers of territorial gulls, on each island visited by survey crews in 1977 and 1986. *Photo by R. Wayne Campbell.*

**Table WM-130.** Seabird nesting records for Moresby Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|
| 21 Jun 1977 | 0 | 0 | (4) | | 25+S | 39, 314 |
| 15 May 1986 | 1eS | 1eS | (1) | 80e | 40eS | 234 |

**Remarks:** One dead Cassin's Auklet was found in 1977 and three Cassin's Auklet wings were found in 1986. In 1986, we recorded one Bald Eagle nest, river otter runs, and river otter scats containing fish.

***Bath Day in the Snow***

*Rain and wind are expected at all times of year on the outer BC coast, but the May 1986 stint in Englefield Bay was one of the wettest and coldest of all our survey periods. Storm-force winds and lashing rain were frequent and on many days seas were too rough to venture very far in a zodiac. For days it seemed that we lived in our raingear and we increasingly got wetter and muddier from exploring burrows and thrashing through soaking bushes. Even with good raingear and rubber boots, your feet and clothes often get wet when you are crawling around looking for and investigating burrows in dripping wet vegetation. At night everybody tries to find a spot around the stove to hang their wet clothes and dry out their boots.*

*At the best of times, surveyors need to work steadily to complete surveys of an area within the short time available. When inclement weather hinders the survey work, it becomes paramount to use every good weather day to conduct surveys. Other necessary activities thus get allocated to bad-weather days. This was the reason that when we woke up one day after a week or so of intensive survey work and it was snowing, raining, and howling a gale, we gave the crew the day off to clean up.*

*There was no water source at our Helgesen Island camp (we had to obtain all our water from the stream on the adjacent Moresby Island shore), so we loaded up our dirty bodies and wet clothes into the zodiac and boated through the snow across the sheltered water to the estuary on Moresby Island. Carrying water away from the stream, we lit a fire and we all washed ourselves and our clothes, all the while with the snow falling around us. This sounds painful and it was. But we turned the experience into a delightful one by building a sweat lodge out of driftwood and plastic tarps so we could all get in and warm up. It was one of the most exhilarating saunas we ever had – it was quite magical to sit inside the steamy plastic dome, cozy and warm, while snow and rain hammered on the roof. Of course someone always had to go out and get more hot rocks out of the fire to keep the sauna warm, but that was a small price to pay for the pleasure of being warm and clean, at least for a short while!*

## WM-140 ARIEL ROCK

**Location:** *52°48'01"N 132°02'54"W; 103 C/16.* Tasu Sound at the mouth of Newcombe Inlet.

**Figure 185.** A solitary pair of Black Oystercatchers standing close together often suggests nesting. If they are nesting, they generally become territorial and start calling raucously as human observers approach. *Photo by R. Wayne Campbell.*

**Description:** *0.1 ha; 2 m high; Bare rock.*

**Historical summary:** A pair of Black Oystercatchers (Figure 185) was territorial around one empty nest in 1977 (Table WM-140). This colony was not surveyed by CWS in 1986.

**Table WM-140.** Seabird nesting record for Ariel Rock. See Appendix 2 for codes.

| DATE | BLOY | SOURCE |
|---|---|---|
| 25 Jun 1977 | 1S | 314 |

## WM-150 LOMGON ISLETS

**Location:** *52°46'34"N 132°05'15"W* (east islet); *103 C/16.*
Tasu Sound north of Tasu Narrows in Lomgon Bay.

**Description:** *1.2 ha; 11 m high; Grassy rock.*

**Historical summary:** Bristol Foster recorded 33 Glaucous-winged Gull nests on two islets at the mouth of Tasu Sound in 1961 (Table WM-150). We assumed he was referring to Lomgon Islets. In 1977, nests counted on the west and east islets were 1 and 1, 13 and 21, and 1 and 3, for Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots, respectively. This colony was not surveyed by CWS in 1986.

**Table WM-150.** Seabird nesting records for Lomgon Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 25 Jun 1961 | | 33 | | 314 |
| 25 Jun 1977 | 2[1] | 34[26] | x4(14) | 39, 314 |

## WM-160 HORN ROCK

**Location:** *52°46'30"N 132°02'29"W; 103 C/16.*
Tasu Sound north of entrance to Fairfax Inlet.

**Description:** *0.2 ha; 2 m high; Bare rock.*

**Historical summary:** Two Black Oystercatchers and six adult Glaucous-winged Gulls were present in 1977 (Table WM-160). No evidence of nesting by oystercatchers was recorded. This colony was not surveyed by CWS in 1986.

**Table WM-160.** Seabird nesting records for Horn Rock. See Appendix 2 for codes.

| DATE | GWGU | SOURCE |
|---|---|---|
| 25 Jun 1977 | 3[2] | 314 |

## WM-170 "MIKE" ROCK

**Location:** *52°31'42"N 131°47'22"W; 103 B/12.*
On the south side of the entrance to Mike Inlet.

**Description:** *0.9 ha; 25 m high; Grassy rock.*

**Historical summary:** Observers were unable to land and made observations from the water in 1977. Glaucous-winged Gulls were on territories (Table WM-170). This colony was not visited by CWS in 1986.

**Table WM-170.** Seabird nesting records for "Mike" Rock. See Appendix 2 for codes.

| DATE | GWGU | SOURCE |
|---|---|---|
| 26 Jun 1977 | 7eS | 314 |

## WM-180 "CONE" ISLET

**Location:** *52°29'33"N 131°44'27"W; 103 B/5.*
Off Puffin Cove, 5.3 km southeast of Mike Inlet.

**Description:** *4.5 ha; 149 m high; Forested.*
This cone-shaped islet has very steep, rocky sides, with grass under spruce on top.

**Historical summary:** Due to rough conditions the BCPM party was unable to land in 1977. The islet was circumnavigated. Common Murres, Pigeon Guillemots, and Tufted Puffins (Figure 186) were suspected nesting but no evidence was obtained other than birds seen flying around the islet (Table WM-180). Observers thought that the vegetated habitat looked suitable for storm-petrels. This colony was not surveyed by CWS in 1986.

**Figure 186.** Landing on a colony in rough weather can be dangerous and sometimes observations can be made only from the water. Tufted Puffins seen flying around "Cone" Islet in 1977 suggested that they were nesting but we were unable to land and investigate. *Photo by Alan D. Wilson.*

**Table WM-180.** Seabird nesting records for "Cone" Islet. See Appendix 2 for codes.

| DATE | COMU | PIGU | TUPU | SOURCE |
|---|---|---|---|---|
| 26 Jun 1977 | S(40) | S(8) | S(60) | 314 |

**Remarks:** There was an active Bald Eagle nest on the island in 1977.

## WM-190 "BETWEEN" ISLET

**Location:** *52°28'20"N 131°40'00"W; 103 B/5.*
At entrance to a small, unnamed inlet between Mike Inlet and Gowgaia Bay.

**Description:** *8.4 ha; 30 m high; Forested.*
This granitic islet has a forest of spruce on top with an understory of grass, false lily of the valley, currant (*Ribes* spp.), and salmonberry.

**Historical summary:** Sparse Cassin's Auklet burrows were found on the east side in 1977 (Table WM-190). Twelve Glaucous-winged Gulls were present and suspected nesting on the west end. One Tufted Puffin was seen there as well. This colony was not surveyed by CWS in 1986.

**Table WM-190.** Seabird nesting records for "Between" Islet. See Appendix 2 for codes.

| DATE | GWGU | PIGU | CAAU | TUPU | SOURCE |
|---|---|---|---|---|---|
| 26 Jun 1977 | 6eS | 2+eS(4) | 100eS | (1) | 39, 314 |

## WM-200 GOSKI ISLET

**Location:** *52°25'45"N 131°33'22"W; 103 B/5.*
At the entrance to Goski Bay in Gowgaia Bay. This group is composed of three small islets in Goski Bay, including Goski Islet proper on the east side and two nearby islets in the centre and west side of the bay.

**Description:** *0.6 ha; 6 m high; Forested; Grassy rock.*
Goski Islet and the islet in the centre of Goski Bay are low, flat, and forested. The centre islet is tidally connected to the shore of Moresby Island. The west islet is a 5 m high rock, with some forbs and grass.

**Historical summary:** Eight Black Oystercatchers were sighted on the west rock during the BCPM visit in 1977 (Table WM-200). Two chicks were walking about and one dead chick was found near one nest. Two oystercatchers were also seen on the main Goski Islet. An eggshell was found there but no nest. Glaucous-winged Gull and Pigeon Guillemot nests with eggs were found on the west rock. There was no evidence of burrowing on either of the forested islets. This colony was not surveyed by CWS in 1986.

**Table WM-200.** Seabird nesting records for Goski Islet. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 27 Jun 1977 | 2+[2] | 1 | x(5) | 314 |

**Remarks:** There was one Bald Eagle nest on the east islet.

## WM-210 "EAST NANGWAI" GROUP

**Location:** *52°24'50"N 131°35'50"W* (west island); *103 B/5.*
East of Nangwai Islands on the north side of Gowgaia Bay.

**Description:** *5.0 ha; 25 m high; Forested; Bare rock.*
This is a group of four islands. The two larger islands have spruce forests with ground covers of moss, bare humus, grass, and forbs. The smaller islands are rock with little vegetation.

**Historical summary:** In 1977, a Fork-tailed Storm-Petrel adult was found dead in a burrow on each of the forested islands (Table WM-210). A pair of Glaucous-winged Gulls was nesting on the central, small rock, and Black Oystercatchers were found nesting on both small rocks. Pigeon Guillemots were seen and suspected nesting on the eastern forested island (2 birds) and the eastern rock (6 birds). This colony was not surveyed by CWS in 1986.

**Table WM-210.** Seabird nesting records for "East Nangwai" Group. See Appendix 2 for codes.

| DATE | FTSP | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|---|
| 27 Jun 1977 | 2 | 3[3] | 1 | S(8) | 314 |

**Remarks:** There was a Bald Eagle nest on the largest island.

## WM-220 GOWDAS ISLANDS

**Location:** *52°23'41"N 131°36'03"W* (north island); *103 B/5.*
At the south side of the entrance to Gowgaia Bay.

**Description:** *1.8 ha; 13 m high; Grassy rock.*

**Historical summary:** Three species were nesting on the northern island in 1977 (Table WM-220). Eight adult Black Oystercatchers were present but only one empty scrape was found. This colony was not surveyed by CWS in 1986.

**Table WM-220.** Seabird nesting records for Gowdas Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 27 Jun 1977 | 1S | 21[15] | 10e(20) | 39, 314 |

## WM-230 "LOWER VICTORIA" ROCK

**Location:** *52°16'20"N 131°27'51"W; 103 B/6.*
About 600 m south of the outlet from Lower Victoria Lake.

**Description:** *0.1 ha; Grassy rock.*
This is a steep-sided rock separated from Moresby Island by a narrow surge channel.

**Historical summary:** We have no record of BCPM crews visiting this site in 1977. We were unable to land on the rock in 1986. We counted 38 Glaucous-winged Gulls on territories and could see some sitting on nests (Table WM-230). Pigeon Guillemots were on the water around the rock.

**Table WM-230.** Seabird nesting records for "Lower Victoria" Rock. See Appendix 2 for codes.

| DATE | GWGU | PIGU | SOURCE |
|---|---|---|---|
| 13 Jun 1986 | 19eS | S(3) | 227 |

## WM-240 "KEYHOLE" ROCK

**Location:** *52°14'02"N 131°25'59"W* (approximate); *103 B/3.*
About 2.5 km north of McLean Fraser Point.

**Description:** *Grassy rock.*
This rock has vertical sides and a hole through the middle. The top is grassy with a few fallen spruce.

**Historical summary:** We have no record of BCPM crews visiting this site in 1977. We were unable to land on the rock in 1986. Twenty-two Glaucous-winged Gulls were on territories and Tufted Puffins were seen on the water near the rock (Table WM-240).

**Table WM-240.** Seabird nesting records for "Keyhole" Rock. See Appendix 2 for codes.

| DATE | GWGU | TUPU | SOURCE |
|---|---|---|---|
| 13 Jun 1986 | 11eS | S(26) | 227 |

## WM-250 "MCLEAN FRASER" PINNACLE

**Location:** *52°12'56"N 131°25'21"W; 103 B/3.*
About 500 m northwest of McLean Fraser Point.

**Description:** *9 m high; Bare rock.*

**Historical summary:** We have no record of BCPM crews visiting this site in 1977. We were unable to land on this pinnacle in 1986 and made observations from the water. Ten Glaucous-winged Gulls were visible on territories (Table WM-250). Pigeon Guillemots were on the water around the rock.

**Table WM-250.** Seabird nesting records for "McLean Fraser" Pinnacle. See Appendix 2 for codes.

| DATE | GWGU | PIGU | SOURCE |
|---|---|---|---|
| 13 Jun 1986 | 5eS | S(2) | 227 |

## WM-260 "LOUSCOONE" ROCKS

**Location:** *52°08'37"N 131°14'27"W* (north rock); *52°08'03"N 131°14'13"W* (south rock); *103 B/3.*
These are two rocks along the west shore of Louscoone Inlet between Louscoone Point and Tsuga Point.

**Description:** *0.2 ha; 5 m high; Bare rock.*

**Historical summary:** We have no record of BCPM crews visiting these rocks in 1977. In 1986, we found two Black Oystercatcher nests on the north rock and one on the south rock, all with eggs (Table WM-260). Nine adult birds were present.

**Table WM-260.** Seabird nesting records for "Louscoone" Rocks. See Appendix 2 for codes.

| DATE | BLOY | SOURCE |
|---|---|---|
| 17 Jun 1986 | 3[3] | 227 |

## WM-270 ADAM ROCKS

**Location:** *52°06'51"N 131°13'40"W; 103 B/3.*
West of entrance to Louscoone Inlet between Louscoone Point and SGang Gwaay. Colony includes the unnamed rock just north of Adam Rocks and south of Louscoone Point.

**Description:** *2.4 ha; 15 m high; Grassy rock; Bare rock.*
The main rock is grassy on top with a clump of six windswept spruce trees on the southeast corner (Figures 187 and 188). The other three islets in this group, including the unnamed islet to the north, are bare rock (Figure 189).

**Historical summary:** Summers and Ellis recorded Glaucous-winged Gulls and Tufted Puffins nesting in 1971 (Table WM-270). Numbers of Tufted Puffins appear to have declined over the last two decades: Summers and Ellis found a dozen puffin burrows in the dense grass on the east side of the largest islet in 1971, about six burrows were noted in 1977, and we found only one burrow there in 1985 (Figure 190).

**Figure 187.** The Adam Rocks colony includes four islets. The larger islet has a clump of windswept Sitka spruce on the southeast end. *Photo by Michael S. Rodway, 17 June 1986.*

**Figure 188.** Grasses and herbaceous vegetation cover much of the top of the largest of the four islets in the Adam Rocks colony. *Photo by Michael S. Rodway, 17 June 1986.*

Black Oystercatcher nests have been found on the largest islet (1 in 1985 and 2 in 1986) and on the northern rock (1 in 1977 and 1986). Most Glaucous-winged Gull nests have been found on the main islet; five nests were found on two of the other rocks in 1986. Pigeon Guillemots were confirmed nesting on the largest islet in 1977 and were seen there in 1985 and 1986. Observers in 1977 also counted over 600 Pigeon Guillemots in the bay just southwest of Louscoone Point.

**Table WM-270.** Seabird nesting records for Adam Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | TUPU | SOURCE |
|---|---|---|---|---|---|
| 15 Jul 1971 | | 10eS | | 12e(2) | 262 |
| 29 Jun-4 Jul 1977 | 1 | 45[19] | x4(5) | 6e(11) | 39, 314 |
| 29 May 1985 | 1 | 35eS | S(24) | 1(1) | 234 |
| 17 Jun 1986 | 3[3] | 48[40] | S(20) | S(4) | 234 |

**Remarks:** River otter runs and scats were noted on the largest islet in 1985. Disturbance from increasing tourist traffic in Gwaii Haanas and especially around nearby SGang Gwaay is a concern and may have contributed to the decrease of Tufted Puffins nesting on Adam Rocks.

**Figure 189.** Three smaller islets of the Adam Rocks colony are bare rock. *Photo by Michael S. Rodway, 17 June 1986.*

**Figure 190.** The small Tufted Puffin colony on Adams Rocks has decreased from 12 burrows in 1971 to a single burrow in 1985. Disturbance from increased numbers of visits by tourists wanting to see a puffin may have contributed to the decline. *Photo by Alan D. Wilson.*

## WM-280 SGANG GWAAY (ANTHONY ISLAND)

**Location:** *52°05'45"N 131°13'10"W; 103 B/3.*
West of Houston Stewart Channel at the south end of Moresby Island. Colony includes all small islets offshore to the north and south.

**Description:** *170 ha; 75 m high; Forested; Grassy rock; Bare rock.*
SGang Gwaay (Anthony Island) and the 27 islets that surround it (Figure 191) display a wide variety of habitats. Cliffs, gorges (Figure 192a), and rocky knolls occur around many of the island perimeters, especially on western faces. Extensive areas on the northwest corner of the main island and on a number of the islets are bare rock (Figure 192b) with small patches of herbaceous vegetation (Figure 192c and d). There are bays and beaches (Figure 192e) on both the east and west sides of the main island. Western slopes and knolls are grassy under mature spruce trees (Figure 192f), while moss or bare litter is most common under interior hemlock and redcedar forest, and under spruce forest along eastern shores of the main island. Thick salal under mixed forests covers areas on the north end of the main island and on some of the adjacent islets. Large tracts of old windfall on the southwest side of the main island were covered with dense, young spruce in 1985.

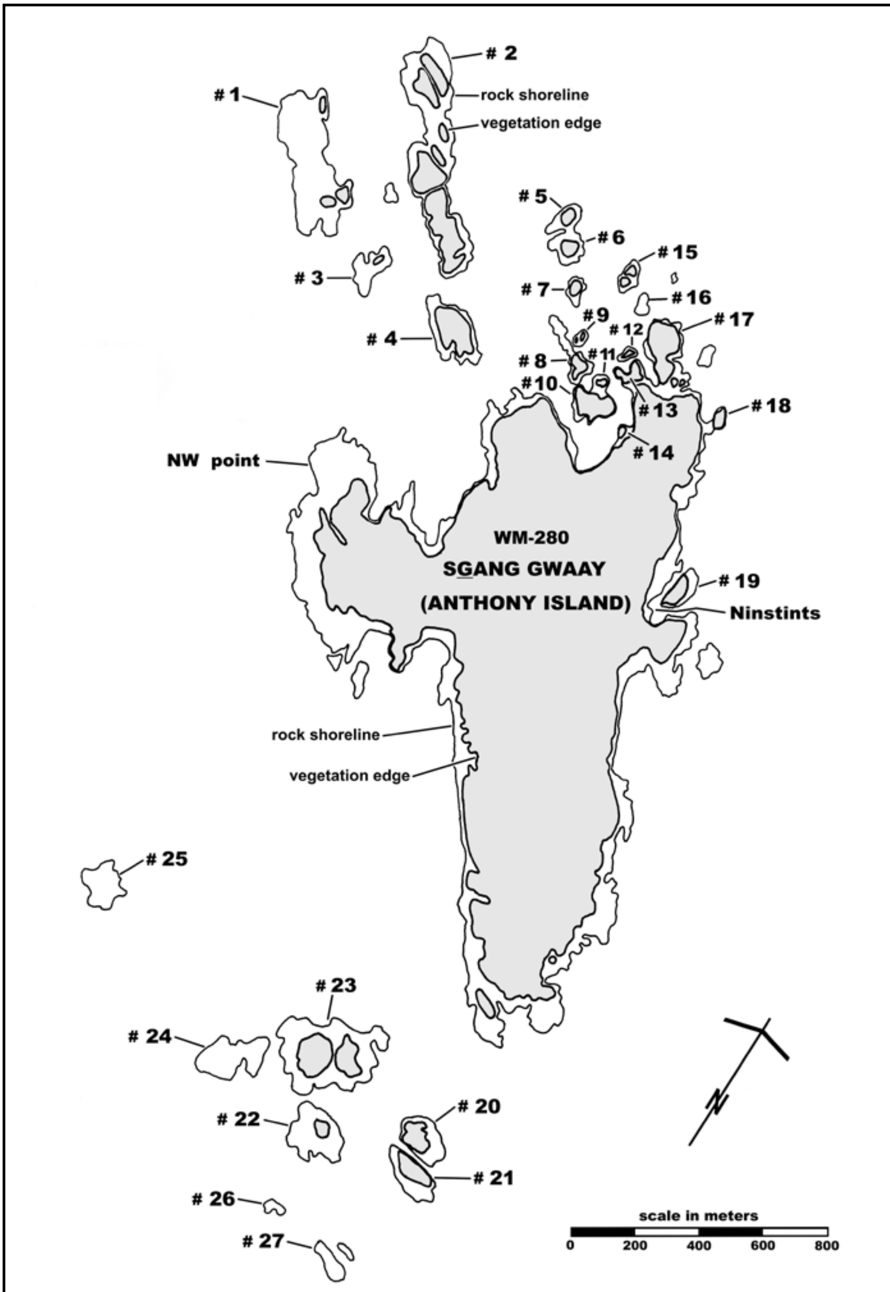



**Figure 191.** Locations mentioned in the text and numbered islets around SGang Gwaay (Anthony Island), BC.

**Figure 192.** Habitats on SG̲ang Gwaay (Anthony Island) and its 27 satellite islets are diverse. They include (photos a-f clockwise from upper left): gorges; bare rock; patches of herbaceous vegetation on bare rocks; bays and beaches; and mature Sitka spruce forests. *Photos by the authors.*

On the east side of SGang Gwaay is the old Haida village of Ninstints, which was occupied until about 1890. A uniform stand of second-growth hemlock and redcedar behind the Ninstints site is probably the result of cutting and burning by the past inhabitants. The island has been declared a United Nations World Heritage Site.

The islets off SGang Gwaay were designated an Ecological Reserve in 1978, but that status was revoked to allow their inclusion in Gwaii Haanas (Figure 193).

**Historical summary:** Foster visited the area in 1969 and Summers and Ellis surveyed part of the island in 1971 (Table WM-280). The main census by the BCPM occurred from 29 June to 4 July 1977. The northwest rock was revisited on 5 August 1977 to check for Horned Puffins. We made a brief visit to SGang Gwaay in 1982, the main CWS survey was conducted in 1985, and surface-nesting species were censused in 1986.

**Figure 193.** From late spring to late autumn, two or three Haida Watchmen are stationed at three historic village sites within Gwaii Haanas. The program began in 1981 to guard and protect the natural and cultural heritage of these sites. SGang Gwaay (Anthony Island; shown) is the most popular site visited by tourists. *Photo by R. Wayne Campbell, 9 June 2000.*

**Table WM-280.** Seabird nesting records for SGang Gwaay. See Appendix 2 for codes.

| DATE | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 May 1969 | | | | | | | | | x | | | 262 |
| 15 Jul 1971 | | | | | 50+eS | 15+e(35+) | | | 5,000+e | (5-10) | | 262, 314 |
| 29 Jun-4 Jul 1977 | 400e | 6,400e | 11[11] | 19e[9][a] | 247[134] | 150e(139) | 200e | 25,000e | 2,700e | 60e(190) | 1+(6) | 39, 44, 314 |
| 3-5 Jun 1982 | S | | 18 | S | x | S(91) | | | 2,300+ | x3(8) | S(2) | 234 |
| 20 May-2 Jun 1985 | 2,100t | 8,600t | | | | S(395) | 200e | 24,700t | 13,800t | S(26) | (0) | 234 |
| 16-17 Jun 1986 | | | 7 | 11[7] | 352[302][b] | x(40+) | | | | 20eS(32) | S(20) | 234 |
| 21 Aug 1986 | | | | | | x(59) | | | | (30) | (3) | 315 |
| 11 Jun 1988 | | | | | | | | | | (20) | (2) | 315 |

[a] Only 17 nests were found, 9 of which held eggs or young. Two additional pairs were suspected nesting but nests were not found.

[b] Total included 20 pairs estimated nesting on inaccessible pinnacles on the northwest rock (islet #1) where nest contents could not be determined.

Nesting by Horned Puffins (Figure 194a) was confirmed on 4 July 1977 when an egg was located in a crevice on the northwest rock (islet #1). This was the only confirmed nesting site for Horned Puffins in BC as of 1990 [44] (nesting was confirmed at a second site in 2017; see Appendix 1). We saw two Horned Puffins there in 1982 and Keith Moore reported about 20 around this rock on 4 June 1986.

There were fewer Tufted Puffins (Figure 194b) present around SGang Gwaay and the adjacent islets in 1985 than in 1977 and numbers of nesting birds appear to have decreased. In those years, nesting was observed or suspected at three locations: along the southwest side of the main island; at the northwest point of the main island; and on the outer northwest rock (islet #1). In 1977, over 100 were counted around the northwest rock plus 90 along the southwest coast of the main island. In the 1980s, the highest count in these areas was 26 in 1985 and 32 in 1986. Observers counted 33 Tufted Puffin burrows in the grassy areas on the northwest rock in 1977, only 3 in 1982, and none in 1985 or 1986. Tufted Puffins were still present at this location in 1985 and 1986, but appeared to be nesting only in crevices. The main nesting location in 1985 and 1986 was around the cliffs along the southwest side of the main island, where we saw 25 birds in 1985 and 24 birds in 1986. According to Dick Wilson, warden at Ninstints at that time, one pair usually nested just north of the village site, but no puffins were seen there during our surveys.

Rhinoceros Auklet (Figure 194c) populations may have increased and their colony area expanded on SGang Gwaay. We previously suggested that the more intensive survey in 1985 may account for most of the differences between the 1977 and 1985 estimates,[234] but a more careful perusal of field notes and survey results from 1977 has led us to re-evaluate potential changes. Rhinoceros Auklets have been documented nesting on the east side of the main island during all visits, and the colony area mapped there was similar in 1977 and 1985. However, in 1985, we found them nesting over a large area on the southwest coast of the island where they were not previously reported. That area was not explored in 1969 or 1971 but was surveyed thoroughly by the BCPM crew in 1977. Trudy Carson (now Chatwin) in 1977 noted some larger burrows in this area that may have been Rhinoceros Auklet burrows, but Rhinoceros Auklets were not confirmed nesting in this area, and the burrows were attributed to Cassin's Auklets. It is possible that some Rhinoceros Auklets were nesting there in 1977 but it seems unlikely that their numbers approached the 11,000 burrows estimated in 1985. Though estimates from 1977 and 1985 are not directly comparable due to differences in methods, the extent of burrowing mapped in each year was very similar, and the total number of burrows calculated for both Cassin's Auklets and Rhinoceros Auklets along the southwest side in 1985 was similar to the 1977 estimate for just Cassin's Auklets. This suggests that Rhinoceros Auklets may have displaced or replaced Cassin's Auklets in this area.

Small numbers of Rhinoceros Auklets also were found nesting on 12 of the surrounding islets in 1985. In 1977, BCPM crews reported or suspected nesting on only two of those islets: the most northern, large islet (islet #2), where they counted 300 burrows, similar to the 289 burrows estimated there in 1985; and the southeast islet (#20), where they found a few large burrows mixed with Cassin's Auklet burrows, again similar to that found in 1985. Few Rhinoceros Auklet burrows were found on most of the other islets in 1985, except for the large, southwestern islet (#23) where almost 500 Rhinoceros Auklet burrows were estimated amongst 4,300 Cassin's Auklet burrows (estimate derived from 16 quadrats, 3x3 m (9 $m^2$), spaced at 15 m intervals along two line transects, and a colony area estimate of 1.8 ha). Only Cassin's Auklets were reported nesting on this islet in 1977, following a thorough search and a count of burrows in 15 quadrats, 10x10 ft. (9.3 $m^2$), spaced 50 ft. (15.2 m) apart along a 10 ft. (3.05 m) wide strip transect run west-to-east across the length of the vegetated area (6,800 burrows estimated in an approximate colony area of 1.9 ha). Similar sampling intensities in the two years on this islet again suggest possible expansion of Rhinoceros Auklets in some areas.

Flocks of Rhinoceros Auklets were staging and probably feeding around the Ibbertson Banks between SGang Gwaay and Gordon Island in 1977, 1985, and 1986 (see Figure 224 on p. 201). We estimated 800 birds present in that area on 2 July 1977 and 2,900 birds present there at mid-day on 21 May 1985. Some of these birds may have been associated with the colony on Gordon Islands (see below).

Except for possible displacement by Rhinoceros Auklets discussed above, there is little evidence of population changes for Cassin's Auklets or other burrow-nesting species. Cassin's Auklets were reported nesting on the main island, mostly along the southwest side, in both 1977 and 1985, and on 15 of the surrounding islets in 1977 and 18 islets in 1985. Storm-petrels were found nesting on five and 10 of the surrounding islets in 1977 and 1985, respectively, and have never been found nesting on the main island. In the 1985 survey, the majority of storm-petrel burrows were found on seven of those small islets, while only a few burrows were found on the remainder. Ancient Murrelets are known to nest only on the main island, on the east side north of Ninstints, where 200 pairs were estimated nesting in both 1977 and 1985. Ellis listed Anthony Island as an important traditional hunting location for Ancient Murrelets,[101] suggesting that populations may have been larger in the past.

Pelagic Cormorants (Figure 194d) are known to have nested at three different locations around SGang Gwaay: on a southeast-facing cliff in the centre of the outer southwest islet (#25) in 1977; on three cliff faces on the northwest rock (islet #1) in 1982; and in two gorges on the southwest side of the main island in 1985 and 1986. Seven nests had been built in each of the two gorges in 1986, but only the nests in the southern gorge were attended at the time of our visit.

Glaucous-winged Gulls (Figure 194e) and Black Oystercatchers (Figure 194f) nest on several of the islets as well as on the rocky, northwest point of the main island. The main concentration of nesting gulls was on the outer northwest rock (#1) in 1977 and 1986. The distribution of gull nests was similar in the two years, except in 1977 there was one gull nest on the bare rock just east of Ninstints and three nests on the closest southern islet (#20), respectively, where none were found in 1986. No nests were found in 1977 on the northwest rocky point of the main island where there were six nests in 1986. The total number of gull nests was higher in 1986 than in 1977.

More oystercatcher nests were found in 1977 than 1986 but the number of nests with eggs or young was similar in the two years. In 1977, 17 oystercatcher nests were found plus two pairs were suspected nesting where no nests were found. Eight of the 17 nests found were empty. Hidden young were suspected at two of those nests. Four of the 11 nests found in 1986 were empty.

Pigeon Guillemots have been recorded around much of the main island and around many of the smaller islets. Maximum numbers of Pigeon Guillemots were counted in 1985. One juvenile guillemot was seen with 59 adults on a late-season count in August 1986. Ten Common Murres were observed on the northwest rocks (#1) on 5 August 1977, but heavy seas prevented observers from landing to check for evidence of nesting. There were three murres in the same location in 1982, but none in 1985 or 1986.

**Figure 194.** Eleven seabird species were confirmed breeding on SGang Gwaay (Anthony Island) during surveys in 1977 and 1986. Six of those species and apparent trends in their breeding populations between 1977 and 1986 are (next page, clockwise): (a) Horned Puffin (no trend data; first BC breeding record in 1977); (b) Tufted Puffin (numbers declined); (c) Rhinoceros Auklet (numbers increased); (d) Pelagic Cormorant (numbers varied); (e) Glaucous-winged Gull (numbers increased); and (f) Black Oystercatcher (no evidence of change). *Photos by the authors except Horned Puffin by Alan D. Wilson and Rhinoceros Auklet by Jared Hobbs.*

**Remarks:** SGang Gwaay is a popular tourist site and some nesting areas may have suffered from human disturbance (Figure 195). The northwest rock is frequently visited by observers to the island. This may be the cause of the decline of Tufted Puffins nesting there and their withdrawal from grassy nesting areas to rocky crevices that are less accessible to people, and to the absence of Pelagic Cormorants on that rock during the most recent surveys. Note that Tufted Puffins also declined on nearby Adam Rocks, possibly for the same reason. Human disturbance needs to be monitored and guidelines instituted to protect nesting species on these islands (programs put into place since 1990 by Gwaii Haanas will hopefully lead to recovery of nesting seabirds at these sites).






**Figure 195.** SGang Gwaay (Anthony Island) is an attractive destination for boaters, kayakers, and other tourists. Increasing tourist traffic is a concern as human disturbance can cause seabirds to abandon nesting sites. *Photo by R. Wayne Campbell.*

Few signs of predation were found during BCPM and CWS surveys. In 1985, there were at least four active Bald Eagle nests and one Peregrine Falcon eyrie. Rhinoceros Auklet bills and feet were found in Bald Eagle pellets. One Common Raven nest was found in the interior of the main island. Some raven pellets contained remains of Cassin's Auklets, Rhinoceros Auklets, and Black Oystercatchers. River otters were active in many areas around the main island and surrounding islets in 1985.

## WM-290 FLATROCK ISLAND

**Location:** *52°06'27"N 131°10'08"W; 103 B/3.*
At the west entrance to Houston Stewart Channel.

**Description:** *3.4 ha; 21 m high; Bare rock.*
This bare rock is aptly named. Perimeter cliffs are deeply creviced (Figure 196) and rise to a stepped, flat summit. There are thin, horizontal crevices under large slabs of rock on the top. Scattered grasses and forbs grow along cracks in the rock (Figure 197) and there is a vegetated wet area on the higher northeast side. There is a navigational beacon on the highest point.

**Historical summary:** In 1900, Osgood documented nesting by about 100 Glaucous-winged Gulls and reported a "moderate-sized" Tufted Puffin colony on an islet in Houston Stewart Channel.[208] He may have been referring to Flatrock Island. There is also an earlier Tufted Puffin egg specimen [94, 320] that

**Figure 196.** Cliffs around Flatrock Island have deep crevices. *Photo by R. Wayne Campbell, 8 June 2000.*

**Figure 197.** The top of Flatrock Island has patches of vegetation growing in cracks in the rocks. *Photo by Michael S. Rodway, 15 June 1986.*

might have come from Flatrock Island. That egg was collected by Walter Raine on 28 June 1890 at a location given as "Rock Island, Queen Charlotte Sound." Drent and Guiguet [94] were uncertain of the location of this record, as are we, but Carter and Sealy [57] speculated that the location may have been Flatrock Island in Haida Gwaii (i.e., in the Queen Charlotte Islands instead of Queen Charlotte Sound; we discuss this record further in the upcoming Part 3 of this seabird catalogue). E.O. Ormsby, in a letter to Charles Guiguet, reported Tufted Puffins nesting in rock crevices on the island in 1962 and 1963 (Table WM-290). Summers viewed the island from a distance in 1971 and estimated over 50 pairs of gulls, and Bristol Foster counted gull nests in 1972.

Pelagic Cormorants, Black Oystercatchers (Figure 198), and Pigeon Guillemots were first recorded nesting by the BCPM crew in 1977. Four of the cormorant nests (1 with 1 egg, 3 empty) were in one group and there was one isolated nest (with 2 eggs). That is the only record of Pelagic Cormorants nesting on the island. Glaucous-winged Gulls (Figure 199) and Tufted Puffins were also nesting in 1977 and again in 1986. Pigeon Guillemot (Figure 200) and Tufted Puffin nests (Figure 201) were scattered around the island in rock crevices. All nests counted in 1977 contained eggs. Puffin nests were again found in rock crevices in 1986; adults were incubating in eight nests and were seen flying out of three others. A late-season count of Pigeon Guillemots in August 1986 found only two juveniles among 78 adults.[315]

We only boated past the island in 1985. While conducting boat tours of the area in June 1985-1988, Campbell each year observed two Horned Puffins on the island and flying into crevices [299] (breeding was confirmed in 2017; see Appendix 1).

**Figure 198.** Black Oystercatcher nest with fragments of clams, limpets, and mussels on Flatrock Island in 1986. *Photo by Michael S. Rodway, 16 June 1986.*

**Figure 199.** Glaucous-winged Gull nest composed mainly of assorted grasses on Flatrock Island in 1986. *Photo by Michael S. Rodway, 16 June 1986.*

**Figure 200.** Pigeon Guillemot eggs laid on a nest of shell fragments in a crevice on Flatrock Island in 1986. *Photo by Michael S. Rodway, 16 June 1986.*

**Figure 201.** Single egg of a Tufted Puffin nesting in a rock crevice on Flatrock Island in 1986. *Photo by Michael S. Rodway, 16 June 1986.*

**Table WM-290.** Seabird nesting records for Flatrock Island. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | TUPU | HOPU | SOURCE |
|---|---|---|---|---|---|---|---|
| 1962-63 | | | | | x | | 314 |
| 15 Jun 1971 | | | 50eS | | | | 262 |
| Jun 1972 | | | 12 | | | | 262 |
| 30 Jun 1977 | 5[2] | 2[2] | 140[91] | 12+ | 4 | | 39, 314 |
| 15 Jul 1980 | | | | | | (1) | 315 |
| 5 Jun 1985 | | | 98eS | S(2) | x3(3) | S(2) | 234, 299 |
| 16 Jun 1986 | 0 | 2[2] | 145[137] | x5(24) | 11(16) | S(2) | 234, 299 |
| 21 Aug 1986 | | | | x(78) | (25) | (1) | 315 |
| 12 Jun 1987 | | | | | (12) | S(2) | 299, 315 |
| Jun 1988 | | | | | | S(2) | 299 |

**Remarks:** Martin Lee, who was part of the BCPM survey crew in June 1977, returned to the island on 5 August 1977 and reported no young gulls, 20 broken gull eggs, gull nests in disarray, five broken puffin eggs, and one dead Northwestern Crow. He did not speculate as to the cause of the destruction. He found two active Pigeon Guillemot nests at that time, one with a large young and one with an egg.

## WM-300 GORDON ISLANDS

**Location:** *52°05'46"N 131°08'42"W; 103 B/3.*
South of the west entrance to Houston Stewart Channel.

**Description:** *38.4 ha; 81 m high; Forested; Bare rock.*
These islands are composed of a series of dissected rocky knolls with steep, rugged sides, especially towards the south end. Most of the vegetated area is covered with thick salal under a sparse spruce forest. Small open patches of moss, grass, and forbs occur at the edges. The lower northwestern islands are mainly bare rock.

**Historical summary:** Osgood reported a few Pelagic Cormorants breeding on islets off the west coast of Kunghit Island.[208] He may have been referring to the Gordon Islands, although there are no records of cormorants breeding there since. Bristol Foster visited the islands in 1961 (Table WM-300).

Black Oystercatcher and Glaucous-winged Gull nests have been found on the northwest rocks. Eggshells were found and young were suspected around two of the oystercatcher nests in 1977. Three adults were noted. No oystercatchers were seen in 1985 or 1986. Two of the gull nests found in 1977 had clutches of three eggs, but we found only a started nest attended by two adults in 1986. A Pigeon Guillemot nest with one egg was found on the northwest rocks and guillemots were reported nesting in crevices of the dissected rocks along the east side of the islands in 1977. Guillemots were seen mostly along the southern east side cliffs in 1985 and mostly along the west side of the main island in 1986.

Burrowing appears to have been more extensive in 1977 than in 1985, especially along the east side of the islands, and populations of auklets and Tufted Puffins may have declined. Colony areas of mixed Cassin's and Rhinoceros auklet burrows were mapped along much of the east side of the islands in 1977. Burrows occurred in perimeter vegetation above the cliffs. Few burrows were found in these areas in 1985. Mainly Cassin's Auklet burrows (Figure 202)

**Figure 202.** Cassin's Auklet burrows are about 13 cm high and 15 cm wide. As the nesting season progresses the burrow entrance becomes distinctively marked with feces. *Photo by R. Wayne Campbell.*

**Table WM-300.** Seabird nesting records for Gordon Islands. See Appendix 2 for codes.

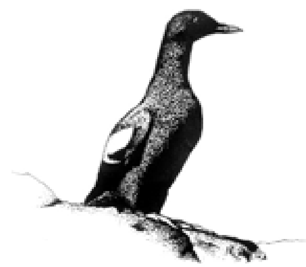
| DATE | BLOY | GWGU | PIGU | CAAU | RHAU | TUPU | SOURCE |
|---|---|---|---|---|---|---|---|
| 5 Aug 1961 | | | | | 20-30eS | | 314 |
| 2 Jul 1977 | 3[2] | 6[2] | 23e(25) | 3,000e | 300eS | 100eS | 39, 314 |
| 21 May 1985 | 0 | | S(25) | 700e | 80eS | (0) | 234 |
| 16 Jun 1986 | 0 | 1S | S(26) | | | (1) | 234 |

were reported in 1977 on the rocky knolls along the southwest shore of the southern island where we found the main concentration of mixed species burrows in 1985. Although burrows were reported over a more restricted area in 1985 than 1977, more burrows were actually counted rather than estimated in 1985 than 1977 and differences in the population estimates from the two years are difficult to interpret.

Cassin's Auklets were confirmed nesting in 1977 and 1985 but breeding by Rhinoceros Auklets and Tufted Puffins was not confirmed (Rhinoceros Auklets were confirmed nesting in 1993; see Appendix 1). Observers in 1977 and 1985 were confident that Rhinoceros Auklets were nesting, based on burrow size and droppings around burrow entrances. They were less certain that Tufted Puffins were nesting. Puffins were observed flying around the cliffs at the southeast tip of the southern island and large burrows were found above those cliffs in 1977, but no definitive evidence of puffins nesting was found. No Tufted Puffins were observed in 1985, though we did find 10 burrows large enough to be of this species.

Large groups of Rhinoceros Auklets were seen staging or feeding between SGang Gwaay and Gordon Island in 1977, 1985, and 1986 (see SGang Gwaay colony account above).

**Remarks:** Foster reported Rhinoceros Auklets caught in otter traps set on the northeast corner of the islands in 1961. Few signs of predation were seen in 1977 and 1985: a few Rhinoceros Auklet wings in 1977 and one Cassin's Auklet wing in 1985. In 1977, some river otter scats contained a few feathers. There was a Bald Eagle nest and a Peregrine Falcon eyrie on the islands in 1985.



## WM-310 ST. JAMES ISLAND

**Location:** *51°56'14"N 131°01'03"W; 102 O/14.*
Off the south end of Kunghit Island (see Figure 227 on p. 204). Also called Hummock Island prior to 1949. Colony includes the small rocks at the north and south ends.

**Description:** *19 ha; 96 m high; Forested; Grassy rock; Bare rock.*
St. James Island is the first in the small chain of islands at the southern extremity of the Haida Gwaii archipelago. It is a rugged island surrounded by cliffs and steep slopes (Figure 203). The higher, southern portion is grassy and treeless (Figure 204), and separated by a grassy draw from the northern section, which has a forest of spruce on top. Salmonberry thickets occur on the forest perimeter, and luxuriant forbs carpet the slopes under larger trees. The trees are smaller and ground cover is absent on the south side. The rocks at the north and south ends are mostly bare.

**Figure 203.** The main portion of St. James Island is forested and is surrounded by cliffs and steep slopes. *Photo by J. Bristol Foster, 3 July 1977.*

**Figure 204.** The southern part of St. James Island is treeless with patches of grassy vegetation. *Photo by Michael S. Rodway, 10 June 1986.*

A lighthouse and weather station were established on the island in 1913 and were still occupied as of 1990 (the light was automated in 1992 and now receives regular servicing by helicopter).

**Historical summary:** Surprisingly, given the long human tenure on this island, we have no seabird nesting records before Geoff Stewart from the BCPM reported on a visit from 23 June to 6 July 1975, in the company of a UBC field party. He found Glaucous-winged Gull nests with eggs, observed Tufted Puffins going into burrows, and saw two Horned Puffins on 27 June and seven on 5 July (Table WM-310). He also noted the presence of Pelagic Cormorants, Black Oystercatchers, Pigeon Guillemots, and Cassin's Auklets, and saw some old burrows in the grass on the west side below the weather station.

BCPM crews in 1977 found a few active-looking Cassin's Auklet burrows in grassy habitat on the northern, forested part of the island and some old burrows in other areas. We found no evidence of nesting by Cassin's Auklets in 1986.

Tufted Puffins were nesting on very steep perimeter slopes above the cliffs along the south and southwest sides of the island. Burrowing appeared to be more extensive there in 1977 than in 1986, especially along the west side. Trudy Carson (now Chatwin) traversed the steep slope below the lightstation in 1977 and found densities of 2-3 burrows per 10x10 ft. (9.3 $m^2$) quadrat at the lower reaches of the grass slopes. Most of the colony was inaccessible. She reported more than 200 puffins flying around those slopes on 3 July. The entire colony was considered inaccessible and we saw a maximum of 30 birds in 1986. Weather station employees estimated a maximum nesting population for Tufted Puffins of 100 pairs based on their observations throughout the 1986 season.

Pelagic Cormorants and Glaucous-winged Gulls were nesting at different locations in 1977 and 1986. In 1977, 24 Pelagic Cormorant nests were located on the rocky islet off the southeast tip of the main island. All had broken eggs. Sixteen adults were counted flying from this area. Six other nests with adults sitting on them were seen in crevices on the mid-west coast of the island. In 1986, Pelagic Cormorants were nesting on cliffs at the southwest corner of the main island.

In 1977, Glaucous-winged Gulls were nesting on the rocky islet off the southeast tip of the main islet (29 nests) and on the west coast of the main island (2 nests). Contents of those 31 nests were determined: eight were empty. An additional 30 pairs were estimated nesting on inaccessible cliff ledges of the southeast islets. Gulls were nesting only along the southwest side of the main island in 1986. Twenty-nine of 36 accessible nests on the southwest corner contained eggs.

Two pairs of Black Oystercatchers were seen in 1977, one on the southeast rocks and one in the sheltered area near the dock, and three birds were recorded in 1986; no nests were found. Pigeon Guillemots were counted around the island and were seen flying from crevices on the mid-west side in 1977. Birds were counted on the water around the island in 1986.

**Remarks:** Introduced rats were abundant (prior to their eradication in 1998; see Appendix 1), and cats (Figure 205) and dogs were common pets of lightkeepers on the island. Prior to these introductions, St. James Island may have housed seabird populations similar to those on the adjacent Kerouard Islands. Station staff reported that many alcids are killed by striking the light tower, especially during storms. There were river otter runs with scats containing fish at the north end of the island in 1986.

**Table WM-310.** Seabird nesting records for St. James Island. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | CAAU | TUPU | HOPU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 1972-1974 | | | | | | | S(1-2) | 44 |
| Jun-Jul 1975 | | | x | | | x | S(7) | 44, 314 |
| 3-4 Jul 1977 | 30 | 2eS | 61e[a] | S(14) | 20+eS | 1,500e(200+) | S(2) | 39, 44, 314 |
| 10&12 Jun 1986 | 6 | 2eS | 76e | S(16) | 0 | 100e(30) | S(1) | 234 |

[a]Gull numbers corrected from Campbell and Garrioch.[39]

**Figure 205.** The cats of lightkeepers on St. James Island mainly caught young Norway Rats and had little impact on overall rat numbers. A program to eradicate the introduced rats was completed in 1998. *Photo by R. Wayne Campbell.*

## WM-320 KEROUARD ISLANDS

**Location:** *51°55'45"N 131°00'10"W* ("Mile 1" Island); *102 O/14,15.*
The southern tip of Haida Gwaii. This chain of islands is clustered into three groups, locally known from north to south as "Mile 1" Island, "Sealion Rocks", and "Mile 2" Island (see Figure 227 on p. 204).

**Description:** *24.5 ha; 81 m high; Grassy rock; Bare rock.*
These exposed islands (Figures 206, 207, and 208) are steep and dissected with many cliffs and knolls. The higher portions of the larger islands are grassy, but much of the area is bare rock. They are one of only a few islands in Haida Gwaii where we have found no sign of deer, and in some areas, grass tussocks reached heights of 1.5 m with meter thick bridges of dead stalks between them.

The Kerouard Islands were given Ecological Reserve status in 1979, but are now part of Gwaii Haanas.

**Historical summary:** Dawson described the islands in 1878 and noted breeding by "innumerable gulls, puffins, and other seabirds" (Table WM-320). S. Shearman collected on the islands in 1958. The 1977 observation of nesting Common Murres was the first substantiated record of this species breeding in Haida Gwaii. That year, murres were nesting on a south-facing rock ledge off "Mile 2" Island and on the western side of "Sealion Rocks". Two murres incubating eggs and six depredated eggs were found when observers first approached the "Mile 2" Island location. Remaining eggs were preyed upon by gulls following the disturbance caused by the observers.

**Figure 206.** The northern island ("Mile 1" Island) in the Kerouard Island group is steep-sided, with cliffs and knolls capped with dense grasses. *Photo by J. Bristol Foster, 4 July 1977.*

**Figure 207.** The smaller, central islet ("Sealion Rocks") in the Kerouard Islands is bare rock and is a hauling-out site for Steller sea lions (*Eumetopias jubatus*). *Photo by Moira J.F. Lemon, 10 June 1986.*

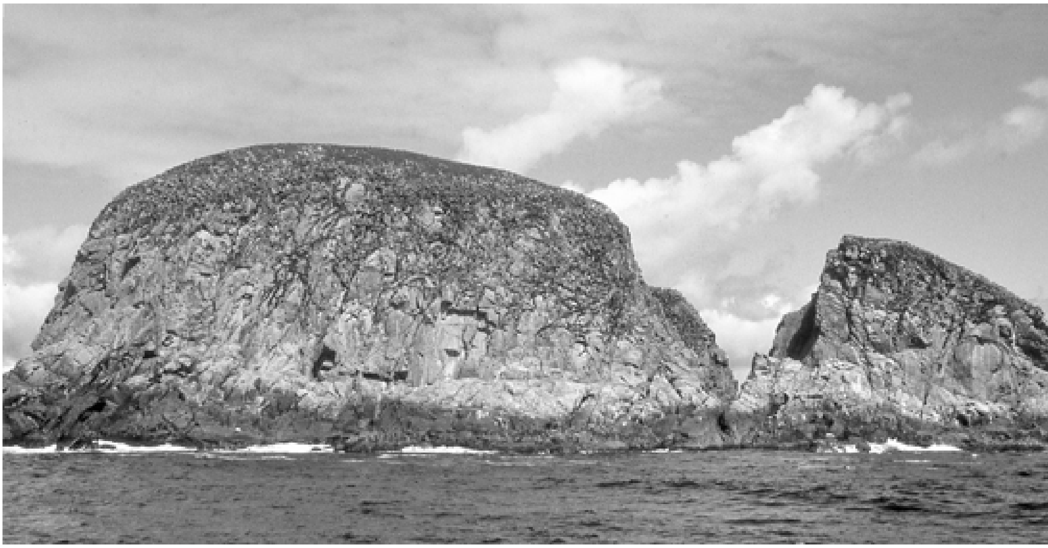


**Figure 208.** The southern island ("Mile 2" Island) of the Kerouard Islands is also steep, with perimeter cliffs and two grassy sections on top. *Photo by Michael S. Rodway, 10 June 1986.*

Groups of 22 and 17 murres were seen on "Sealion Rocks" but observers could not inspect any nests. In the 1980s, murres were flying around the south end of "Mile 2" Island in 1986, Alan Whitney counted murres there in 1987 (Figure 209), and Wayne Campbell counted and confirmed nesting (6 birds on eggs) of murres in 1989.

Cassin's Auklets were nesting in almost all grassy habitats on "Mile 1" and "Mile 2" islands in 1977 and 1986. Tufted Puffin burrows were found mixed with Cassin's Auklet burrows in grassy areas on the west and south side of "Mile 1" Island and on the southeast grassy sections of "Mile 2" Island. Puffins were also nesting in rock crevices on the west side of "Mile 1" and around the southeast, south, and west cliffs of "Mile 2" island (Figure 210). In 1977, puffins were seen flying from a crevice on "Sealion Rocks". We suspect the differences in Cassin's Auklet

**Figure 209.** Alan Whitney counted Common Murres on the Kerouard Islands from the sailboat *Darwin Sound* in 1987. *Photo by R. Wayne Campbell.*

**Figure 210.** Tufted Puffins were found nesting in grassy areas on the main Kerouard Islands in 1977 and 1986. A smaller number also nested in rock crevices. *Photo by Michael S. Rodway, 10 June 1986.*

and Tufted Puffin numbers in 1977 and 1986 were due to estimating techniques. Al Whitney and Wayne Campbell confirmed breeding by Tufted Puffins in June 1987 (Figure 211).

Tufted Puffins gather on the water and circle nesting areas around all islands (see Figure 224 on p. 201). Horned Puffins have been seen amongst Tufted Puffins in 1977 and 1987 and likely nest (Figure 212). One entered a burrow in 1987.[36]

Pelagic Cormorant nests were found in a tiered chasm on the northern rock off "Mile 1" Island in 1977. Birds were also seen flying from the western side of "Sealion Rocks" and may have been nesting in an inaccessible chasm there. No Pelagic Cormorants were seen in 1986. Three Black Oystercatchers were seen and suspected nesting in 1977; none were recorded in 1986.

The number of nesting Glaucous-winged Gulls was similar in 1977 and 1986 but the distribution of nests was different. There were 60, 2, and 12 nests counted in 1977 and an estimated 24, 19, and 33 nests in 1986 on "Mile 1", "Sealion Rocks", and "Mile 2" island groups, respectively. Numbers were estimated from the water in 1986. Pigeon Guillemots were seen and suspected nesting on all three groups of islands. Three nests with eggs were found in rock crevices on "Mile 2" Island in 1977.

**Figure 211.** Al Whitney with an adult Tufted Puffin extracted from a burrow on the Kerouard Islands in 1987. *Photo by R. Wayne Campbell, June 1987.*

**Figure 212.** Sometimes observations from the water provide the only evidence of nesting by seabird species such as Horned Puffins. Part of the CWS survey crew making observations from an inflatable boat in 1986 included, from left to right, Dave Powell, Moira Lemon, Gary Kaiser, and Norm Holmes. *Photo by Michael S. Rodway, 10 June 1986.*

**Table WM-320.** Seabird nesting records for the Kerouard Islands. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | COMU | PIGU | CAAU | TUPU | HOPU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|
| 1878 | | | x | | | | x | | 83 |
| 21 Jun 1958 | | | 7+ | | | | x | | 94 |
| 3-4 Jul 1977 | 10[7] | 2eS | 74[63] | 50e(90) | 25+e(24) | 22,000e | 1,500e(232+) | S(1) | 39, 314 |
| 10&12 Jun 1986 | 0 | 0 | 76eS | 0(300) | S(68) | 78,000t | 600e(900) | | 234 |
| 8 Jun 1987 | | | | | | | x | S(3) | 36, 299 |
| 4 Jul 1987 | | | | S(400) | | | | | 312 |
| 11 Jun 1988 | | | | | (40) | | (20) | | 315 |
| 16 Jul 1989 | | | | x(118) | | | | | 299 |

**Remarks:** Many Cassin's Auklet feathers were found on "Mile 1" Island, and wings of Cassin's Auklets and Tufted Puffins and a dead Tufted Puffin were seen on "Mile 2" Island in 1977 (Figure 213). Immature eagles were flying around the colony that year. There was one Peregrine Falcon eyrie in 1986. River otter runs with scats containing fish were seen on the northeast corner of "Mile 2" Island.

**Figure 213.** Occasionally an adult Tufted Puffin is found dead at a colony. The cause of death is often obvious, especially if the bird has been killed by a predator, but sometimes the cause of death is unknown. *Photo by R. Wayne Campbell.*

***Birds Do It***

*Birds were long thought to be models of monogamy. When David Lack published his watershed work on the breeding biology of birds in the late 1960s,[183] over 90% of bird species were considered monogamous. The picture of faithful partners industriously working together to raise their offspring was inspiring – paradigms of Victorian virtue. Alas, not all was as it appeared. With the advent of paternity testing and DNA analysis, the myth of monogamy was shattered – females often have offspring that are not sired by their mates. Today we know that infidelity is common in most bird species, and although 90% of birds are "socially" monogamous, most are not "sexually" monogamous. Has Pete the postman been sneaking in the back door or has Susie been out to play at the neighbour's?*

*Mate choice in birds is largely under female control. Ultimately, this is likely because females, who lay the eggs, invest more than males in producing offspring. It is expensive for a female to produce eggs and she may only produce one, as in many auk or petrel species. Which male fertilizes her egg(s) is important when her opportunities to produce young are so limited. For males, producing sperm is relatively cheap and they are happy to contribute to fertilizing as many eggs as they can. Sexual selection operating through male competition and female choice is why males are generally the more ornamented and colourful sex. Males compete and females choose. It is not that simple of course. Females are under greater sexual selection pressure than males in some role-reversed species such as the Spotted Sandpiper (*Actitis macularia*),[102] and mate choice and sexual selection is mutual in some species such as Crested Auklets (*Aethla cristatella*; Figure 214),[171] in which the sexes are similarly ornamented. It is likely that mutual mate choice is prevalent among seabirds, given that most species show little sexual dimorphism. The question remains though, after all the effort of choosing a mate by both partners, why do females often end up having multiple males sire their offspring? Albatrosses may take many years to choose a suitable mate, and pairs may stay mated for life, but still 3-25% of chicks are fathered by extra-pair males.[175]*

*Individuals of both sexes want to mate with the highest quality partner they can find, but not every female can pair with their "Prince Charming" and not*

**Figure 214.** Mate choice among seabirds, like this Crested Auklet, is likely mutual as they show little sexual dimorphism. *Photo by Alan D. Wilson.*

*every male can find their "Cinderella". Thus when you settle on a partner, he or she may not be everything you were hoping for. Further complicating the issue is the fact that the most attractive mates may not always be the best parents. Since the main goal of reproduction is to contribute offspring to future generations, it is important that you find good and compatible genes in your partner, so that they sire attractive sons and daughters that will successfully mate and raise young in their turn, but also that your partner is a good provider and will help insure that your chicks survive and have a good chance of reaching adulthood. What happens if you can't find both in a partner? Extra-pair copulations (EPCs) may be the answer. But only if you don't get caught!*

*In most seabird species, it is difficult for one parent to raise chicks and help from a loyal partner is important* (Figure 215). *Males are willing as long as they have confidence that they are raising their own offspring - it is generally not adaptive for a male to raise another male's offspring. Although females can sometimes be parasitized by other females laying eggs in their nest, for the most part females know that their eggs are their own. Males have no such confidence and largely have to rely on cues from the female's behaviour. A female thus needs to appear faithful so as not to jeopardize her partner's contribution to raising the young. Females seeking benefits from good genes or simply a diversity of genes need to be secretive in their pursuit of extra-pair*

**Figure 215.** Adult Common Murre shielding a single chick. In this species, incubation is shared equally between the sexes, which allows both partners time to feed and bathe. *Photo by R. Wayne Campbell.*

*sex. This is why birds were always thought to be pillars of prudishness – they excel at sneaking around. And although males may come knocking and occasionally get lucky, it is mostly the females that are sneaking off to dally with the handsome lad next door when their partner is not looking.*

*Female pursuit of EPCs has led to an interesting, though largely untested theory about colony formation.*[289] *The theory suggests that males aggregate close to reproductive females to increase their chance of obtaining copulations, and that a female unable to pair with the highest quality male will preferentially pair with a lower quality male if he has a territory close to a high-quality male, thus increasing her chances of obtaining EPCs with the more attractive male. Benefits accrued from these behaviours would select for colonial nesting. It is known that Razorbill* (Alca torda) *males aggregate in mating arenas that are visited by females pursuing EPCs. Such behavior may be more widespread in colonial seabirds, so the next time you see clusters of birds roosting just outside breeding areas, consider that they may have more on their mind than just relaxing in the sun.*

## EAST COAST MORESBY ISLAND

Seventy-eight islands along the east side of Moresby Island (Figure 216) are breeding grounds for half a million seabirds of 10 species (Figure 217; Table 6). The region supports 44% of the population of Ancient Murrelets nesting in BC, as well as substantial proportions of the storm-petrels, Black Oystercatchers, and Cassin's Auklets (Figure 218).[231] Thirty-two percent of the Pigeon Guillemots in Haida Gwaii have been sighted in this region.

Seabirds face a number of threats in this area. Population declines or abandonment by burrow-nesting species have been confirmed at 15 colonies (Table 2, page 65) and probably occurred at another six colonies (High, Charles, Annette, Langtry, Rock, and Sels Islet) where previous breeding was suspected but not confirmed. Abandonment was also suspected on one other colony (Mabbs Island) where only old burrows had been observed. In addition, there are several sites (Ellen Island, "Huston" Islet, Poole Point on Burnaby Island, Kat Island, Stansung Islets, and Kilmington Point on Louise Island) that were not designated colonies as of 1990 because breeding was never documented, but unoccupied burrows and other evidence suggest past nesting and current abandonment (see Appendix 3). Most population declines can be attributed to human causes, although river otters may have contributed to the disappearance of storm-petrels from Hoskins Islets.

Introduced rats and raccoons are the most immediate threat to seabirds in the region. Rats are present on many islands and as of 1990 were suspected to have impacted nesting populations at three sites: on Kunghit Island, a Rhinoceros Auklet colony at Moore Head (Figure 219), close to the centre of rat dispersal in Rose Harbour, had disappeared; on Murchison Island, the colony of Ancient Murrelets and Cassin's Auklets was restricted to the outer northeast peninsula; and on Lyell Island, the extent of the Ancient Murrelet

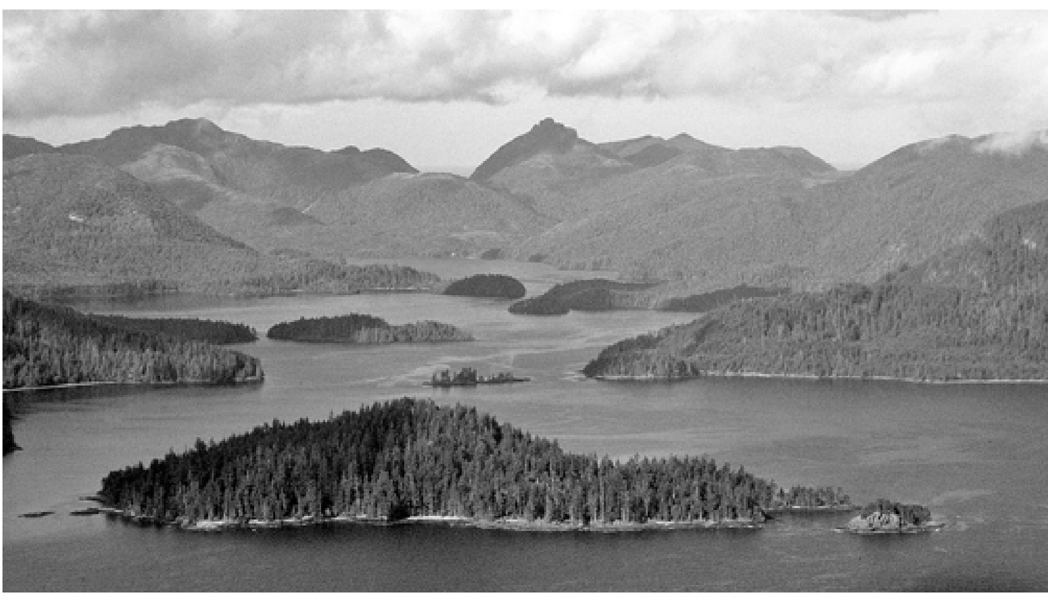


**Figure 216.** Seventy-eight colonies along the east coast of Moresby Island support 33% of the nesting seabirds in Haida Gwaii. This photo shows an aerial view of Alder Island (foreground), directly behind which is Nakons Islet, Section Island, Centre Island, the southern portion of Wanderer Island, and Nomad Island, with the south end of Huxley Island on the right, the north end of Burnaby Island on the left, and Moresby Island in the back. Only some of these islands support nesting seabirds. *Photo by Moira J.F. Lemon, 16 June 1986.*

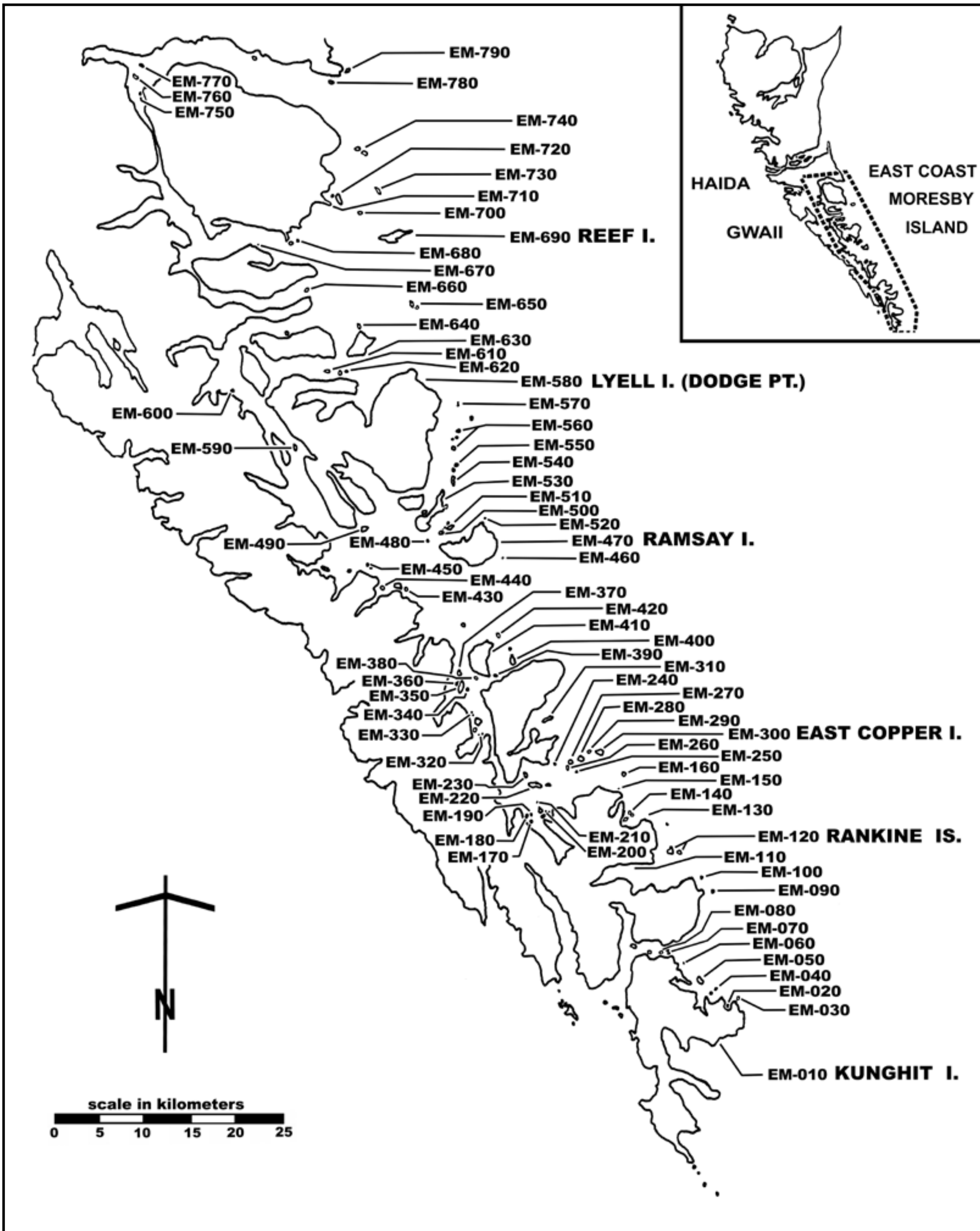



**Figure 217.** Locations of seabird colonies on the east coast of Moresby Island (modified from Rodway et al.[233]).

**Table 6.** Estimates of seabird breeding populations on the east coast of Moresby Island as of 1990. Estimates are numbers of breeding pairs except for numbers in parentheses, totals in the "All species" column, and totals in the "Total breeding birds" row, which are numbers of individuals. See Appendix 2 on pages 467-468 for an explanation of the letter codes used to qualify population estimates.

| SITE CODE | SITE NAME | Total Storm-Petrels[a] | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | ALL SPECIES[b] | SURVEY YEAR(S)[c] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EM-010 | Kunghit Island | | | | 22 | 7 | 29e | S(155) | 8,800e | 50eS | 2,500e | 250e(323) | S(3) | 23,297 | 1986,87 |
| EM-020 | Marshall Island | | | | | 1eS | | 17(27) | | | | | | 36 | 1986 |
| EM-030 | Gull Islet | | | | | 2 | 1eS | x(8) | | | | | | 14 | 1986 |
| EM-040 | Rainy Islands | 100eS | S | | | 3 | 26 | x6(20) | | | | | | 278 | 1986 |
| EM-050 | High Island | | | | | | | S(8) | 0 | | 10eS | | | 28 | 1985 |
| EM-060 | Haydon Rock | | | | | 1 | 1 | | | | | | | 4 | 1986 |
| EM-070 | Charles Islands | 100e | 100e | | | 1S | | x(24) | | 0 | 130S | | | 486 | 1985,86 |
| EM-080 | Annette Island | | | | | | | x(16) | | 0 | 20S | | | 56 | 1985,86 |
| EM-090 | Garcin Rocks | | | | | 0 | 102 | 3(6) | | | | | | 210 | 1986 |
| EM-100 | Langtry Island | 12,300t | x | x | | 3 | | x(7) | | 0 | | | | 24,613 | 1985 |
| EM-110 | Samuel Rock | | | | | 1 | 5 | S(13) | | | | | | 25 | 1977 |
| EM-120 | Rankine Islands | 14,300t | 2,000t | 12,300t | | 5 | 43 | S(12) | 26,000t | 26,000t | | | | 132,708 | 1984-86 |
| EM-130 | Marion Rock | | | | | 1 | 1 | | | | | | | 4 | 1986 |
| EM-140 | Nest Islets | | | | | 4 | 0 | S(25) | | | | | | 33 | 1986 |
| EM-150 | Inner Low Rock | | | | | 1 | | | | | | | | 2 | 1986 |
| EM-160 | Joyce Rocks | | | | | 1 | 197 | S(9) | | | | | | 405 | 1986 |
| EM-170 | Sea Pigeon Island | | | | | | | S(5) | E | | | | | 5 | 1985 |
| EM-180 | Boulder Island | | | | | | | (0) | E | | | | | 0 | 1985 |
| EM-190 | Green Rock | | | | | 3 | 3 | x5(21) | | | | | | 33 | 1986 |
| EM-200 | "Jedway" Islets | | | | | 2 | | ( 4) | | | | | | 8 | 1977 |
| EM-210 | Bush Rock | | | | | 1eS | | S(1) | | | | | | 3 | 1986 |
| EM-220 | Bolkus Islands | 230eS | S | | | 4S | 1 | S(41) | 9,900t | 960e | 20eS | | | 22,271 | 1985,86 |
| EM-230 | Swan Islands | | | | | 4 | 1 | S(4) | | | | | | 14 | 1986 |
| EM-240 | "Pelican" Rock | | | | | 2 | 1S | | | | | | | 6 | 1986 |
| EM-250 | Slug Islet | | | | | 2S | 48 | x(18) | | | | | | 118 | 1986 |
| EM-260 | Rock Islet | 17,000t | 4,400t | 12,600t | | 4 | 1 | x2(6) | 0 | 5,100t | | | | 44,216 | 1985,86 |
| EM-270 | Skincuttle Island | 4,300t | x | x | | 1 | | (0) | 2,200t | 1,000t | | | | 15,002 | 1985,86 |
| EM-280 | George Island | E | 0 | E | | | | (1) | 11,600t | 5,900t | | | | 35,001 | 1985 |
| EM-290 | Jeffrey Island | | | | | | | (0) | 1,000t | 2,700t | | | | 7,400 | 1985 |
| EM-300 | East Copper Island | 40eS | 20eS | 20eS | | 2 | | S(30) | 4,400t | 10,900t | | | | 30,714 | 1985 |
| EM-310 | Howay Island | 10eS | 10eS | | 0 | 2eS | 10e | S(6) | 300e | 250eS | | | | 1,150 | 1985,86 |
| EM-320 | "Island Bay" Group | | | | | 1S | 0 | (2) | | | | | | 4 | 1986 |

**Table 6.** cont'd

| SITE CODE | SITE NAME | Total Storm-Petrels[a] | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | ALL SPECIES[b] | SURVEY YEAR(S)[c] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EM-330 | "Kat" Rocks | | | | | 9 | 6 | x10(28) | | | | | | 58 | 1986 |
| EM-340 | Centre Islet | | | | | | | 10e(10) | | | | | | 20 | 1986 |
| EM-350 | Wanderer Island | | | | | 1eS | | S(35) | | | | | | 37 | 1986 |
| EM-360 | Sels Islet | 0 | 0 | | | 5 | | S(40) | | | | | | 50 | 1986 |
| EM-370 | Park Island | | | | | 1eS | | S(27) | | | | | | 29 | 1986 |
| EM-380 | Koga Islet | | | | | | | S(36) | | | | | | 36 | 1986 |
| EM-390 | Nakons Islet | | | | | 1S | | (0) | | | | | | 2 | 1985 |
| EM-400 | Alder Island | 60S | | | | 3S | 1S | S(2) | 14,400t | 3,200t | | | | 35,330 | 1985 |
| EM-410 | Huxley Island | | | | | 2 | | S(29) | | | | | | 33 | 1977 |
| EM-420 | Arichika Island | 0 | 0 | 0 | | 1eS | | S(7) | E | E | | | | 9 | 1985 |
| EM-430 | Marco Rock | | | | | 5 | 18 | x8(30) | | | | | | 76 | 1986 |
| EM-440 | Hutton Island | | | | | | | 10e(11) | | | | | | 20 | 1977 |
| EM-450 | Hoskins Islets | E | E | | | 1 | | x9(92) | | | | | | 94 | 1986 |
| EM-460 | Tatsung Rock | | | | | 4 | 11 | (0) | | | | | | 30 | 1986 |
| EM-470 | Ramsay Island | | | | 14eS | 2e | 16e | S(29) | 18,200t | 12,900t | | | | 62,293 | 1984, 86 |
| EM-480 | Ramsay Rocks | | | | | 2eS | 5 | | | | | | | 14 | 1986 |
| EM-490 | Bischof Islands | 50eS | | | | 0 | | S(24) | E | | | | | 124 | 1985 |
| EM-500 | Hotspring Island | 900e | x | S | | 1 | | 15e(24) | 6e | 10eS | | | | 1,864 | 1984,86 |
| EM-510 | House Island | | | | | 0 | | S(10) | 2,600t | 40eS | | | | 5,290 | 1984 |
| EM-520 | Kloo Rock | | | | | 1 | 0 | (0) | | | | | | 2 | 1984 |
| EM-530 | Murchison Island | | | | 0 | 2 | 27e | S(28) | 20e | 50eS | | | | 226 | 1984,86 |
| EM-540 | Agglomerate Island | 5,500t | x | S | | 2 | 2 | x2(14) | 2,200t | 200eS | | | | 15,822 | 1985,86 |
| EM-550 | Kawas Islets | 700e | x | | | 3 | 11 | x4(7) | | 200e | | | | 1,836 | 1984-86 |
| EM-560 | Tar Islands | 330e | x | x | 0 | 10e | 32e | x2(46) | 0 | 120eS | | | | 1,030 | 1985,86 |
| EM-570 | Tuft Islets | | | | | | 1eS | S(1) | | 0 | | E | | 3 | 1982 |
| EM-580 | Lyell Island, Dodge Point | | | | 1 | 3 | | S(4) | 10,700t | | | | | 21,412 | 1982,86 |
| EM-590 | Topping Islands | | | | | 1eS | | 15+e | | | | | | 32 | 1977 |
| EM-600 | Gil Islet | | | | | 1eS | | 1(1) | | | | | | 4 | 1977 |
| EM-610 | Dog Island | | | | | | | 6+e(37) | | | | | | 37 | 1977 |
| EM-620 | Kul Rocks | | | | | 1eS | 0 | S(1) | | | | | | 3 | 1986 |
| EM-630 | Kelo Rocks | | | | | 2 | 2 | x(13+) | | | | | | 21 | 1971 |
| EM-640 | Titul Island | | | | | 0 | | S(114) | | 170 | | | | 454 | 1983 |
| EM-650 | Lost Islands | 80 | 80 | x | | 3 | 75 | x(31) | | 210 | | | | 767 | 1983,85,86 |
| EM-660 | Helmet Island | | | | 0 | 0 | | S(19) | | | | | | 19 | 1983 |

**Table 6.** cont'd

| SITE CODE | SITE NAME | Total Storm-Petrels[a] | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | ALL SPECIES[b] | SURVEY YEAR(S)[c] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EM-670 | Procter Rocks | | | | | 1 | | (3) | | | | | | 5 | 1977 |
| EM-680 | Kingsway Rock | | | | | 1 | 43 | x3(72) | | | | | | 160 | 1986 |
| EM-690 | Reef Island | 140e | x | | 0 | 4 | 15e | x(338) | 3,600t | 1,700e | E | | | 11,256 | 1983,85,87,89 |
| EM-700 | South Low Island | | | | | 1eS | 0 | S(18) | | | | | | 20 | 1986 |
| EM-710 | Louise Island, Vertical Point | | | | 0 | | | S(7) | | | | | | 7 | 1983,86 |
| EM-720 | Limestone Islands | | | | | 3 | | x2(65) | 1,600t | 40 | 2S | | | 3,355 | 1983,89,90 |
| EM-730 | Low Island | 160 | x | | 0 | 1S | 39 | x2(115) | | 30 | | | | 575 | 1983,86 |
| EM-740 | Skedans Islands | 1,100e | 1,100e | | 4 | 3 | 13 | x7(136) | E | 100 | | | | 2,576 | 1983,88 |
| EM-750 | Mabbs Islet | | | | | | | 27(60) | | | | | | 60 | 1977 |
| EM-760 | Nedden Island | | | | | 2 | | (174) | | | | | | 178 | 1977 |
| EM-770 | Oliver Islet | | | | | 1 | | (2) | | | | | | 4 | 1977 |
| EM-780 | Kingui Island | 0 | 0 | | | 1 | | S(4) | | | | | | 6 | 1977 |
| EM-790 | Cumshewa Island | | | | | 1S | 37 | x2(62) | | | | | | 138 | 1986 |
| **TOTAL NESTING PAIRS** | | **57,400** | **7,710+[d]** | **24,920+[d]** | **41** | **145** | **824** | | **117,526** | **71,830** | **2,682** | | | | |
| **TOTAL BREEDING BIRDS** | | **114,800** | **15,420+[d]** | **49,840+[d]** | **82** | **290** | **1,648** | **2,339** | **235,052** | **143,660** | **5,364** | **323** | **3** | **503,561** | |
| **TOTAL CURRENT SITES** | | 19 | 17+ | 9+ | 4 | 61 | 34 | 68 | 17 | 23 | 6 | 1 | 1 | 78 | |
| ***Confirmed on last survey*** | | 13 | 13 | 6 | 3 | 42 | 30 | 30 | 17 | 16 | 1 | 1 | 0 | 63 | |
| ***Confirmed on any survey*** | | 16 | 14 | 8 | 4 | 51 | 33 | 45 | 17 | 21 | 1 | 1 | 0 | 77 | |
| ***Unconfirmed*** | | 3 | 3 | 1 | 0 | 10 | 1 | 23 | 0 | 2 | 5 | 0 | 1 | 1 | |
| **TOTAL HISTORICAL SITES** | | 24 | 24 | 11 | 11 | 66 | 39 | 74 | 25 | 28 | 7 | 2 | 1 | 79 | |
| ***Confirmed*** | | 18 | 16 | 9 | 10 | 53 | 38 | 46 | 22 | 22 | 2 | 2 | 0 | 78 | |
| ***Unconfirmed*** | | 6 | 8 | 2 | 1 | 13 | 1 | 28 | 3 | 6 | 5 | 0 | 1 | 1 | |
| **CURRENTLY ABANDONED SITES** | | 5 | 5 | 2 | 7 | 5 | 5 | 6 | 8 | 5 | 1 | 1 | 0 | 1 | |
| ***Previously confirmed*** | | 2 | 1 | 1 | 6 | 2 | 5 | 1 | 5 | 1 | 1 | 1 | | 1 | |
| ***Previously unconfirmed*** | | 3 | 4 | 1 | 1 | 3 | 0 | 5 | 3 | 4 | 0 | 0 | | 0 | |

[a] At some colonies, total number of breeding pairs was estimated but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

[b] Number of individuals.

[c] For sources see individual colony accounts.

[d] If we assume 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 Haida Gwaii, then we derive total breeding population estimates of 38,789 individuals (19,394 pairs) of Fork-tailed and 76,011 individuals (38,006 pairs) of Leach's storm-petrels on the east coast of Moresby Island as of 1990.

**Figure 218.** Colonies along the east coast of Moresby Island support 24% of the Cassin's Auklets breeding in Haida Gwaii. This one- or two-day-old Cassin's Auklet chick was extracted from a burrow by Trudy Carson (now Chatwin). Excavating burrows takes a toll on seabird surveyors, as shown by Trudy's bandaged finger. *Photo by Moira J.F. Lemon, Frederick Island, May 1980.*

**Figure 219.** Rats were likely introduced to Kunghit Island at the whaling station in Rose Harbour. Rats proliferate rapidly and rats dispersing from the whaling station were likely responsible for the disappearance of a Rhinoceros Auklet colony at Moore Head and the decline of burrow-nesting species elsewhere on the island. A female Norway Rat usually does not live beyond a year but may produce over 40 young in her short lifetime. *Photo by R. Wayne Campbell.*

colony was diminished. Recent camera monitoring surveys have detected rats on 27 islands on the east coast of Moresby Island (Appendix 1), including High, Annette, Arichika, and Bischof islands where seabird declines were confirmed or suspected but unexplained as of 1990. Rats may have had undetected impacts on other islands where data are inadequate to demonstrate historical presence or trends in seabird nesting populations.

Raccoons (Figure 220) have likely already eliminated seabirds from at least three colonies (Sea Pigeon Island, Boulder Island, Sels Islet) along the east coast of Moresby Island. They have been intermittently present and most likely responsible for declines of Ancient Murrelets on Limestone Islands,[23] and they have been recorded on two other colonies (Kunghit and Skedans islands) and suspected on a third (Bischof Islands [233]) where seabird declines are apparent (Table 2, page 65). Signs or sightings of raccoons have also been reported on Swan, Rock, Skincuttle, George, "Island Bay", Centre, Wanderer, Alder, Huxley, Hutton, and Louise islands.[155, 276] They threaten to spread to any of the other colonies close to the shore of Moresby Island.[155] Their unchecked expansion could devastate seabird nesting populations in Haida Gwaii.

**Figure 220.** Raccoons are a serious threat to breeding seabirds, especially burrow-nesting alcids, along the entire east coast of Moresby Island. *Photo by R. Wayne Campbell.*

The east coast of Moresby Island has become a popular recreational area (Figure 221), especially since the southeast coast was designated a National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site. Intensifying tourist traffic is a threat to nesting seabirds, especially sensitive species like Pelagic Cormorants and Tufted Puffins. Regulations are in place within Gwaii Haanas to restrict public access to sensitive nesting sites, which should limit impacts to seabird colonies, although regulations are difficult to enforce. The region is potentially threatened by oil and wind power development in Hecate Strait and colonies will require adequate buffer zones to shield them from possible accidents.

**Figure 221.** Tour boat operators on the east coast of Moresby Island are aware of the potential damage clients can cause by landing and exploring a seabird colony without guidance and supervision. *Photo by R. Wayne Campbell.*

Surveys in 1971, 1977, and 1986 provide comparative data for Pelagic Cormorants. Breeding populations have declined. At nesting sites surveyed in all three years, there were 180 nests at five sites in 1971, 48 nests at three sites in 1977, and 25 nests at two sites in 1986. In addition, no breeding birds were seen in 1986 on the west coast of Kunghit Island where 30 pairs were estimating nesting in 1977. Historical populations may have been larger because nesting sites in 1986 at "Luxana" arch on Kunghit Island and on Lyell Island (Table 6) were not visited in 1971 and 1977. Declines were also evident prior to the 1970s: the large colony of about 100 pairs on Skedans Island reported by Cowan in 1946 was abandoned or at most had four nests on subsequent visits; and the colony of 50 pairs estimated by Foster on Howay Island in 1961 was unsuccessful in 1977 and unused in 1986. The total population estimated for the region, 41 pairs nesting at four sites as of 1990 (Table 6), is likely less than a quarter of the population historically nesting in the area.

Most known colonies of Black Oystercatchers were surveyed by BCPM crews in 1977 and by CWS in 1985/1986. Surveys in 1971 for oystercatchers were incomplete. Of the 66 sites where this species historically was observed or suspected nesting (Table 6), 61 were visited in 1977 and 56 were visited in 1985/1986 (Table 7). Total nesting populations during each survey period were likely greater than indicated in Table 7, as a number of nesting sites were missed each year (Figure 222). In addition, birds were present but no information on nesting was reported at 11 sites surveyed in 1977. Even so, it appears that nesting populations for Black Oystercatchers increased between 1977 and 1985/1986 (Table 7), but this may have been because shoreline areas were explored more thoroughly during the CWS surveys in 1985/1986.

Nesting sites for Glaucous-winged Gulls were also surveyed in 1977 and 1986. Those surveys included all but two known sites (Table 6): "Kat" Rocks was missed in 1977 (6 nests in 1986), Samuel Rock was missed in 1986 (5 nests in 1977), and Kelo Rocks was missed in both years (2 nests in 1971 [262]). Total breeding populations at surveyed colonies increased 37% between 1977 and 1986, although gulls were nesting at similar numbers of sites in both years (Table 7). Despite the overall increase, populations at several

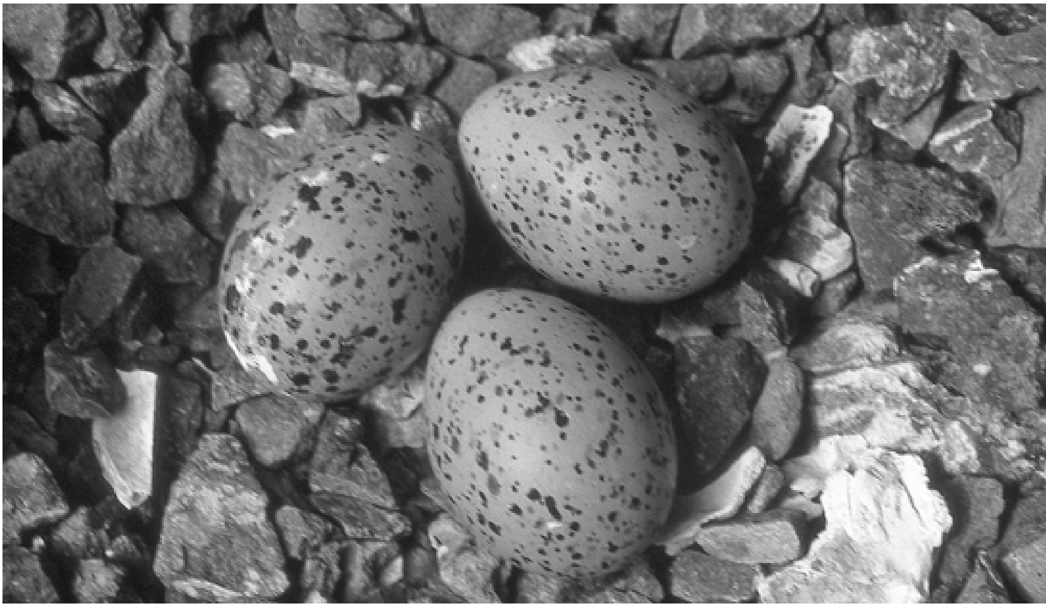


**Figure 222.** Surveys in 1977 and 1986 underestimated the nesting population of Black Oystercatchers on the east coast of Moresby Island because some nesting sites were not visited and some nests were likely missed during searches of potential nesting sites where adults were present. *Photo by R. Wayne Campbell, Kingsway Rock, BC, 30 May 1977.*

colonies declined, most notably on Agglomerate Island, Kawas Islets, and Kingsway Rock. Some evidence of predation was recorded on Agglomerate and Kawas islands and egging has been observed on Kingsway Rock. Some declines also occurred earlier: Kul Rock and South Low Island that, respectively, had 11 and 20 pairs nesting in 1971 were abandoned in 1977 and 1986, and the number of nests on Tatsung Rock was greater in 1971 (43 nests) than in 1977 (12 nests) and 1986 (11 nests). The greatest increases between 1977 and 1986 were seen on Joyce Rocks and Rankine, Tar, Murchison, Lost, Low, Skedans, and Cumshewa islands, although higher numbers were nesting on Low Island in 1972 (70 nests) than in 1986 (39 nests).

**Table 7.** Breeding populations of Black Oystercatchers and Glaucous-winged Gulls, and numbers of Pigeon Guillemots counted around colonies on the east coast of Moresby Island in 1977 and 1983-1986[a].

| | BLOY | | | GWGU | | | PIGU | | |
|---|---|---|---|---|---|---|---|---|---|
| **Survey Date** | **Pairs nesting** | **Nests found[b]** | **Sites** | **Pairs nesting** | **Nests found[b]** | **Sites** | **Confirmed Nests** | **Birds[c]** | **Sites** |
| 3-12 Jul 1977 | 87 | 72[47] | 47[d] | 617 | 603[472] | 33 | x111 | 1,560 | 70 |
| 1983-1986[a] | 129[e] | 116[79][e] | 50[e] | 845 | 810[646] | 32 | x81 | 1,957 | 61 |

[a] Black Oystercatchers were surveyed in 1985 and 1986; Glaucous-winged Gulls were surveyed in 1986; and Pigeon Guillemot counts are from 1983-1986 (compilation has been revised since Rodway [227]).
[b] Nests found includes total nests with nests with eggs or young in brackets.
[c] Number of birds counted or twice the numbers of nests found, whichever was greater.
[d] Birds were seen at 11 additional sites but no information about nesting was recorded.
[e] Includes Lyell Island surveyed in 1982 (3 nests) and Skedans Islands surveyed in 1983 (3 nests).

Of the 74 colonies along the east coast of Moresby Island where Pigeon Guillemots (Figure 223) have been recorded, 70 were visited by BCPM crews in 1977 and 61 were surveyed by CWS during the mid-1980s. Two sites, Lyell Island and Kelo Rocks, were not surveyed during either period (a total of 17 birds were seen at those two colonies on other surveys). More birds were tallied at sites visited in the mid-1980s than at those surveyed in 1977, in spite of the fact that fewer sites were visited by CWS crews (Table 7). We suspect that increased numbers were due to the greater time spent on colonies during the more intensive CWS surveys. Differences would have been even greater if all sites had been visited by CWS crews. A total of 349 Pigeon Guillemots were counted in 1977 at other sites missed during the CWS surveys (including Samuel Rock, "Jedway" Islets, Procter Rocks, and Hutton, Topping, Gil, Dog, Mabbs, Nedden, Oliver, and Kingui islands). Also, Huxley Island was incompletely surveyed by CWS crews. There are no records of BCPM crews visiting "Kat" Rocks or Vertical Point, although we suspect that they may have boated by Vertical Point and saw no birds. Ten nests were confirmed and 28 birds seen at "Kat" Rocks and seven birds were seen at Vertical Point during CWS surveys.

Most colonies in this region have protected status within Gwaii Haanas. All islands from Kunghit Island north to Lost Islands are included in the National Park Reserve. The status of Ecological Reserve No. 44, which included Rankine Islands, Jeffrey Island, and East Copper Island, was revoked to allow inclusion of those islands in Gwaii Haanas. Three colonies north of the park boundary, Reef Island, Limestone Islands, and Skedans Islands, have been designated BC Wildlife Management Areas and fall within the K'uuna Gwaay Heritage Site/Conservancy.

Staging areas for Ancient Murrelets occur around major colonies (Figure 224) and measures are needed in those areas to protect staging birds from disturbance. In Part 1, we recommended a permitting process for visiting seabird colonies that would restrict boat traffic through offshore and nearshore staging areas, and prohibit anchoring near staging areas at night.[231] Permitting should apply to all activities, including the ecotourism industry and sports fishing lodges that are increasingly becoming established in the vicinity of major seabird colonies. Permitting could be added to the Gwaii Haanas programs already in place to help protect seabird populations within the park.

**Figure 223.** Pigeon Guillemots often nest in hidden and inaccessible locations and determining the nesting population at a colony is difficult and time consuming. Only counts of birds around a colony were obtained during seabird surveys in Haida Gwaii. Many factors influence the numbers of guillemots present at a colony, including time of day, tide level, weather, stage of the incubation and nestling period, and the distance that adults are foraging from the colony. Repeated visits during times of day when attendance is highest are required just to obtain accurate estimates of numbers of individuals present. Without further study, an estimate of the breeding population at a colony can only be a "best guess." *Photo by Ervio Sian.*

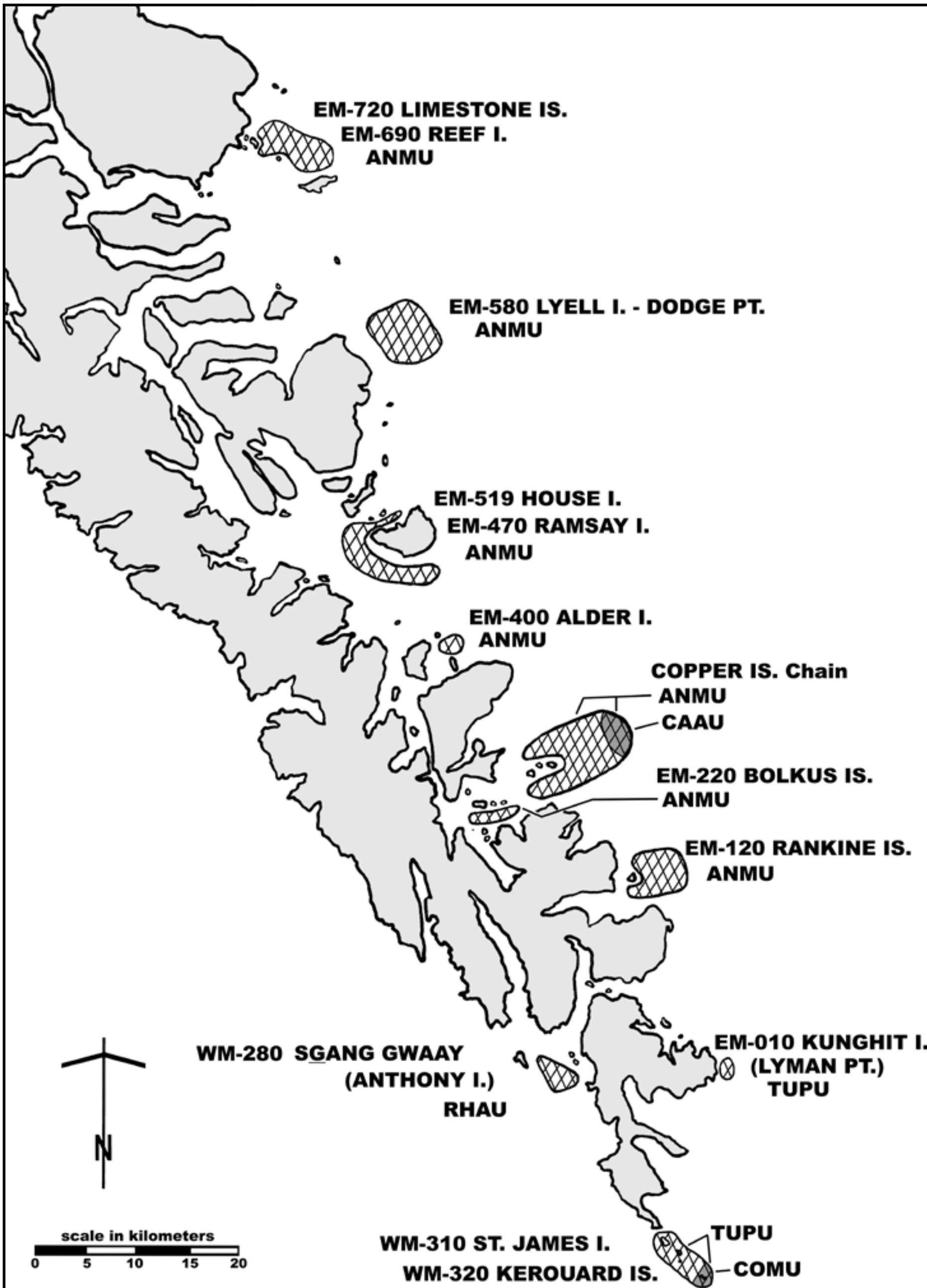



**Figure 224.** Major staging areas of nesting seabirds on the east and southern west coasts of Moresby Island (modified from Rodway et al.[233]).

## EM-010 KUNGHIT ISLAND

**Location:** *52°05'N 131°05'W; 103 B/2, 3 and 102 O/14.*
At the south end of Moresby Island. Colony includes all unnamed rocks and islets along the shore.

**Description:** *12,330 ha; 116 km perimeter; 546 m high; Forested.*
Kunghit Island is steep-sided with many cliffs (Figures 225 and 226), crevices, sea-caves, and deeply cut bays around its extensive perimeter (Figure 227). Expansive sandy beaches occur at the heads of some of those bays (Figure 228). The topography is especially dramatic on the west side near the south tip and on the east side south of Lyman Point. The north end is less imposing. The island is forested with the typical mix of spruce, hemlock, and redcedar. The steep slopes around exposed cliffs and much of the shoreline are grassy under spruce, changing to moss and bare litter further inland under thicker hemlock and redcedar forest canopy. Salal creates a dense understory in some areas and is more prevalent towards the north end. Kunghit is one of the largest islands in BC with colonies of burrow-nesting seabirds – only Lyell Island, with its colony of Ancient Murrelets, is larger (although the shoreline perimeters of the two islands are similar).

There is a small settlement in Rose Harbour at the site of the old whaling station. Many Haida villages were located around the island, including major settlements in Woodruff Bay near Ballard Point, in Keeweenah Bay, on the west side of Blackburn Peninsula, and east of Hornby Point.[79] An excavation about 15 m long at Moore Head is associated with a mineral claim recorded there in 1913.

**Historical summary:** The extensive perimeter of Kunghit Island has never been completely explored for nesting seabirds and comparative historical data are lacking for many areas. However, available records do document abandonment of some colony areas and suggest declines in numbers of burrow-nesting seabirds over the last few decades. The Rhinoceros Auklet colony at Moore Head that Cowan and Guiguet found in 1947 was abandoned when the BCPM checked major headlands around the island in 1977 (Table

**Figure 225.** Kunghit Island has steep sides with many cliffs around the perimeter. *Photo by Michael S. Rodway, 10 June 1986.*

**Figure 226.** The west side of Kunghit Island showing the rugged coastline. *Photo by Michael S. Rodway, 11 June 1986.*

**Figure 228.** A large sandy beach in Woodruff Bay on Kunghit Island. *Photo by Michael S. Rodway, 10 June 1986.*

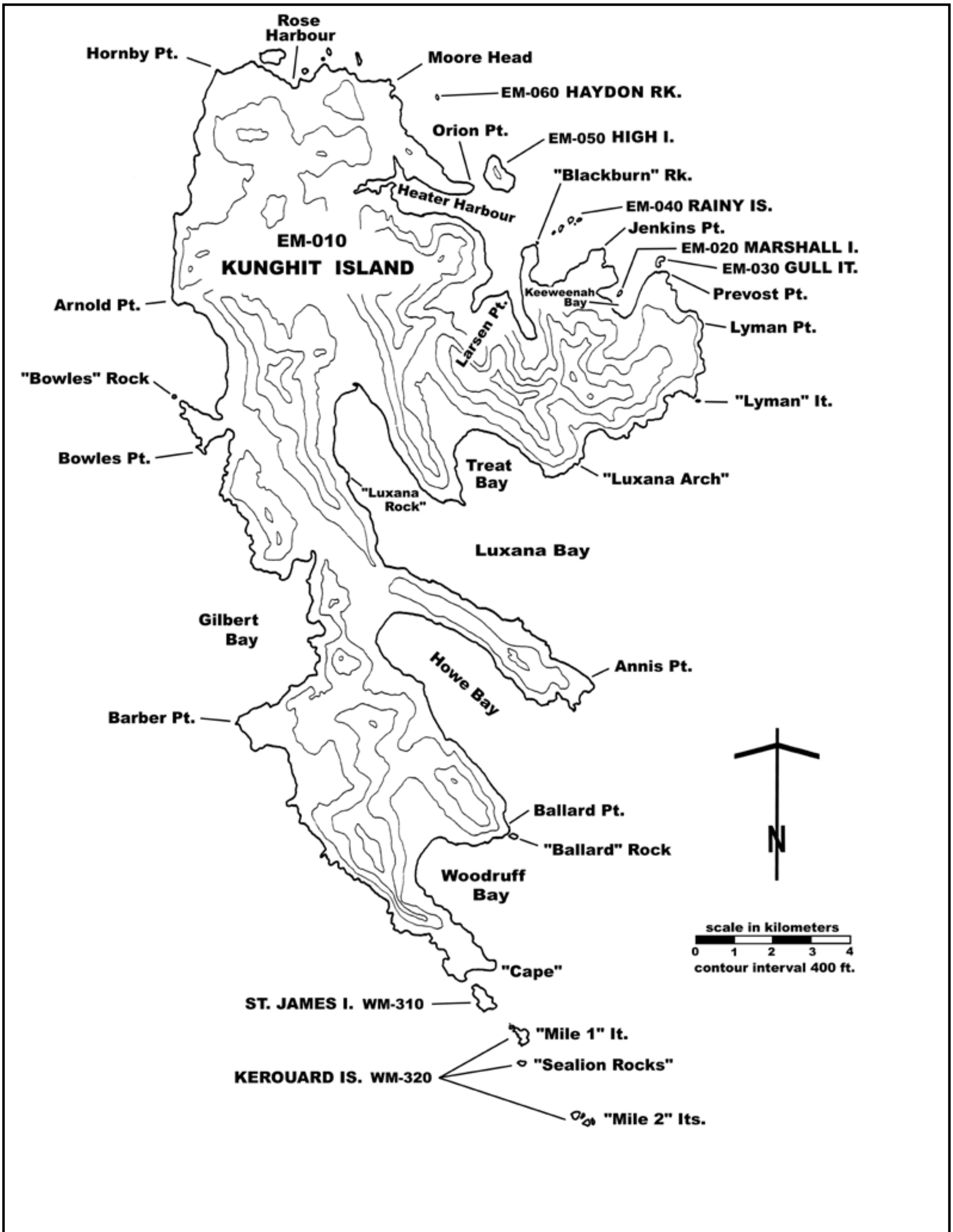



**Figure 227.** Locations mentioned in the text around Kunghit Island, BC.

EM-010). In 1977, only ten old Rhinoceros-Auklet-sized burrows were found at Moore Head, and many old Cassin's- and Rhinoceros-auklet-sized burrows with cobwebs in their entrances were encountered on other headlands checked, including Ballard and Annis points. Observers in 1977 suspected that burrow-nesting populations were much larger in the past. Some Cassin's Auklets were still nesting at Barber Point and active-looking Ancient Murrelet burrows and many Ancient Murrelet prey remains were noted at Jenkins Point. No evidence of nesting by Rhinoceros Auklets was found in the areas explored in 1977 but observers suspected that they may have been nesting elsewhere on the island.

Much of the perimeter of the island was explored for nesting seabirds in 1986 (Figure 229), except for areas around Howe Bay, Gilbert Bay, and between Arnold Point and Hornby Point, which were examined only from the water. Except for Jenkins Point, colonies of Ancient Murrelets and Rhinoceros Auklets were found in previously unexplored areas. In addition to Jenkins Point, Ancient Murrelets were found nesting on the south side of Luxana Bay, west of Annis Point. Rhinoceros Auklets were nesting in disjunct patches along an extensive stretch of shoreline from east of Treat Bay to north of Lyman Point. A few active-looking Cassin's Auklet burrows were found mixed with Rhinoceros Auklet burrows in the area around Lyman Point. Evidence of abandoned burrowing areas were also seen in 1986: old Cassin's- and Rhinoceros-auklet-sized burrows containing old feathers were found on the east and west corners of the south tip of the island, along the west side north of the south tip, the point east of Jenkins Point, and at Prevost Point. Burrowing areas were measured and mapped and partial counts of burrows were conducted, but the Ancient Murrelet and Rhinoceros Auklet colonies were not surveyed with line transects in 1986 due to lack of time. Kunghit Island is thus the only major colony of these species in BC that lacks replicable baseline population data as of 1990 (the main Ancient Murrelet colony area on the south side of Luxana Bay was surveyed with line transects in 1993; see Appendix 1).

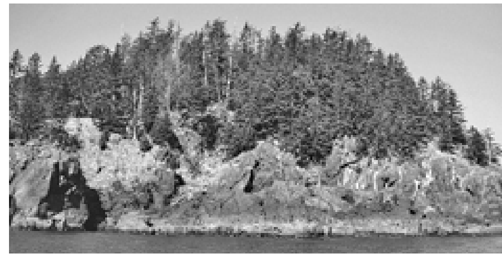


**Figure 229.** Much of the perimeter of Kunghit Island was explored for nesting seabirds in 1986, including these slopes around Annis Point. *Photo by Moira J.F. Lemon, 12 June 1986.*

Foster documented nesting by Tufted Puffins at Lyman Point and the islet south of it in 1960. Tufted Puffins were again recorded nesting on the islet south of Lyman Point (400+ birds sighted) and also on the point south of Bowles Point (35 birds sighted) in 1977 (Figure 230). Only birds that were gathered near Lyman Point (see Figure 224 on p. 201) were counted as we boated by in 1985. In 1986 we found them nesting at the same locations recorded in 1977 as well as on the cliffs just north of the Lyman Point islet and at the rock arch in Luxana Bay. Most birds recorded in 1986 (318 of 323) were sighted around the Lyman Point colony areas. Numbers of puffins sighted and the extent of their nesting areas on Lyman Point islet seemed similar in 1977 and 1986. The larger population estimate in 1977 may have been due to different estimating techniques. Extrapolating from the number of burrows counted in two 10x10 ft. (9.3 $m^2$) quadrats and a rough estimate of colony area, observers estimated the nesting population to be around 2,500 pairs in 1977 (note that Campbell and Garrioch [39] gave the estimate of 25 pairs made by Foster in 1960 for the Lyman Point colony). To avoid disturbing breeding birds, we did not land on Lyman Islet to census the puffin population in 1986; judging from the number of puffins sighted, we suspected about 250 pairs nesting. Better burrow density and colony area estimates are needed to provide reliable comparative population estimates. Incidental observations of puffins were made around Lyman Point in 1987 and 1988.[315] In 1987, Wayne Campbell observed three Horned Puffins around Lyman Islet, one sitting on the islet and two flying.

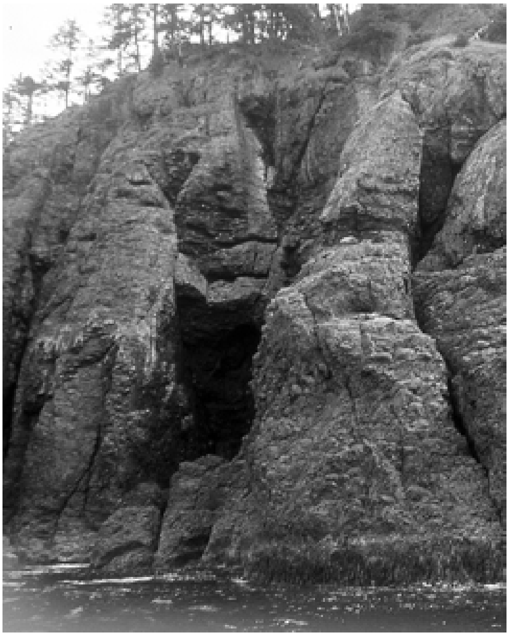


**Figure 230.** Tufted Puffins were nesting on cliffs of pillow lava on the west side of Kunghit Island in 1977. *Photo by J. Bristol Foster, 3 July 1977.*

One Pelagic Cormorant nest was observed on the cliffs south of Bowles Point (Figure 231) and 42 birds in breeding plumage were seen flying from cliffs and sea-caves along the west coast in 1977. At least 30 pairs were suspected nesting at those locations but large swells and rough water prevented close inspection. Some cormorants were also seen around Annis Point on the east coast in 1977; observers suspected nesting in crevices and sea caves in the vicinity. In 1986, cormorants were nesting around "Luxana" arch; six nests were located under the arch, visible only from land, and 16 were in and above the crevice east of it. That area was not explored in 1977. We inspected all shoreline cliff habitat around Kunghit Island by boat in 1986 and saw no other locations where we suspected cormorants were nesting. We may have missed possible nests in inaccessible caves and crevices that could not be viewed from the water.

Glaucous-winged Gulls have been reported nesting at four locations around Kunghit Island. Three on the east side include: Lyman Islet (11 nests [contents not reported] found in 1977, 8 nests estimated in 1986); "Luxana" arch (4 nests estimated in 1986); and the rock off Ballard Point (one nest with 3 eggs in 1977, 6 nests [3 of 4 known with eggs] in 1986). The fourth location, on the west side of the island, is the rock off Bowles Point (11 nests, 9 with eggs, in 1986). Black Oystercatchers have been confirmed or suspected nesting at seven locations around the east and west coasts of the island, six of them mapped in Rodway et al.,[233] plus one on the point south of Lyman Point where one pair was suspected nesting in 1977. No oystercatcher nests were located in 1977. Pigeon Guillemots were suspected nesting at a number of suitable locations around the island in 1977 and 1986. The greatest concentration (107 birds) observed in 1986 was in the area around Lyman Point.

Groups of up to 80 Marbled Murrelets were regularly sighted at the mouth of Heater Harbour, and individuals were repeatedly heard calling and flying inland over our camp on the south shore in the evening and early morning.

**Figure 231.** A single Pelagic Cormorant nest was recorded on a cliff south of Bowles Point on Kunghit Island in 1977. *Photo by J. Bristol Foster, 3 July 1977.*

**Table EM-010.** Seabird nesting records for Kunghit Island and unnamed islets around its perimeter. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | TUPU | HOPU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|
| 15,16 Aug 1947 | | | | | | | 100-150e | | | 94 |
| 15 Aug 1960 | | | | | | | | 25e | | 94 |
| 3-5 Jul 1977 | 30e | 5eS | 12 | S(47) | S | 50-60eS | S | 2,500e(792) | | 314 |
| 5 Jun 1985 | | | 8eS | | | | | S(41) | | 233 |
| 5-17 Jun 1986 | 22 | 7[5] | 29e | S(155) | 8,800e | 50eS | 2500e | 250e(323) | | 233 |
| 11 Jun 1987 | | | | | | | | (25) | S(3) | 299, 315 |
| 11 Jun 1988 | | | | | | | | (40) | | 315 |

**Remarks:** Rats (*R.r. rattus* and *R.r. alexandrinus* [74]) were probably introduced to Kunghit Island by whaling ships returning to the old whaling station in Rose Harbour. Rats may have contributed to the abandonment of the auklet colony at Moore Head close to Rose Harbour and at other areas around the island where only old burrows have been found. Raccoons were first recorded on the island in trapline records from 1984 and individuals were seen on the island at least four times between 1986 and 1988.[308] During that period, residents at Rose Harbour reported seeing a raccoon, Fisheries officer Rick Nickerson saw one in Heater Harbour, and skipper Al Whitney photographed one in Luxana Bay. They may have impacted nesting seabirds since their arrival, although Hartman and Eastman did not detect them during their surveys in 1989-1990 [155] (raccoons also were not found during subsequent monitoring in 1995-1999 [152] and 2011-2018; [317] see Appendix 1).

Four active Bald Eagle nests were seen in 1986. We observed Peregrine Falcons at five locations. Observers in 1977 noted many Ancient Murrelet kills at Jenkins Point and we saw abundant predation remains in both Ancient Murrelet colony areas in 1986. River otter trails, dens, and scats containing fish were common in 1977 and 1986.

***Finding New Colonies***

*Attempting to locate and survey all the seabird colonies along the BC coast has been an ambitious undertaking, with each survey effort building on what previous surveyors had found. Knowledge gained about species breeding habits and habitats from collectors, researchers, surveyors, and amateur naturalists provided the "search parameters" for subsequent explorations looking for undocumented colonies in remote areas of the coast* (Figure 232).

*The majority of seabird colonies along the BC coast had been identified by the time the BCPM surveys were completed in 1978. However, contingencies of time, personnel, weather, and experience preclude any survey from being exhaustive and there is always more to be discovered. Also, new colonies may become established in previously unoccupied sites. Although a main aim of the CWS surveys in the 1980s was to better delineate the boundaries of known colonies of burrow-nesting species and systematically survey those colonies with a replicable sampling scheme, we also planned enough time into the survey season to ensure we could explore other areas for previously undocumented nesting sites.*

*Unlike surface-nesting species, like gulls and cormorants, whose daily presence is obvious at a nesting colony, burrow-nesting storm-petrels and alcids (except for puffins and guillemots) are more secretive and only visit their colonies under the cover of darkness, thus making their colonies much more difficult to find. In the end it is just a lot of hard work walking through the often steep, cliff bound and wind-tossed forests of the coastal islands to determine whether or not birds are nesting in an area of potential habitat. In those situations, what you find is related to how hard you look.*

*It is always exciting to discover something new or previously unknown. Such discoveries were a daily occurrence during the BCPM surveys in the 1970s, and on a number of occasions during the CWS surveys in the 1980s we also had a chance to experience the thrill of discovery.*

*During the 1982 CWS surveys, while Michael* (Figure 233) *and I (Moira)* (Figure 234) *were surveying the Ancient Murrelet colony at Dodge Point on Lyell*

*Island, part of the work required us to visit Rankine Island, a colony near the southern end of Moresby Island. On our way back to Lyell Island, we stopped the zodiac on the calm waters of Juan Perez Sound to watch a pod of Orcas* (Orcinus orca) *swim by the south side of Ramsay Island. Up until then, only a small colony of Cassin's Auklets and Ancient Murrelets had been found on the north side of that island. Looking up at the steep forested slopes of the south coast of Ramsay, we speculated that there must surely be a colony of Ancient Murrelets there. Two years later, our prediction was proven correct when our CWS crews did a thorough survey of Ramsay Island.*

*On Kunghit Island, the largest island at the southern end of the Haida Gwaii archipelago, prior surveys had found a few isolated pockets of nesting Cassin's Auklets and Ancient Murrelets on some of the major headlands* (see Figure 227). *Those were the only areas explored during the BCPM surveys. During our CWS surveys in 1986, we took on the daunting task of walking as much of the 116 kilometer coastline of Kunghit Island as we could, to search for previously unknown colonies* (Figure 235). *One calm day, while boating down the coastline of the island, I spied a tiny Ancient Murrelet chick, separated from its parents, swimming and peeping near the mouth of Luxana Bay. Scanning the surrounding landscape, I focused in on the forested slopes on the north side of the peninsula that separates Luxana Bay from Howe Bay just west of Annis Point. "That was where we would find a colony," I said to the rest of the crew in the boat. And the next day, we found it, an extensive area of dense Ancient Murrelet burrows spanning an area of over 35 hectares. Still we weren't able to explore all of Kunghit Island and undoubtedly, there, or on other islands along the coast, future seabird surveyors will also discover some unknown nesting site hiding in plain sight.*

**Figure 232.** Finding new seabird colonies in remote locations of BC is exciting. It is also important to keep track of new nesting sites in urban areas, such as this rooftop where Glaucous-winged Gulls were discovered nesting in downtown Victoria in 1993. *Photo by R. Wayne Campbell, 29 June 1993.*

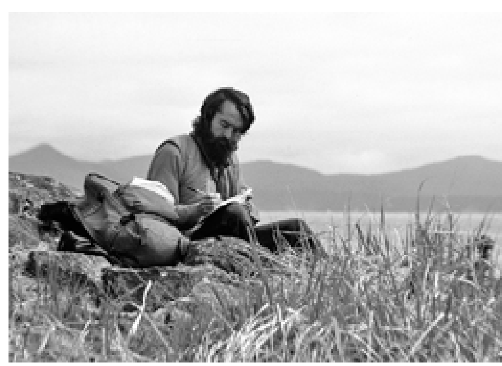


**Figure 233.** Memories fade quickly and recollections can be vague, so it is important that field notes are taken at the time observations are made, as Michael Rodway is doing here on SGang Gwaay (Anthony Island). *Photo by Moira J.F. Lemon, 31 May 1985.*

**Figure 234.** Finding a new seabird colony is always a thrill. However, much of the work of surveying nesting seabirds is less exciting, as Moira Lemon well knows. Here, she is shoving an arm down a burrow to find out what is inside, a task she has repeated thousands of times during her career. *Photo by Glen Keddie, Rankine Islands, 22 June 2005.*

**Figure 235.** Much of the 116 km coastline of Kunghit Island was searched for nesting seabirds by Michael Rodway, Moira Lemon, and other members of the CWS crew in 1986. *Photo by Michael S. Rodway, 10 June 1986.*

## EM-020 MARSHALL ISLAND

**Location:** *52°06'02"N 130°58'02"W; 103 B/2.*
In Keeweenah Bay on the northeast side of Kunghit Island (see Figure 227 on p. 204).

**Description:** *1.2 ha; 10 m high; Forested.*
Marshall Island is boat-shaped and covered with salal under a forest of spruce, redcedar, and hemlock. Some grass occurs on the rocky edges.

**Historical summary:** Black Oystercatchers and Pigeon Guillemots were confirmed nesting in 1977 (Table EM-020). An agitated pair of oystercatchers was observed on the north end in 1986 but no nest was found. Guillemots were nesting in burrows at the edge of the vegetation in 1977 and 1986. Burrows were counted in both years and birds were seen flying out of four burrows in 1977 and one burrow in 1986.

**Table EM-020.** Seabird nesting records for Marshall Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 5 Jul 1977 | 1 | 20(6) | 39, 314 |
| 6 Jun 1986 | 1eS | 17(27) | 233 |

**Remarks:** There was one Bald Eagle nest on the island in 1977 and 1986. River otter runs and scats were recorded in 1986.

## EM-030 GULL ISLET

**Location:** *52°06'28"N 130°57'10"W; 103 B/2.*
North of Prevost Point on the east side of Kunghit Island (see Figure 227 on p. 204).

**Description:** *1.7 ha; 5 m high; Grassy rock.*
Gull Islet is an extensive, dissected low rock, with an area of grass and a few stunted spruce trees on the southern portion (Figure 236).

**Historical summary:** Two Black Oystercatchers were present in 1977 but no evidence of nesting was recorded. They were confirmed nesting in 1986 (Table EM-030). A Glaucous-winged Gull nest with eggs and young was found in 1977 and a pair was standing

**Figure 236.** Gull Islet is a long, low islet, with a pocket of grass and some gnarled Sitka spruce trees on the southern end. *Photo by Michael S. Rodway, 18 June 1986.*

on territory and suspected nesting in 1985 and 1986, although we did not find a nest when we explored the islet in 1986. We only boated by in 1985. One Pigeon Guillemot flew from a crevice in 1986.

**Table EM-030.** Seabird nesting records for Gull Islet. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 5 Jul 1977 | | 1 | S(7) | 39, 314 |
| 5 Jun 1985 | | 1eS | | 233 |
| 18 Jun 1986 | 2[1] | 1eS | x(8) | 233 |

## EM-040 RAINY ISLANDS

**Location:** *52°07'01"N 130°59'06"W; 103 B/2.*
North of Montserrat Bay on northeast side of Kunghit Island (see Figure 227 on p. 204).

**Description:** *4.4 ha; 16 m high; Forested; Bare rock.*
The two larger islands in this group of five islets are covered with a predominantly spruce forest (Figure 237) with an understory of salal and some moss and grass. The other three are bare rock (Figure 238).

**Historical summary:** It is possible that storm-petrels have recently colonized these islands. Observers explored all islands in 1977 and made no mention of burrows or other evidence of storm-petrels nesting. We found storm-petrels burrows and evidence of predation on Fork-tailed Storm-Petrels on the north side of the northern large island in 1986 (Table EM-040). A few old Cassin's- and Rhinoceros-auklet-sized burrows were also found in 1986.

Black Oystercatcher nests were found only on the southeast rock in 1977 (Figure 239) and on both east rocks and the northern large island in 1986. Glaucous-winged Gulls were nesting in similar numbers on the two east rocks in 1977 and 1986. Pigeon Guillemots were recorded around the two larger islands in 1977 and around all islets in 1986. Guillemots were flushed from nests on the larger islands in 1986.

**Figure 237.** The two largest islands of the five Rainy Islands have a Sitka spruce forest, here seen in silhouette. *Photo by R. Wayne Campbell, 5 July 1977.*

**Figure 238.** Three of the smaller Rainy Islands are bare rock. *Photo by Michael S. Rodway, 18 June 1986.*

**Table EM-040.** Seabird nesting records for Rainy Islands. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|---|---|
| 5 Jul 1977 | | | 3[1] | 25 [19][a] | (8) | 39, 314 |
| 5 Jun 1985 | | | | 24eS | | 233 |
| 18 Jun 1986 | 100eS[b] | S | 3[2] | 26[23] | x6(20) | 233 |

[a] Corrected from Campbell and Garrioch.[39]

[b] Total number of breeding pairs was estimated from a partial count but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** One Bald Eagle nest was located on the southern large island in 1986. Signs of river otter were seen on the northern large island in 1977.

**Figure 239.** Black Oystercatcher nest with two eggs found on the southeast rock of the Rainy Islands in 1977. *Photo by R. Wayne Campbell, 5 July 1977.*

## EM-050  HIGH ISLAND

**Location:** *52°07'38"N 131°00'42"W; 103 B/3.*
East of Orion Point on northeast side of Kunghit Island (see Figure 227 on p. 204).

**Description:** *42 ha; 177 m high; Forested.*
High Island rises sharply with many cliffs along the shore as well as in the interior. Large spruce, hemlock, and redcedar grow on the steep slopes, with bare litter or moss covering most of the ground. There are steep grassy slopes on the northeast side, and grass, shrubs, and young regenerating spruce occur on open edges around the island. Historically, there was a Haida village located on the east side.[79]

**Historical summary:** Records suggest that burrow numbers have declined. About 100 Ancient Murrelet burrows were reported on 29 May 1977 (Table EM-050). No other information was given. On 5 July 1977, observers found no evidence of recent use and stated that burrows were abandoned and that there were no nesting seabirds at that time (the previous report of Rhinoceros Auklets nesting in 1977 [39] was an error). We found four active-looking Rhinoceros Auklet burrows just west of the south point in 1985. One possible Ancient Murrelet burrow and a couple of old Rhinoceros Auklet burrows were also found. At 13:00 hr on 6 June 1985, 120 Rhinoceros Auklets were feeding off the south end of High Island. Nine Pigeon Guillemots were seen offshore in 1977.

**Table EM-050.** Seabird nesting records for High Island. See Appendix 2 for codes.

| DATE | PIGU | ANMU | RHAU | SOURCE |
|---|---|---|---|---|
| May, Jul 1977 | | 100eS | 0[a] | 39, 314 |
| 5-6 Jun 1985 | S(8) | 0 | 10eS | 233 |

[a]Corrected from Campbell and Garrioch.[39]

**Remarks:** Two adult Bald Eagles and a family of Peregrine Falcons were recorded in 1977. Observers also reported signs of bear in 1977 (Figure 240) and river otter in 1985. Depredated remains of one or two Rhinoceros Auklets were found in 1977 and 1985.

**Figure 240.** Recent American Black Bear droppings, composed mainly of grasses, were found on High Island in 1977. *Photo by R. Wayne Campbell, 5 July 1977.*

## EM-060  HAYDON ROCK

**Location:** *52°08'38"N 131°02'09W; 103 B/3.*
Southeast of Moore Head on the northeast corner of Kunghit Island (see Figure 227 on p. 204).

**Description:** *0.2 ha; 6 m high; Bare rock* (Figure 241).

**Historical summary:** Two empty Black Oystercatcher nests were found in 1977 (Table EM-060). Two birds were present (Figure 242). Oystercatcher and Glaucous-winged Gull nests found in 1986 contained eggs.

**Figure 241.** Haydon Rock is a bare rock with no vegetation. *Photo by Michael S. Rodway, 18 June 1986.*

**Figure 242.** Empty Black Oystercatcher nests found during surveys, such as the two found on Haydon Rock in 1977, could indicate that eggs were never laid, that eggs were laid and lost, that eggs had successfully hatched and that young were hiding nearby, or a number of other possibilities. *Photo by R. Wayne Campbell.*

**Table EM-060.** Seabird nesting records for Haydon Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 5 Jul 1977 | 2S | 0 | 314 |
| 18 Jun 1986 | 1 | 1 | 233 |

## EM-070 CHARLES ISLANDS

**Location:** *52°09'17"N 131°03'45"W; 103 B/3.*
At the east entrance to Houston Stewart Channel.

**Description:** *2.6 ha; 37 m high; Forested.*
These two rocky islands are connected by a gravel beach. Most of the ground cover is thick salal under a spruce forest, with a few mossy and grassy patches on the perimeter.

**Historical summary:** Numbers of storm-petrel burrows found by survey crews increased between 1977 and 1986 and differences may reflect an increase in the storm-petrel nesting population (Table EM-070). BCPM crews found only 10 inactive storm-petrel burrows in 1977 (Figure 243). More burrows that seemed active were found in 1985 and 1986. There was plentiful sign of Fork-tailed Storm-Petrels and a broken storm-petrel egg found in a dug-up burrow confirmed nesting in 1986. Storm-petrels were nesting on both islands.

Records suggest that Cassin's Auklets have been displaced by Rhinoceros Auklets, though neither species of auklet had been confirmed nesting up to 1990 (Rhinoceros Auklets were confirmed nesting in

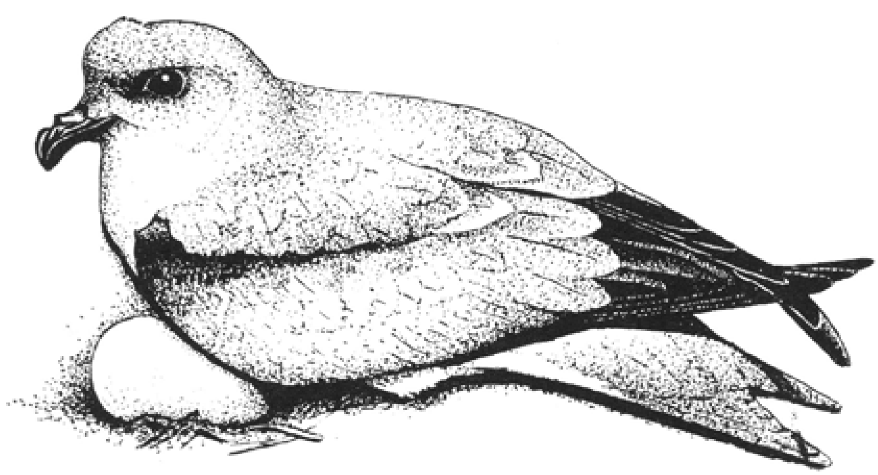


**Figure 243.** In 1977, Fork-tailed Storm-Petrels may have attempted to nest on Charles Islands but only a few inactive burrows were found. They were confirmed nesting in 1986, but many were being preyed on, likely by Northern River Otters. *Drawing by Keith Taylor.*

1993; see Appendix 1). Seventy-six Cassin's Auklet burrows were counted in 1977 and some active-looking Cassin's Auklet burrows were found on the south island in 1985, but no sign of Cassin's Auklets was found in 1986. Rhinoceros Auklet burrows with abundant evidence of activity at their entrances were found on both islands in 1985 and 1986.

One Black Oystercatcher nest with eggs and one with young were recorded in 1977. An empty nest was found on the south island in 1985. A Pigeon Guillemot was seen flying from one of 17 burrows counted in 1977 and one flew from a crevice on the south island in 1986.

**Remarks:** One Cassin's Auklet kill was seen in 1977 and considerable evidence of predation on Fork-tailed Storm-Petrels was observed in 1986. Five storm-petrel burrows and one Rhinoceros Auklet burrow had been dug up, likely by river otter, in 1986. Some river otter scats contained feathers but most had only fish remains. There was one adult Bald Eagle sighted on the island in 1986.

**Table EM-070.** Seabird nesting records for Charles Islands. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE[a] | FTSP | BLOY | PIGU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 4 Jul 1977 | 10 | | 2[2] | 17(1) | 76+S | | 314 |
| 6 Jun 1985 | 24+S | | 1S | S(24) | 10S | 50S | 233 |
| 6 Jun 1986 | | 100e | | x(1) | 0 | 130S | 233 |

[a] Total number of breeding pairs was estimated from burrow counts but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

## EM-080 ANNETTE ISLAND

**Location:** *52°09'22"N 131°04'27"W; 103 B/3.*
At east end of Houston Stewart Channel northeast of Rose Harbour, west of Charles Islands. Colony includes the unnamed island southwest of Annette Island.

**Description:** *1.3 ha; 41 m high; Forested.*
Salal covers most of the ground under a spruce forest, with some mossy fringes on the rocky shores.

**Historical summary:** The distribution of burrows and the species nesting on these two islands appear to have changed between 1977 and 1986 and signs of abandonment were found in both years. Fifty Cassin's Auklet burrows were counted on the southwest island in 1977 but only about half of them appeared active (Table EM-080). Only eight old Rhinoceros Auklet-sized and 10 old storm-petrel-sized burrows were found there in 1986. Rhinoceros Auklets were not recorded nesting in 1977 but were nesting on the main island in 1986. However, only 21 of 65 burrows counted there appeared active. Pigeon Guillemots were nesting in burrows at the edge of the vegetation on the north end of the main island in all years and one was seen flying out of a burrow there in 1985.

**Table EM-080.** Seabird nesting records for Annette Island. See Appendix 2 for codes.

| DATE | PIGU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|
| 4 Jul 1977 | 15S(1) | 25S | | 314 |
| 6 Jun 1985 | x(16) | | | 233 |
| 6 Jun 1986 | S(9) | 0 | 20S | 233 |

**Remarks:** A Bald Eagle nest was seen on the southwest island in 1977 and 1986. Little sign of predation was noted in either year and the reason for the abandoned burrows was unknown (rats have recently been confirmed present; see Appendix 1). A few Fork-tailed Storm-Petrel and Rhinoceros Auklet feathers were noted on the main island in 1977.

## EM-090 GARCIN ROCKS

**Location:** *52°12'30"N 130°58'00"W; 103 B/2.*
East of Benjamin Point, south of Langtry Island.

**Description:** *0.6 ha; 15 m high; Bare rock.*
Although mostly bare rock, there are pockets of grasses, forbs, and sedges (*Carex* spp.) in depressions in the rock (Figure 244). A navigational beacon is situated on the northeast section.

**Figure 244.** In 1986, Don Garnier helped survey Garcin Rocks, a mostly bare islet with small pockets of herbaceous vegetation. *Photo by Michael S. Rodway, 18 June 1986.*

**Historical summary:** Summers and Ellis viewed the rocks from a distance and could see about 50-100 pairs of Glaucous-winged Gulls on the rocks in 1971 (Table EM-090). Similar numbers of gull nests were counted in 1977 and 1986 (Figure 245). Two Black Oystercatchers were present and one empty scrape was found in 1977. No oystercatchers were seen in 1986. Three Pigeon Guillemot nests with eggs were found under rocks and in crevices in 1986 (Figure 246).

**Table EM-090.** Seabird nesting records for Garcin Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 15 Jul 1971 | | 50eS[a] | | 262, 314 |
| 4 Jul 1977 | 1S | 102[102] | 4eS(4) | 39, 314 |
| 18 Jun 1986 | 0 | 102[93] | x3(6) | 233 |

[a] Mistakenly listed for Green Rock in Summers.[262]

**Figure 245.** Numbers of Glaucous-winged Gull nests counted on Garcin Rocks were similar in 1977 and 1986. *Photo by Michael S. Rodway, 18 June 1986.*

**Figure 246.** Pigeon Guillemot nest in a rock crevice on Garcin Rocks in 1986. *Photo by Michael S. Rodway, 18 June 1986.*

## EM-100 LANGTRY ISLAND

**Location:** *52°13'52"N 131°00'26"W; 103 B/3.*
East of Ingraham Point at the southeast corner of Carpenter Bay.

**Description:** *3.4 ha; 50 m high; Forested.*
Langtry Island is oval shaped, with rock shelves and bluffs around the perimeter. A deep gully divides the island into a large southern portion and a smaller northern knoll. In 1985, the southern portion was forested with a dense stand of young spruce with a spongy, bare litter ground cover. The northern knoll was covered with lush grass and forbs under large spruce trees. Salmonberry and other shrubs, and lush grass occur on the perimeter of the south ridge.

**Historical summary:** Cassin's Auklets appear to have abandoned the island between 1977 and 1985 (Table EM-100).They were not confirmed nesting in 1977 but burrows appeared active. Some burrows were Rhinoceros Auklet sized but they had characteristic Cassin's Auklet defecation streaks at their entrances. We found no sign of nesting by auklets in 1985.

Fork-tailed Storm-Petrels were pulled from burrows but no evidence of Leach's Storm-Petrels nesting was found in 1977. Both species were heard in burrows in 1985.

An empty Black Oystercatcher scrape and two agitated adults that were most likely protecting young were observed on the northeast shore in 1977 (Figure 247). Nests were located on the west side, the southwest tip, and the southeast corner of the island in 1985. Pigeon Guillemots were suspected nesting in rock crevices on the northeast coast in 1977, and were confirmed nesting in burrows at the edge of the vegetation on the west side in 1985.

**Table EM-100.** Seabird nesting records for Langtry Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | BLOY | PIGU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 5 Jul 1977 | | 4,000e | | 1S | 15eS(15) | 200eS | 39, 314 |
| 6, 7 Jun 1985 | 12,300t[a] | x | x | 3[3] | x(7) | 0 | 233 |

[a] Total number of breeding pairs was derived from transect surveys but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Figure 247.** An agitated, noisy adult Black Oystercatcher seen on Langtry Island in 1977 was a strong indication that young were hiding nearby. *Photo by R. Wayne Campbell.*

**Remarks:** There was one active Bald Eagle nest on the island in 1977 and 1985. Remains of three Fork-tailed Storm-Petrels and one Cassin's Auklet were recorded in 1977. More remains of both storm-petrel species were seen in 1985. Two burrows had been dug up and we suspected minor predation on the storm-petrels by river otter in 1985. Some scats with feathers were found.

## EM-110 SAMUEL ROCK

**Location:** *52º14'32"N 131º07'38"W; 103 B/3.* On the north shore of Carpenter Bay.

**Description:** *0.1 ha; 4 m high; Grassy rock.*

**Historical summary:** Black Oystercatchers were incubating eggs in 1977 (Table EM-110). Glaucous-winged Gulls were nesting unsuccessfully; ten adult gulls were present and five nests were found but only one nest contained eggs, and those were broken. The rock was not visited during the CWS surveys in 1985 and 1986.

**Table EM-110.** Seabird nesting records for Samuel Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 5 Jul 1977 | 1 | 5[1] | S(13) | 314 |

**Remarks:** Signs of river otter were noted in 1977. This rock is very close to the main shore of Moresby Island and could be easily reached by raccoons.

## EM-120 RANKINE ISLANDS

**Location:** *52°15'30"N 131°03'40"W* (west island); *103 B/6.*
North of the mouth of Carpenter Bay.

**Description:** *63 ha; 78 m high; Forested; Bare rock.* Rankine Islands are composed of a west and an east island and some small, bare rocks off the north end of each island. The west Rankine Island has a circular, rocky shoreline (Figure 248) indented by a few small bays and beaches (Figure 249). A series of north-to-south-tending ridges run through the island. Most slopes on these ridges are moderate, with some steeper slopes on the northwest side. Wet, low-lying areas occur between the ridges in the interior of the island. The island is forested with spruce, redcedar, and hemlock, with spruce more abundant near shore (Figure 250). The forest floor is mostly mossy, with fringes of grass growing along the shore at the north end, and in windfall areas. Windfalls have occurred in the past on the northwest corner, the outer west side, and on the southeast corner (Figure 251). In the 1980s, young spruce trees were regenerating in the southeast and outer west areas, while well-established second growth hemlock and redcedar were growing in the northwest area.

The terrain on the east Rankine Island varies from steep knolls and bluffs to areas of level ground.

**Figure 248.** Rocky shoreline along the west side of the west Rankine Island. A fog bank lies behind the bare rock off the north end of the island. *Photo by Moira J.F. Lemon, 18 June 2005.*

**Figure 249.** CWS field camp in a small bay on the west Rankine Island (from left to right): Michael Rodway, Doug Bertram, Mike Biro, Dave Powell, and Tony Robichaud. *Photo by Moira J.F. Lemon, 4 June 1984.*

**Figure 250.** Sitka spruce with "octopus" roots on a rocky outcrop along the shore of west Rankine Island. *Photo by Moira J.F. Lemon, 4 June 1984.*

**Figure 251.** Michael Rodway finding Ancient Murrelet burrows under windfallen trees that were common on Rankine Islands in 1984. *Photo by Moira J.F. Lemon, 5 June 1984.*

In the 1980s, lush grass and forbs were growing under a sparse stand of spruce trees towards the south end, while the northern portion was covered with a dense, young stand of spruce without ground vegetation in the interior.

Rankine Islands became part of Ecological Reserve No. 44 in 1973, but that status was revoked to allow their inclusion in Gwaii Haanas.

**Historical summary:** The Rankine Islands are one of the most densely burrowed seabird colonies in Haida Gwaii. Haida people say that in the past only Langara Island had a higher density of nesting Ancient Murrelets.[101] There is no evidence that populations of burrow-nesting species have changed, but more Black Oystercatcher and Glaucous-winged Gull nests were counted in 1982 and 1986 than in 1977 (Table EM-120).

Bristol Foster reported a large colony of Leach's Storm-Petrel and noted the presence of Ancient Murrelets in 1960. David Ellis visited the western island in 1972 and documented a large colony of both storm-petrel species as well as Cassin's Auklets. The BCPM surveyed the islands on 27 May and 4 and 5 July 1977. CWS crews visited the islands from 31 May to 3 June 1982, surveyed the west island from 29 May to 8 June 1984, and surveyed the east island on 8 June 1985. A storm-petrel occupancy plot and a Glaucous-winged Gull count were completed on 18 June 1986.

Ancient Murrelets have been found nesting only on the west island (Figure 252). Differing population estimates have resulted from different survey methods. In 1977, BCPM crews ran transects through the colony during both the May and July visits. In May, two 20 ft. (6.1. m)-wide strip transects were run from shore over a total distance of 896 ft. (273 m) on the southwest side of the island. Extrapolating over a roughly estimated colony area of over 5.9 million sq. ft. (about 55 ha), observers estimated a total of 51,700 Ancient Murrelet burrows. Cassin's Auklet burrows were tallied separately but no total estimate was attempted for them at that time. In July, a single line transect with 21 (10x10 ft.) quadrats surveyed every 100 ft. (30.5 m) was run east-to-west across the southern portion of the island. The estimate for the Ancient Murrelet colony area was much smaller (about 5.8 ha) resulting in an estimate of almost 14,000 burrows. This latter estimate was used by Campbell and Garrioch to arrive at the estimate of 11,000+ nesting pairs.[39] The more rigorous estimate from the CWS surveys (38.3 ha colony area and 39,900 total burrows [233]) fell between the May and July estimates from the BCPM surveys.

**Figure 252.** The west Rankine Island has the largest colony of Ancient Murrelets on the east coast of Moresby Island. From the CWS survey in 1984 (next page, clockwise from upper left): Tony Robichaud, one of several volunteer assistants, in front of a large western redcedar; Tony taking notes; a double-decker burrow; four Ancient Murrelet eggs found in one burrow, likely laid by two females; Ancient Murrelet feathers from a Bald Eagle kill; and a depredated Ancient Murrelet egg. *Photos by the authors.*






**Figure 253.** A large Cassin's Auklet nestling, still with down, extracted from a burrow on west Rankine Island in 1984. *Photo by Michael S. Rodway, 4 June 1984.*

**Figure 254.** Black Oystercatcher nest found in 1984 on the west Rankine Island. The nest was an accumulation of marine turban snails (*Tegula funebralis*) and fragments of cockle (*Clinocardium nuttallii*) shells. *Photo by Michael S. Rodway, 6 June 1984.*

Ancient Murrelets were observed staging about 1 km southwest of the west island in 1977. In 1984, the staging grounds extended north and south of the west island and as far as 1 km east of the east island (see Figure 224 on p. 201).

Storm-petrels and Cassin's Auklets (Figure 253) nest on both west and east Rankine Island, but east Rankine supports the majority of the nesting storm-petrels, while most Cassin's Auklets nest on the west island.

Black Oystercatcher nests (Figure 254) were found on the east island in 1977 (1 nest), 1982 (4 nests), 1985 (1 nest) and 1986 (3 nests). On the west island, oystercatcher nests were found in 1984 (1 nest on the mid-west side) and 1986 (2 nests on the two northern rocks). Chicks were suspected around one empty oystercatcher nest found on the east island in 1986 (Figure 255). Most nesting by Glaucous-winged Gulls has been recorded on the south end of the east island. Some nests were still being built at the time of the 1982 survey. One pair of gulls was nesting on the northern rock off the western island in 1977 and 1986. Pigeon Guillemots have been recorded only around the east island, mainly near the south end.

**Figure 255.** The posture of this adult Black Oystercatcher, with hunched back and spread wings, likely indicates that there are small young close by. *Photo by Moira J.F. Lemon, Ramsay Island, BC, 15 June 2007.*

**Table EM-120.** Seabird nesting records for Rankine Islands. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 17 Aug 1960 | | x | | | | S | | 262, 314 |
| 1972 | x | x | | | | | x | 262 |
| May, Jul 1977 | 3,500e | 7,500e | 1S | 6[5] | 25+eS(28) | 11,000+e | 5,000e | 39, 314 |
| May, Jun 1982 | x | x | 4[4] | 65[46] | S(27) | x | x | 314 |
| 1984-1986[a] | 2,000t | 12,300t | 5[4] | 43[42] | S(12) | 26,000t | 26,000t | 233 |

[a] Total estimates derived from three years of surveys.

**Remarks:** There were active Bald Eagle nests on the west (3 in 1977, 2 in 1984) and east (1 in both 1977 and 1985) islands (Figure 256). In 1977, we observed considerable evidence of predation on both storm-petrel species, Cassin's Auklets, and Ancient Murrelets on the west island, and on storm-petrels on the east island. Many remains of Ancient Murrelets were recorded on the west island in 1984 (Table 3, page 68). A Peregrine Falcon was heard in 1977 but no eyrie was located. A Northwestern Crow nest (Figure 257) was found near the beach adjacent to quadrats surveyed for Cassin's Auklets.

**Figure 256.** Bald Eagle nest on the west side of the west Rankine Islands in 1984. *Photo by Michael S. Rodway, 5 June 1984.*

**Figure 257.** A Northwestern Crow nest with a large nestling was found on the ledge of a small cliff just above the beach rock on the southwest corner of the west Rankine Islands in 1984. *Photo by Michael S. Rodway, 4 June 1984.*

Burrows in high density areas, particularly on the east island, are easily trampled by human or deer traffic. Deer may have reached the east island just prior to the 1980s' surveys [233] and impact to fragile storm-petrel habitat is a concern.

***Watching the Tides***

*Tides are constant phenomena that need to be dealt with by anyone working on marine shores. Tidal ranges of 3-5 m (10-16 feet) are common along the BC coast, and although they do not compete with the maximum tidal ranges of 17 m (56 feet) in the Bay of Fundy on the east coast of Canada, they do make a huge difference in what shoreline conditions are like for landing boats or moving gear ashore. Easy landings on beaches at high tide can, at low tide, become nightmarish expanses of slippery, seaweed-covered rocks, that are hazardous to walk over, and barnacle-covered boulders, that easily puncture rubber zodiacs* (Figure 258). *That is why we always try to time our arrivals or departures when we are establishing or moving camps to coincide with high tides.*

*Tide tables that predict the timing and height of tides are an indispensable tool for conducting coastal field work* (Figure 259). *In BC, we have what is called a mixed tidal cycle, meaning that there are two high and two low tides of unequal size each day. The tidal day is a lunar day lasting about 24 h 50 min, so that tides occur about 50 min later each day. In summer the higher of the two daily high tides generally occurs at night, so you cannot gauge how high the tide will be by what is seen during the day. There is also a 14-day cycle between successive spring tides, which are the highest and lowest tides over the course of a lunar month, and occur around the time of full and new moons. A biannual cycle, related to the inclination of the sun, produces the largest tides of the year around the summer and winter solstices. In addition, stormy weather can push tides higher than normal.*

*Forgetting or misjudging tidal changes can spell disaster for boats and equipment left on shore, which can endanger personnel that depend on that equipment for their safety in remote areas. Prudence dictates that boats are secured well above possible high-tide storm surges. Even when boats are placed safely above high tides, experienced persons are not comfortable until the boat is also securely tethered to a tree or some* *other unmoveable object onshore. Careful attention to tidal changes is also essential when exploring shoreline habitat. Cliffs that can be walked around at low tide become impassable barriers at high tide. If you misjudge, you have a long wait until the next tidal cycle.*

**Figure 258.** An effective strategy for landing on treacherous rocky shorelines is to look for a pocket of beach above the rocky shore that would provide a safe landing spot when the tide is high. You then plan your visit around the tidal cycle, arriving at a high but ebbing tide so you can strand your boat on the beach, and then returning to your boat after a full tidal cycle to leave when the flood tide re-floats your boat. Of course, it is important to leave your boat securely tied to the shore and firmly anchored in case your plans go astray. A second strategy, which is better if the tidal cycles are not conveniently timed or if you are staying for an extended period, is to tie the boat across a channel that does not dry at low tides. We were lucky to have such a site for our extended stay on Rankine Islands in 1984. *Photo by Moira J.F. Lemon, 4 June 1984.*

**Figure 259.** Current spring and summer tide tables are indispensable for coastal seabird surveys, especially when searching for a safe site for an extended stay. Shown in this photo offshore of Ramsay Island are, from left to right, Glen Keddie, Renaude Samson, and Moira Lemon. *Photo by Johanna Havelaar, 18 June 2007.*

## EM-130 MARION ROCK

**Location:** 52°17'26"N 131°06'33"W; 103 B/6.
West of Goodwin Point at the east corner of Collison Bay.

**Description:** *0.1 ha; 3 m high; Bare rock.*

**Historical summary:** Young were suspected around an empty Black Oystercatcher nest found in 1977 (Table EM-130). The oystercatcher nest found in 1986 was empty but the Glaucous-winged Gull nest contained one oystercatcher egg in addition to two gull eggs (Figure 260). The gull was incubating all three eggs. We thus considered breeding confirmed for both species.

**Figure 260.** Two Glaucous-winged Gull eggs and a smaller Black Oystercatcher egg in a gull nest on Marion Rock in 1986. Egg dumping was occasionally observed during seabird surveys. *Photo by Michael S. Rodway, 19 June 1986.*

**Table EM-130.** Seabird nesting records for Marion Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 5 Jul 1977 | 1S | 2[2] | 314 |
| 19 Jun 1986 | 1 | 1 | 233 |

## EM-140 NEST ISLETS

**Location:** *52°17'38"N 131°07'33"W; 103 B/6.*
At the mouth of Collison Bay.

**Description:** *7.5 ha; 67 m high; Forested.*
Of the two Nest Islets, the larger, northwest islet is forested with a mix of spruce, hemlock, and redcedar, with grass, moss, and patches of salal around the edges. The small southeast islet is mostly bare rock with grass and a few spruce trees on top (Figure 261).

**Historical summary:** The islets were checked on 27 May and 5 July 1977. Black Oystercatchers were recorded on both visits but no evidence of nesting was reported. In 1986, there was one empty nest with broken eggshell nearby on the southeast islet, and three nests with eggs on the northwest islet (Table EM-140). A Glaucous-winged Gull nests with three eggs was located on a rocky ledge on the northwest islet in July 1977. No gulls were present in 1986. Pigeon Guillemots were seen around the southeast islet in 1986.

**Figure 261.** The smaller, southeast islet of the two Nest Islets is mostly bare rock, with a patch of grass and several Sitka spruce trees on top. *Photo by Michael S. Rodway, 19 June 1986.*

**Table EM-140.** Seabird nesting records for Nest Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 5 Jul 1977 | | 1 | S(8) | 314 |
| 19 Jun 1986 | 4[4] | 0 | S(25) | 233 |

**Remarks:** One Bald Eagle nest and a river otter den were found on the northwest islet in 1977. Two Bald Eagles were seen and river otter runs were noted on the southeast islet in 1986 (Figure 262).

**Figure 262.** River otter runs were seen through the grassy areas on the southeast islet of the two Nest Islets in 1986. *Photo by Michael S. Rodway, 19 June 1986.*

## EM-150 INNER LOW ROCK

**Location:** *52º19'20"N 131º08'39"W; 103 B/6.*
North of Ikeda Point.

**Description:** *0.4 ha; 5 m high; Bare rock.*

**Historical summary:** The survey in 1986 is the first recorded survey of this rock. One Black Oystercatcher nest with two eggs was found; four adults were present (Table EM-150).

**Table EM-150.** Seabird nesting records (nests) for Inner Low Rock.

| DATE | BLOY | SOURCE |
|---|---|---|
| 19 Jun 1986 | 1 | 233 |

## EM-160 JOYCE ROCKS

**Location:** *52º20'10"N 131º08'23"W; 103 B/6.*
At the east end of Skincuttle Inlet, north of Ikeda Point.

**Description:** *0.7 ha; 8 m high; Bare rock* (Figure 263).

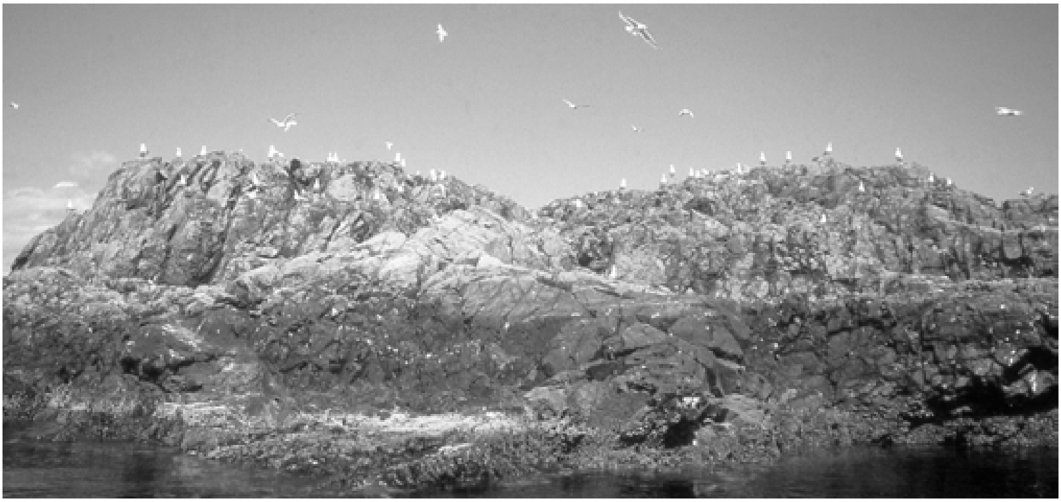


**Figure 263.** Joyce Rocks is a low, bare rock where Glaucous-winged Gulls, Black Oystercatchers, and probably Pigeon Guillemots nest. *Photo by Michael S. Rodway, 19 June 1986.*

**Figure 264.** Many Glaucous-winged Gull nests (bottom) seen on Joyce Rocks in 1986 were composed of a sparse collection of seaweeds. A number of nests were situated low on the rocks, just above the tidal barnacle zone, where they would be washed away in any major storm. *Photo by Michael S. Rodway, 19 June 1986.*

**Historical summary:** Black Oystercatchers were seen flying around in 1977 but no evidence of nesting was found. We only boated by the island in 1985; we confirmed nesting by oystercatchers in 1986. Numbers of nesting Glaucous-winged Gulls (Figure 264) doubled between 1977 and 1986 (Table EM-160). Pigeon Guillemots were suspected nesting in 1986.

**Table EM-160.** Seabird nesting records for Joyce Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 5 Jul 1977 | | 95[90][a] | (0) | 39 |
| 8 Jun 1985 | 2eS | 110eS | | 233 |
| 19 Jun 1986 | 1 | 197[185] | S(9) | 233 |

[a] Corrected from Campbell and Garrioch.[39]

## EM-170 SEA PIGEON ISLAND

**Location:** *52°17'07"N 131°17'10"W; 103 B/6.*
On the west side of Huston Inlet, west of Jedway Bay.

**Description:** *4.2 ha; 69 m high; Forested.*
Salal covers most of the ground under a hemlock, spruce, and redcedar forest, with open, bare litter and mossy areas in the interior and along the north side, especially at the northeast corner.

**Historical summary:** Ancient Murrelets have disappeared from Sea Pigeon Island. In 1960, Foster reported that the whole island appeared to be utilized (Table EM-170). Summers and Ellis found one eggshell but no burrows in 1971. BCPM crews found 5-10 burrows that they identified as Ancient Murrelet on 25 May 1977, but on 7 July 1977, observers reported none. They did, however, find 15-20 Pigeon Guillemot burrows and saw birds fly out of seven of them. The burrows seen in May might have been misidentified. We found no sign of Ancient Murrelets nesting in 1985.

Observers in July 1977 also noted a few old storm-petrel-sized burrows. Three Black Oystercatchers were present but there was no evidence of nesting.

**Table EM-170.** Seabird nesting records for Sea Pigeon Island. See Appendix 2 for codes.

| DATE | PIGU | ANMU | SOURCE |
|---|---|---|---|
| 4 Aug 1960 | | x | 94 |
| 5 Jul 1971 | (4) | E | 262, 314 |
| May, Jul 1977 | 15+e(9) | 5+S | 39, 314 |
| 17 May 1985 | S(5) | E | 233 |

**Remarks:** Two adult Bald Eagles were recorded in July 1997. We saw one Bald Eagle and signs of river otter and raccoon in 1985. Hartman and Eastman confirmed raccoons present in 1989-1990.[155]

**Feeding a Hungry Crew**

*The beginning of every CWS seabird field season was a frantic time of frenzied planning, purchasing, and packing of supplies. Among all the varied tasks, one of the most taxing was the food planning. Field seasons were two and a half to three months long, and the field crew was sometimes as large as eight people. The amount of food needed for a season was always astounding. A successful season depended on having enough food to keep a hungry crew working; the worst scenario would be to run out of food before the end of the field season in a remote location, days from the nearest supplies. At times when we had transport with a larger boat, or had a mothership, as we sometimes had during the BCPM surveys in the 1970s* (Figures 265 and 266)*, we could err on the generous side and even pack luxury food items. More often however, we had to move ourselves and all our supplies between field camps in our small inflatable boats* (Figure 267)*. Resupply was infrequent, so food had to be light, compact, and as non-perishable as possible. That, together with satisfying a range of dietary likes, dislikes, and allergies, was a challenge. Ensuring that there was enough, but not too much food, was also daunting. Meal plans had to be prepared and the amounts of required ingredients determined.*

*I (Moira) used the experience and expertise of mountaineering clubs who plan food for trips where everything must be carried on your back. Mountaineering expeditions use the "person-day" amount for each ingredient needed. Sometimes these amounts had to be revised depending on the age of the participants – our assistants were often young university students with big appetites. Over the years, I refined the amounts and developed a "person-day" spreadsheet to assist with calculations and streamline the process. Others have found the method useful and that spreadsheet is still used for planning the food for CWS field seasons.*

**Figure 265.** In the mid-1970s, Dr. Harry Carter, an orthopedic surgeon in Victoria, purchased the Tedmac to serve as a mothership for BCPM surveys of seabirds along the BC coast. "Doc" also piloted the vessel and cooked meals, a great comfort to tired field crews. *Photo by R. Wayne Campbell, 27 June 1976.*

**Figure 266.** Luxury deserts, like the strawberry shortcake here eyed by Harry Carter Jr. (front), Marilyn Paul, and Keith Taylor, were special treats on BCPM surveys and were only possible because we had a mothership. Such treats were never available to BCPM or CWS field crews travelling independently from island to island in inflatable boats. *Photo by R. Wayne Campbell, 2 July 1976.*

**Figure 267.** Don Garnier (left) and Dick Grinnell, with 2- 3 months of food that had to be transported between islands by zodiac during CWS surveys. *Photo by Michael S. Rodway, Nest Islets, BC, 19 June 1986.*

## EM-180 BOULDER ISLAND

**Location:** *52°17'30"N 131°17'46"W; 103 B/6.*
West side of Huston Inlet, west of Jedway Bay, northwest of Sea Pigeon Island.

**Description:** *5.6 ha; 70 m high; Forested.*
Boulder Island is moderately sloped, with a ground cover of mainly moss and bare litter under a hemlock, redcedar, and spruce forest. In 1985, there was scattered old and new windfall throughout the island, especially through the center and east side.

**Historical summary:** Foster found many Ancient Murrelet burrows over the whole island in 1960 (Table EM-180). The colony was extirpated by 1971. In 1977, six Pigeon Guillemots were seen on 25 May and five were present on 7 July. A pair of Black Oystercatchers was seen around the island in 1971, 1977, and 1985 but no evidence of nesting has been reported.

**Table EM-180.** Seabird nesting records for Boulder Island. See Appendix 2 for codes.

| DATE | PIGU | ANMU | SOURCE |
|---|---|---|---|
| 4 Aug 1960 | | x | 94 |
| 5 Jul 1971 | | E | 262, 314 |
| May, Jul 1977 | (6) | E | 39, 314 |
| 17 May 1985 | (0) | E | 233 |

**Remarks:** An adult with one young Bald Eagle was noted in 1977. We found two old eagle carcasses and one recently dead eagle, and an inactive nest in 1985. There was abundant sign of raccoons in 1985 and they were confirmed present in 1989-1990.[155]

## EM-190 GREEN ROCK

**Location:** *52°17'32"N 131°17'10"W; 103 B/6.*
At the entrance to Huston Inlet, west of Jedway Bay.

**Description:** *0.1 ha; 3 m high; Grassy rock.*
Green Rock is composed of eroded limestone rock with many sinkholes, arches, and crevices, and covered with a lush growth of grasses and forbs (Figures 268 and 269).

**Figure 268.** Green Rock is a small islet with a dense growth of grasses and forbs. *Photo by Michael S. Rodway, 19 June 1986.*

**Historical summary:** Five adult Black Oystercatchers were present in 1977 and 1985 and six were present in 1986, when three nests containing eggs were found (Table EM-190). Feeding stations were evident and there may have been hidden young around the two empty nests found in 1977. Fewer Glaucous-winged Gulls were nesting in the 1980s than the 1970s, contrary to the general trend for gulls in the region. Pigeon Guillemots have been recorded nesting in rock crevices (Figure 270) around the island and in sunken pockets in the limestone in the middle of the island where nests were often concealed by the lush growth of American dune grass (*Elymus mollis*). Two nests with eggs were located in 1977 and five with eggs were found in 1986.

**Table EM-190.** Seabird nesting records for Green Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 5 Jul 1971 | 1 | 7[6] | 15eS(35) | 314 |
| 7 Jul 1977 | 3[1] | 8[3][a] | 10e(10) | 39, 314 |
| 17 May 1985 | 2[1] | 2S | S(4) | 233 |
| 19 Jun 1986 | 3[3] | 3[3] | x5(21) | 233 |

[a] Corrected from Campbell and Garrioch.[39]

**Remarks:** Thirteen broken gull eggs were found and likely accounted for the high proportion of empty nests in 1977.

**Figure 269.** Yellow monkey-flower (*Mimulus guttatus*) thrives in rock crevices on islands like Green Rock along the coast of BC. *Photo by R. Wayne Campbell.*

**Figure 270.** Rarely is a Pigeon Guillemot nest found with three eggs like this one on Green Rock in 1986. This clutch may have resulted from two females laying in the same crevice. *Photo by Michael S. Rodway, 19 June 1986.*

## EM-200 "JEDWAY" ISLETS

**Location:** *52°18'00"N 131°16'30"W* (northern large islet); *103 B/6.*
In Jedway Bay on the south side of Skincuttle Inlet. This cluster of unnamed islets consist of: two larger, forested islets east of Green Rock and south of Bush Rock; a small rock off the southeast end of the northern forested islet; and rocks along the east side of Jedway Bay, including the rocky knob off Kankidas Point.

**Description:** *29 ha; 69 m high; Forested; Bare rock.*

**Historical summary:** Summers and Ellis saw no nesting seabirds on the two larger islets in 1971 (Table EM-200). Two Black Oystercatchers were sighted on the southern of the two larger islets on 25 May 1977. On 7 July 1977, pairs of oystercatchers were present on the northern larger islet, on the rock off the southeast end of that islet, and on the rocky knob off Kankidas Point. Nests with young were found at the latter two locations (Figure 271). Four Pigeon Guillemots were seen around the northern large islet in May and one was recorded at the rock south of Kankidas Point along the east shore of Jedway Bay in July, but no evidence of nesting was reported. These islets were not explored by CWS crews in the 1980s.

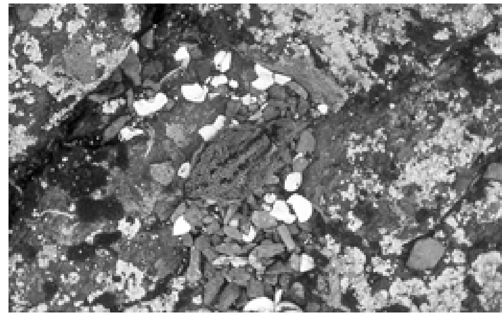


**Figure 271.** This Black Oystercatcher nest containing a chick, found on "Jedway" Islets in 1977, was composed of a few pieces of shell placed on bare rock. *Photo by R. Wayne Campbell, 7 July 1977.*

**Table EM-200.** Seabird nesting records for "Jedway" Islets. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 5 Jul 1971 | 0 | (0) | 314 |
| May, Jul 1977 | 2[2] | (4) | 314 |

## EM-210 BUSH ROCK

**Location:** *52°18'14"N 131°16'40"W; 103 B/6.*
At the east corner of the mouth of Huston Inlet.

**Description:** *0.2 ha; 5 m high; Grassy rock.*
There is a navigational beacon on this small, grassy rock (Figure 272).

**Figure 272.** Bush Rock is a small rocky island with some herbaceous vegetation. It has a navigational beacon on top. *Photo by Michael S. Rodway, 19 June 1986.*

**Figure 273.** Two Black Oystercatchers flew off to tidal areas and exhibited no territorial behaviour on Bush Rock in 1986. *Photo by R. Wayne Campbell.*

**Historical summary:** Black Oystercatchers were confirmed nesting in 1977 and 1985 (Table EM-210). In 1986, two oystercatchers were seen on the top of the rock but they were not defensive and flew off to the lower tidal areas at our approach (Figure 273); no nest was found. Pigeon Guillemots were recorded in 1977 and one flew off the rock in 1986.

**Table EM-210.** Seabird nesting records for Bush Rock. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 7 Jul 1977 | 1 | (3) | 314 |
| 17 May 1985 | 1 | | 233 |
| 19 Jun 1986 | 1eS | S(1) | 233 |

## EM-220 BOLKUS ISLANDS

**Location:** *52°19'25"N 131°17'W* (west island); *103 B/6.*
Skincuttle Inlet, north of Huston Inlet.

**Description:** *61 ha; 79 m high; Forested; Bare rock.* The Bolkus Islands consist of one large western island, four islets connected to its east end, and a chain of eight small islands east of those (Figure 274). The shorelines are rocky (Figure 275), except for beaches in the mid-south bay and on the northwest corner of the main island. The west half of the main island is low and undulating, with many wet, seepage areas, while to the east there are higher, steep-sided ridges with a low valley between them. The smaller eastern islands have minimal to moderate slopes, with some steeper knolls in their interiors.

Except for the bare rocks at the east end of the island chain (island #12) and the rock (#13) east of the main island group, the islands are forested with a

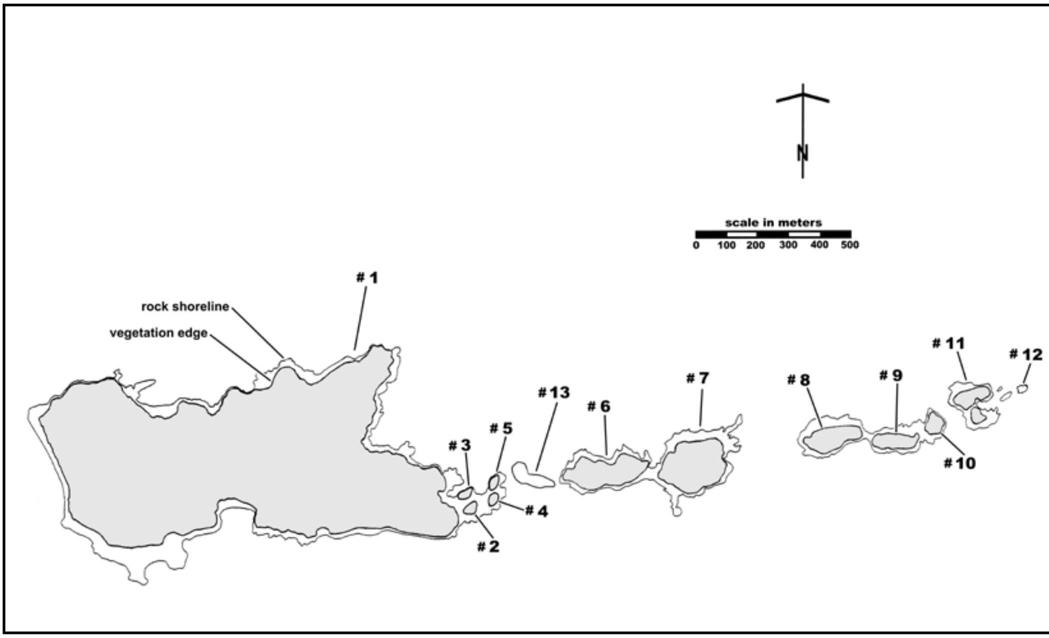



**Figure 274.** Numbered islands in the Bolkus Islands referred to in the text (note that island #13 was not numbered in Rodway et al.,[233] and is out of sequence).

**Figure 276.** The Bolkus Islands are comprised of 13 islands, most of which are forested. *Photo by R. Wayne Campbell, 6 July 1977.*

**Figure 275.** On dull days, with a threatening storm, the bright yellow cinquefoil (*Potentilla villosa*) is a welcome sight. The plant is commonly found along the BC coast and often grows on exposed rocky shores and bluffs that few other plants can colonize. *Photo by Moira J.F. Lemon, 28 May 2014.*

mix of spruce, hemlock, and redcedar (Figure 276). The majority of the ground cover is moss, but there are patches of spruce seedlings and hemlock saplings in open and windfall areas, and salal becomes more abundant on the south face of the east ridge of the large island and over much of the eastern islands. Large tracts of windfall have occurred on the large island (#1), and very recent sections had fallen on the northeast ridge just before our survey in 1985.

An important Haida village was located along the west side of the largest island. House pits were still visible in the 1970s.[79]

**Historical summary:** Foster confirmed nesting by three species on the east islands during a brief visit in 1969 (Table EM-220). Summers and Ellis checked islands #1 and #6 and estimated numbers of five species in 1971. The islands were completely surveyed by BCPM crews on 27 May and 6 July 1977 and by CWS on 3, 14, 15, and 17 May 1985. We made a brief visit to the mid-south side of the main island and to island #7 in 1982. Only the eastern rock (island #12) was checked in 1986. Differing population estimates from these surveys can be attributed to differences in survey effort and methods and provide little evidence of population changes for any species.

Haida traditionally hunted Ancient Murrelets on the islands, but reported that birds were not numerous.[101] During BCPM and CWS surveys, Ancient Murrelets (Figures 277 and 278) were found nesting on all forested islands, with the majority of the population on the largest island. During the 1985 visit, 3,700 Ancient Murrelets were counted on 15 May in a staging area off the south side of the islands (see Figure 224 on p. 201). Campbell observed 3,200 Ancient Murrelets feeding in this same area on 23 May 1988 at 10:30-12:30 hr.[299]

**Figure 277.** During coastal seabird surveys, Ancient Murrelet eggshells and membranes found in burrows indicate successful hatching. Occasionally eggs are found that did not hatch for unknown reasons. *Photo by Moira J.F. Lemon, Rankine Islands, BC, 17 June 2005.*

**Figure 278.** An Ancient Murrelet chick, still with an egg tooth on the bill, extracted from a burrow on Bolkus Islands in 1977. *Photo by R. Wayne Campbell, 27 May 1977.*

**Figure 279.** Cassin's Auklet burrows (like these on Rankine Islands) are often found under roots and logs and in open ground in forested habitat on many colonies in Haida Gwaii. *Photo by Moira J.F. Lemon, 31 May 1984.*

Other burrowing species have been reported only on the eastern islands #6-11. Foster in 1969 discovered two Fork-tailed Storm-Petrels in burrows, one only two feet from another burrow containing a Leach's Storm-Petrel adult. That is the only year that Leach's Storm-Petrels were confirmed nesting, although remains of that species were found in 1971 and 1977. Storm-petrel burrows were seen on island #6 in 1971, islands #9 and 11 in May 1977, islands #6, 10, and 11 in July 1977, and on islands #6-11 in 1985.

Cassin's Auklets were first confirmed nesting in 1971 on island #6, and burrows were found on islands #8, 10, and 11 in May 1977 and on islands #6-11 in July 1977 and in 1985 (Figure 279). Rhinoceros Auklets were first reported nesting in July 1977 when burrows were found only on island #7; burrows were found on islands #6-10 in 1985 but only a few burrows were seen on each island. Cassin's Auklets have been confirmed nesting on all visits in 1971-1985. Nesting by Rhinoceros Auklets has not been confirmed, although the size of the burrows and droppings and feathers at burrow entrances left little doubt that they were nesting.

Black Oystercatchers were confirmed nesting on the east rock in 1977, but only empty nests or pairs have been seen on other islands and in other years. Summers recorded one pair in the small bay on the southeast corner of the main island in 1971.[311] Four empty nests were found in 1985 during the survey of the entire island chain, and two empty nests attended by one pair were seen on the east rock in 1986. Overall, surveys in 1977 and 1985/86 located oystercatcher nests on five islands: the north side of the large, western island (#1), and four of the smallest eastern islands including the east rock (islands #13, 7, 11, and 12).

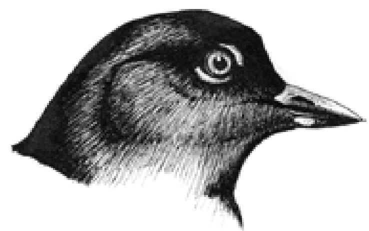
Glaucous-winged Gull nests have been found only on the east rock (island #12). Pigeon Guillemots were recorded around island #1 in May 1977, around islands #1 (18 birds), #7 (5 birds), and #8 (2 birds) in July 1977, and around island #1 in 1986 (8 on the north side and 33 on the south side). Guillemots have not been confirmed nesting on the islands.

**Table EM-220.** Seabird nesting records for Bolkus Islands. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 May 1969 | | x | x | | | | x | | | 262 |
| 5 Jul 1971 | | 500+eS | 50eS | 1eS | | | 500e | 100e | | 262, 311 |
| May, Jul 1977 | | 125+e | 500eS | 3[2] | 2[2] | (25) | 4,500+e | 1,200+e | 100eS | 39, 314 |
| 31 May 1982 | | | | | | | x | x | S | 314 |
| May 1985 | 230eS[a] | S | | 4S | | S(41) | 9,900t | 960e | 20eS | 233 |
| 19 Jun 1986 | | | | 2+S | 1 | | | | | 233 |

[a] Total number of breeding pairs was estimated from partial counts but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** Evidence of predation was reported in 1977 and 1985 on all burrowing species, especially Ancient Murrelets (over 50 eggshells and 45 feather piles in May 1977; 74 eggshells, 91 feather piles, and wings and carcasses of about 20 more birds in 1985; Table 3, page 68) and storm-petrels (remains of over 10 Fork-tailed and 60 Leach's in July 1977; 5 Fork-tailed remains in 1985). Remains of five Glaucous-winged Gulls were found in 1985. Two active Bald Eagle nests were seen in 1977and three were found in 1985. Eagles were suspected to be responsible for most predation.



## EM-230 SWAN ISLANDS

**Location:** *52°20'06"N 131°17'22"W (east rocks); 103 B/6.*
In Swan Bay on the south end of Burnaby Island.

**Description:** *24.3 ha; 75 m high; Forested; Grassy rock.*
Most of the Swan Islands have open, mossy forests with little slope (Figure 280). The most eastern islands are grassy rocks (Figure 281).

**Figure 280.** Most of Swan Islands are forested and have gradual sloping sides. *Photo by R. Wayne Campbell, 7 July 1977.*

**Figure 281.** The eastern of the Swan Islands are rocky with some grassy areas. *Photo by Michael S. Rodway, 19 June 1986.*

**Historical summary:** The larger, forested islands were checked by Summers and Ellis on 5 July 1971,[262] by Ray Billings from the BCPM on 25 May 1977, and by CWS crews in 1985. No sign of seabird use was found on those islands. Wayne Campbell and Heather Garrioch found Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots nesting on the eastern rocks in July 1977 (Table EM-230). Nests were also located on those rocks in 1985 and 1986.

**Table EM-230.** Seabird nesting records for Swan Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 7 Jul 1977 | 3[3] | 2[2] | x | 314 |
| 13 May 1985 | 3[2] | 1S | S(4) | 233 |
| 19 Jun 1986 | 4[4] | 1 | S(4) | 233 |

**Remarks:** Signs of raccoon were observed around much of the perimeter of the forested islands in 1985. One Bald Eagle and river otter dens, runs, and scats were recorded. Raccoons were also present in 1989-1990. [155]

## EM-240 "PELICAN" ROCK

**Location:** *52°20'40"N 131°15'25"W; 103 B/6.*
South of Pelican Point at the southeast corner of Burnaby Island.

**Description:** *0.1 ha; 4 m high; Bare rock.*

**Historical summary:** Observers in 1977 suspected that an empty Black Oystercatcher nest had been used that year, although no young could be found (Table EM-240). In 1986, there were two pairs of oystercatchers and two nests, both containing eggs. A Glaucous-winged Gull nest contained two eggs in 1977. There was one empty gull nest attended by one pair and one disheveled nest start on the rock in 1986.

**Table EM-240.** Seabird nesting records for "Pelican" Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 7 Jul 1977 | 1S | 1 | 314 |
| 19 Jun 1986 | 2[2] | 1S | 233 |

## EM-250 SLUG ISLET

**Location:** *52°20'18"N 131°13'10"W; 103 B/6.* Southernmost island of the Copper Islands chain (see Figure 288 on p. 240), at the east end of Skincuttle Inlet.

**Description:** *0.9 ha; 4 m high; Grassy rock.* The top of this rocky islet (Figure 282) is vegetated with grasses and forbs, and a clump of four short spruce trees (Figure 283). There is a small bare rock off the south side.

**Figure 282.** Aerial view of Slug Islet (lower right corner) and Bolkus Islands (centre), with Moresby Island in the background. *Photo by Moira J.F. Lemon, 16 June 1986.*

**Figure 283.** Slug Islet is long, low rock, with an area of grasses and forbs and a few Sitka spruce trees on the highest section. *Photo by Michael S. Rodway, 19 June 1986.*

**Historical summary:** The visit in 1985 occurred on 17 May and 10 June (Table EM-250). Black Oystercatcher nests (Figures 284 and 285) were seen on the main islet in 1977 (3 empty nests), 1985 (3 nests with eggs) and 1986 (2 empty nests). Glaucous-winged Gulls were nesting on the main islet and the southern rock: 38 and 16 nests in 1977 and 39 and 9 nests in 1985, respectively. Gull nests were still being built when we visited the islet on 10 June 1985. Pigeon Guillemot nests were found under rocks in 1977 and 1986.

**Figure 284.** An adult Black Oystercatcher feigning injury or squatting as if it is incubating, as seen here on Slug Islet in 1996, is a sure sign that a nest is nearby. *Photo by R. Wayne Campbell, 25 May 1996.*

**Figure 285.** Black Oystercatcher nest (bottom centre) on Slug Islet in 1996. A single egg was laid on bare rock surrounded by vegetation. *Photo by R. Wayne Campbell, 25 May 1996.*

Note that the record for Ancient Murrelets nesting on Slug Islet by Campbell and Garrioch [39] should have been listed for Rock Island.

**Table EM-250.** Seabird nesting records for Slug Islet. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 6 Jul 1977 | 3S | 54[49] | x3 | 39, 314 |
| May, Jun 1985 | 3[3] | 14+ | S(18) | 233 |
| 19 Jun 1986 | 2S | 48[35] | x(5) | 233 |

**Remarks:** Bald Eagles were beginning to build a nest at the time of our visit in 1985. They had laid eggs in the completed nest in 1986.

***SLUGS - UUGH!***

*One of the more distasteful encounters while investigating the burrows of seabirds is with an otherwise innocuous small creature which makes the damp coastal forests its home. Slithering along on a self-made bed of slime* (Figure 286), *it blends in well with the mossy ground cover and herbal vegetation. It finds a haven in the dark earth-bound enclosure of the tunnels of burrow-nesting seabirds – pity the unfortunate seabird researcher's arm that chances upon the soft and squishy body of a slug. Now the hand is covered with a slime that dirt and detritus sticks to with the qualities of the finest glue. Back at camp, warm water and soap cannot begin to remove it, and only a long session with a nail brush will eliminate the cemented dirt.*

*The relationship that slugs have with burrow-nesting seabirds may well be an interesting one. In Cassin's Auklet burrows whose chicks had recently fledged, we often found the tunnel walls, ceilings and floors to be coated with slugs, while outside was a steady convoy of more slugs marching resolutely towards the entrance. The buildup of spilled food deliveries and the accumulation of feces in the chicks' latrine are probably an attractant to the slugs, and perhaps they perform a worthwhile cleaning service. The absence of slugs in burrows of storm-petrels that we investigated made us speculate that the adult birds were somehow evicting the slugs from the premises.*

*Slugs were a frequent and uninvited guest in our field camps and could materialize seemingly instantaneously with what could only be described as an otherworldly ability to "astro-project" to where you least expected them. It was common practice to check boots and raingear that were stored in the outside vestibule of the tent for unwanted tenants before putting them on. If sleep was evasive, watching the slow progress of a slug crawling across the outer fabric of the tent ceiling was a sleep-inducing solution. In the cook tent, food containers had to be securely fastened to prevent the entrance of these intruders, and plates and cutlery stored in containers with tight fitting lids. There is nothing worse than looking forward to a nice hot cup of tea at the end of a long, wet, cold, and exhausting day and finding a slug in your mug* (Figure 287).

**Figure 286.** A slime trail follows this Banana Slug (*Ariolimax coulumbianus*). *Photo by R. Wayne Campbell, Cleland Island, BC, 12 August 1969.*

**Figure 287.** Finding a Banana Slug crawling out of your juice jug is not the most delightful way to finish a tiring day on a seabird colony. *Photo by Moira J.F. Lemon, Frederick Island, BC, June 1981.*

## EM-260 ROCK ISLET

**Location:** *52°20'41"N 131°14'15"W; 103 B/6.*
The westernmost of the Copper Islands chain. Colony includes all islets north and south of the main Rock Islet.

**Description:** *6.0 ha; 43m high; Forested; Grassy rock.*
Eight of these 10 islets (Figure 288) are forested, primarily with spruce, mixed with hemlock and redcedar on the main islet (Figure 289). Much of the ground cover is moss or grass, but major portions of some islets were covered with thick, young, regenerating spruce in 1985. The two northeast rocks (#9 and 10) are mostly bare, with patches of lush forbs (Figure 290).

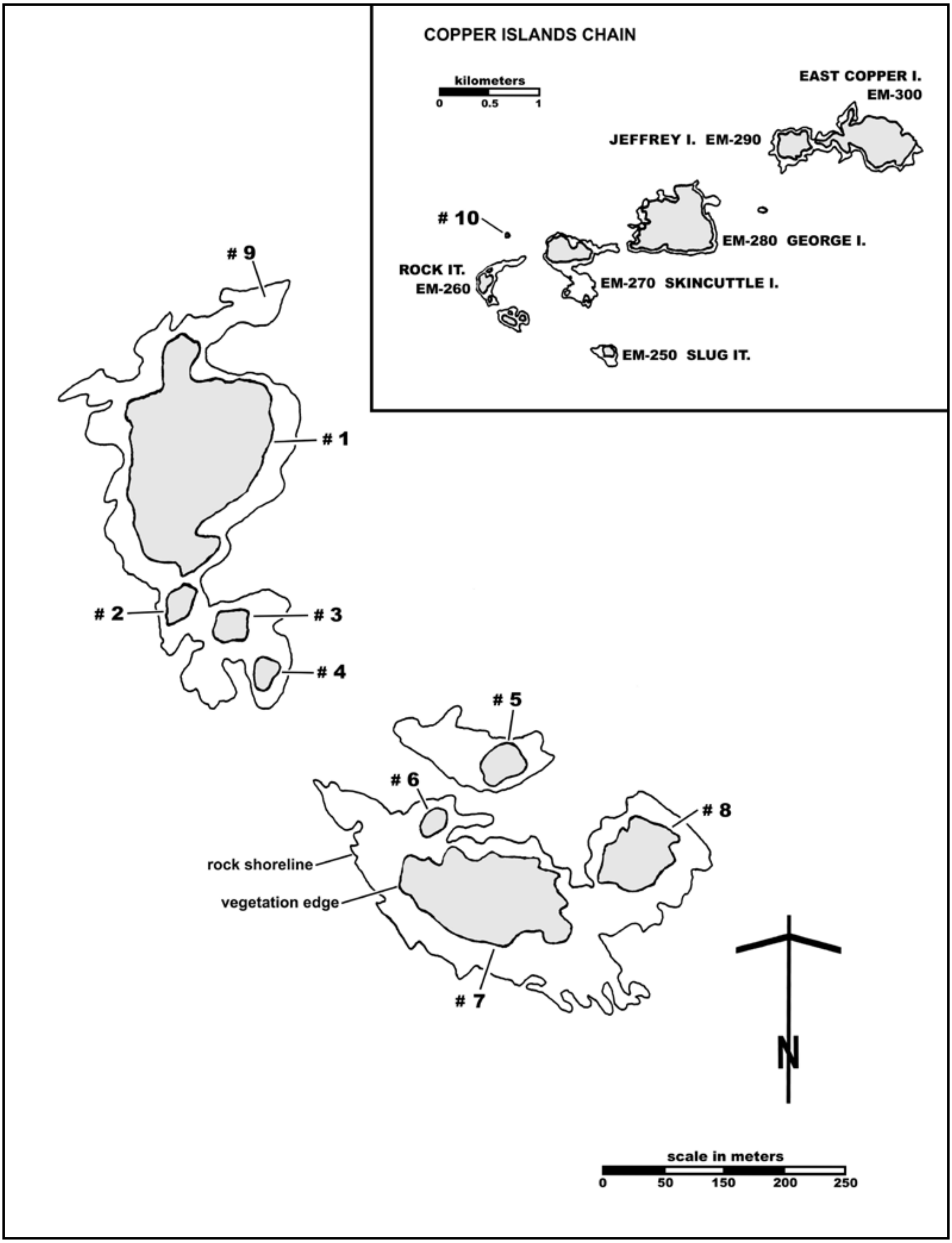



**Figure 288.** Numbered islets around Rock Islet and overview of the Copper Islands chain.

**Figure 289.** Most of the islets in the Rock Islet group are forested. *Photo by R. Wayne Campbell, 6 July 1977.*

**Historical summary:** Surveys by the BCPM were on 24 May and 6 July 1977. CWS surveyed the colony on 10 and 12 June 1985 and 16 and 19 June 1986. Only the southern islet (#7) was visited in 1982. Observers in May 1977 reported burrows on all islets but did not estimate numbers at that time, except for 10-20 that they suspected were Ancient Murrelet burrows (Table EM-260). Most burrows were identified as storm-petrel or Cassin's Auklet burrows, but they found depredated Ancient Murrelet eggshells and thought that a few burrows mixed with the others could possibly belong to Ancient Murrelets. Thus, historical nesting by Ancient Murrelets seems likely but was not confirmed. No evidence of nesting by Ancient Murrelets was found in 1985-86.

Numbers of Cassin's Auklets estimated nesting in July 1977 and in 1985 suggest a marked increase in population. Although the survey methods differed and population estimates were not directly comparable, we think that the increase likely represented real population change. All islets were explored and observers in July 1977 reported a few Cassin's Auklets nesting around the perimeters of two of the southeast islets (#5 and 7) and none around other islets. Also, only storm-petrel burrows were recorded in 10, arbitrarily-placed, 10x10 ft. (9.3 $m^2$) quadrats surveyed to estimate burrow density on the largest, southeast islet (#7). In contrast, mixed nesting by storm-petrels and Cassin's Auklets was reported in all forested areas

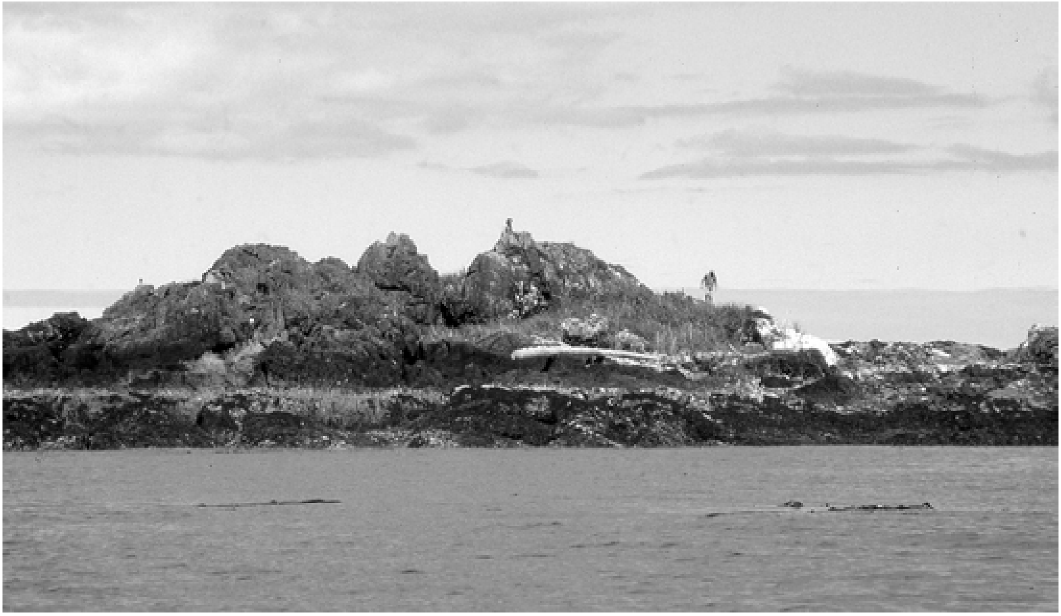


**Figure 290.** The northeast islet of the Rock Islet group is mostly bare rock with patches of lupine (*Lupinus spp.*) and other forbs. *Photo by Michael S. Rodway, 19 June 1986.*

on islets #1-8 in 1985, except only storm-petrels were nesting in the centre of the main Rock Islet (#1). It seems unlikely that observers in 1977 could have missed Cassin's Auklet burrows in the surveyed quadrats on the southeast islet if they had been present. The Cassin's Auklet burrows we saw in 1982 around islet #7 were conspicuous and appeared very active with lots of droppings at the entrances.

Black Oystercatchers were recorded around the southern islet (#7) in 1977 but no evidence of nesting was reported. In 1985, we saw three pairs on islet #10 and a single bird on islet #9. Nests were found on the northern rocks in 1986: two with eggs or eggshells on the most northern rock (islet #10), and two empty nests on the rocky islet (#9) at the north end of the main islet. Two pairs were present on both islets.

The Glaucous-winged Gull nest found in 1977 was located on the southern islet (#7), while the one found in 1986 was on the most northern rock (islet #10). In each year, the single nest found contained a full clutch of three eggs. Pigeon Guillemots were sighted around the southeast islets in 1977, around the east side of the main islet in 1985, and were confirmed nesting on the northern rock (#10) in 1986.

**Figure 291.** On one of the larger Rock Islets in 1977, we saw a large nestling Bald Eagle perched in a Sitka spruce tree that was still being fed by its parents. *Photo by R. Wayne Campbell, 6 July 1977.*

**Table EM-260.** Seabird nesting records for Rock Islet. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|
| May, Jul 1977 | | 3,000e | 3,000e | | 1 | (2) | 10-20eS | 25eS | 39, 314 |
| 5 Jun 1982 | 100+S[a] | | | | | | | S | 314 |
| 1985-1986 | | 4,400t[b] | 12,600t[b] | 4[2] | 1 | x2(6) | 0 | 5,100t | 233 |

[a] The proportion of burrows occupied by each of the two storm-petrel species was not determined.
[b] Estimates for Fork-tailed and Leach's storm-petrels were adjusted from those in Rodway et al. [233]

**Remarks:** A few remains of all burrowing species were found in 1977 and 1985. A Bald Eagle was recorded on two islets in July 1977 (Figure 291) and there were two active Bald Eagle nests in 1985. Raccoons were detected but did not persist on the island in 1989-1990 [155] (raccoon were not detected during subsequent monitoring in 1995-1999 [152]).

## EM-270 SKINCUTTLE ISLAND

**Location:** *52°20'52"N 131°13'34"W; 103 B/6.*
In the Copper Islands at the east end of Skincuttle Inlet (see Figure 288 on p. 240).

**Description:** *6.1 ha; 50 m high; Forested.*
Skincuttle is a low, eroded limestone island with minimal slopes on a few small rises. The shore is rocky with extensive tidal reefs off the south and east sides. The forest is predominantly spruce and hemlock with an open mossy ground cover. Alder (*Alnus* spp.) and crabapple (*Malus fusca*) are frequent, especially towards the east end, and scattered large redcedar

trees occur through the forest. In 1985, there were dense patches of young spruce on the west and east ends, mixed with sporadic elderberry, huckleberry (*Vaccinium* spp.), salmonberry, and salal. Mineral exploration occurred on the island in the late 1800s, and excavated pits were still obvious in the 1970s.[79]

**Historical summary:** Surveys were conducted on 25 May and 6 July 1977 (Figure 292), and 27 April and 4 May 1985. We boated by the southern rocks in 1982. Fork-tailed Storm-petrels were confirmed nesting in May 1977 and Leach's Storm-Petrels were confirmed in July (Table EM-270). Campbell and Garrioch [39] mistakenly omitted Fork-tailed Storm-Petrels from their estimates. We confirmed single pairs of both species nesting in 1985, but an accurate ratio was not determined. Most storm-petrel burrows examined in 1985 were worn but empty, suggesting a greater proportion of Leach's Storm-Petrels, which would have begun to lay eggs after our survey was completed.

**Figure 292.** Surveying islands for nesting seabird often requires some agility. Here, the BCPM crew is balancing on a fallen Sitka spruce tree to get to a Bald Eagle nest on Skincuttle Island. *Photo by R. Wayne Campbell, 6 July 1977.*

Observers in May 1977 reported but did not confirm Cassin's Auklets nesting. No population estimate was made. No evidence of Cassin's Auklets nesting was reported from the July visit of that year. Cassin's Auklet burrows would be conspicuous at that time of year, so it is likely that they would have been recorded if they had been present. In 1985, we found Cassin's Auklets nesting around most of the perimeter of the island. The greater evidence of nesting in 1985 may reflect population increase, as was the case on nearby Rock Islet (see above). Although estimates for other burrowing species were lower in 1977 than 1985, there is no convincing evidence of population change for those species. In fact, storm-petrel burrow density in four quadrats surveyed in the main part of the colony in 1977 was much higher than the burrow density determined in the highest density parts of the colony in 1985.

Ancient Murrelets were found nesting over most of the island in 1977 and 1985, although burrows were sparse in some areas. The Ancient Murrelet staging area (Figure 293) for all the Copper Islands was continuous off the south side of the islands in Skincuttle Inlet, wrapped around to the north of George Island, and extended east eight kilometers into Hecate Strait (see Figure 224 on p. 201). A total of 7,100 birds were counted on a run through this area on 15 May 1985.

**Figure 293.** In the early evening, Ancient Murrelets nesting in the Copper Islands begin to assemble in a staging area off the south side of the islands in Skincuttle Inlet. *Photo by Moira J.F. Lemon, 15 May 1985.*

Ten Black Oystercatchers were noted in May 1977 but no evidence of nesting was reported (Figure 294). One pair was seen in 1982 and nesting was confirmed in 1985 and 1986 on the south rocks. Pigeon Guillemot was included on a list of species observed on 6 July 1977 but no count or other information was given. None were seen on subsequent visits.

**Figure 294.** Although 10 Black Oystercatchers were seen on Skincuttle Island by BCPM crews in 1977, no nests were found. *Photo by R. Wayne Campbell, 6 July 1977.*

**Figure 295.** A Bald Eagle nest was first reported in a spruce tree on Skincuttle Island in early May 1977. The nest was later photographed. *Photo by Ken R. Summers, 24 May 1977.*

**Figure 296.** In early July 1977, the Bald Eagle nest on Skincuttle Island held a single large young. *Photo by R. Wayne Campbell, 6 July 1977.*

**Table EM-270.** Seabird nesting records for Skincuttle Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | BLOY | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| May, Jul 1977 | | x | 500+e | | (≥1) | 500e | S | 39, 314 |
| 5 Jun 1982 | | | | 1eS | | | | 314 |
| Apr-Jun 1985 | 4,300t[a] | x | x | 1 | (0) | 2,200t | 1,000t | 233 |
| 19 Jun 1986 | | | | 1 | (0) | | | 233 |

[a] Total number of breeding pairs was derived from transect surveys but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** Signs of predation on Ancient Murrelet eggs and adults were noted as "evident but not excessive" in 1977. We found the remains of 13 eggs and over 50 adult Ancient Murrelets (Table 3, page 68), plus a few adult storm-petrel, Glaucous-winged Gull, and Cassin's Auklet remains in 1985. An active Bald eagle nest was recorded in 1977 (Figure 295 and 296) and 1985. River otter runs were present in 1985. Evidence of raccoon on the island was reported by van den Brink [276] but Hartman and Eastman [155] did not detect them during their surveys in 1989-1990 (raccoons were also not found during subsequent monitoring in 1995-1999 [152] and 2011-2018; [317] see Appendix 1).

***Rice Lentil Polou***

*In our CWS field camps we didn't have a designated cook and we shared all the camp duties, taking turns usually in pairs, to cook dinner or wash dishes and clean up after the nightly feast* (Figure 297). *Breakfasts of pancakes or bannock were prepared by the cooking team for the day, unless it was a granola day. Everyone organized their own lunches in the morning, and these were then eaten out on some picturesque rocky outcrop, deep in the forest, or on a lovely sandy beach of one of the islands that we were surveying.*

*For dinner we had a variety of food choices to accommodate different preferences, but our crews obligingly agreed to a mostly vegetarian menu, to keep things simple and to respect ovo-lacto vegetarians (like myself [Moira]) and Michael's vegan way of life. Many of our CWS field crew members were young university students, not long away from home, who had not previously developed much culinary expertise. Since the vegetarian ingredients and cooking methods were unfamiliar, this led to many hilarious cooking adventures that were a major source of entertainment at our evening camps.*

*The kitchen was basic – a two burner Coleman stove and a small collapsible sheet metal oven, that fit on top of the Coleman stove, for the more inspired chefs. Shuffling fry pans, and large and small cooking pots to create evening meals for usually six people and sometimes more, could be challenging. Everyone dove into the novelty of cooking with the often unfamiliar vegetarian ingredients with hearty enthusiasm. I ensured that we had recipes for the various meals and several recipe books along for any novel creations for the more adventuresome cooks. However, there were times when suggestions were required to launch into a new culinary direction from the usual fare. One of our longest-standing cooking teams, and good friends, Dave Powell and Doug Bertram had their favorite repertoire of menus when it was their time to cook. Their planning conversation usually went something like this –*

*"What shall we cook tonight, Doug?"*

*"I don't know, Dave, how about spaghetti?"*

*"We had spaghetti last night, Doug……… I know, how about Rice Lentil Polou??"*

*"Oh, yeah, Rice Lentil Polou, great idea, Dave!"*

*– and off they would go to begin their preparations, until one fateful day when Michael decided an intervention was required, and hauled out the cook book to find another recipe, muttering good naturedly that Rice Lentil Polou was beginning to taste like breakfast porridge.*

**Figure 297.** CWS field crews shared cooking meals, washing dishes, and general clean-up at the end of each day; here Dave Powell is washing dishes. *Photo by Moira J.F. Lemon, Vertical Point, BC, 15 May 1983.*

## EM-280 GEORGE ISLAND

**Location:** *52°21'N 131°12'30"W; 103 B/6.*
The middle island in the Copper Islands chain at the east end of Skincuttle Inlet (see Figure 288 on p. 240).

**Description:** *42 ha; 72 m high; Forested.*
George Island's topography is undulating with higher ridges and some cliffs and rocky bluffs on the south side (Figure 298). There is an extensive low, wet area in the centre of the island. The forest is predominantly spruce near shore, changing to more hemlock and some redcedar in the interior, with a ground cover of moss or bare litter (Figure 299). Salal used to be extensive along the south side, but by 1985 most of it was dead. Large areas on the east side and the northwest corner were covered with dense spruce seedlings and saplings in 1985. Past windfall events are evident along the east and southeast shores, and just west of the north bay. Mining occurred from 1910-1912 and copper ore was shipped from the island during that period.[79]

**Figure 298.** George Island is forested and has rocky bluffs and tidal shelves on the south side. *Photo by Moira J.F. Lemon, 15 June 2008.*

**Figure 299.** The interior of George Island is forested with western hemlock and some western redcedar, and has a ground cover of moss and forest litter. *Photo by R. Wayne Campbell, 6 July 1977.*

**Historical summary:** Foster visited the island in 1960, BCPM crews surveyed the island on 25 May and 6 July 1977, and the census by CWS was conducted on 27, 29, and 30 April 1985 (Table EM-280). Ancient Murrelet burrows were counted in a 20 ft. (6.1 m)-wide strip transect run north to south across the middle of the island in May 1977. The extent of burrowing by Ancient Murrelets and Cassin's Auklets (Figures 300 and 301) described in 1977 and 1985 was similar and there is no evidence to suggest changes in population sizes for those species. The Ancient Murrelet staging area was described in the account for Skincuttle Island (see Figure 224 on p. 201).

**Figure 300.** Cassin's Auklet burrow beneath fallen log (top centre) on George Island with typical trail of "white wash" near the entrance. *Photo by R. Wayne Campbell, 7 July 1977.*

**Figure 301.** A fuzzy Cassin's Auklet chick from a burrow on George Island in 1977. *Photo by R. Wayne Campbell, 7 July 1977.*

Observers in July 1977 estimated 1,000-2,000 Leach's Storm-Petrel (Figure 302) burrows within 100 yards (91.4 m) of shore. They also suspected nesting by Fork-tailed Storm-Petrels. No further details were given. We found no evidence of nesting by storm-petrels in 1985 (but see Appendix 1 for recent records).

**Figure 302.** Adult Leach's Storm-Petrel with a fresh egg extracted from a burrow on George Island in 1977. *Photo by R. Wayne Campbell, 6 July 1977.*

Two Black Oystercatchers were recorded in May 1977 and there were six on tidal reefs in 1985 but no evidence of nesting had been reported as of 1990 (nesting has been confirmed since; see Appendix 1). Other than one sighted in 1985, there has been no evidence of nesting by Pigeon Guillemots.

**Remarks:** Ample evidence of predation on Ancient Murrelets was encountered, especially in 1985 (Table 3, page 68). Only a few remains of other nesting species were found in 1985; none were recorded in 1977. Three Bald Eagle nests and river otter runs and scats were observed in 1985. Raccoons were detected but did not persist on the island in 1989-1990 [155] (raccoons were not detected during subsequent monitoring in 1995-1999 [152] and 2011-2018; [317] see Appendix 1).

**Table EM-280.** Seabird nesting records for George Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|
| 31 Jul 1960 | | | | x | | 94 |
| May, Jul 1977 | S | 1,500e | (0) | 7,500e | 750e | 39, 314 |
| 27-30 Apr 1985 | 0 | E | (1) | 11,600t | 5,900t | 233 |

## EM-290 JEFFREY ISLAND

**Location:** *52°21'25"N 131°11'30"W; 103 B/6.*
Part of the Copper Islands at the east end of Skincuttle Inlet (see Figure 288 on p. 240).

**Description:** *6.1 ha; 65 m high; Forested.*
Jeffrey Island is steep-sided and rocky, covered with young regenerating spruce around perimeter sections, and mature spruce with some hemlock and Sitka Alder (*Alnus viridis*) in the interior. Much of the ground is bare litter with patches of moss under the larger trees. There is a wet area in the interior. The island is tidally connected to the west side of East Copper Island.

There was a homestead with house, garden, and well on the south side of the island,[79] but we saw little evidence of it during our surveys. Jeffrey Island was part of Ecological Reserve No. 44 established in 1973, but has been re-designated as part of Gwaii Haanas.

**Historical summary:** In 1977, Ancient Murrelet and Cassin's Auklet (Figure 303) nesting populations were estimated by counting burrows in a 10 ft. (3.05 m)-wide transect run across the island and extrapolating to the estimated area of the colony (Table EM-290). The total area surveyed along this transect (Figure 304) was similar to that surveyed within quadrats in 1985, and population estimates from the two methods were similar. The Ancient Murrelet staging area off the Copper Islands has been described in the Skincuttle Island account (see Figure 224 on p. 201). Pigeon Guillemots were seen swimming off the east side of Jeffrey Island in 1977. Two Black Oystercatchers were seen in 1985 but there was no evidence of nesting.

**Figure 303.** Cassin's Auklet chick extracted from a burrow on Jeffrey Island in 1977. *Photo by J. Bristol Foster, 6 July 1977.*

**Figure 304.** BCPM personnel at a seabird transect for burrow-nesting alcids in bare soil habitat on Jeffrey Island in 1977. *Photo by J. Bristol Foster, 6 July 1977.*

**Table EM-290.** Seabird nesting records for Jeffrey Island. See Appendix 2 for codes.

| DATE | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|
| 6 Jul 1977 | 6eS(6) | 600+e | 2,000e | 39, 314 |
| 12, 18 May 1985 | (0) | 1,000t | 2,700t | 233 |

**Remarks:** Remains of 10 Ancient Murrelets and six Cassin's Auklets were found in 1977. Evidence of predation on Ancient Murrelets (21 eggs and over 40 adults) was substantial for the size of this colony in 1985 (Table 3, page 68). A number of remains of Cassin's Auklet adults and eggs were also found in 1985. One Bald Eagle nest was seen in 1977 and 1985 and river otter runs and scats were recorded in 1985. Many Bald Eagle pellets and some river otter scats contained feathers in 1985.

## EM-300 EAST COPPER ISLAND

**Location:** *52°21'25"N 131°10'36"W; 103 B/6.*
At the east end of the Copper Islands chain at the east end of Skincuttle Inlet (see Figure 288 on p. 240).

**Description:** *30.9 ha; 78 m high; Forested.*
East Copper Island has rock bluffs along the shore (Figure 305) and some steep slopes on the edges of knolls and ridges (Figure 306), but most of the interior of the island has only moderate slopes. Behind the large bay on the north side is an extensive wet seepage area. Spruce is the dominant tree around the perimeter, and hemlock and some redcedar are more abundant in the interior. There were extensive tracts of young, regenerating spruce at the east end and along the north and south sides in 1985. There is little understory in the interior, which is mostly bare litter with some moss. Grass grows on the fringes around the island and through a valley on the mid-north side, where there is a swath of old windfall.

**Figure 305.** There are many rock bluffs and some sheltered rocky channels along the shores of East Copper Island. *Photo by Moira J.F. Lemon, 10 June 2008.*

**Figure 306.** Perimeter slopes on East Copper Island provide burrowing habitat for Cassin's Auklets. *Photo by Moira J.F. Lemon, 21 June 2008.*

Towards the west end of the island is an open, grassy meadow situated between two narrow bays. This meadow is the location of past mineral exploration and is kept open by browsing deer. Remains of buildings and machinery were evident in 1985. We found a deep vertical shaft and the ridge of tailings from it on the hill west of this meadow. This shaft has been a death trap for many Ancient Murrelets. We attempted to seal the entrance. Ellis reported that the entire island was burned off during early mining operations.[101] It was later re-colonized by burrowing seabirds, many of which became trapped and died every year in abandoned shafts.

Along with Rankine Islands and Jeffrey Island, the former Ecological Reserve status of East Copper Island was rescinded to allow its inclusion in Gwaii Haanas.

**Historical summary:** Foster visited the island in 1960 and on 25 May and 15 June 1969 (Table EM-300). Surveys were conducted on 25 May and 6 July 1977, and on 26 and 28 April and 11 and 12 May 1985 (Figure 307). In 1977, BCPM surveyors found storm-petrels nesting on the headlands along the north side. We found no evidence of storm-petrels nesting in that area in 1985, but a few storm-petrel burrows were present on rocky knolls along the south side. Storm-petrel numbers thus appear to have declined on East Copper Island as they have on George Island. An adult on an egg found in a burrow confirmed breeding by Leach's Storm-Petrels in 1977. Fork-tailed Storm-Petrels have not been confirmed nesting but remains were found in 1977 and we heard both storm-petrel species calling at night in 1985.

There is no evidence of change in the distribution or abundance of other nesting species. In 1969, 1977, and 1985, surveyors found Ancient Murrelet burrows over most of the island, except the outer perimeter, and Cassin's Auklet burrows in most perimeter areas as far as 70 m inland from the edge of the vegetation. The Ancient Murrelet staging area off the Copper Islands has been described in the Skincuttle Island account above. On 15 May 1985 we encountered an unusual gathering of 420 Cassin's Auklets on the water 6-8 km east of the island (see Figure 224 on p. 201). Cassin's Auklets are not known to stage around their colonies like Ancient Murrelets, and this was the largest gathering of Cassin's Auklets we have seen near any colony.

Two pairs of Black Oystercatchers were present along the north coast in July 1977 but no nests were found. Oystercatcher nests were located on the east and west extremities of the island in 1985.

**Figure 307.** The CWS survey crew on East Copper Island in 1985 included, from left to right, Moira Lemon, Michael Rodway, Doug Bertram, and Dave Powell. *Photo by Moira J.F. Lemon, 15 May 1985.*

**Table EM-300.** Seabird nesting record for East Copper Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 1960 | | | | | x | | 262 |
| 25 May 1969 | | | | | x | x | 314 |
| 1972 | | | | | x | | 262 |
| May, Jul 1977 | 1,000eS | 500e | 2eS | (0) | 4,500e | 4,700e | 39, 314 |
| Apr-Jun 1985 | 20eS | 20eS | 2[2] | S(30) | 4,400t | 10,900t | 233 |

**Remarks:** In 1977, there was evidence of predation on storm-petrels (feather piles and wings of 8 Fork-tailed and 5 Leach's storm-petrels) and Ancient Murrelets (15 feather piles; 33 eggshells). Bald Eagles had a nest and eagle pellets containing feathers were noted. In 1985, the remains of Ancient Murrelets (Table 3, page 68), six depredated Cassin's Auklet eggshells, and one Fork-tailed Storm-Petrel feather pile were found. Bald Eagles and Common Ravens were observed nesting in 1985. Both ravens and eagles were preying on Ancient Murrelets. A Peregrine Falcon in flight and a river otter were also seen in 1985.

***Perils in the Forest***

*There are natural hazards other than predators for birds nesting on coastal islands, including collisions with trees, entrapment in windfall debris, and being buried in landslides. Deep hollows around the roots of large spruce, hemlock, and cedars can be a trap from which adult and fledgling birds cannot escape* (Figure 308)*. We have also found dead adult Ancient Murrelets in open fissures and deep cavities in the eroded limestone bedrock that underlies islands such as Alder and Limestone.*

*Of the numerous potential manmade hazards, some are not readily obvious – we once found a dead Cassin's Auklet which had drowned in a water-filled bucket washed up on the shore. Past mining explorations on East Copper Island have left behind a slag heap and several mineshafts which pose a threat to humans as well as wildlife. When we arrived there on 24 April 1985 to set up camp, we came across a deep vertical shaft on the rise above our campsite at the west end of the island. Overhung by shrubs, we did not initially see it, but when we looked over the edge, we could hear birds splashing and beating their wings in the water below. Two live and many dead Ancient Murrelets were visible at the bottom when we looked in the next morning. We decided a rescue was in order, and so, gathering ropes, bird bags, and flashlights from camp, we lowered Michael down about 30 feet to the bottom of the water-filled well. The live birds were rescued and released, and numerous carcasses were collected and later made into study skins (a second recovery mission two weeks later, rescued three more live birds, including two Cassin's Auklets). Realizing this had been a death trap to the nesting birds on the island for years (possibly trapping as many as one bird a night during the breeding season), and that it was a safety hazard for people as well, we wanted to prevent any further loss. We trimmed back the surrounding shrubs, and covered over the hole with a large fishing net that we had beach combed from the nearby Swan Islands* (Figure 309)*. Amply secured into the ground, the openings in the doubled-over net were small enough that no birds could fall through. The next crew change brought along some "Danger" signs, which we attached to the nearby trees so that any unwary human visitors would not fall in. Since that time, the fishing net cover has not deteriorated, and Parks Canada staff have enhanced the warning signs and erected a fence around the opening to the mine shaft.*

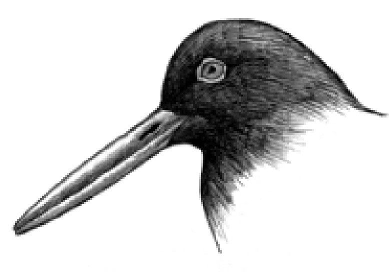


**Figure 308.** Adult and young seabirds can get trapped in deep hollows around the roots of large trees where they dig their burrows. The root system of this large western redcedar on Frederick Island may penetrate the soil for more than seven metres from the trunk of the tree. Above ground, branches of the tree may extend laterally more than six metres. *Photo by Moira J.F. Lemon, 10 May 2014.*

**Figure 309.** In 1985, we discovered an abandoned vertical mine shaft on East Copper Island that had trapped many breeding seabirds each year. We found some old fish-net on nearby Swan Islands to cover the hole and prevent birds from falling in. *Photo by Moira J.F. Lemon, 20 May 1985.*

## EM-310 HOWAY ISLAND

**Location:** *52°23'24"N 131°15'47"W; 103 B/6.*
East of Poole Inlet on east side of Burnaby Island.

**Description:** *25 ha; 89 m high; Forested.*
Howay Island is long and narrow, with dissected cliffs and steep slopes towards the east end and more moderate, consistent slopes on the west end. Most of the area is covered with dense salal under a spruce, hemlock, and redcedar forest. There are some open breaks in the salal cover in the interior.

**Historical summary:** Observations were made by Bristol Foster in 1961 and David Ellis in 1972 (Table EM-310). The BCPM surveyed the island on 24 May and 6 July 1977. CWS crews only explored the east half of the island in 1985, and only the south cliffs were checked in 1986. The island is difficult to explore completely because of the steep areas and thick salal. Observers in May 1977 found Cassin's Auklets nesting along the north side and on the east end of the island. Fifteen Ancient Murrelet burrows were identified in a small pocket on the mid-north side and a few Ancient Murrelet burrows were mixed with more abundant Cassin's Auklet burrows in the nesting area located at the east end of the island. In 1985, mixed Ancient Murrelet and Cassin's Auklet burrows occurred around the north and south sides of the east end area that we explored.

Four storm-petrel burrows were found near the east end on the south side in 1985. Identification of species was based on depredated remains found in the vicinity. There are no other records of nesting by storm-petrels and they have not been confirmed nesting.

Pelagic Cormorants were nesting on the south side cliffs in 1961, 1972, and 1977, but appeared unsuccessful in 1977 and were absent in 1986. Eight nests inspected in July 1977 were empty and broken eggs were found below the nests (Figure 310). Four other nests were seen and more were suspected in inaccessible areas. Seventy adults in breeding plumage flew off the cliffs. In 1985, adults in breeding plumage were present but nests had not been built at the time of our visit. Two Black Oystercatchers were noted in 1977 and two pairs were suspected nesting on the south-side rocks in 1985. Glaucous-winged Gulls were nesting on cliff ledges below the cormorant colony in 1977. Five nests with eggs were reported in July 1977, but the number of nests may have been greater, as observers noted 25 adults flying off the cliffs. Seventeen and 20 adults were on the cliffs in 1985 and 1986, respectively. Three of four accessible nests contained eggs in 1986.

**Figure 310.** In July 1977, only broken eggshells were found below eight empty Pelagic Cormorant nests on Howay Island. *Photo by R. Wayne Campbell.*

**Table EM-310.** Seabird nesting records for Howay Island. See Appendix 2 for codes.

| DATE | FTSP | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 8 Jul 1961 | | 50e | | 12eS | | S | S | 314 |
| 1972 | | x | | x | | | x | 262 |
| May, Jul 1977 | | 20+e | | 5[5] | (0) | 15+eS | 200e | 39, 314 |
| 5 May 1985 | 10eS | 19eS | 2eS | 9eS | S(6) | 300e | 250eS | 233 |
| 19 Jun 1986 | | 0 | | 10e | S(2) | | | 233 |

**Remarks:** A pair of Peregrine Falcons was suspected nesting in 1977 and an eyrie was located on the island in 1985. Observers in 1985 suspected that falcons were responsible for most of the depredated remains they found of Fork-tailed Storm-Petrels, Ancient Murrelets, and Cassin's Auklets. River otter runs were recorded in 1985 and one Bald Eagle was present in 1977 and 1986. An old, incomplete eagle nest was noted in July 1977. No sign of deer was observed in 1985.

## EM-320 "ISLAND BAY" GROUP

**Location:** *52°22'21"N 131°22'28"W* (middle rock); *103 B/6.*
In Island Bay on Moresby Island, west of Burnaby Island. Colony includes all the islands in Island Bay.

**Description:** *2.5 m high; Grassy rock.*
Most of the islands in Island Bay are forested and have no records of breeding by seabirds, but there are a few bare and grassy rocks where nests have been found.

**Historical summary:** Specific locations were not given for nests found in 1977 (Table EM-320). In 1986, one pair of Black Oystercatchers was present near three empty nests on the small, grassy rock in the middle of the group. Glaucous-winged Gulls were confirmed nesting in 1977 but no gulls were seen in 1986. Three Pigeon Guillemot nests with eggs were found in 1977 and two birds were seen flying in the area in 1986.

**Table EM-320.** Seabird nesting records for "Island Bay" Group. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 8 Jul 1977 | 2[2] | 3[3] | x3 | 314 |
| 19 Jun 1986 | 1S | 0 | (2) | 233 |

*cont'd next page*

**Remarks:** Raccoons were detected on five islands in this group in 1989-1990.[155]

## EM-330 "KAT" ROCKS

**Location:** *52°23'37"N 131°23'00"W* (south rock)*; 103 B/6.*
North of Kat Island in Burnaby Strait.

**Description:** *0.3 ha; 6 m high; Grassy rock* (Figure 311).

**Figure 311.** The two "Kat" Rocks are a low grassy islets. *Photo by Michael S. Rodway, 19 June 1986.*

**Historical summary:** We have no survey records for these rocks prior to 1982 (Table EM-330). We only boated by the rocks in 1982, but the survey in 1986 was done from shore. In 1986, there were four and five Black Oystercatcher nests and two and four Glaucous-winged Gull nests on the south and north rocks, respectively. All Pigeon Guillemot nests found were on the south rock but there were seven adults around the north rock. Nests were under rocks.

**Table EM-330.** Seabird nesting records for "Kat" Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 31 May 1982 | | 3eS | | 314 |
| 19 Jun 1986 | 9[6] | 6[5] | x10(28) | 233 |

**Remarks:** Raccoons were present on Kat Island but not "Kat" Rocks in 1989-1990.[155]

## EM-340 CENTRE ISLET

**Location:** *52°25'04"N 131°23'41"W; 103 B/6.*
East of Wanderer Island towards the north end of Burnaby Strait.

**Description:** *1.7 ha; 50 m high; Forested.*
Centre Islet is covered with dense salal under a redcedar, spruce, and hemlock forest.

**Historical summary:** Summers and Ellis visited the islet and saw no birds in 1971 (Table EM-340). One Pigeon Guillemot nest with two eggs was found in 1977. Pigeon Guillemots were nesting in 10-15 burrows at the edge of the vegetation along the east side in 1986. Birds were flushed from three burrows.

**Table EM-340.** Seabird nesting records for Centre Islet. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 10 Jul 1971 | (0) | 262, 311 |
| 8 Jul 1977 | 15+e(30) | 39, 314 |
| 17 Jun 1986 | 10e(10) | 233 |

**Remarks:** Abundant river otter sign and suspected raccoon scats were noted in 1986. Raccoons were confirmed present in 1989-1990.[155]

## EM-350 WANDERER ISLAND

**Location:** *52°25'20"N 131°24'15"W; 103 B/6.*
Northern end of Burnaby Strait, northeast of Skaat Harbour.

**Description:** *87 ha; 142 m high; Forested.*
Salal mixed with moss under a redcedar, hemlock, and spruce forest covers most of the island. The north end had been logged before 1985, and a tangle of fallen or windblown trees remained (Figures 312 and 313).

**Historical summary:** No nesting seabirds were found when Summers and Ellis visited the island in 1971, nor when CWS surveyed it in 1985 (Table EM-350). Ten Pigeon Guillemots were seen on the water around the island in May 1977 and seven nests were reported (contents were not determined and locations

**Figure 312.** Logging debris on the shores of Wanderer Island in 1977. *Photo by R. Wayne, Campbell, 8 July 1977.*

were not specified) in July 1977. Pigeon Guillemots were seen in the bay at the north end in 1986. Two Black Oystercatchers were seen around the rock at the northwest corner of the island in 1986.

**Table EM-350.** Seabird nesting records for Wanderer Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 9 Jul 1971 | 0 | (0) | 311, 314 |
| 23 May, 8 Jul 1977 | 0 | 7(10) | 314 |
| 21 Apr 1985 | 0 | (0) | 233 |
| 19 Jun 1986 | 1eS | S(35) | 233 |

**Remarks:** Raccoon scats were observed on both sides of the island in 1985 [233] and raccoons were confirmed present in 1989-1990.[155] Bald Eagle and river otter were also recorded in 1985.

**Figure 313.** Erosion of surface soil and rocks on Wanderer Island in 2000. *Photo by R. Wayne, Campbell, 7 June 2000.*

## EM-360 SELS ISLET

**Location:** *52°25'27"N 131°24'48"W; 103 B/6.*
North of Skaat Harbour, west of Wanderer Island.

**Description:** *1.7 ha; 50 m high; Forested; Bare rock.*
About two-thirds of Sels Islet is covered with salal and the rest is more open ground under a forest of spruce, redcedar, and hemlock. There are small, bare rocks at the north end.

**Historical summary:** Summers reported Fork-tailed Storm-Petrels nesting throughout the interior of the islet in 1971 (Table EM-360). None were reported in 1977 and we saw no sign of storm-petrels in 1986. One pair of Black Oystercatchers was present in 1971. Oystercatchers were nesting on the north rocks in 1986. One Pigeon Guillemot nest with two eggs was found in 1977.

**Table EM-360.** Seabird nesting records for Sels Islet. See Appendix 2 for codes.

| DATE | FTSP | BLOY | PIGU | SOURCE |
|---|---|---|---|---|
| 9 Jul 1971 | 1,000+eS | 1eS | (10+) | 262, 314 |
| 8 Jul 1977 | | 1 | x | 314 |
| 17, 19 Jun 1986 | 0 | 5[2] | S(40) | 233 |

**Remarks:** We suspected the presence of raccoon from scats seen in 1986 and Hartman and Eastman [155] detected raccoons in 1989-1990. A river otter den and scats were also seen in 1986.

## EM-370 PARK ISLAND

**Location:** *52°26'10"N 131°24'33"W; 103 B/6.*
North of Wanderer Island at northern end of Burnaby Strait.

**Description:** *4.6 ha; 54 m high; Forested.*
The interior of Park Island is a mix of salal and open ground under a spruce, hemlock, and redcedar forest. There had been a recent, extensive blowdown on the south end in 1986.

**Historical summary:** The BCPM checked the island on 23 May and 8 July 1977. Two Black Oystercatchers but no evidence of nesting was recorded in May 1977. A pair of oystercatchers was chasing a raven from the south beach rock in 1986 but no nest was found (Table EM-370). Four Pigeon Guillemots were seen flying out of burrows in July 1977. Most Pigeon Guillemots were gathered around the north end of the island in 1986. Two possible old storm-petrel burrows were observed in 1986 but no evidence of nesting by burrow-nesting species other than Pigeon Guillemot was reported in other years.

**Table EM-370.** Seabird nesting records for Park Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 9 Jul 1971 | | (50+) | 314 |
| May, Jul 1977 | | x4(10) | 314 |
| 17 Jun 1986 | 1eS | S(27) | 233 |

**Remarks:** Summers and Ellis found depredated remains of Fork-tailed Storm-Petrels on the island in 1971 and one Fork-tailed Storm-Petrel feather pile was found in 1986. River otter runs, scats, and a den were noted in 1986. Large, unidentified rodent droppings were found in a few burrows in 1986.

## EM-380 KOGA ISLET

**Location:** *52°25'46"N 131°22'49"W; 103 B/6.*
South of Huxley Island at the northern end of Burnaby Strait.

**Description:** *1.1 ha; 50 m high; Forested.*
Dense salal covers Koga Islet under a redcedar, hemlock, and spruce forest. There was an extensive, recent blowdown along the west and north sides in 1985.

**Historical summary:** Summers and Ellis reported no nesting seabirds in 1971 (Table EM-380). BCPM surveyors checked the islet on 23 May and 8 July 1977. Two Pigeon Guillemots were present in May and one was seen flying out of a burrow in July. Guillemots were observed along the west side in 1985 and all but two were seen along the east side in 1986.

**Table EM-380.** Seabird nesting records for Koga Islet. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 10 Jul 1971 | (0) | 262, 311 |
| May, Jul 1977 | x(2) | 314 |
| 2 May 1985 | S(30) | 233 |
| 17 Jun 1986 | S(36) | 233 |

**Remarks:** River otter runs and one Bald Eagle were noted in 1986.

## EM-390 NAKONS ISLET

**Location:** *52°26'01"N 131°21'15"W; 103 B/6.*
Off the southeast corner of Huxley Island, northwest of Burnaby Island.

**Description:** *1.1 ha; 35 m high; Forested.*
This is a low island with mossy knolls under a sparse spruce forest. Grass and some salal occur on the edges. In 1985, a number of the large spruce had blown down.

**Historical summary:** Summers and Ellis reported no nesting seabirds in 1971 (Table EM-390). A Black Oystercatcher nest with three eggs was found in May and two empty nests were seen in July 1977. One bird of a pair was sitting on an empty nest in 1985. Four Pigeon Guillemots were recorded in May and two were seen in July 1977 but no information about nesting was noted.

**Table EM-390.** Seabird nesting records for Nakons Islet. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 8 Jul 1971 | 0 | (0) | 262, 311 |
| 23 May, 8 Jul 1977 | 2[1] | (4) | 314 |
| 22 Apr 1985 | 1S | (0) | 233 |

## EM-400 ALDER ISLAND

**Location:** *52°26'50"N 131°19'16"W; 103 B/6.*
On the northwest side of Burnaby Island. Colony includes the islet at the north end.

**Description:** *52 ha; 75 m high; Forested.*
Most of Alder Island has mossy or bare litter slopes under a forest of hemlock, spruce, and redcedar (Figure 314). On the east side of the island, small seepage valleys alternate with dry ridges that have moderate slopes. The slopes are steeper on the west side. Patches of grass, salal, and spruce seedlings occur around the perimeter, and there are areas of windfall on the east side. The 0.7 ha north islet has steep rocky sides with a top mostly of moss under spruce.

**Figure 314.** Alder Island is forested and has steep slopes on the west side. *Photo by J. Bristol Foster, 7 July 1977.*

**Historical summary:** Storm-petrels have been found nesting only on the north islet (Table EM-400). Ancient Murrelets and Cassin's Auklets nest on both the main island and the north islet (Figure 315). In 1985, Ancient Murrelets were staging between Alder and Arichika islands to two kilometers east of there (see Figure 224 on p. 201).

A pair of Black Oystercatchers was seen on the north islet in 1971. In 1977 and 1985, oystercatchers were suspected nesting on the main island, where five birds were sighted in 1977 and three pairs were seen in 1985. In 1985, we found three empty nests on the rocky area at the southeast corner. A pair of Glaucous-winged Gulls may have been nesting on the southeast corner of the main island in 1985. Pigeon Guillemots were suspected nesting along the east side of the main island in 1977 and 1985.

**Figure 315.** Cassin's Auklets nest on both the main Alder Island and the smaller north islet. *Photo by R. Wayne Campbell.*

**Table EM-400.** Seabird nesting records for Alder Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 8 Jul 1971 | | 25eS | 1eS | | | 4,000e | 300e | 262 |
| 23-24 May, 7 Jul 1977 | | 10eS | S | 0 | 12+eS(12) | 5,500e | 1,600e | 39, 314 |
| 16-23 Apr 1985 | 60S[a] | | 3S | 1eS | S(2) | 14,400t | 3,200t | 233 |

[a] Total number of breeding pairs was estimated from partial counts but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** Haida traditionally hunted Ancient Murrelets on the island, although they reported that birds were not numerous.[101] In 1971, remains of Fork-tailed Storm-Petrels were found on the north islet. Two pairs of Bald Eagles were nesting in 1977 and there were three Bald Eagle nests on the island in 1985. Predation was moderate on Ancient Murrelets in 1977 and 1985 (Table 3, page 68). In 1985, we found numerous Ancient Murrelets that had been trapped and died in limestone caverns on the island. River otter runs, scats, and a den were found in 1985. Scats contained fish remains except one contained a few feathers. Lisa Hartman found evidence that raccoons had visited the island but they were not continuously present in 1989-1990.[155] A Northwestern Crow nest found in 1977 contained pin-feathered nestlings (Figure 316).

**Figure 316.** A Northwestern Crow nest, found on the ground under a log on Alder Island in 1977, had three small young. *Photo by J. Bristol Foster, 27 May 1977.*

**At the Mercy of the Weather**

*Travel by small inflatable boats between colony islands was always dependant on what the weather and sea conditions were at the time* (Figure 317)*, and what was predicted for the near future. Despite receiving marine weather forecasts over our VHF radios, it was prudent to keep a watchful eye on local conditions and if the weather turned for the worse, be prepared to retreat and head back to camp, or wait until conditions improved. But storms are notorious for having a life of their own, and more than a few times we had our decisions tested.*

*During the 1984 CWS field season, we had the good fortune to set up our basecamp in a cabin on Hotspring Island* (Figure 318) *while we surveyed the seabird colonies on Ramsay Island and others in the northern part of Juan Perez Sound. On the day that we were planning to survey nearby House Island, the weather was rather unsettled (to put it mildly) and forecast to become much worse later on. Only a narrow channel separated the two islands, so we decided even if conditions deteriorated sooner than expected, the boats could handle the short passage back to Hotspring Island* (Figure 319)*. It was not a pleasant day, just a regular wet, windy spring day in Haida Gwaii. We worked for a number of hours, the rain getting progressively heavier as the day wore on. Soon, bedraggled and decidedly cold and wet, and with the wind well into the gale force category, we headed back to the beach for what we anticipated would be an uncomfortable, but short journey back to Hotspring Island. We launched the two boats through the steep breaking surf and set off in tandem over the raging seas. And of course, just abeam of an offshore reef, the motor on the lead boat quit and refused to start again. But luckily (or by careful planning and foresight) with the second boat just a few wave lengths behind, we were able to toss a line to it and the foundering boat was then successfully towed away from the rocks. A pinched fuel line turned out to be the culprit for the engine failure, showing that even simple problems have the potential to become calamities* (Figure 320).

*In the spring of 1985, while surveying colonies in the southern part of Juan Perez Sound and further south in Skincuttle Inlet, we had endured several weeks of nearly continuous storms with only the occasional break. We were longing for the warmth of Hotspring Island (the site of our 1984 camp) and finally decided that we needed to go there to clean up. So one deceptively calm morning we set off, just as the rain began and the ominous sounds of a rising gale moaned through the trees. The rain soon became torrential and poured down our floater coats and sou'westers, soaking through our rain pants. Avoiding most of the rough seas by going along the northern side of the string of islands, we finally entered the sheltered waters of Burnaby Narrows. Rounding into Section Cove near the north end of Burnaby Island, the wind bit hard, lashing our faces with the rain driven before it, and gusts lifted water off the tops of the waves. We headed towards Alder Island and could just see Arichika Island in the near distance, but beyond there was only a wild fury of heavy grey with rain driven horizontally in columns across the surface of the wind-torn waves. This was a taste of what the open waters of Juan Perez Sound would be like, and our choice was obvious – turn back. With the sting of the southeaster in our faces, growing colder all the time, and feeling as if we were living in a waterfall, Doug laughingly remarked "I always wondered what would turn Michael back".* [Doug Bertram contributed his own memory of that episode: *When we came to Juan Perez Sound the wind was blowing hard and the rollers looked 15 feet high! I asked Mike "when do we turn back"? "When the waves are taller than the boat is long" he said.*] *We made our way back to the protective embrace of the mossy spruce forest on the shores of Burnaby Narrows and holed up for the night in a tiny windowless cabin. There was no dry firewood inside, but we managed to build a cheery crackling fire on the beach, drying out a bit and warming up with tea and campfire tales. The next morning dawned with an echoing stillness, clouds still clothed the hills, but all other signs of the storm had passed and Juan Perez Sound bore no resemblance to the raging beast of the previous day.*

**Figure 317.** Weather and sea conditions can change quickly during seabird surveys. In this photo Wayne Campbell uses a boat gas funnel to keep dry. *Photo by Harry R. Carter, 19 June 1976.*

**Figure 318.** This older cabin on Hotspring Island was a welcome respite for seabird crews in 1977. A newer cabin was a 5-star camp for the CWS team in 1984. *Photo by R. Wayne Campbell, 10 June 1977.*

**Figure 319.** Despite a storm warning and rough seas on this day in 1984, the CWS survey crew decided to take the short trip from their camp on Hotspring Island to survey the nearby seabird colony on House Island. Dressed for the event were, from left to right, Dave Powell, Moira Lemon, Doug Bertram, Eric Lofroth, Mike Biro, and Michael Rodway. *Photo by Moira J.F. Lemon, 19 May 1984.*

**Figure 320.** Celebrating after their harrowing trip back to camp on Hotspring Island from nearby House Island in 1984, a few of the CWS crew frolicked (for a brief time) in the stormy sea. Braving the waters were, from left to right, Dave Powell, Eric Lofroth, Mike Biro, Doug Bertram, and Michael Rodway. *Photo by Moira J.F. Lemon, 19 May 1984.*

## EM-410 HUXLEY ISLAND

**Location:** *52°27'N 131°22'30"W; 103 B/6.*
In the southeast corner of Juan Perez Sound. Colony includes the rock on northwest side.

**Description:** *672 ha; 436 m high; Forested; Bare rock.*
This is a steep-sided island. The west and mid-east sides have been logged in the past and in 1985 were covered by young regenerating forests with many old snags. Slides are frequent on these steep slopes. The northeast and southeast corners of the island have open mossy slopes under mature hemlock, spruce, and redcedar forest. The northwest rock is mainly bare and there are beaches along the east side. Prospecting work occurred on the island from 1906 to 1913; surface work, trails, and a cabin were put in and then abandoned.[79]

**Historical summary:** Black Oystercatchers were nesting on the small rock off the northwest side and Pigeon Guillemots were counted along the west side of the island in 1977 (Table EM-410). Only the north and south ends on the east side of the island were explored in 1985, so we considered the records for oystercatchers and guillemots from 1977 to be better estimates of total numbers nesting.

**Table EM-410**. Seabird nesting records for Huxley Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 8 Jul 1977 | 2[2] | S(29) | 314 |
| 22 Apr 1985 | | S(13) | 233 |

**Remarks:** Two Bald Eagle nests were seen in 1977. We saw Bald Eagle, river otter, and scats we suspected were raccoon in 1985. Raccoons were confirmed present in 1989-1990.[155]

## EM-420 ARICHIKA ISLAND

**Location:** *52°28'20"N 131°20'29"W; 103 B/6.*
Northeast of Huxley Island in southeast corner of Juan Perez Sound.

**Description:** *14.6 ha; 84 m high; Forested.*
Arichika Island has steep, open mossy slopes under a mature spruce and hemlock forest. Shrubs and grass occur around the edges, and dense stands of regenerating spruce and hemlock were growing in old windfall areas towards the north end in 1985. There are cliffs and a rocky peninsula at the southern end.

**Historical summary:** Four burrow-nesting species are no longer present on Arichika Island (Table EM-420). Summers and Ellis in 1971 reported Fork-tailed Storm-Petrels nesting in perimeter forest habitat around much of the island, Leach's Storm-Petrels at the north end, Ancient Murrelets on interior slopes, and Cassin's Auklets at the forest edges around the north, east, and south sides. Observers on 23 May 1977 noted 100+ Cassin's Auklet or Ancient Murrelet-sized burrows, but were uncertain which species were using the burrows. Only some appeared active. Single depredated remains of both species were found. Only a few old-looking Cassin's Auklet-sized burrows were found on 7 July 1977 and in 1985 we found only one possible old storm-petrel burrow.

Black Oystercatchers and Pigeon Guillemots may still nest on the island, although neither species was confirmed nesting during surveys in the 1970s and 1980s. Oystercatchers were recorded in 1971 (1 bird) and 1977 (2 birds) and one pair was suspected nesting on the south peninsula in 1985 (Figure 321).

**Figure 321.** Black Oystercatchers were seen on Arichika Island in the 1970s, and one pair was suspected nesting in 1985, but they were not confirmed breeding on the island until recently (see Appendix 1). *Photo by R. Wayne Campbell.*

**Table EM-420.** Seabird nesting records for Arichika Island. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 9 Jul 1971 | 500eS | 25+eS | | | 500+e | 500e | 262 |
| May, Jul 1977 | 0 | 0 | | 8eS(8) | E[a] | E[a] | 314[b] |
| 22 Apr 1985 | 0 | 0 | 1eS | S(7) | E | E | 233 |

[a] See text.
[b] Campbell and Garrioch [39] reported estimates from Summers,[262] except for Pigeon Guillemots.

**Remarks:** Haida traditionally hunted Ancient Murrelets on the island. They reported that birds were more numerous on Arichika than on Alder Island.[101] Two pairs of Bald Eagles were reported nesting in 1977 and one active nest was seen in 1985. River otter were noted in 1985. As of 1990, there were no clues to suggest why this colony has been abandoned, but introduced rats or raccoons were considered likely culprits (rats were later confirmed on the island and were eliminated in 2011; see Appendix 1).

## EM-430 MARCO ROCK

**Location:** *52°31'06"N 131°29'39"W; 103 B/11.*
South side of Juan Perez Sound, east of entrance to Hutton Inlet, east of Marco Island.

**Description:** *0.3 ha; 8 m high; Grassy rock.*
A profusion of blooming forbs decorated this rock in 1986. There was a patch of salmonberry.

**Historical summary:** Numbers of nesting Black Oystercatchers and Glaucous-winged Gulls have remained fairly constant from 1971 to 1986 (Table EM-430). Only three oystercatcher nests with eggs were found in 1971 but four pairs were present. Seventeen Pigeon Guillemot nests with eggs or young were located in 1977 and eight birds were seen flying out of crevices in 1986.

**Table EM-430.** Seabird nesting records for Marco Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 13 Jun 1971 | 4e | 20[18] | <10e | 262, 314 |
| 8 Jul 1977 | 5[5] | 24[16] | 17 | 39, 314 |
| 19 Jun 1986 | 5[2] | 18[18] | x8(30) | 233 |

## EM-440 HUTTON ISLAND

**Location:** *52°31'09"N 131°32'01"W; 103 B/12.*
At the entrance to Hutton Inlet on the south side of Juan Perez Sound. Colony includes all islands at the mouth of Hutton Inlet between Hutton Point and Marco Island.

**Description:** *11.3 ha; 50 m high; Forested.*
Salal under spruce and hemlock covers most of these islands.

**Historical summary:** Summers and Ellis saw no nesting seabirds on Hutton Island, but counted 10 Pigeon Guillemots in the entrance to Hutton Inlet and four west of Hutton Island in 1971 (Table EM-440). Four Pigeon Guillemots were observed around Hutton Island in May 1977. In July, one guillemot was near the islet south of Hutton Point; seven were around Hutton Island, where two carrying fish were seen flying into burrows (Figure 322); and three, one carrying fish, were seen around the island west of Marco Island. These islands were not checked by CWS in 1986.

**Table EM-440.** Seabird nesting records for Hutton Island. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 14 Jun 1971 | (14) | 262, 311 |
| 23 May, 8 Jul 1977 | 10e(11) | 39, 314 |

**Remarks:** Raccoons were detected in 1989-1990.[155]

**Figure 322.** Adult Pigeon Guillemots carrying fish were seen flying into burrows at the edge of the forest on Hutton Island in 1977. *Photo by R. Wayne Campbell, 8 July 1977.*

***Best-laid Plans of Mice and Men***

*Most of us are now used to living in a global community with instant communication and it is hard to remember or imagine what it was like before the world was connected by cell phones and satellites. It wasn't that long ago.*

*We didn't have communication to the outside world during most of the seabird surveys conducted in the 1970s and 1980s. Crews were often on their own for extended periods of time without means to call for help or to communicate a change of plans. This made it vital to plan carefully and to anticipate the ways things could go wrong. Ken Summers and Dave Ellis endured a challenging 10 days during their 1971 surveys that could have been completely avoided if they had only been able to make one phone call (or even send a smoke signal!). Here is that story from Ken's notes (material in square brackets has been either summarized or added later by Ken):*

*"As we worked our way south in search of seabird colonies, we stopped at the logging camp at Thurston Harbour on Talunkwan Island, hoping [for we did not make prior arrangements], that we could buy gasoline and food. They were good about selling us gas at $0.25/gallon and 2-stroke engine oil for $0.55/quart. Food, however, had to be ordered in from Sandspit and delivered via the scheduled floatplane. We ordered 3 lb rolled oats, 10 lb rice, 7 lb flour, 2 lb butter, and 4 lb each of honey & jam: total price including freight was an exorbitant $15 for what we figured would have cost $10 in Sandspit or $8 back home in Vancouver.*

*"To save us having to make multiple trips because of the quantity of gas we bought, the friendly folks at the logging camp offered to deliver our fuel and most of our food and gear to us in Hutton Inlet either later that night or the next. We were to go ahead to find a suitable drop location. So, on June 13th we made the 35 mile (56 km) trip in our 12' 8" inflatable boat, and set up camp at what we thought was a suitable meeting place. We had no idea that we would not see anyone for eight days.*

*"We saw nobody on the night of the 13$^{th}$ and so expected the boat from Thurston Harbour to arrive on the 14$^{th}$. We spent that day checking Hoskins Islets and Hutton Island for seabirds plus fishing and harvesting in the intertidal* (Figures 323 and 324). *No delivery boat. We began to become concerned. In the morning we checked small islands just north of camp and Marco Island for seabirds and did some more fishing but spent the rest of the day in camp reading as there was not enough gas left to do any running about, especially if we were to keep enough in case of an emergency.*

*"June 16 dawned grey and wet:*

*...Got up and had breakfast by 11:30, consisting of porridge and the last of the gulls' eggs [that we had fortuitously collected from Kingsway Rock four days earlier]. Built a large fire by which we sat talking, reading and writing. I made one excursion to look for seaside plantain or other edible plants. Found a meager helping of plantain. We now have enough porridge and rice left for one more day — caught some more fish.... [The next few days blended together; we had saved enough fuel for the 5.5 mile (9 km) trip to Hotspring Island where we knew people occasionally stopped, but how long should we wait?]*

*...finished up porridge and rice today, leaving us with 6 oranges, a package of dried bananas, half a pound of dates, half a package of raisins, and fish. In evening rowed to a small tidal island where there was a fair amount of plantain.*

*... filleted yesterday's fish then put the ling head and the remainder of the others (after cleaning) into a pot with 2 handfuls of plantain, one handful of sword fern (*Polystichum munitum*) roots (for what they were worth) and half an orange peel for spice. After boiling it made a delicious broth, which fulfilled Dave's requirements for lunch.*

*...Rained for about 12 hours last night until 10:00 this morning (1.5-2 inches). Weather was unsettled all day. Spent the day sitting around fire, retiring to the tent once when the rain became heavy. Added another orange peel to spice up the fish head soup, which is by now becoming very diluted. Finished off the last of the cod (28 fish eaten now).*

*"June 21: we waited until noon, then finally decided the boat from Thurston Harbour wasn't coming, and so packed up and headed to Hotspring Island. Here we found some halibut fishermen who had heard a distress call about us on the DOT broadcast that morning that said we were one day overdue at Thurston [no such plan had been made] and might be at Hotspring "Inlet." They kindly left us with a tank of gas to get back to Thurston Harbour and some food. I returned to Thurston Harbour [while Dave stayed behind to make more room in the boat for the supplies].*

*"The crew at the logging camp told me what had happened. Their boat had come to deliver our supplies the first night, arriving about 11 pm [whereas we had expected the early-rising loggers after dinner if they were coming that night, and certainly before sunset, which was about 10:15 pm]. They had gone up and down both sides of Hutton Inlet, blowing their horn and scanning the shoreline with a searchlight but said they hadn't come into our bay because it was so shallow. [Nevertheless, if they were in the same inlet we were as they insisted, we wondered how we could have slept through that and didn't know how they would have missed our red tent on shore.] After that, they went to see whether we were on Hotspring Island and woke up two other people before discovering they weren't us. The logging crew admitted to a mixture of annoyance and worry at not finding us. When I explained our ordeal to them 10 days later, they were even more helpful than before."*

**Figure 323.** Intertidal life is abundant on Haida Gwaii. Ken Summers and David Ellis ran out of supplies during their survey trip along the east coast of Moresby Island in 1971 and had to depend on food from the sea to survive. They harvested intertidal animals but were likely unaware of the possible hazards associated with eating some species. For example, eating mussels and clams that have toxins (e.g., paralytic shellfish poisoning) can have life-threatening neurological effects. Ken and David had no radio contact with the outside world and were not able to receive warnings issued by the Department of Fisheries. *Photo by R. Wayne Campbell.*

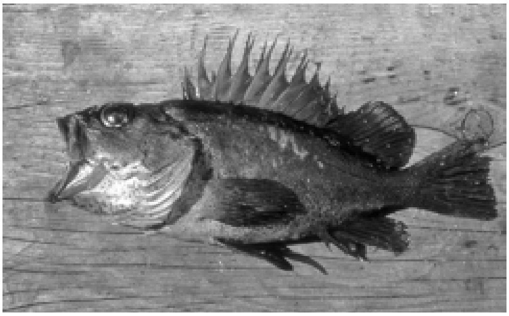


**Figure 324.** The Black Rockfish (*Sebastes melanops*) is common in kelp beds along the BC coast and was harvested by Ken Summers and David Ellis when they ran out of food during their survey trip in 1971. *Photo by R. Wayne Campbell.*

## EM-450 HOSKINS ISLETS

**Location:** *52º32'24"N 131º33'01"W* (north islet); *103 B/12.*
South side of Juan Perez Sound, northwest of Hutton Point.

**Description:** *3.2 ha; Forested.*
Hoskins Islets are two small islets with spruce and hemlock forests and medium to dense salal understory (Figure 325). Many windfalls were reported in 1977.

**Historical summary:** The storm-petrel colony present in 1971 was abandoned by 1977 (Table EM-450). Summers and Ellis found storm-petrel burrows on both islets, with higher burrow density on the east sides of the islets. Burrows were under logs, around the roots of spruce trees, and under thick salal. One incubating Fork-tailed Storm-Petrel was found in one burrow. No evidence of burrowing was found on either islet in 1977 and 1986.

Two Black Oystercatcher nests with eggs were found within 50 ft. (15 m) of each other along the rocky shore in 1971. One nest with young was present on the south islet and four adults were seen on the north islet in July 1977. In 1986, one nest with young was found on the north islet. Four adults were recorded. Pigeon Guillemots have been seen around both islets, but in 1986 most (90) were around the south islet. Three birds flew out of burrows on the south islet in 1977.

**Table EM-450.** Seabird nesting records for Hoskins Islets. See Appendix 2 for codes.

| DATE | FTSP | BLOY | PIGU | SOURCE |
|---|---|---|---|---|
| 14 Jun 1971 | 2,000e | 2[2] | x(30+) | 262, 314 |
| 23 May, 8 Jul 1977 | E[a] | 1+e | 10e(24) | 314 |
| 19 Jun 1986 | E | 1 | x9(92) | 233 |
| 13 Jun 1988 | | | (32) | 315 |

[a] Corrected from Campbell and Garrioch,[39] who reported the estimate for Fork-tailed Storm-Petrels from Summers.[262]

**Figure 325.** Two forested islands comprise Hoskins Islets. *Photo by R. Wayne Campbell, 8 July 1977.*

**Remarks:** Summers and Ellis noted abundant sign of river otters and many storm-petrel remains around river otter runs in 1971. Perhaps river otters contributed to the demise of storm-petrels on the islets. River otter runs, dens, and scats composed of fish were seen in 1986.

## EM-460 TATSUNG ROCK

**Location:** *52°32'43"N 131°20'52"W; 103 B/11.*
Off the southeast side of Ramsay Island.

**Description:** *0.5 ha; 13 m high; Grassy rock.*

**Historical summary:** Two pairs of Black Oystercatchers were present in 1971 (Table EM-460). Numbers of Glaucous-winged Gulls nesting have declined since 1971. Sixty-six adult gulls were counted but only 12 nests were found in 1977. Numbers of oystercatcher and gull nests found in 1986 were similar to those of 1977.

**Table EM-460.** Seabird nesting records for Tatsung Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 27 Jun 1971 | 2eS | 43[29] | 6eS(12+) | 262, 314 |
| 9 Jul 1977 | 3[3] | 12[9][a] | S(3)[a] | 314 |
| 20 Jun 1986 | 4[3] | 11[7] | (0) | 233 |

[a]Corrected from Campbell and Garrioch,[39] who reported the estimates for Glaucous-winged Gulls and Pigeon Guillemots from 1971.

**Remarks:** One dead Pigeon Guillemot was found in 1977.

## EM-470 RAMSAY ISLAND

**Location:** *52°33'40"N 131°22'40"W; 103 B/11.*
Juan Perez Sound north of Burnaby Island. Colony includes the unnamed islets on the north and east sides of Ramsay Island.

**Description:** *1,776 ha; 23.4 km perimeter; 370 m high; Forested; Grassy rock.*
The southwest shore of Ramsay Island presents a challenging array of cliffs, sea-caves, and very steep slopes (Figure 326). There are also steep slopes on the northwest side, interrupted by a broad valley that rises to a low saddle in the middle of the island. Most slopes are mossy or bare under mature spruce, hemlock, and redcedar forest (Figure 327). Salal becomes the dominant understory on the slopes north of Crombie Point and is thick along the flatter shoreline on the east and southeast sides of the island. Grassy fringes occur around Andrew Point (Figure 328) and Crombie Point. The tidally connected islets on the mid-northwest side are forested and have a thick salal understory, and the islet on the mid-east side is rocky with patches of grass and forbs.

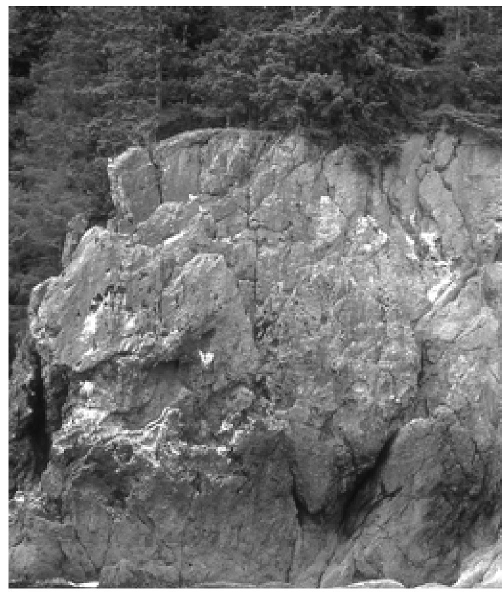


**Figure 326.** Cliffs and steep slopes are prominent features of Ramsay Island. *Photo by R. Wayne Campbell, 9 July 1977.*

**Historical summary:** Nesting was first documented by Summers and Ellis in 1971 (Table EM-470). They explored the areas around Andrew Point, Crombie Point, and the rock off the east side between Andrew and Yadus points. BCPM crews visited major headlands and small islets on 21 May, 9 July, and 3 August 1977. CWS conducted a more exhaustive survey and set up permanent monitoring plots for Ancient Murrelets and Cassin's Auklets from 19 April to 28 May 1984 (Figure 329). Only surface-nesting species were surveyed in 1986.

**Figure 327.** Old-growth western redcedar trees are still found on Ramsay Island. In this photo, from left to right, Christine Rodway, Dave Powell, and Eric Lofroth, with their arms spread wide, cannot circle the tree's girth. *Photo by Michael S. Rodway, 4 May 1984.*

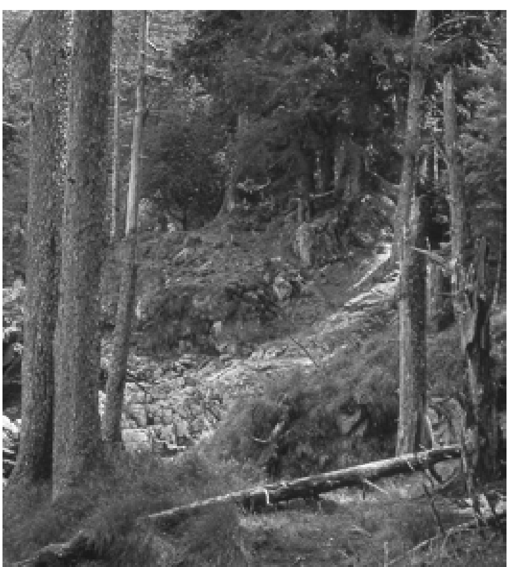


**Figure 328.** Grassy habitat occurs on the fringes of the forest around Andrew Point on Ramsay Island. *Photo by R. Wayne Campbell, 9 July 1977.*

**Figure 329.** Over 73 km of transects with 1,000s of quadrats, ranging in size from 3x3 m to 7x7 m, were surveyed by CWS crews on Haida Gwaii in the 1980s; over 400 quadrats along 56 transects were surveyed on Ramsay Island in 1984. Larger permanent monitoring plots, ranging in size from 10x10 m to 20x20 m, were established on selected colonies, including Ramsay Island. Along transects, burrows were counted and identified to species and vegetation was recorded within all quadrats, and burrows were explored to determine contents in a proportion of the quadrats. Getting to the end of a burrow to determine contents often required digging one or more access holes into the tunnel. Crews carried redcedar shingles to patch any access holes dug so that burrows were left intact. For permanent monitoring plots, the corners of each plot were marked with metal stakes and the vegetation and location of each burrow were mapped on gridded paper; burrows were counted and identified to species but were not disturbed further. The number of quadrats that could be surveyed by a crew in a day varied tremendously, depending on the difficulty of access, the type of terrain, and the size of the crew (2-6

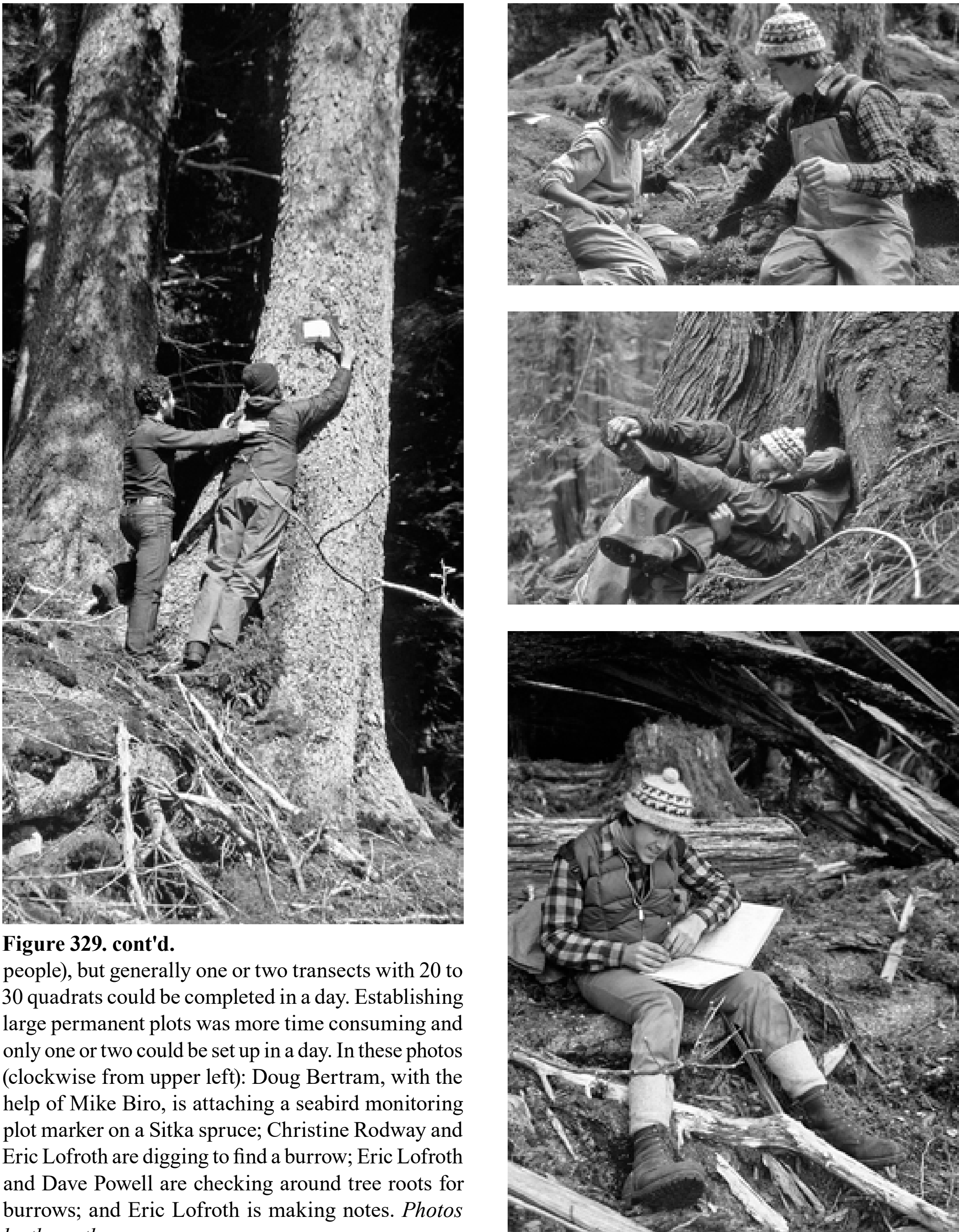


**Figure 329. cont'd.**

people), but generally one or two transects with 20 to 30 quadrats could be completed in a day. Establishing large permanent plots was more time consuming and only one or two could be set up in a day. In these photos (clockwise from upper left): Doug Bertram, with the help of Mike Biro, is attaching a seabird monitoring plot marker on a Sitka spruce; Christine Rodway and Eric Lofroth are digging to find a burrow; Eric Lofroth and Dave Powell are checking around tree roots for burrows; and Eric Lofroth is making notes. *Photos by the authors.*

Larger populations of Ancient Murrelets and Cassin's Auklets estimated in 1984 than in 1971 and 1977 likely reflect a more intensive survey rather than population change. In 1986, we found birds nesting in many previously unexplored locations. Ancient Murrelets (Figure 330) and Cassin's Auklets (Figure 331) were nesting in perimeter forest along shoreline distances of 8.0 and 8.3 km, respectively, occurring together over an estimated 3.6 km. Ramsay Island may have had the largest colony area in BC as of 1990, though colonies on Langara, Frederick, Hippa, and Lyell Islands are of comparable extent. Colony areas on Langara and perhaps Lyell and Kunghit islands were larger before they were impacted by invasive predators. The major staging area of Ancient Murrelets in 1984 lay off the west and southwest sides of Ramsay Island in Juan Perez Sound and extended north and east into Ramsay Passage (see Figure 224 on p. 201). The maximum number of birds counted in this area was 7,500 on 28 April 1984.

**Figure 330.** In terms of area, Ramsay Island may currently support the largest mixed colony of Ancient Murrelets (shown) and Cassin's Auklets in BC. *Photo by Michael S. Rodway, 4 May 1984.*

Pelagic Cormorants were found nesting at Crombie Point in 1971 and on the headland east of Crombie Point in 1977 and 1986 (Figure 332). Birds could be seen sitting on nests in 1971. In 1977, 18 of 20 nests were accessible; 16 of those contained eggs or newly-hatched young. In 1986, birds were visible in crevices in the rock face but no nests could be seen. In 1986, guano was abundant in caves along the southwest side west of Crombie Point but no birds were observed. Cormorants clearly roost and may nest in those caves in some years.

**Figure 331.** Colony areas of Cassin's Auklets (shown) and Ancient Murrelets on Ramsay Island extended along 8.3 and 8.0 km of perimeter forests, and overlapped over a distance of 3.6 km. *Photo by Michael S. Rodway, 4 May 1984.*

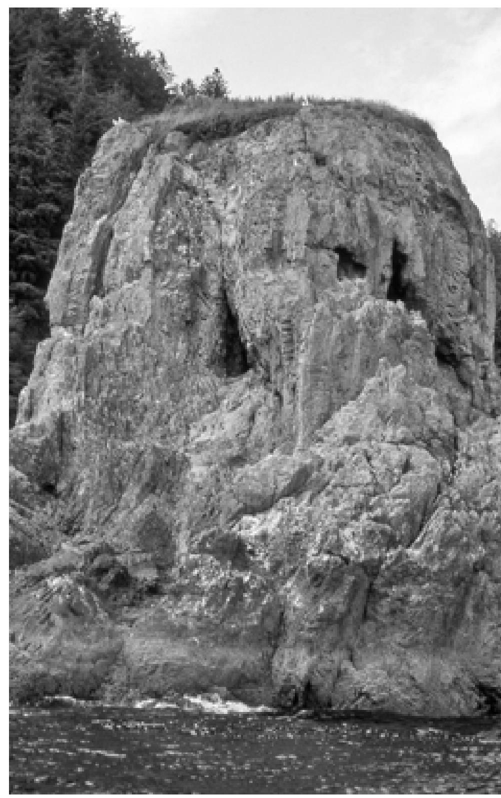


**Figure 332.** Location of a Pelagic Cormorant colony east of Crombie Point on Ramsay Island in 1977 and 1986. *Photo by R. Wayne Campbell, 9 July 1977.*

Nesting Black Oystercatchers have been reported at four locations: Crombie Point (1 nest in 1971, 5 nests, 2 with eggs or chicks, in 1977, and a pair with young in 1986), the headland east of Crombie Point (1 pair in 1986), the rock between Andrew and Yadus points (2 nests, 1 with 1 egg and 1 young in 1977, and 1 empty nest in 1984), and the point in the bay west of the prominent peninsula on the mid-northwest side (1 nest with a cold egg in 1984).

Glaucous-winged Gulls have nested at three locations: Crombie Point (7 nests with eggs in 1971, 15 nests, 14 with eggs or young, in 1977, and 9 nests with eggs in 1986), the headland east of Crombie Point (6 nests estimated in 1977 and 1986), and the rock between Andrew and Yadus points (19 nests, 11 with eggs, in 1971, 3 nests with eggs in 1977, and 1 nesting pair in 1986).

Pigeon Guillemots have been confirmed nesting only on the islet between Andrew and Yadus points. In 1971, 40 birds were present and four nests with eggs were found, and in 1977, two nests with eggs were found. Birds have also been seen and suspected nesting at Crombie Point (18+ birds in 1971, 2 birds in 1977, and 17 birds in 1984); east of Crombie Point (2 birds in 1977); east side of Andrew Point (6 birds in 1977); and around the sea caves on the mid-west side of the island (12 birds in 1984). The count in 1984 was more thorough than in 1986.

**Figure 333.** Steep slopes used for nesting by burrow-nesting seabirds are vulnerable to erosion, as shown in this photo of mud slides that had occurred near the south beach on Ramsay Island in 1984. *Photo by Michael S. Rodway, 16 May 1984.*

**Figure 334.** Small Bald Eagle chick in a nest on Ramsay Island in 1984. *Photo by Michael S. Rodway, 16 May 1984.*

**Table EM-470.** Seabird nesting records for Ramsay Island. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 27 Jun 1971 | 3 | 1 | 26[18] | x4(58) | 25eS | 10,200e | 262, 314 |
| May, Jul 1977 | 20 | 7[3] | 24e | 20e(10) | 1,000e | 7,500e | 39, 314 |
| Apr-May 1984 | S | 2[1] | 16eS | S(29) | 18,200t | 12,900t | 233 |
| 20 Jun 1986 | 14eS | 2e | 16e | S(1) | | | 233 |

**Remarks:** The very steep nesting slopes would be highly susceptible to erosion if forested areas above were ever destroyed (Figure 333).

In 1977 at Andrew Point, there was evidence of heavy predation on Ancient Murrelets in May, including 19 wings found near a suspected raven nest, and on Cassin's Auklets in July. Fourteen Bald Eagles and three nests were tallied in all the areas surveyed, and two adult and three young ravens were seen around Andrew Point in July 1977. In 1984, we found nine active and 14 total Bald Eagle nests (Figure 334) and one Peregrine Falcon eyrie (Figure 335). Eight of the Bald Eagle nests were within Ancient Murrelet or Cassin's Auklet colony areas. Bald Eagles were likely responsible for the signs of predation on Ancient Murrelets found within surveyed quadrats in 1984 (Table 3, page 68).

**Figure 335.** Location of a Peregrine Falcon eyrie on the south side of Ramsay Island just east of Crombie Point in 1984. *Photo by Michael S. Rodway, May 1984.*

River otters were seen in 1977 and signs of river otter were encountered in many locations around the islands in 1984. Scats inspected were composed of fish. Domestic goats were abandoned on the island by homesteaders in 1976 [134] and three were seen on the east side of Crombie Point in 1984.

***Menace From the Deep***

*Lugging zodiacs and motors on and offshore can be gruelling and hazardous, especially at low tide on a slippery, rocky shoreline. Given the daily changes in the times of high and low tides, it was inevitable that during our day-to-day survey work we had to access seabird colony areas under such conditions. If possible at those times, we tried to anchor the boat offshore rather than lugging it up and down. A deep channel where the boat can be tied across is ideal* (Figure 336). *Otherwise, an anchor has to be put down with ropes attached to boat and anchor that allow the boat to be retrieved from shore when crews return later in the day. Careful appraisal of how the boat will fare as tides, waves, and weather conditions change is vital to ensure the security of the boat and the safe return of survey crews. However, sometimes one's best judgement proves inadequate.*

*One day on Ramsay Island, Moira and I (Michael) carefully anchored the zodiac off a rocky shoreline. The tide was rising and I thought the boat was sitting in nice deep water where it would be safe for the day. The weather was pleasant and I gave the boat no further thought during the day. We returned in the evening to an unpleasant surprise. The tide was now dropping and the zodiac, like the Ark on Mount Ararat, was balanced on top of a sharp rock pinnacle that had emerged out of the deep. We tried pulling this way and that on the tether lines, but to no avail. I was scared the rock would tear a great gash in the bottom of the boat, especially because the tide was still dropping. There was no other solution but to strip off and swim for it to try to free the boat. Ocean water is still pretty cold around the islands* *in the spring and it seemed like a long swim to get to the boat, though it was probably no more than about 30 m. I tried pushing the zodiac off the rock while I was in the water but I had no purchase and could not move it. I climbed in, partially to get out of the cold water, and tried to dislodge it. Eventually, by standing on one side of the zodiac and pulling up the other side as if to flip it over, I manage to slide it off the rock. Getting to shore to retrieve my clothes was a relief, and we were both grateful for a hot supper and a comfy tent for the night instead of what we might have had to face for the night if we had failed to free the boat.*

**Figure 336.** A narrow channel where a boat can be tied across is ideal for securely anchoring an inflatable boat offshore, but rocks lurking in the deep can be a problem when the tide drops. *Photo by Moira J.F. Lemon, Rankine Island, BC, 1 June 1982.*

## EM-480 RAMSAY ROCKS

**Location:** *52°34'02"N 131°27'54"W; 103 B/11.*
West of Ramsay Island.

**Description:** *0.2 ha; 6 m high; Bare rock.*

**Historical summary:** Black Oystercatchers had not been confirmed nesting as of 1990 (but see Appendix 1). A pair was present in 1971, five adults and an empty nest were seen in 1977, and five adults were recorded in 1986 (Table EM-480). Young were suspected around the empty nest found in 1977. Glaucous-winged Gull numbers have declined.

**Table EM-480.** Seabird nesting records for Ramsay Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 28 Jun 1971 | 1eS | 14[13] | 262, 314 |
| 9 Jul 1977 | 1S | 9[8] | 314 |
| 19 Jun 1986 | 2eS | 5[5] | 233 |

## EM-490 BISCHOF ISLANDS

**Location:** *52°34'50"N 131°34'00"W* (northwest island); *103 B/12.*
South of Beresford Inlet at the northwest end of Juan Perez Sound.

**Description:** *66 ha; 87 m high; Forested; Bare rock.* Most of the area of the six main islands is vegetated with salal under a hemlock, spruce, and redcedar forest (Figure 337). Moss and bare litter occur in patches in the interior of the salal understory and on the shore edges. In 1985, a recent windfall had occurred on the north side of the middle, east island, and some large redcedars had blown over on the north peninsula of the north island. There are small rocky islets on the east side.

**Figure 337.** Most of the Bischof Islands are heavily forested. *Photo by Ray Billings, July 1977.*

**Historical summary:** Seabird populations have declined on the Bischof Islands (Table EM-490). In 1971, Summers and Ellis reported a high density of storm-petrel burrows on the small island west of the most southeastern island, scattered burrows on the north peninsula of the large northwest island, and evidence of birds nesting in natural cavities on the two east islands and the smallest central island. They found Fork-tailed Storm-Petrel feathers in burrows and heard adults calling from burrows. No evidence of nesting by Leach's Storm-Petrels was found. Storm-petrel populations apparently declined rapidly and six years later no storm-petrel burrows were found during the surveys on 22 May and 10 July 1977. In 1985, we found two storm-petrel burrows in rock cavities and could smell their distinctive scent on the small island where Summers and Ellis had found the highest density of nests in 1971. Thus a small, remnant population may still have been nesting on the islands in 1985.

Ancient Murrelets may have declined more gradually. Five hundred pairs were estimated nesting in two areas on the largest island in 1971. BCPM crews estimated 300 burrows on that island plus 50 on the northeast island in 1977. We found no sign of Ancient Murrelets in 1985. In both 1971 and 1977, on the largest island, the main nesting area with a few hundred burrows was located along the north side of the east arm of the island [311, 314] (Summers [262] described the main colony area being on interior slopes along the northeast side of the north peninsula but later confirmed this was a mistake). There were also a few burrows scattered around the southeast corner of the south peninsula in both years. The few burrows found on the northeast island in 1977 were located on the mid-north side of that island.

At least two pairs of Black Oystercatchers were suspected nesting in 1971, and a nest with one egg was found on the most eastern rock in 1977. We saw no oystercatchers in 1985. Pigeon Guillemots have been recorded around most islands but the majority of birds seen in 1977 and 1985 were around the east rocks. No nests were found on the east rocks but birds were seen flying from rock crevices and burrows at the north tip of the largest north island and on the two large eastern islands in July 1977.

**Remarks:** The decline of seabird nesting populations on the Bischof Islands suggest that the islands have been invaded by introduced predators. One raccoon scat containing crab shells was observed on the middle, east island in 1985. Raccoons may have contributed to the decline, although none were detected by Lisa Hartman during her studies in 1989-1990 [155] (rats but not raccoon were detected during recent camera monitoring; see Appendix 1). Signs of river otter were seen in 1977 and 1985. There were five Bald Eagle nests on the islands, only one of which was definitely active in 1977 and 1985. Ancient Murrelet eggshells were found in all colony areas in 1971 and 1977 and over 11 adult remains were found in 1977.

## EM-500 HOTSPRING ISLAND

**Location:** *52°34'35"N 131°26'24"W; 103 B/11.*
Between Ramsay and Murchison Island at the west end of Ramsay Passage. Colony includes the islets off the northeast end of the main island (Figure 338).

**Description:** *21 ha; Forested.*
Hotspring Island is relatively flat with some small rocky knolls. Most of the island is covered with a mature spruce and hemlock forest with a mossy ground cover (Figure 339). At the southwest corner, around the hot springs the island is named for, dense salal and wild crabapple surround open mossy and seepage areas. Early in 1984, a large windfall occurred on the mid-north side. The small, northeast islets are mostly salal under spruce, with some open mossy patches. A mineral claim was worked on the island in 1907, without result, and different cabins have been built around the frequently-visited hot springs since the early 1900s (Figures 340 and 341).[79]

**Table EM-490.** Seabird nesting records for Bischof Islands. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | BLOY | PIGU | ANMU | SOURCE |
|---|---|---|---|---|---|---|
| 28 Jun 1971 | | 5,000e | 2+S | S(50) | 500e | 262, 314 |
| May, Jul 1977 | | E[b] | 1 | 10+e(27) | 300e | 39, 314 |
| 16 Jun 1985 | 50eS[a] | | 0 | S(24) | E | 233 |

[a] Total number of breeding pairs was estimated but the proportion of burrows occupied by each of the two storm-petrel species was not determined.
[b] Corrected from Campbell and Garrioch,[39] who listed the estimate from 1971 for Fork-tailed Storm-Petrels.

**Figure 338.** The Hotspring Island colony includes the small islets off the northeast end. *Photo by Moira J.F. Lemon, 16 June 1986.*

**Figure 339.** The forest cover on Hotspring Island is mature Sitka spruce and western hemlock. *Photo by R. Wayne Campbell, 29 May 1996.*

**Figure 340.** In 1977, the small cabin on Hotspring Island gave travelers a private place to change for a soak in the hotsprings and leisurely relax afterwards. *Photo by R. Wayne Campbell, 10 July 1977.*

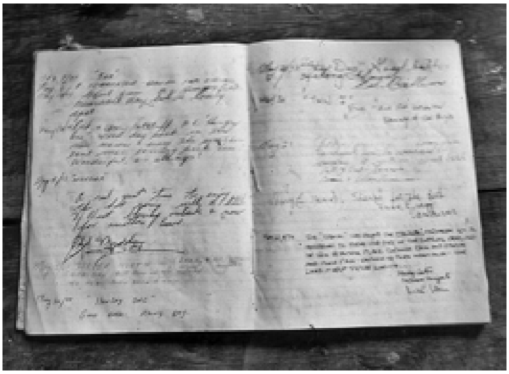


**Figure 341.** Many visitors to Hotspring Island in 1977 signed the guest book with stories of their adventures. *Photo by R. Wayne Campbell, 10 July 1977.*

**Figure 342.** For over a month, Michael Rodway and the CWS crew enjoyed working from a warm and dry base camp on Hotspring Island while local colonies were surveyed. *Photo by Moira J.F. Lemon, 9 May 1984.*

***Paradise on Earth***

*If we suffered the most discomfort from inclement weather and marginal camping conditions at our 1986 camp in Englefield Bay, our stay at Hotspring Island in 1984 more than made up for it! With permission from the Skidegate Band Council, our accommodation was in the newly-built and most comfortable watchmen's cabin* (Figure 342) *located right next to the steaming hot pools! Compared to all other field camps, our time there was like a holiday in paradise. No matter how taxing a day we had of surveying surrounding areas, when we got back to Hotspring Island we were able to slip into the hot pools and soak our cares away. Incredibly, we were stationed there for well over a month as a home base from which to survey the extensive seabird colony areas on nearby Ramsay Island and other smaller islands. Many a magical night was spent in the pools gazing at the stars and listening to the waves washing against the shore, or letting the rain fall on your head while you sat immersed neck-deep in the soothing hot waters. Can you imagine a finer Eden?*

**Historical summary:** Summers and Ellis in 1971, and the BCPM on 21 May and 9 July 1977 found no nesting seabirds on the main island. Nesting was recorded on the outer northeast islets (Table EM-500). CWS crews surveyed the main island on 16 and 21 April, and 10 June 1984, and the outer northeast islets on 20 June 1986. In 1984, a few Ancient Murrelets were nesting on the north side of the main island. This is the only record of Ancient Murrelets nesting on Hotspring Island.

Survey data indicate that Cassin's Auklets declined and storm-petrels increased on the northeast islets between 1971 and 1986. Survey effort was likely similar in all three years that we have data for, so these indicated trends may accurately reflect population changes. No storm-petrel burrows were found by Summers and Ellis in 1971. Storm-petrels were nesting on the outer three northeast islets in 1977 and 1986. Estimated numbers were higher in 1986 than 1977. Nesting was not confirmed in 1977, but remains of Fork-tailed Storm-Petrels were found. Fork-tailed Storm-Petrels were confirmed nesting and remains of both storm-petrel species were found in 1986. Cassin's Auklets were nesting on those islets in 1971 and 1977 and young were confirmed in burrows

**Table EM-500.** Seabird nesting records for Hotspring Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | BLOY | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| 26 Jun 1971 | | | | | S(35) | | 400e | 262, 314 |
| May, Jul 1977 | | 100eS | | | 50e(60) | | 500e | 39, 314 |
| Apr, Jun 1984 | | S | | 1 | S(24) | 6e | | 233 |
| 20 Jun 1986 | 900e[a] | x | S | 1 | 15e(8+) | | 10eS | 233 |

[a] Total number of breeding pairs was estimated but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

in both years. In 1986, some Cassin's Auklet-sized burrows were found but all those investigated were suspected to contain storm-petrels. One Cassin's Auklet eggshell was found and only a remnant few pairs were suspected nesting.

Two Black Oystercatchers were noted on the northeast islets in May 1977 but no evidence of nesting was reported. A pair was nesting on the rock off the south side of the main island in 1984 and 1986. Pigeon Guillemot nests have been found and most birds have been counted around the northeastern islets. A nest with one young was found in July 1977 and three nests with eggs were found in 1986.

**Remarks:** River otter runs, a den, and scats composed of fish were seen on the south islet of the northeast chain in 1986. Little evidence of predation was found in any year. Reasons for the indicated trends in Fork-tailed Storm-Petrel and Cassin's Auklet numbers are unknown.

***Birthday Treats***

*Seabird survey field seasons often stretched over the course of several months, and with a lot of area to cover during the relatively short breeding season, we needed to work just about every day. There was rarely time for regularly scheduled days off. When we did take a break it was usually on a day of miserable weather when boat travel was not possible, or it was too wet to venture into the colonies where our presence could damage nesting habitat. So days off were normally devoted to laundry and baths, catching up on field notes, cooking up fancier meals, or just reading a book around the warmth of the wood stove (with rain gear dripping nearby). Although there was always adventure and discovery associated with exploring seabird colonies, towards the end of our CWS field seasons, we would often experience a restless urge to seek out and explore some other remote beach or destination that we had either seen from afar on our colony surveys or had spied on the charts or maps that we carried with us. My (Moira's) birthday occurred at this time and was a good excuse to treat ourselves to an "extra-curricular adventure." Laundry could wait 'til some other day! Such adventures were a refreshing break from grubbing burrows and served as a good morale booster for tired crews (change is as good as a rest my mother always said).*

*It was not just the beaches and rugged coastline that intrigued us – alpine vistas also beckoned. In many areas of Haida Gwaii, the raised bog habitat of the alpine zone descends nearly to sea level, particularly on the west coast of Graham Island above Nesto Inlet, not too far from Hippa Island. This provides a fairly easy route up into the alpine. So in 1983, after Michael and I had been conducting surveys on Hippa Island for over a month, we set off in the zodiac for the head of Nesto Inlet. From there, a short hike up the forested nose of a ridge and we were soon into the open rolling raised alpine bog terrain that connected a continuous series of broad ridges dissected by steep sided inlets. As we ascended we were rewarded with increasingly panoramic views and were spellbound by the beauty of the alpine landscape.*

*Another year, on a brilliant birthday in mid-June, when we could see that most of the snow had melted from the skyline ridges above Juan Perez Sound, all of our crew, plus the crew from Reef Island, set off from the shores of a small inlet on the east coast of Moresby Island to attain those lofty heights. It was an expedition! Unlike a lot of areas in coastal BC, "bushwacking" in Haida Gwaii can be a breeze if you choose the right route. Continuous browsing of shrubs by introduced deer has helped create a more open forest understory. Winding ever upwards we found a route where lower ridges connected into higher ones – something like following* *the course of small creeks to their eventual confluence with the main stream. Once on the ridge crest we had a magnificent, unparalleled view south down the spine of Moresby Island to Kunghit Island and beyond to Cape St James and the Kerouard Islands. To the west, from the mouth of Mike Inlet on the outer coast of Moresby Island, the blue Pacific stretched onwards to the horizon. And to the east we could look down onto the waters of Juan Perez Sound and all the islands that we had been surveying – Ramsay, Alder, Arichika, and the rest* (Figure 343). *We were on top of the world and our spirits soared!*

**Figure 343.** Only ambitious people venture into alpine areas on Haida Gwaii. The reward for Dave Powell (left) and Doug Bertram is a stunning view of Juan Perez Sound. *Photo by Moira J.F. Lemon, 14 June 1984.*

## EM-510 HOUSE ISLAND

**Location:** *52°34'48"N 131°25'26"W; 103 B/11.*
North of Ramsay Island. Colony includes the islet off the east side, east of Hotspring Island.

**Description:** *44 ha; 70 m high; Forested.*
The higher central portion of House Island is surrounded by steep slopes which drop to flat low-lying areas on the east and west sides, and directly to the shore to the north and south. The forest is a mix of hemlock, spruce, and redcedar, with some alder around the edges of the low-lying areas. Ground cover is moss or bare ground, with patches of salal, especially along the shore. Hemlock seedlings were thick on some areas of the northeast slopes, and large tracts of fresh windfall were present on the west end and along the north and east sides of the island in 1984. Wet seepage occurs on the slopes and on the low-lying east side. The tidally connected islets on the west and east sides are forested. An important Haida village was located in the cove on the west side.[79]

**Historical summary:** Surveys were conducted by the BCPM on 22 May and 9 July 1977 and by CWS on 16 to 18 April and 17 and 19 May 1984. In 1977, the Ancient Murrelet nesting population was estimated by counting burrows along three, 20 ft. (6.1 m)-wide strip transects run across different parts of the colony on 22 May (Table EM-510). We boated by the island several times between 9 May and 6 June 1982.

Ancient Murrelets were found nesting only on the main island in 1971 and 1977. We found one burrow on the east islet in 1984. There is no evidence to suggest population change. Ancient Murrelets were regularly observed in Ramsay Passage (see Figure 224 on p. 201) at all times of the day in 1982 and 1984, though numbers were highly variable. The highest count of 1,000 birds was seen on 19 April 1984. Many chicks were heard and seen on the water on the night of 28 May 1982 and several were heard calling on the night of 6 June. Some of these birds may have been associated with the Ramsay Island colony. Summers and Ellis found a few Cassin's Auklets nesting on the east side of the main island and on the east islet. Since then they have been reported nesting only on the east islet.

A pair of Black Oystercatchers with young was seen on the east islet in 1977. No oystercatchers have been recorded on other visits. Pigeon Guillemots were also confirmed nesting on the east islet in 1977; one nest with one young was found in a rock crevice. Some were suspected nesting along the west side of the main island in 1984.

**Table EM-510.** Seabird nesting records for House Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|
| 24, 25 Jun 1971 | | | 4,000e | 50e | 262 |
| May, Jul 1977 | 1 | 5+e(8) | 3,000+e | 50+eS | 39, 314 |
| May, Jun 1982 | | S(20) | x | | 314 |
| Apr, May 1984 | 0 | S(10) | 2,600t | 40eS | 233 |

**Remarks:** House Island was a favorite location for hunting Ancient Murrelets by the Haida.[101] There was an active Bald Eagle nest on the east islet in 1977 and on the main island in 1984. Many Ancient Murrelet kills and depredated eggshells were noted in 1977. Predation was moderate in 1984 (Table 3, page 68). Signs of river otter were observed in 1971 and 1977.

## EM-520 KLOO ROCK

**Location:** *52°35'17"N 131°22'14"W; 103 B/11.*
Off Andrew Point on the north side of Ramsay Island (Figure 344).

**Description:** *0.4 ha; 11 m high; Bare rock.*
Kloo Rock is a jagged rock with near vertical sides (Figure 345).

**Historical summary:** Hidden chicks were suspected associated with the pair of Black Oystercatchers present in 1977 (Figure 346); a nest with one egg was found in 1984 (Table EM-520). Glaucous-winged Gull nests with eggs and young were found in 1977; a pair was present but no nest was found in 1984. Four Pigeon Guillemot nests with eggs or young were found under rocks in 1977.

**Figure 344.** Mid-way between Kloo Rock and Andrew Point on Ramsay Island is a large bed of bull kelp (*Nereocystis luetkeana*). This brown algae is common along the BC coast and warns boaters of shallow reefs. The kelp beds shelter many species of fishes, bivalves, and jelly fishes. *Photo by Moira J.F. Lemon, 24 June 2005.*

**Figure 345.** Kloo Rock is a bare rock with saw-toothed edges. *Photo by R. Wayne Campbell, 9 July 1977.*

**Figure 346.** Black Oystercatcher chicks are black and difficult to spot on bare rock; the presence of agitated adults is a good clue that hidden chicks are nearby. *Photo by R. Wayne Campbell.*

**Table EM-520.** Seabird nesting records for Kloo Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 27 Jun 1971 | | | S(25) | 314 |
| 9 Jul 1977 | 1eS | 2[2] | x4(23) | 314 |
| 11 Jun 1984 | 1 | 0 | (0) | 233 |

**Remarks:** An adult Bald Eagle and signs of river otter were seen in 1984.

## EM-530 MURCHISON ISLAND

**Location:** *52°35'42"N 131°27'14"W; 103 B/11.*
Off the southeast corner of Lyell Island. Colony includes the island on the northwest side and the island and rocks off the east side.

**Description:** *425 ha; 160 m high; Forested; Grassy rock.*
There are many knolls, ridges, bays, and headlands around the perimeter of Murchison Island. Steep slopes and cliffs occur on the northeast point and the west end, and there is a large lagoon on the north side. The island is forested with spruce, hemlock, and redcedar (Figure 347), and the understory is mostly salal, with mossy openings on knobs and ridges near shore and on the steeper slopes above the cliffs at the northeast end. There have been frequent windfalls around the island. The larger, adjacent islands have similar forested habitat, but the rocks off the east side are mostly bare, with patches of grass and forbs. There were several Haida villages and, sometime before 1913, there was a small Japanese abalone cannery operating on the island.[79]

**Figure 347.** Sitka spruce around the perimeter is replaced by a forest of western hemlock and western redcedar in the interior of Murchison Island. *Photo by Ken R. Summers, 20 May 1977.*

**Historical summary:** Surveys were conducted by the BCPM on 20-22 May and 8 July 1977 and by CWS on 22 April, 1 and 16 May, and 10 June 1984. Only the east rocks were surveyed in 1985 and 1986.

Between 1977 and 1984, estimated populations of Ancient Murrelets and Cassin's Auklets declined, although overall trends since 1971 are less clear (Table EM-530). Summers and Ellis in 1971 estimated only a few pairs of Ancient Murrelets nesting amongst Cassin's Auklets along the east side of the northeast peninsula. That is the only area they explored. Observers in May 1977 counted 117 Ancient Murrelet burrows and estimated over 500 in that area, many more than in 1971. About 100 Ancient Murrelet burrows were also found on headlands on the southeast side opposite Hotspring Island in 1977. Those areas were abandoned by 1984, and a remnant population was confined to the northeast peninsula. Observers in 1977 found old burrows on the southeast headlands and suspected that the colony had been more extensive in the past. Cassin's Auklets have been found nesting only on the northeast peninsula. Burrows were seen along the east side and on the north tip of the peninsula in 1971 and 1977, but were confined to the north tip in 1984. Some areas of abandoned burrows were noted around the falcon eyrie in 1977. Abandoned burrows and contraction of colony areas suggest that populations have decreased for both species since 1977.

Pelagic Cormorants nest on the cliffs at the northeast end of the island. When Summers and Ellis surveyed the area in 1971, the cormorant colony was the largest along the east coast of Moresby Island. They counted 92 nests and estimated a total of 100. Other observations indicate fewer numbers using the site intermittently.

Black Oystercatcher nests have been found on the east rocks. Glaucous-winged Gulls were nesting only on the east rocks in 1971, 1977, and 1979. In addition to nests on the east rocks, five pairs were suspected nesting on the northeast cliffs in 1982, and three pairs were suspected nesting there in 1984 and 1986. Thirteen of the 14 nests found in 1979 were empty and likely depredated. More nests were counted in 1986 than in other years but again many nests were empty; only seven of the 24 nests counted on the east rocks held eggs.

Pigeon Guillemots have been suspected nesting at three locations along the east side, including the east rocks. The count of birds in 1984 was more thorough than in 1986, as only the east rocks were surveyed in 1986.

**Remarks:** Signs of rats were encountered in 1984 and they have likely contributed to the decline in burrow-nesting seabirds on the island. There were two active Bald Eagle nests and a Peregrine Falcon eyrie in 1977 and 1984 (Figure 348). Remains of 28 birds, mostly Ancient Murrelet and some Cassin's Auklet, were found near the falcon eyrie in 1977. River otter were noted in 1977 and 1984 and the remains of a Pigeon Guillemot were seen near an otter den at the south end of the island in 1984. Remains of Fork-tailed Storm-Petrels were found on the northeast peninsula in 1977 but no evidence of nesting has been discovered.

**Figure 348.** A Peregrine Falcon eyrie was located on a grass ledge at the base of a triangular rock cliff on Murchison Island. *Photo by R. Wayne Campbell, 30 May 1990.*

**Table EM-530.** Seabird nesting records for Murchison Island. See Appendix 2 for codes.

| DATE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 1 Jun 1969 | 24e | | | | | | 314 |
| 26 Jun 1971 | 100e | 2eS | 6e | S(33) | 25e | 200e | 262, 314 |
| May, Jul 1977 | 8[a] | 1 | 6[3] | 14+eS(48) | 800+e | 150e[a] | 39, 314 |
| 9 Aug 1979 | | 2+S | 14[1] | | | | 314 |
| 6 Jun 1982 | 0 | | 5eS | | | | 314 |
| Apr-Jun 1984 | 21 | | 3+eS | S(28) | 20e | 50eS | 233 |
| 13 Jun 1985 | | | 12+eS | | | | 233 |
| 20 Jun 1986 | 0 | 2[1] | 27e | S(10) | | | 233 |
| 15 Jun 1988 | | | | (11) | | | 315 |

[a] Corrected from Campbell and Garrioch,[39] who based their estimates for Pelagic Cormorants and Cassin's Auklets on data from Summers.[262]

**Food Fantasies**

*It doesn't take long for people living in field camps to start fantasizing and talking about food. Even with the best camp food, cravings for the food you can't have become more intense the longer you are out. Campfire conversations after a few weeks more and more include: "Oh, what I wouldn't give for a fresh-baked cherry pie, or a double-layered chocolate fudge cake, or a pizza with all the toppings; or a lovely, crisp, tossed salad, loaded with juicy tomatoes and creamy avocados, laced with Kalamata olives, and smothered in a garlic-balsamic dressing; or a fresh ripe peach that drips juice down your chin when you bite into it." Everybody has their own particular cravings. For Ken Summers and Dave Ellis, it was bread.*

*During their 1971 survey, Ken and Dave had only basic rations for camp food and often were scraping the bottom of the camp larder, living mostly on fish, seaside plantain* (Figure 349)*, and other foods they could harvest locally. It was thus a fantasy come true when a family of halibut fishermen at Hotspring Island offered them lunch. Ken's journal tells the story (material in square brackets has been either summarized or added later by Ken): "One topic that we had discussed very much during the week was food (not that we were hungry but unsalted cod became a little tiring after a while) and the one item we both wanted most was bread. We were thus delighted when we sat down to lunch to find an entire loaf of home-made bread on the table. When the others stopped eating, we continued until there was only one slice left. I would have left it until it was offered to me; however, Dave being less hindered by customs, and knowing that I was eying it as greedily as he was, picked it up and (with all five crew members watching) broke it in half and gave me half." [We probably would have devoured a whole other loaf had one been put before us.]*

*The only thing other than scrumptious food that might distract a young man's fantasies on these expeditions was a pretty face. Another encounter by Ken and Dave addressed both: "While we were checking for colonies between Murchison and Faraday Islands, we came across a 40-foot sailing vessel, the Homeward Bound, anchored north of Murchison. We went over and talked with the owner, Sam Simpson, over an offer of ham, eggs and whisky. Sam is a 65-year-old resident of Naden Harbour (having lived there since 1916) and takes one or two parties on a cruise each summer. He is currently on tour with Dr. and Mrs. Ferguson of San Francisco and their 19-year-old daughter and 21-year-old son. The Fergusons had been visiting Hotspring Island and returned while we were aboard.*

*"The Fergusons invited us for a fruit salad dinner that evening, and we offered to supply abalones [that we had already gathered*]. With that decided, we went off to finish our check of islands in the Hotspring and House Island chains and prepare the abalones. [Although the journal doesn't say, I'm sure we also cleaned up — if only to impress the 19-year-old daughter — having spent more than five weeks living in our tent and cooking over a fire].*

*"We returned near dinner time and talked with our hosts while waiting for Dr. Ferguson and his son to return from fishing. As Mrs. Ferguson put the abalone into the frying pan she held up one slice and exclaimed about how much it would cost in San Francisco. California wine and Canadian whisky contributed to an enjoyable meal as we dined on local abalones, salad made of fresh California fruit, and noodles with mushrooms, followed by cake with chocolate sauce for desert." [It was a wonderful banquet compared to our standard camp fare! The Fergusons loved the abalones* (Figure 350) *and each party felt the other had contributed the best part of the meal. Then it was back to our world, as we left them to theirs.]*

**Northern Abalones were very abundant in those days, though likely artificially so because their primary predator, sea otters* (Enhydra lutris)*, had been wiped out during the previous century. Due to their abundance, a commercial fishery was opened in the 1980s that wiped them out too—two times. Now abalones are endangered federally and Red-listed provincially.*

**Figure 349.** Seaside plantain (*Plantago maritima*), commonly known as goose tongue, is a coastal plant that grows in brackish and salt marshes as well as on cliffs and ledges. The young leaves can be eaten raw or cooked. *Photo by R. Wayne Campbell, Skidegate Inlet, BC, 18 June 1974.*

**Figure 350.** During seabird surveys in the 1960s and 1970s, Northern Abalone (*Haliotis kamtschatkana*) was an abundant intertidal marine snail along the BC coast and some crews gathered them to eat. In this photo, from left to right, Lowell Orcut, Ken Kennedy, and Norm Clarkson are preparing a few at the end of a trip to Langara Island. The fishery was closed in 1990 due to illegal harvesting. *Photo by R. Wayne Campbell, May 1966.*

## EM-540 AGGLOMERATE ISLAND

**Location:** *52°37'40"N 131°25'24"W; 103 B/11.*
Off the southeast side of Lyell Island, northeast of Murchison Island, south of Kawas Islets (see Figure 354 on p. 285). Colony includes the rocks at the south end.

**Description:** *20.5 ha; 83 m high; Forested; Bare rock.*
Agglomerate Island is long and narrow, with a steep-sided ridge running down its spine. The lower south section is covered with dense salal under a predominantly spruce forest, some of which has blown down. Salal rims the west side and covers the north end of the higher north section, but gives way to moss and bare litter under redcedar, hemlock, and spruce in the interior (Figure 351). There is extensive rocky shoreline along the east side, with some grassy areas, and a bare rock off the south end (Figure 352).

The island had been burnt over and was covered with standing dead trees in 1878.[79] In 1986, forestry test plots had been recently cut in the middle of the island.

**Historical summary:** BCPM crews visited the island on 20 May and 8 July 1977. We boated by the island in 1982. The main CWS survey was begun in 1984 and completed in 1985. Only surface-nesting species were surveyed in 1986.

Except for Cassin's Auklets, historical records for burrow-nesting species on Agglomerate Island are difficult to interpret (Table EM-540). Foster documented nesting by Ancient Murrelets in 1960. Summers and Ellis reported Fork-tailed Storm-Petrels nesting extensively throughout forested areas in 1971. They noted that burrows were large, as if old Ancient Murrelet burrows were being used. Identification was based on numerous feathers found in burrow entrances and many depredated remains scattered throughout colony areas. Only a few pairs of Ancient Murrelets were reported nesting on open, interior slopes under spruce forest. Observers in May 1977, extrapolating from burrow counts made in eight 20x20 ft. (37.2 $m^2$) quadrats surveyed along two transects run up the east side, estimated a total of 4,700 Ancient Murrelet burrows on the northern half of the island. They

**Figure 351.** Agglomerate Island is long and narrow and is forested with Sitka spruce, western hemlock, and western redcedar. *Photo by Moira J.F. Lemon, 16 June 1986.*

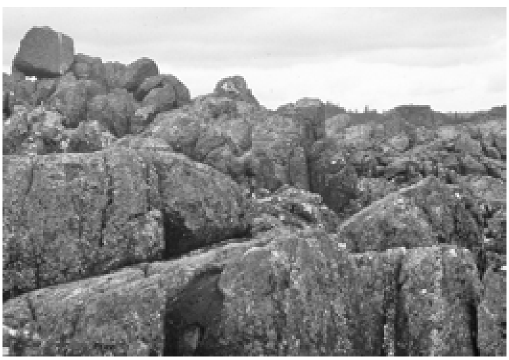


**Figure 352.** The south rock and much of the eastern shoreline of Agglomerate Island is bare rock. *Photo by Michael S. Rodway, 20 June 1986.*

also recorded remains and burrows of Fork-tailed Storm-Petrels throughout the northern area, and found some remains at the south end. However, in July 1977, storm-petrel-sized burrows were seen on the northern part of the island extending from the east shore up to 400 ft. (122 m) inland, but observers reported no Ancient Murrelet-sized burrows and no evidence of nesting by Ancient Murrelets other than one kill found, even though, as they noted "…much suitable Ancient Murrelet habitat exists." Abundant remains of Leach's Storm-Petrels were seen – many feathers and wings scattered about – and some Fork-tailed Storm-Petrel remains were noted. No burrows were found in the southern portion of the island. In 1984/85, we found mixed storm-petrel and Ancient Murrelet burrows over northern areas, with some along the east side of the southern portion. Fork-tailed Storm-Petrel and Ancient Murrelet remains were also found throughout these areas. Cassin's Auklets were nesting on perimeter slopes in all years, mainly at the north tip and along the west side of the southern portion of the island.

Storm-petrel burrows were reported in the same areas in all survey years and total numbers estimated in 1985 were similar to those of the rougher estimate made in 1971. Except in 1985, when Fork-tailed Storm-Petrels were confirmed nesting, species identification has been based on depredated remains. Fork-tailed Storm-Petrels nest earlier than Leach's Storm-Petrels, which may explain the prevalence of Fork-tailed remains found in May 1977 and June 1985 and those of Leach's in July 1977. However, in July 1971, only Fork-tailed remains were recorded. This suggests that Leach's Storm-Petrels have become proportionately more abundant since 1971.

More puzzling is the history of observations for Ancient Murrelets. Colony area and numbers estimated in May 1977 and in 1985 were similar. However in July 1977, only storm-petrel-sized burrows were reported in contrast to the numerous Ancient Murrelet burrows counted in May. More Ancient Murrelet-sized burrows were reported in July 1971 than in July 1977, but observers in 1971 thought that most of those larger burrows were being used by storm-petrels. Ancient Murrelets would have largely departed the colony by July and perhaps late-nesting Leach's Storm-Petrels were using vacated Ancient Murrelet burrows in 1971 and 1977, and in 1977 were actively obstructing the entrances so that they appeared smaller.

Black Oystercatchers and Glaucous-winged Gulls nest on the southern rock. Oystercatcher nests found in 1977 were empty. Fewer gulls were nesting in 1986 than in 1977, contrary to the general trend for the area. Observers in 1971, 1979, and 1982 did not land on the rock. Adult gulls were visible on territories in 1971 and 1982. No adults or young were seen when Michael Shepard from the BCPM boated by the rock in 1979, although his visit was late in the season. Pigeon Guillemots were recorded around the island only in the 1980s and were seen flying from nesting crevices on the southern rock in 1986.

**Table EM-540.** Seabird nesting records for Agglomerate Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|
| 27 Jul 1960 | | | | | | | x | | 94 |
| 2 Jul 1971 | | 10,000+eS | | | 5eS | (0) | 25e | 200eS | 262, 311 |
| May, Jul 1977 | | S | 1,000+eS | 2S | 21[16] | (0) | 2,000+e | x | 39, 314 |
| 9 Aug 1979 | | | | | 0 | | | | 314 |
| 28 May 1982 | | | | 1eS | 4eS | | | | 314 |
| 29 Apr 1984 | x | | | | | S(14) | x | 200eS | 233 |
| 15 Jun 1985 | 5,500t[a] | x | S | | | S(12) | 2,200t | | 233 |
| 20 Jun 1986 | | | | 2[2] | 2[1] | x2(6) | | | 233 |

[a] Total number of breeding pairs was derived from transect surveys but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** One active Bald Eagle nest was recorded in 1977 (Figure 353) and 1984. Two Peregrine Falcons were sighted flying over the island in July 1977. As noted above, remains of Fork-tailed Storm-Petrels were numerous throughout the interior of the island in 1971 and in May 1977, and remains of Leach's Storm-Petrels were scattered throughout the island in July 1977. Predation was moderate on Fork-tailed Storm-Petrels and Ancient Murrelets in 1985 (Table 3, page 68). Two Fork-tailed Storm-Petrel burrows had been dug up in 1985. A river otter was seen at the south end in 1984.

**Figure 353.** Two down-covered Bald Eagle chicks were found in a nest 70 feet above the ground in a Sitka spruce tree on Agglomerate Island in 1977. *Photo by Ray Billings, 20 May 1977.*

## EM-550 KAWAS ISLETS

**Location:** *52°38'42"N 131°24'41"W* (north islet); *103 B/11.*
Off the east side of Lyell Island.

**Description:** *9.8 ha; 41 m high; Forested; Grassy rock.*
The five Kawas Islets (Figure 354) have rocky shores with steep bluffs and small cliffs on perimeter and interior slopes. Jumbles of large boulders occur at the base of some of these cliffs. The larger north (#1) and south (#5) islets are covered with thick salal under spruce (Figure 355), with fringes of grass, moss, and small, regenerating spruce. The smaller islets (#2-4) are mostly bare rock (Figure 356), except higher sections on islets #3 and #4 are grassy with a few small spruce trees on islet #4.

**Historical summary:** The islets were surveyed on 20 May and 10 July 1977, and on 29 April 1984 (southern two islets #4 and #5) and 13 June 1985 (northern islets #1-3). Only the middle rocky islet (#3) where gulls were nesting was surveyed in 1986.

Foster confirmed nesting by Cassin's Auklets on the north islet (#1) in 1969 (Table EM-550). Summers and Ellis noted that they were nesting only on that islet in 1971, but in 1977 (Figure 357) and 1984/85 burrows were found in grassy perimeter areas of both north (#1) and south (#5) large islets. Observers in May 1977 stated that there were more Cassin's Auklet burrows on the north islet than on the south islet. The reverse was true in 1984/85. These records suggest that Cassin's Auklets have colonized and expanded on

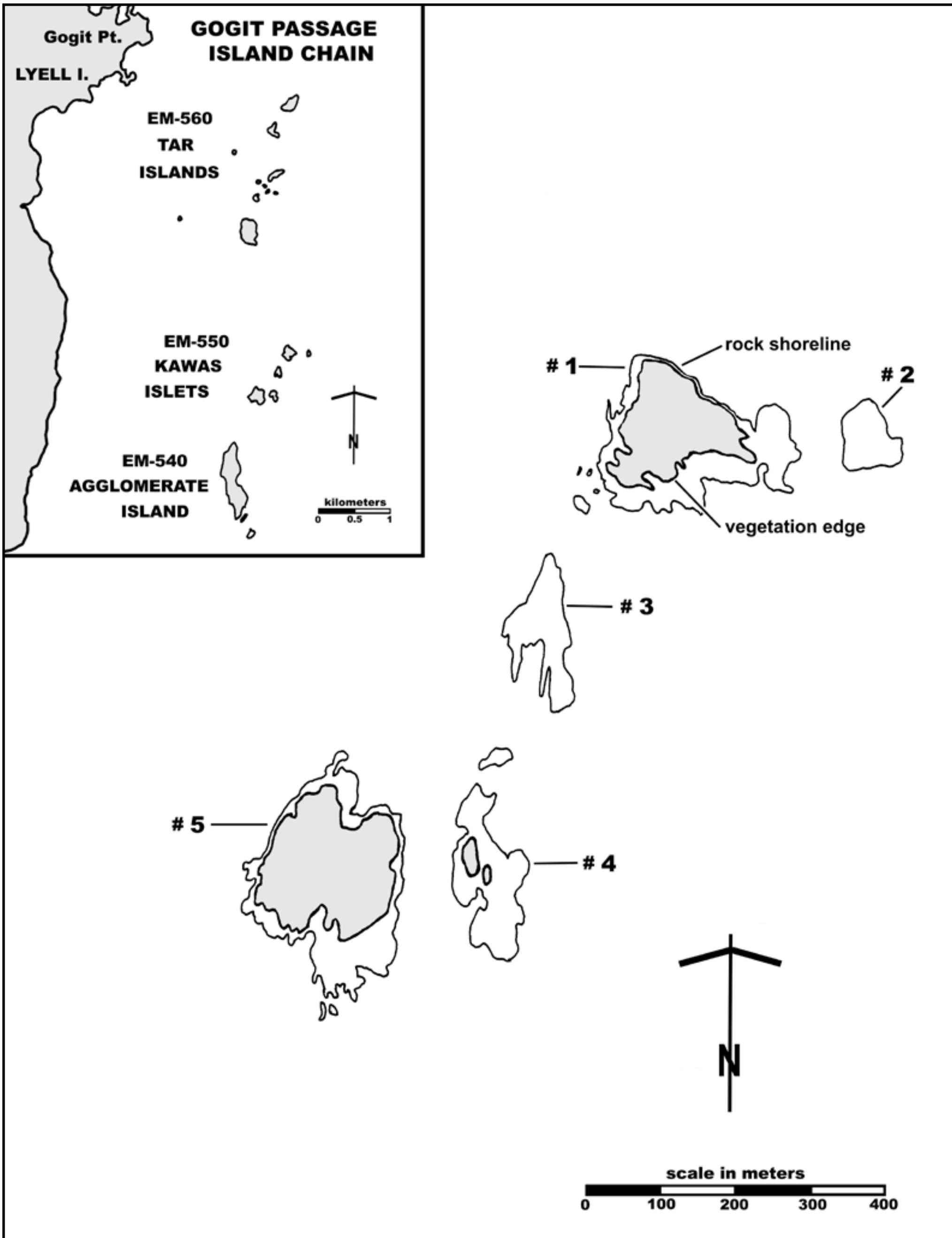



**Figure 354.** Numbered islets in the Kawas Islets and overview of the Gogit Passage island chain.

the south islet since 1971, although still only in small numbers. A few burrows were also found on the small, southeast islet (#4) in 1984.

Records also suggest that Fork-tailed Storm-Petrels colonized the islands between 1971 and 1977. Ken Summers was part of the survey crew in both years and found none in 1971 but estimated as many as 500 burrows on the north island in May 1977. We found them nesting on the large, north islet and on the two southern islets (#4 and 5) in 1984/85. Observers in 1977 and 1985 found many nesting in the jumble of boulders that runs across the north islet at the base of the steep rocky bluffs, as well as on perimeter grassy slopes under salal and regenerating spruce.

Observers in July 1977 reported 50-100 old Tufted Puffin or Rhinoceros Auklet-sized burrows that were overgrown. There are no other reports of large burrows on the islets.

**Figure 357.** About a two-day-old Cassin's Auklet chick extracted from a burrow on the Kawas Islets in 1977. *Photo by R. Wayne Campbell, 10 July 1977.*

**Figure 355.** The larger islets in the Kawas Islets are covered with thick salal under Sitka spruce forest. *Photo by R. Wayne Campbell, 10 July 1977.*

Black Oystercatcher nests were found in 1971 and 1977 but locations were not specified. In 1985, a pair was suspected nesting on the northeast rock (islet #2) and a nest was found on the middle rock (#3). Nests were found on islet #3 in 1986. Glaucous-winged Gull nests have been found only on the middle rock (#3). All nests counted in 1979 were empty, but chicks were already fledging and four ready-to-fledge young were seen on the rock. Only three of the nine gull nests contained full clutches in 1985, one other contained a depredated egg, and the rest were empty. Nine of the 11 gull nests found in 1986 contained eggs; the remaining two nests were under construction.

**Figure 356.** The smaller Kawas Islets are bare rock. *Photo by Michael S. Rodway, 20 June 1986.*

Pigeon Guillemots were present on and around the middle rock (#3) in 1971. Nests were reported on the middle rock in 1985 and 1986 and on the northeast rock (#2) in 1985. We combined records from 1985/86 to provide an overall estimate for numbers of Pigeon Guillemots present and the number of nests found (total of 7 birds and 4 nests).

**Table EM-550.** Seabird nesting records for Kawas Islets. See Appendix 2 for codes.

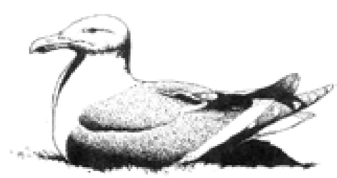
| DATE | FTSP and/or LSPE | FTSP | BLOY | GWGU | PIGU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| 25 May 1969 | | | | | | x | 262 |
| 2 Jul 1971 | | | 1 | 9e | 20eS(40+) | 300e | 262, 314 |
| May, Jul 1977 | | 300e | 1 | 24[15] | 15+eS[a] | 250e | 39, 314 |
| 9 Aug 1979 | | | 2S | 21[0][b] | | | 314 |
| 1984, 85 | 700e[c] | x | 2e | 9[4] | x4(4) | 200e | 233 |
| 20 Jun 1986 | | | 3[2] | 11[9] | x(5) | | 233 |

[a] Pigeon Guillemots were recorded present in 1977 but no numbers or information on nesting was given. We suspect the estimate of 15+ pairs nesting was derived from data in Summers.[262]

[b] See text.

[c] Total number of breeding pairs was estimated from partial counts but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** Abundant river otter scats containing fish scales and feathers were noted in 1971 and runs were seen in 1977. One active Bald Eagle nest was recorded in 1977 and 1985. Remains of 11 Fork-tailed Storm-Petrels were found in May 1977 and a few Fork-tailed Storm-Petrel and Cassin's Auklet remains were seen in 1985. Deer trails were evident in 1984/85. Browsing of salal by deer may have opened up nesting habitat for Fork-tailed Storm-Petrels and Cassin's Auklets.



## EM-560 TAR ISLANDS

**Location:** *52°40'37"N 131°24'43"W* (north island); *103 B/11.*
Off the east side of Lyell Island, north of Kawas Islets (see Figure 354 on p. 285). Colony includes the rocks to the west in Gogit Passage.

**Description:** *18.3 ha; 66 m high; Forested; Grassy rock.*
The shorelines of these 11 islands (Figure 358) are rocky with frequent small cliffs and bluffs. Much of the area on the larger islands is covered with dense salal mixed with salmonberry and twinberry under spruce forest. Patches of grass grow on the fringes, as well as over more extensive areas on some of the islands. Smaller rocks are mostly bare, with tufts of grass and forbs (Figure 359).

**Historical summary:** Species recorded and numbers of burrows estimated have varied somewhat among visits, but overall there is little evidence to indicate population changes on these islands (Table EM-560). Foster in 1961 observed burrows under salal and suspected both Ancient Murrelets and Cassin's Auklets nesting. However, Summers reported no signs of nesting by Ancient Murrelets and made no mention of Cassin's Auklets in 1971.[262] No definite evidence of Ancient Murrelets nesting has yet been found, but active-looking Cassin's Auklet burrows (feces and feathers at entrances) were found in perimeter habitat on three islands in 1977 and six islands (#1, 2, 7, 8, 9,

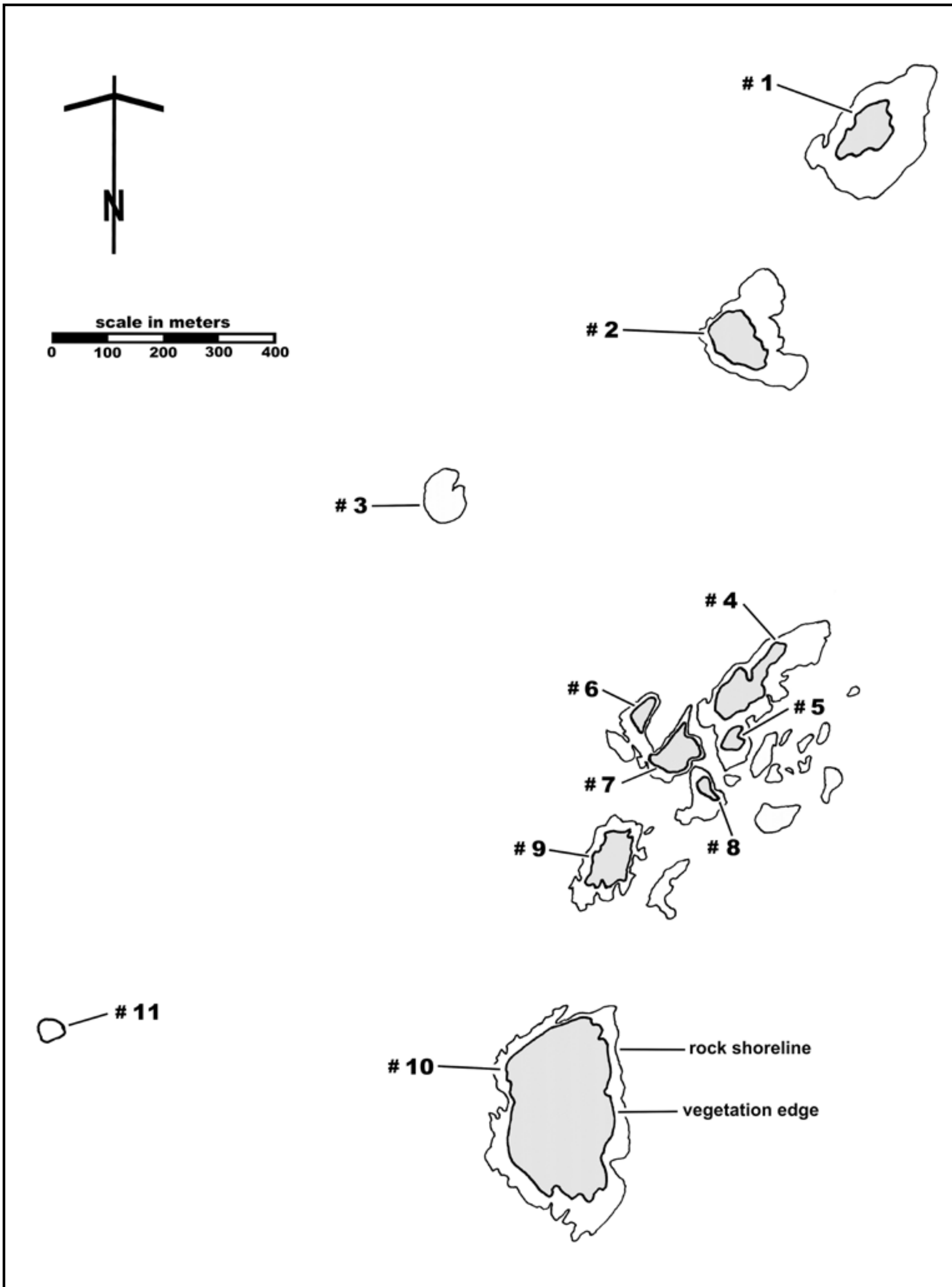



**Figure 358.** Numbered islands in the Tar Islands referred to in the text.

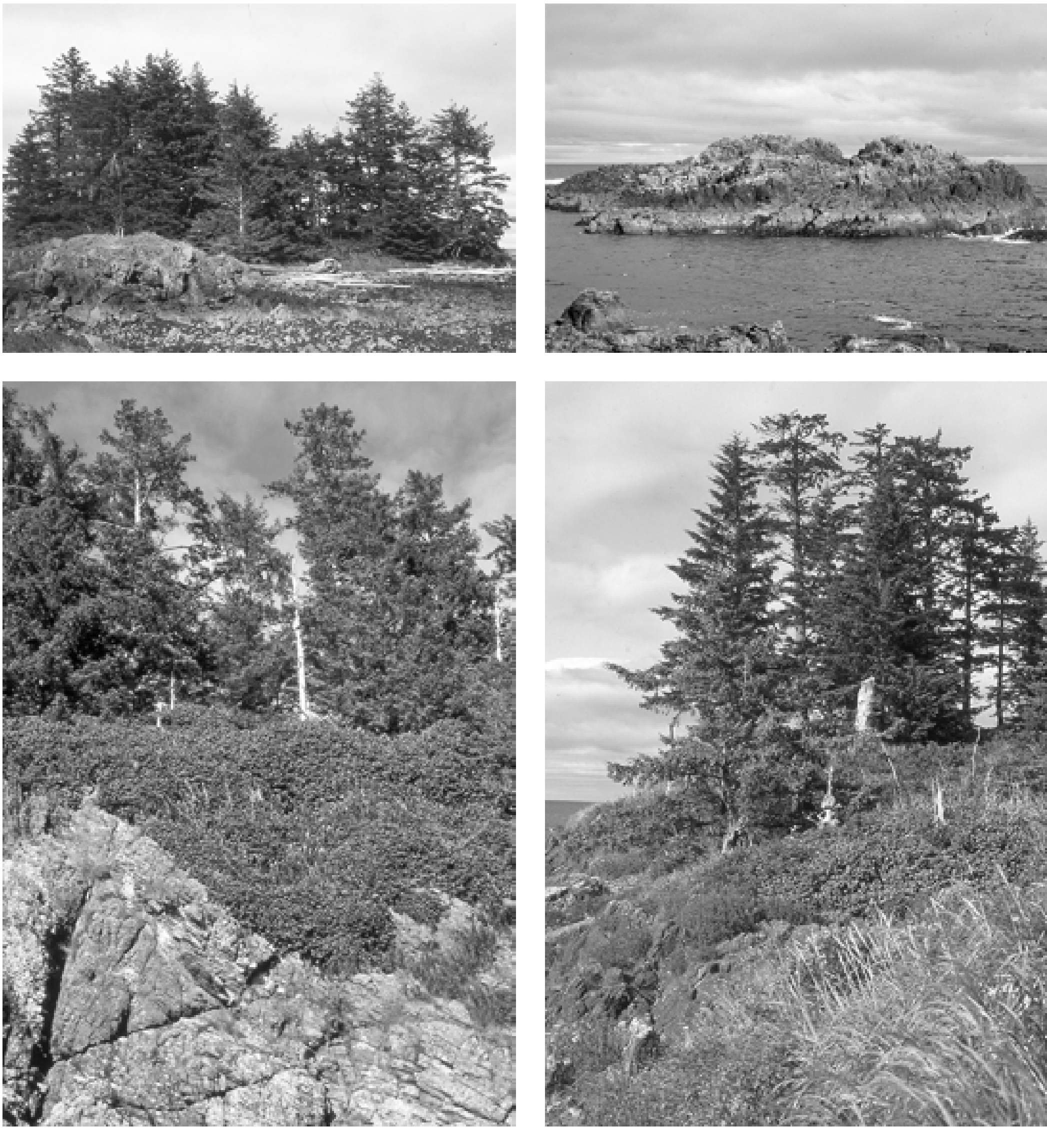


**Figure 359.** Habitats on the 11 Tar Islands include small cliffs, rocky bluffs, Sitka spruce forests with dense salal understories, perimeter patches of grasses and forbs, and bare rock. *All photos by R. Wayne Campbell, 10 July 1977.*

and 10) in 1985. On the north island (#1) in 1985, three active-looking burrows were found on the north and west sides and six old, obviously abandoned burrows were found on the southwest knob.

An adult Leach's Storm-Petrel was pulled from a burrow and remains of Fork-tailed Storm-Petrels were found on four islands in 1971. One or two Fork-tailed Storm-Petrel remains were noted in May 1977, but no storm-petrel burrows were reported on either the 20 May or 10 July visit in 1977. We counted storm-petrel burrows on six islands (# 4 and #6-10) and confirmed both species nesting in 1985.

In 1971, Summers [262] noted two partially built but unattended Pelagic Cormorant nests on the west side of island #2; only immature cormorants were roosting. In 1982, we observed two nests being built and 22 breeding birds at the same location. No evidence of successful nesting has been recorded.

Black Oystercatchers have been reported nesting on seven (#1, 2, 3, 5, 9, 10, and 11) of the 11 islands. Of the two nests found on islands #3 and #11 in 1979, one young was located near one nest and young were suspected around the other. Seven of eight nests found in 1985 held eggs.

Numbers of Glaucous-winged Gulls nesting have varied, from two nests found in 1977 to 32 pairs estimated nesting in 1986, but overall suggest little change in the nesting population between 1971 and 1986. Gulls were nesting on island #2 (8 nests inspected, 4 with eggs; total of 10 pairs estimated) and island #3 (16 nests, 9 with eggs) in 1971. In 1979, seven and 10 nests were found on islands #3 and #11, respectively. Observers also noted one pair possibly nesting on island #2. All gull nests were empty, no young were seen, and evidence of predation (3 dead gulls and some eggshell pieces) was observed during the late season survey in 1979. In 1986, nests were found on islands #2 (5 nests found, 4 with eggs; total of 9 pairs estimated; Figure 360), #3 (14 nests, 13 with eggs), and on the southwest rock, island #11 (9 nests with eggs).

Pigeon Guillemots were recorded in a list of birds seen in July 1977 but no numbers were given. In 1985, guillemots were sighted around three islands (#2, 4, and 5) and two nests with eggs were found in crevices on the west side of island #2.

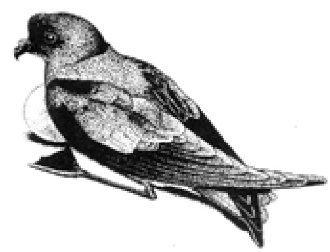
**Figure 360.** Nine pairs of Glaucous-winged Gulls were recorded nesting at the edge of the Sitka spruce forest on the northern island #2 of the Tar Islands in 1986. *Photo by Michael S. Rodway, 20 June 1986.*

**Table EM-560.** Seabird nesting records for Tar Islands. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | LSPE | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 Jul 1961 | | | | | | | | S | S | 262, 314 |
| 1 Jul 1971 | | 15eS | 15e | 0 | 7eS | 26e[a] | | 0 | | 262, 314 |
| May, Jul 1977 | | 0[b] | 0[b] | 0 | 2[2] | 2[2][b] | (≥1) | | 100eS | 39, 314 |
| 19 Aug 1979 | | | | | 2 | 17[0] | | | | 314 |
| May 1982 | | | | 2S | 1 | 12eS | | | | 233 |
| 13 Jun 1985 | 330e[c] | x | x | 0 | 10e | 24e | x2(46) | 0 | 120eS | 233 |
| 20 Jun 1986 | | | | 0 | 6+[2] | 32e | | | | 233 |

[a] Summers reported 24 nests,[262] but noted two additional nests were suspected.[314]
[b] Corrected from Campbell and Garrioch,[39] who quoted estimates from Summers.[262]
[c] Total number of breeding pairs was estimated from partial counts but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

**Remarks:** Two pairs of Bald Eagles were present in 1971 and there were two active Bald Eagle nests in 1985. A Peregrine Falcon was sighted around the cliffs on island #2 in 1979. Much river otter sign was noted in 1971 and runs were seen in 1985. A few depredated remains of Fork-tailed Storm-Petrels, Glaucous-winged Gulls, and Cassin's Auklets were found in 1977 and 1985.



## EM-570 TUFT ISLETS

**Location:** *52°42'07"N 131°24'43"W; 103 B/11.*
East of Fuller Point on Lyell Island.

**Description:** *5.3 ha; 40 m high; Grassy rock; Bare rock.*
Tuft Islets are a small chain of about five rocky islets. The islets have steep rocky sides (Figure 361) with grasses and forbs on the crests of the southern three islets. The largest islet has a few spruce trees (Figure 362). The northern two islets are low bare rocks.

**Figure 361.** Most of the Tuft Islets have steep rocky profiles. *Photo by Michael S. Rodway, 10 July 1977.*

**Figure 362.** There are about 10 Sitka spruce trees growing on the largest of the Tuft Islets. *Photo by Michael S. Rodway, 10 July 1977.*

**Historical summary:** Nesting populations have declined on these islets (Table EM-570). The small colony of Tufted Puffins that Foster confirmed in 1960 was abandoned when he returned in 1969. Cassin's Auklets also may have abandoned this site, although they were never confirmed breeding. Foster reported Cassin's Auklet burrows in the grass in 1961, Summers found three Cassin's Auklet-sized burrows in 1971, and we found only five old Cassin's Auklet-sized burrows on the southern islet in 1982. Fewer Glaucous-winged Gulls have been recorded nesting since Foster confirmed breeding in 1961. Pigeon Guillemots likely nest but have not been confirmed breeding.

**Table EM-570.** Seabird nesting records for Tuft Islets. See Appendix 2 for codes.

| DATE | GWGU | PIGU | CAAU | TUPU | SOURCE |
|---|---|---|---|---|---|
| 27 Jul 1960 | | 20eS | | 30e | 94, 314 |
| 4 Jul 1961 | 4[4] | | S | | 262, 314 |
| 27 May 1969 | | | | E | 262 |
| 1 Jul 1971 | | S(60) | | E | 262, 314 |
| 11 Jul 1977 | 1 | (0) | | | 314 |
| 9 May 1982 | 1eS | S(1) | 0 | E | 233 |

**Remarks:** One dead Cassin's Auklet was found in 1961. A pair of Bald Eagles was present in 1971 and there was one active Bald Eagle nest in 1982. Many river otters were seen in 1971.

## EM-580 LYELL ISLAND, DODGE POINT

**Location:** *52°44'N 131°29'30"W; 103 B/11.*
Dodge Point is at the northeast corner of Lyell Island.

**Description:** *17,290 ha; 110 km perimeter; 629 m high; Forested.*
Lyell Island is the largest island in BC to support a colony of burrow-nesting seabirds (Figure 363). Presently, seabirds are known to nest only in the vicinity of Dodge Point. The topography around the Dodge Point area is steep, with rock bluffs (Figure 364), slides, scree slopes, windfalls, creek valleys, and wet seepage areas that frequently disrupt the open forested slopes. The slopes are bare or mossy under a forest of predominantly spruce near shore, changing to more hemlock and redcedar in the interior. There are some grassy slopes on the east side south of Dodge Point.

*cont'd next page*

**Figure 363.** Lyell Island (in foreground), at over 17,000 ha in size, is the largest island in BC that supports a colony of burrow-nesting seabirds. *Photo by Moira J.F. Lemon, May 1982.*

Clear-cut logging was extensive in the past (Figure 365) but no longer occurs on the island since its inclusion into Gwaii Haanas.

**Historical summary:** The Haida of Tanu knew of the Ancient Murrelet colony at Dodge Point and also at another location on the north side of Lyell Island opposite Dog Island.[101] Those areas were traditional hunting sites.

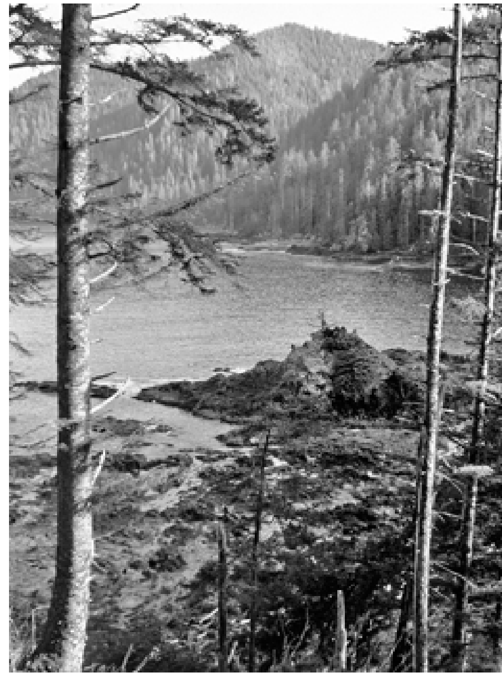


**Figure 364.** The terrain on the east side of Lyell Island is very steep with rock bluffs. *Photo by Moira J.F. Lemon, 15 May 1982.*

**Figure 365.** Portions of the east side of Lyell Island in the vicinity of Dodge Point have been previously logged. *Photo by R. Wayne Campbell, 10 June 2000.*

The colony at Dodge Point was repeatedly investigated during the 1970s due to the need for forestry management plans (Table EM-580). British Columbia Fish and Wildlife Branch explored the area and mapped the colony between 8 June and 1 July 1975, and 31 May and 2 June 1976. They found no sign of nesting in the vicinity of Dog Island.[158] BCPM crews visited the area from 17 to 20 May 1977 (Figure 366). Blood and Associates conducted a more intensive survey between 22 and 31 May 1979, running 17 strip transects (10 m wide) through the colony.[17] CWS repeated the survey from 20 April to 28 May (Figure 367), and 6 to 9 June 1982, with 459 quadrats, each 25 m$^2$, placed along 25 line transects.[233] We only boated by the island in 1986.

**Figure 366.** Plot used to count Ancient Murrelet burrows in the forest on Dodge Point, Lyell Island in 1977. *Photo by Ray Billings, May 1977.*

**Figure 367.** For 39 days in 1982, this field camp was used as a base by Moira Lemon and Michael Rodway from which to survey the extent of the colony and estimate numbers of Ancient Murrelets nesting on Lyell Island. *Photo by Moira J.F. Lemon, May 1982.*

Colony boundaries appear to have contracted from 1976 to 1982, based on information from various surveys. Colony area was estimated to be 445 ha (229 ha of higher density) in 1976, 170 ha (68 ha of higher density) in 1979, and 126 ha (66 ha of higher density) in 1982. The 1976 area estimate may be inflated due to generalizing colony extent from limited exploration. High and moderate density areas were of similar extent in 1979 and 1982, but extensive low density areas had disappeared (40 ha), suggesting that the colony was contracting to the higher density core. How this translates into population trends is unclear as only the 1979 and 1982 figures are from comparable methods. Nesting is very sparse in low density areas, and abandonment of those areas would involve only a small proportion of the overall population.

The Ancient Murrelet staging area was between 2 and 6 km off the east side of Lyell between Dodge Point and Fuller Point in 1982 (see Figure 224 on p. 201). We counted 941 birds in that area on 8 June 1982.

In 1982, we repeatedly observed large groups of Marbled Murrelets in the bay at the mouth of Gate Creek on the east side of Lyell Island, and scattered birds along the north end of the island near Dodge Point. In 1983, 245 Marbled Murrelets were counted near the Topping Islands on the west side of Lyell Island on 13 May. A group of 142 birds were seen in this same area by observers on 10 July 1977. These observations suggest that Lyell Island is an important area for this species and should be investigated for nesting evidence.

Pelagic Cormorants have been observed or suspected nesting at two locations. They were suspected nesting in 1982 in a sea cave on the north side of the point 0.5 km east of Dodge Point, although no nests were seen. In 1986, one adult was sitting on a nest located on the cliffs just north of Fuller Point (Figure 368). There are no records of those coastline areas being explored on earlier surveys. Black Oystercatchers were found nesting at two locations in 1982: two nests with eggs located 5 m apart on the rocky point 1 km west of Dodge Point, and one empty nest attended by two agitated adults on Dodge Point. Pigeon Guillemots were suspected nesting around Dodge Point in 1982.

**Figure 368.** Location of a Pelagic Cormorant nest on the cliffs north of Fuller Point on Lyell Island in 1986. *Photo by Michael S. Rodway, 20 June 1986.*

**Table EM-580.** Seabird nesting records for Lyell Island, Dodge Point. See Appendix 2 for codes.

| DATE | PECO | BLOY | PIGU | ANMU | MAMU | SOURCE |
|---|---|---|---|---|---|---|
| Jun, Jul 1975 | | | | x | | 158 |
| May, Jun 1976 | | | | 10,000+e | | 158 |
| 17-20 May 1977 | | | | 60,000e | | 39 |
| 22-31 May 1979 | | | | 10,400t | | 17 |
| Apr-Jun 1982 | S | 3[2] | S(4) | 10,700t | S(292) | 233 |
| 20 Jun 1986 | 1 | | | | | 233 |

**Remarks:** Past clear-cut logging likely destroyed Marbled Murrelet nesting habitat and encroached on the western extent of the Ancient Murrelet colony. Slides originating in the logging slash above destroyed previously identified nesting areas.

Signs of introduced Black (also called Alexandrian) Rats have been reported on most surveys. Observers in 1977 reported seeing one rat, and surveyors in 1979 and 1982 saw rat droppings, encountered Ancient Murrelet skulls and other bones within burrows, and found caches of Ancient Murrelet eggshells and adult carcasses chewed open around the neck and breast that were likely a result of rat predation (Figures 369 and 370). We suspect that rats were responsible for the contraction of Ancient Murrelet colony area observed between 1976 and 1982 (and for further declines documented in 1992 and the likely extirpation of the colony by 2016; see Appendix 1).

There were seven active Bald Eagle nests and two Peregrine Falcon eyries in 1982. Two falcon eyries were also noted in 1977. Evidence of predation on Ancient Murrelets by those species was substantial (Table 3, page 68).

**Figure 369.**Two adult Ancient Murrelets with neck wounds typical of rat predation found on Lyell Island in 1977. *Photo by Ray Billings, 18 May 1977.*

**Figure 370.** Ancient Murrelet chick that had likely been gnawed on by a rat on Lyell Island in 1982. *Photo by Moira J.F. Lemon, 28 May 1982.*

## EM-590 TOPPING ISLANDS

**Location:** *52°39'45"N 131°40'45"W* (west island); *103 B/12.*
In Darwin Sound east of Shuttle Island. Colony includes the unnamed island 1 km to the north and the unnamed rock almost 1 km to the south.

**Description:** *14.9 ha; 73 m high; Forested; Bare rock.*
Except for the south rock, these islands have a mature redcedar and hemlock forest with a dense salal understory.

**Historical summary:** A pair of Black Oystercatchers with suspected young was seen in 1977 (Table EM-590). Pigeon Guillemots were flushed from burrows and crevices along the rocky shoreline. Locations of these sightings were not specified. The islands were not surveyed by CWS in the 1980s.

**Table EM-590.** Seabird nesting records for Topping Islands. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 10 Jul 1977 | 1eS | 15+e | 314 |

## EM-600 GIL ISLET

**Location:** *52°42'45"N 131°46'39"W; 103 B/12.*
On the west side of Darwin Sound north of Echo Harbour.

**Description:** *2.6 ha; 70 m high; Forested.*

**Historical summary:** Cowan reported Pigeon Guillemots nesting in 1946 (Table EM-600). The BCPM crew noted one guillemot nesting and suspected nesting by a pair of Black Oystercatchers in 1977. The islet was not visited by CWS crews in the 1980s.

**Table EM-600.** Seabird nesting records for Gil Islet. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 18 Aug 1946 | | 10-12e | 94 |
| 10 Jul 1977 | 1eS | 1(1)[a] | 314 |

[a] Corrected from Campbell and Garrioch,[39] who listed the estimate from 1946.

## EM-610 DOG ISLAND

**Location:** *52°44'12"N 131°37'41"W; 103 B/12.*
In Richardson Inlet on the north side of Lyell Island.

**Description:** *14.3 ha; 105 m high; Forested.*
Dog Island has a perimeter of cliffs and steep rocky shoreline, with a top of dense salal under redcedar, hemlock, and pine.

**Historical summary:** Summers and Ellis recorded about 10 Pigeon Guillemots around the north side of the island in 1971 (Table EM-610). Guillemots were nesting in rock crevices around the island in 1977. Maximum numbers were seen in May. No evidence of other nesting species was found during explorations in 1971 or 1977. The island was not surveyed by CWS in the 1980s.

**Table EM-610.** Seabird nesting records for Dog Island. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 7 Jun 1971 | (10+) | 311 |
| 17 May, 10 Jul 1977 | 6+e(37) | 314 |

## EM-620 KUL ROCKS

**Location:** *52°44'08"N 131°36'14"W* (west rock); *103 B/12.*
At the mouth of Richardson Inlet north of Lyell Island.

**Description:** *0.7 ha; 19 m high; Grassy rock.*
Kul Rocks support a lush growth of grasses and forbs, plus a couple of spruce trees and some rose (*Rosa nutkana*) bushes.

**Historical summary:** Glaucous-winged Gulls appear to have abandoned this site (Table EM-620). Summers and Ellis counted 11 nests in 1971, two birds but no nests were recorded in 1977 (Figure 371), and no gulls were present in 1986. Black Oystercatcher nests with eggs and young were found in 1971. In July 1977, nine oystercatchers were present, one empty scrape was found, and at least two pairs were estimated nesting. In 1986, one pair was sighted but no nests were found.

**Figure 371.** Two Glaucous-winged Gulls were seen at Kul Rocks in 1977 but nesting was not confirmed. *Photo by R. Wayne Campbell.*

The numbers of Pigeon Guillemots observed around these rocks have varied markedly, likely in relation to the timing of different surveys. Maximum numbers were seen in May 1977. They were nesting in burrows and rock crevices around the perimeter of these islets, except for one burrow that was found about 6 m from shore. Adults were flushed from their burrows.

**Table EM-620.** Seabird nesting records for Kul Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 5 Jun 1971 | 2[2] | 11[4] | x | 262, 314 |
| 17 May, 10 Jul 1977 | 2eS | 0[a] | 50+e(215)[a] | 314 |
| 20 Jun 1986 | 1eS | 0 | S(1) | 233 |

[a] Corrected from Campbell and Garrioch,[39] who listed estimates from 1971.

**Remarks:** River otter scats were recorded in May 1977. One adult Bald Eagle was present in 1986.

## EM-630 KELO ROCKS

**Location:** *52°44'57"N 131°34'05"W; 103 B/12.* Off the southeast corner of Kunga Island.

**Description:** *0.2 ha; 5 m high; Bare rock.*

**Historical summary:** Two Black Oystercatcher nests were found (1 with 3 eggs and 1 with 2 young) and Pigeon Guillemots were seen flying from crevices in 1971 (Table EM-630). On 3 May 1982, 14 Pigeon Guillemots were sitting on ledges and on the water along the Kunga Island shoreline adjacent to Kelo Rocks. They may have been from the Kelo Rocks colony. There are no records of BCPM or CWS crews visiting these rocks in the 1970s and 1980s.

**Table EM-630.** Seabird nesting records for Kelo Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 5 Jun 1971 | 2[2] | 2[1] | x(13+) | 262, 314 |

***Rainy Day, Dream Away***

*Sometimes in the field the weather or other compromising events make it impossible to carry on with the work. Then there is no option but to wait for things to improve. At these times patience is a necessity. They are also occasions for reflection and contemplation. The following excerpts are from Ken Summers' 1971 notebook (material in square brackets has been either summarized or added later by Ken). These notes give some idea of the thoughts that go through the mind of a 23-year-old man on a great adventure and in the process of forging his place in the world. Ken and David Ellis (a few years younger) were at the time base camped by the abandoned Haida village site of Tanu.*

***June 8:*** *After dinner we had a long discussion on the state of western society, its relationship to the natural environment and [our expectation of its] longevity, compared with the relationship of primitive societies to their natural environment and their proven longevity. We also discussed our relationships with western society: our rejections of it, our affinities for it, and our dependence on it [we could not live entirely off the land as the former residents of Tanu had to]. Also discussed was the relevance to ourselves and to society of what we were presently doing. We asked many questions but found that in the end we had few answers.*

***June 9:*** *Cloudy, rained most of day, blowing southeasterly. The only good shelter was in the tent, so we spent almost all day sleeping and reading. I finished Emily Carr's 'Klee Wyck' and Frank Beebe's 'Marine Peregrines of the N.W Pacific Coast'* (Figure 372). *[It was a strange feeling reading Carr's descriptions, from her visit 50 years earlier, of the same villages we were seeing; and how the signs of humanity were gradually slipping back into the forest.*

***June 10:*** *A group of anthropology grad students from the University of Alberta arrived on a fishing boat. It was led by a husband and wife team. She had received a MSc studying Haida art, but had never been to the Charlottes to see any of the old villages and totems. However, after studying some of the fallen poles she was able to name the artist by the square ears, etc. After a very brief visit they left, undoubtedly [I thought, with youthful distain] now an authority on Tanu and other villages similarly visited. [I was sure that Dave and I had a more intimate awareness of the place than she possibly could, which in my mind highlighted the difference between academic and real-world experience.]*

***June 11:*** *We [ran into] two girls taking the federal census. Not knowing how else to record our "residence" they followed the procedure of naming the location we were staying at census time: Tanu. [We found it satisfying to know during the next 10 years that until the next census, our residence was documented as being at Tanu on the census date. It gave us a sense of identity with this world we loved as opposed to the urban and suburban worlds we had come from.]*

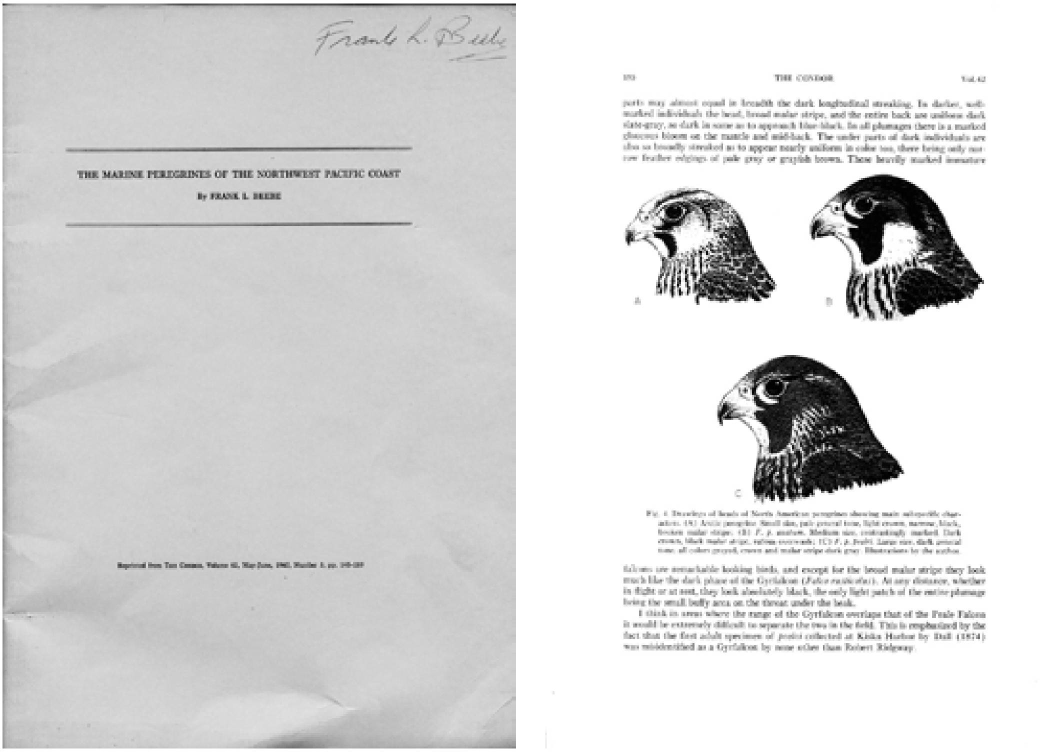



**Figure 372.** This article, published in 1960 in the scientific journal Condor, remains, 60 years later, a major contribution to BC ornithology. Author Frank Beebe emphasizes the significance of seabirds to Peregrine Falcons when he states that the high density of nesting falcons found on seabird islands is partially due to a "food supply of such abundance that territorial competition for food between pairs appears to be entirely absent."

## EM-640 TITUL ISLAND

**Location:** *52º46'56"N 131º34'31"W; 103 B/13.*
North of Kunga Island on the south side of Laskeek Bay.

**Description:** *7.2 ha; 72 m high; Forested.*
Titul Island is long, narrow, and steep-sided, with cliffs overhung with forest along the west side, and steeply rounded rock with grassy fringes at the forest edge on the east side. The forest is a mix of spruce, redcedar (Figure 373), alder, and some willow (*Salix* spp.) and crabapple, with an understory of cow parsnip (*Heracleum maximum*), sword fern, mosses, seedling spruce, salal and other shrubs, and some bare litter areas under thick cedar stands.

**Figure 373.** Titul Island is long and narrow, forested mainly with Sitka spruce and western redcedar. *Photo by R. Wayne Campbell, 11 July 1977.*

**Historical summary:** Similar numbers of Cassin's Auklet burrows have been reported on all surveys (Table EM-640). Most burrows have been located in the grassy fringes along the east side. Pigeon Guillemots were seen flying from crevices around the island in 1971 and 1977. In 1983, we found two storm-petrel-sized burrows but no other evidence of nesting by either storm-petrel species. A pair of Black Oystercatchers was suspected nesting in 1971, one bird was recorded in May 1977, and two were seen in 1982, but no nests were found during those surveys.

**Table EM-640.** Seabird nesting records for Titul Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | CAAU | SOURCE |
|---|---|---|---|---|
| 5 Jun 1971 | 1eS | 25+e(80+) | 200e | 262, 314 |
| 17 May, 11 Jul 1977 | | 10+e(115+) | 200+e | 39, 314 |
| 3 May 1982 | | S(1) | 200e | 314 |
| 12 May 1983 | 0 | S(114) | 170 | 233 |

**Remarks:** Single Bald Eagles were recorded in July 1977, 1982, and 1983 (Figure 374). There was one Peregrine Falcon eyrie in 1983. Signs of river otter were seen in 1982 and 1983.

**Figure 374.** A single Bald Eagle was present on Titul Island during three visits in the 1970s and 1980s. *Photo by Alan D. Wilson.*

## EM-650 LOST ISLANDS

**Location:** *52°48'13"N 131°29'15"W; 103 B/14.*
Within Laskeek Bay between Dodge Point on Lyell Island and Reef Island.

**Description:** *12.7 ha; 53 m high; Forested.*
Lost Islands have an undulating topography with a number of rocky knobs and ridges separated by draws and steep rocky gorges from the body of the main island (Figure 375). Extensive portions of the south point and southeast knob are bare rock with patches of grass and forbs (Figure 376). Dense salal under a sparse spruce forest covers most of the vegetated area on the rest of the islands. Grass, false lily of the valley, and moss occur on the fringes of the salal.

**Figure 375.** Lost Islands are composed of a series of rocky knobs and ridges that are mostly forested. *Photo by J. Bristol Foster, 11 July 1977.*

**Figure 376.** The southeast rocky knobs of Lost Islands are mostly bare rock, with some patches of grasses and forbs. *Photo by Michael S. Rodway, 20 June 1986.*

**Historical summary:** In 1977 (17 May and 10-11 July) and 1983, Fork-tailed Storm-Petrels and Cassin's Auklets were nesting sporadically in open patches around the perimeter of the vegetated habitat (Table EM-650). In 1977, a few storm-petrel burrows, one containing a Fork-tailed Storm-Petrel chick, were also found in a small patch of open habitat located about 50 m from shore. Burrows were most abundant on the southern and eastern sides of the islands. A few old Cassin's Auklet-sized burrows were found on the west side in 1983. Observers in May 1977 noted a few burrows that were large enough to be Rhinoceros Auklet burrows but there was no evidence of nesting by that species. No sign of Leach's Storm-Petrels was found in 1977 or 1983, but they were heard calling from burrows in 1985.

A few Glaucous-winged Gull nests were found on the northern islet in 1977, otherwise all nests were counted on the southern and eastern rocky knobs of the main island (Figure 377). Black Oystercatchers have nested on the main island (1977) and on the south and east rocks (other years). Young were suspected around one empty nest on the main island in July 1977. Four oystercatchers were recorded but no nests were found in 1983. Pigeon Guillemots have been observed flying from rock crevices around the islands, and an incubating bird was seen in a burrow in July 1977.

**Figure 377.** A downy Glaucous-winged Gull chick photographed on the southeast rocky knobs of Lost Islands in 1986. *Photo by Michael S. Rodway, 20 June 1986.*

**Figure 378.** Sounding an alarm call is usually ineffective at deterring a Bald Eagle from its prey. *Photo by R. Wayne Campbell.*

**Table EM-650.** Seabird nesting records for Lost Islands. See Appendix 2 for codes.

| DATE | FTSP | LSPE | BLOY | GWGU | PIGU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|
| May, Jul 1977 | 100+e | | 1S | 43[17] | 45e(43) | 45eS | 39, 314 |
| 22 May 1982 | | | 1 | 66e | | | 314 |
| 11 May 1983 | 80 | | | 75eS | S(31) | 210 | 233 |
| 30 May 1985 | | x | | | | | 122 |
| 20 Jun 1986 | | | 3[2] | 75[53] | x(6) | | 233 |

**Remarks:** One Bald Eagle nest was seen in 1977 and there were two active nests in 1983. In July 1977, an eagle was observed preying on nesting gulls and twice was seen carrying gull eggs to an eaglet in the nest. Nesting gulls were protesting vehemently but ineffectively (Figure 378). Most gull nests were empty. A pair of Peregrine Falcons was seen diving on gulls on the east rocks and may have been nesting in 1982. One falcon was recorded in 1983. Signs of river otter were recorded in 1977 and 1983. Two Fork-tailed Storm-Petrel wings were found near an otter den in 1983.

## EM-660  HELMET ISLAND

**Location:** *52°49'02"N 131°39'39"W; 103 B/13.*
At the mouth of Dana Inlet, north of Porter Head. Colony includes the small islet on the south side.

**Description:** *10.4 ha; 111 m high; Forested.*
Helmet Island is very steep-sided. Most of the interior is mossy under a forest of redcedar, spruce, and hemlock, with alder, salal, huckleberry, and stands of lodgepole pine growing around the edges. The small islet on the south side is covered with dense salal under redcedar and spruce.

**Historical summary:** Pelagic Cormorants were nesting on a rock bluff on the southeast face of the southern islet in 1971 (Table EM-660). About 12 adult and seven immature cormorants were present. Also in that year, there were two pairs of Black Oystercatchers on the south rock but no nests were located. Except for one immature Pelagic Cormorant sighted in 1983, no cormorants or oystercatchers have been recorded since 1971. Pigeon Guillemots have been seen around the island during each visit and likely still nest.

**Table EM-660.** Seabird nesting records for Helmet Island. See Appendix 2 for codes.

| DATE | PECO | BLOY | PIGU | SOURCE |
|---|---|---|---|---|
| 10 Jun 1971 | 7 | 2eS | S(30-35) | 262, 314 |
| 16 May, 11 Jul 1977 | 0 | 0 | S(4) | 314 |
| 13 May 1983 | 0 | 0 | S(19) | 233 |

**Remarks:** One Bald Eagle was recorded in July 1977 and there was one eagle nest in 1983. A river otter was seen in 1983.

## EM-670  PROCTER ROCKS

**Location:** *52°51'40"N 131°44'46"W; 103 B/13.*
Off Harbridge Point on the north side of Talunkwan Island.

**Description:** *0.1 ha; 4 m high; Bare rock.*

**Historical summary:** A Black Oystercatcher nest containing two eggs was found in 1977 (Table EM-670). Five oystercatchers were present. Pigeon Guillemots were recorded but no evidence of nesting was reported. There are no records of other visits to these rocks.

**Table EM-670.** Seabird nesting records for Procter Rocks. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 12 Jul 1977 | 1 | (3) | 314 |

## EM-680  KINGSWAY ROCK

**Location:** *52°51'44"N 131°40'20"W; 103 B/13.*
East of Haswell Island at the mouth of Selwyn Inlet.

**Description:** *1.1 ha; 10 m high; Grassy rock* (Figure 379).

**Figure 379.** Kingsway Rock is mostly bare rock with patches of grasses and low forbs. *Photo by R. Wayne Campbell, 11 July 1977.*

**Historical summary:** Cowan confirmed Glaucous-winged Gulls nesting in 1946 (Table EM-680). Summers and Ellis counted gull nests and noted 2-3 pairs of Pigeon Guillemots in 1971. John Ward and Chris Shepherd monitored gull nests in 1972 and on 23 June observed two pairs of Black Oystercatchers, one with chicks, which were about a week old. They noted the absence of Pigeon Guillemots. Oystercatchers were suspected nesting in 1977 but no nest was found. Most gull chicks had fledged or were nearly fledged (accounting for the large number of empty nests recorded) when Mike Shepard, Teresa Shepard, and Mary Morris visited the rocks in 1979. Counts of Glaucous-winged Gull nests in 1986 were similar to counts from the early 1970s but lower than in 1977.

**Table EM-680.** Seabird nesting records for Kingsway Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 31 Jul 1946 | | x | | 94 |
| 12 Jun 1971 | | 52[31] | S(4-6) | 262, 311 |
| 23 Jun-30 Jul 1972 | 2e | 40[40] | (0) | 314 |
| 11 Jul 1977 | 1eS | 70[45] | 9[9] | 39, 314 |
| 9 Aug 1979 | 1 | 57[3] | x2(30) | 314 |
| 13 May 1983 | | 10+eS | S(34) | 233 |
| 21 Jun 1986 | 1 | 43[31] | x3(72) | 233 |

**Remarks:** Summers and Ellis harvested a dozen gull eggs to sustain themselves when their food was running out in 1971. Observers in 1972 noted that the gull colony had been "egged" twice that season in the first part of June. Replacement eggs had been laid in the 40 nests counted. In 1977, four depredated Pigeon Guillemot eggs and one chick were found at nests, likely preyed on by Northwestern Crows. We found five gull nests with depredated eggs in 1986. There was abundant river otter sign on the south side of the island, although scats contained only fish remains. Only four of the 43 gull nests were located in that area even though it comprised about a quarter of the area available for nesting.

Kingsway Rock was one of three study sites in Haida Gwaii used by Ward in his Ph.D. thesis work on Glaucous-winged Gulls conducted from 23 June to 30 July 1972.[291]

## EM-690 REEF ISLAND

**Location:** *52°52'20"N 131°31'W; 103 B/13.*
Laskeek Bay, southeast of Louise Island. Colony includes small islets off the south side and east end.

**Description:** *249 ha; 181 m high; Forested; Bare rock.*
The south side of Reef Island presents an impressive band of cliffs cut by a few steep, grassy and mossy slopes with separated knolls and pinnacles rising from their lower reaches (Figure 380). The north side has fewer cliffs, but steep slopes rise directly from the shore. Spruce is dominant around the perimeter, with hemlock and redcedar more abundant in the interior (Figure 381). Stands of lodgepole pine occur along the south side. At the east end are extensive grassy knolls with a large tract of thickly regenerating spruce separating them from the mossy interior forest to the west. On the south side there is evidence of an old fire, and one stand of large spruce was infected with aphids in 1983.

**Figure 380.** Cliffs are prevalent on the south side of Reef Island and there are rocky knolls on the headlands. *Photo by R. Wayne Campbell, 11 July 1977.*

**Figure 381.** Reef Island is predominantly forested with a typical mix of Sitka spruce on the edges changing to western hemlock and western redcedar in the interior. Cliffs, rocky knolls, and grassy slopes occur around the perimeter. *Photo by R. Wayne Campbell, 11 July 1977.*

The islet off the south side is mostly dense salal under spruce with some open, grassy patches. Smaller rocks off the east end are bare. The Haida from Tanu had a fort on the island.[79]

**Historical summary:** Foster visited the island in 1960 and Summers and Ellis surveyed the island in 1971 (Table EM-690). Surveys were conducted by the BCPM on 16 May and 11 July1977 and by CWS on 16-19 and 21 May 1983, May-June 1985,[122] and April-June 1989.[114, 126] In 1986, Pelagic Cormorant nests were counted on 31 May [303], and Glaucous-winged Gull nests were counted on the east rock on 20 June.[233]

**Table EM-690.** Seabird nesting records for Reef Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|---|
| 4-5 Jul 1960 | | | | | 9[9] | | x | | | 94 |
| 31 May 1971 | | | 45e | 2eS | 10e | S(42+) | 500+e | 500e | | 262, 314 |
| May, Jul 1977 | | x | 0[a] | 2eS | 8e[a] | 10+e(24) | 1,200e[a] | 500+e | 100e | 39, 314 |
| May 1983 | 140e[b] | x | | x | 3+eS | S(167) | x | 1,700e | | 233 |
| May-Jun 1985 | | x | 10-12 | 4 | | S(338) | 5,000t | 1,700e | | 122, 303 |
| May-Jun 1986 | | x | 11 | 4 | 7[5] | x | x | x | E | 233, 303 |
| May-Jun 1987 | | | 0 | 4 | 15e | x | x | x | | 303 |
| May-Jun 1988 | | | | | | | | x | | 26 |
| Apr-Jun 1989 | | | | | | | 3,600t[c] | x | | 126, 114 |
| May-Jun 1990 | | | | | | | | x | | 113 |

[a] Corrected from Campbell and Garrioch,[39] who reported estimates from previous surveys.
[b] Total number of breeding pairs was estimated from a partial count but the proportion of burrows occupied by each of the two storm-petrel species was not determined.
[c] Total number of breeding pairs recalculated from area and density estimates given in Gaston et al.[126] and Gaston.[114]

Records suggest changes in the abundance and distribution of some nesting species. Fork-tailed Storm-Petrels have been found nesting only on the islet off the southeast side, except in 1971 when Summers and Ellis recorded no sign of storm-petrels nesting there. They did report abundant Cassin's Auklet burrows on that islet and it seems unlikely that they would have missed storm-petrels if they were present. Nesting by Fork-tailed Storm-Petrels was confirmed in 1977 but no population estimate was made. No sign of nesting by Leach's Storm-Petrels has been recorded. Researchers who were on the island between 1984 and 1987 frequently heard and saw Fork-tailed but not Leach's storm-petrels.[303]

Ancient Murrelets were noted nesting sparsely in very scattered patches on steep forested slopes only on the north side of the island in 1971 and 1977 (Figure 382). In contrast, colony area was described as nearly continuous along the north side in 1983 and 1985, although average burrow density found along transects was low. The highest density of burrows occurred near the ridge tops where the slopes rounded off. An area of burrowing was found on the south side towards the east end in 1983 that had not been recorded on previous surveys. Staging Ancient Murrelets were observed off the north side of Reef Island to just east of the Limestone Islands and likely involved birds from both colonies (see Figure 224 on p. 201).

**Figure 382.** Ancient Murrelet nesting habitat under a mainly western hemlock forest on the central north side of Reef Island in 1977. *Photo by R. Wayne Campbell, 11 July 1977.*

In 1971, Cassin's Auklet burrows were reported in scattered groups along the south side and in larger groups along the north side near the east end of the main island and on the southeast islet (Figure 383). A similar distribution was mapped in 1983.

**Figure 383.** An active Cassin's Auklet burrow, showing tell-tale white fecal streaking near the entrance, on Reef Island in 1977. *Photo by R. Wayne Campbell, 11 July 1977.*

The BCPM crew confirmed nesting by Rhinoceros Auklets in July 1977 but no sign of nesting was found in other years. During the 1977 survey, 73 Rhinoceros Auklet burrows were counted mixed with Cassin's Auklet burrows in two areas along the south side of the island near the west end. Rhinoceros Auklet eggs were pulled from two excavated burrows and eggshells were found in others. Adult Rhinoceros Auklets were frequently seen on the waters around the island by researchers from 1984-87 but no evidence of nesting was discovered.[114] The apparent disappearance of Rhinoceros Auklets from Reef Island is contrary to trends for this species at most other colonies.

**Figure 384.** Pigeon Guillemots were nesting on this 265-foot (81 m) cliff on Reef Island in 1977. *Photo by R. Wayne Campbell, 11 July 1977.*

One Tufted Puffin was seen on the water in May 1977 but no evidence of nesting has been found on Reef Island.

Pelagic Cormorants have nested sporadically at two locations near the east end of the island. In 1971, they were nesting on cliffs on the north side, and in 1985 and 1986 nests were located on the south side near the east end. An empty Black Oystercatcher nest was found along the mid-north coast and a pair of oystercatchers was seen on the rock at the western tip of the island in July 1977. At least four pairs of oystercatchers nested around the island during 1984-1987.[303] Glaucous-winged Gulls have been found nesting on the rock off the east end of the island and on cliff ledges along the south side of the main island. The highest count for Pigeon Guillemots occurred in 1985 when extensive observations were made by researchers. Four nests with eggs were located under rocks and five birds were seen flying out of crevices in 1977 (Figure 384).

**Remarks:** One egg had been depredated in three of four Pigeon Guillemot nests found in 1977. Predation was moderate on Ancient Murrelets, Cassin's Auklets, and Fork-tailed Storm-Petrels in 1983, and on Ancient Murrelets in 1989 (Table 3, page 68).

A small research cabin was constructed by CWS on Reef Island in 1984. The main objective of the CWS studies was to measure demographic rates for Ancient Murrelets, including adult survival, reproductive success, age at first breeding, and immigration/emigration.[111, 114] Subsequent work by the Laskeek Bay Conservation Society greatly expanded this information. Studies were also conducted by CWS on the breeding biology of Ancient Murrelets and its relation to survey and population monitoring methods.[67, 117, 122, 127, 128] Ian Jones studied vocalizations and colony departure of Ancient Murrelet family groups in 1984 and 1985,[169, 170, 172, 173, 174] Burger and Powell studied diet and diving depths of Cassin's Auklets in 1987 and 1988,[26] and Gaston marked Cassin's Auklets from 1985-1991 to estimate adult survival rate.[113]

***Do Seabirds Sing?***

*Tony Gaston established a research camp on Reef Island in 1984 from which he and a number of graduate students embarked on a detailed study of the life history of Ancient Murrelets. One of Tony's first students was Ian Jones who went on to become a world-recognized seabird biologist and research scientist. Ian's studies on Reef Island uncovered the fascinating vocal repertoire of Ancient Murrelets. Not only did Ian demonstrate that adults and chicks recognize and find each other by their calls,[172] he also showed that this little auk has a vocal repertoire comparable to passerines such as Black-capped Chickadees* (Poecile atricapillus; Figure 385) *and White-crowned Sparrows* (Zonotrichia leucophrys).[173] *Ian identified nine distinct vocal displays that are used hierarchically in different combinations, one of which is a complex song. Like many passerines, Ancient Murrelets typically sing from perches in trees (this is more remarkable than it sounds when you remember that alcids have no halyx, or rear toe, and that their other three toes are webbed – not the best design for clasping tree branches!). Songs are sung by males and likely function in courtship to attract females and as threatening signals to other males, although they do not seem to serve in maintaining territories as in many passerines, given that these birds often sing from different locations on successive nights. Vocalizations of other auk species are not as complex, and Ancient Murrelets may be an exceptional member of the family. Ian speculated that, "a complex song-like advertising signal appears to be useful for mate attraction in Ancient Murrelets because of the nocturnal timing of colony activity and the relatively dispersed distribution of nests compared to other colonial alcids."* [173]

**Figure 385.** Studies on Reef Island by Ian Jones showed that Ancient Murrelets have a vocal repertoire for communication, similar in complexity to passerines such as the Black-capped Chickadee. *Photo by Alan D. Wilson.*

## EM-700 SOUTH LOW ISLAND

**Location:** *52°53'38"N 131°34'25"W; 103 B/13.*
East of Vertical Point on Louise Island.

**Description:** *13.3 ha; 38 m high; Forested.*
South Low Island is flattish, with small rocky knolls and long narrow points (Figure 386). A thick underbrush of salal, thimbleberry (*Rubus parviflorus*), and saskatoon berry (*Amelanchier alnifolia*) covers most of the island under a forest of spruce, alder, and willow. Luxuriant patches of forbs grow in shallow soil above the shore rock on the south side.

**Historical summary:** No evidence of active burrows has been found but two or three old Cassin's Auklet burrows were noted in May 1977, and three old Cassin's Auklet burrows were discovered on the isthmus in the middle of the island in 1983. A few birds may periodically attempt to nest on the island.

While Glaucous-winged Gull nesting populations were generally increasing throughout Haida Gwaii, this is one of few colonies that disappeared.[227] Summers and Ellis found three empty nests and one nest with one egg, and noted that not many nests had been built at the time of their visit in 1971 (Table EM-700). They estimated 20 pairs present. Two gulls were recorded in May 1977 and four were seen in 1983 but there was no evidence of nesting on either of those surveys. None were present in May 1983 or in 1986.

Six and 17 Black Oystercatchers were present but likely not nesting in May and July 1977, respectively. One empty nest attended by two adults was found on the west point in 1983, and one pair was suspected nesting on the northeast point in 1986. Nesting by oystercatchers was not confirmed on any of those surveys. Pigeon Guillemots were confirmed nesting in rock crevices around the island in 1971.

**Figure 386.** Aerial view of South Low Island. *Photo by Moira J.F. Lemon, 16 June 1986.*

**Table EM-700.** Seabird nesting records for South Low Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 3 Jun 1971 | | 20e | 50e(100) | 262, 314 |
| 16 May, 11 Jul 1977 | | 0 | (8) | 314 |
| 7 May 1983 | 1S | 0 | | 233 |
| 21 Jun 1986 | 1eS | 0 | S(18) | 233 |

**Remarks:** Remains of two Fork-tailed Storm-Petrels were found in May 1977. Two adult Bald Eagles were present in July 1977, and 14 eagles were seen circling the island and two empty nests (one old) were recorded in 1983. River otter runs were noted in May 1977.

## EM-710 LOUISE ISLAND, VERTICAL POINT

**Location:** *52°54'04"N 131°37'30"W; 103 B/13.* Vertical Point is on the southeast side of Louise Island.

**Description:** *30 m high; Cliffs.*

**Historical summary:** Summers [262] surveyed the area in 1971 and reported on visits there in 1970 and 1972 (Table EM-710). We have no record of BCPM crews visiting Vertical Point in 1977, although they may have boated by and saw no birds. CWS crews camped in the Vertical Point area from 24 April to 23 May 1983 (Figures 387 and 388).

**Figure 387.** Keith Moore, who has worked for many years as a forestry consultant in Haida Gwaii, often helped with the CWS surveys. He is shown here at a small cabin used mainly for storage of field equipment at Vertical Point on Louise Island in 1983. *Photo by Moira J.F. Lemon, 15 May 1983.*

**Figure 388.** A prolonged high pressure system kept skies sunny while CWS crews were working out of a base camp at Vertical Point on Louise Island in 1983. During that period, Moira Lemon could safely examine maps of the next island to be surveyed without worrying about rain. *Photo by Michael S. Rodway, 30 April 1983.*

Pelagic Cormorants were nesting near the top of a shallow cave on the south side of the point in 1970 and 1971. When Summers and Ellis first surveyed the area in May 1971, they counted 17 nests, half with birds sitting on them, and noted lots of nest-building activity. When they returned in July, the colony was deserted and broken eggs littered the ground beneath the nests. No sign of nesting was seen there during subsequent visits. We saw a few Pigeon Guillemots at the base of the cliffs in 1983 and 1986.

**Table EM-710.** Seabird nesting records for Louise Island, Vertical Point. See Appendix 2 for codes.

| DATE | PECO | PIGU | SOURCE |
|---|---|---|---|
| Aug 1970 | x | | 262 |
| 29 May 1971 | 25e | | 262 |
| 16 Jul 1971 | 0 | | 262 |
| 1972 | 0 | | 262 |
| Apr-May 1983 | 0 | S(7) | 233 |
| 21 Jun 1986 | 0 | S(1) | 233 |

**Remarks:** Summers suspected human disturbance was responsible for the abandonment of the Pelagic Cormorant colony in 1971.[262] The sheltered bay just west of the nesting cliffs is a popular stop for the increasing numbers of recreational boaters in the area. Native marten are present [297] and raccoons were seen in 1983 but are unlikely to have impacted the cormorant colony. Raccoons were also reported on Louise Island in 1989-1990.[155]

***Campground Visitors and Bear Deterrents***

*Our CWS campsites were preferentially situated on one of the main seabird colony islands we were surveying. We could then conduct surveys of that island on foot from our campsite when bad weather prohibited boat travel to other colonies (making efficient use of the short survey season), and we were also able to make evening and nocturnal observations of activities on the colony and staging areas around the colony. Though bears are present on larger coastal islands, including Graham and Moresby islands in Haida Gwaii, they do not generally occur on smaller seabird islands and we never worried about bear proofing our campsite* (Figure 389). *We only had to contend with mice, shrews, and the ubiquitous slugs. Storing our food in rubbermaid totes and buckets with tight fitting lids prevented these campground marauders from making off with our provisions. Slugs, however, were remarkably adept at getting into almost any container and, although they didn't scamper off with our bags of peanuts, they did leave a rather unpleasant mess.*

*An exception to our bear-free existence happened in 1983 when, because there were no ideal campsites on nearby seabird colonies, we decided to camp at Vertical Point on the southeast point of Louise Island while surveying the islands in the Laskeek Bay area. Louise Island is separated from Moresby Island only by a narrow channel on its protected west side, which is dredged to a depth that allows ships passage at low tide. At the time it didn't occur to us that bears might cross from Moresby Island and could well be present on Louise Island.*

*The campsite at Vertical Point is beautiful with a small open grassy field in a forest of majestic Sitka spruce. It faces onto a wide shallow bay encircled with protective islets along its exposed southern shore. A tiny cabin provided a fine place to store our food containers and other gear from any inclement weather, while our kitchen was on a bench we constructed outside with a lovely ocean view. A month of glorious weather meant that we never got around to stringing a tarp over this structure. Compost items and other food residues were always gathered up into a bucket, and once full, were either buried in a deep hole dug in the forest duff, or into a hole dug at low tide in the sandy bay, to be consumed by the intertidal creatures. One day, as we were launching the boats, I (Moira) looked back and was startled to see a small black bear walking along the shore towards our camp. Fortunately all our food was stored away in the cabin, but our full compost bucket was an open dining invitation to the bear. The quickest thing I could think of at that moment was to dump the contents of the compost bucket down our outhouse. When we returned at the end of the day, the outhouse was in a bit of a shambles, and it was obvious that once the bear had gone below the layer of compost it found a less desirable banquet. We didn't see the bear again that season!*

**Figure 389.** American Black Bears are not generally found on seabird islands in Haida Gwaii, although they have occasionally reached colony islands and dug up seabird burrows. Encountering a bear during seabird surveys is thus a surprise. *Photo by R. Wayne Campbell.*

## EM-720 LIMESTONE ISLANDS

**Location:** *52°54'28"N 131°36'48"W* (east island); *103 B/13.*
Northeast of Vertical Point on Louise Island.

**Description:** *64 ha; 120 m high; Forested.*
The topography of the two Limestone Islands consists of series of rocky ridges with some steep slopes and cliffs near shore (Figure 390). The limestone substrate has been eroded to form many crevices and sinkholes (Figure 391). Most of the ground cover is bare litter or moss under redcedar, spruce, and hemlock trees (Figure 392). Red and Sitka Alder grow in valleys near shore. Along the south side of the east island there is an old burn with areas of thickly regenerating spruce and some stands of large alder. The Haida reported that a forest fire was accidentally started here by bird hunters.[101] In 1983, a recent windfall swath cut up to the crest of the island on the south side.

**Figure 390.** Limestone Islands consists of two forested islands that have a few steep slopes and cliffs around the perimeter. *Photos by J. Bristol Foster, 12 July 1977.*

**Figure 391.** Moira Lemon in an eroded limestone sinkhole on Limestone Islands in 1983. *Photo by Michael S. Rodway, 11 May 1983.*

**Historical summary:** Newcombe collected on the islands in 1901 [54] and Cowan made a visit in 1946 (Table EM-720). Surveys were conducted by the BCPM on 13-14 May and 12 July in 1977, and by CWS on 28-30 April and 2-7 May in 1983 and from late-May to mid-June 1989.

Although breeding birds were well known by the Haida, the first documented record of Ancient Murrelets nesting in BC is from Newcombe's visit here in 1901.[54] After careful investigation, Carter and Sealy [54] concluded that an egg in the Provincial Museum collection [324m] initially identified as a Marbled Murrelet egg collected on 2 May 1901 from Marble Island, was in fact an Ancient Murrelet egg collected

**Figure 392.** Much of the ground cover on Limestone Islands is moss and bare litter under a forest of Sitka spruce, western hemlock, and western redcedar. *Photo by Ken R. Summers, 13 May 1977.*

by Newcombe when he visited Limestone Islands on 30 April 1901. The trail of evidence that led to this conclusion by Carter and Sealy [54] is an example of biological sleuthing at its best.

Unfortunately, the Ancient Murrelet nesting population on this historic colony has declined (Figure 393). Summers and Ellis in 1971 described burrows covering both islands except for an area of deciduous trees on the south side of the east island. They estimated a nesting population of at least 5,000 pairs. In May 1977, burrows were counted in 10x10 ft. (9.3 $m^2$) quadrats (Figure 394) surveyed along two transects

**Figure 393.** Adult Ancient Murrelet with a full clutch of two eggs from a burrow on Limestone Islands in 1977. *Photo by Ken R. Summers, 13 May 1977.*

**Figure 394.** A plot to count Ancient Murrelet burrows established by the BCPM crew in forested habitat on west Limestone Islands in 1977. *Photo by Ken R. Summers, 14 May 1977.*

on the west island (8 quadrats) and two transects on the east island (18 quadrats). Burrow density along these arbitrarily-placed transects was similar on the two islands, averaging about 0.8 burrows per quadrat. Extrapolating over estimated colony area, observers calculated a total of 30,100 burrows on the two islands: 22,632 on the east island and 8,438 on the west island. A rougher estimate of 5-10,000 nesting pairs was made without the use of surveyed quadrats in July 1977. These figures formed the basis for the estimate of 15,000 nesting pairs presented by Campbell and Garrioch.[39] Colony area mapped on air photos in 1977 was similar to that mapped in 1983 when CWS conducted the more systematic survey, but burrow density on both islands in 1983 was much lower than that estimated in 1977. Burrow occupancy was notably very low on the west island (20% compared to 61% on the east island) in 1983. The majority of the estimated total nesting population was on the east island in 1983; only 100 pairs were estimated nesting on the west island. Gaston found the west island practically deserted in 1987, and in 1988, he found most parts of the colony on the east island had an even lower density of burrows than in 1983.[303]

Ancient Murrelets were staging in 1983 over an area from just east of the Limestone Islands to off the north side of Reef Island (see Figure 224 on p. 201). Staging birds may have included birds from both colonies.

Newcombe also documented the first breeding record for Cassin's Auklet in BC when he obtained eggs from Limestone Islands on 1 May 1901.[54, 57] After 1901, Cassin's Auklets were not recorded nesting again until 1983 but the few burrows found then could easily have been missed on previous surveys. Surveyors in July 1977 noted an area of abandoned Cassin's Auklet burrows on the east island but no evidence of active breeding was found. Cassin's Auklets were nesting on rocky knolls and promontories over a small area at the southeast corner of the east island in 1983. In 1990, Cassin's Auklets were often heard calling at night from headlands on the north side of the east island. A half-grown chick was found dead in a burrow there on 4 June 1990.

On 28 June 1971, Summers heard one or two Rhinoceros Auklets calling in the Ancient Murrelet colony, but could not locate any burrows.[262] In 1983, we found 2 large burrows in the center of the east island that we suspected were dug by Rhinoceros Auklets. Rhinoceros Auklets were frequently heard calling at night on the east island in June 1990. A few pairs were probably nesting on the island.

Summers and Ellis observed at least one pair of Black Oystercatchers in 1971. None were seen during the BCPM survey in 1977 or the CWS survey in 1983. Three pairs had eggs in nests on the east island in 1990.

Pigeon Guillemots have been reported nesting in a number of areas around the islands. Cowan in 1946 observed birds flying in and out of nesting holes in a sandstone cliff on the north face, likely referring to the east island. Summers and Ellis counted birds along the northwest shore of the east island in 1971. Eighty-five birds were seen around the east island in May 1977, and there were 68 around the east island and 20 around the west island in July 1977. Birds were flushed from nests in crevices and caves along the steep rocky shore. Some Pigeon Guillemots were nesting in burrows at the edge of the vegetation on the west side of the east island in 1983. They were also suspected nesting in crevices on the rocky promontories at the southeast end of the east island.

signs of predation were not abundant. A dead Pigeon Guillemot was found on the west island in July 1977. Ancient Murrelet remains were abundant in 1983 and 1988, especially on the west island (Table 3, page 68). A few burrows had been dug up in those years. Bald Eagles were suspected to be responsible for much of the predation and four were sighted in 1983, but river otters may have been taking some birds as a few river otter scats were found to contain feathers. An otter den was found on each island. Observers in 1988 found many river otter scats containing feathers.

**Figure 395.** Signs of predation, including piles of Ancient Murrelet feathers and a carcass, were found on Limestone Islands in 1977. *Photo by Ken R. Summers, 13 May 1977.*

**Table EM-720.** Seabird nesting records for Limestone Islands. See Appendix 2 for codes.

| DATE | BLOY | PIGU | ANMU | CAAU | RHAU | SOURCE |
|---|---|---|---|---|---|---|
| 30 Apr-1 May 1901 | | | x | x | | 54, 57 |
| 19 Aug 1946 | | 50e | | | | 94 |
| 28-29 May 1971 | 1+S | S(70) | 5,000+e | | S | 262, 314 |
| May, Jul 1977 | 0 | 50e(88) | 15,000e | | | 39, 314 |
| Apr-May 1983 | 0 | x2(65) | 1,600t | 40 | 2S | 233 |
| 16 Jun 1987 | | | x | | | 303 |
| 7,13 Jun 1988 | | | x | | | 303 |
| May-Jun 1989 | | | 1,600t | | | 188 |
| Apr-Jun 1990 | 3[3] | | x | x | S | 112 |

**Remarks:** Evidence of predation in the form of Ancient Murrelet feather piles (Figure 395) and eggshells and dug-up burrows (Figure 396) was noted in 1977. Observers in May recorded several adult remains, broken eggshells scattered thinly about the colony, and at least six burrows that were partially dug up by a mammalian predator (Figure 397). Many eggshells were found on both islands in July 1977 but observers found only eight feather piles and stated that

**Figure 396.** A mammalian predator, likely a raccoon, dug up this burrow on Limestome Islands in 1977; the burrow entrance is at the far left. An adult Ancient Murrelet with full clutch of two eggs was the likely target. *Photo by Ken R. Summers, 14 May 1977.*

**Figure 397.** Predation by raccoons has caused a decline in the numbers of Ancient Murrelets nesting on Limestone Islands. *Photo by R. Wayne Campbell.*

The Limestone Islands are close to the shore of Louise Island, so it was inevitable that raccoons would invade the colony. Observers in 1983 and 1988 wondered if raccoons may have been responsible for some of the dug-up burrows and predation remains, particularly one severed Ancient Murrelet head (which is unusual to find and likely associated with raccoon predation), plus eggshells at one dug-up burrow on the west island in 1983. Evidence of raccoons was confirmed in 1989-1990.[155] A raccoon was present and preying on Ancient Murrelets on the east island throughout the breeding season and made brief forays onto the west island in 1990.[112] This was the first clear evidence that raccoons will prey on nesting Ancient Murrelets and their eggs, and substantiated previous perceptions of the serious threat that raccoons pose to nesting seabirds in Haida Gwaii.

In 1990, the Laskeek Bay Conservation Society was formed and set up a base of operations on the east island (Figure 398).[112]

**Figure 398.** A volunteer (left) explains the research activities of the Laskeek Bay Conservation Society on Limestone Islands to a group of tourists. *Photo by R. Wayne Campbell, 5 June 2000.*

## EM-730 LOW ISLAND

**Location:** *52°54'32"N 131°32'09"W; 103 B/13.*
East of Louise Island, north of Reef Island.

**Description:** *9.6 ha; 66 m high; Forested; Grassy rock.*
The rocky knolls and ridges of Low Island are covered with dense salal under spruce (Figure 399), with scattered crabapple, salmonberry, and roses, and fringes of grass and false lily of the valley. There is a navigational beacon on the grassy rock at the north end (Figure 400).

**Figure 399.** Low Island is mostly forested and has prominent rocky knolls scattered around the perimeter. *Photo by J. Bristol J. Foster, 12 July 1977.*

**Figure 400.** The rock at the north end of Low Island is mostly bare rock with some patches of forbs; there is a navigational beacon on the top of the rock. *Photo by Michael S. Rodway, 21 June 1986.*

**Historical summary:** The first documented evidence of seabird nesting was recorded by Drent in 1970 and reported by Summers.[262] Fork-tailed Storm-Petrels were confirmed nesting in 1970 and 1983, and remains and a few burrows were noted in May and July 1977 (Table EM-730). Ninety-two Forked-tailed Storm-Petrels were mist-netted on the night of 9-10 June 1985.[122] One Leach's Storm-Petrel was caught in a mist net in 1986, but no other evidence of nesting by Leach's Storm-Petrel has been found.

Drent observed Ancient Murrelets flying to the island after dark, but nesting was not confirmed. Ancient Murrelets were heard calling at night in 1985 and 1986, but again no evidence of nesting was found.[303] A few pairs may nest.

Sporadic patches of Cassin's Auklet burrows were found around the island perimeter in 1977 and 1983. Breeding was not confirmed in 1977 but observers noted that the burrows looked active. One chick was found in a burrow in 1983.

Pelagic Cormorants were reported nesting by Drent in 1970 but have not been observed since. Black Oystercatchers have been suspected nesting on most surveys but nesting was not confirmed. Two were present in May 1977 but no evidence of nesting was reported. Empty oystercatcher nests were found in 1983 and 1986. Glaucous-winged Gulls were nesting on the rock at the northwest end of the island in 1977, 1983, and 1986. In July 1977, three nests were also found on the southern, rocky edge of the island. Observers in May 1977 noted 150 Glaucous-winged Gulls nesting but only 12 nests were found in July. Many nests were empty in 1986. John Ward and Chris Shepherd noted numerous Pigeon Guillemots on rocks around the island, but made no count in 1972. They found six guillemot nests with young on 14 July. In 1977, guillemots were nesting at the northern and southern ends of the island, and birds on eggs were seen in two nests at the southern tip.

**Table EM-730.** Seabird nesting records for Low Island. See Appendix 2 for codes.

| DATE | FTSP and/or LSPE | FTSP | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|---|
| 1970 | | x | x | | | | S | x | 262 |
| 23 Jun-30 Jul 1972 | | | | 2S | 70[70] | x6 | | | 314 |
| 16 May, 12 Jul 1977 | | S | 0 | | 12[12][b] | 15+e(75) | | 100eS | 39, 314 |
| 22 May 1983 | 160[a] | x | 0 | 2S | 7+ | S(115) | | 30 | 233 |
| 21 Jun 1986 | | | 0 | 1S | 39[11] | x2(45) | | | 233 |

[a] Total number of breeding pairs was estimated from burrow counts but the proportion of burrows occupied by each of the two storm-petrel species was not determined.

[b] Corrected from Campbell and Garrioch,[39] who quoted number of gull nests from Ward's 1972 study.[291]

**Remarks:** A few Fork-tailed Storm-Petrel remains were seen in 1977 and there were signs of predation on Fork-tailed Storm-Petrels (7 feather piles), Glaucous-winged Gulls (a depredated egg in one empty nest and a feather pile of an adult), and Pigeon Guillemots (two depredated eggs) in 1986. One Bald Eagle was sighted in July 1977. Sixteen eagles were soaring over the island and two inactive nests were found in 1983.

**Figure 401.** As part of his Ph.D. thesis, John Ward spent the summer of 1972 studying Glaucous-winged Gulls in three small colonies off the east coast of Moresby Island – Kingsway Rock, Low Island, and Skedans Islands. One of his findings was that gull chicks being fed natural foods at colonies in Haida Gwaii grew better than at colonies in southern BC, where the chicks were fed both natural foods and human refuse. *Photo by R. Wayne Campbell.*

Signs of river otter were noted in 1977 and 1983.

Many old battery cases from the navigational beacon were found in 1983 strewn about the grassy rock at the north end.

Low Island was one of the study sites used by Ward in his Ph.D. thesis work on Glaucous-winged Gulls (Figure 401) conducted from 23 June to 30 July 1972.[291]

## EM-740 SKEDANS ISLANDS

**Location:** *52°57'24"N 131°34'44"W* (largest island); *103 B/13.*
Off the northeast corner of Louise Island.

**Description:** *37.9 ha; 56 m high; Forested; Grassy rock.*
There are five islands in the Skedans Islands, including the one lying just off Skedans Point ( Figures 402 and 403). The islands are rocky with some steep slopes and small cliffs as well as some flat areas with raised ridges on the large western island (#4). Spruce predominates (Figure 404) with some hemlock in the interior of the larger islands (Figure 405). Salal is the dominant understory in most areas, with open patches of grass or moss occurring around the perimeters and on the north side of the southernmost island (#3). The eastern end of the most easterly island (#2) consists of massive, vertical blocks of bare rock with lower grassy patches between (Figure 406).

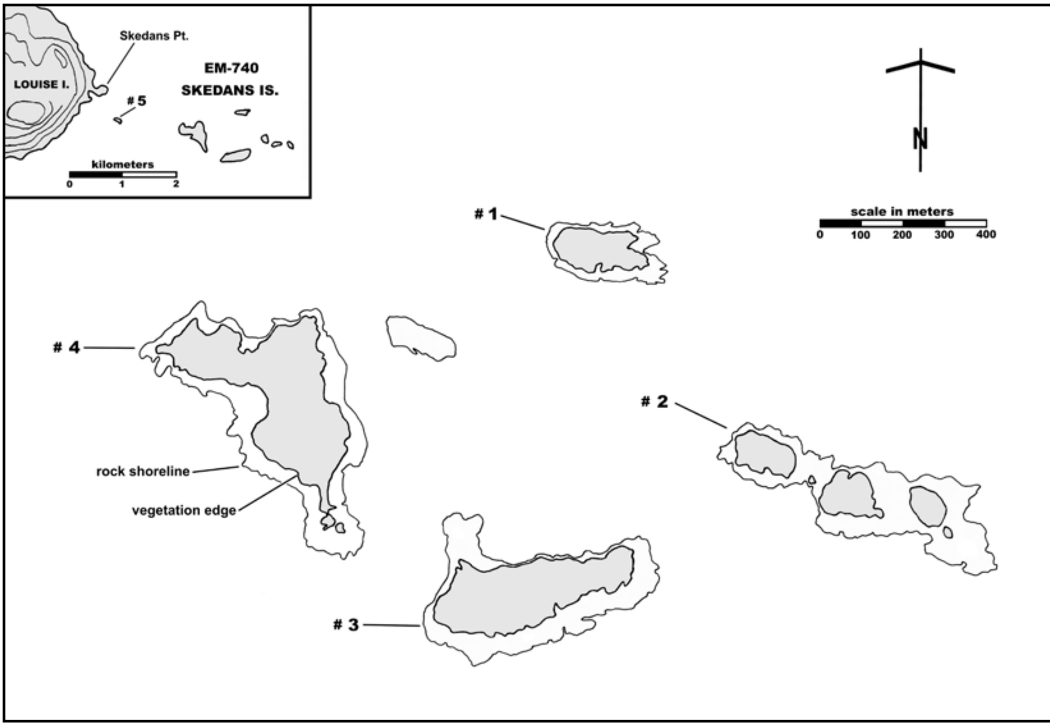



**Figure 402.** Numbered islands in the Skedans Islands referred to in the text.

**Figure 403.** Five islands comprise the Skedans Islands group. *Photo by Moira J.F. Lemon, 16 June 1986.*

**Figure 404.** Sitka spruce is the dominant tree in most forested areas of the Skedans Islands. *Photo by R. Wayne Campbell, 12 July 1977.*

**Figure 405.** Some western hemlock trees grow in the interior of the larger Skedans Islands. *Photo by R. Wayne Campbell, 12 July 1977.*

**Figure 406.** The east end of the eastern Skedans Islands (#2) is composed of blocks of bare rock with scant vegetation between. *Photo by J. Bristol Foster, July 1977.*

**Historical summary:** Early visits were made by Osgood, who confirmed Pelagic Cormorants nesting in 1900, and Cowan in 1946 (Table EM-740). A Pelagic Cormorant egg specimen in the RBCM [324n] dated 1 June 1900 with a location of just "Queen Charlotte Islands" may have been collected here. The exact location of Cowan's 1946 record is uncertain, but is most likely Skedans Islands.[94] Observations by Foster in 1961 and Drent in 1970 were reported in Summers.[262] We have no other information about Drent's visit. Summers and Ellis explored three islands (#1, 2, and 4) in 1971 but did not visit the southern island. John Ward, accompanied by Chris Shepherd, visited the east rock (#2) as part of his thesis work on Glaucous-winged Gulls in 1972 [291] and BCPM crews surveyed the four main islands in 1977. CWS crews surveyed all five islands in the group in May 1983. Cormorants, gulls, and Pigeon Guillemots were surveyed on the east island (#2) in 1986 and Keith Moore counted cormorant and gull nests there in 1988. There are no records for island #5 lying just off Skedans Point from any year except 1983.

The good-sized Pelagic Cormorant colony here reported by Cowan in this area in 1946 has not been seen since. At the time of our visit in 1983, cormorants were just beginning to build nests on island #2. We do not know if the few breeding birds present nested successfully. In 1971 and 1986, only roosting flocks of immature birds were present. Four nests with eggs seen on the eastern rocky area of island #2 in 1988 is the first confirmed breeding record since Cowan's visit.

Records also suggest declines in other species: Ancient Murrelets disappeared between 1970 and 1977, estimated numbers of Fork-tailed Storm-Petrels declined rapidly from 1971 to 1977, and estimates for Cassin's Auklets decreased between 1977 and 1983. Drent recorded Ancient Murrelets nesting on the southern island (#3) in 1970.[262] That island was not searched in 1971, but the four main islands were explored in 1977 and all five islands were explored in 1983. No sign of Ancient Murrelets was found in either year.

On BCNRS cards they submitted in 1971, Summers and Ellis estimated thousands of pairs of Fork-tailed Storm-Petrels nesting. In his 1974 paper, Summers gave an estimate of 10,000 pairs in 1971. He noted that evening activity of the birds was intense on the three islands they explored. Ken Summers, along with Ray Billings, also explored the islands and made estimates in May 1977. They estimated only 500 burrows on the large, west island (#4) and found remains of Fork-tailed Storm-Petrels on two other islands (#2 and 3). In July 1977, observers estimated 200 burrows on the east island and 25 pairs nesting on the north island, giving a total estimate for the islands of less than 10% of what Summers estimated in 1971.[262] However, Summers retrospectively concluded that estimates in his original field notes for 1971 of hundreds or thousands on the west island and thousands on the eastern islands were exaggerated and a better total estimate would have been closer to 2,000 pairs.[311]

There is little evidence of change in storm-petrel numbers between 1977 and 1983. We found Fork-tailed Storm-Petrels nesting on all five islands in 1983, and found many storm-petrels nesting in what appeared to be old Cassin's Auklet-sized burrows. Summers made the same observation in 1971.[262] Those burrows may also have been abandoned by Ancient Murrelets, which have similar-sized burrows.

Evidence of Cassin's Auklets nesting was found on the three islands explored in 1971 and on the four main islands in 1977, and estimated numbers were similar in those years. We counted fewer Cassin's Auklet burrows in 1983. Observers in July 1977 noted about 50 active-looking burrows on the large, west island (#4), but all Cassin's Auklet-sized burrows found there in 1983 appeared to be occupied by Fork-tailed Storm-Petrels. Small pockets of burrows were found around the other four islands surveyed in 1983.

Leach's Storm-Petrels have not been recorded nesting on the Skedans Islands, but most surveys occurred before their nesting season and no burrows were investigated in July 1977. Observers in 1977 found the remains of one bird of this species on island #3. It was unlikely they were breeding on the islands in 1983, since 95% of burrows explored contained Fork-tailed Storm- Petrels.

Black Oystercatchers have been recorded nesting (Figure 407) on the largest island (#4: 2 nests, 1 with

**Figure 407.** Only a few rock fragments and shells lined this Black Oystercatcher nest found on the largest (#4) of the Skedans Islands in 1977. *Photo by R. Wayne Campbell, 12 July 1977.*

2 eggs and 1 with a broken egg, in July 1977) and the southern, central island (#3: 2 partially-grown young in July 1977, and 1 nest with 1 egg and 2 empty nests in 1983).

Glaucous-winged Gulls have been recorded nesting only on the most eastern rock, where numbers have varied. Nest counts were completed in 1972, July 1977, 1986, and 1988; other visits occurred before nest building was complete. Summers and Ellis noted 80-100 adults there on 27 May 1971 but nest construction was just beginning and only two nests were found. Sixty birds were present there in May 1977 but only 16 nests were found in July. On 8 May 1983, 70 adults were on territories and just beginning to build nests.

Pigeon Guillemots have been recorded around most islands and nests have been found in rock crevices and burrows on island #2 (in 1972, 1977, and 1983) and island #1 (in 1983). Maximum numbers in 1972 were counted on 24 June.

**Figure 408.** Bald Eagle nest in a large Sitka spruce (upper right) on Skedans Island in 1977. *Photo by R. Wayne Campbell, 12 July 1977.*

**Table EM-740.** Seabird nesting records for Skedans Islands. See Appendix 2 for codes.

| DATE | FTSP | PECO | BLOY | GWGU | PIGU | ANMU | CAAU | SOURCE |
|---|---|---|---|---|---|---|---|---|
| Jun, Jul 1900 | | x | | | | | | 208 |
| 19 Aug 1946 | | 100e[a] | | | | | | 94 |
| 4 Jul 1961 | x | | | | | | | 262 |
| 1970 | | | | x | | x | x | 262 |
| 16-31 May 1971 | 10,000e | 0 | 1 | 40eS | 75eS(150) | | 500e | 262, 314 |
| 23 Jun-30 Jul 1972 | | | 1+S | 35[35] | 50e(200+) | | | 314 |
| 15 May, 12 Jul 1977 | 725e | 0 | 3[3] | 16[11] | 12+e(60) | 0 | 500eS | 314[b] |
| 8, 10 May 1983 | 1,100e | 3+S | 3[1] | 35e | x7(136) | E | 100 | 233 |
| 21 Jun 1986 | | 0 | | 49[30] | x(78) | | | 233 |
| 7 Jun 1988 | | 4[4] | | 13[13] | | | | 308 |

[a] See text regarding location.
[b] Estimates for 1977 were corrected from Campbell and Garrioch,[39] who listed estimates from 1971 given by Summers.[262]

**Remarks:** Bald Eagles were suspected of preying on Fork-tailed Storm-Petrels, Pelagic Cormorants, Glaucous-winged Gulls, and Cassin's Auklets in 1983, and on Glaucous-winged Gull eggs and adults in 1986. They were observed catching storm-petrels offshore and carrying them back to the islands before and after dusk in 1971.Two Bald Eagle nests were seen in 1971, one was found in 1977 (Figures 408 and 409), and four active nests were recorded in 1983. Fifteen Bald Eagles were counted around the islands on 10 May 1983. Ample signs of river otter were found on all islands in 1983. Otter dens were located on the large, west island in 1977 and 1983. Some river otter scats contained feathers in the vicinity of one Cassin's Auklet and two storm-petrel burrows that had been partially dug up in 1983. Evidence of raccoons on the island was reported by van den Brink [276] but Hartman and Eastman [155] did not detect them during their surveys in 1989-1990 (raccoons were also not found during subsequent monitoring in 1995-1999 [152]).

**Figure 409.** In mid-July 1977, one large Bald Eagle chick was near fledging in the nest found on Skedans Islands. *Photo by R. Wayne Campbell, 12 July 1977.*

The eastern island was one of the study sites used by Ward in his Ph.D. thesis work on Glaucous-winged Gulls conducted from 23 June to 30 July 1972.[291]

## EM-750 MABBS ISLET

**Location:** *53°00'43"N 131°56'10"W; 103 G/4.*
In the northwest entrance to Carmichael Passage.

**Description:** *0.6 ha; 25 m high; Forested.*

**Historical summary:** Pigeon Guillemots were nesting in burrows at the edge of the vegetation in 1977 (Table EM-750). One hatched and one depredated eggshell were found and 27 burrows were counted. Observers noted some old burrows in the interior of the island. The islet was not surveyed in the 1980s.

**Table EM-750.** Seabird nesting records for Mabbs Islet. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 12 Jul 1977 | 27(60) | 314 |

**Remarks:** Signs of river otter were noted in 1977.

## EM-760 NEDDEN ISLAND

**Location:** *53°01'35"N 131°56'45"W; 103 G/4.*
Southeast of Barge Point near the head of Cumshewa Inlet.

**Description:** *4.8 ha; 58 m high; Forested.*
Much of the forested area was regenerating spruce about 5 m high in 1977.

**Historical summary:** Two Black Oystercatcher eggshells were found around two nests in 1977 (Table EM-760). Two pairs of oystercatchers were present. Pigeon Guillemots were counted but no details were given on whether or not they were nesting in 1977. The island was not visited by CWS crews in the 1980s.

**Table EM-760.** Seabird nesting records for Nedden Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 12 Jul 1977 | 2 | (174) | 314 |

**Remarks:** One adult Bald Eagle was present in 1977.

## EM-770 OLIVER ISLET

**Location:** *53°02'15"N 131°56'08"W; 103 G/4.*
Northeast entrance to Gillatt Arm, Cumshewa Inlet.

**Description:** *1.0 ha; 35 m high; Forested.*
Wild rose occurs under a redcedar, spruce, and alder forest.

**Historical summary:** There is a set of Black Oystercatcher eggs [323a] collected by Osgood on 13 June 1900 labelled only Cumshewa Inlet, Queen Charlotte Islands. The location could have been Oliver Islet or another nearby colony. One oystercatcher nest with two eggs was found in 1977 (Table EM-770). Four adults were present. Two Pigeon Guillemots were seen but no evidence of nesting was recorded. No burrows of other species were found. The island was not surveyed by CWS in the 1980s.

**Table EM-770.** Seabird nesting records for Oliver Islet. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 12 Jul 1977 | 1 | (2) | 314 |

**Remarks:** One adult Bald Eagle was noted in 1977.

## EM-780 KINGUI ISLAND

**Location:** *53°01'28"N 131°37'48"W; 103 G/4.*
South of Cumshewa Head at the mouth of Cumshewa Inlet.

**Description:** *7.5 ha; 29 m high; Forested.*
Kingui Island is covered with dense salal under spruce trees.

**Historical summary:** Summers and Ellis found a few storm-petrel burrows and some Fork-tailed Storm-Petrel wings in openings in the salal under spruce at the east end of the island in 1971 (Table EM-780). They counted 150-200 Pigeon Guillemots on the rocks in the late morning. No burrows or other signs of storm-petrels were found in 1977.

An empty Black Oystercatcher scrape with signs of hatched young and attended by a pair of adults was found in 1977. Observers suspected that young were hidden. The island was not visited by CWS crews in the 1980s.

**Table EM-780.** Seabird nesting records for Kingui Island. See Appendix 2 for codes.

| DATE | FTSP | BLOY | PIGU | SOURCE |
|---|---|---|---|---|
| 19 May 1971 | 15eS | | 75eS(150+) | 262, 314 |
| 12 Jul 1977 | 0[a] | 1 | S(4) | 314 |

[a] Estimate given by Campbell and Garrioch [39] was based on Summers [262] observations in 1971.

## EM-790 CUMSHEWA ISLAND

**Location:** *53°01'48"N 131°36'05"W; 103 G/4.*
At the mouth of Cumshewa Inlet.

**Description:** *2.4 ha; Grassy rock.*

**Historical summary:** Foster first recorded Glaucous-winged Gulls nesting in 1960 (Table EM-790). Numbers nesting have varied, with the maximum number of nests counted in 1986. In 1986, 26 gull nests contained clutches of eggs, two nests contained a depredated egg each, and nine nests were empty. Black Oystercatchers have been seen in most years: one was recorded in 1971; three pairs were present but only one nest with two eggs was found in 1972; a nest with two eggs was found in 1977; and one pair was attending an empty nest in 1986. The rock is regularly used as a roost by non-breeding Pelagic Cormorants: first noted by Drent in 1970; 150 seen in 1971; 68 counted in 1977; and 21 recorded in 1986.

**Table EM-790.** Seabird nesting records for Cumshewa Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 29 Jun 1960 | | 20eS | | 314 |
| 19 May 1971 | | 25eS | S(75) | 262, 314 |
| 28 Jun 1972 | 1 | 5[3] | | 314 |
| 12 Jul 1977 | 1 | 18[10] | 5+eS(11) | 39, 314 |
| 21 Jun 1986 | 1S | 37[28] | x2(62) | 233 |

**Remarks:** One Bald Eagle was noted in 1977.

***The Maverick Auk***

*Although the BC coast is an important breeding area for Marbled Murrelets,[69] we have not given much attention in this volume to this species because of their non-colonial, inland nesting habits. But they have not been ignored in seabird studies* (Figure 410). *Spencer Sealy documented aspects of their breeding biology inferred from observed and collected birds around Langara Island in the early 1970s [244, 245] and Harry Carter carried on studies of this species in Barkley Sound on the west coast of Vancouver Island in the early 1980s.[53, 254] The first attempts to measure inland activity in relation to potential nesting habitat began in BC in 1989 when Alan Burger out of the University of Victoria began studies* *in the Carmanah Valley on the west coast of Vancouver Island* [27] *and Jean-Pierre Savard with Moira Lemon from CWS initiated preliminary surveys around Vancouver, in the Carmanah Valley, and in Haida Gwaii. A more intensive CWS study was designed and conducted in 1990 in Haida Gwaii. That study was supervised by Jean-Pierre Savard and led by myself (Michael) with the assistance of Moira and a number of dedicated students.*[236-239] *We measured inland activity in old-growth, second-growth, and alpine habitats in study areas at the south end of Graham Island. We also measured diurnal and seasonal abundance of Marbled Murrelets on the water in Long Inlet, off Skidegate Inlet, adjacent to one of our inland study areas.*

*Determining the distribution and abundance of the colonial-breeding seabird species that we consider in this catalogue is straightforward – we count or calculate from sample quadrats the number of nests of each species on each colony. Marbled Murrelets are a whole other ball game. Because Marbled Murrelet nests are so difficult to find, alternative, surrogate methods to measure their nesting distribution and inland abundance had to be developed. From work conducted in California, Oregon, and Washington, biologists developed a protocol to measure inland activity based on what was called a "detection."* [213] *This measure of activity took advantage of the fact that Marbled Murrelets flying to and from nest sites can be seen and more often heard calling by observers on the ground. Activity by nesting birds is concentrated in the early morning and late evening and the amount of activity at specific sites can be measured by conducting continuous observations during those periods. The total number of detections recorded provides a relative measure of abundance at sample stations. Unfortunately, numbers of detections cannot be translated into numbers of nesting birds in an area because most detections only record birds flying over and only rarely is a bird seen or heard landing at what might be a nest site. However, with enough sampling in different areas, associations can be made between activity levels and habitat types.*

*Conducting surveys of Marbled Murrelet activity in forested habitat presents a number of challenges. To conduct morning surveys, observers must station themselves before the break of day in an opening where they can get a view of the sky. Then, for two hours they must keep their eyes trained on the sky while they watch and listen for any murrelets flying over. Because you have to be at your station before light, you have to previously find the site and mark a route to it from your camp so that you can find it in the dark. Florescent flagging tape was a great boon for marking the route. When you are conducting such surveys, there is nothing worse than getting up at two in the morning (dawn breaks early in summer in Haida Gwaii) and then losing your way to your survey station and ending up wandering around in the dark looking for it! Of course, the almost mystical experience of standing quietly in the middle of an ancient forest while the world comes to life around you more than compensates for any unpleasant ordeals you may have to suffer.*

*The 1990 study in Haida Gwaii resulted in some important findings that further confirmed the association of Marbled Murrelets with old-growth forests and helped in the design of future studies* (Figure 411)*. Many studies have been conducted in BC since, primarily under the guidance of Alan Burger at the University of Victoria, Fred Cooke and later David Lank at Simon Fraser University, Gary Kaiser and later Doug Bertram at CWS, and Trudy Chatwin and Monica Mather at the BC Ministry of Environment. With this research, our knowledge about the abundance and distribution of Marbled Murrelets and their dependence on old-growth forests in BC has improved* (Figure 412)*.*[69] *Other research tools have been developed since 1990 that have improved the measure of breeding activity associated with different areas. Marine radar is able to detect birds flying into watersheds and has been used extensively in different areas of the BC coast to provide relative measures of abundance.*[25] *Radio-telemetry has been used to locate nest sites and determine use of the marine environment, and a molecular sexing technique and hormonal assays that indicate breeding status have also been developed.*[165] *As a culmination of many years of conducting surveys and studies of Marbled Murrelets in many areas of the BC coast, Gary Kaiser has even written a popular account of the species.*[176]

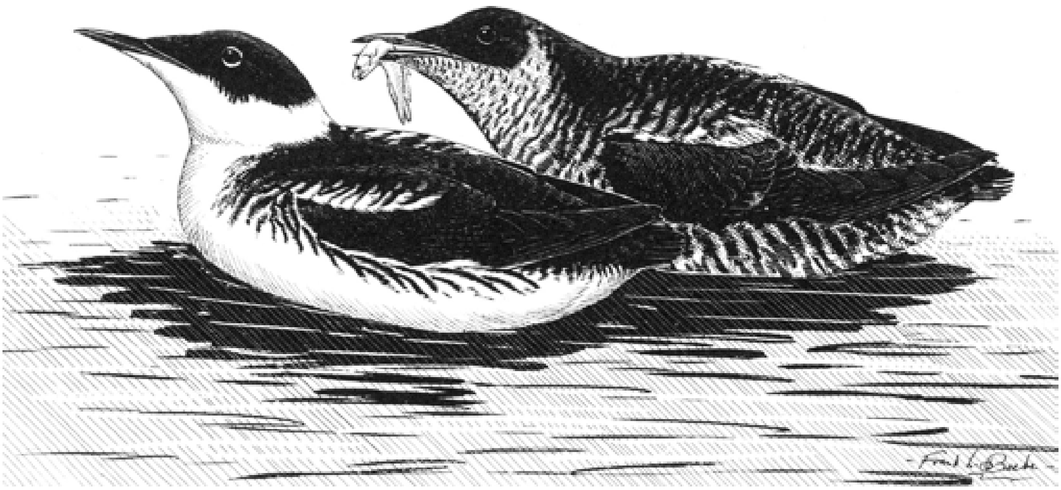


**Figure 410.** Most of the research on Marbled Murrelets in BC has been conducted during the breeding season and has focused on determining breeding habitat requirements, population status, and demographic rates. *Drawing courtesy Frank L. Beebe.*

**Figure 411.** A novel approach to capture newly fledged Marbled Murrelets in the forest was to set funnel traps along stream channels to catch young birds that may be travelling overland to the sea. *Photo by R. Wayne Campbell, near Powell River, BC, 18 January 2001.*

**Figure 412.** A Marbled Murrelet in winter plumage. Few studies have been conducted of this species during the winter and much information on basic natural history during the non-breeding season is lacking. Studies are needed on the survival of fledglings after they leave the nest, post-breeding movements of young and adults, possible moult migrations, and winter food habits in relation to the distribution and abundance of prey species and oceanographic conditions. *Photo by Carita Bergman, Gwaii Haanas, 27 October 2010.*

## SKIDEGATE INLET

The numerous islands in Skidegate Inlet (Figure 413), between Graham and Moresby islands, are nesting sites for Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots (Figures 414 and 415). No other seabird species have been recorded nesting in these sheltered waters. As of 1990, a total of 3,445 birds of the three species were estimated nesting at 34 sites (Table 8).

Earliest seabird breeding records in Skidegate Inlet are from 1895, when Kermode collected two oystercatcher chicks on 28-29 July, [55] and noted Pigeon Guillemots common in the inlet in August.[179] Spreadborough collected Pigeon Guillemot and Glaucous-winged Gull eggs in 1910 [314] and Guiguet documented nesting by these two species in 1946 and 1947.[94]

**Figure 413.** Skidegate Inlet lies between the eastern portions of Graham and Moresby islands. It is about 10 km wide at its eastern mouth at Sandspit and extends about 30 km inland where it narrows to its headwaters in Long Inlet. The inlet has a long sand spit at its mouth and contains large forested islands, smaller bare and grassy islets, and sheltered channels and bays. The island in the photo is Torrens Island at the eastern end of Skidegate Inlet. *Photo by R. Wayne Campbell, 5 June 2000.*

**Figure 414.** An estimated 3,445 individuals of three seabird species breed at 34 sites in Skidegate Inlet as of 1990, including, top to bottom, Black Oystercatcher (53 pairs), Glaucous-winged Gull (182 pairs), and Pigeon Guillemot (almost 3,000 individuals). *Photos by R. Wayne Campbell except Pigeon Guillemot by Alan D. Wilson.*

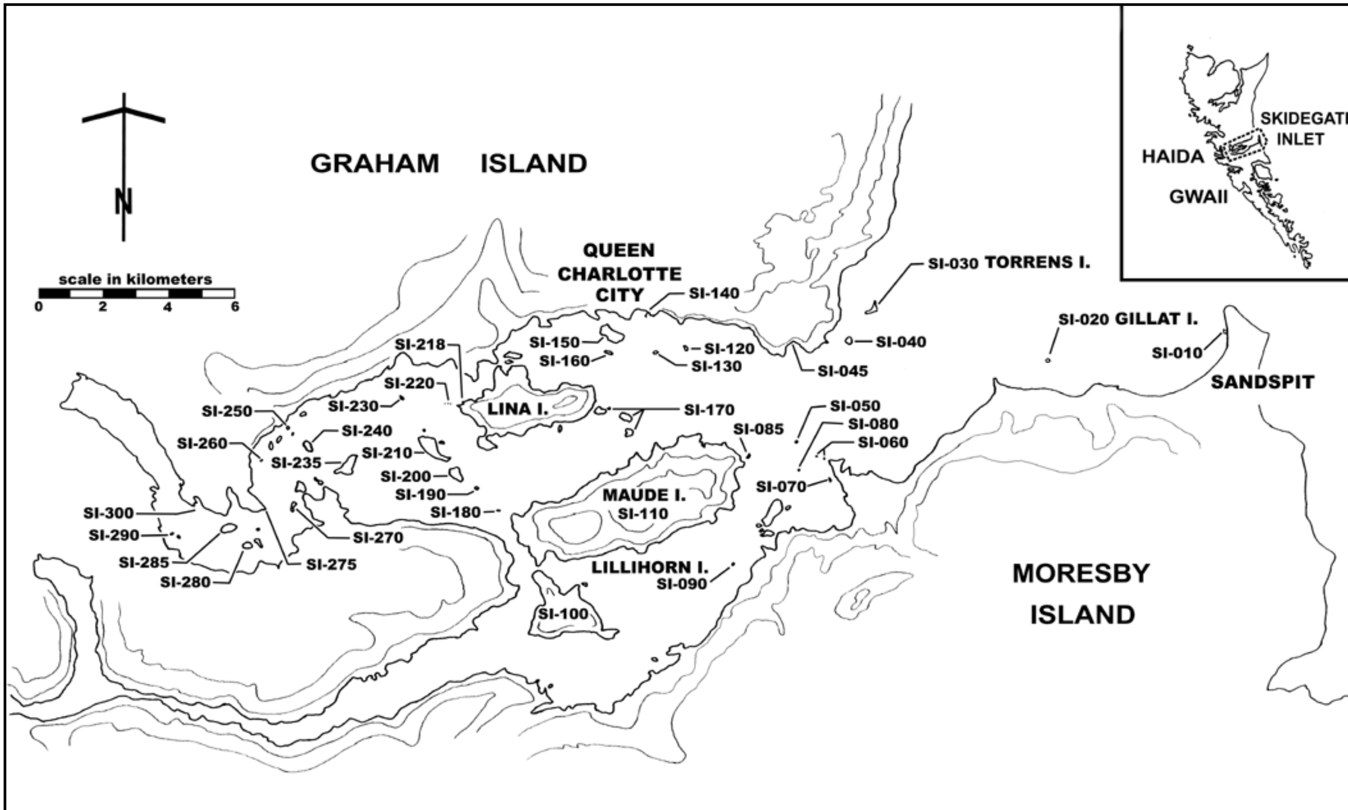



Figure 415. Locations of seabird colonies in Skidegate Inlet (modified from Rodway [227]).

**Table 8.** Estimates of seabird breeding populations in Skidegate Inlet as of 1990. Estimates are numbers of breeding pairs except for numbers in parentheses, totals in the "All species" column, and totals in the "Total breeding birds" row, which are numbers of individuals. See Appendix 2 on pages 467-468 for an explanation of the letter codes used to qualify population estimates.

| SITE CODE | SITE NAME | BLOY | GWGU | PIGU | ALL SPECIES[a] | SURVEY YEAR[b] |
|---|---|---|---|---|---|---|
| SI-010 | Sandspit - Wharf | | | 8e | 16 | 1977 |
| SI-020 | Gillatt Island | 3 | 80 | x(72) | 238 | 1990 |
| SI-030 | Torrens Island | 0 | | x(516) | 516 | 1990 |
| SI-040 | Jewell Island | | | x(311) | 311 | 1990 |
| SI-045 | Skidegate - Ferry Dock | | | x(17) | 17 | 1990 |
| SI-050 | Flowery Islet | | 22 | | 44 | 1990 |
| SI-060 | "Kwuna" Rocks | 1 | 20 | x(21) | 63 | 1990 |
| SI-070 | "Alliford" Islets | 6 | 0 | x(61) | 73 | 1990 |
| SI-080 | Bush Island | 3 | 30 | x(62) | 128 | 1990 |
| SI-085 | Robber Island | 1 | | | 2 | 1990 |
| SI-090 | Lillihorn Island | 2 | 7e | x(590) | 608 | 1990 |
| SI-100 | Sandilands Island | 4 | 2 | x(66) | 78 | 1990 |
| SI-110 | Maude Island | | 0 | x(1) | 1 | 1990 |
| SI-120 | Maple Island | 4 | 7e | x(151) | 173 | 1990 |
| SI-130 | Gooden Island | 1 | 0 | x(169) | 171 | 1990 |
| 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 | 1 | 1 | x(82) | 86 | 1990 |
| 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 |
| 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)[c] | 0[c] | 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 |
| **TOTAL NESTING PAIRS** | | **53[d]** | **182** | | | |
| **TOTAL BREEDING BIRDS** | | **106** | **364** | **2,975** | **3,445** | |
| **TOTAL CURRENT SITES** | | 22 | 16 | 26 | 34 | |
| ***Confirmed on last survey*** | | 22 | 16 | 26 | 34 | |
| ***Confirmed on any survey*** | | 22 | 16 | 26 | 34 | |
| ***Unconfirmed*** | | 0 | 0 | 0 | 0 | |
| **TOTAL HISTORICAL SITES** | | 24 | 21 | 28 | 36 | |
| ***Confirmed*** | | 24 | 20 | 27 | 35 | |
| ***Unconfirmed*** | | 0 | 1 | 1 | 1 | |
| **CURRENTLY ABANDONED SITES** | | 2 | 5 | 2 | 2 | |
| ***Previously confirmed*** | | 2 | 4 | 1 | 1 | |
| ***Previously unconfirmed*** | | 0 | 1 | 1 | 1 | |

[a] Number of individuals.
[b] For sources see individual island accounts.
[c] Pigeon Guillemots were present here on other surveys conducted in 1990 (see colony account).
[d] Total has been revised from that given in Vermeer et al.[285] based on original data and tallies provided by Ken Morgan.[309]

Four comprehensive surveys have been conducted in the inlet, providing quantitative data for 1974,[34, 314] 1977,[314] 1986,[227] and 1990 [285, 286, 287, 309] (Table 9). The 1990 data were from intensive studies conducted through the summer of 1990 that provided more robust estimates of nesting populations than previous surveys conducted over shorter time periods, and some of the differences between 1990 data and earlier are due to more thorough survey methods, especially for Pigeon Guillemots. In 1977, in addition to the main survey conducted by the BCPM in July, seven colonies were visited in May as part of an assessment by the BC Fish and Wildlife Branch in response to numerous applications for handlogging on small islands in Skidegate Inlet and in Masset and Juskatla inlets.[159]

Survey results suggested that nesting Black Oystercatcher and Glaucous-winged Gull populations in Skidegate Inlet increased from 1974 to 1986 and from 1974 to 1990, respectively (Table 9). Differences in effort spent searching for nests of both species, in searching for hidden oystercatcher chicks when they are hiding away from nests, and in recording of observations, particularly of empty nests, may account for some of the apparent changes. For Glaucous-winged Gulls, recording methods have been consistent across years and we are confident that changes in the number of gull nests recorded over the four years reflect real population change. Some of the increase in numbers in 1990 was due to repeated and more thorough searches for nests,[287] but we believe that the proportion of nests that may have been missed on earlier surveys was small and the more thorough searches for nests in 1990 would introduce only a small bias in the inter-annual comparisons. Thus, we think it safe to conclude that the gull population has more than tripled from 1974 to 1990. However, comparative data from 1947 for the major colony on Gillatt Island and from 1946 for Maple Island (see colony accounts below) suggest that the regional population may have been larger in the past and the increase seen since 1974 follows a previous decline between the 1940s and the 1970s.

**Table 9.** Breeding populations of Black Oystercatcher and Glaucous-winged Gull, and numbers of Pigeon Guillemots counted around colonies in Skidegate Inlet in 1974, 1977, 1986, and 1990.

| | BLOY | | | GWGU | | | PIGU | | |
|---|---|---|---|---|---|---|---|---|---|
| **Survey Date** | **Pairs nesting[a]** | **Nests found[b]** | **Sites** | **Pairs nesting[a]** | **Nests found[b]** | **Sites** | **Confirmed Nests** | **Birds** | **Sites** |
| 17-18 June 1974[c] | 25 | 25[15] | 14 | 42 | 42[13] | 11 | x27 | 968 | 17 |
| 13&17 July 1977 | 36 | 36[10] | 13 | 51 | 50[33] | 11 | x82 | 1,260 | 20 |
| 22 June-1 July 1986 | 63 | 54[21] | 18 | 119[d] | 111[80] | 14[d] | S | 719 | 11 |
| 13 May-14 August 1990[e] | 53[f] | 53[53] | 22 | 182 | 175[175] | 16 | x28+ | 2,975 | 26 |

[a] If greater than nests found, includes pairs that were suspected nesting but nests were not observed.
[b] Nests found includes total nests followed by nest with eggs or young in brackets.
[c] Numbers are revised from those in Campbell [34] based on original notes in the BCNRS.
[d] Numbers revised from Rodway.[227] Note that numbers of empty nests and nests with eggs in 1986 quoted by Vermeer et al.[287] was an error.
[e] Number of sites differs from that given in Vermeer et al.[285, 286, 287] because we grouped small, unnamed rocks differently.
[f] Total has been revised from that given in Vermeer et al.[285] based on original data and tallies provided by Ken Morgan.[309]

Reporting methods for Black Oystercatcher nests have varied among years and we are less confident that the number of nests reported accurately reflects nesting populations in the different years (Figure 416). In 1974, Campbell reported 15 definitely active nests.[34] However, an additional 10 empty nests were found in 1974 that were suspected to have had associated young.[314] We have included those 10 empty nests in our tabulation (Table 9), to be consistent with 1977 and 1986, when empty nests as well as nests with eggs were reported.[227, 314] A second problem that confounds comparisons for Black Oystercatcher is the difficulty of finding chicks when they are hiding away from the nest. In 1977, eggs or young were found at only 10 nests, and in 1986, only 21 of 54 nests found had eggs. No chicks were recorded in 1986, which is unusual at the end of June when that survey was conducted, and some empty nests likely had hidden young nearby. Allowing for the difficulty of finding wandering young, we suspect the increase in nests found indicates a real increase in the Black Oystercatcher nesting population between 1974 and 1986. The number of oystercatcher nests found was essentially the same in 1990 as in 1986 and the greater number that held eggs in 1990 (Table 9) was due to repeated visits throughout the breeding season.

**Figure 416.** Useful historical information on seabird species nesting in Skidegate Inlet can be obtained by talking with local egg-gatherers, boaters, and residents living in the inlet. For example, people living on Robertson Island have been observing the activities of a pair of Black Oystercatchers for years. *Photo by R. Wayne Campbell, 17 July 1977.*

Data for Pigeon Guillemots are inadequate for interpreting trends, and differences among years in numbers of birds counted were most likely due to survey timing and intensity. Repeated surveys in 1990 at times of maximum attendance provide the only reliable estimate of total numbers of guillemots using the area, although actual breeding populations were still unknown (Figure 417). Numbers of Pigeon Guillemots listed for each colony in 1990 are taken from the survey date with the maximum total count of 2,959 birds on 3-4 July.[286] Individual colonies sometimes had higher counts on other survey dates in 1990,[286] but the overall maximum count was considered the best estimate of total numbers. As we noted earlier, of all regions in BC, the greatest number of Pigeon Guillemots has been counted at colonies in Skidegate Inlet in 1990. However, Skidegate Inlet is the only region in BC where Pigeon Guillemot numbers have been reliably estimated and the relative importance of the area to provincial populations has not been determined. Considering that some birds in attendance were likely non-breeders, Vermeer et al. estimated the breeding population in Skidegate Inlet in 1990 to be 1,000-1,100 pairs.[286]

**Figure 417.** Skidegate Inlet is the only region in Haida Gwaii and in BC where reliable estimates have been obtained of the numbers of Pigeon Guillemots attending colonies, although total numbers breeding on those colonies remains unknown. *Photo by Alan D. Wilson.*

Raccoons are a serious threat to nesting seabirds in Skidegate Inlet (Figure 418). Predation accounted for 47% of 113 Black Oystercatcher eggs that did not hatch during the intensive study in 1990.[285] Raccoons were likely responsible for much of the egg predation; they were seen on many of the larger forested islands in the inlet and signs of raccoon were common on smaller nesting rocks. Pigeon Guillemots killed by raccoons and dug-up burrows were also found on some colonies in 1990.[286] The apparent disappearance of Pigeon Guillemots from Scalus Island by 1990 may be related to the spread of raccoons in the inlet.

**Figure 418.** Throughout Haida Gwaii, Northern Raccoons have invaded seabird colonies and impacted breeding populations, including those of the three species nesting in Skidegate Inlet. *Photo by R. Wayne Campbell.*

Egg harvesting by local people was the main cause of egg loss for Glaucous-winged Gulls nesting in Skidegate Inlet in 1990 [287] and may have been the reason for many empty nests recorded during previous surveys (Table 9).[34, 227] Productivity in gull nests was not reduced where egging occurred only at the beginning of the egg-laying period, but no chicks were produced in colonies that were egged throughout the season.[287] Gull populations in Skidegate Inlet have continued to increase in spite of egg harvesting.

Flooding of nests placed close to the shore was another major cause of egg loss in 1990. Nests washed out by waves at high tides accounted for 38% and 19% of the egg loss from Black Oystercatcher and Glaucous-winged Gull nests, respectively.

## SI-010 SANDSPIT - WHARF

**Location:** *53°15'15"N 131°49'23"W; 103 G/4.*
West of Spit Point, on the north side of the town of Sandspit on Moresby Island.

**Description:** *Wharf.*
This government wharf was dismantled in 2018.

**Historical summary:** Wayne Campbell found two Pigeon Guillemot nests with eggs laid on crossbeams under the wharf in 1974 (Table SI-010). Three nests with eggs were found in similar locations and a total of eight pairs were estimated nesting in 1977. Dave Younger recorded one Pigeon Guillemot nest with young in 1980, but total nesting population was not estimated. Up to 1990, the 1977 record is the most recent estimate for total numbers of birds.

**Table SI-010.** Seabird nesting records for Sandpit - Wharf. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 16 Jun 1974 | x2(6) | 34 |
| 3 Jul 1977 | 8e | 314 |
| 5 Jul 1980 | x | 314 |

***Pigeon Guillemots on the Move***

*Many seabird species have adapted to using human-made structures for nesting. Large numbers of Pelagic and Double-crested cormorants and Glaucous-winged Gulls nest on bridges, pilings, breakwaters, and light beacons and many gulls nest on rooftops and other structures in urban areas. One gull nest was found high up on a derrick in the Esquimalt naval yard in Victoria and others have been seen on log booms in the Vancouver area. Even Black Oystercatchers have been known to nest on rooftops in Nanaimo. Pigeon Guillemots have been found nesting on or under a variety of artificial substrates, including wharfs in Sandspit, Skidegate, Queen Charlotte City, Prince Rupert, Port Hardy, and Tsawwassen, and piles of abandoned cable on "Alliford" Islets in Skidegate Inlet. These seabird nesting locations are generally stationary structures, but some nests have been found on artificial habitats on the move, such as a gull nest found on a sawdust barge travelling between Vancouver to Nanaimo. It is* *not known whether birds colonize these habitats while they are moving or whether they settle on them when they are stationary and only subsequently find their chosen nest sites on the move.*

*One of the most surprising locations for a nest was the Pigeon Guillemot nest discovered by Samuel de Beer on 21 July 2007 aboard the small ferry, the* M.V. Kwuna*, that travels back and forth all day across Skidegate Inlet between Graham and Moresby islands* (Figure 419).[84] *The nest was tucked down inside one of the metal pillars that house the hydraulics for the landing ramp. Access to the nest site was through a very small opening through which parents had to enter to feed their two chicks tucked away inside the pillar* (Figure 420). *Just landing on the moving ferry required some coordination and Samuel noted that it took adults several attempts before they were successful at accessing the nest site. Other pairs may also have been nesting on the same ferry. How individual birds make the decision to colonize such a habitat is an intriguing question. In this particular case, it is likely that the ferry was in service when the birds chose it as a nest site. Perhaps Pigeon Guillemots colonized the ferry dock first, and then expanded their nesting habitat to include the ferry during the brief periods that it was docked.*

**Figure 420.** Two downy Pigeon Guillemot chicks crammed in a crevice aboard the *M.V. Kwana* in 2007. *Photo by Samuel de Beer, 21 July 2007.*

**Figure 419.** Pigeon Guillemots were discovered nesting in 2007 on the *M.V. Kwuna* that travelled daily across Skidegate Inlet between Graham and Moresby islands. *Photo by Samuel de Beer, 21 July 2007.*

## SI-020 GILLATT ISLAND

**Location:** *53°14'40"N 131°53'57"W; 103 G/4.*
East of Onward Point at the east entrance to Skidegate Inlet. Prior to 1946, this island was known as Grassy Island.[79]

**Description:** *0.8 ha; 3 m high; Grassy rock.*
Gillatt Island is a low, flat rock with a crown of grasses and forbs (Figure 421). Patches of wild roses, short willows, and other shrubs occur in central areas. A sandy spit with beaches on either side extends off the south end of the island. There is a navigational beacon on the island.

**Historical summary:** Guiguet reported a large colony of Glaucous-winged Gulls in 1947, although all nests were empty (Table SI-020). Much lower numbers were found nesting in the 1970s, but by 1990, Gillatt Island was by far the largest gull colony in Skidegate Inlet, supporting 44% of the total breeding population in the inlet. A total of 88 Glaucous-winged Gull nests with eggs were found but many replacement clutches were laid and some new nests were built between 30 May and 9 July during the intensive study of reproductive success in 1990.[287, 309] The nesting population was estimated to be 80 pairs.[309]

Five empty Black Oystercatcher scrapes were found along the upper beach in 1974. Three birds were excited and two pairs were suspected nesting. Nests with eggs were found on the beach in 1977 (Figure 422). Pigeon Guillemot nests with one egg each were found in 1974, one under a rock and one in a crevice below the high tide line. The egg in the latter nest was cold and had likely recently been inundated by the tide.

**Table SI-020.** Seabird nesting records for Gillatt Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 15 Jul 1947 | | 30[0] | | 94 |
| 17 Jun 1974 | 2S | 9[2] | x2(28) | 34, 314 |
| 14 Jul 1977 | 2[2] | 19[11] | x | 314 |
| 22 Jun-1 Jul 1986 | 3[1] | 40[16] | S(11) | 227 |
| May-Jul 1990 | 3[3] | 80[80] | x(72) | 285, 286, 287, 309 |

**Remarks:** Drent and Guiguet noted that all gull nests were empty in 1947.[94] They suspected that young had hatched although none were found. We suspect that egg harvesting may account for the low proportions of nests with eggs found in 1947 and 1986 (the few nests with eggs in 1974 was due to the timing of the survey which occurred when egg laying was just beginning). During the intensive study in 1990, 27 gull clutches were lost to egging and 17 were washed out by high waves.[309]

An adult Bald Eagle was seen harassing scoters around the island, and a Sitka Deer carcass entangled in seaweed (Figure 423) was found on the beach in 1974. A broken guillemot egg was found on the beach in 1977.

**Figure 421.** Gillatt Island is a low, grassy rock with patches of shrubs and forbs. *Photo by R. Wayne Campbell, 14 July 1977.*

**Figure 422.** Black Oystercatcher nest on a bed of barnacle and clam shell fragments on Gillatt Island in 1977. Note the one smaller egg (bottom). *Photo by R. Wayne Campbell, 14 July 1977.*

**Figure 423.** A carcass of a Sitka Deer, entangled in seaweed, was found on the beach on Gillatt Island in 1974. *Photo by R. Wayne Campbell, 17 June 1974.*

## SI-030 TORRENS ISLAND

**Location:** *53°15'25"N 131°58'37"W; 103 G/5.* Southeast of the Haida community of Skidegate. Named Bare Island on charts prior to 1945.[79]

**Description:** *6.4 ha; 50 m high; Forested.* Torrens Island is heavily forested with pine and spruce (Figure 424). It has rocky headlands, and a grassy, rocky knob connected to the southwest end by meadow and gravel beach. There was a Haida fort on the island in the past.[79]

**Figure 424.** Torrens Island is forested with Sitka spruce and lodgepole pine. *Photo by R. Wayne Campbell, 4 June 2000.*

**Historical summary:** A pair of Black Oystercatchers was found nesting on the southwest grassy knob in 1974 (Figure 425) and 1986 (Table SI-030). No

**Figure 425.** Black Oystercatcher nest with two eggs laid on bare rock in a patch of cinquefoil (centre left) on Torrens Island in 1974. *Photo by R. Wayne Campbell, 17 June 1974.*

oystercatchers were seen in 1977 or 1990 and they appear to nest intermittently. Seven Pigeon Guillemot nests with eggs were found in 1967. Guillemots were nesting in burrows around the main island and one burrow explored held one egg in 1977 (Figure 426). Large numbers of guillemots have been observed around the island in most years except 1986; during the intensive study in 1990, numbers counted around Torrens Island were exceeded only by counts around Lillihorn Island.[286]

**Figure 426.** Pigeon Guillemots were nesting in burrows under vegetation on Torrens Island in 1977. *Photo by R. Wayne Campbell, 13 July 1977.*

**Table SI-030.** Seabird nesting records for Torrens Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 6 Jun 1967 | | x7 | 16 |
| 17 Jun 1974 | 1 | S(261) | 34 |
| 13 Jul 1977 | 0 | 25+e(167) | 39, 314 |
| 22 Jun-1 Jul 1986 | 1 | (0) | 227 |
| May-July 1990 | 0 | x(516) | 285, 286, 309. |

**Remarks:** European Rabbits (*Oryctolagus cuniculus*) were reported introduced and flourishing on the island in the late 1800s.[79] An immature Bald Eagle was sighted in 1974 and an adult was present in 1977. Two depredated guillemot eggs were found in 1977.

Six adult Pigeon Guillemots and four clutches of eggs were collected for pesticide analysis in 1967 (Figure 427).[16]

**Figure 427.** In response to world-wide concern in the 1960s about egg-shell thinning in birds due to ingested pesticides, clutches of eggs of fish-eating Pigeon Guillemots were collected from Torrens Island in 1967 for analysis. *Photo by R. Wayne Campbell.*

## SI-040 JEWELL ISLAND

**Location:** *53°14'53"N 131°59'11"W; 103 G/4.*
Northeast of Image Point. Known as Tree Island on charts prior to 1945.[79]

**Description:** *3.2 ha; 46 m high; Forested.*
Jewell Island has precipitous sides, with many cracks and crevices in the rock bluffs. The top is heavily forested with redcedar and spruce (Figure 428). Extensive patches of moss are found in the interior (Figure 429).

**Figure 428.** Jewell Island is a forested island with steep sides and rocky bluffs. *Photo by R. Wayne Campbell, 17 June 1974.*

**Figure 429.** The interior of Jewell Island has extensive mossy patches under a western redcedar and Sitka spruce forest. *Photo by R. Wayne Campbell, 17 June 1974.*

**Historical summary:** Young collected a Black Oystercatcher egg in 1930 on "Tree Island" at the entrance to Skidegate Inlet, which most likely was Jewell Island (Table SI-040). Nesting by oystercatchers has not been observed since. Pigeon Guillemots were nesting under large boulders and in rock crevices, especially towards the north end of the island in 1974 (Figure 430). They were also noted nesting in burrows in 1977. Similar numbers have been recorded around the island through to the 1990 survey, except none were seen in 1986.

**Figure 430.** Pigeon Guillemots were nesting under large boulders and in rock crevices on Jewell Island in 1974. *Photo by R. Wayne Campbell, 17 June 1974.*

**Table SI-040.** Seabird nesting records for Jewell Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 31 May 1930 | x | | 325b |
| 17 Jun 1974 | 0 | x3(311) | 34 |
| 13 Jul 1977 | 0 | x6(284) | 314 |
| 22 Jun-1 Jul 1986 | 0 | (0) | 308 |
| 3-4 July 1990 | 0 | x(311) | 286, 309 |

**Remarks:** There was a Bald Eagle nest on the island in 1974 and 1977; one fledged young was present in 1974 and two adults were seen in 1977. Many bear scats were seen in 1974 (Figure 431).

**Figure 431.** Scats seen in 1974 on Jewell Island demonstrate that American Black Bears readily swim to islands in Skidegate Inlet. *Photo by R. Wayne Campbell, 16 July 1974.*

## SI-045 SKIDEGATE - FERRY DOCK

**Location:** *53°14'48"N 132°00'33"W; 103 G/4.*
At Skidegate between Image Point and Haida Point on Graham Island.

**Description:** *Wharf and ferry dock.*

**Historical summary:** There are no records prior to the 1990 survey when Pigeon Guillemots were found nesting under the ferry dock (Figure 432; Table SI-045).

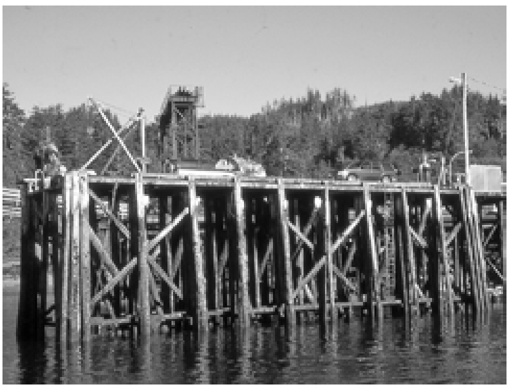


**Figure 432.** Pigeon Guillemots nest under the ferry dock at Skidegate. *Photo by R. Wayne Campbell, 4 June 2000.*

**Table SI-045.** Seabird nesting records for Skidegate - Ferry Dock. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 3-4 July 1990 | x(17) | 286, 309 |

## SI-050 FLOWERY ISLET

**Location:** *53°13'19"N 132°00'26"W; 103 F/1.*
Northwest of the rocks off Kwuna Point, north of Bush Island.

**Description:** *0.05 ha; 4 m high; Grassy rock.*
This small islet is mostly bare rock, with patches of lush grasses and forbs in crevices where soil has collected. There is a navigational beacon on the islet.

**Historical summary:** Surveys were conducted on land in all years except 1979 when Michael Shepard from the BCPM made observations from the ferry (Table SI-050). Thirty Glaucous-winged Gull nests containing eggs were found between 7 June and 23 July during the study of reproductive success in 1990.[287, 309] Many replacement clutches were laid, some new nests were built, and the nesting population was estimated to be 22 pairs.[309]

**Table SI-050.** Seabird nesting records for Flowery Islet. See Appendix 2 for codes.

| DATE | GWGU | SOURCE |
|---|---|---|
| 17 Jun 1974 | 8[2] | 34 |
| 13 Jul 1977 | 8[5] | 314 |
| 4 Aug 1979 | S | 314 |
| 22 Jun-1 Jul 1986 | 21[19] | 227 |
| May-Jul 1990 | 22[22] | 287, 309 |

**Remarks:** Twenty-six gull clutches were lost to egging in 1990. Egging continued throughout the season and no eggs hatched on Flowery Island by the end of that study.[287]

## SI-060 "KWUNA" ROCKS

**Location:** *53°13'11"N 132°00'05"W* (outer rock); *103 G/4.*
Unnamed rocks northwest of Kwuna Point.

**Description:** *0.06 ha; 3 m high; Bare rock.*
This is a set of three rocks extending northwest from Kwuna Point.

**Historical summary:** Nesting has been recorded only on the outer, northwestern most rock. A Black Oystercatcher nest with two young was found in 1974 (Figure 433; Table SI-060). Three adults were flushed off the rock. Three adults were again seen in 1977 but it was not recorded whether observers searched for nests or observed any territorial behaviour.

**Figure 433.** A Black Oystercatcher chick (lower right) spotted on "Kwuna" Rocks in 1974 remained motionless until the danger posed by our presence had passed. *Photo by R. Wayne Campbell, 17 June 1974.*

Few Glaucous-winged Gull nests held eggs at the time of the survey in 1974 (Figure 434). In 1990, a total of 26 gull nests with eggs were found between 11 June and 11 July during the intensive study of reproductive success; some were replacement clutches and new nests, and the nesting population was estimated to be 20 pairs.[287, 309] One Pigeon Guillemot nest was found in a rock crevice in 1974.

**Figure 434.** Only three of 10 Glaucous-winged Gull nests found on "Kwuna" Rocks in 1974 contained eggs. *Photo by R. Wayne Campbell, 17 June 1974.*

**Table SI-060.** Seabird nesting records for "Kwuna" Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 17 Jun 1974 | 1 | 10[3] | 1 | 34 |
| 13 Jul 1977 | | 13[13] | S(8) | 314 |
| 22 Jun-1 Jul 1986 | 3[1] | 12[9] | S(26) | 227 |
| May-Jul 1990 | 1 | 20[20] | x(21) | 285, 286, 287, 309 |

**Remarks:** One of two eggs in the Pigeon Guillemot nest found in 1974 was depredated by crows (Figures 435 and 436). Two Northwestern Crows were flushed off the broken egg. Thirteen of the 26 gull clutches were lost to egging in 1990.[309]

**Figure 435.** All seabirds nesting in Skidegate Inlet, even cavity-nesting Pigeon Guillemots, must contend with predation of eggs and young, as was observed on "Kwuna" Rocks in 1974. *Photo by R. Wayne Campbell, 17 June 1974.*

**Figure 436.** Northwestern Crows are abundant in Skidegate Inlet and from May through July opportunistically feed on eggs and small chicks of nesting seabirds. *Photo by R. Wayne Campbell.*

## SI-070 "ALLIFORD" ISLETS

**Location:** *53°12'44"N 131°59'34"W* (north islet) ; *103 G/4.*
Three unnamed islets on the east side of Alliford Bay.

**Description:** *0.6 ha; Forested; Grassy rock.*
Of the three islets, the largest, northern islet is forested (Figure 437), with grass and salal around the rocky perimeter. Rock crevices, boulders (Figure 438), and tangled piles of wire rope, that have been abandoned on the rocky shoreline, providing nesting habitat for Pigeon Guillemots. There is a navigational beacon on the north end of this islet. The middle islet is a grassy rock with patches of shrubs. The small, southern islet is tidally connected to Moresby Island. The northern islet, where Pigeon Guillemots were nesting in all survey years, was called "Ferry Island" in Vermeer et al.[286]

**Historical summary:** In 1974, Wayne Campbell and Gary Seedhouse from the BCPM found: one Black Oystercatcher nest with two young on the northern islet (Figure 439) and four empty nest scrapes on the middle islet; one partially-built Glaucous-winged Gull nest on the northeast end of the northern islet and another on the middle islet; and one Pigeon Guillemot nest with eggs located under a pile of wire rope on the northern islet (Figure 440; Table SI-070). In 1986, oystercatchers were nesting on the northern (3 nests with eggs), middle (2 nests with eggs), and southern (3 nests, 2 with eggs) islets. One gull nest with eggs was found on each of the middle and southern islets in 1986. In 1990, Black Oystercatchers were nesting on the northern (2 pairs) and middle (4 pairs) islets.

**Figure 438.** Pigeon Guillemots nest in gaps between large rocks on "Alliford" Islets. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 437.** The largest of the "Alliford" Islets is forested. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 439.** Only bare legs and a fluffy tail are visible on this "hidden" Black Oystercatcher chick on "Alliford" Islets in 1974. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 440.** A pair of Pigeon Guillemots located their nest under a pile of thick wire cables on the beach on "Alliford" Islets in 1974. *Photo by R. Wayne Campbell, 18 June 1974.*

**Table SI-070.** Seabird nesting records for "Alliford" Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jun 1974 | 5[1] | 2S | x(11) | 34, 314 |
| 22 Jun-1 Jul 1986 | 8[7] | 2[2] | S(54) | 227 |
| May-Jul 1990 | 6[6] | 0 | x(61) | 285, 286, 309 |

**Remarks:** Many Pigeon Guillemot eggs were found crushed and cached on the northern or "Ferry" islet in 1990. Some burrows had been dug up and signs of raccoon were abundant. Raccoon predation was suspected to have compromised reproductive efforts and no guillemot eggs were known to have hatched.

## SI-080 BUSH ISLAND

**Location:** *53º12'53"N 132º00'22"W; 103 F/1.*
West of Kwuna Point.

**Description:** *0.15 ha; 2 m high; Grassy rock.*
This is a low, flat rock covered with wild roses and grasses.

**Historical summary:** Two empty Black Oystercatcher scrapes and four adults were seen in 1974 (Table SI-080). One pair was excited, suggesting that there were young hidden nearby. Four oystercatchers were also present in 1977 but no information about possible nesting was reported. Four Glaucous-winged Gull nests had been built but no eggs laid at the time of the visit in 1974 (Figure 441). Only one nest with three young was found in 1977. In 1990, a total of 37 gull nests with eggs were found between 29 May and 16 July during the intensive study of reproductive success; some were replacement clutches and new nests, and the nesting population was estimated to be 30 pairs.[287, 309] One Pigeon Guillemot nest found in 1974 was located under a log (Figure 442) and one was under rocks at the edge of the vegetation; both contained two eggs.

**Figure 441.** Only empty Glaucous-winged Gull nests were tallied on Bush Island in mid-June 1974. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 442.** A Pigeon Guillemot nest with two eggs tucked between rocks under driftwood on Bush Island in 1974. *Photo by R. Wayne Campbell, 18 June 1974.*

**Table SI-080.** Seabird nesting records for Bush Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jun 1974 | 2S | 4S | x2(26) | 34, 314 |
| 13 Jul 1977 | | 1 | S(37) | 314 |
| 22 Jun-1 Jul 1986 | 4[2] | 12[11] | S(56) | 227 |
| May-Jul 1990 | 3[3] | 30[30] | x(62) | 285, 286, 287, 309 |

**Remarks:** Six gull clutches were lost to egging and three were washed out by high waves in 1990.[309]

## SI-085 ROBBER ISLAND

**Location:** *53°13'04"N 132°01'39"W; 103 F/1.*
Off the northeast end of Maude Island.

**Description:** *0.6 ha; 8 m high; Forested.*
Robber Island is a rocky island with a small stand of trees and some open grassy areas (Figure 443). It is connected by tide to the east end of Maude Island.

**Historical summary:** No seabirds were seen in 1974, 1977, and 1986 (Table SI-085). A pair of Black Oystercatchers was nesting in 1990.

**Table SI-085.** Seabird nesting records for Robber Island. See Appendix 2 for codes.

| DATE | BLOY | SOURCE |
|---|---|---|
| 18 Jun 1974 | 0 | 34, 314 |
| 17 Jul 1977 | 0 | 314 |
| 22 Jun-1 Jul 1986 | 0 | 308 |
| May-Jul 1990 | 1 | 285 |

**Figure 443.** Robber Island is rocky with grassy areas and scattered conifers. *Photo by R. Wayne Campbell, 17 July 1977.*

## SI-090 LILLIHORN ISLAND

**Location:** *53°11'23"N 132°01'57"W; 103 F/1.*
Near the shore of Moresby Island, northwest of Whiteaves Bay, southeast of Maude Island.

**Description:** *1.3 ha; 38 m high; Forested.*
The perimeter of Lillihorn Island is steep rock and cliffs. The top is thickly wooded (Figure 444).

**Historical summary:** Large numbers of Pigeon Guillemots have been present around the island during each survey. Guillemots were nesting in burrows among tree roots at the edge of the forest in 1977; three birds were seen flying out of burrows (Table SI-090). The count of 590 guillemots around Lillihorn Island was the maximum number counted around any island in Skidegate Inlet during the 1990 study.[286] Six Black Oystercatchers were present but no nests were found in 1986. Oystercatchers were confirmed nesting in 1990. Eight Glaucous-winged Gull nests with three eggs each were found in 1986; two additional pairs were suspected nesting. In 1990, one gull nest with eggs was found and a total of seven pairs were estimated nesting.[309]

**Table SI-090.** Seabird nesting records for Lillihorn Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 17 Jul 1977 | | | x3(82) | 314 |
| 22 Jun-1 Jul 1986 | 3eS | 10e | S(200) | 227 |
| May-Jul 1990 | 2[2] | 7e | x(590) | 285, 286, 287, 309 |

**Figure 444.** Lillihorn Island has rock cliffs and a forested top. *Photo by R. Wayne Campbell, 17 July 1977.*

## SI-100 SANDILANDS ISLAND

**Location:** *53°10'30"N 132°06'30"W; 103 F/1.*
South of Maude Island. Labelled as South Island on charts prior to 1925.[79] Colony includes islets off the east side of the main Sandilands Island.

**Description:** *258 ha; 186 m high; Forested.*
Sandilands Island is densely forested with signs of past logging. Much of the shoreline is sandy with rocky promontories. The islets off the east side are partially forested with some rocky areas, especially on the southern islet.

**Historical summary:** No nesting seabirds were seen in 1974 or 1977, and Glaucous-winged Gulls were not found nesting in 1986 (Table SI-100). Black Oystercatcher nests were found and Pigeon Guillemots were suspected nesting on the two small islets connected by tide to the east side of the main island in 1986. In 1990, one and three pairs of Black Oystercatchers were nesting on the northern and southern of those islets, respectively, and one pair of Glaucous-winged Gulls was nesting on each islet.[309] Although only four pairs of oystercatchers were nesting in 1990, eggs were laid in a total of nine different nests, some of which were replacement nests. Pigeon Guillemots were sighted at the east islets (60 birds) and on the main island (6 birds) in 1990.

**Table SI-100.** Seabird nesting records for Sandilands Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jun 1974 | 0 | 0 | (0) | 34, 314 |
| 17 Jul 1977 | 0 | 0 | (0) | 314 |
| 22 Jun-1 Jul 1986 | 10[2] | 0 | S(20) | 227 |
| May-Jul 1990 | 4[4] | 2[2] | x(66) | 285, 286, 287, 309 |

**Remarks:** With the exception of one egg, all oystercatcher eggs were lost to predation (7 nests) or washed out by waves (2 nests) in 1990.[309] Raccoon were suspected predators and were commonly seen. Two decapitated Pigeon Guillemot corpses surrounded by raccoon scats were found on the east islets in 1990.

## SI-110 MAUDE ISLAND

**Location:** *53°12'30"N 132°04"W; 103 F/1.*
Largest island in Skidegate Inlet, directly south of Queen Charlotte City.

**Description:** *1,428 ha; 415 m high; Forested.*
Maude Island is a large forested island with a long history of Haida settlement, more recent homesteading, and logging operations.

**Historical summary:** Seabird nesting has been documented only on the rocky shoreline. Spreadborough collected two Glaucous-winged Gull eggs in 1910 but gulls have not been recorded nesting since (Table SI-110). Pigeon Guillemots were confirmed nesting in a burrow in 1977, and in 1990 one was seen flying from a likely nest on the point on the southeast side of Maude Island, northwest of Lillihorn Island.

**Table SI-110.** Seabird nesting records for Maude Island. See Appendix 2 for codes.

| DATE | GWGU | PIGU | SOURCE |
|---|---|---|---|
| 14 Jul 1910 | x | | 320b |
| 18 Jun 1974 | 0 | (0) | 314 |
| 17 Jul 1977 | 0 | x(7) | 314 |
| 3-4 July 1990 | 0 | x(1) | 286, 309 |

## SI-120 MAPLE ISLAND

**Location:** *53°14'42"N 132°03'23"W; 103 F/1.*
Bearskin Bay south of Smith Point. It was called Observation Island on an old chart from 1852.[79] Colony includes the rock off the east side of the main Maple Island.

**Description:** *1.0 ha; 14 m high; Forested; Bare rock.*
Maple Island is covered with a dense forest of spruce and redcedar (Figure 445). There is a small bare rock off the southeast end.

**Figure 445.** Maple Island is heavily forested with Sitka spruce and western redcedar. *Photo by R. Wayne Campbell, 17 July 1977.*

**Historical summary:** Black Oystercatchers and Glaucous-winged Gulls have been recorded nesting on the east rock and on the main island, and Pigeon Guillemots have been recorded nesting only on the main island (Table SI-120). Cowan confirmed nesting by Glaucous-winged Gulls and Pigeon Guillemots in 1946. Several pairs of Pigeon Guillemots were noted nesting in burrows and one nearly fledged young (Figure 446) was found in one deep burrow excavated in 1946. Guillemots were also nesting in burrows around the main island in 1977 and 1986.

One oystercatcher nest found on the east rock in 1974 contained one oystercatcher and one gull egg (Figure 447); a second empty oystercatcher nest attended by two adults was seen on the northeast corner of the main island. In 1990, oystercatchers were nesting on the main island (2 pairs) and the east rock (2 pairs). Those four pairs laid eggs in nine different nests on the main island (4 nests) and east islet (5 nests) during the intensive study of reproductive success conducted that year.[309]

**Figure 446.** When they are 29 to 39 days old, young Pigeon Guillemots leave their nest and scramble down to the water. *Photo by R. Wayne Campbell.*

**Figure 447.** Occasionally, a Glaucous-winged Gull will lay an egg (left) in a Black Oystercatcher nest, as in this nest on Maple Island in 1974. *Photo by R. Wayne Campbell, 17 June 1974.*

A gull nest with an egg was located on the east rock and an empty gull nest was found under salal at the edge of the forest on the main island in 1974. In 1986, gulls were nesting under salal or trees around the perimeter of the main island. Six gull nests with eggs were located and a total of seven pairs were estimated nesting in 1990.

**Table SI-120.** Seabird nesting records for Maple Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 3 Aug 1946 | | 7-8 | x | 94 |
| 17 Jun 1974 | 2[1] | 2[1] | x(74) | 34 |
| 17 Jul 1977 | 1 | | x12(26) | 314 |
| 22 Jun-1 Jul 1986 | 2eS | 7[7] | S(60) | 227 |
| May-Jul 1990 | 4[4] | 7e | x(151) | 285, 286, 287, 309 |

**Remarks:** A freshly broken guillemot egg was found on the beach in 1974. Oystercatcher clutches were washed out in four nests and depredated in two nests in 1990.[309] The island has been a popular picnic site and is frequently visited by locals (Figure 448).[79]

**Figure 448.** A stone hut built by local visitors to Maple Island. *Photo by R. Wayne Campbell, 17 July 1977.*

## SI-130 GOODEN ISLAND

**Location:** *53°14'37"N 132°04'09"W; 103 F/1.*
Bearskin Bay south of Beattie Point.

**Description:** *1.0 ha; 27 m high; Forested.*
Gooden Island has low, rocky shores surrounding a dense spruce forest (Figure 449).

**Figure 449.** Gooden Island is covered by a thick Sitka spruce forest. *Photo by R. Wayne Campbell, 17 June 1974.*

**Historical summary:** Cowan found one pair of Glaucous-winged Gulls nesting in 1946 (Table SI-130). None have been recorded since. There were two Black Oystercatchers at the south end and one at the north end of the island in 1974 but no nests were found and nesting was not suspected. In 1977, observers suspected that oystercatcher chicks were hiding around one nest found, but 1990 was the first year that nesting was confirmed. Pigeon Guillemots were seen flying from five nests, and one nest was inspected in 1977 that held two young. The number of Pigeon Guillemots recorded in 1990 far exceeded those from previous surveys.

**Table SI-130.** Seabird nesting records for Gooden Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 3 Aug 1946 | | 1 | | 94 |
| 17 Jun 1974 | 0 | 0 | S(5) | 34, 314 |
| 17 Jul 1977 | 1S | 0 | 5(5) | 314 |
| 22 Jun-1 Jul 1986 | 0 | 0 | (0) | 308 |
| May-Jul 1990 | 1 | 0 | x(169) | 285, 286, 309 |

## SI-140 QUEEN CHARLOTTE CITY - WHARF

**Location:** *53°15'12"N 132°04'21"W; 103 F/1.*
Queen Charlotte City waterfront.

**Description:** *Wharf.*

**Historical summary:** Pigeon Guillemot nests were located on horizontal support beams of the government wharf in both 1977 and 1990 (Table SI-140).

**Table SI-140.** Seabird nesting records for Queen Charlotte City - Wharf. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 30 Jun 1977 | 3(6) | 314 |
| 3-4 July 1990 | x(6) | 286, 309 |

## SI-150 ROBERTSON ISLAND

**Location:** *53°14'55"N 132°05'15"W; 103 F/1.*
Bearskin Bay, offshore of Queen Charlotte City. Colony includes two small islets off the north side.

**Description:** *19.3 ha; 57 m high; Forested.*
This is a densely wooded island with a rocky shore (Figure 450).

**Figure 450.** Robertson Island is forested and has rocky shores. Only Black Oystercatchers have been found nesting on the island. *Photo by R. Wayne Campbell, 17 July 1977.*

**Historical summary:** Two empty Black Oystercatcher nests were found in 1977 and two pairs of oystercatchers were present and suspected nesting in 1986 (Table SI-150). Nesting was confirmed in 1990.

**Table SI-150.** Seabird nesting records for Robertson Island. See Appendix 2 for codes.

| DATE | BLOY | SOURCE |
|---|---|---|
| 17 Jul 1977 | 2S | 314 |
| 22 Jun-1 Jul 1986 | 2eS | 227 |
| May-Jul 1990 | 1 | 285, 309 |

## SI-160 RODERICK ISLAND

**Location:** *53°14'37"N 132°05'19"W; 103 F/1.*
South of Robertson Island in Bearskin Bay.

**Description:** *1.7 ha; 26 m high; Forested.*
Roderick Island is a low island covered with dense spruce forest above rocky shores (Figure 451).

**Figure 451.** No seabirds have been reported nesting on forested Roderick Island since the mid-1970s. *Photo by R. Wayne Campbell, 17 July 1977.*

**Historical summary:** Nesting seabirds have disappeared from this island since the 1970s (Table SI-160). Pigeon Guillemots were seen on the water around the island in 1974 but none have been recorded on subsequent surveys. A pair of Black Oystercatchers was confirmed nesting in 1974 and a pair was present and suspected nesting in 1977 but none were recorded in 1986 or 1990.

**Table SI-160.** Seabird nesting records for Roderick Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 17 Jun 1974 | 1 | S(5) | 34 |
| 17 Jul 1977 | 1eS | (0) | 314 |
| 22 Jun-1 Jul 1986 | 0 | (0) | 308 |
| May-Jul 1990 | 0 | (0) | 285, 286 |

## SI-170 BALCH ISLANDS

**Location:** *53°13'38"N 132°04'56"W* (north island); *103 F/1.*
Off the east end of Lina Island. Colony includes all the islands off the east end of Lina Island. The eastern of the Balch Islands were previously named Channel Islands and are still known locally by that name.[79]

**Description:** *10.7 ha; 30 m high; Forested; Grassy rock.*
The larger islands are thickly forested with spruce (Figure 452) and have predominantly sandy shorelines. The southwest islet is a grassy rock (Figure 453), and there are small rocks attached to the east and west ends of the north island, and off the north side of the islands closest to Lina Island.

**Figure 452.** The larger of the Balch Islands are forested with Sitka spruce. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 453.** The southwest islet in the Balch Islands is a grassy rock. *Photo by R. Wayne Campbell, 18 June 1974.*

**Historical summary:** Most nests have been found on the southwest rock. Guiguet found one pair of Glaucous-winged Gulls nesting in 1947 (Table SI-170). Gull nests have been found only on the southwest rock in 1974, 1977, 1986, and 1990, except there was one empty nest on the rocks off the north side of the island closest to Lina Island in 1986. Black Oystercatchers were nesting on the southwest rock in 1974, 1986, and 1990; an empty nest attended by a pair of excited adults was seen in 1974, a pair was suspected nesting but no nest was found in 1986, and one pair was confirmed nesting in 1990. In 1974, Pigeon Guillemots were nesting on the southwest rock (Figure 454; 4 nests with eggs; 16 adults), the north island (1 nest with an egg in a rock crevice at north end of the island; 8 adults), and the larger island closest to Lina Island (1 nest with an egg in a rock crevice under spruce roots at south end of the island; 2 adults). Most guillemots (18) were seen on the southwest rock in 1977. Guillemots were present around the north island (4 birds) and the southwest rock (34 birds) in 1990.

**Table SI-170.** Seabird nesting records for Balch Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 13 Jul 1947 | | 1 | | 94 |
| 18 Jun 1974 | 1S | 3[1] | x6(26) | 34, 314 |
| 17 Jul 1977 | 0 | 1 | x(22) | 314 |
| 22 Jun-1 Jul 1986 | 1eS | 4[3] | (0) | 227 |
| May-Jul 1990 | 1 | 4[4] | x(38) | 285, 286, 287, 309 |

**Remarks:** Broken Glaucous-winged Gull and Pigeon Guillemot eggs were found on the southwest rock in 1977. Raccoons were reported on these islands in 1986.

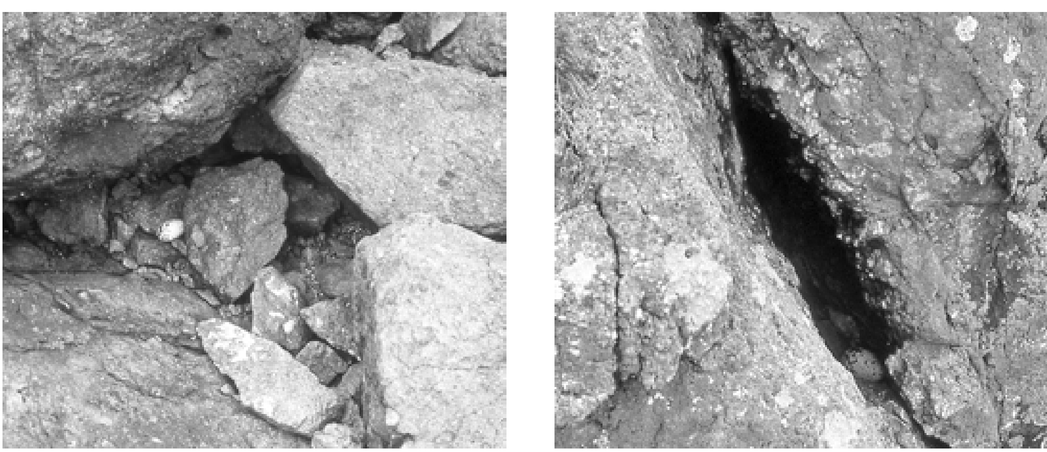


**Figure 454.** Two Pigeon Guillemot nests on the southwest rock in the Balch Islands in 1974. The egg in the left photo is exposed and could be easily depredated by Northern Raccoons or Northwestern Crows, while the egg in the crevice would be difficult for predators to reach. *Photos by R. Wayne Campbell, 18 July 1974.*

## SI-180 TREE ISLET

**Location:** *53°12'09"N 132°08'15"W; 103 F/1.*
Off the northwest corner of Maude Island.

**Description:** *0.3 ha; 11 m high; Forested.*
Tree Islet is a low, rocky island with a wooded crown (Figure 455).

**Figure 455.** Tree Islet is small and forested. *Photo by R. Wayne Campbell, 17 July 1977.*

**Historical summary:** Black Oystercatchers were recorded nesting in all survey years except 1986 (Table SI-180). All nests found in 1974 held clutches of three eggs. Glaucous-winged Gulls have been found nesting only in 1974 and 1990. A nest with three eggs was located among rose bushes in 1974. Two Pigeon Guillemot nests with eggs were found under boulders in 1974. Guillemots were nesting in burrows and under a log in 1977.

**Table SI-180.** Seabird nesting records for Tree Islet. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jun 1974 | 3[3] | 1 | x2(18) | 34 |
| 17 Jul 1977 | 4[1] | 0 | x6(58) | 314 |
| 22 Jun-1 Jul 1986 | 0 | 0 | (0) | 308 |
| May-Jul 1990 | 1 | 1 | x(82) | 285, 286, 287, 309 |

**Remarks:** Depredation of one Pigeon Guillemot egg found in 1974 was attributed to crows. Two broken guillemot eggs were found in 1977.

## SI-190 ANGLE ISLAND

**Location:** *53°12'29"N 132°08'50"W; 103 F/1.*
West end of Maude Channel. Like Legace Island, Angle Island was also formerly known as Triangle Island. Colony includes the rock to the northwest between Angle and Claudet islands.

**Description:** *1.1 ha; 21 m high; Forested; Bare rock.*
Dense spruce forest covers the island (Figure 456), with steep, rocky outcroppings occurring around the shore. The rock off the northwest end is mostly bare (Figure 457).

**Figure 456.** A dense Sitka spruce forest covers Angle Island. *Photo by R. Wayne Campbell, 17 July 1977.*

**Figure 457.** The islet off the northwest end of Angle Island is mostly bare rock. *Photo by R. Wayne Campbell, 18 June 1974.*

**Historical summary:** In 1974, Black Oystercatcher (Figure 458) and Glaucous-winged Gull (Figure 459) nests were found on the northwest rock, and Pigeon Guillemots were nesting under boulders (Figure 460), in crevices, and in burrows on the main island (Table SI-190). Nesting was recorded only on the main island in 1977 and 1986. Two empty oystercatcher and two empty gull nests were found in July 1977, and four empty oystercatcher nests were found in 1986. In 1990, oystercatchers and gulls were again nesting on the northwest rock.

**Figure 458.** Two Black Oystercatcher eggs in a nest of rock fragments and scattered pieces of shell found on the northwest rock off Angle Island in 1974. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 459.** Glaucous-winged Gull egg in a nest formed by a depression in the grass on the northwest rock off Angle Island in 1974. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 460.** Pigeon Guillemots were found nesting under boulders on Angle Island in 1974. *Photo by R. Wayne Campbell, 18 June 1974.*

**Table SI-190.** Seabird nesting records for Angle Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jun 1974 | 1 | 1 | x6(139) | 34 |
| 18-30 May 1977 | | | x4 | 159 |
| 17 Jul 1977 | 2S | 2S | | 314 |
| 22 Jun-1 Jul 1986 | 4S | 1 | (0) | 227 |
| May-Jul 1990 | 1 | 1 | x(191) | 285, 286, 287, 309 |

**Remarks:** Several broken Pigeon Guillemot eggs were found in 1974 that had probably been preyed on by crows. One river otter was sighted in May 1977.

## SI-200 CLAUDET ISLAND

**Location:** *53°12'42"N 132°09'22"W; 103 F/1.* Southwest of Withered Point on Lina Island. Named Wedge Island on charts prior to 1945.[79] Colony includes islets off the north end.

**Description:** *10.0 ha; 91 m high; Forested; Bare rock.*
Claudet Island has an area of 9.0 ha, and the three sets of northern islets, from west to east, have areas of 0.3 ha, 0.4 ha, and 0.3 ha respectively. Claudet Island (Figure 461) and the west and middle islets north of it (Figure 462) are heavily forested. Patches of forest on the main island have been logged (Figure 463). There is a bare rock off the north end of the middle islet. The eastern of the north islets has two higher knobs with patches of trees (Figure 464) and one knob of mostly bare rock (Figure 465).

**Figure 461.** Claudet Island is heavily forested. *Photo by R. Wayne Campbell, 17 July 1977.*

**Figure 462.** The west and middle islets off the north end of Claudet Island are forested. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 463.** Portions of Claudet Island have been logged. *Photo by R. Wayne Campbell, 17 July 1977.*

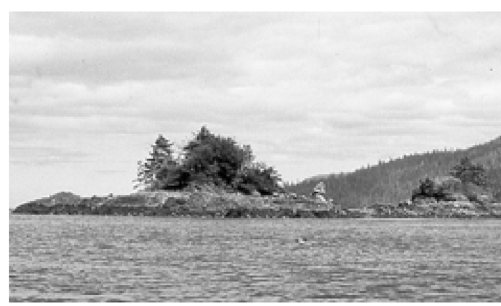


**Figure 464.** There are patches of trees on the larger, higher portion of the eastern of the islets north of Claudet Island. *Photo by R. Wayne Campbell, 18 June 1974.*

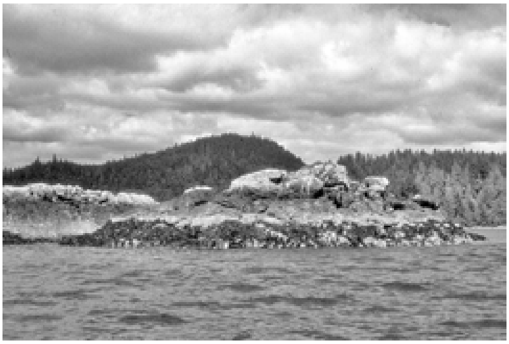


**Figure 465.** The lower portion of the eastern of the islets north of Claudet Island is bare rock. *Photo by R. Wayne Campbell, 18 June 1974.*

**Historical summary:** Only the main island was surveyed in May 1977 when no birds were seen. Except for Pigeon Guillemots around the main island in July 1977 and in 1990, all nesting observations pertain to the three sets of northern islets (Table SI-200). Black Oystercatcher and Glaucous-winged Gull nests found in 1974, 1986, and 1990 were located on the east of those islets, except one oystercatcher nest was found on the west islet in 1990. In 1974, two pairs of oystercatchers were seen, one at either end of the east islet, and one empty nest scrape was found. One of the pairs was defensive and young were suspected. One empty gull nest was found in 1977.

Pigeon Guillemots were observed around the western of the north islets (2 birds), the rock off the north end of the middle islet (26 birds; 1 nest with 2 eggs in a rock crevice), and around the east islet (14 birds) in 1974. In 1977, Pigeon Guillemots were recorded around the main island (29 birds) and the northern islets (51 birds); many birds were seen flying out of burrows and 14 birds were carrying fish (Figure 466). In 1990, Pigeon Guillemots were recorded around the main island and two larger forested islets (133 birds) and around the east islet (27 birds).

**Figure 466.** Fourteen Pigeon Guillemots carrying fish were recorded around Claudet Island in 1977. *Photo by R. Wayne Campbell.*

**Table SI-200.** Seabird nesting records for Claudet Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jun 1974 | 2eS | 0 | x(42) | 34, 314 |
| 18-30 May 1977 | | | (0) | 159 |
| 17 Jul 1977 | 5[1] | 1S | x20(80) | 314 |
| 22 Jun-1 Jul 1986 | 5[2] | 0 | (0) | 227 |
| May-Jul 1990 | 3[3] | 1 | x(160) | 285, 286, 287 |

**Remarks:** Two river otters were recorded in May 1977.

## SI-210 BURNT ISLAND

**Location:** *53º13'08"N 132º10'00"W; 103 F/1.*
Southwest of Lina Island. Colony includes islets off the north end and east side.

**Description:** *30 ha; 76 m high; Forested; Grassy rock.*
Except for exposed bluffs and a rocky shore, Burnt Island and the larger islets off the north end and east side are covered with a thick, spruce forest (Figure 467). Hand logging on the island was approved by the BC Forest Service and part of the forest on the main island had been harvested in 1977 (Figure 468). There are rocks with patches of grass and shrubs off the northwest end of the main islet and off the east side of the forested north islet. There was a Haida fort on the island.[79]

**Figure 467.** Burnt Island and the larger associated islands in this colony are forested with Sitka spruce. *Photo by R. Wayne Campbell, 18 June 1974.*


**Figure 468.** Small hand logging operations on Burnt Island were approved in 1977. *Photo by R. Wayne Campbell, 17 July 1977.*

**Historical summary:** Black Oystercatcher and Glaucous-winged Gull nesting records (Table SI-210) are from the smaller northwest and northeast rocks, except in 1990 when, in addition to one gull nest found on the northwest rock, one pair was observed nesting on an inaccessible cliff on the main island.[309] Oystercatchers were suspected nesting in May 1977 but no nests were found. No gull nests were found in 1986 but a pair was territorial on each of the northwest and northeast rocks. Pigeon Guillemots were observed around the main island in 1974 and 1977 (seen flying from burrows in July 1977), around the east islet in 1986, and around the main island and all islets in 1990.

**Table SI-210.** Seabird nesting records for Burnt Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jun 1974 | 1 | 1 | S(6)[a] | 34, 314 |
| 18-30 May 1977 | 3eS | | S(92) | 159 |
| 17 Jul 1977 | 3[1] | 2[1] | x11(11) | 314 |
| 22 Jun-1 Jul 1986 | 0 | 2eS | S(50) | 227 |
| May-Jul 1990 | 3[3] | 2e | x(264) | 285, 286, 287, 309 |

[a] Erroneously listed under BLOY in Campbell.[34]

**Remarks:** Observers saw one river otter on the northern islets and signs of river otter on the main island in May 1977.

## SI-218 WEED ROCK

**Location:** *53°13'48"N 132°09'19"W; 103 F/1.*
North of Dyer Point on Lina Island.

**Description:** *1 m high; Bare rock.*

**Historical summary:** There are no records of nesting seabirds for Weed Rock prior to the 1990 survey when Black Oystercatchers and Glaucous-winged Gulls were confirmed nesting (Table SI-218).

**Table SI-218.** Seabird nesting records for Weed Rock. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| May-Jul 1990 | 4[4] | 2[2] | 285, 287, 309 |

## SI-220 "DYER POINT" ROCKS

**Location:** *53°13'53"N 132°09'41"W* (north rocks); *103 F/1.*
West and northwest of Dyer Point at the west end of Lina Island. The "Dyer Point" Rocks colony includes two clusters of small, unnamed rocks: the southern group is tidally connected to Lina Island west of Dyer Point; and the northern group is offshore to the northwest of Dyer Point, west of Weed Rock.

**Description:** *1 m high; Bare rock* (Figure 469).

**Figure 469.** "Dyer Point" Rocks (centre) includes two groups of low islets barely a metre above water. *Photo by R. Wayne Campbell, 17 July 1977.*

**Historical summary:** Black Oystercatchers have nested on both the southern and northern rocks. In 1986, one nest with eggs was found on the southern rocks and two empty nests were seen on the northern rocks (Table SI-220). In 1990, two pairs were nesting on the southern rocks and one pair was nesting on the northern rocks. Those three pairs used a total of five nests to lay replacement clutches through the 1990 breeding season.[309]

We are uncertain of the location of the Glaucous-winged Gull nest found in 1977. The location was identified as Noble Rock,[314] but as marine charts show this as a tidal rock, we assumed that the observation occurred on one of the nearby unnamed rocks that we have included in the "Dyer Point" Rocks colony. Gulls were nesting on the northern rocks in 1986.

**Table SI-220.** Seabird nesting records for "Dyer Point" Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 17 Jul 1977 | | 1 | 314 |
| 22 Jun-1 Jul 1986 | 3[1] | 2[2] | 227 |
| May-Jul 1990 | 3[3] | 0 | 285, 309 |

**Remarks:** Of the five different oystercatcher clutches found during the study in 1990, four were washed out and one was depredated.[309]

## SI-230 MEYER ISLAND

**Location:** *53°13'53"N 132°10'45"W; 103 F/1.*
Northeast corner of Kagan Bay. Known as Reef Island on charts prior to 1945.[79]

**Description:** *1.3 ha; 1 m high; Forested.*
Meyer Island is a low island with extensive rock and pockets of shingle beach around the shore. The crown is wooded (Figure 470). There is a small rocky knob connected by tide off the south end.

**Historical summary:** A pair of Black Oystercatchers was defending a nest with two eggs in 1974 (Figure 471; Table SI-230). Pairs were present and suspected nesting in 1977 and 1986. Two adult Glaucous-winged Gulls were present but observers could not find a nest in 1974. A pair was reported as probably

**Figure 470.** Meyer Island is low and the central portion has spruce trees and a tall snag used as a perch for corvids and Bald Eagles. *Photo by R. Wayne Campbell, 18 June 1974.*

nesting in 1977. One gull nest with three eggs was found and an additional pair was suspected nesting in 1986. Locations of oystercatcher and gull nests were not specified in 1974 or 1977 but were likely on the southern rocky knob where an oystercatcher and gull nest were found in 1990. Two Pigeon Guillemots were flushed from a short burrow at the edge of the forest and another pair was flushed from under a boulder in 1974; an egg was found in the short burrow. Nine guillemots were seen flying from burrows in 1977.

**Figure 471.** Black Oystercatcher nest containing two eggs in a scrape lined with stone pebbles on the upper beach area on Meyer Island in 1974. *Photo by R. Wayne Campbell, 18 June 1974.*

**Table SI-230.** Seabird nesting records for Meyer Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18 Jun 1974 | 1 | 0 | x2(4) | 34, 314 |
| 17 Jul 1977 | 2eS | 1eS | x9(133) | 314 |
| 22 Jun-1 Jul 1986 | 1eS | 2e | S(34) | 227 |
| May-Jul 1990 | 1 | 1 | x(50) | 285, 286, 287, 309 |

## SI-235 LEGACE ISLAND

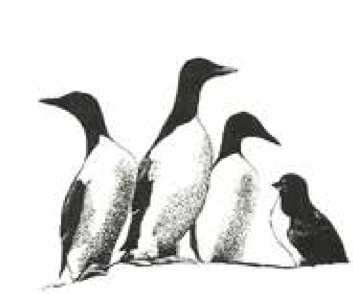
**Location:** *53°12'48"N 132°12'10"W; 103 F/1.*
West of Burnt Island. Named Triangle Island on charts prior to 1945.[79]

**Description:** *22 ha; 116 m high; Forested.*
This densely forested island has a narrow rocky shoreline, with a small rocky point at the northeast end.

**Historical summary:** A few Pigeon Guillemots were seen around the island in 1977 (Table SI-235) and flying from likely nests at the edge of the forest in 1990.[309]

**Table SI-235.** Seabird nesting records for Legace Island. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 18-30 May 1977 | (3) | 159 |
| 17 Jul 1977 | (1) | 314 |
| 3-4 Jul 1990 | x(6) | 286, 309 |



## SI-240 TREBLE ISLAND

**Location:** *53°13'06"N 132°13'11"W; 103 F/1.*
West side of Kagan Bay, north of Canoe Point.

**Description:** *5.3 ha; 49 m high; Forested.*
Treble Island is a dome-shaped, densely forested island with little exposed shoreline (Figure 472). Hand logging had recently occurred at the time the island was visited in July 1977.

**Figure 472.** Treble Island is heavily forested, with scattered small rock bluffs. *Photo by R. Wayne Campbell, 18 June 1974.*

**Historical summary:** A Pigeon Guillemot nest with one egg was found in a rock crevice in 1974, and birds were seen flying from burrows in July 1977 (Table SI-240). Guillemots were also seen flying from likely nests in 1990.[309]

**Table SI-240.** Seabird nesting records for Treble Island. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 18 Jun 1974 | x(8) | 34 |
| 18-30 May 1977 | x(50) | 159 |
| 17 Jul 1977 | x4(4) | 314 |
| 3-4 Jul 1990 | x(10) | 286, 309 |

**Remarks:** Signs of river otter were noted in May 1977.

## SI-250 "SLATECHUCK" ISLETS

**Location:** *53°13'36"N 132°13'21"W* (northeast islet); *103 F/1.*
West side of Kagan Bay, off the mouth of Slatechuck Creek. This is a group of five islands lying close to the Graham Island shore north and south of the mouth of Slatechuck Creek. The islets south of the creek were likely part of what was labeled Ship Islets on charts prior to 1945, which also included Hallet Island.[79]

**Description:** *3.8 ha; 41 m high; Forested* (Figure 473).

**Figure 473.** All five islets in the "Slatechuck" Islets colony are densely forested and have minimal exposed shoreline. *Photo by R. Wayne Campbell, 17 July 1977.*

**Historical summary:** No seabirds were observed around these islands in 1974. Black Oystercatchers were nesting on the northeast islet in 1986 (2 pairs present and 2 empty nests found) and on the eastern islet, closest to Treble Island, in 1990 (Table SI-250).

**Table SI-250.** Seabird nesting records for "Slatechuck"Islets. See Appendix 2 for codes.

| DATE | BLOY | SOURCE |
|---|---|---|
| 22 Jun-1 Jul 1986 | 2S | 227 |
| May-Jul 1990 | 1 | 285 |

**Remarks:** The single Black Oystercatcher clutch of three eggs was lost to predation in 1990.

## SI-260 HALLET ISLAND

**Location:** *53°12'54"N 132°14'23"W; 103 F/1.*
North of Anchor Cove, south of the mouth of Slatechuck Creek. This is the southernmost of a group of three islets labelled as Ship Islets prior to 1945.[79]

**Description:** *0.08 ha; Grassy rock.*
Hallet Island is a small rock with a crown of wild roses surrounded by grasses and forbs (Figure 474).

**Historical summary:** A Glaucous-winged Gull nest with three eggs was found in 1974 located behind rose bushes almost a meter into the vegetation (Table SI-260). Two empty gull nests were found in 1977, and one pair of gulls nested in both 1986 and 1990. Similar numbers of Black Oystercatchers were nesting in all survey years. Young were seen in one of the nests found in 1977 (Figure 475) but could have been hidden around some of the other nests.

**Table SI-260.** Seabird nesting records for Hallet Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 18 Jun 1974 | 3[3] | 1 | 34 |
| 17 Jul 1977 | 5[1] | 2S | 314 |
| 22 Jun-1 Jul 1986 | 3[3] | 1 | 227 |
| May-Jul 1990 | 4[4] | 1 | 285, 287, 309 |

**Remarks:** Eggs were depredated in the Glaucous-winged Gull nest found in 1986.

**Figure 474.** Hallet Island is a small rock with a patch of wild rose shrubs surrounded by grasses and forbs. *Photo by R. Wayne Campbell, 17 July 1977.*

**Figure 475.** Two Black Oystercatcher chicks in a nest scrape at the edge of a patch of wild roses on Hallet Island in 1974. *Photos by R. Wayne Campbell, 18 June 1974.*

## SI-270 SCALUS ISLAND

**Location:** *53°12'09"N 132°13'31"W; 103 F/1.*
East of Anthracite Point, west of Christie Bay.

**Description:** *5.3 ha; Forested.*
Scalus Island is covered with thick forest, leaving little exposed shoreline (Figure 476).

**Historical summary:** Pigeon Guillemots were seen flying out of burrows at the vegetation edge in 1977 (Table SI-270). Guillemots may have abandoned this colony as none were recorded around the island on any of the surveys in 1990.[286]

**Table SI-270.** Seabird nesting records for Scalus Island. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 17 Jul 1977 | x5(5) | 314 |
| 22 Jun-1 Jul 1986 | S(8) | 227 |
| 3-4 Jul 1990 | (0) | 286 |

## SI-275 ANTHRACITE POINT

**Location:** *53°12'05"N 132°14'18"W; 103 F/1.*
The point of Graham Island south of Anchor Cove and east of Gosset Bay. Known as South Point on charts prior to 1945.[79]

**Description:** *Forested point.*

**Historical summary:** Pigeon Guillemots were seen flying from nesting locations here on surveys conducted on 19-20 June (3 birds) and 30-31 July (2 birds) 1990.[286, 309] We consider those observations confirmation that this is a breeding site (see Key to Summary Tables). No birds were present on three other surveys conducted in 1990, including the survey conducted on 3-4 July when the maximum total count for Skidegate Inlet was obtained that was used in colony summary tables presented here (Table SI-275).

**Table SI-275.** Seabird nesting records for Anthracite Point. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 3-4 Jul 1990 | x(0)[a] | 286, 309 |

[a] See text.

**Figure 476.** A thick forest covers Scalus Island almost to the waterline. *Photo by R. Wayne Campbell, 17 July 1977.*

## SI-280 SANDSTONE ISLANDS

**Location:** *53°11'30"N 132°14'45"W* (largest island); *103 F/1.*
Entrance of Long Inlet, west of Saltspring Bay. Colony includes the unnamed rock to the west, south of Gust Island.

**Description:** *5.3 ha; 61 m high; Forested; Bare rock.*
The main islands are densely wooded (Figure 477). There are rocky islets west and north of the largest island.

**Historical summary:** Black Oystercatcher nests with eggs were found on two of the islets in May 1977 (Table SI-280). Five oystercatcher nests found in July 1977 and in 1986, and three Glaucous-winged Gull nests found in 1986, were all located on the west rock and all were empty. Four oystercatchers and four gulls were present in 1986. Oystercatchers were also nesting on the west rock in 1990. Pigeon Guillemots were nesting in burrows in 1977. Guillemots were counted around the main islands (25 birds) and the west rock (85 birds) in 1990.

**Table SI-280.** Seabird nesting records for Sandstone Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18-30 May 1977 | 3[3] | 0 | S(21) | 159 |
| 17 Jul 1977 | 5S | 0 | 48e(162) | 314 |
| 22 Jun-1 Jul 1986 | 5S | 3S | S(200) | 227, 308 |
| May-Jul 1990 | 1 | 0 | x(110) | 285, 286, 309 |

**Remarks:** Abundant sign of river otters was noted in May 1977.

**Figure 477.** A dense forest covers the main islands in the Sandstone Islands colony. *Photo by R. Wayne Campbell, 17 July 1977.*

## SI-285 GUST ISLAND

**Location:** *53°11'48"N 132°15'14"W; 103 F/1.*
South of Josette Point at the entrance to Long Inlet.

**Description:** *7.9 ha; 76 m high; Forested.*
Gust Island is densely forested with little shoreline habitat. It was traditionally used as a grave site by the Haida.[79]

**Historical summary:** In 1977, Pigeon Guillemot was noted in a list of birds sighted but observers stated that no seabirds were nesting (Table SI-285). Pigeon Guillemots were seen flying from nests in 1990.[309]

**Table SI-285.** Seabird nesting records for Gust Island. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 17 Jul 1977 | (1) | 314 |
| 3-4 Jul 1990 | x(2) | 286, 309 |

## SI-290 BERRY ISLANDS

**Location:** *53°11'42"N 132°16'37"W; 103 F/1.*
Close to the Graham Island shore off the Indian Cabin Creek estuary at the mouth of Long Inlet. Colony includes the small rock southeast (southeast rock) of the main Berry Islands (northwest rocks).

**Description:** *0.3 ha; Grassy rock.*
The two Berry Islands are grassy rocks connected to the shore of Graham Island by the tidal, estuarine flats of Indian Cabin Creek. The southeast rock is offshore of the estuary.

**Historical summary:** Black Oystercatchers were nesting on the southeast (1 pair) and northwest (2 pairs) rocks in 1977; on the higher of the northwest rocks in 1986; and again on both the southeast (2 pairs) and northwest (2 pairs) rocks in 1990 (Table SI-290). A pair of Glaucous-winged Gulls was nesting on the northwest rocks in 1990.

**Table SI-290.** Seabird nesting records for Berry Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | SOURCE |
|---|---|---|---|
| 18-30 May 1977 | 3[3] | 0 | 159 |
| 22 Jun-1 Jul 1986 | 3[1] | 0 | 227 |
| May-Jul 1990 | 4[4] | 1 | 285, 287, 309 |

## SI-300 "JOSETTE" ISLET

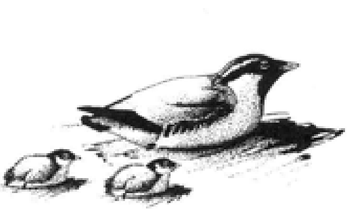
**Location:** *53°11'59"N 132°16'05"W; 103 F/1.*
West of Josette Point, north of Berry Islands.

**Description:** *0.7 ha; Forested.*

**Historical summary:** There are no survey records prior to the 1990 visit, when Pigeon Guillemots were confirmed nesting (Table SI-300), although during previous surveys in 1974, 1977, and 1986, the area was likely boated by and no birds were seen.

**Table SI-300.** Seabird nesting records for "Josette" Islet. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 3-4 Jul 1990 | x(3) | 286, 309 |



## MASSET AND JUSKATLA INLETS

Masset and Juskatla inlets form a unique body of water on the BC coast, being one of the largest inland seas in the northeastern Pacific. The islands in those inlets are nesting sites for Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots (Figure 478). As of 1990, a total of 555 birds of the three species were estimated nesting at 16 sites (Figure 479, Table 10).

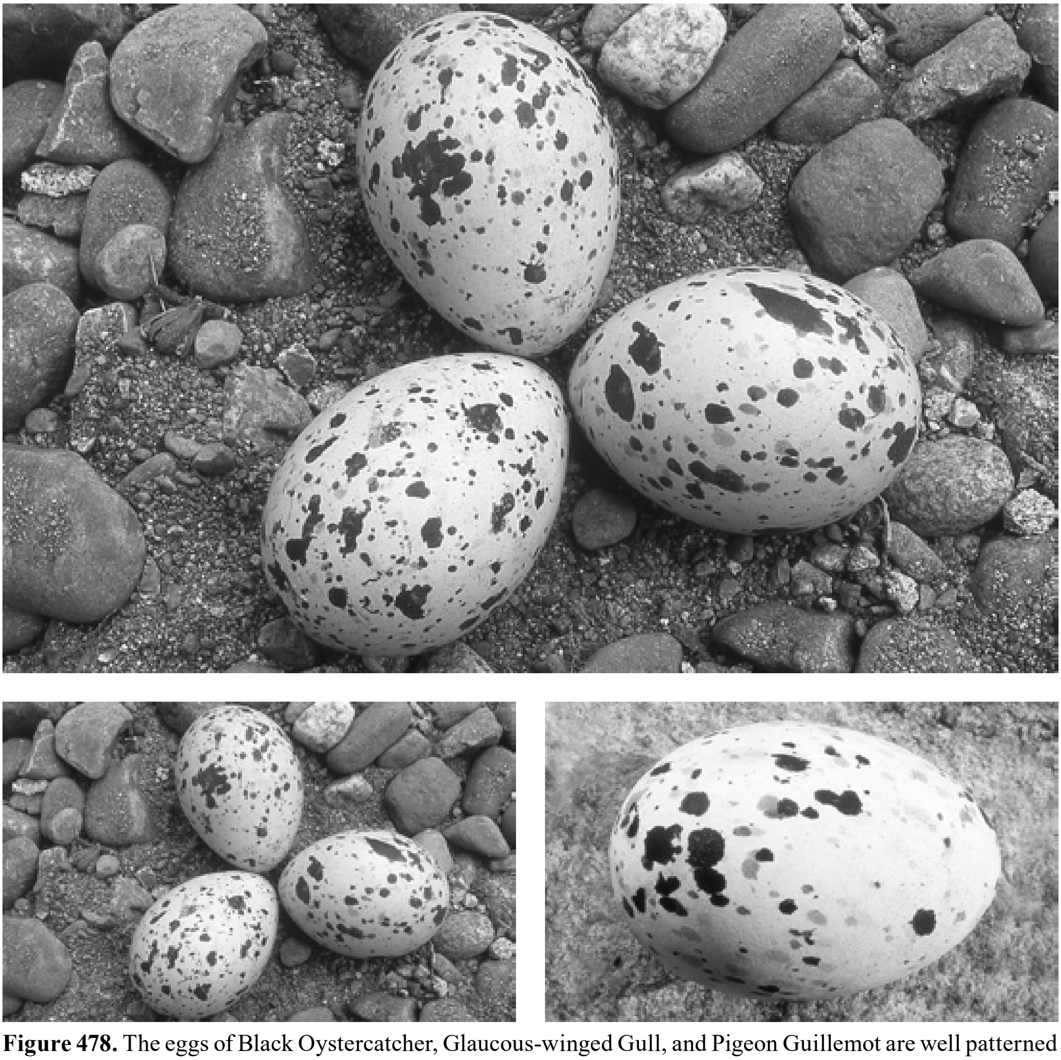


**Figure 478.** The eggs of Black Oystercatcher, Glaucous-winged Gull, and Pigeon Guillemot are well patterned for concealment. Oystercatcher eggs (top), which are laid in the open, are creamy buff and variably blotched with brownish black; gull eggs (bottom left), also laid in the open, are yellowish olive green with dark blotches; and guillemots eggs, laid in crevices and cavities, are a pale cream with small dark-brown blotches. *Photos by R. Wayne Campbell.*

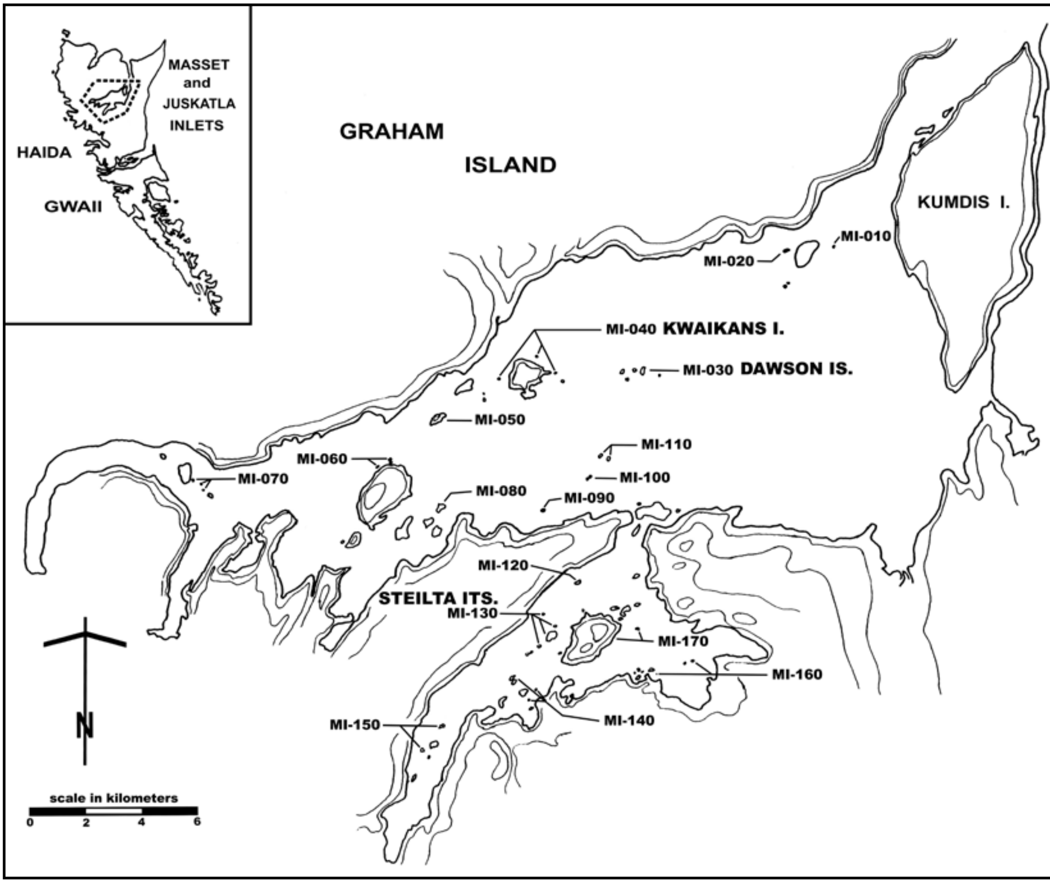



**Figure 479.** Locations of seabird colonies in Masset and Juskatla inlets (modified from Rodway [227]).

There are some historical records from this region without specific locations. Darcus mentioned a small colony of Herring Gulls (*Larus argentatus*) in Masset Inlet in 1927.[81] This is the only record of Herring Gulls nesting on the coast of BC, no evidence of nesting by this species in this area has been reported since, and the record has not been accepted as confirmation of breeding on the BC coast (Figure 480).[46, 94, 231] There is a Glaucous-winged Gull egg specimen [325c] collected on 20 June 1926 with a location of “Masset Inlet, south end of Masset Sound”. The description would fit Sloop Islet or perhaps Dawson Islands. The collector is not recorded. Darcus gave a location of “Masset Inlet” for a Pigeon Guillemot egg [324] collected on 6 August 1930 that was likely from Dawson Islands, as Darcus noted a few pairs of Glaucous-winged Gulls nesting on Dawson Islands on the same date. The only other historical data before 1977 were collected by Bristol Foster who visited Mamin Islets and Powell Island in 1960.

**Table 10.** Estimates of seabird breeding populations in Masset and Juskatla Inlets as of 1990. Estimates are numbers of breeding pairs except for numbers in parentheses, totals in the "All species" column, and totals in the "Total breeding birds" row, which are numbers of individuals. See Appendix 2 on pages 467-468 for an explanation of the letter codes used to qualify population estimates.

| SITE CODE | SITE NAME | BLOY | GWGU | PIGU | ALL SPECIES[a] | SURVEY YEAR[b] |
|---|---|---|---|---|---|---|
| MI-010 | Sloop Islet | 1 | 2S | x3(7) | 13 | 1986 |
| MI-020 | Ship Kieta Island | | | (0) | 0 | 1986 |
| MI-030 | Dawson Islands | 2 | 32 | x6(11) | 80 | 1986 |
| MI-040 | Kwaikans Island | 4 | 6 | S(2) | 22 | 1986 |
| MI-050 | McCreight Island | 1 | 4 | x10(52) | 62 | 1986 |
| MI-060 | Wathus Island | 1S | | (0) | 2 | 1986 |
| MI-070 | Mutus Island | 4 | 1 | S(3) | 13 | 1986 |
| MI-080 | Learmonth Island | 4 | 0 | x(3) | 11 | 1986 |
| MI-090 | Ross Islets | 1 | | x(2) | 4 | 1986 |
| MI-100 | Powell Island | 0 | 12 | x2(4) | 28 | 1986 |
| MI-110 | Cowley Islands | 2 | 19 | 32e(17) | 106 | 1986 |
| MI-120 | Ohala Islets | 1S | 1S | x2(2) | 8 | 1986 |
| MI-130 | Steilta Islets | 3 | 1 | x9(131) | 139 | 1986 |
| MI-140 | Seegay Islets | 7 | 0 | x(2) | 16 | 1986 |
| MI-150 | Modeets Islands | 2 | 1 | S(2) | 8 | 1986 |
| MI-160 | Mamin Islets | 3 | 0 | x(1) | 8 | 1986 |
| MI-170 | Harrison Islands | 1S | 2 | x(29) | 35 | 1986 |
| | **TOTAL NESTING PAIRS** | **37** | **81** | | | |
| | **TOTAL BREEDING BIRDS** | **74** | **162** | **319**[c] | **555**[c] | |
| | **TOTAL CURRENT SITES** | 15 | 11 | 15 | 16 | |
| | ***Confirmed on last survey*** | 12 | 9 | 12 | 16 | |
| | ***Confirmed on any survey*** | 14 | 11 | 14 | 16 | |
| | ***Unconfirmed*** | 1 | 0 | 1 | 0 | |
| | **TOTAL HISTORICAL SITES** | 16 | 14 | 17 | 17 | |
| | ***Confirmed*** | 15 | 13 | 16 | 17 | |
| | ***Unconfirmed*** | 1 | 1 | 1 | 0 | |
| | **CURRENTLY ABANDONED SITES** | 1 | 3 | 2 | 1 | |
| | ***Previously confirmed*** | 1 | 2 | 2 | 1 | |
| | ***Previously unconfirmed*** | 0 | 1 | 0 | 0 | |

[a] Number of individuals.
[b] For sources see individual colony accounts.
[c] Errors were made in these totals in Table 3 presented in Part 1 (page 63).[231]

**Figure 480.** Herring Gulls are present year-round in Haida Gwaii, becoming more abundant during spring (mid-April to early May) and autumn (July to early September) migrations. The nearest nesting colony, at Ootsa Lake, is 360 km east of Masset Inlet. *Photo by R. Wayne Campbell.*

Surveys in 1977 [35, 159, 314] and 1986 [227] provide comparative data for the three nesting species (Table 11). All islands were visited and at least boated around in both years (Figure 481). Summary data for 1977 presented in Table 11 are a composite from three different visits made that year: Michael Rodway and Trudy Carson (now Chatwin) visited four colonies on 6 May on their way to conduct surveys along the west coast of Graham Island as part of the early survey by the BCPM; Ian Hater and Linda Stordeur [159] surveyed seven colonies in May as part of an assessment by the BC Fish and Wildlife Branch in response to numerous applications for handlogging on small islands in Skidegate and Masset and Juskatla inlets; and Wayne Campbell and Heather Garrioch conducted the main BCPM survey in July. Where there were multiple records for a colony in 1977, we used the maximum number of nests or birds (in the case of Pigeon Guillemots) recorded for each colony to produce a regional total. Tallies for 1977 presented here are slightly different than those presented in Rodway [227] because additional records have been found since that report was written.

Seabirds were confirmed breeding at 15 of the 17 historical colony sites in both 1977 and 1986. We are confident that the data indicate a real increase in the nesting population of Glaucous-winged Gulls (Figure 482) as the recording methods were the same in the two years (i.e., both empty nests and nests with eggs or young were tallied). The proportion of empty nests was similar in the two years. For Black Oystercatchers, only nests with eggs or associated young were reported in 1977; no empty nests were recorded. In 1986, 19 of the nests found were empty,

**Figure 481.** Surveys of seabird colonies in Masset and Juskatla inlets have generally started from the Haida fishing village of Masset. From there it is a 30 km trip down Masset Sound to the first islands in Masset Inlet to be surveyed. *Photo by R. Wayne Campbell, 3 June 2000.*

**Figure 482.** The small population of Glaucous-winged Gulls nesting in Masset Inlet almost doubled in the 10 years between 1977 and 1986. *Photo by R. Wayne Campbell.*

**Table 11.** Breeding populations of Black Oystercatcher and Glaucous-winged Gull, and numbers of Pigeon Guillemots counted around colonies in Masset and Juskatla Inlets in 1977 and 1986.

| | BLOY | | | GWGU | | | PIGU | | |
|---|---|---|---|---|---|---|---|---|---|
| Survey Date | Pairs nesting[a] | Nests found[b] | Sites | Pairs nesting[a] | Nests found[b] | Sites | Confirmed Nests | Birds[c] | Sites |
| May-Aug 1977 | 20 | 20[20] | 12 | 47 | 39[d] | 10 | x38 | 444 | 15 |
| 24-26 Jun 1986 | 37 | 37[18] | 15 | 81 | 81[46] | 11 | x69 | 319 | 15 |

[a] If greater than nests found, includes pairs that were suspected nesting but nests were not observed.
[b] Nests found includes total nests followed by nests with eggs or young in brackets.
[c] Number of birds counted or twice the numbers of nests found, whichever was greater.
[d] A total of 39 gull nests were found in 1977 but nest contents were not reported for 12 nests on Sloop Islet. Of the 27 nests whose contents were reported, 12 contained eggs or young.

leaving only 18 definitely active nests, close to the 20 reported in 1977 (Table 11). Thus, the nesting populations of oystercatchers in the two years may have been similar. Data for Pigeon Guillemots are inadequate to interpret trends.

***What We Might Have Known***

*In May 1948, Ed Ricketts had tickets bought and equipment packed for a biological reconnaissance of Masset Inlet and other northern waters with his good friend John Steinbeck. On 8 May, only a week before Ed was going to depart from his home in Pacific Grove, California, he was struck by a train while driving to dinner and died three days later. That tragedy undoubtedly diminished our present knowledge and understanding of the biological diversity and ecology of inter-tidal habitats in the northern coastal regions of British Columbia. Regarding their plans for that trip, John Steinbeck wrote, "...There was one deep bay with a long and narrow opening where we thought we might observe some changes in animal forms due to a specialized life and a long period of isolation." After Ricketts died, Steinbeck reflected, "... Maybe someone else will study that little inland sea. The light has gone out of it for me."*[160]

*Ed Ricketts is best known for his exhaustive work cataloguing inter-tidal life along the Pacific Coast from Mexico to Alaska* (Figure 483) *and his opus publication, "Between Pacific Tides". He collected extensively around California and adjacent waters and published "Between Pacific Tides" in 1939. That treatise on intertidal life is still valuable and widely used today and is currently in its fifth edition. Ed was one of the first to interpret inter-tidal life in an ecological context and his account of seashore life is presented ecologically rather than taxonomically. He was also keenly aware of human impacts on ecological systems and was one of the earliest conservationists to warn against the dangers of over-fishing and other human impacts to the marine environment, including his own zealous collecting of intertidal specimens. Today, Ricketts, alongside Aldo Leopold* (Figure 484)*, is acknowledged as a major influence in the emergence both of environmentalism and conservation biology, although Leopold has been much more widely recognized. Interestingly, these two ecologists never knew each other's work, even though they were born only 200 miles apart and died within weeks of each other. Leopold's pivotal work, "A Sand County Almanac", was published 10 years after "Between Pacific Tides".*

*John Steinbeck is better known as a Pulitzer Prize and Nobel Prize winning author of "Grapes of Wrath", also published in 1939, and other novels. Less widely known is that Ricketts was a major inspiration behind much of Steinbeck's creative work and was the man behind the personae in six of Steinbeck's novels and novellas. It was Ricketts that Steinbeck immortalized as "Doc" in "Cannery Row" and Ricketts' ecological point of view had a big influence on Steinbeck's philosophy. In the "Grapes of Wrath", Steinbeck depicted the ecological devastation that followed human mismanagement of the environment, resulting in the Dust Bowl years of the Great Depression. That environmental perspective in Steinbeck's work was likely largely due to Ed Ricketts.*

*In 1940, Ricketts and Steinbeck conducted an extensive collecting trip around the Gulf of California, the results of which they published in "The Sea of Cortez" in 1941. Ricketts travelled to the west coast of Vancouver Island in 1945, just around the end of the Second World War, and to the west coast of Vancouver Island and Haida Gwaii, where he collected around Masset and the north coast of Graham Island, in 1946. His planned return with John Steinbeck in 1948 was to finish gathering material for a third volume in what would have been a trilogy on Pacific Coast intertidal life, that started with "Between Pacific Tides", then "The Sea of Cortez" dealing with more southern waters, and finally what was to be called "The Outer Shores" to chronicle intertidal life in the northern waters of British Columbia and Alaska. His sudden death was a great loss to the science of marine ecology and perhaps curtailed the earlier development of an environmental awareness that might have helped mediate human impacts that are so ubiquitous today.*

**Figure 483.** Ed Ricketts studied marine invertebrates along the Pacific coast of North America and was the first to categorize them ecologically, by intertidal zone, substrate type, and degree of exposure to the open ocean, rather than taxonomically. *Photo by R. Wayne Campbell, Long Beach, BC, 2 August 1969.*

## MI-010 SLOOP ISLET

**Location:** *53°45'28"N 132°14'42"W; 103 F/16.*
At the south entrance to Masset Sound, northeast of Ship island.

**Description:** *0.05 ha; 4 m high; Grassy rock.*
Sloop Islet is a small, narrow islet covered with dune grass, cow parsnip, and roses. There is a navigational beacon on the island.

**Historical summary:** One empty Black Oystercatcher scrape and a started Glaucous-winged Gull nest were found on 6 May 1977; one pair of oystercatchers (Figure 485) and 24 adult gulls were present (Table MI-010). Later that May, the oystercatcher nest held eggs but three gull nests found were still empty. Contents of oystercatcher and gull nests were not specified in July 1977. In 1986, we found one oystercatcher nest with eggs and two empty gull nests. Three Pigeon Guillemot nests with eggs were found in July 1977, and a nest with two eggs and three birds flying out of burrow-like tunnels in the grass under driftwood were seen in 1986.

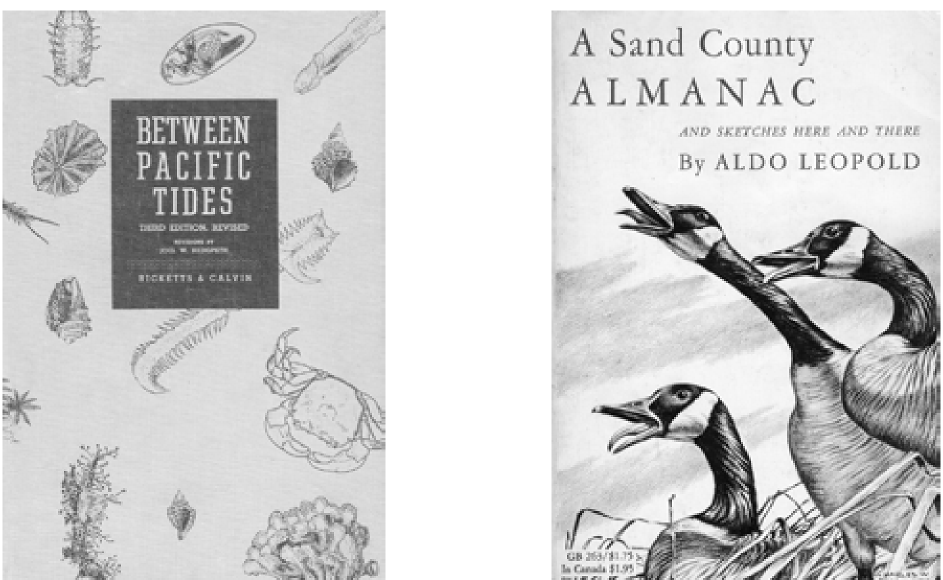



**Figure 484.** The classic books by Ed Ricketts and Aldo Leopold changed human attitudes towards the conservation of plants and animals and our responsibilities for maintaining healthy ecosystems.

**Figure 485.** On 6 May 1977, a pair of Black Oystercatchers was present on Sloop Islet and an empty nest scrape was found, but eggs had not yet been laid. *Photo by R. Wayne Campbell.*

**Table MI-010.** Seabird nesting records for Sloop Islet. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 6 May 1977 | 1S | S | (0) | 314 |
| 18-30 May 1977 | 1 | 3S | (0) | 159 |
| 30 Jul 1977 | 1 | 12 | x3(53) | 35, 314 |
| 24 Jun 1986 | 1 | 2S | x3(7) | 227 |

## MI-020 SHIP KIETA ISLAND

**Location:** *53°45'20"N 132°16'11"W; 103 F/16.*
West of Ship Island at the mouth of Masset Sound. Also known as Little Ship Island and West Ship Island prior to 1910.[79]

**Description:** *8.0 ha; 55 m high; Forested.*

**Historical summary:** Pigeon Guillemots were nesting in 1977, but none were seen in 1986 (Table MI-020).

**Table MI-020.** Seabird nesting records for Ship Kieta Island. See Appendix 2 for codes.

| DATE | PIGU | SOURCE |
|---|---|---|
| 31 Jul 1977 | x2(6) | 35, 314 |
| 24 Jun 1986 | (0) | 227 |

## MI-030 DAWSON ISLANDS

**Location:** *53°43'07"N 132°20'48"W* (largest island); *103 F/9.*
Middle of Masset Inlet east of Kwaikans Island. Colony includes the rocks to the east of the largest island.

**Description:** *5.3 ha; 34 m high; Forested; Grassy rock.*
This is a group of four larger islands and several smaller rocks, including two rocks to the east. The larger islands are forested (Figure 486), with an understory of salal. Smaller rocks are topped with salal, dune grass, other grasses, and forbs. The northeast corner of the largest island has a basaltic columnar bluff on the east side. There is a navigational beacon on the southern of the east rocks.

**Figure 486.** The larger islands in the Dawson Islands are forested. *Photos by R. Wayne Campbell, 31 July 1977.*

**Historical summary:** Darcus visited Dawson Islands in 1930. We suspect that a Pigeon Guillemot egg specimen,[324] with the location given only as Masset Inlet, may have been collected by Darcus on these islands at that time (Table MI-030). Dalzell stated that the islands were a favorite nesting place for "seagulls".[79] Local artist and wildlife researcher, Janet Gifford made notes of Pigeon Guillemots on the islands in 1983.

Black Oystercatchers have been recorded nesting on the most northern rock (1 nest with young in 1977 and 1 nest with 3 eggs in 1986) and the southern of the east rocks with the navigational beacon (an empty nest attended by 2 adults in 1986). A pair was also observed on the northeast point of the largest island in 1986 but it was not determined whether they were nesting. Glaucous-winged Gull nests (Figure 487) have been found on the northern of the east rocks (1 nest in 1977; 10 nests in 1986), the southern of the east rocks (9 nests in 1977; 20 nests in 1986), the most northern rock (1 nest in 1977 and 1986), and on the northeast point of the largest island (1 nest in 1986). Nesting by Pigeon Guillemots was confirmed on seven islands, including all the larger islands, in 1977 and on the east rocks in 1986. Nests were located under logs and rocks, in crevices, and in burrows.

**Figure 487.** A downy Glaucous-winged Gull chick in a nest on Dawson Islands in 1977. *Photo by R. Wayne Campbell, 31 July 1977.*

**Table MI-030.** Seabird nesting records for Dawson Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 6 Aug 1930 | | 3+ | x[a] | 314 |
| 31 Jul 1977 | 1 | 11[4] | x10(62) | 35, 314 |
| 5 May 1983 | | | S(20) | 314 |
| 24 Jun 1986 | 2[1] | 32[20] | x6(11) | 227 |

[a] See text.

**Remarks:** In 1977, two of three Glaucous-winged Gull eggs had been preyed on in the nest on the northern of the east rocks, and single Pigeon Guillemot eggs had been depredated on the most northern rock and on the forested island in the middle of the group. An adult Bald Eagle and four ravens were recorded around the islands.

## MI-040 KWAIKANS ISLAND

**Location:** *53°43'N 132°24'40"W; 103 F/9.*
South of the Ain River mouth along the north shore of Masset Inlet. Dawson gave the island its current name in 1878, but it has variously been referred to as Edward Kwa-kans in 1884, Watson Island from 1913 to 1919, and later Reject Island, a name still used locally.[79] Colony includes all the islets along the east, north, and west sides of the main Kwaikans Island.

**Description:** *100 ha; 102 m high; Forested; Grassy rock.*
The main island is densely forested. The small islet off the mid-northeast side has a stand of redcedar and spruce trees with a salal understory (Figure 488). The other low rocks are grassy.

**Figure 488.** Islet off the mid-northeast side of Kwaikans Island. Black Oystercatchers and Glaucous-winged Gulls were found nesting on this islet in 1986. *Photo by Michael S. Rodway, 24 June 1986.*

**Historical summary:** Black Oystercatcher nests were found on two rocks in 1977 (Table MI-040). In 1986, oystercatchers were nesting on three rocks and islets, including the islet off the mid-northeast side and the two small rocks at the north end of the cluster of islets off the west side of the main Kwaikans Island (Figure 489). A pair of oystercatchers was sighted on the rock just off the east point of the main island, but no nest was found. No Glaucous-winged Gull nests were found in 1977 but one adult gull was present and suspected nesting. In 1986, gull nests were also found on three rocks, including the rock just off the east point, the islet off the mid-northeast side, and the eastern of the two west rocks where oystercatchers were nesting. Pigeon Guillemots were sighted around the main island and three of the surrounding islets in 1977; nests were found in a burrow and under a log on two of the islets.

**Figure 489.** A full complement of Black Oystercatcher eggs in a nest of rock chips located on a rock off the west side of Kwaikans Island in 1986. *Photo by Michael S. Rodway, 24 June 1986.*

**Table MI-040.** Seabird nesting records for Kwaikans Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 31 Jul 1977 | 3[3] | 1eS | x2(33) | 35, 314 |
| 24 Jun 1986 | 4[2] | 6[3] | S(2) | 227 |

**Remarks:** Two adult Bald Eagles were seen on the main island in 1977. In 1986, a pair of Harlequin Ducks (*Histrionicus histrionicus*) was nesting on the 2 m rock on the west side of Kwaikans Island (Figure 490). Raccoon were suspected on the northeast islet in 1986.

**Figure 490.** This is the first Harlequin Duck nest found on Haida Gwaii and is the only known nest located on a maritime island in North America. The nest (located in the centre of the left photo) was on a 2 m-high rock on the west side of Kwaikans Island. The nest contained a newly hatched chick, a pipping egg, and four unhatched eggs. The only other breeding record in the BC Nest Record Scheme for Harlequin Ducks in Haida Gwaii is from Tom Reimchen. He watched five Class 1B (1-2 week old) young swimming with a female on Moresby Lake in 1983. *Photos by Michael S. Rodway, 24 June 1986.*

***Why a Duck is Not a Seabird***

*Categorizing and labelling is an essential component of human language and communication. However labelled categories are rarely precisely distinguished. Even basic categories in biology, such as "plant" and "animal" or "species", are vague at some level.*

*In this catalogue of seabird colonies, we found that the label "seabird" was too vague and general for our purposes and thus categorized the group of species that we included as "... those marine-dependent species that rely on maritime forested and rocky island habitats for breeding in BC." This definition excluded non-breeding seabird visitors like Sooty Shearwaters* (Ardenna grisea) *and resident waterbirds like Harlequin Ducks and other seaducks that spend most of their lives in the marine environment but generally move inland to breed. Even then, we had to make exceptions for Double-crested Cormorants, which now breed inland in BC and are abundant inland breeders in other parts of North America, and Glaucous-winged Gulls, which also, though rarely, nest on freshwater lakes and other inland sites. For Double-crested Cormorant, our category only made sense at the geographical scale of BC. At the continental scale, the majority of the Double-crested Cormorant population breeds inland and it would be more appropriate to consider them a freshwater than a marine species* (Figure 491).

*Considering populations at smaller geographical scales also posed problems for our categorical definition. Most ducks are primarily inland breeders at a provincial or continental scale, but if we were to narrow our geographical scale to Masset Inlet, our categorical definition would no longer suffice. In Masset Inlet we found two species of seaduck and Canada Geese* (Branta canadensis) *sharing some of the same island habitats for breeding as Glaucous-winged Gulls and Black Oystercatchers. Red-breasted Mergansers* (Mergus serrator) *were found nesting on six islands. The Harlequin Duck nest we found on Kwaikans Island in 1986 is the only maritime-nesting record for the species in Canada. Canada Geese were nesting on two islands. Perhaps the more sheltered and likely lower salinity waters of Masset and Juskatla inlets, which form an inland sea with a long, narrow opening to the open Pacific, make the area more suitable for these waterfowl species; we have never found them nesting in more exposed coastal areas. Canada Geese are also known to nest on some seabird islands in the similarly sheltered and lower salinity waters of the Salish Sea* (Figure 492). *At any rate, in Masset Inlet, it would be entirely appropriate to include these species in our seabird catalogue. A duck is thus a seabird at the right geographical scale.*

**Figure 491.** Most Double-crested Cormorants in North America breed inland. *Photo by R. Wayne Campbell.*

**Figure 492.** Canada Goose nests, such as this one found on Vivian Island in 1995, have been found on at least 11 seabird colonies in the Strait of Georgia. *Photo by R. Wayne Campbell, 17 April 1995.*

## MI-050 McCREIGHT ISLAND

**Location:** *53°42'12"N 132°27'20"W; 103 F/9.*
South of Buckley Cove on the north side of Masset Inlet.

**Description:** *8.4 ha; 70 m high; Forested.*
McCreight Island has steep rocky sides with bays and two tidally-connected points on the east side. Ground cover on much of the island is open moss under a redcedar, hemlock, and spruce forest (Figure 493). Observers in 1977 noted some recent hand logging on the main island (Figure 494).

**Figure 493.** The northern tidally-connected point on the east side of McCreight Island has steep rocky sides under a mixed coniferous forest. *Photo by Michael S. Rodway, 25 June 1986.*

**Figure 494.** A large Sitka spruce (foreground) recently felled by hand-loggers on McCreight Island in 1977. *Photo by R. Wayne Campbell, 31 July 1977.*

**Historical summary:** In 1977, three Black Oystercatchers and one Glaucous-winged Gull were seen on rocky areas on the tidally-connected points on the east side, but no evidence of nesting was found (Table MI-050). In 1986, an oystercatcher nest with an egg and one large young was found on the northern of the tidally-connected east points (Figure 495), and gulls were nesting on the two tidally-connected east points (Figure 496) and on the point south of there. Pigeon Guillemots were nesting in burrows, crevices, and under rocks on the southern, tidally-connected east point and on the point south of there.

**Table MI-050.** Seabird nesting records for McCreight Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 31 Jul 1977 | 0 | 0 | S(1) | 35, 314 |
| 25 Jun 1986 | 1 | 4[2] | x10(52) | 227 |

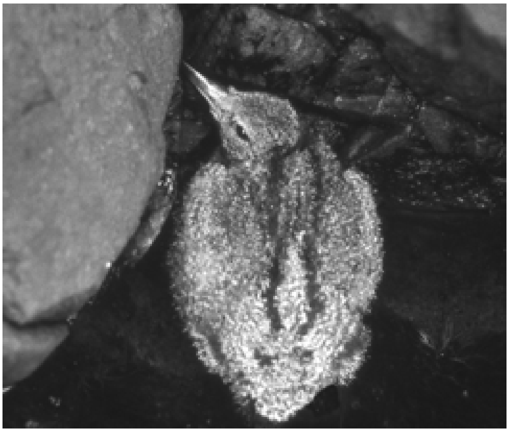


**Figure 495.** A Black Oystercatcher nest on McCreight Island in 1986 contained an egg and had one large young nearby. *Photo by Michael S. Rodway, 25 June 1986.*

**Figure 496.** Glaucous-winged Gulls were nesting on the tidally-connected points on the east side of McCreight Island in 1986. *Photo by Michael S. Rodway, 25 June 1986.*

## MI-060 WATHUS ISLAND

**Location:** *53°40'50"N 132°29'W; 103 F/9.*
South of Parker Point, north of Shannon Bay. Labelled Wat-hoo-us on charts from 1878, then renamed Young Island in 1907, though also referred to as Wathus Island at that time.[79] Colony includes the islets off the north and south ends and along the west side of the main Wathus Island.

**Description:** *252 ha; 141 m high; Forested.*
Wathus Island and the perimeter islets are mostly covered with dense forest; shorelines are rocky and there are some rocky knobs off the northern islets.

**Historical summary:** Records from 1977 do not indicate where nesting was found around Wathus Island: eight Black Oystercatchers were noted but no evidence of nesting was found; Pigeon Guillemots were nesting in burrows (Table MI-060). In 1986, oystercatchers were nesting on the rocky knob at the north end of the western, 18 m-high islet of the north group of islets. Two excited adults were present around an empty scrape and hidden young were suspected.

**Table MI-060.** Seabird nesting records for Wathus Island. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 31 Jul 1977 | 0 | x2(22) | 35, 314 |
| 25 Jun 1986 | 1S | (0) | 227 |

**Remarks:** One immature Bald Eagle was present in 1977.

## MI-070 MUTUS ISLAND

**Location:** *53°41'15"N 132°35'25"W; 103 F/10.*
At the mouth of Dinan Bay in the western arm of Masset Inlet. First charted as Mut-oos in 1878.[79] Colony includes the islets and rocks off the northwest corner and to the southeast of the main Mutus Island.

**Description:** *31 ha; 58 m high; Forested; Grassy rock.*
The larger islands are forested; smaller rocks are covered with mosses, grasses, and forbs (Figure 497).

**Figure 497.** Two of the smaller islets southeast of Mutus Island that are covered with grasses and forbs. *Photos by Michael S. Rodway, 25 June 1986.*

**Historical summary:** There are no records prior to the survey in 1986, when nesting was recorded only on the smaller rocks (Table MI-070). Black Oystercatcher nests were found on three of the southeast rocks and on a small, mossy rock off the northwest corner of the main island; one nest held an egg and one young (Figure 498) and hidden young were suspected around each of the three empty nests found. One pair of Glaucous-winged Gulls was nesting on the 2 m-high southeast rock, and Pigeon Guillemots were sighted around the most southerly of the southeast rocks.

.**Table MI-070.** Seabird nesting records for Mutus Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 25 Jun 1986 | 4[1] | 1 | S(3) | 227 |

**Remarks:** In 1986, there was a Canada Goose nest (Figure 499) and a Red-breasted Merganser nest (Figure 500) on the southeast rocks.

**Figure 499.** Six eggs hatched in this Canada Goose nest found on an islet southeast of Mutus Island in 1986. *Photo by Michael S. Rodway, 25 June 1986.*

**Figure 498.** Black Oystercatcher nest with an egg on a few mussel, turban, and clam shells on one of the rocks southeast of Mutus Island in 1986. A chick was nearby. *Photo by Michael S. Rodway, 25 June 1986.*

**Figure 500.** A female Red-breasted Merganser was flushed from this nest concealed in vegetation (left) on an islet southeast of Mutus Island in 1986. Nine eggs were nestled in down. This was one of seven Red-breasted Merganser nests found on seabird colonies in Masset and Juskatla inlets in 1986. The only other nest with eggs found in BC was a clutch of eight collected by Harry S. Swarth in Atlin Lake in 1931. *Photos by Michael S. Rodway, 25 June 1986.*

## MI-080 LEARMONTH ISLAND

**Location:** *53°40'31"N 132°27'14"W; 103 F/9.* East of Wathus Island. Colony includes the islets and rocks off the north end, the mid-west side, and the southwest corner of the main island.

**Figure 501.** The larger islands in the Learmonth Island group are forested, with rocky shores. *Photo by Michael S. Rodway, 25 June 1986.*

**Figure 502.** A navigational beacon is present on a bare rocky islet off the north tip of Learmonth Island. *Photo by Michael S. Rodway, 25 June 1986.*

**Description:** *6.4 ha; 45 m high; Forested; Grassy rock.*
The main island and larger islets are forested, with rocky shorelines (Figure 501). The eastern islet at the north end is covered with salal under a few trees. Smaller rocky knobs are mostly bare, with some grass. There is a navigational beacon on the north rock (Figure 502).

**Historical summary:** Nesting Black Oystercatchers were found on the rocks off the north end (Figure 503) and southwest corners of the main island in May 1977 and in 1986 (Table MI-080). Nest locations were just given as Learmonth Island in July 1977. Two Glaucous-winged Gull nests were found in 1977, but only one old nest start was found on the eastern islet at the north end, where in 1986 one adult gull was present. Pigeon Guillemots were nesting in burrows in July 1977 and in 1986. In 1986, one guillemot flew out of a burrow under roots at the edge of the vegetation on the eastern islet off the north end of the main island.

**Figure 503.** A large Black Oystercatcher chick, attaining juvenal plumage, on the islet with the light beacon off the north tip of Learmonth Island in 1986. *Photo by Michael S. Rodway, 25 June 1986.*

**Table MI-080.** Seabird nesting records for Learmonth Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18-30 May 1977 | 2[2] | 0 | (0) | 159 |
| 31 Jul 1977 | 3[3] | 2[2] | x5(23) | 35, 314 |
| 25 Jun 1986 | 4[2] | 0 | x(3) | 227 |

**Remarks:** Hand logging was noted by observers in July 1977.

## MI-090 ROSS ISLETS

**Location:** *53°40'31"N 132°23'55"W; 103 F/9.*
On the mid-south shore of Masset Inlet off Yestalton Bay, west of the entrance to Juskatla Inlet.

**Description:** *0.2 ha; 17 m high; Forested.*
Ross Islets are composed of only one islet. The islet is a round, rocky knob with a ground cover of primarily salal under spruce, redcedar, Sitka alder, and hemlock trees (Figure 504). There are some grassy and mossy areas.

**Figure 504.** Ross Islets is a misnomer – it is only one islet. The islet is forested, with a rocky shore along which Black Oystercatchers and Pigeon Guillemots nest. *Photo by Michael S. Rodway, 25 June 1986.*

**Historical summary:** Dalzell noted that the grassy and mossy areas provided habitat for "oystercatchers and sea-gulls" that nested on the islet,[79] but no other evidence of nesting by gulls has been reported. Black Oystercatchers were reported nesting in May 1977 (Table MI-090). Observers in July 1977 stated that there was no evidence of nesting by any seabirds, although nine Pigeon Guillemots, four carrying fish, one Black Oystercatcher, and one adult Glaucous-winged Gull were recorded (note that these records from July 1977 were originally listed for Powell Island but we believe that was a mistake and they actually referred to Ross Islets; see Powell Island account below). In 1986, we found one oystercatcher nest with three young hidden in the salal nearby. Pigeon Guillemots were nesting in a burrow under the salal.

**Table MI-090.** Seabird nesting records for Ross Islets. See Appendix 2 for codes.

| DATE | BLOY | PIGU | SOURCE |
|---|---|---|---|
| 18-30 May 1977 | 1 | (0) | 159 |
| 31 Jul 1977[a] | 0 | (9) | 35, 314 |
| 25 Jun 1986 | 1 | x(2) | 227 |

[a] See text.

## MI-100 POWELL ISLAND

**Location:** *53°41'08"N 132°22'32"W; 103 F/9.*
Northwest of the entrance to Juskatla Inlet, southwest of Cowley Island.

**Description:** *6 m high; Grassy rock.*
Powell Island is a narrow, low island covered with roses, grasses, and forbs, including dune grass and sea-watch (*Angelica lucida*) (Figure 505 and 506).

**Figure 505.** Powell Island is 6 m-high rock covered with rose bushes, grasses, and forbs. *Photo by Michael S. Rodway, 6 May 1977.*

**Figure 506.** Eight Harbour Seals (*Phoca vitulina*) were hauled out on the rocks on Powell Island on 19 June 1981. *Photo by Alan D. Wilson.*

**Historical summary:** Bristol Foster found three Glaucous-winged Gull nests with eggs in 1960 (Table MI-100). Dalzell noted that the island was a favorite nesting place for "sea-gulls".[79] In 1977, one pair of gulls was present but no nests had yet been built on 6 May, one completed but still empty nest was found later in May, and eight nests were found at the end of July (note that the nesting records from 31 July 1977 were listed for Cowley Rock, but that rock is wave-washed, and the description given for the site, including all the wild roses, fits Powell Island). Black Oystercatchers have been reported nesting only in May 1977. Pigeon Guillemots were confirmed nesting in July 1977 and two nests with eggs were found in 1986.

**Table MI-100.** Seabird nesting records for Powell Island. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 15 Jun 1960 | | 3[3] | | 94 |
| 6 May 1977 | | 1eS | (0) | 314 |
| 18-30 May 1977 | 1 | 1S | (0) | 159 |
| 31 Jul 1977[a] | | 8[5] | x(4) | 35, 314 |
| 25 Jun 1986 | 0 | 12[7] | x2(4) | 227 |

[a] See text.

**Remarks:** A Canada Goose was flushed off a nest with five eggs on 6 May 1977. In 1986, there were three Red-breasted Merganser nests (Figure 507) and one Canada Goose nest on the island.

**Figure 507.** One of three Red-breasted Merganser nests found on Powell Island in 1986. *Photo by Michael S. Rodway, 25 June 1986.*

## MI-110 COWLEY ISLANDS

**Location:** *53°41'33"N 132°22'07"W* (west island); *103 F/9.*
Northwest of the entrance to Juskatla Inlet.

**Description:** *3.0 ha; 55 m high; Forested.*
These two islands are covered with salal under a redcedar, hemlock, and spruce forest (Figure 508). Sitka alder, roses, and vetch (*Vicia* spp.) occur along the edges.

**Figure 508.** Cowley Islands are forested with western redcedar, western hemlock, and Sitka spruce. *Photo by Michael S. Rodway, 25 June 1986.*

**Historical summary:** Pigeon Guillemots were nesting in burrows in 1977 (Table MI-110). In 1986, 16 guillemots were seen flying from burrows and crevices; 20 and 12 pairs were estimated nesting on the west and east islands, respectively.

Two adult Black Oystercatchers and three adult Glaucous-winged Gulls were present but no sign of nesting was found in 1977. Oystercatcher and gull nests were found on both islands in 1986: one oystercatcher nest on each island (Figure 509); and five and 14 gull nests on the west and east islands, respectively.

**Figure 509.** Black Oystercatcher nest lined with salal leaves on the western of the two Cowley Islands in 1986. *Photo by Michael S. Rodway, 25 June 1986.*

**Table MI-110.** Seabird nesting records for Cowley Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 31 Jul 1977 | 0 | 0 | x(6) | 35, 314 |
| 25 Jun 1986 | 2[2] | 19[9] | 32e(17) | 227 |

**Remarks:** There was one Red-breasted Merganser nest on the islands in 1986. River otter scats containing fish and feathers were found on the east island in 1986.

## MI-120 OHALA ISLETS

**Location:** *53°39'09"N 132°22'52"W* (south islet); *103 F/9.*
Juskatla Inlet, southwest of the entrance.

**Description:** *1.6 ha; 26 m high; Forested.*
These two islets are covered with salal under redcedar and spruce trees (Figure 510).

**Historical summary:** Nesting was recorded on the smaller, northern islet in May 1977 and in 1986. Two completed Glaucous-winged Gull nests were found but no eggs had yet been laid in May 1977 (Table MI-120). In August 1977, gulls were nesting on the north islet and Black Oystercatchers and Pigeon Guillemots were found nesting on the larger, south islet. In 1986: adult oystercatchers were excited, and chicks were suspected around the empty nest found; one incomplete gull nest was found; and Pigeon Guillemots were nesting in burrows under roots at the edge of the vegetation (Figure 511).

**Figure 510.** The two Ohala Islets are forested with western redcedar and Sitka spruce. *Photo by Michael S. Rodway, 25 June 1986.*

**Figure 511.** Pigeon Guillemots were nesting in burrows under tree roots at the edge of the vegetation on the northern Ohala Islets in 1986. *Photo by Michael S. Rodway, 25 June 1986.*

**Table MI-120.** Seabird nesting records for Ohala Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18-30 May 1977 | 1 | 2S | x(1) | 159 |
| 1 Aug 1977 | 1 | 3[1] | x2(12) | 35, 314 |
| 25 Jun 1986 | 1S | 1S | x2(2) | 227 |

**Remarks:** A female Red-breasted Merganser flushed out of the salal where a nest was likely located in 1986.

## MI-130 STEILTA ISLETS

**Location:** *53°38'08"N 132°23'43"W* (main islet); *103 F/9.*
Juskatla Inlet, west of Harrison Islands. Colony includes the 23 m-high islet to the north of the Steilta group.

**Description:** *14.4 ha; 95 m high; Forested; Bare rock.*
Most of these islets are covered with salal under hemlock, redcedar, and spruce trees (Figure 512). There are open, mossy areas under lodgepole pine occurring on the south and east sides of the southwest islets. There is a small bare rock on the west side of the main island.

**Historical summary:** Black Oystercatchers have been recorded nesting on four islets: in May and August 1977, oystercatcher nests were found on the 23 m-high islet to the north and on the 20 m-high islet southwest of the large islet (nests held eggs in May, and young were seen around both nests in August); and in 1986 an empty oystercatcher nest was found on the 20 m-high islet, plus nests with young were found on the small islet off the north end of the main islet (Figure 513) and on the bare rock off the mid-west side of the main islet (Table MI-130).

**Figure 513.** Black Oystercatcher nest with a recently-hatched chick and an unhatched egg on the small islet at the north end of the Steilta Islets in 1986. *Photo by Michael S. Rodway, 26 June 1986.*

One completed, empty Glaucous-winged Gull nest was found on the 23 m-high islet to the north in May 1977. Three adult gulls were present in August 1977 but no nests were found. In 1986, a pair of gulls was nesting on the small islet off the north end of the main islet, where a nest with four eggs plus an additional egg outside the nest was found (Figure 514).

**Figure 512.** Islets at the north end (left) and southwest end of the Steilta Islets group. The islets are forested with conifers. *Photos by Michael S. Rodway, 26 June 1986.*

**Figure 514.** Glaucous-winged Gull nest composed of mosses and plant stems on the small islet at the north end of the Steilta Islets in 1986. About 0.2 % of Glaucous-winged Gull nests in BC have four eggs; rarely, nests have five eggs. *Photo by Michael S. Rodway, 26 June 1986.*

Pigeon Guillemots have been recorded around most islets. In 1977, most birds were seen around the islet off the north end of the main islet (45 birds) and around the two most southwestern islets (38 birds). A few birds were also seen around the 23 m-high islet to the north (1 bird), the main islet (5 birds), and the rock off the mid-west side (1 bird). In 1986, guillemots were most numerous around the 23 m-high islet to the north (62 birds), and were also seen around the islet off the north end (11 birds), and the 34 m-high (21 birds), the 20 m-high islet (22 birds), and the two most southwestern (15 birds) of the islets to the southwest of the main islet. Guillemots were nesting in burrows and crevices under the edge of the salal around these islets.

**Table MI-130.** Seabird nesting records for Steilta Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18-30 May 1977 | 2[2] | 1S | x(90) | 159 |
| 1 Aug 1977 | 2[2] | 0 | S(6) | 314 |
| 26 Jun 1986 | 3[2] | 1 | x9(131) | 227 |

**Remarks:** One adult Bald Eagle was present but not nesting on the main islet in August 1977.

## MI-140 SEEGAY ISLETS

**Location:** *53°37'23"N 132°24'56"W* (north islet); *103 F/9.*
Juskatla Inlet, southwest of Harrison Islands. Colony includes the unnamed islets and rocks to the southeast, close to the shore of Graham Island.

**Description:** *6.4 ha; 58 m high; Forested; Mossy rock.*
The larger islands are forested (Figure 515), with a salal understory. The smaller islets to the southeast are low islets with mossy ground under spruce, hemlock, and redcedar, except the 2 m-high rock which has no trees (Figure 516).

**Historical summary:** Black Oystercatchers have nested on three islets in the group. An oystercatcher nest with two eggs was found on the small 2 m-high rock to the southeast of Seegay Islets on 6 May 1977 (Table MI-140). Later in May 1977, oystercatcher nests with eggs were found on that rock and on the small, east islet (17 m high) of the main Seegay cluster. In 1986, oystercatcher nests were found on the 2 m-high, southeast rock (4 nests, one with 1 egg; Figure 517) and on the 3 m-high rock southwest of

**Figure 515.** The larger Seegay Islets are forested. *Photo by Michael S. Rodway, 26 June 1986.*

**Figure 516.** One-year-old Deva Wynd Rodway searching for nests on the 2 m-high rock southeast of the Seegay Islets. *Photo by Michael S. Rodway, 26 June 1986.*

**Figure 517.** Black Oystercatcher nest composed of rock chips on the small rock southeast of the Seegay Islets in 1986. *Photo by Michael S. Rodway, 26 June 1986.*

there and close to the Graham Island shore (3 empty nests).

A pair of Glaucous-winged Gulls was present and suspected nesting on the 2 m-high rock during both visits in May 1977, but none have been recorded on subsequent visits. No seabirds were seen in August 1977. Pigeon Guillemots were nesting in a burrow at the edge of the vegetation on the west side of the 17 m-high, east islet in 1986.

**Table MI-140.** Seabird nesting records for Seegay Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 6 May 1977 | 1 | 1eS | | 314 |
| 18-30 May 1977 | 2[2] | 1eS | (1) | 159 |
| 1 Aug 1977 | 0 | 0 | (0) | 314 |
| 26 Jun 1986 | 7[1] | 0 | x(2) | 227 |

**Remarks:** There was one Red-breasted Merganser nest on the southeastern 2 m-high rock in 1986 (Figure 518).

**Figure 518.** Red-breasted Merganser nest on the small rock southeast of Seegay Islets in 1986. The small nesting population, which we estimated at about 20 pairs, of Red-breasted Mergansers found in Masset and Juskatla inlets in 1986 is unique in BC and is the densest nesting cluster of this species known in the province. *Photo by Michael S. Rodway, 26 June 1986.*

## MI-150 MODEETS ISLANDS

**Location:** *53°36'04"N 132°27'30"W* (largest island); *103 F/9.*
In the southwest arm of Juskatla Inlet.

**Description:** *8.4 ha; 73 m high; Forested.*
Most of these islands are forested, with an understory of salal (Figure 519). The 15 m-high islet on the west side of the group is a small narrow islet covered with moss and dune grass under crabapple and some spruce and hemlock trees.

**Figure 519.** Most of the Modeets Islands are heavily forested. *Photos by Michael S. Rodway, 31 July 1977.*

**Historical summary:** Hatter and Stordeur reported one Black Oystercatcher nest in May 1977 (Table MI-150). Observers reported no evidence of use by seabirds in August 1977, although 12 Pigeon Guillemots were recorded in the area. In 1986, one oystercatcher nest on the 15 m-high west islet contained one egg, and young were suspected but not found around one nest on the most southern islet. A Glaucous-winged Gull nest with three eggs was found on the west islet, and Pigeon Guillemots were seen around the west islet and northern islet.

**Table MI-150.** Seabird nesting records for Modeets Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 18-30 May 1977 | 1 | 0 | x(60) | 159 |
| 1 Aug 1977 | 0 | 0 | (12) | 314 |
| 26 Jun 1986 | 2[1] | 1 | S(2) | 227 |

## MI-160 MAMIN ISLETS

**Location:** *53°37'42"N 132°19'08"W* (east islet)*; 103 F/9.*
Juskatla Inlet in the mouth of Mamin Bay. Colony includes the unnamed group of islands west of Mamin Bay near the shore of Graham Island.

**Description:** *3.2 ha; 26 m high; Forested; Bare rock.*
The two main Mamin Islets are covered with salal under a forest of spruce, hemlock, and redcedar. There is a bare rock at the east end of the group west of Mamin Bay (Figure 520), and a small islet at the west end of this group vegetated with moss and a few crabapple.

**Figure 520.** Eastern rock of the group of islands west of Mamin Bay that we have included in the Mamin Islets colony. *Photo by Michael S. Rodway, 26 June 1986.*

**Historical summary:** Foster found one Glaucous-winged Gull nest with eggs in 1960 (Table MI-160). Two empty gull nests were found on the west Mamin islet and one pair was suspected nesting on the unnamed islets to the west in May 1977, but no gulls were recorded on any islets in August 1977 or in 1986.

Black Oystercatchers have nested on four islets. In 1977, there was one nest with eggs on the west Mamin islet and two nests with eggs on the east Mamin islet in May, and a pair with large young on both islets in August. In 1986, nests were found on the east Mamin islet, the bare rock at the east end of the group west of Mamin Bay (Figure 521), and the small islet at the west end of this group.

**Figure 521.** Black Oystercatcher chick found on the 1 m-high east rock in the group of islands west of Mamin Bay. *Photo by Michael S. Rodway, 26 June 1986.*

One Pigeon Guillemot was recorded on the west Mamin islet in May 1977, and one was seen flying out of a burrow under salal on the east side of that islet in 1986.

**Table MI-160.** Seabird nesting records for Mamin Islets. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 15 Jun 1960 | | 1 | | 94 |
| 18-30 May 1977 | 3[3] | 3eS | S(1) | 159 |
| 1 Aug 1977 | 2[2] | 0 | S(14) | 35, 314 |
| 26 Jun 1986 | 3[3][a] | 0 | x(1) | 227 |

[a] Contents were not determined in one of the nests, but an adult was sitting on the nest and it was assumed that it contained eggs or brooded young.

## MI-170 HARRISON ISLANDS

**Location:** *53°38'10"N 132°22'25"W* (main island); *103 F/9.*
Centre of Juskatla Inlet. The largest island was named Has-keious, after the Haida name for it, by Dawson in 1878; renamed Harrison Island in 1907, and Harrison Islands in 1953.[79]

**Description:** *230 ha; 125 m high; Forested.*
There are about nine islands in the Harrison Islands, composed of one large main island and several satellite islets off the northeast corner and the west side of the main island. The edges of the larger islands are covered with salal under redcedar, hemlock, and spruce trees, with some mossy patches near shore (Figure 522). The eastern of the northeast islets is a 15 m-high islet with crabapple, pine, and roses around the perimeter.

**Figure 522.** Most of the Harrison Islands are forested with western redcedar, western hemlock, and Sitka spruce. *Photo by Michael S. Rodway, 26 June 1986.*

**Historical summary:** Two adult Glaucous-winged Gulls were seen and hatched eggshells were found by Bristol Foster in 1960 (Table MI-170). Gulls were nesting on the eastern 15 m-high islet in July 1977 and 1986. In 1977, 10 adult gulls were present, chicks had already fledged, and two young-of-the-year were sighted on the water. No nests were recorded but observers estimated five pairs nesting.

Black Oystercatchers have been recorded nesting on two islands: the western of the two larger islands northeast of the main island in May 1977; and on the 15 m-high eastern islet in 1986. Young were suspected around the nest found in 1986. The location of the nest found in July 1977 was not specified. In addition, one oystercatcher was present and possibly nesting on the most northeast (49 m-high) island in May 1977 and two were present but not suspected nesting on the 26 m-high island west of the south end of the main island in July 1977.

Pigeon Guillemots have been sighted around at least three islands: the most northeast island (1 in May 1977); the eastern 15 m-high islet (40 in July 1977 and 16 in 1986); and the 26 m-high island west of the south end of the main island (2 in July 1977 and 13 in 1986). They were nesting in burrows and crevices at the edge of the salal.

**Table MI-170.** Seabird nesting records for Harrison Islands. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 13 Jun 1960 | | x | | 314 |
| 18-30 May 1977 | 1 | | (1) | 159 |
| 31 Jul 1977 | 1 | 5e | x9(48) | 35, 314 |
| 26 Jun 1986 | 1S | 2[2] | x(29) | 227 |

**Remarks:** Red-breasted Mergansers were found nesting in 1986 (Figure 523).

**Figure 523.** The discovery in 1986 of Red-breasted Mergansers breeding in Masset and Juskatla inlets in Haida Gwaii extended the known breeding range in British Columbia over 600 km south from Atlin Lake. Nests documented from Masset and Juskatla inlets are the first records of Red-breasted Mergansers breeding in the marine environment. *Photo by Alan D. Wilson.*

## NORTH COAST GRAHAM ISLAND

There are only a few scattered rocks off the north shore of Graham Island where Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots nest. Nesting by oystercatchers also occurs on the shore of Graham Island (Figure 524). As of 1990, a total of 437 birds of the three species was estimated nesting at three of the six historical nesting sites in this region (Figure 525, Table 12). Most of the regional population nests on one colony on the rocks west of Naden Point ("Naden" Rocks).

**Figure 524.** The north coast of Graham Island is a popular destination for tourists, from the village of Old Masset, where they can photograph totem poles (top), to Rose Spit, which is popular for sightseeing. Shore-nesting Black Oystercatchers may be impacted by human disturbance along this coast. *Photos by R. Wayne Campbell.*

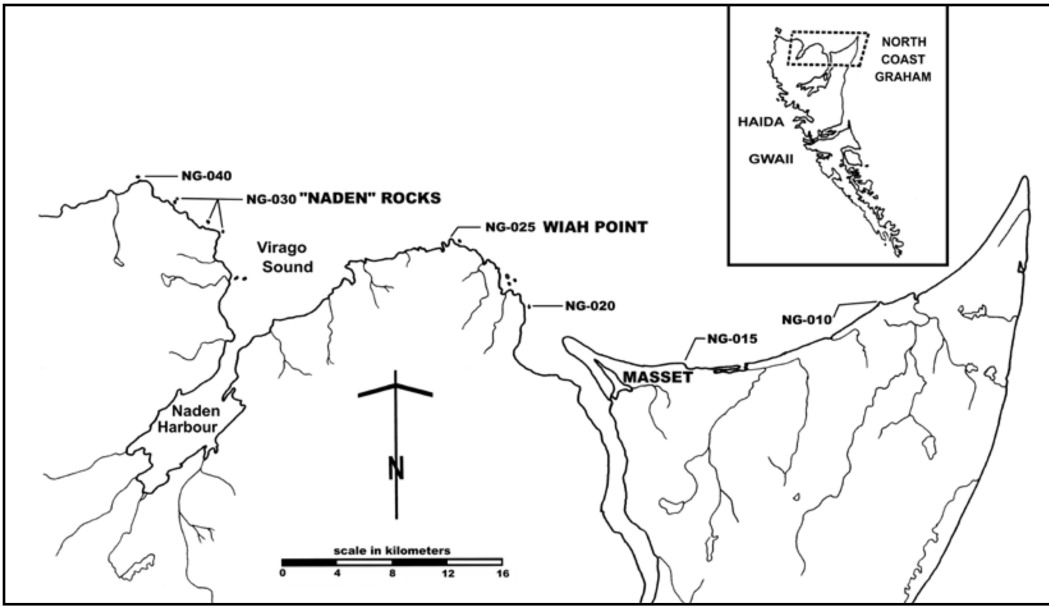



**Figure 525.** Locations of seabird colonies on the north coast of Graham Island (modified from Rodway [227]).

**Table 12.** Estimates of seabird breeding populations on the north coast of Graham Island as of 1990. Estimates are numbers of breeding pairs except for numbers in parentheses, totals in the "All species" column, and totals in the "Total breeding birds" row, which are numbers of individuals. See Appendix 2 on pages 467-468 for an explanation of the letter codes used to qualify population estimates.

| SITE CODE | SITE NAME | BLOY | GWGU | PIGU | ALL SPECIES[a] | SURVEY YEAR[b] |
|---|---|---|---|---|---|---|
| NG-010 | Yakan Point | 0 | | | 0 | 1978 |
| NG-015[c] | Skonun Point | 1 | | | 2 | 1988 |
| NG-020 | "Westacott" Rock | 0 | | | 0 | 1986 |
| NG-025[c] | 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 |
| **TOTAL NESTING PAIRS** | | **18** | **113** | | | |
| **TOTAL BREEDING BIRDS** | | **36** | **226** | **175** | **437** | |
| **TOTAL CURRENT SITES** | | 3 | 2 | 2 | 3 | |
| ***Confirmed on last survey*** | | 3 | 2 | 2 | 3 | |
| ***Confirmed on any survey*** | | 3 | 2 | 2 | 3 | |
| ***Unconfirmed*** | | 0 | 0 | 0 | 0 | |
| **TOTAL HISTORICAL SITES** | | 6 | 2 | 2 | 6 | |
| ***Confirmed*** | | 6 | 2 | 2 | 6 | |
| ***Unconfirmed*** | | 0 | 0 | 0 | 0 | |
| **CURRENTLY ABANDONED SITES** | | 3 | 0 | 0 | 3 | |
| ***Previously confirmed*** | | 3 | | | 3 | |
| ***Previously unconfirmed*** | | 0 | | | 0 | |

[a] Number of individuals.
[b] For sources see individual colony accounts.
[c] These sites were only recently identified as nesting areas and were not included on summary Table 6 presented in Part 1 (page 66).[231]

Nesting by Black Oystercatchers on the north shore of Graham Island may have been more widespread in the past. Brooks [19] reported oystercatchers breeding on the shoreline of Graham Island north of Masset, Young [295] found a nest at Yakan Point in 1926, and we recently uncovered a 1947 record of 18 Black Oystercatcher nests on the Graham Island shore at Wiah Point.[327b] Nesting has not been recorded at those sites during recent surveys (Table 12). However, we also recently became aware of repeated nesting in the 1980s by one pair of Black Oystercatchers on the sandy beach at Skonun Point,[72] which is also on the main shore of Graham Island, east of Masset. The main shores of Graham and Moresby islands have not been well explored for nesting oystercatchers and the relatively recent records of nesting at Skonun Point suggest that other unknown nesting sites may exist along those shorelines. The area around Skonun Point is a popular and increasingly well-travelled recreational area and it is unknown whether nesting oystercatchers have persisted there since Cooper and Miller [72] made their last observations in 1988.

Data from 1977 [39, 314] and 1986 [227] surveys provide comparable population estimates (Table 13). The apparent increase in the Black Oystercatcher nesting population may again, as in Masset and Juskatla inlets, be due to differences in the recording of empty nests; empty nests were not recorded in 1977 (Figure 526) but were in 1986. In 1986, 11 of the nests were empty and numbers of nests with eggs or young were similar in the two years. The number of nesting Glaucous-winged Gulls increased from 1977 to 1986. The data are inadequate to interpret Pigeon Guillemot trends.

**Figure 526.** Estimates of the number of Black Oystercatchers nesting along the north coast of Graham Island in 1977 and 1986 were difficult to compare because empty nest scrapes were not tallied during surveys in 1977. *Photo by R. Wayne Campbell.*

**Table 13.** Breeding populations of Black Oystercatcher and Glaucous-winged Gull, and numbers of Pigeon Guillemots counted around colonies on the north coast of Graham Island in 1977 and 1986.

| | BLOY | | GWGU | | PIGU | | |
|---|---|---|---|---|---|---|---|
| **Survey Date** | **Nests[a]** | **Sites** | **Nests[a]** | **Sites** | **Confirmed nests** | **Birds** | **Sites** |
| May, Jul 1977 | 5[5] | 3 | 43[b] | 2 | S | 77 | 1 |
| 29 Jun 1986 | 18[7] | 3 | 113[68] | 2 | x21 | 175 | 2 |

[a] Nests found includes total nests followed by nests with eggs or young in brackets.
[b] Total includes 42 nests counted on “Naden” Rocks and one pair suspected nesting on “Klashwun” Rocks. Nest contents were unknown.

## NG-010 YAKAN POINT

**Location:** *54°04'13"N 131°50'08"W; 103 J/4.*
On the north shore of Graham Island west of Tow Hill.

**Description:** *Rocky point.*

**Historical summary:** The one pair of Black Oystercatchers attending a nest here were the only oystercatchers seen by Young during his exploration of the shoreline between Masset and Rose Spit in 1926 (Table NG-010). No oystercatchers were seen here in 1978.

**Table NG-010.** Seabird nesting records (nests) for Yakan Point.

| DATE | BLOY | SOURCE |
|---|---|---|
| 4-6 Jun 1926 | 1 | 295 |
| May 1978 | 0 | 314 |

## NG-015 SKONUN POINT

**Location:** *54°01'54"N 132°03'31"W; 103 J/4.*
On the north shore of Graham Island east of Masset, west of the mouth of the Sangan River.

**Description:** *Sandy point.*

**Historical summary:** Cooper and Miller monitored the success of one pair of Black Oystercatchers nesting on the sandy beach each year from 1984-1988 (Table NG-015).

**Table NG-015.** Seabird nesting records (nests) for Skonun Point.

| DATE | BLOY | SOURCE |
|---|---|---|
| 1984-1988 | 1 | 72 |

**Remarks:** An oystercatcher egg specimen was collected on 17 June 1985.[324p]

## NG-020 "WESTACOTT" ROCK

**Location:** *54°04'10"N 132°14'16"W; 103 K/1.*
South of Westacott Point on the west side of McIntyre Bay.

**Description:** *2 m high; Grassy rock.*

**Historical summary:** We are not certain that Young [295] was referring to this rock for his observation of nesting Black Oystercatchers in 1926, but the site must have been in this vicinity (Table NG-020). An oystercatcher nest with one young was found in 1977. The rock was surveyed from the water in 1986 and no oystercatchers were seen.

**Table NG-020.** Seabird nesting records for "Westacott" Rock. See Appendix 2 for codes.

| DATE | BLOY | SOURCE |
|---|---|---|
| Jun 1926 | 2[2] | 295 |
| 30 Jul 1977 | 1 | 314 |
| 29 Jun 1986 | 0 | 227 |

## NG-025 WIAH POINT

**Location:** *54°06'52"N 132°19'06"W; 103 K/1.*
Northern point on Graham Island between Masset Harbour and Virago Sound.

**Description:** *Rocky point.*

**Historical summary:** We recently (June 2018) uncovered two 1947 Black Oystercatcher egg specimens held in the UBC Beaty Biodiversity Museum and the Western Foundation for Vertebrate Zoology (Table NG-025). The eggs were collected by W.S. Maguire at Wiah Point. Notes on the specimen cards say, "18 nests along a 1/4 mile of shore". This colony site was not included in the summary given in Part 1 of this seabird catalogue.[231] We boated by this area and saw no birds in 1986.

**Table NG-025.** Seabird nesting records (nests) for Wiah Point.

| DATE | BLOY | SOURCE |
|---|---|---|
| 6 Jun 1947 | 18 | 327b, 328g |
| 29 Jun 1986 | 0 | 227 |

**Remarks:** Maguire noted that crows were continually raiding oystercatcher nests in 1947 (Figure 527).

**Figure 527.** Northwestern Crows often feed opportunistically on seabird eggs. They are an abundant resident along the north coast of Graham Island and were reported raiding Black Oystercatcher nests at Wiah Point in 1947. *Photo by R. Wayne Campbell.*

## NG-030 "NADEN" ROCKS

**Location:** *54°07'17"N 132°34'47"W* (rock at Cape Naden); *103 K/2.*
From Cape Naden to 4 km westwards. Colony includes: the 4 m-high rock connected to Cape Naden; the 9 m-high rock 1.2 km northwest of Cape Naden (*54°07'41"N 132°35'46"W*); and a connected pair of 2 m-high rocks 4 km northwest of Cape Naden (*54°08'27"N 132°38'00"W*).

**Description:** *9 m high; Grassy rock.*
These rocks have extensive bare rocky areas with small patches of grass.

**Historical summary:** The visit in May 1977 occurred before birds were nesting. Ten Black Oystercatchers and five adult Glaucous-winged Gulls were present, and one empty oystercatcher nest scrape was found on the 9 m-high rock (Table NG-030).

Three pairs of Black Oystercatchers with large young were seen on the 9 m-high rock in July 1977. In 1986, nesting oystercatchers were found on the 4 m-high rock (3 empty nests), 9 m-high rock (3 empty nests, 2 nests with eggs or young), and the pair of 2 m-high rocks (4 empty nests, 3 nests with eggs; Figure 528). Hidden chicks were suspected around five of the 10 empty nests.

**Figure 528.** Black Oystercatcher nests are often a simple collection of rock chips. *Photo by R. Wayne Campbell.*

Details are missing about the Glaucous-winged Gull nests counted in July 1977, but in 1986 gulls were nesting on the 9 m-high rock (5 empty nests, 27 nests with eggs or young) and the pair of 2 m-high rocks (39 empty nests, 39 nests with eggs or young; Figure 529). Pigeon Guillemots in 1986 were nesting on the same rocks where gulls were found nesting. Nests were located in crevices and under rocks, except two nests were found tucked against a rock in depressions in the dune grass and were hidden only by the tall grass.

**Figure 529.** Of the 110 Glaucous-winged Gull nests counted on “Naden” Rocks on 29 June 1986, two contained one newly hatched chick and one unhatched egg. *Photo by R. Wayne Campbell.*

In July 1977, Harry Carter found one cold Pelagic Cormorant egg [324q] on the 9 m-high rock in an area where cormorants were roosting. No other evidence of nesting by cormorants has been found in surveys up to 1990.

**Table NG-030.** Seabird nesting records for “Naden” Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 9 May 1977 | S | 0 | (0) | 314 |
| 29 Jul 1977 | 3[3] | 42 | S(77) | 39, 314 |
| 29 Jun 1986 | 15[5] | 110[66] | x17(142) | 227 |

## NG-040 “KLASHWUN” ROCKS

**Location:** *54°09'20"N 132°40'14"W; 103 K/2.*
Group of three rocks just off Klashwun Point, west of Shag Rock.

**Description:** *6 m high; Grassy rock.*
These are mostly bare rock with patches of grasses and sedges.

**Historical summary:** Nesting occurred on the 6 m-high rock at the southeast corner of this group. A Black Oystercatcher nest with two eggs was found in 1977 (Table NG-040). There was an egg in one nest and chicks were suspected around the other nest found in 1986. We saw one pair of Glaucous-winged Gulls but no nests in 1977, but our visit occurred early in the season and we suspected they would likely build a nest later. Eggs in two gull nests confirmed breeding in 1986 (Figure 530). Pigeon Guillemots were nesting under rocks and in crevices in 1986, except one nest with an egg was located in the open in the middle of a patch of sedges.

**Figure 530.** Glaucous-winged Gulls breed at two sites along the north coast of Graham Island. Only three pairs have been recorded nesting on “Klashwun” Rocks; most (97 %) of the breeding population in this region nests on “Naden” Rocks to the east. *Photo by R. Wayne Campbell.*

**Table NG-040.** Seabird nesting records for “Klashwun” Rocks. See Appendix 2 for codes.

| DATE | BLOY | GWGU | PIGU | SOURCE |
|---|---|---|---|---|
| 9 May 1977 | 1 | 1eS | (0) | 314 |
| 29 Jun 1986 | 2[1] | 3[2] | x7(33) | 227 |

## ACKNOWLEDGEMENTS

Full acknowledgements and a more complete list of people that contributed to our increased knowledge of seabird colonies in BC were presented in Part 1.[231] Here we have tried to acknowledge those who participated specifically in seabird surveys in Haida Gwaii (Figure 531), or have just contributed incidental breeding records for seabirds in Haida Gwaii, in the years subsequent to Drent and Guiguet [94] up to 1990. Information on surveys conducted by the BCPM in the 1970s, and most other historical information prior to the CWS surveys in the 1980s, was retrieved from the British Columbia Nest Record Scheme and species files maintained by the Biodiversity Centre for Wildlife Studies.[51,199] We have added some historical records submitted by contributors to eBird,[315] however, the names of contributors are no longer included in the eBird database and so those people in most cases remain anonymous. We thank them all and apologize for any other observers we may have omitted. Since 1990, many others have contributed to our knowledge of seabird breeding populations. Those people are acknowledged in Appendix 1.

West Coast Graham Island: Douglas F. Bertram (Figure 532), Lynne Bonner, R. Wayne Campbell, Harry R. Carter (Figure 533), Trudy A. Chatwin (Figure 534), J. Bristol Foster, Heather M. Garrioch, Susan Guiguet, David F. Hatler, Robert (Bob) B. Hay, Heather Hay, Kent Henderson, Denise Herlinveaux, Nancy Hillis, Norman Holmes, Gary W. Kaiser, Lin Langley, Martin C. Lee, Moira J.F. Lemon, Michael McKay, Marilyn Nelson, R. Wayne Nelson, Steve Parcells, David Powell, Leo J. Rankine, Tom E. Reimchen, Randy Reusch, Christine M. Rodway, Joy

**Figure 531.** Co-operative efforts were required to conduct the field work to survey seabird colonies and subsequently to compile the data gathered to produce this publication. Here in the field on Ramsay Island, some of the CWS crew co-operate to launch the zodiac, including (left to right) Mike Biro, Eric Lofroth, Michael Rodway, Dave Powell, Doug Bertram, Christine Rodway, and Moria Lemon. *Photo by Joy Ann Rodway, May 1984.*

**Figure 532.** Doug Bertram (left) airing his boots and mending his jeans, in the company of Dave Powell and Randy Reusch at the CWS base camp on Vertical Point on Louise Island in 1983. Doug was part of the CWS survey crew on the west coast of Graham Island and east coast of Moresby Island for three seasons. *Photo by Moira J.F. Lemon, 30 April 1983.*

**Figure 534.** Trudy Carson (now Chatwin) participated in the BCPM seabird surveys in Haida Gwaii in 1977 and in 1980 helped Moira Lemon with the first CWS surveys conducted in Haida Gwaii on Frederick Island. In 1983, Trudy, and her husband Steve Chatwin, volunteered to help with storm-petrel surveys on Hippa Island. In all, Trudy, a seabird aficionada, participated in surveys in five of the six regions in Haida Gwaii. *Photo by Michael S. Rodway, 4 June 1977.*

**Figure 533.** During the BCPM seabird surveys in Haida Gwaii in 1977, Harry Carter navigated the mothership *Tedmac* and participated in the surveys. That year, Harry took over as skipper from his father, Harold "Doc" Carter, who had captained the ship during the previous two years of seabird surveys along the BC coast. In the left photo, Harry (left) and Michael Rodway are confirming daily survey destinations, and in the other photo, Harry is leaping into a zodiac from a colony. *Photos by R. Wayne Campbell.*

Ann Rodway, Michael S. Rodway, Spencer G. Sealy, E. Anne Stewart, Kenneth R. Summers (Figure 535), and Yves Turcotte.

**Figure 535.** Ken Summers has had a long-standing passion for nesting seabirds in BC. Not only has he conducted surveys in various regions of the BC coast, he has also put in the extra effort required to publish the results of his work.[262, 263, 264, 265] *Photo by Michael S. Rodway, Triangle Island, BC, 1989.*

West Coast Moresby Island: Ray R. Billings, R. Wayne Campbell, Trudy A. Chatwin, Harry R. Carter, Andrew Eisenhauer, David W. Ellis, J. Bristol Foster (Figure 536), Donald Garnier, Heather M. Garrioch, Dick Grinnell, Susan Guiguet (Figure 537), David F. Hatler, Heather Hay, Rick J. Hoar, Norman Holmes, Gary W. Kaiser, Martin C. Lee, Moira J.F. Lemon, Keith Moore, E. Orsmby, David Powell, Damian Power, Michael S. Rodway, E. Anne Stewart, Geoff E. Stewart, and Kenneth R. Summers.

**Figure 536.** As Director of the BCPM, Bristol Foster supported the inaugural survey of nesting seabirds in the province and assisted with field work. He later became a resource person on marine trips for tourists along the coast and is here shown visiting Langara Island. *Photo by R. Wayne Campbell, June 1988.*

East Coast Moresby Island: G.G. Anweiler, Douglas F. Bertram, Ray R. Billings, Mike Biro, Donald A. Blood, David Bustard, R. Wayne Campbell, Trudy A. Chatwin, Harry R. Carter, Myke J. Chutter, Rudolph H. Drent, Andrew Eisenhauer, David W. Ellis, J. Bristol Foster, Donald Garnier, Heather M. Garrioch, Anthony (Tony) J. Gaston, Dick Grinnell, Susan Guiguet, Ian Hatter, Heather Hay, Kathleen Heise, Norman Holmes, Ian Jones, Gary W. Kaiser, Andrea Lawrence, Martin C. Lee, Moira J.F. Lemon, Eric C. Lofroth (Figure 538), Linda J. Loftus, Keith Moore, Mary C. Morris, David Noble, David Powell (Figure 539), Damian Power, Randy Reusch, Tony Robichaud (see Figure 539), Christine M. Rodway, Joy Ann Rodway, Michael S. Rodway, Jean-Pierre L. Savard, Michael G. Shepard, Teresa Shepard, Christopher D. Sheperd, E. Anne Stewart, Kenneth R. Summers, Yves Turcotte, and John G. Ward.

**Figure 537.** Wayne Campbell steadying Susan Guiguet who is checking the contents of a Brown Creeper (*Certhia americana*) nest on Hippa Island in 1977. *Photo by Harry R. Carter, 21 July 1977.*

<u>Skidegate Inlet:</u> Donald A. Blood, R. Wayne Campbell, Harry R. Carter, Dave Davies, Heather M. Garrioch, Martin C. Lee, Keith Moore, Ken H. Morgan, Mary C. Morris, Michael S. Rodway, Gary Seedhouse, Michael G. Shepard, and E. Anne Stewart.

<u>Masset and Juskatla inlets:</u> R. Wayne Campbell, Trudy A. Chatwin, Harry R. Carter, Heather M. Garrioch, Janet Gifford, Martin C. Lee, Christine M. Rodway, Joy Ann Rodway, and Michael S. Rodway.

<u>North Coast Graham Island:</u> R. Wayne Campbell, Trudy A. Chatwin, Harry R. Carter, Martin C. Lee, Christine M. Rodway, Joy Ann Rodway, and Michael S. Rodway.

**Figure 538.** Eric Lofroth (wearing toque), with other members of the CWS survey crew, hanging data sheets to dry from the window of a small cabin on Hotspring Island. *Photo by Michael S. Rodway, May 1984.*

**Figure 539.** Dave Powell (left) and Tony Robichaud posing for a photo on Rankine Island. *Photo by Michael S. Rodway, June 1984.*

Inventories of colonial nesting seabirds in BC were sponsored and financed in part by the BCPM between 1975 and 1979 and by CWS from 1980 to 1990. BCPM surveys were organized and directed by Wayne Campbell and the CWS inventory program was supervised by Kees Vermeer and Gary Kaiser. G.E. John Smith, Jean-Pierre Savard, and Tony Gaston provided many years of technical and statistical advice at CWS. Thanks to Rob Butler, Tony Gaston (Figure 540), Jean-Pierre Savard, and Steve Wetmore for making helpful comments at various stages in the preparation of parts of this seabird catalogue that were written in the 1980s. Carita Bergman, Heidi Regehr, and Ken Summers tackled the daunting task of reviewing draft versions of the completed Haida Gwaii volume. They all made many helpful suggestions that much improved the text. We are further indebted to Heidi Regehr (Figure 541) for her superb organizational and editorial skills that were fully exploited throughout the production of the final document. The final version was reviewed in its entirety by Dennis A. Demarchi and Patricia Huet, and in part by Spencer G. Sealy and we are very grateful to them for their comments and recommendations that put the final polish on the manuscript (Figure 542).

**Figure 540.** Tony Gaston in his capacity as seabird research scientist for CWS provided early and continued support and encouragement for Michael Rodway's seabird work. Tony's research interests include marine and terrestrial birds on Haida Gwaii and elsewhere. He has published extensively, including an authoritative book on the Ancient Murrelet which was based on years of research on that species in Haida Gwaii.[114] *Photo by Anne-Marie Gaston, Quebec, 2002.*

**Figure 541.** Throughout the production of this work, Heidi Regehr unstintingly gave her time and expertise to provide comments and suggestions that greatly improved the presentation and organization of the document. Here she is revelling in the view above Taseko Lakes in the BC interior. *Photo by Michael S. Rodway, 15 September 2014.*

The manuscript has immensely benefitted from contributions of data, anecdotes, and comments on specific sections from a number of people. As well as reviewing the entire document, Carita Bergman also contributed data and two delightful anecdotes about the recent work being carried out in Gwaii Haanas. Many thanks to Ken Summers for reviewing information about his surveys along the east coast of Moresby Island in 1971 and for providing additional

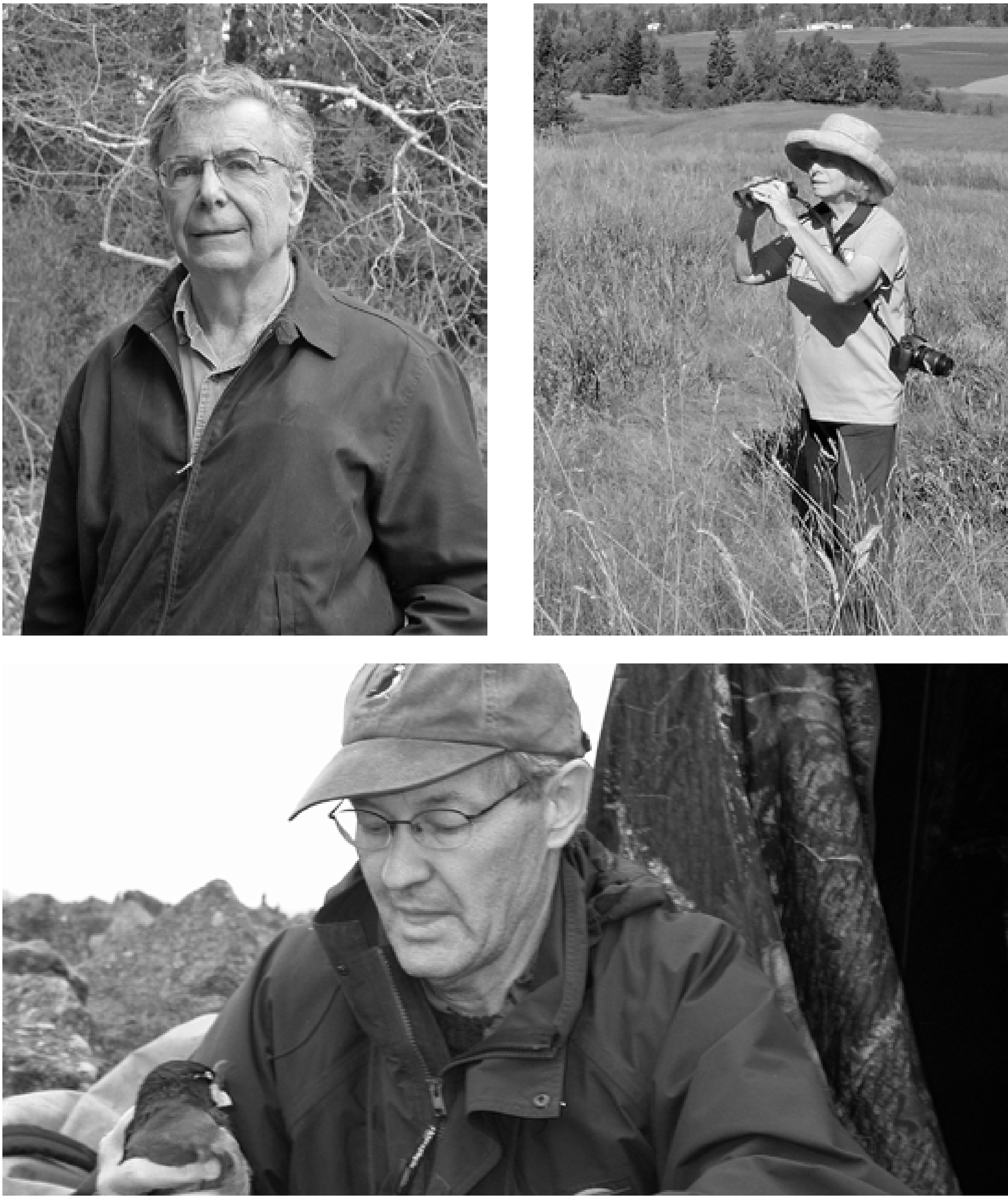


**Figure 542.** The large number of tables and maps, and hundreds of pages of text in this document were a challenge to review. The Biodiversity Centre for Wildlife Studies' editors that devoted their time to this task included, Dennis A. Demarchi (top left), Patricia Huet (top right), and Spencer G. Sealy. *Photographers unknown.*

data, especially for Black Oystercatchers and Pigeon Guillemots, that were not summarized in his 1974 publication.[262] Ken also made helpful comments on the entire manuscript and contributed several entertaining anecdotes about his experiences in Haida Gwaii. Doug Bertram kindly contributed an anecdote about some of his memories as part of the CWS survey crews during the 1980s. We are very grateful to Ken Morgan for helping to interpret data from his surveys in Skidegate Inlet in 1990.[285, 286, 287] We further thank Tony Gaston for his recent help in contributing unpublished data from his surveys of burrow-nesting species in Englefield Bay and Black Oystercatchers in Masset and Juskatla inlets and for reviewing pertinent sections related to those data and to the work being conducted by Laskeek Bay Conservation Society (Figure 543). Tony also provided helpful comments that improved the Reef Island colony account. Many thanks to Laurie Wilson (Figure 544) for providing unpublished data from recent CWS permanent plot and colony surveys and for reviewing burrow occupancy estimates from numerous surveys to ensure they were derived from unbiased samples. Unpublished data from Glaucous-winged Gull surveys conducted in Gwaii Haanas in 2005 were made available thanks to Mark Hipfner (Figure 545). Peter Sinkins kindly provided unpublished reports from the ongoing Black Oystercatcher surveys conducted in collaboration between Gwaii Haanas and Laskeek Bay Conservation Society. We are grateful to Quinn McCallum at the

**Figure 543.** Signs posted by the Laskeek Bay Conservation Society, at key landing sites on Limestone Island, inform tourists and other visitors about conditions required to visit the seabird colony. *Photo by R. Wayne Campbell, 5 June 2000.*

**Figure 544.** CWS seabird biologist Laurie Wilson has been responsible for monitoring seabird breeding populations in BC since Moira Lemon retired in 2014. She has contributed greatly to post-1990 updates for this Haida Gwaii volume. This photo captures her on Frederick Island while conducting studies on Ancient Murrelets in 2014. *Photo by Moira J.F. Lemon, 5 May 2014.*

**Figure 545.** Mark Hipfner, here surveying one of the Rhinoceros Auklet permanent monitoring plots on SGang Gwaay (Anthony Island), provided access to unpublished CWS survey data on Glaucous-winged Gulls for Haida Gwaii. *Photo by Moira J.F. Lemon, 9 July 2006.*

UBC Beaty Biodiversity Museum and René Corado at the Western Foundation of Vertebrate Zoology for checking Black Oystercatcher egg specimens collected at Wiah Point by Maquire in 1947. We want to thank Wayne C. Weber for contributing memories of Rudi Drent and Joost M. Tinbergen for his detailed account of Rudi's activities in the Netherlands and elsewhere.

Thanks to Harry Carter, who bravely skippered the mothership *Ted Mac* around Haida Gwaii during the BCPM surveys, and Art Babcock on the *Bajo Point* who assisted with transportation of CWS field crews and supplies during the CWS surveys (Figure 546). Our work in Haida Gwaii was greatly assisted by Keith Moore and Rick Hoar of the British Columbia Fish and Wildlife Branch. We are indebted to Keith Moore for bringing us warning of the possible tsunami in 1986 that could have spelled the demise of the entire survey crew in Englefield Bay had it materialized.

**Figure 546.** The *Bajo Point*, skippered by Art Babcock, provided transportation for CWS field crews and supplies during surveys in Haida Gwaii in the 1980s. In this photo, taken at Moresby Camp at the head of Cusmshewa Inlet, (from left to right) Joy Ann Rodway, Michael Rodway, and Norm Holmes are loading gear onto the boat for surveys along the east coast of Moresby Island in 1984. *Photo by Moira J.F. Lemon, 15 April 1984.*

We are very grateful to wildlife and landscape artist Mark Hobson (Coastline Art Inc.; art@markhobson.com), who enthusiastically donated images of his coastal artwork that appear in the coloured inserts (Figure 547). Many thanks to Rino del Zoppo, Gallery Manager and Assistant to Artist Mark Hobson, for his help in providing high-quality images of Mark's paintings. We also thank Keith Taylor and Mark Nyhof who contributed artwork to this volume. Most photographs are by the authors. Others who generously contributed photographs include Carita Bergman, Ray Billings, Bryan Blood, Bristol Foster, the late Anne-Marie Gaston, Tony Gaston, Chris Harris, Jared Hobbs (Figure 548), Mark Nyhof, Ervio Sian, K.C. Smith, Ken Summers, Alan D. Wilson, and Laurie Wilson. We thank all contributors.

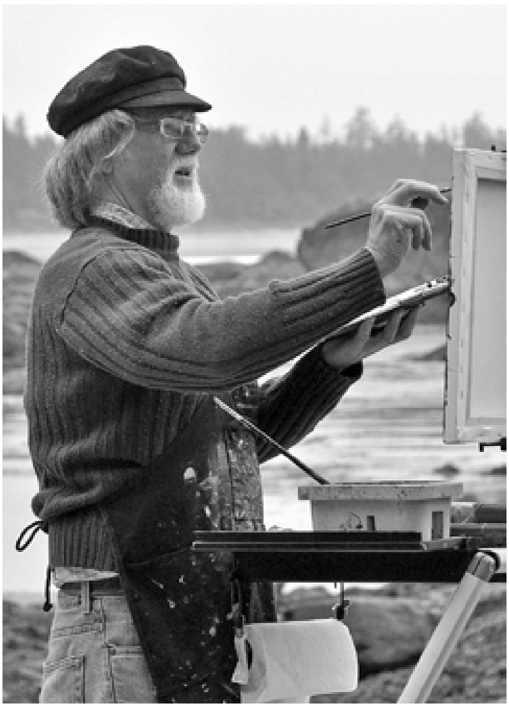


**Figure 547.** Mark Hobson is an award-winning wildlife artist who captures the essence of the British Columbia coast in his paintings. We are honoured to showcase reproductions of some of his wonderful works to introduce this seabird book. *Photo by Christopher Pouget, 3 June 2014.*

**Figure 548.** Jared Hobbs is a biologist and nature photographer and is currently a wildlife consultant. His superb images have been portrayed on the covers of the first two volumes of this seabird catalogue. *Photographer unknown.*

**Figure 549.** Throughout much of her life, Eileen Campbell has dedicated a tremendous amount of time to assist with the archiving and organization of data on wildlife in BC. Her contribution to this seabird book is immeasurable and extends back decades. In this photo, Eileen is recording nest counts of colonial-nesting waterbirds in northeastern BC. *Photo by R. Wayne Campbell, Boundary Lake, BC, 8 June 2005.*

**Figure 550**. Christopher McNeill (centre) kindly provided assistance that helped us through technical difficulties that we encountered on several occasions during the production of this work. He is shown here on the alpine ridges above Paradise Creek, BC with two of his devoted wilderness compatriots, Moira Lemon (right) and Heidi Regehr. *Photo by Michael S. Rodway, 21 September 2019.*

Many thanks to Eileen Campbell (Figure 549) 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. Eileen also sorted through about 30,000 nest records cards of older museum specimens to dig out records of seabird egg specimens collected at colonies in Haida Gwaii. Kate Seymour and Carley Clifford, staff in the photo department at London Drugs in Saanich, carefully processed hundreds of photographs from black-and-white negatives the seabird book. We thank Christopher McNeill (Figure 550) for his generous technical assistance that helped us overcome obstacles that obstructed our progress at several points during the production of this document.

We are much indebted to Mark Nyhof (Figure 551) for his dedication in laying out the manuscript and preparing it for publication. The high quality appearance of the final product is largely due to his efforts. 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.

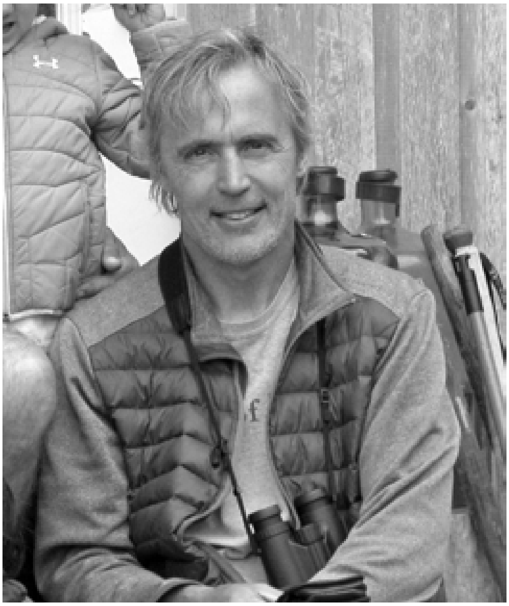


**Figure 551**. Laying out the material in this book for publication was a monstrous undertaking that would not have been possible without the dedication of Mark Nyhof. The high quality of the presentation is due to his artistic and technical talents. *Photo by Rose Nyhof, Skedans, BC, 1 June 2019.*

Publication of the seabird catalogue in *Wildlife Afield* was supported by the Ron Jakimchuk Wildlife Heritage Foundation (Figure 552), administered by the Victoria Foundation, and personal contributions from Peter Blokker, Eileen C. Campbell, Cyril Colonel, the late Clifford Day, Dennis A. Demarchi, Bryan Gates, Phillip S. Henderson, Werner and Hilda Hesse, Edward (Ted Hillary), the late Douglas Leighton, Fred McMechan, the late Wayne Nelson, Peter Ommundsen, Lowell Orcutt (Orcutt Family Fund), the late Sylvia Pincott, Keith Pincott, Gerry Powers, Robert Puls, Andrew Reynolds, Chris Siddle, Jim Sims, Tom Stevens, David Stirling, Mary Taitt, the late Howard A. Telosky, and John and Mary Theberge.

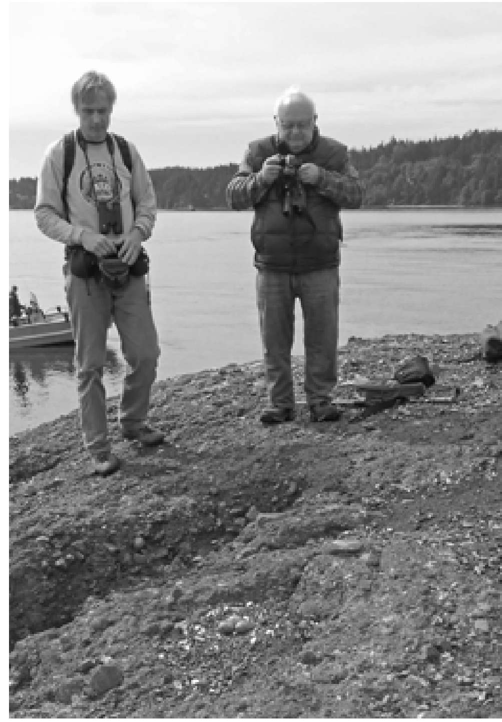


**Figure 552.** Ron Jakimchuk (right) viewing a Black Oystercatcher nest (lower centre) with Mark Nyhof on Arbutus Island in the Gulf Islands, BC. Ron established the Ron Jakimchuk Wildlife Heritage Foundation in February 2017 to support the objectives of the Biodiversity Centre for Wildlife Studies that include publishing the Haida Gwaii seabird compendium. *Photo by R. Wayne Campbell, 2 June 2018.*

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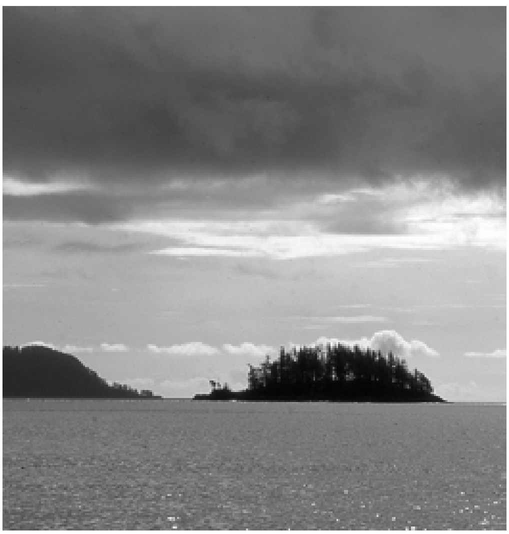

**Figure 553.** When conducting seabird surveys in Haida Gwaii or elsewhere, biologists have to respond to climatic changes and threatening weather conditions on a daily basis. *Photo by R. Wayne Campbell, Hoskins Islets, BC, 10 June 2000.*

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**Figure 554.** In an update of the status of nesting Peregrine Falcons on Haida Gwaii, the late Frank Beebe identified two very high density areas: from Langara Island down the west side of Graham Island south to Tasu; and from SGang Gwaay (Anthony Island) south to Cape St. James. The nesting populations are associated with the availability of seabird prey. Note the leg band on the eyas (nestling falcon). *Photo by Frank L. Beebe.*

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**Figure 555.** The breeding status of Ancient Murrelets on the west coast of Graham Island was a growing concern for seabird biologists in the 1980s. *Photo by Moira J.F. Lemon, Frederick Island, BC, 27 May 2014.*

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**Figure 556.** Oftentimes the title of an article may not adequately describe its contents. We included Black Oystercatcher as a seabird species in this book, but since it is taxonomically a shorebird, Brooks' 1921 paper was consulted and provided some useful information on nesting by oystercatchers on the north coast of Graham Island. In reference to falcon predation, Brooks noted that the oystercatcher, "seems to be immune, rearing their young right under the falcon's nest, unmolested." *Photo by R. Wayne Campbell.*

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**Figure 557.** Raccoons were present on East Limestone Island every year from 1989-1995 except 1992 after intensive culling. They recurred in 2001, 2007, and 2009. Predation in the Ancient Murrelet colony was higher when raccoons were known to be present. *Photo by R. Wayne Campbell.*

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**Figure 558.** Diving depths of Cassin's Auklets off Reef Island were measured using miniature gauges. Maximum diving depth averaged 28 m and food captured was mainly euphausiids and juvenile fish. Auklets that delivered euphausiids to chicks dived deeper than those that delivered fish. *Photo by Carita Bergman, 11 July 2012.*

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[33]Campbell, R.W. 1969. Spring bird observations on Langara Island, British Columbia. Blue Jay 27:155-159. [Figure 559]

**Figure 559.** In spring 1966, four enthusiastic young naturalists (Wayne Campbell, Norm Clarkson, Ken Kennedy, and Lowell Orcut) drove from Vancouver to Prince Rupert, hitched a ride with the fish packer *Challenger* to Masset, and chartered a single-engine Otter for transport to Langara Island to collect Ancient Murrelet eggs and record bird life. *Photo by R. Wayne Campbell, May, 1966.*


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**Figure 560.** Initiated in 1955, the BC Nest Record Scheme originally encouraged university students to submit nest cards on their research species, including seabirds. The scheme has expanded over the years to include hundreds of contributors and thousands of new records every year, which are summarized in annual reports. For example, in the 2012 nesting season report, 11,173 historical records were transferred from literature and notebooks for six seabird species and 1,313 records were received for Glaucous-winged Gull. Compiled records have been widely used by researchers, including the authors of this seabird book.

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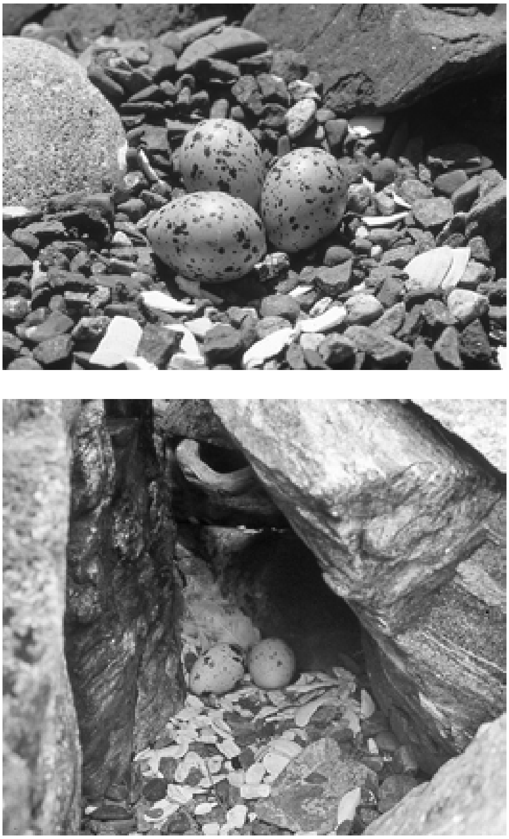

**Figure 561.** Previous authors documented the earliest known records of breeding by seabird species in BC, but occasionally further "digging" reveals new information. For example, Harry Carter's recent sleuthing found BC breeding records from 1862 for Black Oystercatcher and 1858 for Pigeon Guillemot, 33 and 38 years, respectively, earlier than previously reported. *Photos by R. Wayne Campbell.*

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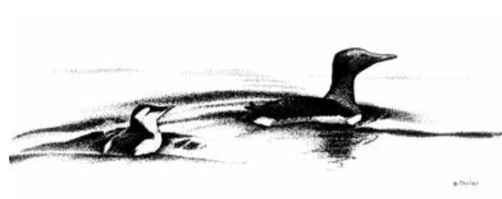

**Figure 562.** Summary information on breeding seabird species, such as the multi-authored paper on the population status of Common Murre in the southern portion of its breeding range along the Pacific coast, was helpful in preparing this catalogue. *Drawing by Keith Taylor.*

[62]Charest, S. and C. Epners. 2004. East Limestone Island field station: report on the 2004 field season. *In* A.J. Gaston (ed.). Laskeek Bay Research 13:19-33. Laskeek Bay Conservation Society, Queen Charlotte City, BC.

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**Figure 563.** Early explorers to Haida Gwaii documented many aspects of Haida culture. Western redcedar trees are an integral part of Haida culture being used for monument poles, buildings, boxes, ceremonial headgear, and ocean-going canoes. Signs of historical use of redcedar trees were often encountered during seabird surveys in Haida Gwaii, including two "test holes" that were made to evaluate the central core of the tree for use (left), and scars on trees where bark had been stripped and used for weaving, clothing, baskets, and medicines. *Moira J.F. Lemon (left; 2010) and Michael S. Rodway (1986), Rankine Islands, BC.*

[70]Committee on the Status of Endangered Wildlife in Canada. 2014. COSEWIC assessment and status report on the Cassin's Auklet *Ptychoramphus aleuticus* in Canada. Ottawa, ON. 69 pp. www.registrelep-sararegistry.gc.ca/default_e.cfm.

[71]Committee on the Status of Endangered Wildlife in Canada. 2014. COSEWIC status appraisal summary on the Ancient Murrelet *Synthliboramphus antiquus* in Canada. Ottawa, ON. xxi pp. www.registrelep-sararegistry.gc.ca/default_e.cfm.

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**Figure 564.** Protecting natural resources on Haida Gwaii, including nesting seabirds, and managing increasing numbers of tourists is a challenge. In 1987, a longhouse (left) named "Looking Around and Blinking House" was built at Windy Bay to house protesters against logging on Lyell Island. Protests led to the creation of Gwaii Haanas National Park Reserve and Haida Heritage Site. Inside the longhouse are carvings, some adorned with eagle feathers, hanging mobiles of beach clams, shells of abalone and red turban snails on wall ledges, and artwork by Bill Reid, signed by attendees at the opening ceremony. *Photos by R. Wayne Campbell, 29 May 1996.*

**Figure 565.** *Queen Charlotte Islands Places and Names* by Kathleen Dalzell was a valuable source of information for a number of locations on Haida Gwaii, including a brief history of the abandoned whaling station at Rose Harbour. *Photos by R. Wayne Campbell, 4 July 1977.*


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**Figure 566.** Dawson provided detailed notes from his visit in 1878 describing various aspects of Haida culture, including villages, social organization, and social customs. *Photo by R. Wayne Campbell, Ninstints (now SGang Gwaay Llnagaay), BC, 4 July 1977.*

**Figure 567.** A pair of Pigeon Guillemots examining a potential nest site at the Skidegate Inlet ferry dock. *Photo by Moira J.F. Lemon, 24 June 2008.*

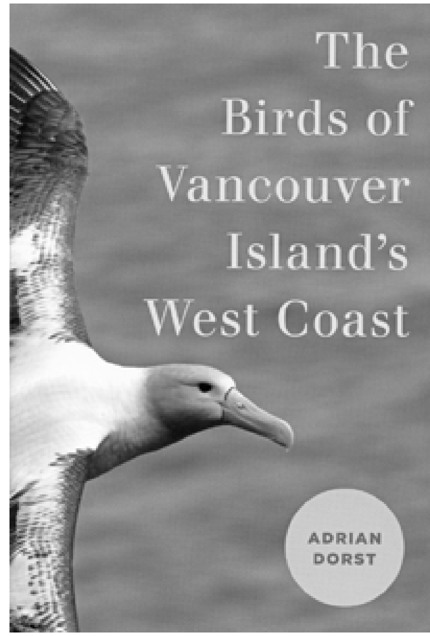


**Figure 568.** Well researched regional bird summaries covering portions of the BC coast, such as Adrian Dorst's recent book, were useful references for the seabird catalogue.

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**Figure 569.** A series of permanent seabird monitoring plots were set up on Ramsay Island in 1984 by the CWS crew, including, from left to right, Christine Rodway, Eric Lofroth, and Dave Powell. Resurveyed about every five years, these plots have indicated increases for Cassin's Auklets at an annual rate of 1% per year and Ancient Murrelets at 2% per year (see Appendix 1). *Photo by Michael S. Rodway, 4 May 1984.*

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**Figure 570.** The annual reports of the Laskeek Bay Conservation Society, edited by Tony Gaston and others, include updated information on research activities in Haida Gwaii, especially along the east coast of Moresby Island. The society has been monitoring Black Oystercatcher nesting populations and banding chicks in the Laskeek Bay area since 1992. Oystercatchers occupy territories when three years old, first breed at four to five years old, and may continue breeding until they are at least 12 years old. In this photo, the bird on the left is a juvenile that lacks the solid blood-red bill and eye ring of an adult, and has a mottled body. *Photo by R. Wayne Campbell.*

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**Figure 571.** Physical examination of Ancient Murrelet burrows during incubation frequently causes adults to desert the burrow. To avoid this, Tony Gaston and colleagues suggest searching burrows for egg membranes after the chicks have left, using knock-down tags to monitor occupancy, and catching chicks en route to the sea to monitor productivity. In this photo, Christine Rodway (left) and Dave Powell are recording results of burrow searches on Ramsay Island. *Photo by Michael S. Rodway, May 1984.*

[130]Gaston, A.J., S. Sharpe, S.A. Stockton, T. Golumbia, and J.-L. Martin. 2008. Reduction in deer numbers on Reef Island and SGang Gwaay: progress, results, and vegetation changes. Pages 103-116 *in* A.J. Gaston, T.E. Golumbia, J.-L. Martin, and S.T. Sharpe (eds.). Lessons from the islands: introduced species and what they tell us about how ecosystems work. Proceedings from the Research Group on Introduced Species 2002 Symposium, Queen Charlotte City, Queen Charlotte Islands, British Columbia. Canadian Wildlife Service Special Publication, Environment Canada, Ottawa.

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**Figure 572.** Since European contact in the late 18th century, 10 non-native mammals have been introduced to Haida Gwaii, which constitute nearly half of the mammal species present there today. Nesting seabirds are most impacted by introduced mammalian predators, but introduced deer have had major impacts on vegetation communities and have affected the abundance and reproductive success of nesting songbirds in Haida Gwaii. *Photo by R. Wayne Campbell, Ninstints (now SGang Gwaay Llnagaay), BC, June, 1989.*

**Figure 573.** Chestnut-backed Chickadee (*Poecile rufescens*) is the only chickadee in BC to inhabit the humid coastal regions of the coast, including offshore islands and Haida Gwaii. *Photo by R. Wayne Campbell, Victoria, BC, 10 September 2005.*

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**Figure 574.** Research into the impacts of introduced rats on nesting seabirds has focused mainly on burrow-nesting alcids, but predation on other nesting seabirds, like Glaucous-winged Gulls, also occurs. *Photo by R. Wayne Campbell, Langara Point, BC, 28 July 1977.*

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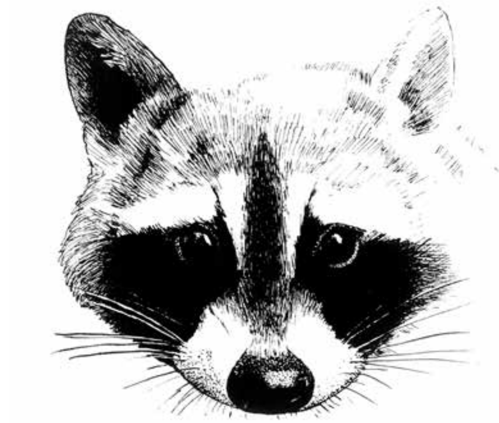

**Figure 575.** The *Carnivores of British Columbia* was a valuable source of information on the ecology and biology of species like the Northern Raccoon in BC. *Drawing by Keith Taylor.*

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**Figure 576.** Authors contributing to *Islands at the Edge: Preserving the Queen Charlotte Islands Wilderness*, were concerned about the consequences of attracting visitors to these wilderness areas, as well as the impacts of local logging and mining activities. In the mid-1970s, people wanting a wilderness experience were not controlled and had unintentional impacts on seabird colonies. Since Gwaii Haanas was established in July 1987 to protect much of the South Moresby wilderness area, guidelines and supervision for tourists have helped prevent disturbance to nesting seabirds. *Photo by R. Wayne Campbell, SGang Gwaay (Anthony Island), BC. 4 July 1977.*

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**Figure 577.** In 2003 and 2004, Common Murres were breeding at only two sites in BC: Triangle Island off northwestern Vancouver Island and the Kerouard Islands at the southern tip of Haida Gwaii. At the latter location, the species does not breed every year. *Photo by R. Wayne Campbell.*

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**Figure 578.** At Reef Island, the largest numbers of Ancient Murrelets were present and vocalizing on calm moonless nights, likely a strategy to avoid predators. Inter-year differences in nocturnal activity probably resulted from the interaction of weather, especially wind speed, and general foraging conditions. *Photo by Michael S. Rodway, 4 June 1977.*


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[197]Morgan, K.H., K. Vermeer, and R.W. McKelvey. 1991. Atlas of pelagic birds of western Canada. Canadian Wildlife Service, Occasional Paper No. 72, Ottawa, ON.

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**Figure 579.** Many of the threats to seabirds along the west coast of Vancouver Island are also present on Haida Gwaii. These include logging of old-growth forest, commercial fishing activities, human disturbance at colonies, and introduction of non-native predators. *Photo by R. Wayne Campbell, Lyell Island, BC, 10 June 2000.*

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**Figure 580.** From 21 June to 28 September 1919, Clyde Patch made observations of birds and mammals on northern Graham Island. He noted incidental records of six of the 16 species of seabirds nesting on Haida Gwaii, including Cassin's Auklet wings collected at a Peregrine Falcon nest. Mention of a young Norway Rat at Tow Hill is noteworthy. *Photo by R. Wayne Campbell.*

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**Figure 581.** After the removal of Norway Rats on Langara Island in 1995, the area of the Ancient Murrelet colony had increased by 1999 and had expanded to twice its pre-eradication area by 2004. However, the nesting population size initially decreased between 1995 and 1999, but then almost doubled between 1999 and 2004 (see Appendix 1). *Photo by R. Wayne Campbell.*

[223]Reimchen, T. and A. Byun. 2005. The evolution of endemic species in Haida Gwaii. Pages 77-95 *in* D.W. Fedje and R.W. Mathewes (eds.). Haida Gwaii: human history and environment from the time of loon to the time of the iron people. UBC Press, Vancouver, BC. 450 pp.

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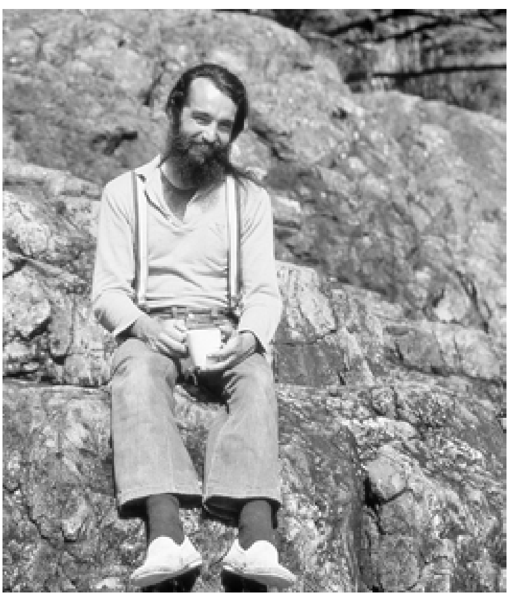

**Figure 582.** For over 40 years, Michael Rodway has dedicated a major part of his life to the conservation of nesting seabirds in British Columbia. *Photo by Moira J.F. Lemon, 1983.*

[229]Rodway, M. S. and R.W. Campbell. 1977. Natural history theme study of marine bird and mammal habitat in the Gulf Islands, British Columbia. Unpublished Project Report, Parks Canada, Ottawa, ON. 107pp. [Figure 583]

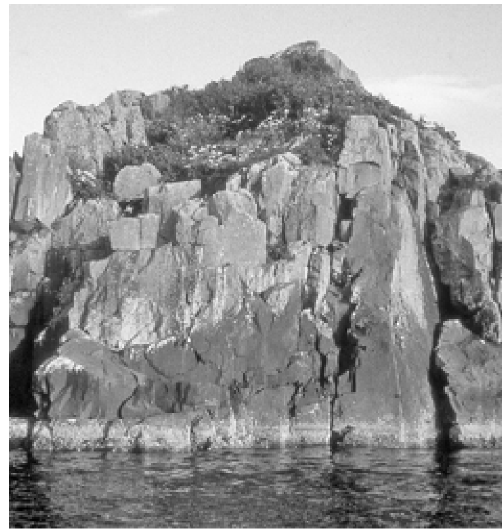

**Figure 583.** Most reports on seabirds breeding in BC, such as the 1977 report by Rodway and Campbell on nesting habitats in the Gulf Islands, only list known breeding colonies. In the present volume on seabird colonies in Haida Gwaii however, we have also listed all potential islands that have been explored for nesting seabirds, but where nesting has not been observed (Appendix 3). These kinds of "negative" data are valuable for detecting future changes. Monument Island, on the east coast of Moresby Island, has suitable nesting habitat for some species but is not at present a known nesting site. It may be colonized in the future. *Photo by Michael S. Rodway, 19 June 1986.*

[230]Rodway, M.S. and M.J.F. Lemon. 2011. Use of permanent plots to monitor trends in burrow-nesting seabird populations in British Columbia. Marine Ornithology 39:243-253. [Figure 584]


**Figure 584.** Eric Lofroth (left) setting up a permanent plot and Christine Rodway checking burrows on Ramsay Island in 1984. During CWS surveys in the 1980s, 97 permanent plots, ranging in size from 10x10 m to 20x20 m, were established at major alcid-nesting colonies in BC. Data from repeat surveys were used to analyze trends in species numbers. It was encouraging that this study found close agreement between the trends determined in permanent monitoring plots and in full-colony transect surveys on the same colony. *Photos by Michael S. Rodway, 1984.*

[231]Rodway, M.S., R.W. Campbell, and M.J.F. Lemon. 2018. Seabird colonies of British Columbia: a history to 1990. Part 1: Introduction and provincial summary. Wildlife Afield 13(1&2):1-298. (Note that the publication date for this volume is 2018 but the journal issue is dated 2016 due to delays in production).

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[233]Rodway, M.S., M.J.F. Lemon, and G.W. Kaiser. 1988. British Columbia Seabird Colony Inventory: Report #1 – East Coast Moresby Island. Technical Report Series No. 50, Canadian Wildlife Service, Pacific and Yukon Region, British Columbia, 276 pp. http://publications.gc.ca/collections/collection_2018/eccc/cw69-5/CW69-5-50-eng.pdf. [Figure 585]

**Figure 585.** Some of the stalwart crew that assisted with CWS surveys in Haida Gwaii during the 1980s. Next page, clockwise from upper left: Mike Biro holding a Cassin's Auklet chick on Ramsay Island in 1984; Damian Power on SGang Gwaay in 1985; Doug Bertram sunbathing using beach stones as a substitute for sunglasses on Ramsay Island in 1974; Norm Holmes (left) and Heather Hay in a zodiac off Kunghit Island in 1986; Tony Robichaud on Rankine Island in 1984; and Yves Turcotte modelling fashion-conscious field clothes at Vertical Point in 1983. *Photos by the authors.*






[234]Rodway, M.S., M.J.F. Lemon, and G.W. Kaiser. 1990. British Columbia seabird colony inventory: Report #2 – west coast Moresby Island. Canadian Wildlife Service, Pacific and Yukon Region, Technical Report Series No. 65, Delta, BC. 163 pp. http://publications.gc.ca/collections/collection_2018/eccc/cw69-5/CW69-5-65-eng.pdf.

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[236]Rodway, M.S., H.M. Regehr, and J-P.L. Savard. 1993. Activity levels of Marbled Murrelets in different inland habitats in the Queen Charlotte Islands, British Columbia. Canadian Journal of Zoology 71:977-984.

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[241]Rowan, M.K. 1952. The Greater Shearwater *Puffinus gravis* at its breeding grounds. Ibis 94:97-121.

**Figure 586.** Denise Herlinveaux (left), holding a Cassin's Auklet chick, and Glen Keddie, dressed for checking seabird burrows, helped with CWS surveys on Frederick Island in 1981 and 2014, respectively. *Photos by Moira J.F. Lemon.*

[242]Sealy, S.G. 1972. Adaptive differences in breeding biology in the marine family Alcidae. Ph.D. Thesis, University of Michigan, Ann Arbor.

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[245]Sealy, S.G. 1975. Aspects of the breeding biology of the Marbled Murrelet in British Columbia. Bird-banding 46:141-154.

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**Figure 587.** Red Squirrel is another species intentionally introduced by humans to Haida Gwaii. Individuals captured near Campbell River on Vancouver Island were released in 1950 between Queen Charlotte City and Tlell on southeastern Graham Island. Twenty years later the species had spread to the northwestern corner of Graham Island. *Drawing by Keith Taylor.*

[250]Sealy, S.G. 2015. Breeding status of Ancient Murrelets attending gathering grounds near Langara Island, British Columbia, 1970-1971. Northwestern Naturalist 96:87-92.

[251]Sealy, S.G. 2016. The Reverend John H. Keen's observations of birds and unpublished list from the Queen Charlotte Islands (Haida Gwaii), British Columbia, 1890-1899. British Columbia Birds 26:16-23.

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**Figure 588.** Published catalogues or synopses of seabird colonies and breeding populations along the Pacific coast, from Alaska to California, and elsewhere, provide critical information for assessing seabird breeding populations at metapopulation scales. For example, BC supports major proportions of the world breeding populations for Ancient Murrelets and Cassin's and Rhinoceros auklets, whereas Alaska is responsible for the majority of the world's population of Parakeet Auklets (*Aethia psittacula*). *Photo by Alan D. Wilson.*

[262]Summers, K.R. 1974. Seabirds breeding along the east coast of Moresby Island, Queen Charlotte Islands, British Columbia. Syesis 7:1-12.

[263]Summers, K.R. and R.W. Campbell. 1978. Natural history theme study of bird and mammal habitats of Canada's Pacific coast and adjacent coastal waters. Parks Canada Unpublished Project Report. Ottawa, ON. 239 pp.

[264]Summers, K. and R.H. Drent. 1979. Breeding biology and twinning experiments of Rhinoceros Auklets on Cleland Island, British Columbia. Murrelet 66:16-22.

[265]Summers, K. and M.S. Rodway. 1988. Raccoon-seabird interactions (with notes on rats and Marten) on Moresby Island, Queen Charlotte Islands: a problem analysis. British Columbia Ministry of Environment and Parks Unpublished Report, Smithers, BC. 62 pp.

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**Figure 589.** Canada has the longest coastline in the world. The ambitious, $1.5 billion national Oceans Protection Plan launched by the Government of Canada in 2016 is a welcome start towards having effective marine safety systems in place that are able to respond quickly to oil spills and other marine incidents, and towards protecting marine ecosystems, fisheries, and indigenous ways of life. Part of the plan includes protection of significant world populations of marine mammals and birds like Cassin's Auklet. *Photo by R. Wayne Campbell.*


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[283]Vermeer, K., K. Devito, and L. Rankin. 1988. Comparison of nesting biology of Fork-tailed and Leach's Storm-Petrels. Colonial Waterbirds 11:46-57. [Figure 590]

 

**Figure 590.** Research on Hippa Island in 1983 provided basic life-history information on the two storm-petrels breeding in Haida Gwaii. For example, the study found that Fork-tailed Storm-Petrel chicks (left) fledge from the end of July to the beginning of September, whereas Leach's Storm-Petrel chicks fledged much later, mostly in October. However, average fledging time was similar for the two species, 62 and 63 days, respectively. *Photos by the authors.*


[284]Vermeer, K., J.D. Fulton, and S.G. Sealy. 1985. Differential use of zooplankton prey by Ancient Murrelets and Cassin's Auklets in the Queen Charlotte Islands. Journal of Plankton Research 7:443-459.

[285]Vermeer, K., K.H. Morgan, and G.E.J. Smith. 1992. Black Oystercatcher habitat selection, reproductive success, and their relationship with Glaucous-winged Gulls. Colonial Waterbirds 15:14-23.

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**Figure 591.** While the greatest threat to burrow-nesting seabirds in Haida Gwaii is from alien predators, the tracks in the sand of a Northern River Otter here on Kunghit Island is a reminder that this native mammal also preys on seabirds, especially storm-petrels. *Photo by Moira J.F. Lemon, 5 June 1985.*


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[294]Wijnandts, H. 1982. Ecological energetics of the Long-eared Owl (*Asia otus)*. Ardea 72:1-92.

[295]Young, Rev. C.J. 1927. A visit to the Queen Charlotte Islands. Auk 44:38-43. [Figure 592]

**Figure 592.** Reverend C. J. Young was one of the few early collectors to survey the north coast of Graham Island for nesting seabirds. He found several Black Oystercatcher nests which he described as, "a depression lined with stones and a few bits of shell." *Photo by R. Wayne Campbell.*

[296]Young, Rev. C.J. 1930. A study of the Rhinoceros Auklet and other birds in British Columbia, 1929. *In* Report of the Provincial Museum of Natural History for the year 1929. King's Printer, Victoria, BC. p. F16–F19.

## OTHER SOURCES OF INFORMATION

### Personal Communications and Unpublished Data

[297]Carita Bergman, Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site.

[298]Kenneth Brunn, lighthouse keeper at Langara Point.

[299]R. Wayne Campbell, Biodiversity Centre for Wildlife Studies.

[300]Michael J. Chutter, BC Ministry of Water, Land and Air Protection (reported in Harfenist et al.[153]).

[301]Peter Dyment, Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site.

[302]J. Bristol Foster, BC Ecological Reserves Program (retired).

[303]Anthony J. Gaston, Canadian Wildlife Service, Environment and Climate Change Canada (retired).

[304]Charles J. Guiguet, Royal British Columbia Museum (deceased). [Figure 593]

**Figure 593.** Charles Guiguet (left) and Bruce Ford searching for Leach's Storm-Petrel burrows. The field notes for BC of the late Charles Guiguet have been copied and are part of the collection of historical data from BC biologists and naturalists housed by the Biodiversity Centre for Wildlife Studies in Victoria. *Photo by R. Wayne Campbell, 24 June 1975.*

[305]J. Mark Hipfner, Science & Technology Branch, Environment and Climate Change Canada.
[306]Rick J. Hoar, BC Conservation Officer Service.
[307]Moira J.F. Lemon, Canadian Wildlife Service, Environment and Climate Change Canada (retired).
[308]Keith Moore, Moore Resource Management.
[309]Ken H. Morgan, Canadian Wildlife Service, Environment and Climate Change Canada.
[310]Michael S. Rodway, Wildwing Environmental Research.
[311]Ken R. Summers, KS Biological Services.
[312]Alan Whitney, Pacific Synergies – Nature, Art and Anthropology Expeditions Under Sail.
[313]Laurie Wilson, Canadian Wildlife Service, Environment and Climate Change Canada.

**Other Sources of Unpublished Data**

[314]British Columbia Nest Record Scheme (BCNRS), Biodiversity Centre for Wildlife Studies.
[315]eBird Basic Dataset. Version: EBD_relMar-2019. Cornell Lab of Ornithology, Ithaca, New York. March 2019.
[316]Environment and Climate Change Canada Canadian Wildlife Service Seabird Colony Database and other unpublished data.
[317]Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve and Haida Heritage Site (Gwaii Haanas). Unpublished data provided by Carita Bergman.
[318]Laskeek Bay Conservation Society, unpublished data contributed by Tony Gaston, Vivian Patterson, Neil Pilgrim, Joanna Smith, and others; compiled in the Canadian Wildlife Service Seabird Colony Database.

**Museum Specimens**

[319]Academy of Natural Sciences of Philadelphia (ANSP):
a – TUPU nestling specimen No. 101337.
[320]Canadian Museum of Nature (CMNAV):
a – TUPU egg specimen No. E556.
b – GWGU egg specimen No. E924.
[321]Delaware Museum of Natural History (DMNH):
a – PEFA egg specimens, not accessioned: 5 clutches of 4 eggs each collected between 24 April and 1 May 1927 on Langara Island; 6 clutches of 4 eggs each collected between 22 April and 1 May 1936 on Langara Island; and 2 clutches of 4 eggs each collected at Cape Knox on 23 April 1936.
[322]Museum of Vertebrate Zoology at Berkley (MVZ):
a – ANMU egg specimen No. 5820.
[323]National Museum of Natural History (NMNH or USNM): a – BLOY egg specimen No. 29359.
[324]Royal British Columbia Museum (RBCM; formerly British Columbia Provincial Museum):
a – BLOY egg specimen No. E0182.
b – TUPU egg specimen No. E1503.
c – BLOY egg specimen No. E1429.
d – PIGU egg specimen No. E0233 and E1538.
e – BLOY egg specimen No. E1431.
f – BLOY egg specimen No. E1430.
g – TUPU egg specimen No. E1243 (renumbered E2040).
h – TUPU egg specimen No. E1390.
i – PECO egg specimen No. E1262.
j – PIGU egg specimen No. E1392.
k – FTSP egg specimens No. E1474 and E1475.
l – PIGU egg specimen No. E1543.
m – ANMU egg specimen (originally identified as MAMU) No. E0236.
n – PECO egg specimen No. E0039
o – PIGU egg specimen No. E1540.
p – BLOY egg specimen No. E2192.
q – PECO egg specimen No. E1671. [Figure 594]

**Figure 594.** A total of 64 museum specimens provided new historical information on seabirds breeding in Haida Gwaii and are referenced in this volume of the seabird catalogue. Of those, 19 clutches of eggs of six species of seabirds are housed in the Royal BC Museum. *Photo by R. Wayne Campbell, Victoria, BC, July 1980.*

[325]Royal Ontario Museum (ROM):
- a – GWGU egg specimen No. 375 (renumbered 503556).
- b – BLOY egg specimen No. 513160.
- c – GWGU egg specimen No. 503560.

[326]Sam Noble Oklahoma Museum of Natural History (OMNH):
- a – GWGU egg specimen No. E3355.

[327]University of British Columbia Beaty Biodiversity Museum (UBCBBM):
- a – BLOY egg specimen No. B020533.
- b – BLOY egg specimen No. B020534.

[328]Western Foundation of Vertebrate Zoology (WFVZ):
- a – PEFA egg specimens No. 13327, 15715, 44027, 121609, 121610, 121611, 128886, and 144879.
- b – PEFA egg specimen No. 30972.
- c – BLOY egg specimen No. 128516.
- d – GWGU egg specimens No. 792, 39062, 39063, 39290, 43507, 45334, and 156920.
- e – BLOY egg specimen No. 178709
- f – BLOY egg specimen 88042 and 17323.
- g – BLOY egg specimen No. 66171.

# APPENDIX 1.
# POST-1990 DATA KNOWN TO US ABOUT SEABIRD NESTING POPULATIONS AT COLONIES IN HAIDA GWAII

## Introduction to Post-1990 Data

Colony accounts in this document present all known records of visits to seabird colonies in Haida Gwaii up to 1990. The reasons for limiting the colony accounts to that time period were given in Part 1 of this seabird catalogue[231] and are briefly reiterated in the introduction to this second volume. In Part 1, we summarized post-1990 by species. Here we present all post-1990 data known to us for each colony and summarize them for each region in Haida Gwaii. Much of the information presented here in Appendix 1 is the same as that presented in the species accounts in Part 1, but here we have re-organized it by colony, and have also incorporated a substantial amount of new data that we have obtained since the publication of Part 1, including a number of records from eBird.[315] Although the summaries are inevitably incomplete, we think the information presented below identifies most of the survey efforts that have been undertaken since 1990 and indicates where the 1990 population estimates need revision. Future compilations to maintain an up-to-date account of breeding population estimates would require the participation of all parties that collect population data (Figure 595).

Post-1990 data presented below include those from: results of the camera monitoring program for introduced predators conducted by Gwaii Haanas; extensive surveys of Black Oystercatchers and more limited surveys of Glaucous-winged Gulls conducted along the east coast of Moresby Island by Laskeek Bay Conservation Society, often in collaboration with Parks Canada and CWS; some surveys of Black Oystercatchers in Skidegate Inlet and in Masset and Juskatla inlets; regular counts of burrows in permanent monitoring plots at colonies where they were established in the 1980s by CWS (Figure 596); and population estimates from a few colonies of burrow-nesting species that have been resurveyed since 1990 by CWS. We also list some incidental counts of Pigeon Guillemots, most gleaned from eBird,[315] especially if they indicated higher numbers than were recorded during surveys up to 1990.

**Figure 595.** Much of Haida Gwaii is protected by National Parks and ecological reserves and programs are in place to study and protect nesting seabirds in many areas. Co-ordinated efforts are required to compile data collected on seabird nesting populations by the various agencies involved. In addition, submission of incidental observations and counts of seabirds on islands, including nonbreeding aggregations, should be encouraged, especially from places where biologists rarely visit, such as northern Graham Island and many small isolated islets. *Photo by R. Wayne Campbell, North Beach, Naikoon Provincial Park, BC, 25 May 1996.*

**Figure 596.** Since 1990, CWS personnel have re-surveyed permanent monitoring plots established on major alcid colonies in Haida Gwaii, like this dense Rhinoceros Auklet colony on SGang Gwaay (Anthony Island). *Photo by Moira J.F. Lemon, 22 July 2011.*

**Figure 597**. Since 2011, Carey Bergman has been monitoring seabird colonies in Gwaii Haanas for the presence of invasive rats and raccoons that threaten the survival of nesting species like Cassin's Auklets. *Photo by Laurie Wilson, SGang Gwaay, 1 June 2016.*

**Introduced Predators Post-1990**

Carita Bergman (Figure 597), terrestrial ecologist for Gwaii Haanas, has contributed many recent data on colonies in Gwaii Haanas and elsewhere, including the results of recent camera monitoring to determine the presence of invasive rats and raccoons (Table A1-1). Her input has provided valuable updates to our colony histories. Detection of rats on many islands has helped account for seabird declines that were unexplained as of 1990 (e.g., Arichika, Bischof, and High islands). Eradication programs have been successfully conducted on eight colonies but re-invasions have occurred on five of those colonies (Bischof, Hotspring, House, Faraday, and Murchison islands) and the prognosis for controlling rats in Gwaii Haanas and elsewhere in Haida Gwaii appears dire (Figure 598). We have discussed these data further in the Introduction.

In addition to the data presented in Table A1-1, other observations have indicated that Robertson Island in Skidegate Inlet now has rats and raccoons. Black Rats have also been noted on Louise Island in the past,[134] but camera monitoring at one station near the active log sort in 2018 failed to detect rats (Table A1-1) and they may no longer be present.[297]

**Figure 598.** The total eradication of introduced rats on Haida Gwaii is a daunting and, at present, a seemingly impossible task, given the high reproductive output and adaptability of the species and the constant threat of reinvasions due to the unintentional transport of rats to the islands by humans. However, it is a challenge that must be met if Haida Gwaii is going to provide the safe place for seabirds to nest that it was historically. *Photo by R. Wayne Campbell.*

**Table A1-1.** Results from 2011 to 2019 of the camera monitoring program initiated in 2011 to determine the presence of rats and raccoons on islands within Gwaii Haanas, with additional data from Graham, Langara, Talunkwan, and Louise islands (note that introduced predators have been recorded on many other islands outside Gwaii Haanas that were not included in the camera monitoring program and are not listed here – see Introduction). Site codes are included for designated seabird colonies. Records in bold font indicate islands where rats were present and successful eradication programs have been conducted (re-invasions have occurred at Bischof, Hotspring, House, Faraday, and Murchison islands). Data indicate the maximum number of individuals captured in any one photo from 2011-2019.[317]

| Islands monitored | Any rat spp. | Black Rat | Norway Rat | Raccoon | Marten |
|---|---|---|---|---|---|
| Adam Rks. (treed islet) WM-270 | 0 | 0 | 0 | 0 | 0 |
| Agglomerate EM-540 | 1 | 0 | 1 | 0 | 0 |
| Alder EM-400 - main island | 0 | 0 | 0 | 0 | 0 |
| - N islet | 0 | 0 | 0 | 1[a] | 0 |
| All Alone Stone EM-422[b] | 0 | 0 | 0 | 0 | 0 |
| Annette EM-080 | 1 | 0 | 1 | 0 | 0 |
| **Arichika EM-420** | **1** | **0** | **3** | **0** | **0** |
| **Bischof (5 islands) EM-490** | **1** | **0** | **3** | **0** | **0** |
| Bolkus (and islets) EM-220 | 0 | 0 | 0 | 0 | 0 |
| Boulder EM-180 | 0 | 0 | 0 | 0 | 0 |
| Burnaby[c] | 0 | 0 | 0 | 1 | 1 |
| "Carpenter" EM-107[b] - 61 m islet | 0 | 0 | 0 | 1 | 0 |
| - 55 m islet | 0 | 0 | 0 | 1 | 0 |
| Charles EM-070 | 0 | 0 | 0 | 0 | 0 |
| "Collison Bay" (W of Nest Its.) EM-138[b] | 0 | 0 | 0 | 1 | 0 |
| De la Beche[c] | 0 | 0 | 0 | 1 | 0 |
| "West la Beche" (W of De la Beche I.) | 0 | 0 | 0 | 1 | 0 |
| Dog EM-610 | 0 | 0 | 0 | 0 | 0 |
| East Copper EM-300 | 0 | 0 | 0 | 0 | 0 |
| Ellen[c] | 1 | 0 | 2 | 0 | 0 |
| **Faraday EM-535[b] - main island** | **1** | **2** | **1** | **0** | **0** |
| **- east islet** | **1** | **2** | **0** | **0** | **0** |
| Flowerpot | 1 | 0 | 3 | 0 | 0 |
| George EM-280 | 0 | 0 | 0 | 0 | 0 |
| Gordon (N and S) WM-300 | 0 | 0 | 0 | 0 | 0 |
| Graham[d] | 0 | 0 | 0 | 1 | 1 |
| Gull EM-030 | 1 | 0 | 1 | 0 | 0 |
| Harriet | 0 | 0 | 0 | 1 | 0 |
| High EM-050[e] | 1 | 0 | 1 | 0 | 0 |
| Hoskins (N and S) EM-450 | 0 | 0 | 0 | 0 | 0 |
| **Hotspring EM-500 - main island** | **1** | **0** | **1** | **0** | **0** |
| **- N islet** | **1** | **0** | **1** | **0** | **0** |
| **House EM-510 - main island** | **1** | **0** | **1** | **0** | **0** |
| **- E islet** | **1** | **0** | **1** | **0** | **0** |
| Howay EM-310 | 0 | 0 | 0 | 0 | 0 |
| Huxley EM-410 | 1 | 1 | 1 | 0 | 0 |
| "Island Bay" (4 islands) EM-320 | 0 | 0 | 0 | 1[f] | 0 |
| "Jedway" (larger N islet) EM-200 | 0 | 0 | 0 | 1 | 0 |
| Jeffrey EM-290 | 0 | 0 | 0 | 0 | 0 |
| Kat Island[c] | 0 | 0 | 0 | 1 | 0 |
| Kawas EM-550 - N islet | 1 | 0 | 1 | 0 | 0 |
| - S islet | 1 | 0 | 1 | 0 | 0 |
| Kerouard WM-320 | 0 | 0 | 0 | 0 | 0 |
| Kunga EM-631[b] | 1 | 0 | 2 | 0 | 0 |

**Table A1-1.** cont'd

| Islands monitored | Any rat spp. | Black Rat | Norway Rat | Raccoon | Marten |
|---|---|---|---|---|---|
| Kunghit EM-010 | 1 | 1 | 3 | 0 | 0 |
| **Langara WG-010** | **0** | **0** | **0** | **0** | **0** |
| Langtry EM-100 | 0 | 0 | 0 | 0 | 0 |
| Lost EM-650 | 0 | 0 | 0 | 0 | 0 |
| Louise (N end) EM-710 | 0 | 0 | 0 | 1 | 1 |
| Lyell EM-580 | 1 | 2 | 2 | 0 | 0 |
| Marco Island[c] | 0 | 0 | 0 | 1 | 0 |
| Marshall EM-020 | 1 | 0 | 2 | 0 | 0 |
| Moresby[d] | 0 | 0 | 0 | 2 | 1 |
| **Murchison EM-530** | **1** | **3** | **2** | **0** | **0** |
| Murchison Passage | 1 | 2 | 0 | 0 | 0 |
| Nakons EM-390 | 1 | 4 | 0 | 0 | 0 |
| Nomad | 0 | 0 | 0 | 1 | 0 |
| Park EM-370 | 0 | 0 | 0 | 0 | 0 |
| Rainy (east) EM-040 | 1 | 0 | 1 | 0 | 0 |
| Ramsay (N side) EM-470 | 1 | 0 | 1 | 0 | 0 |
| Rankine (E and W) EM-120 | 0 | 0 | 0 | 0 | 0 |
| Richardson | 1 | 0 | 3 | 0 | 0 |
| Ross[c] | 0 | 0 | 0 | 1 | 0 |
| **St. James WM-310** | **0** | **0** | **0** | **0** | **0** |
| Sea Pigeon EM-170 | 0 | 0 | 0 | 1 | 0 |
| Section EM-378[b] | 0 | 0 | 0 | 3 | 0 |
| SG̲ang Gwaay (main island and 8 islets) WM-280 | 0 | 0 | 0 | 0 | 0 |
| Sivart EM-448[b] | 1 | 1 | 0 | 0 | 0 |
| Skaga[c] | 0 | 0 | 0 | 0 | 0 |
| Skincuttle EM-270 | 0 | 0 | 0 | 0 | 0 |
| Skindaskun | 0 | 0 | 0 | 1 | 0 |
| Slug EM-250 | 0 | 0 | 0 | 0 | 0 |
| Swan EM-230 - main island | 1 | 3 | 0 | 1 | 0 |
| - E rock | 0 | 0 | 0 | 1 | 0 |
| Talunkwan | 1 | 1 | 0 | 1 | 0 |
| Tanu | 1 | 0 | 2 | 0 | 0 |
| Tar EM-560 - N island | 1 | 0 | 1 | 0 | 0 |
| - S island | 1 | 0 | 1 | 0 | 0 |
| Titul EM-640 | 1 | 0 | 2 | 0 | 0 |
| Topping EM-590 - E island | 1 | 0 | 3 | 0 | 0 |
| - W island | 1 | 0 | 0 | 0 | 0 |
| - unnamed N island | 1 | 0 | 2 | 0 | 0 |
| Tuft EM-570 | 0 | 0 | 0 | 0 | 0 |
| Wanderer EM-350 | 0 | 0 | 0 | 1 | 0 |
| **Designated seabird colonies with confirmed presence since 2011** | **24**[g] | **8** | **21** | **10** | **1** |

[a] Raccoons were detected only on the north islet in 2017 and were not present in 2018.
[b] Newly designated colonies since 1990; see Appendix 1, East Coast Moresby Island Black Oystercatcher and Glaucous-winged Gull surveys, and Appendix 3.
[c] Not a designated colony but seabirds were present and/or nesting was suspected on the island in the past (see Appendix 3).
[d] Rats are present in areas of human habitation but were not detected at remote camera monitoring stations in Gwaii Haanas or at other locations on Moresby or Graham island away from human settlement.
[e] Rats were not detected during recent monitoring in 2018.
[f] Raccoons were detected on each of the 4 islands monitored.
[g] Rats were previously present and successfully eradicated in the 1990s on two additional islands (Langara and St. James) that had no rats detected during the camera monitoring program in 2011-2019.

**Burrow-occupancy Rates Post-1990**

Although complete colony surveys have been conducted at only a few colonies since 1990, burrow occupancy data have been gathered more frequently in conjunction with surveys of permanent plots and other research. Though not necessarily indicative of population change, occupancy rates help reveal annual differences in breeding effort and success and as such are useful indicators of immediate and potential longer-term impacts to breeding populations. We summarize available occupancy rates determined since 1990 at colonies in Haida Gwaii in Table A1-2. We also indicate the presence of introduced predators that may have affected occupancy rates in a particular year.

For comparative purposes, median occupancy rates at all colonies in BC (excluding colonies impacted by introduced predators) where occupancy rates were determined during the intensive CWS inventory program of the 1980s were: 91% for storm-petrels (Figure 599); 63% for Ancient Murrelets; 75% for Cassin's Auklets; and 77% for Rhinoceros Auklets.[233] Considering only rates determined from samples of at least 30 burrows on islands free of introduced predators, median rates since 1990 were 57% for Ancient Murrelets and 76% for Cassin's Auklets (few rates have been determined for storm-petrels and Rhinoceros Auklets since 1990). These post-1990 median rates suffer from pseudoreplication because they were determined at only a few colonies repeatedly sampled in different years, and so are not very comparable to those determined in the 1980s. However, repeated, lower-than-median occupancy rates for Ancient Murrelets on major colonies such as Lihou and Ramsay islands during recent surveys (Table A1-2) are a cause for concern. Except for three low-occupancy years on Frederick Island, occupancy rates for Cassin's Auklets at monitored colonies have been similar to the BC median rate from the 1980s. Occupancy rates for Rhinoceros Auklets on SGang Gwaay since 1990 have been similar to the 64% determined on that colony during the main survey in 1985 (Figure 600). Burrow occupancy rates are discussed further in the specific colony and regional sections that follow.

**Figure 600.** On SGang Gwaay, burrow occupancy rates for Rhinoceros Auklet determined since 1990 were similar to the 64% determined on that colony during the main CWS survey in 1985. *Photo by R. Wayne Campbell.*

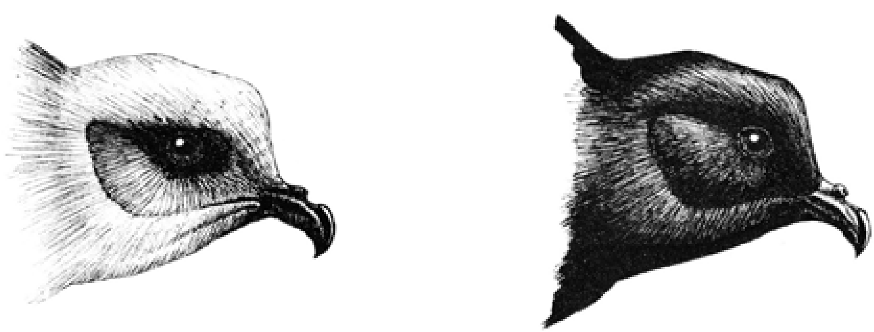

**Figure 599.** Fork-tailed (left) and Leach's storm-petrels nest together on most storm-petrel colonies in BC. Burrow occupancy rates determined at BC colonies in the 1980s were on average higher for storm-petrels than for burrow-nesting alcid species. Burrow occupancy rate for storm-petrels has been determined on only one colony since 1990. *Drawings by Keith Taylor.*

**Table A1-2.** Burrow occupancy rates determined at colonies in Haida Gwaii since 1990. Occupancy rates have been reviewed by Laurie Wilson, Moira Lemon, and Michael Rodway to confirm that they were derived from unbiased samples of burrows. In some cases rates have been revised from those previously reported. Rates determined from samples of <30 burrows have been labelled approximate (~).

| Colony | Year | Occupancy rate (%) | Number of burrows sampled | Introduced predators | Source |
|---|---|---|---|---|---|
| **Storm-Petrel** | | | | | |
| EM-070 Charles Is. | 1993 | 69 | 32 | | 150 |
| **Ancient Murrelet** | | | | | |
| WG-010 Langara I. | 1993 | 36 | 226 | rats | 150 |
| | 1999 | 39 | 83 | | 99 |
| | 2004 | 63 | 54 | | 222 |
| WG-100 Frederick I. | 1998 | 73 | 172 | | 307 |
| | 2005 | 41 | 83 | | 307 |
| | 2013 | 47 | 32 | | 313 |
| | 2014 | 59 | 166 | | 313 |
| | 2015 | 61 | 33 | | 313 |
| WG-230 Hippa I. | 2014 | ~57 | 14 | | 313 |
| WM-030 Helgesen I. | 2011 | ~11 | 18 | raccoons | 131 |
| | 2016 | ~10 | 21 | raccoons | 313 |
| WM-050 Carswell I. | 2016 | ~36 | 22 | | 313 |
| WM-080 Lihou I. | 2011 | 13[a] | 56 | | 131 |
| | 2016 | 36 | 62 | | 313 |
| EM-010 Kunghit I. | 1993 | 53 | 30 | rats | 150 |
| EM-120 Rankine Is. (west island) | 2000 | 74 | 61 | | 307 |
| | 2005 | 43 | 58 | | 313 |
| | 2010 | 59 | 59 | | 313 |
| | 2017 | 63 | 32 | | 313 |
| EM-280 George I.[b] | 1996 | 81 | 125 | | 186 |
| | 2013 | 84 | 43 | | 313 |
| | 2014 | 60 | 101 | | 313 |
| | 2017 | 45 | 31 | | 313 |
| | 2019 | 64 | 72 | | 313 |
| EM-470 Ramsay I. | 2002 | 40 | 30 | | 313 |
| | 2007 | 65 | 43 | | 313 |
| | 2012 | 33 | 40 | | 313 |
| | 2018 | 30 | 33 | | 313 |
| EM-690 Reef I. | 2014 | 54 | 52 | | 313 |
| **Cassin's Auklet** | | | | | |
| WG-100 Frederick I. | 1998[c] | 81 | 97 | | 313 |
| | 2005 | 60 | 30 | | 313 |
| | 2013 | 55 | 31 | | 313 |
| | 2014 | 81 | 85 | | 313 |
| | 2015 | 58 | 31 | | 313 |
| WM-300 Gordon Is. | 1993 | 74 | 39 | | 150 |
| EM-120 Rankine Is. (west island) | 2000 | 82 | 39 | | 313 |
| | 2005 | 75 | 44 | | 313 |
| | 2010 | ~85 | 27 | | 313 |
| | 2017 | 82 | 34 | | 313 |

**Table A1-2.** cont'd

| Colony | Year | Occupancy rate (%) | Number of burrows sampled | Introduced predators | Source |
|---|---|---|---|---|---|
| EM-300 East Copper I. | 2003 | 83 | 63 | | 187 |
| | 2008 | 71 | 38 | | 313 |
| | 2013 | 70 | 30 | | 313 |
| | 2017 | 77 | 30 | | 313 |
| EM-470 Ramsay I. | 2002 | ~63 | 24 | | 313 |
| | 2007 | 83 | 52 | | 313 |
| | 2012 | 83 | 41 | | 313 |
| | 2018 | 72 | 32 | | 313 |
| **Rhinoceros Auklet** | | | | | |
| WM-280 SGang Gwaay | 2006 | ~80 | 20 | | 313 |
| | 2011 | 60 | 30 | | 313 |
| | 2016 | 70 | 30 | | 313 |
| EM-010 Kunghit I. | 1993 | 68 | 87 | rats | 150 |
| EM-070 Charles Is. | 1993 | ~43 | 23 | | 150 |

[a] Seven of the 56 burrows examined were occupied by Ancient Murrelets and three contained incubating Fork-tailed Storm-Petrels.
[b] We have not listed occupancy rates previously presented for 1991, 2003, and 2008 on George Island because the recent review of the data concluded that there may have been some bias in the samples of burrows used.
[c] A lower occupancy rate (~56%) was presented for Frederick Island in 1998 by Bertram et al.[12] (see their Figure 2). Those authors presented occupancy rates for 1995-2000 but those were determined in selected study burrows and were not representative of the entire colony.[316] We have not listed those occupancy rates here. For 1998, the occupancy rate of 81% presented here was determined from samples of burrows distributed throughout colony areas and is considered representative and reliable.

## West Coast Graham Island Post-1990

Post-1990 data known to us suggest little change in species populations for the region since 1990 (see Table 4, pages 80-81). The most recent population estimate for Ancient Murrelets on Langara Island in 2004,[222] showing some recovery after rat removal, was almost identical to that from 1988,[235] and a provisional estimate of Ancient Murrelets on Frederick Island in 1998 indicated similar numbers as in 1980 (Figure 601; Table A1-3). A lower estimate was generated for Cassin's Auklet populations on Frederick Island in 1998 but the difference may have been largely due to methodological changes. The 1998 estimate was considered more accurate than the previous estimate from 1980, although it assumed that colony area was the same as that in 1980. Reduced population estimates for both Ancient Murrelets and Cassin's Auklets were derived for Frederick Island in 2005 [103] but those estimates were in large part a result of low burrow occupancy rates that year, which were likely associated with an anomalous atmospheric blocking event that resulted in warm sea-surface temperatures and reduced seabird productivity along the eastern Pacific seaboard from California to BC.[266, 305] Thus,

**Figure 601.** Ancient Murrelet with one of two eggs that were extracted from a burrow located 90 m from shore on the east side of Frederick Island in 1977. A provisional estimate of the size of the Ancient Murrelet breeding population on Frederick Island derived from a repeat survey in 1998 was similar to the population size estimated from the CWS survey in 1980. *Photo by Michael S. Rodway, 24 May 1977.*

the 2005 estimates may not be reliable indicators of actual population change and it is recommended (in association with more recent evidence – see below) that the 1998 estimates be accepted as the better and most current estimates of the Ancient Murrelet and Cassin's Auklet breeding populations on Frederick Island. Although we do not think that the evidence indicates actual population change, a more accurate estimate for the total population of Cassin's Auklets breeding in the region may result if the 1998 data from Frederick Island were used, especially if the colony area was re-measured using the data from that survey (Figure 602).

Post-1990 data have added a new breeding site for storm-petrels (Frederick Island) [151] and one re-established breeding site for Cassin's Auklets (Langara Island),[222] although breeding was not confirmed in the latter case. Only a few pairs of these species were likely nesting at those sites. Langara, Cox, and Lucy islands are overdue for a thorough follow-up survey to investigate recovery following rat eradication. As far as we know, many small colonies along the west coast of Graham Island still have not been re-visited since 1977.

**Figure 602.** Data from a repeat survey of the Cassin's Auklet colony on Frederick Island in 1998 may provide a more accurate estimate of breeding population size than was obtained during the original CWS survey in 1980. *Photo by R. Wayne Campbell.*

**Table A1-3.** Post-1990 data for seabird colonies on the west coast of Graham Island.

| Species | Post-1990 data |
|---|---|
| **WG-010 Langara Island** | |
| PIGU | Harfenist counted 81 and 181 birds around the island on 19 May and 12 June 1993, respectively.[150] Concentrations were observed around the NE corner, Langara Rocks, near Cox Island, and in Henslung Cove. The June count was similar to the count made in 1988. The highest count submitted to eBird [315] was 150 birds on 13 July 2016. |
| ANMU | Ancient Murrelets continued to decline on Langara Island to an estimated 18,000 pairs in 1993 (estimate in Harfenist [150] was recalculated in Regehr et al.[221]). Rats were successfully eradicated from Langara, Cox, and Lucy islands in 1995-96 [177, 267] and although estimated Ancient Murrelet populations continued to decline through 1999 (13,000 pairs),[99] signs of recovery on Langara Island were apparent by 2004 (24,000 pairs).[222] The most recent 2004 estimate is very similar to the 1988 estimate (24,000 pairs).[235] Colony area had expanded in 2004 beyond its size in 1988 but was still only about half of what it was in 1981. The establishment of a commercial fishing lodge on part of the former colony has usurped nesting habitat, compromising potential population recovery. It also increases the risk of rat reintroductions. In 2007, Heather Major investigated the use of artificial social attraction using call playbacks to enhance population recovery with encouraging results.[191] Camera monitoring at McPherson Point, Explorer Bay, and Dadens in 2011 detected no rats, raccoons, or marten.[297] |
| CAAU | A small pocket of burrows with obvious signs of activity was found on the north side of the island in 2004.[222] Breeding was not confirmed. |
| RHAU | From 100 to 300 birds have frequently been reported from the waters around the island during the years 2007 to 2016.[315] |
| TUPU | Harfenist observed 10 birds at Langara Point on 18 May and 10 near Lord Bight on 3 June 1993.[150] Twenty-five birds were recorded at Langara Island on 10 August 2007 but the precise location was not specified.[315] |
| **WG-020 Cox Island** | |
| PIGU | A count of 120 birds was made on 16 July 2016.[315] |
| TUPU | During May-June 1993, 3-5 birds were consistently seen around the island.[150] Records from eBird [315] include 4, 6, and 8 birds seen on 10 July 2014, 16 July 2016, and 14 July 2017, respectively, and suggest that small numbers still nest on the island. |
| **WG-100 Frederick Island** | |
| STPE | Storm-petrels were reported nesting on Frederick Island in 1993 [151] where we had heard birds in 1977, 1980, and 1981 but never found burrows. Both species of storm-petrels were heard on the island during the 2014 CWS field season. |
| BLOY | Three nests were found in 1998 and 6 nests were found in 2005.[316] |
| GWGU | Five nests were found in 2005.[305] |
| ANMU | The entire colony was resurveyed in 1998 and 2005 and a portion of the colony was resurveyed in 2014. The distribution of transects was modified in 1998 to better sample colony areas. The 1998 survey gave a population estimate of 70,300 pairs.[68] That estimate assumed that the colony size had remained the same since the 1980 survey. Burrow density was lower in 1998 than 1980; however a higher burrow occupancy rate in 1998 resulted in similar population estimates in the two years. A repeat survey in 2005, using the transect locations defined in the 1998 survey, found continued decline in burrow density since 1998, a strikingly lower occupancy rate,[71] and, assuming that colony area was again the same as in 1980, generated a reduced population estimate of 29,600 pairs (note that a previous figure of 31,300 pairs has been presented for 2005 [103] but there were some errors in the derivation of that estimate and it has since been revised [307]). Both the 1998 and 2005 population estimates are considered tentative because further analyses of colony area may be conducted in the future.[313] Most recently, a partial survey was conducted in 2014: six transects were surveyed of the 23 transects surveyed in 1998 and 2005. Burrow density was determined in 73 quadrats (62 in Ancient Murrelet colony) along the six transects surveyed in 2014, compared to 242 (161 in Ancient Murrelet colony) and 241 (165 in Ancient Murrelet colony) quadrats surveyed along the 23 transects used in 1998 and 2005, respectively. Transects surveyed in 2014 were located in colony areas around the northeast, north, and northwest parts of the island. Comparing only those portions of the colony that were sampled in all years indicated that burrow density in 2014 had rebounded since 2005 and was similar to or even higher than that determined in 1980.[313] The trends in burrow density estimates from 1980, 1998, and 2005 determined from those partial data were almost identical to the trends determined from the full colony samples, which increased our confidence that the partial data were reflecting overall trends in the colony. Thus, we think it is safe to conclude that burrow density had increased in 2014 to levels at least as high as in 1998 and perhaps 1980. |

**Table A1-3.** cont'd

| Species | Post-1990 data |
|---|---|
| ANMU cont'd | Interpreting the overall trend in the breeding population is a challenge. The low occupancy estimate in 2005 may have been related to poor oceanographic conditions that year [266, 305] and not indicative of population change. Also, although methodology was consistent from 1998 to 2014, the 2005 survey did not have an overlap in observers and could have been affected by observer differences and experience. Burrow occupancy rates in 1998, 2014, and 2015 (Table A1-2) were close to the provincial median rate, and higher than the rate determined in 1980 (54%). Because the data from 2014 suggest that burrow density was similar to 1980 or at least 1998, and recent occupancy rates have been average, we consider the estimate of 70,300 pairs from 1998 to be the better and most current estimate for the breeding population. Frederick Island should still be considered the largest Ancient Murrelet colony in BC. Fifteen permanent monitoring plots were established in 2015 with plans to establish five more in the future.[313] |
| CAAU | As with Ancient Murrelets, the entire colony was resurveyed in 1998 and 2005 and a portion of the colony was resurveyed in 2014. Provisional population estimates of 60,600 and 43,800 pairs have been generated from the 1998 and 2005 surveys, respectively, assuming constant colony area since 1980.[307] The estimates are considered tentative because further analyses of colony area from data recorded during those surveys may be conducted in the future. Component measures of burrow density and occupancy can be compared across all three years. Survey results from 1998 indicated a considerably lower burrow density compared to 1980 and, although burrow occupancy rate was higher (note that a reduced occupancy rate has been reported for 1998 from other studies [12, 70] but data collected along transects of the entire colony actually found a higher rate; [313] Table A1-2), overall results suggested considerable population decline since the 89,900 pairs estimated in 1980. However, transect methodology was modified in 1998 and results were not directly comparable to those from 1980. Transects were distributed more systematically around the island and quadrats were spaced more frequently along those transects in 1998 than in 1980. Those changes were not likely to affect the comparison between surveys but an additional change to the way quadrats were distributed did. In 1980, the first quadrat along a transect was placed at the shore edge of the vegetation (as was done during all surveys in the 1980s) whereas in 1998 the first quadrat was placed a random distance between 0-5 m from the edge. Cassin's Auklet burrows tend to be concentrated within a narrow perimeter band and quadrats surveyed at the edge tend to have the highest number of burrows. The change in quadrat placement in 1998 was thought to more randomly sample that area, however studies are needed to determine whether randomly varying the start distance for the first quadrat improves the accuracy of the burrow density estimates, particularly on colonies where the perimeter width of the colony is very narrow and burrows may only occur in the first plot placed at the vegetation edge. The difference in the methodology used in 1980 and 1998 would have an inherent bias towards higher density in 1980. It is difficult to determine whether that bias accounted for all of the difference in burrow density estimates between the two years or whether some of the decline seen in 1998 may have been real. Burrow density in 2005 was virtually the same as in 1998 and the lower population estimate was a result of a reduced occupancy rate that year. The partial survey in 2014 of six of the 23 transects used in 1998 and 2005 suggested similar burrow densities and little change in population size over those years, although, similar to what was seen for Ancient Murrelets, occupancy rate was low in 2005 and higher in 2014.[313] The 1980 estimate was considered current in the most recent status assessment for the species,[70] but we recommend accepting the provisional 1998 estimate of 60,600 pairs as more accurate and current.<br><br>Comparative studies of reproductive performance and survival conducted since 1990 have suggested that populations on Frederick Island are relatively robust in contrast to those at major colonies further south.[70] Those studies found high success and survival on Frederick Island in the Alaska Current System compared to colonies on Triangle and the Farallon islands in the California Current System, although survival of birds, especially subadults, was depressed on Frederick Island during the strong 1997/98 El Niño.[12, 70]<br><br>Fourteen permanent monitoring plots were established in 2015 with six more planned.[313] |
| **WG-230 Hippa Island** | |
| TUPU | Ten birds were recorded on 4 June 2011.[315] |
| **WG-270 Gospel Island** | |
| PIGU | Observers recorded 24 birds on 4 May 2014.[315] |
| **WG-330 Marble Island** | |
| TUPU | Thirty birds were reported on 23 June 1994.[315] |

**West Coast Moresby Island Post-1990**

Colonies in Englefield Bay have been further impacted by invading raccoons since the 1980s and population estimates as of 1990 presented in Table 5 (pages 144-145) need to be revised (Figure 603). Surveys of burrow-nesting species on some colonies in 1993 [120] indicated continued declines on all colonies (Saunders, Helgesen, and Instructor islands) where raccoons were present, offset by some increases on Lihou Island which had not been impacted by raccoons (Table A1-4). Changes between 1986 and 1993 in population estimates at the colonies that were re-surveyed in 1993 were a net loss of 1,800 pairs of Ancient Murrelets, 1,600 pairs of Cassin's Auklets, and about 14,000 pairs of Rhinoceros Auklets (Figure 604). Losses were much greater, about 40,000 pairs of these three species, if declines observed prior to 1986 are included. Despite some monitoring and attempts to control the spread of raccoons, continued impacts have occurred since 1993. By 2011, the Ancient Murrelet population had been reduced to a remnant of its former size and Cassin's and Rhinoceros auklets may have been extirpated from Helgesen Island. These changes represent a loss of another 8,000 pairs of these species.

Other factors may be impacting nesting populations in Englefield Bay. Low occupancy rates for Ancient Murrelets found in 2011 on colonies free from invasive predators (Carswell and Lihou islands) were unexplained and added further concern for the welfare of breeding populations in the area.[131]

There is some evidence that storm-petrels, especially Fork-tailed Storm-Petrels, have been more persistent and successful at breeding in the face of raccoon invasions than alcid species. Storm-petrels were still breeding on Instructor Island in 1993 after Ancient Murrelets and Rhinoceros Auklets had abandoned the colony.[120] A similar pattern was seen on Little Helgesen Island in 2011.[131] Further, storm-petrels have been found using burrows abandoned by

**Figure 603.** Despite efforts to control raccoon populations by trapping, baiting, and shooting, the species has continued to expand its range on Haida Gwaii. Since 1990, some seabird colonies have been newly invaded by raccoons, previously impacted colonies have been re-invaded following elimination of raccoons, and seabird nesting populations on impacted colonies have continued to decline, especially in areas like Englefield Bay on the west coast of Moresby Island. *Photo by R. Wayne Campbell.*

**Figure 604.** Rhinoceros Auklet populations continue to decline and colonies have been abandoned on the west coast of Moresby Island due to introduced raccoons. *Drawing by Keith Taylor.*

other species, including AncientMurrelet/Cassin's Auket-sized and Rhinoceros Auklet-sized burrows. Use of larger burrows by storm-petrels has been observed on seven islands (four in Englefield Bay: Little Helgesen, Instructor, Lihou, and Carswell; and three on the east coast of Moresby Island: Hotspring, Agglomerate, and Skedans), not all of which have been impacted by invasive predators, although alcid species have declined on at least four. As noted above, Ancient Murrelet occupancy was low in 2011 when storm-petrels were observed in larger burrows on Lihou and Carswell islands, suggesting that storm-petrels may take advantage of vacant burrows if they are available. Perhaps the ability of storm-petrels to enter and leave their burrows on the wing reduces their vulnerability to predation by raccoons in comparison with alcid species that generally run across the ground to and from their burrows.

Rats were successfully removed from St. James Island in 1998,[133] but as far as we know, no follow-up surveys have been conducted to determine the status of nesting seabirds on the island. Absence of rats was most recently confirmed in March 2018.[317]

Storm-petrels and Ancient Murrelets were confirmed breeding on Carswell Island in 2011, although storm-petrels were still not identified to species.[131] Abundant signs seen around burrows left little doubt that these species were nesting in previous years (1986 and 1993), but breeding had not been confirmed. A new nesting site for storm-petrels was discovered on Gordon Islands since 1990.[150, 297]

Pelagic Cormorants have also been suspected breeding at a number of new sites since 1990 (Figure 605). During Peregrine Falcon surveys in 2000, about 430 Pelagic Cormorants were flushed from caves at 16 locations previously unidentified as breeding sites.[300] As far as we know, no follow-up surveys have been conducted to determine whether nesting actually occurs at those sites.

The second confirmed nesting by Horned Puffins in BC was documented on Flatrock Island in 2017.[297]

**Figure 605.** Pelagic Cormorants may nest at a number of cave sites on the west coast of Moresby Island that were undocumented as of 1990. Cormorants were flushed from caves during surveys for Peregrine Falcons in 2000, although whether cormorants were nesting was not determined. *Photo by Carita Bergman, Gwaii Haanas, 9 June 2012.*

**Table A1-4.** Post-1990 data for seabird colonies on the west coast of Moresby Island.

| Species | Post-1990 data |
|---|---|
| **WM-020 Saunders Island** | |
| ANMU | All burrows appeared abandoned and raccoons were present in 1993.[120] There was no sign of the remnant population of about 50 pairs of Ancient Murrelets reported in 1986.[234] No definite evidence of breeding was found in 2011, although a few burrows under grass on the south coast looked as though they could be active.[131] |
| **WM-030 Helgesen Island** | |
| STPE | Gaston et al.[131] estimated 100-200 pairs nesting on Little Helgesen Island in 2011, similar to what was estimated there in 1986. Storm-petrels were nesting in Ancient Murrelet- and Rhinoceros Auklet-sized burrows in 2011: three contained cold storm-petrel eggs. No evidence of breeding by storm-petrels was found on the main island in 2011 but in 2016, some storm-petrel-sized burrows (three examined were empty) were found on the main island, and adult Fork-tailed Storm-Petrels were found in three small burrows on Little Helgesen.[313] |
| ANMU | Surveys in 1993 revealed dramatic population decline to 1,100 pairs [120] from the 7,700 pairs estimated in 1986.[234] The northern and central sections of the island were virtually abandoned and only small numbers were found on Little Helgesen where 860 pairs were estimated nesting in 1986. Raccoons were present in 1993. They were eliminated in 1995 and spotlight surveys detected no raccoons through 2006. However, a survey in 2004 found a similar distribution of burrows as in 1993 and no signs of recovery.[131] The island was surveyed again in 2011 and only 500 pairs were estimated nesting.[131] Scats, dug-up burrows, and headless inverted carcasses found indicated that raccoons were again present. Burrows were mainly confined to the southern section of the island as in 1993, although there may have been some expansion of colony area in the central section in 2011. Burrow density in the southern section in 2011 was similar to that found during previous surveys, except in 1993 when it was reduced. However, occupancy rate appeared very low; only 2 of 18 burrows examined were occupied. No sign of nesting was found on Little Helgesen in 2011, but eggshell fragments were found in one burrow in 2016.[313] |
| CAAU | About 200 pairs were estimated nesting in 1993,[120] down from the 3,700 pairs estimated in 1986.[234] Since then, no definitive evidence of nesting has been discovered other than three burrows (one on the north end of the main island and two on Little Helgesen) that smelled of Cassin's Auklets in 2011 [131] and some feathers found in five burrows in 2016.[313] |
| RHAU | Gaston and Masselink estimated 3,300 pairs in 1993,[120] down from the 16,600 pairs estimated in 1986.[234] In 2011, some Rhinoceros Auklet-sized burrows were found on Little Helgesen, but no evidence of use by Rhinoceros Auklets was seen.[131] Rhinoceros Auklet-sized burrows were found on both the main island (south end) and on Little Helgesen in 2016 but the only sign of activity was some eggshell fragments found in one burrow.[313] |
| **WM-050 Carswell Island** | |
| STPE | Storm-petrels were first confirmed breeding in 2011; incubating adults (species not determined) were found in three Ancient Murrelet-sized burrows.[131] Some smaller, typical storm-petrel-sized burrows were also seen. |
| ANMU | Some burrows were found in 1993 on the north side where they had not previously been reported.[120] Ancient Murrelets were confirmed breeding for the first time in 2011; in 23 Ancient Murrelet-sized burrows examined, two contained incubating Ancient Murrelets, two contained Cassin's Auklets, and three contained incubating storm-petrels.[131] Numerous Ancient Murrelet feather piles and depredated eggshells were found in 2011. |
| CAAU | Several pockets of burrows were found in 1993 on the north side where they had not previously been reported.[120] Breeding was confirmed in 2011.[131] |
| **WM-070 Instructor Island** | |
| STPE | Fork-tailed Storm-Petrels were still nesting in 1993.[120] |
| ANMU | No evidence of recent activity was found in 1993.[120] |
| RHAU | No evidence of recent activity was found in 1993.[120] |
| **WM-080 Lihou Island** | |
| STPE | Similar numbers (13,500 pairs) were found nesting in 1993 [120] as in 1986 (13,700 pairs).[234] Gaston et al. confirmed Fork-tailed Storm-petrels nesting in 2011 but made no estimate of burrow density or population size.[131] Fork-tailed Storm-petrels were confirmed nesting in three Ancient Murrelet-sized burrows but typical storm-petrel-sized burrows were also common along transects. |
| ANMU | The estimated breeding population increased from 6,500 pairs in 1986 [234] to 12,100 pairs in 1993 due to an increase in burrow density.[120] No evidence of raccoons was seen in 1993. Partial transect surveys over the main portion of the colony in 2004 and 2011 found similar burrow densities as in 1993,[131] suggesting little change in population between 1993 and 2011. However, burrow occupancy rate appeared depressed in 2011; only 7 of 56 Ancient Murrelet-sized burrows examined contained Ancient Murrelets, 3 contained incubating Fork-tailed Storm-Petrels, and 46 were empty. |
| CAAU | The estimated breeding population increased from 11,200 pairs in 1986 [234] to 13,100 pairs in 1993.[120] No information was collected on the status of Cassin's Auklets in 2011.[131] |
| RHAU | Similar numbers were estimated in 1993 (2,800 pairs) [120] as in 1986 (2,700 pairs).[234] There was no information on the status of Rhinoceros Auklets in 2011.[131] |

**Table A1-4.** cont'd

| Species | Post-1990 data |
|---|---|
| **WM-100 Luxmoore Island** | |
| STPE | Signs of predation, likely by river otters, were seen in 1993.[120] There was no evidence of raccoons. |
| **WM-110 Rogers Island** | |
| STPE | Burrows were dense, and abundant signs of predation, likely by river otters, were seen in 1993.[120] There was no evidence of raccoons. |
| **WM-270 Adam Rocks** | |
| PIGU | Forty guillemots were present on 30 July 2016.[315] |
| TUPU | Greater numbers of puffins have been seen in recent years: 12 on 25 May 2012; 34 seen on and around the islet on 30 July 2016 (called a conservative estimate); 6 on 7 June 2017; and 8 on 11 Aug 2018.[315] |
| **WM-280 SGang Gwaay (Anthony Island)** | |
| RHAU | Burrow numbers in permanent plots were higher in 2011 than in 2006 (Figure 606) and 1985.[230] In 2016, a total of 368 burrows were counted in the seven extant permanent plots, which was an increase of 1% compared to the 363 burrows counted in 2011. The average number of burrows in the permanent plots has increased from 1985 to 2016 at an annual rate of 1.8% per year.[313] A staging concentration of at least 1,000 birds was seen between Flatrock and Gordon Islands at 21:55 hr on 31 May 2016.[315] |
| PIGU | Thirty birds were counted at the north anchorage on 4 June 2017.[315] |
| TUPU | A count of 25 birds, some carrying food was reported for SGang Gwaay on 27 July 2014 [315] but observers noted that birds carrying food were mainly seen on the outcrop to the northeast, which likely referred to Flatrock Island. There are numerous records on eBird from 2007-2018 of 1-5 birds at SGang Gwaay. |
| HOPU | One or two birds were sighted on 23 July 2015 and 29 May 2016.[315] |
| **WM-290 Flatrock Island** | |
| GWGU | Nests with young and an estimated 600 gulls were present on 3 July 2017.[315] |
| PIGU | Sixty birds were reported on 28 May 2007 and 40 were seen on 3 July 2017.[315] |
| TUPU | High counts of birds from eBird [315] include 15 on 1 August 2007, 15 on 30 May 2008, and 13 on 11 August 2018. |
| HOPU | One to two birds were recorded in several years between 1993 and 2015.[315] More have been seen recently: 6 on 30 July 2016; 4 on 3 July 2017; and 3 on 11 August 2018.[315] Carita Bergman [297] photographed a nest with an egg on 3 July 2017. This is the second confirmed breeding record for the province. Birds were seen delivering fish to the nest site in 2018.[315] |
| **WM-300 Gordon Islands** | |
| STPE | Harfenist [150] suspected a few nesting on the north end of the islands, and Carita Bergman [297] detected both Fork-tailed and Leach's Storm-Petrels coming to burrows and heard a Leach's Storm-Petrel singing from a burrow in 2016. These islands are increasingly visited and camped upon by visitors to Gwaii Haanas, with human trails and campsites now evident on the island.[297] |
| BLOY | Two were noted in 1993.[150] |
| PIGU | Harfenist [150] recorded 25 birds in 1993 and 10 were seen on 1 August 2007 and 19 May 2009.[315] |
| CAAU | Similar numbers of auklet burrows were counted and estimated in 1993 [150] as in 1985.[234] A slightly greater proportion of burrows were identified as Rhinoceros Auklet burrows in 1993. Based on the occupancy rate determined in 1993, the Cassin's Auklet breeding population was estimated to be 580 pairs.[150] |
| RHAU | Harfenist estimated a breeding population of 130 pairs,[150] slightly more than the 80 pairs estimated in 1985.[234] Eight of 10 burrows checked were occupied, providing the first confirmation of breeding by Rhinoceros Auklets on the islands. |
| TUPU | Three were noted in 1993.[150] |
| **WM-320 Kerouard Islands** | |
| COMU | Hipfner [163] counted 377 birds in 2003-2004 and Carita Bergman [297] estimated 400-600 birds present during a recent (around 2015) visit. Those counts were similar to the maximum recorded count of 400 birds by Wayne Campbell and Al Whitney in mid-June 1987.[36, 234] Other counts of 118 birds in 1989, 200 in 1995, and 0 in 1997 [61] indicate that numbers fluctuate substantially. |
| HOPU | Two were seen close to the islands on 25 May 2008.[315] |

**Figure 606.** Glen Keddie standing among thickly regenerating Sitka spruce at a permanent monitoring plot for Rhinoceros Auklets on SGang Gwaay (Anthony Island) in 2006. Data from permanent plots can indicate trends in breeding populations but cannot provide estimates of population size. *Photo by Moira J.F. Lemon, 9 July 2006.*

**East Coast Moresby Island Post-1990**

Continued declines and extirpations of Ancient Murrelet populations have been documented, likely due to introduced rats on Kunghit and Lyell islands, and to repeated invasions by raccoons on Limestone Islands (Table A1-5). The most recent surveys (2004 on Kunghit, 1992 on Lyell, and 2006 on Limestone) have indicated losses of 12,300 pairs on those three islands since the 1980s. These losses have been offset by increases likely in excess of 10,000 pairs on George, East Copper, Ramsay, and Reef islands, suggesting some redistribution of nesting populations in the region. Cassin's Auklets appear to have declined on Rankine and George islands for unknown reasons, although a change in methodology may be at least partially responsible for the lower estimate on George Island. Raccoons were again detected on Alder Island in 2017, putting over 35,000 nesting seabirds at risk. Ongoing monitoring and control efforts in place by Gwaii Haanas will hopefully limit impacts to this colony.

Rat eradication programs begun on Arichika and Bischof islands in 2011 and on Murchison and Faraday islands in 2013 have had mixed success. Though initially declared rat-free, rats were again found on Bischof, Murchison, and Faraday islands in 2017.[164, 317] Rats were detected and eliminated on Hotspring and House islands in 2018 but had re-invaded by January 2019. In 2019, Norway Rats were detected on four more colonies: Tar Islands, Kawas Islets, Agglomerate Island, and Ramsay Island.[317] Continued invasions by rats and raccoons to seabird colonies reveal the perennial nature of this management problem and emphasize the need for archipelago-wide solutions.

Luke Halpin,[147] using automated acoustic recording units, compared activity by burrow-nesting seabirds on rat-infested (Arichika and Bischof islands) and rat-free islands (Alder, Ramsay, and Hotspring islands) in 2010 and 2011. As expected, seabird activity was greater on rat-free islands, but a surprising and encouraging result was the frequent detection of seabird species that were thought to be extirpated on rat-infested colonies, especially on Arichika Island. Detections through acoustic surveys do not necessarily indicate nesting, and no seabird burrows were found during the extensive period field workers were on the islands, but the activity detected during these surveys suggest that birds continue to visit these extirpated colonies even though rats are present and bodes well for the potential recovery of these colonies if rats could be permanently eliminated.[147]

***Poacher Antics in Gwaii Haanas***

*Preparations for recent rat eradications on seabird islands in Gwaii Haanas involved the creation of a monitoring program to evaluate ecosystem response to rat removal. One element of this monitoring program utilized a new technology – weather-proof, programmable digital recorders – to evaluate the abundance of seabirds before, during, and after eradication. This approach promised a non-invasive, data-rich method to replace traditional techniques such as burrow quadrats and grubbing. Luke Halpin, a keen graduate student from Simon Fraser University, stepped up to the plate to initiate this work. I was grateful for his enthusiastic interest, as the initial task, at least, seemed mind-numbingly dull. Past monitoring by CWS of the islands where eradications were to occur suggested that colonial seabirds were extirpated from these islands. I envisioned terabytes of recordings of nothing but pure silence. Serene, no doubt… but deadly boring. That said, we needed a "scientific zero," a baseline* *measurement that we could repeat as the seabirds made their comeback to their traditional breeding grounds on the restored, rat-free islands.*

*Sure enough, two years of field work prior to eradication produced daunting terabytes of recordings. Luke was hopeful that newly developed acoustic software would allow automated data capture from the recordings. Sadly, it was not to be. The challenges proved too great, and Luke resorted to the standard data capture procedures of the time… visual inspection of sound spectrograms. This meant learning the vocal array for each of the four seabird species of interest, very much akin to learning a new language. All winter long I opened a trickle of emails from Luke, each containing a new sound clip and spectrogram, and the inevitable question, "Do you know what this is?" We learned together… an intriguing process since there was no way to verify what creature made sounds that we heard on the recordings, other than context. But with terabytes of recordings came that unexpected context. An unknown sound appearing in isolation on one recording was linked with known sounds in another, and the mysteries unravelled as our knowledge increased. Luke's British heritage allowed him to "Keep Calm and Carry On". To my surprise, Luke went big – not only did he document every seabird species present in the recordings, he also documented every other sound! One year, and tens of thousands of records later, Luke completed data capture.*

*Thousands of hours of night time recordings, while generally quiet as expected – Gwaii Haanas has a soundscape that no doubt boasts some of the lowest levels of anthropogenic noise of almost anywhere in North America – held more than a few surprises. For instance, we were able to document the presence of, and precisely define (with a beautiful bell curve!) the calling season of breeding Sooty Grouse inhabiting these remote seabird islands. And there were other unexpected noises too. Gunshots, for instance. Gunshots were the last thing we were expecting, but sure enough Luke sent me a clip that sounded pretty definitive. However, since it took place a couple years previously, I didn't get too excited at first. But after an accumulation of such sounds from a couple of different islands (and at night!), I was increasingly perturbed, and shared the recordings with Gwaii Haanas managers and law enforcement staff. Sure enough, they all agreed: these were definitely gunshots.*

*Then Luke emailed me in a panic. He believed the poachers were shooting at whales! I quickly opened the latest sound clip, and distinctly heard the rush of a whale blowing, followed by ominous gunshots some time later. But wait – the whale would have been well under the surface by then. It didn't make sense. Then it dawned on me. Humpback whales (*Megaptera novaeangliae*) utilize "tail-flick" feeding to stun and confuse their prey. This behaviour involves hard slaps on the water surface with their tail (*Figure 607*). And it sounds like gunshots! I remembered a video I had taken once, and quickly confirmed this sounded the same. Mystery solved. Or so I thought. Months later I was speaking with a DFO pinniped biologist, describing to him some of the marine mammal sounds we heard such as the whale tail flicks, and what initially sounded like muffled human conversation that transformed into seals. He then informed me that the "gunshots" were quite likely made by harbour seals, which are known to make percussive sounds by sharp slaps of their flippers (*Figure 608*). As I pictured the locations of the recorders, I realized that many had seal haul-outs quite close by (*Figure 609*).*

*Oh, how I love being a wildlife spy! No doubt a number of marine mammal species had made the mysterious gunshot sounds that littered our recordings. But the best surprise of all was the detection of remnant breeding populations of seabirds still inhabiting some of the rat-infested islands. The baseline level of seabird activity was not zero! Of course, the cacophony of sound we documented on control (rat-free) islands was orders of magnitude greater, compared with the scattered and sparse calls from seabirds on the rat-infested islands, but the presence of these calls from all four species of interest, and for longer than 60 days during the breeding period was heartening. Perhaps recovery of these seabird colonies, those of Ancient Murrelets, Cassin's Auklets, Leach's and Fork-tailed Storm-petrels, will be dramatically faster than we might have hoped.*

*(contributed by Carita Bergman)*

**Figure 607.** A Humpback Whale seen near SG̲ang Gwaay (Anthony Island) "flick feeding" using slaps of its tail to stun fish or concentrate krill near the surface. *Photo by R. Wayne Campbell, 8 June 2000.*

**Figure 608.** What at first sounded like gun shots on audio recordings of nocturnal activity on seabird colonies in Gwaii Haanas turned out to be a Harbour Seal slapping its flippers. *Photo by R. Wayne Campbell.*

**Figure 609.** Harbour Seals frequently haul-out in small groups close to the water. *Photo by R. Wayne Campbell.*

New nesting sites have been confirmed for Leach's Storm-Petrels on Charles Islands and for Fork-tailed Storm-Petrels on East Limestone Island since 1990. Twenty-seven new Black Oystercatcher nesting locations (and 17 newly designated colonies) have been discovered and population estimates for the region have increased almost 40% due to the focused surveys that have been conducted by Laskeek Bay Conservation Society (LBCS) in collaboration with Parks Canada and CWS since 1990. Continued monitoring has indicated relatively stable populations and the increase in the population estimate is largely a result of increased survey effort. Dedicated surveys have likely provided a more accurate estimate of oystercatcher breeding populations in the region and we suspect that similarly greater numbers would be found if such surveys were conducted in other regions. LBCS have also been monitoring five Glaucous-winged Gull colonies in Laskeek Bay that up to 2017 had larger nesting populations than in the 1980s, but had reduced numbers in 2018 and 2019. Also, contrary trends were seen among the five monitored colonies, with only two colonies increasing while three colonies declined or were abandoned (Figure 610).

**Figure 610.** Since 1990, dedicated surveys of Black Oystercatchers (left) and Glaucous-winged Gulls have been conducted by Laskeek Bay Conservation Society in collaboration with Parks Canada and CWS along the east coast of Moresby Island. *Photos by R. Wayne Campbell.*

Major windfall events that have decimated seabird nesting habitat have been recorded since 1990, especially on Rankine, George, Limestone, and Reef islands, providing further examples of the dynamic nature of the forest habitat on these seabird islands. Describing the main Ancient Murrelet nesting slopes on Reef Island after the winter of 2010-2011, Tony Gaston said, "it looked like a large bomb had gone off (Figure 611); of the two cabins we had there at the time, one (a tent cabin) was completely destroyed, the other was partially demolished."

**Figure 611.** Old-growth forests where seabirds like Ancient Murrelets nest are characterized by a multi-layered canopy of differently aged trees, with young trees growing to fill gaps where old veterans have fallen over. Such gaps are often caused by windfalls and we routinely encounter patches of regenerating forests where past windfall events have disrupted small areas of breeding habitat on seabird colony islands. Windfall events on Reef and Limestone islands during the winter of 2010-2011 were of exceptional magnitude, completely demolishing huge swaths of forest. It will take hundreds of years for this slope above the old research camp on Reef Island to recover the multi-age character of an old-growth forest. *Photo by Anthony J. Gaston, 7 May 2011.*

**Table A1-5.** Post-1990 data for seabird colonies on the east coast of Moresby Island, except see Tables A1-6, A1-7, and A1-8 for results of Black Oystercatcher and Glaucous-winged Gull surveys conducted by Laskeek Bay Conservation Society, Gwaii Haanas, and CWS since 1990.

| Species | Post-1990 data |
|---|---|
| **EM-010 Kunghit Island** | |
| PIGU | During explorations in July and August 1993, Harfenist recorded birds in a number of areas around the island, with concentrations of: 65 between Heater Harbour and Luxana Bay on 24 July; 45 in the area just south of Lyman Point on 10 August; and 20 at Bowles Point on 5 August.[150] Sixty birds were recorded at Lyman Point on 31 July 2016.[315] |
| ANMU | Harfenist resurveyed this rat-infested island in 1993.[150] Transects were run through the main colony area on the south side of Luxana Bay. Colony area had contracted and estimated populations at two surveyed locations declined from 8,800 to 3,500 pairs between 1986 and 1993, with only 11 pairs estimated nesting at Jenkins Point where we had estimated 800 pairs nesting in 1986. However, the comparison between the two years was compromised because the main colony area had not been surveyed with line transects in 1986.[233] Transect surveys of the main colony in 1993 estimated a total of 6,700 burrows over a colony area of 11.1 ha (about a third of the estimated 35.3 ha colony area measured in 1986) and an occupancy rate of 53% (Table A1-2), giving the estimate of 3,500 breeding pairs. Extensive evidence of rat predation on Ancient Murrelet eggs and adults was observed throughout both colony areas in 1993. Populations continued to decline after 1993 and Mark Hipfner reported that both colony areas appeared extirpated in 2004.[68] Camera surveys in 2017 found no Ancient Murrelet activity and detected rats at all survey sites in historical colony areas.[317] |
| CAAU | Four active-looking burrows were found on the slopes just south of Lyman Point in 1993.[150] |
| RHAU | Estimated populations remained the same between 1986 and 1993, although one area east of Treat Bay where we found three burrows in 1986 [233] appeared abandoned in 1993 and the area where the largest numbers of burrows were counted in 1986 was not fully explored in 1993.[150] The same survey method (partial count of burrows) were used in both years, except a burrow occupancy rate was determined in 1993 (Table A1-2) but not in 1986. Some sign of rat predation on adults but not on eggs was seen in 1993. A raft of 300 birds was seen in the Luxana Bay area at 10:19 hr on 31 July 2016.[315] |
| TUPU | In 1993, birds were seen at the same areas where we observed them in 1986: 100 between Heater Harbour and Luxana Bay on 25-28 July; 28 around the cliffs north of Lyman Islet on 10 August; and 2 at Bowles Point on 5 August 1993.[150] Birds were seen entering and exiting burrows at "Luxana" Arch, Lyman Islet, and the cliffs north of Lyman Islet, confirming continued nesting in those areas. About 40 birds were seen at Lyman Islet on 27 May 2009 and 25 were recorded at Lyman Point on 29 May 2010.[315] |
| **EM-050 High Island** | |
| PIGU | Thirty-two birds were counted on 11 July 1993.[150] |
| RHAU | Eight burrows, six of which were occupied, were found in 1993 [150] in the same area where six burrows were found in 1985.[233] |
| TUPU | One was seen around the island on 11 July 1993.[150] |
| **EM-070 Charles Islands** | |
| STPE | Harfenist counted 49 burrows on the north island and 127 burrows on the south island, found 22 of 32 burrows occupied, and estimated a breeding population of 120 pairs in 1993,[150] slightly more than the previous estimate of 100 pairs in 1986. An incubating Leach's Storm-Petrel was found in one burrow (making this a new site for that species) but most burrows contained Fork-tailed Storm-Petrels and only Fork-tailed Storm-Petrels were heard at night. |
| PIGU | Twenty-five birds were noted on 14-15 July 1993.[150] |
| CAAU | A few may have been nesting in 1993 as in 1986, but all burrows checked for occupancy in 1993 contained Rhinoceros Auklets.[150] |
| RHAU | Ninety pairs were estimated nesting in 1993.[150] Number of burrows counted was similar in 1986 and 1993 and the slightly lower population estimate was due to a lower occupancy rate determined in 1993 (Table A1-2) compared to the median rate used in 1986. |
| TUPU | One was recorded on 14-15 July 1993.[150] |
| **EM-090 Garcin Rocks** | |
| PIGU | Observers reported 54 guillemots in the Garcin Rocks area on 27 July 2017.[315] |
| **EM-100 Langtry Island** | |
| PIGU | Ten birds were noted on 25 May 2016.[315] |
| **EM-120 Rankine Islands** | |
| ANMU | The colony was resurveyed in 2000 and the estimated population of 26,000 pairs [307] was the same as that estimated in 1984. Surveys of eight permanent plots since 1990 also indicated a stable population, with slightly higher numbers recorded in 2010 than previously.[230] In 2017, number of burrows counted in the permanent plots was 410, slightly lower compared to the 424 burrows counted in 2010, but still indicating a stable population. The average number of burrows in these plots has increased slightly from 1984 to 2017 with an annual rate of 0.3% per year.[313] |

**Table A1-5.** cont'd

| Species | Post-1990 data |
|---|---|
| CAAU | The colony was resurveyed in 2000. A population estimate was not calculated, but burrow density in sample quadrats showed the same decline as in permanent plots (32% decline between 1984 and 2000 [230, 307]). Numbers of burrows in permanent plots increased somewhat between 2000 and 2005 and remained similar from 2005 to 2017. The number of burrows counted in the eight plots was 306 in 2017, slightly higher than the 298 burrows counted in 2010 but still lower than the 397 burrows counted in 1984. The average number of burrows in the permanent plots has decreased slightly from 1984 to 2017 at an annual rate of -0.8% per year.[313] |
| **EM-280 George Island** | |
| STPE | Lemon [186] confirmed about 400 pairs of Leach's Storm-Petrels nesting in 1996; we thought they were extirpated in 1985 but perhaps we missed them that year. As in 1977, small numbers of Fork-tailed Storm-Petrels were suspected nesting as well. |
| BLOY | Two nests with eggs were found in 1996.[186] |
| ANMU | A 1996 survey estimated 17,400 pairs, an increase from the 11,600 pairs estimated in 1985.[186] Surveys of eight permanent plots at 5-year intervals indicated a similar trend.[230] Numbers of burrows in permanent plots continued to increase through 2013 and then showed some decline in 2017. The number of burrows counted in the permanent plots in 2017 was 429, a decrease of 6.5% compared to the 459 burrows counted in 2013. Overall, the average number of burrows in these plots has increased significantly from 1985 to 2017 at an annual rate of 1.6% per year.[313] |
| CAAU | A survey in 1996 gave an estimate of 4,300 pairs,[186] down from the 5,900 pairs estimated in 1985.[233] The decrease may have been an artifact of changing methods in 1996, similar to that noted for Frederick Island above. In 1985, the first quadrat along a transect was placed at the shore edge of the vegetation whereas in 1996 the first quadrat was placed a random distance between 0-15 m from the edge. This change would most likely have resulted in a lower burrow density estimate in 1996 than 1985.[307] |
| **EM-300 East Copper Island** | |
| ANMU | A survey in 2003 showed an increase from 4,400 to 6,100 pairs between 1985 [233] and 2003.[187] |
| CAAU | The population was estimated at 10,600 pairs in 2003,[187] similar to the 10,900 pairs estimated in 1985.[233] Data from permanent plots also indicate a relatively stable population, although numbers of burrows counted in the plots have varied. Numbers of burrows in permanent plots declined 16% between 1991 and 2003, but differences were not significant.[230] Numbers were similar in 2003 and 2008 and then increased from 195 burrows in 2008 to 236 burrows in 2013. In 2017, the number of burrows counted in the six permanent plots was 234, similar to the count in 2013. The average number of burrows in the permanent plots has decreased slightly, but not significantly, from 1985 to 2017 at an annual rate of -0.1% per year.[313] |
| **EM-310 Howay Island** | |
| PECO | Cormorants have been nesting intermittently and in variable numbers since 1990. More than 50 nests have been seen in recent years.[297] In 2009, at least 48 nests had birds at them on 21 May and young were visible in nests on 21 June.[315] |
| PIGU | Greater numbers of guillemots were seen on 27 May 2007 (30 birds) and 28 May 2008 (20 birds) [315] than had been seen prior to 1990, although no additional evidence of nesting was reported. |
| **EM-400 Alder Island** | |
| PIGU | Twelve guillemots were counted on 2 June 2017 and 30 were noted on 24 April 2018.[315] |
| **EM-420 Arichika Island** | |
| STPE | Acoustic recordings frequently detected Fork-tailed and Leach's storm-petrels in 2010-2013.[147, 317] |
| BLOY | Reported nesting in 2017.[297] |
| PIGU | Reported nesting in 2017.[297] Forty birds were noted on 24 April 2018.[315] |
| ANMU | Frequently detected during acoustic surveys in 2010-2013.[147, 317] One eggshell found in 2008 appeared to have hatched and may have indicated successful breeding.[147, 297] |
| CAAU | Frequently detected during acoustic surveys in 2010-2013.[147, 317] |
| **EM-470 Ramsay Island** | |
| ANMU | Surveys of permanent plots suggested an increasing population up to 2002.[230] The increasing trend has continued through 2018 with over twice as many burrows counted in the 12 permanent plots in 2018 (473 burrows) as in 1984 (218 burrows). Number of burrows counted in 2018 indicated an increase of 18.3% compared to the 400 burrows counted in 2012. The average number of burrows in these plots has increased significantly from 1984 to 2018 at an annual rate of 2.2% per year.[313] However, burrow occupancy rates were low in 2012 and 2018 (Table A1-2). |
| CAAU | Permanent monitoring plots indicated stable or slightly increasing numbers of burrows through 2012.[100, 230] In 2018, the number of burrows counted in the nine permanent plots was 485, slightly higher than the 471 burrows counted in 2012. The average number of burrows in these plots has increased significantly from 1984 to 2018 at an annual rate of 1.0% per year.[313] |
| **EM-480 Ramsay Rocks** | |
| GWGU | As of 2017, more gulls were nesting than in 1986.[297] |

**Table A1-5.** cont'd

| Species | Post-1990 data |
| --- | --- |
| **EM-490 Bischof Islands** | |
| STPE | Acoustic recordings frequently detected Fork-tailed Storm-Petrels and occasionally detected Leach's Storm-Petrels in 2010-2013. [147, 317] |
| ANMU | Occasionally detected during acoustic surveys in 2010-2013.[147, 317] |
| CAAU | Occasionally detected during acoustic surveys in 2010-2013.[147, 317] |
| **EM-530 Murchison Island** | |
| PIGU | Twelve guillemots were recorded on 4 August 2007 and 10 were seen on 22 May 2009.[315] |
| **EM-580 Lyell Island, Dodge Point** | |
| BLOY | Two nests with eggs were found at Dodge Point in 1992.[307] |
| ANMU | The colony was resurveyed in 1992.[185] Colony area had further contracted and the estimated nesting population declined to 8,300 pairs from the 10,700 pairs estimated in 1982.[233] Impacts of introduced rats were obvious in 1992; half the occupied burrows inspected contained adults or eggs that had been killed by rats. Ancient Murrelet bones were also found in a number of unoccupied burrows. The colony may have been extirpated by 2016: camera monitoring in 2016 at two stations within colony areas recorded rats at both stations and failed to detect any Ancient Murrelet activity.[317] |
| **EM-650 Lost Islands** | |
| PIGU | A count of 130 birds was made on 1 August 2016.[315] |
| **EM-690 Reef Island** | |
| PIGU | Circumnavigation of the island by kayak yielded a count of 200 guillemots on 29 June 2015.[315] |
| ANMU | A survey in 1995 estimated a total of 10,465 burrows, indicating an increase of over 30% in burrow numbers since 1985.[119] Using a median 63% occupancy rate [233] yields a population estimate of 6,600 pairs, compared to 5,000 pairs estimated in 1985 [122] and 3,600 pairs estimated in 1989 (recalculated from Gaston et al.[126]). |
| **EM-720 Limestone Islands** | |
| FTSP | Laskeek Bay Conservation Society documented Fork-tailed Storm-Petrels calling on East Limestone Island each year since 1990,[112] heard them calling from burrows in 1994,[123] and found one incubating an egg in 1999 [136] and in 2004,[62] thus confirming a new nesting site for this species. |
| PIGU | Thirty guillemots were seen and suspected nesting on the cliffs on the east island on 18 May 2007.[315] |
| ANMU | Laskeek Bay Conservation Society has documented further impacts of raccoons on East Limestone Island. In 1991, two raccoons killed at least 11% of the Ancient Murrelet breeding population and reduced chick production by 36%.[129] Mortality of adults declined dramatically and chick productivity returned to normal in 1992 following the removal of those raccoons,[118] but invading raccoons were again present and predation rates increased in subsequent seasons.[116, 123] Predation rates were high in all seasons that raccoons have been present.[23] Nesting populations declined on East Limestone Island from an estimated 1,600 pairs in 1989 to 1,300 pairs in 1995 and 500 pairs in 2006.[188] Numbers of departing chicks captured on study areas have decreased dramatically since 1990; numbers captured in 2018 were less than 7% of the numbers captured in 1990 when studies first began. Explorations of West Limestone Island showed that the small colony documented there in 1983 [233] was still extant but reduced in area in 1992.[118] |
| CAAU | A 2015 survey by Laskeek Bay Conservation Society identified 101 active-looking (burrow contents were not determined but burrows had signs of activity at their entrances) Cassin's Auklet burrows on east Limestone Islands, which is higher than the 50 burrows (40 pairs estimated nesting) counted in 1983. The survey was repeated in 2019: a total of 165 burrows were counted, 91 of which appeared active.[318] The apparent increasing trend for Cassin's Auklets between 1983 and 2015 is contrary to the persistently declining trend for Ancient Murrelets. |

**Black Oystercatcher Surveys conducted on the east coast of Moresby Island since 1990 by Laskeek Bay Conservation Society, Gwaii Haanas, and CWS.**

Laskeek Bay Conservation Society (LBCS) has been monitoring Black Oystercatcher breeding populations in the Laskeek Bay area annually since 1992 (Figure 612). Since 2004, they have also been working in conjunction with Parks Canada and the Pacific Wildlife Foundation partnered with BC Parks to monitor populations in BC's coastal national parks. During the first year of surveys in 1992, LBCS recorded 24 pairs and found 18 nests with eggs at six colonies (Lost, Reef, South Low, East Limestone, Low, and Skedans islands),[118] compared to 15 pairs that were estimated nesting at those colonies as of 1990. LBCS found more nests the following season at seven colonies (Kingsway Rock was added with one nest), totalling 28 nests with eggs or chicks.[116] Additional sites were surveyed in subsequent years. With some fluctuations, numbers of nests on monitored colonies have remained similar since 1994, e.g., 24 nests with eggs or chicks in 2013 [215] and 32 nests with eggs or chicks in 2014.[138] Laskeek Bay was designated as an Important Bird Area in 1999 for its population of Black Oystercatchers.[63]

Additional sites were surveyed to the south of Laskeek Bay in 1994,[123] and, in collaboration with Gwaii Haanas, surveys were conducted as far south as Ramsay Island (Figure 613) in 2004 [62] and 2006.[226] A more extensive survey from Laskeek Bay south to Woodruff Bay on Kunghit Island was conducted in 2005 in a co-ordinated effort by LBCS and CWS.[225, 307] In most years since 2010 (all except 2017), LBCS has independently conducted surveys of islands from Haswell Island to Cumshewa Island in Laskeek Bay plus Lost Islands in Gwaii Haanas, and, under contract to Parks Canada, has surveyed the area south of Lost Islands to Alder Island.[138, 210, 211, 214, 215] Over these years, numbers of breeding pairs and reproductive success have been relatively stable at monitored colonies.[211] In 2018, surveyors counted 101 attended nests (94 with eggs or chicks) in the Gwaii Haanas section plus 39 attended nests (34 with eggs or chicks) in the Laskeek Bay section, for a total of 140 attended nests, 128 of which held eggs or chicks.[211] Data from 2005 and 2010 surveys were used by Sebastian Dalgarno in his Master's thesis [77] and subsequent publications [78] on predictive modelling of Black Oystercatcher breeding occurrence. GPS coordinates for nests found during those two surveys are listed in Appendix G of Dalgarno's Master's thesis.

**Figure 612.** Searching for evidence of nesting Black Oystercatchers is not a simple task. When weather is favourable, and landing is possible, surveyors must check every gulley, patch of vegetation, and sheltered site on islands like Skedans Islands (left). In addition, areas around empty nest scrapes, such as this one on Kingsway Rock, must be searched for hiding chicks. *Photos by the authors.*

**Figure 613.** Black Oystercatcher surveys have been conducted by Laskeek Bay Conservation Society as far south as Ramsay Island during several years since 2004. This photo shows Glen Keddie standing under the prominent sea arch along the western shoreline of Ramsay Island where oystercatchers may nest. *Photo by Moira J.F. Lemon, 8 June 2007.*

On the most extensive survey in 2005, CWS surveyed the area from Woodruff Bay on Kunghit Island north to De La Beche Inlet on the west side of Juan Perez Sound (encompassing designated colonies from the east side of Kunghit Island [EM-010] north to Hoskins Islets [EM-450]), while LBCS surveyed the Laskeek Bay colonies south to Ramsay Island (including most designated colonies from Ramsay Island [EM-470] north to Skedans Islands [EM-740] plus Cumshewa Island [EM-790]). As far as we can tell, Tatsung Rock (EM-460), which had four pairs nesting in 1986, one pair reported in 2004,[318] and four pairs again in 2010 [209] was not surveyed in 2005. Sites on the west coast and south end of Kunghit Island, the northwest corner of Huxley Island, Gil Islet, Helmet Island, Procter Rocks, and islands at the head of Cumshewa Inlet were outside the reported survey areas and were not checked in 2005. For Huxley Island, observers made a cursory survey along the southern half of the west side and saw no birds [307] but did not inspect the historical nesting site at the northwest corner. No data were reported for Lyell Point in Richardson Passage that had two nests in 2004, but Richardson Passage was part of the survey route and we assumed that no birds were present at Lyell Point in 2005. The results of the 2005 survey are summarized in Table A1-6.

On the CWS portion of the 2005 survey, 114 pairs of Black Oystercatchers were confirmed nesting at 51 locations (Figure 614): 93 pairs at 36 colonies where 84 pairs were estimated nesting as of 1990, and 21 pairs at fifteen new nesting locations.[307] New nesting locations included three successfully nesting pairs on tidally-connected rock outcrops on the mudflat at the head of Carpenter Bay on the main shore of Moresby Island. Those and some other unusual nest sites indicated that Black Oystercatchers are more flexible in their choice of nesting habitat than has been previously assumed and that surveys should cover all shoreline areas. LBCS found 78 nests with eggs or chicks in the area they surveyed in 2005. The previous year, LCBS found 66 nests in the same area. As of 1990, 48 pairs were estimated in that area. In the combined area surveyed by CWS and LBCS, 215 pairs were estimated nesting (192 nests with eggs or chicks) in 2005 compared to 132 pairs estimated nesting (75 confirmed with eggs or chicks) in the same area as of 1990. Much of the difference was likely due to more complete coverage of shoreline areas, timing of surveys, and the discovery of many new nesting sites in 2005 (Table A1-6).

**Figure 614.** Black Oystercatcher nest with two chicks and an egg on Marco Rock on the east coast of Moresby Island in 2005. *Photo by Moira J.F. Lemon, 29 June 2005.*

Adding the most recent counts prior to 2005 at sites that were not visited in 2005 would suggest a revised breeding population of 225 (adding only historical sites outside the 2005 survey area) to 230 (adding all historical sites outside and within the 2005 survey area where no data were collected in 2005) pairs of Black Oystercatchers at colonies along the east coast of Moresby Island (Table A1-6).

Most sites where Black Oystercatchers were confirmed nesting during the LBCS and CWS surveys along the east coast of Moresby Island since 1990 were at previously identified seabird colonies. Breeding by Black Oystercatchers had been confirmed at most of those colonies, but at some colonies, breeding had been previously suspected but never confirmed as of 1990 (Garcin Rocks, Howay Island, Alder Island, Arichika Island, Ramsay Rocks, Topping Islands, Titul Island, South Low Island, and Low Island). At others, oystercatchers had been sighted (Figure 615) but there had been no previous evidence of nesting (George Island and Jeffrey Island), or there were no previous records of oystercatchers on the island (the south islet off Hutton Point, which is included in the Hutton Island colony, and Dog Island). In addition, nesting was confirmed at sites that were not designated seabird colonies as of 1990. Oystercatchers had been recorded at some of those sites prior to 1990 (All Alone Stone, Sivart Island, Faraday Island, Stansung Islets, Kunga Island, and Haswell Island) but not at others ("Otter" Islet [we are unsure of the location of this islet but suspect it may be part of the Stansung Islets; see Gaston et al.[123]], Shuttle Island, Lyell Point [western extremity of Lyell Island and included as part of the Lyell Island colony], Nelson Point and the point due west of Nelson Point in Breaker Bay on Louise Island, two rocky islets in Skaat Harbour, a rock off Section Island, an islet in Poole Inlet, a rock at the mouth of Collison Bay southwest of Nest Islets, five sites in Carpenter Bay [three at the head, one in South Bay, and one in Koya Bay], and the rocky point on the southwest side of Treat Bay). In total, 26 new nesting locations of Black Oystercatchers have been identified along the east coast of Moresby Island since 1990. In addition, Black Oystercatchers have been found breeding again at two sites where they were historically suspected nesting but were absent as of 1990 (Titul Island and Garcin Rocks; Figure 616).

**Figure 615.** Frequently during surveys, adult Black Oystercatchers (left) are seen on islands but no evidence is found to confirm breeding. Subsequent surveys may confirm breeding at such sites and even at sites where no oystercatchers were previously seen. It is thus important during each survey to search for nesting oystercatchers in all suitable habitats, and not just where they have historically been found nesting, to obtain an accurate estimate of the total breeding population in an area. *Photos by R. Wayne Campbell, Slug Islet, BC, 25 May 1996.*

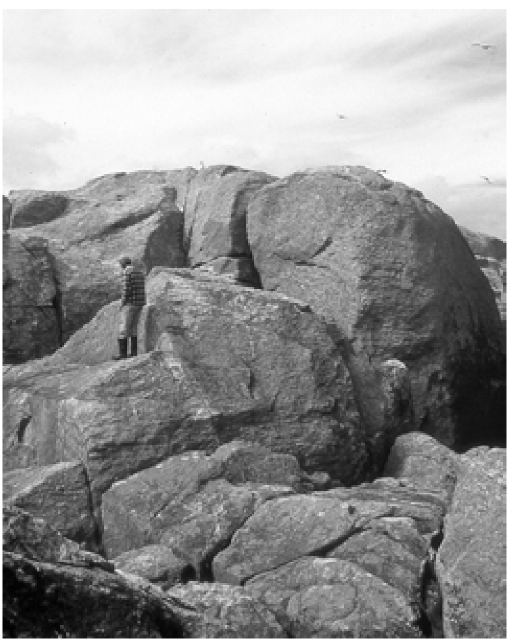

**Figure 616.** The rocky habitat on Garcin Rocks was a suspected Black Oystercatcher nesting site as of 1990; nesting was confirmed there during more recent surveys. *Photo by Michael S. Rodway, 18 June 1986.*

In Table A1-6, we have assigned new colony names to the newly discovered nesting locations, sometimes grouping adjacent unnamed islets under one colony designation (e.g., three islets at the head of Carpenter Bay have been grouped as "Carpenter" Islets). These colony designations bring the total number of known, historical breeding sites for the east coast Moresby Island region to 89 compared to 66 known colonies as of 1990 (see Table 6 on page 66 in Part 1 [231]). As far as we can tell from available data, six of these sites were not used in 2005 (Marshall Island, Park Island, Kloo Rock, Tuft Islets, Kunga Island, and Haswell Island). Others with no data from 2005 also may not have been used that year (see above). Over all years, breeding has been confirmed at 84 of the 89 known historical sites: Wanderer Island (EM-350), Park Island (EM-370), Gil Islet (EM-600), and Helmet Island (EM-660) remain historically suspected breeding sites, and breeding was not confirmed in 2005 at the new site on the rock south of Section Island (newly designated as EM-378).

**Table A1-6.** Known nesting sites of Black Oystercatchers on the east coast of Moresby Island as of 2018, results of the extensive survey conducted in 2005 as a collaborative effort among CWS, Gwaii Haanas, and LBCS, [307, 316, 317] and results of the most recent (2018) surveys at colonies being monitored by Gwaii Haanas and LBCS.[211] For 2005, if no data exist for a site, then the year and count from the most recent survey prior to 2005 is given in parentheses. For 2018, a dash indicates that sites were not included in the Gwaii Haanas/LBCS monitoring program and were not surveyed that year. An asterisk indicates new nesting locations discovered since 1990. New colony numbers assigned since 1990 are in bold.

| | | Nests or breeding pairs | |
|---|---|---|---|
| **Site code** | **Site name** | **2005[a]** | **2018[b]** |
| EM-010 | Kunghit Island - Bowles Rock | (1986 – 3) | - |
| | - Barber Point | (1986 – 1) | - |
| | - Cape west | (1986 – 1) | - |
| | - Ballard Rock | 0 | - |
| | - Luxana Rock | 1 | - |
| * | - SW Treat Bay | 1 | - |
| | - Pt. S of Lyman Point | 0 | - |
| | - Blackburn Rock | 2 | - |
| EM-020 | Marshall Island | 0 | - |
| EM-030 | Gull Islet | 2 | - |
| EM-040 | Rainy Islands | 5 | - |
| EM-060 | Haydon Rock | 1 | - |
| EM-070 | Charles Islands | 1 | - |
| EM-090 | Garcin Rocks | 2 | - |
| EM-100 | Langtry Island | 4 | - |
| **EM-103*** | "Koya Bay" Islet (west islet 18 ft. high) | 2 | - |
| **EM-105*** | "South Cove" Islet (west islet) | 1 | - |
| **EM-107*** <br> * | "Carpenter" Islets (head of Carpenter Bay) <br> - 180 ft. high SE islet | 1 | - |
| * | - 90 ft. high islet | 1 | - |
| * | - 14 ft. high islet in mudflat | 1 | - |
| EM-110 | Samuel Rock | 2 | - |
| EM-120 | Rankine Islands - west | 3 | - |
| | - east | 2 | - |
| EM-130 | Marion Rock | 2 | - |
| **EM-138*** | "Collison Bay" Islet (220 ft. high) | 1 | - |
| EM-140 | Nest Islets | 5 | - |
| EM-150 | Inner Low Rock | 1 | - |
| EM-160 | Joyce Rocks | 2 | - |
| EM-190 | Green Rock | 3 | - |
| EM-200 | "Jedway" Islets - rock off Kankidus Point | 1 | - |
| EM-210 | Bush Rock | 1 | - |
| EM-220 | Bolkus Islands | 6 | - |
| EM-230 | Swan Islands | 5 | - |
| EM-240 | "Pelican" Rock | 1 | - |
| EM-250 | Slug Islet | 2 | - |
| EM-260 | Rock Islet | 4 | - |
| EM-270 | Skincuttle Island | 4 | - |
| EM-280*[c] | George Island | 2 | - |
| EM-290*[c] | Jeffrey Island | 2 | - |
| EM-300 | East Copper Island | 2 | - |
| EM-310 | Howay Island | 3 | - |
| **EM-315*** | "Poole Inlet" Islet (west islet) | 1 | - |
| EM-320 | "Island Bay" Group | 7 | - |

**Table A1-6.** cont'd

| Site code | Site name | Nests or breeding pairs 2005[a] | 2018[b] |
|---|---|---|---|
| EM-330 | "Kat" Rocks | 5 | - |
| **EM-335*** | "Skaat Harbour" Islets - N Rock | 3 | - |
| * | -18 ft. high islet | 1 | - |
| EM-350 | Wanderer Island | 1S | - |
| EM-360 | Sels Islet | 3 | - |
| EM-370 | Park Island | 0 | - |
| **EM-378*** | Section Island - SW Rock | 1S | - |
| EM-390 | Nakons Islet | 1 | - |
| EM-400 | Alder Island | 4 | 5[4] |
| EM-410 | Huxley Island | (1977 – 2) | - |
| EM-420 | Arichika Island | 1 | 4[4] |
| **EM-422***[c] | All Alone Stone | 1 | - |
| EM-430 | Marco Rock | 4 | - |
| EM-440* | Hutton Island | 1 | - |
| * | - islet south of Hutton Point | 2 | - |
| **EM-448***[c] | Sivart Island | 1 | - |
| EM-450 | Hoskins Islets | 1 | - |
| EM-460 | Tatsung Rock | (2004 – 1) | 6[5] |
| EM-470 | Ramsay Island | 10 | 12[12] |
| EM-480 | Ramsay Rocks | 2 | 0 |
| EM-490 | Bischof Islands | 9 | 14[13] |
| EM-500 | Hotspring Island | 1 | 2[2] |
| EM-510 | House Island | 1 | 3[3] |
| EM-520 | Kloo Rock (1 nest with an egg in 1984) | 0 | 0 |
| EM-530 | Murchison Island | 5 | 10[10] |
| **EM-535***[c] | Faraday Island | 1 | 4[4] |
| EM-540 | Agglomerate Island | 2 | 4[3] |
| EM-550 | Kawas Islets | 4 | 6[6] |
| EM-560 | Tar Islands | 5 | 14[13] |
| EM-570* | Tuft Islets | 0 | 1[1] |
| EM-580 | Lyell Island - Dodge Point | 4 | 1[1] |
| * | - Lyell Point (2 nests in 2004) | 0 | - |
| EM-590 | Topping Islands - rock to S | 2 | - |
| **EM-591*** | Shuttle Island | 3 | - |
| EM-600 | Gil Islet | (1977 – 1S) | - |
| EM-610* | Dog Island | 1 | 1[1] |
| **EM-615***[c] | Stansung Islets | 1 | 0 |
| EM-620 | Kul Rocks | 4 | 5[5] |
| EM-630 | Kelo Rocks | 2 | 2[2] |
| **EM-631***[c] | Kunga Island | 0 | 1[1] |
| **EM-635*** | Tanu Rock | 1 | - |
| EM-640 | Titul Island | 1 | 0 |
| EM-650 | Lost Islands | 8 | 6[4] |
| EM-660 | Helmet Island (2 suspected in 1971) | (1983 – 0) | - |
| EM-670 | Procter Rocks | (1977 – 1) | - |
| **EM-678***[c] | Haswell Island (1 active nest in 2009) | 0 | 0 |
| EM-680 | Kingsway Rock | 2 | 7[6] |
| EM-690 | Reef Island | 7 | 13[11] |
| EM-700 | South Low Island | 5 | 2[2] |
| EM-710* | Louise Island - Breaker Bay (including Nelson Point and point to west on Louise Island) | 2 | 0 |

**Table A1-6.** cont'd

| | | Nests or breeding pairs | |
|---|---|---|---|
| **Site code** | **Site name** | **2005[a]** | **2018[b]** |
| EM-720 | Limestone Islands | 4 | 3[3] |
| EM-730 | Low Island | 2 | 3[3] |
| EM-740 | Skedans Islands | 6 | 8[8] |
| **EM-745***[d] | "Lagoon" Islet | - | - |
| EM-760 | Nedden Island | (1977 – 2) | - |
| EM-770 | Oliver Islet | (1977 – 1) | - |
| **EM-775*** | "Moresby Camp" Island | (1996 – 1) | - |
| EM-780 | Kingui Island | (1977 – 1) | - |
| EM-790 | Cumshewa Island | 3 | 3[1] |
| | **Total counted in 2005** | **215** | **n/a** |
| | **Total including previous counts** | **230** | **n/a** |

[a] An "S" indicates suspected breeding but no eggs or young were found to confirm breeding.
[b] Total nests followed by nests with eggs or young in brackets.
[c] Black Oystercatchers had been present on past surveys but no evidence of nesting had been found (see colony accounts or Appendix 3 for sites that were not designated colonies as of 1990).
[d] Two pairs were found nesting on the unnamed islet near the narrows in Lagoon Inlet on 25 May 2010.[315] This is a newly identified nesting site that was not surveyed in other years.

**Glaucous-winged Gull Surveys conducted on the east coast of Moresby Island since 1990 by Laskeek Bay Conservation Society.**

Laskeek Bay Conservation Society has been monitoring Glaucous-winged Gull colonies in the Laskeek Bay area on the east coast of Moresby Island since 1992 (Table A1-7). During the first years of surveys, a slight increase was found in total numbers of nests at five surveyed colonies (Lost Islands, Kingsway Rock, Reef Island, Low Island and Skedans Islands) compared to those from the previous survey in 1986 (from 213 nests in 1986 to 235 in 1992 and 244 in 1993), although contrary trends were seen at individual colonies.[116, 118] Gaston and Lawrence [118] reported large numbers of Bald Eagles roosting on Low and Skedans islands in 1992 where numbers of nesting gulls were much reduced compared to those of 1986. A total of 360 nests were counted at six colonies surveyed in 1994 (Cumshewa Island was added),[123] representing a 44% increase from the 250 nests counted at those colonies in 1986. Increases were most pronounced on Lost Islands where numbers of nests almost tripled.

Since 1994, total numbers of gull nests have fluctuated at five colonies in Laskeek Bay that have been surveyed regularly (only intermittent data have been collected at Reef Island), although comparisons since 1994 are somewhat compromised because empty nests were included in all counts conducted prior to 1990 and up to 1994 but not in some of the Laskeek Bay counts after 1994 (empty nests were counted but not reported [303]). Except for a particularly high count of 413 nests in 2001 and a low count of 271 nests in 2010, numbers of nests ranged between 300 and 400 from 1994 to 2017 (Table A1-7). However, since 2017 numbers have decreased; only 231 nests were counted on the most recent survey in 2019, which is lower than the number of nests found on the same colonies in 1986. The long-term average number of nests with eggs counted on these six colonies since 1994 has been 263, which is higher than the 156 nests with eggs or young found at these sites during the 1986 census,[227] but only 149 and 184 nests with eggs were seen during the two most recent surveys in 2018 and 2019, respectively.

Thus, the distribution of Glaucous-winged Gulls nesting in Laskeek Bay has changed, with a greater proportion of nests on Lost Islands and Kingsway Rock, and few or zero nests on Low, Skedans, and Cumshewa islands, where as many as 70, 49, and 37 nests were counted, respectively, in the 1970s and 1980s. Overall abundance has been generally higher over the last three decades than in the 1980s, although trends are difficult to detect with only one year of survey data from the 1980s, but reduced numbers seen since 2017 are cause for concern.

Large numbers of Bald Eagles have been seen on Low Island in several years, including congregations of 50-80 eagles in 2010.[136] In 2017, three broken gull eggs, six gull feather piles, and one dead adult were found on Lost Islands, and one broken gull egg and two feather piles were found on Kingsway Rock.[318]

**Table A1-7.** Numbers of Glaucous-winged Gull nests at colonies in the Laskeek Bay area on the east coast of Moresby Island that have been monitored by the Laskeek Bay Conservation Society since 1992.[116, 118, 123, 136, 138, 214, 215, 318] Numbers are total nests counted with numbers of nests with eggs or young in brackets.

| Site code | Site name | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|---|---|---|---|---|---|---|---|---|---|
| EM-650 | Lost Islands | 120[118] | 140[134] | 221[165] | [145] | [175] | [226] | [293] | 92[86+][a] |
| EM-680 | Kingsway Rock | 94[90] | 79[79] | 95[65] | [56] | [46] | [36] | [22] | [32] |
| EM-690 | Reef Island | 2S | 1 | 1 | - | - | - | - | 2[2] |
| EM-730 | Low Island | 1 | 4[2] | 8[2] | [1] | [6] | [0] | [9] | 12[9] |
| EM-740 | Skedans Islands | 18[11] | 20[12] | 16[11] | [11] | [1] | [8] | [5] | 0 |
| EM-790 | Cumshewa Island | - | - | 19[7] | [4] | [2] | [6] | [2] | 0 |
| **Total at 5 monitored colonies** (excluding Reef Island) | | n/a | n/a | 359[250] | [217] | [230] | [276] | [331] | [137+][a] |

| Site code | Site name | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|---|---|
| EM-650 | Lost Islands | 231[220] | 366[340] | 305[184] | 323[170] | 202[188] | 318[271][c] | [252] | 272[239] |
| EM-680 | Kingsway Rock | 20[18] | 25[18] | 53[48] | 42[27] | 67[40] | 71[61] | [20] | 35[30] |
| EM-690 | Reef Island | - | 2[2] | - | - | - | - | - | - |
| EM-730 | Low Island | 10[6] | 14[9] | 11[8] | 12[5] | 7[4] | 6[6] | [9] | 8[6] |
| EM-740 | Skedans Islands | 0 | 5[4] | 4[3] | 6[3] | 5[4] | 0 | [2] | 3[2] |
| EM-790 | Cumshewa Island | 2S[b] | 3[1] | 1S[b] | 1 | 0 | 0 | [0] | 0 |
| **Total at 5 monitored colonies** (excluding Reef Island) | | 263[244] | 413[372] | [243] | 384[206] | 281[236] | 395[338] | [283] | 318[277] |

| Site code | Site name | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|
| EM-650 | Lost Islands | 271[236] | 248[224] | 224[195] | 254[236] | 220[196] | 228[213] | 235[202] | 252[228] |
| EM-680 | Kingsway Rock | 48[47] | 62[36] | 42[17][d] | 96[92] | 94[33][d] | 92[81] | 78[77] | 79[70] |
| EM-690 | Reef Island | - | - | - | - | - | - | 1S | 6S[f] |
| EM-730 | Low Island | 7[6] | 8[6] | 4[2] | 5[5] | 2S[b] | 3[1] | 1 | 3[1] |
| EM-740 | Skedans Islands | 1 | 0 | 1 | 0[e] | 0[e] | 0[e] | 0[e] | 0[e] |
| EM-790 | Cumshewa Island | 0 | 0 | 0 | 0[e] | - | 0 | 0 | - |
| **Total at 5 monitored colonies** (excluding Reef Island) | | 327[290] | 318[266] | 271[215][d] | 355[333] | 316[229] | 323[295] | 314[280] | 334[299] |

| Site code | Site name | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|
| EM-650 | Lost Islands | 244[227] | 228[167] | 150[102] | 182[147] |
| EM-680 | Kingsway Rock | 68[61] | 76[66] | 53[47] | 47[37] |
| EM-690 | Reef Island | 3S[f] | 5S[f] | - | - |
| EM-730 | Low Island | 0[g] | 0 | 3S[b] | 2S[b] |
| EM-740 | Skedans Islands | 0[e] | 0[e] | 0 | 0 |
| EM-790 | Cumshewa Island | 0[e] | - | 0 | 0 |
| **Total at 5 monitored colonies** (excluding Reef Island) | | 312[288] | 304[233] | 206[149] | 231[184] |

[a] Only a partial count was conducted on Lost Islands in 1999.
[b] Only empty nests were found.
[c] Includes 12 depredated nests.
[d] Kingsway Rock was surveyed only on 29 May in 2010 and 27 May in 2012; eggs were likely still being laid.
[e] Surveyed from the water; no adults were visible.
[f] Pairs or birds on nests were seen from the water.
[g] Two pairs were present but no nests were found.

A survey of many of the Glaucous-winged Gull colonies along the east coast of Moresby Island was conducted by CWS in collaboration with LBCS in 2005.[225, 305, 318] Counts at 27 sites that were surveyed in 1986 and 2005 suggested an 8% increase in gull populations over those two decades (Table A1-8; Figure 617). Four new nesting locations were identified in 2005, bringing the number of known historical nesting sites of Glaucous-winged Gulls on east coast Moresby Island to 43.

**Figure 617.** Between 1986 and 2005, the nesting population of Glaucous-winged Gulls increased by 8% at 27 sites surveyed on the east coast of Moresby Island. *Photo by Michael S. Rodway, Garcin Rocks, BC, 18 June 1986.*

**Table A1-8.** Glaucous-winged Gull nests counted at colonies along the east coast of Moresby Island in 1986,[227] and 2005.[225, 305, 318] All known colonies are listed; a dash indicates that sites were not surveyed. An asterisk indicates new nesting locations discovered since 1990. New colony numbers assigned since 1990 are in bold. See Appendix 2 on pages 467-468 for an explanation of the letter codes used to qualify population estimates in 1986.

| Site code | Site name | 1986 | 2005 |
|---|---|---|---|
| EM-010 | Kunghit Island - "Bowles" Rock[a] | 11[a] | - |
| | - "Ballard" Rock | 6e | - |
| | - "Luxana" Arch | 4e | 5 |
| | - Lyman Islet | 8e | 7 |
| EM-030 | Gull Islet | 1eS | 3 |
| EM-040 | Rainy Islands | 26 | 19 |
| EM-060 | Haydon Rock | 1 | 0 |
| EM-090 | Garcin Rocks | 102 | 116 |
| EM-110 | Samuel Rock | - | 2 |
| EM-120 | Rankine Islands - west | 1 | 0 |

**Table A1-8.** cont'd

| Site code | Site name | 1986 | 2005 |
|---|---|---|---|
| | - east | 42 | 66 |
| EM-130 | Marion Rock | 1 | 0 |
| EM-140 | Nest Islets | 0 | 1 |
| **EM-138*** | "Collison Bay" Islet (220 ft. high) | - | 1 |
| EM-150* | Inner Low Rock | 0 | 1 |
| EM-160 | Joyce Rocks | 197 | 209 |
| EM-190 | Green Rock | 3 | 0 |
| EM-210* | Bush Rock | 0 | 1 |
| EM-220 | Bolkus Islands | 1 | 0 |
| EM-230 | Swan Islands | 1 | 1 |
| EM-240 | "Pelican" Rock | 1S | 0 |
| EM-250 | Slug Islet | 48 | 0 |
| EM-260 | Rock Islet | 1 | 1 |
| EM-310 | Howay Island | 10e | 11 |
| EM-320 | "Island Bay" Group | 0 | - |
| EM-330 | "Kat" Rocks | 6 | 4 |
| EM-400 | Alder Island | - | 0 |
| EM-430 | Marco Rock | 18 | 4 |
| **EM-444*** | "Haswell Bay" Islet (7 ft. high) | - | 2 |
| EM-460 | Tatsung Rock | 11 | - |
| EM-470 | Ramsay Island | 16e | - |
| EM-480 | Ramsay Rocks | 5 | - |
| EM-520 | Kloo Rock | - | - |
| EM-530 | Murchison Island | 27e | - |
| EM-540 | Agglomerate Island | 2 | - |
| EM-550 | Kawas Islets | 11 | - |
| EM-560 | Tar Islands | 32e | - |
| EM-570 | Tuft Islets | - | - |
| EM-620 | Kul Rocks | 0 | - |
| EM-630 | Kelo Rocks | - | - |
| EM-650 | Lost Islands | 75 | 258 |
| EM-680 | Kingsway Rock | 43 | 65 |
| EM-690 | Reef Island | 7 | - |
| EM-700 | South Low Island | 0 | - |
| EM-730 | Low Island | 39 | 3 |
| EM-740 | Skedans Islands | 49 | 0 |
| EM-790 | Cumshewa Island | 37 | 0 |
| | **Total at all sites surveyed in 1986** | **843**[a] | **n/a** |
| | **Total at 27 sites surveyed in both 1986 and 2005** | **715** | **775** |

[a] The "Bowles" Rock location was included in the west coast Moresby Island region in Rodway,[227] which accounts for the difference in the total nests reported for 1986 here and in Rodway.[227]

### Skidegate Inlet Post-1990

Surveys for Black Oystercatchers were conducted by Gwaii Haanas at a number of colonies in Skidegate Inlet on 13 June 1996, 10 May and 15 June 1997, and 21 May, 3 June, and 18 June 2005.[317] The following table (Table A1-9) summarizes the results of those surveys in comparison to counts from 1990 and lists all known historical colonies (Figure 618). Four new nesting locations were discovered during the surveys since 1990. Other sites were checked with no evidence of nesting: Jewell Island (SI-040) was checked in 1990, 1996, and 2005; and Flowery Islet (SI-050) was checked in 1990, 1996, 1997, and 2005; no sign of nesting by oystercatchers has ever been recorded at those two sites. At eight nesting sites surveyed in all four years, a total of 19, 16, 7, and 17 nesting pairs were found in 1990, 1996, 1997, and 2005, respectively, suggesting little population change except for the low count in 1997 (Figure 619). A large proportion of nests (10 of 21) in 1996 were empty.

**Figure 618.** On treed islands like Robber Island, the nesting habitat for Black Oystercatchers is restricted to rocky shoreline areas. Between 1974 and 1990, oystercatchers were found nesting on Robber Island only in 1990; the island has not been surveyed since. *Photo by R. Wayne Campbell, 18 June 1974.*

**Figure 619.** Three to five pairs of Black Oystercatchers were found nesting on Hallet Island during each of four surveys conducted between 1974 and 1990; the island has not been surveyed since 1990. *Photo by R. Wayne Campbell, 18 June 1974.*

**Table A1-9.** Black Oystercatcher nests counted at some colonies in Skidegate Inlet in 1996, 1997, and 2005,[317] and counts from 1990 at all known colonies in Skidegate Inlet.[285] A dash indicates that sites were not surveyed. An "S" following a number indicates that no eggs or young were seen to confirm nesting. An asterisk indicates new nesting locations discovered since 1990. New colony numbers assigned since 1990 are in bold.

| Site code | Site name | 1990 | 1996 | 1997 | 2005 |
|---|---|---|---|---|---|
| **SI-005*** | Spit Point[a] | - | - | - | 1 |
| SI-020 | Gillatt Island | 3 | 3 | 2 | 4 |
| SI-030 | Torrens Island | 0 | 1S | - | 0 |
| SI-060 | "Kwuna" Rocks | 1 | 0 | 0 | 1S |
| SI-070 | "Alliford" Islets | 6 | 4 | 2 | 4 |
| SI-080 | Bush Island | 3 | 2S | 1S | 3 |
| SI-085 | Robber Island | 1 | - | - | - |
| **SI-088*** | Transit Island - islets to S | 0 | 1 | 0 | 1 |
| SI-090 | Lillihorn Island | 2 | 2S | 0 | 1S |
| SI-100 | Sandilands Island | 4 | 3 | 1 | 2 |
| **SI-105*** | Deena Creek - mouth | - | 1S | - | 1 |
| SI-110* | Maude Island | 0 | 1 | 1 | 1 |
| SI-120 | Maple Island | 4 | 2S | - | 3 |
| SI-130 | Gooden Island | 1 | 1 | - | 1 |
| SI-150 | Robertson Island | 1 | - | - | - |
| SI-160 | Roderick Island | 0 | - | - | - |
| SI-170 | Balch Islands | 1 | - | - | - |
| SI-180 | Tree Islet | 1 | - | - | 1S |
| SI-190 | Angle Island | 1 | - | - | - |
| SI-200 | Claudet Island | 3 | - | - | - |
| SI-210 | Burnt Island | 3 | - | - | - |
| SI-218 | Weed Rock | 4 | - | - | - |
| SI-220 | "Dyer Point" Rocks | 3 | - | - | - |
| SI-230 | Meyer Island | 1 | - | - | - |
| SI-250 | "Slatechuck" Islets | 1 | - | - | - |
| SI-260 | Hallet Island | 4 | - | - | - |
| SI-280 | Sandstone Islands | 1 | - | - | - |
| SI-290 | Berry Islands | 4 | - | - | - |

[a] Called "Sandspit Point" in the data file but we assume it refers to Spit Point.

An unusual Pigeon Guillemot nest site was discovered on 21 July 2007 aboard the small ferry, the *M.V. Kwuna* that travels back and forth all day between Graham and Moresby islands.[84] One pair of Pigeon Guillemots was successfully raising two chicks inside one of the metal pillars that house the hydraulics for the landing ramp, delivering food to the chicks while the ferry was moving. Ken Summers noted the same behaviour in 2008.[311] There were 10 birds roosting on the ferry on 22 July and 17 birds, including one carrying a fish, on 2 August 2008 (Figure 620).

**Figure 620.** First reported in 2007, Pigeon Guillemots appear to regularly nest onboard the *M.V. Kwuna* that is on the move all day, ferrying passengers between Alliford Bay on Moresby Island and Skidegate on Graham Island. *Photo by Ken R. Summers, Skidegate Inlet, BC, 2 August 2008.*

A new nesting site was reported for Glaucous-winged Gulls at the Skidegate ferry dock in 2008 (Table A1-10). Ken Summers made a few incidental observations and partial counts while paddling his kayak through some of the eastern colonies (Flowery Islet to Bush Island) on 12 July 2009 and some western colonies (Burnt Island to Meyer Island) on 19 June 2009.[311] Most records listed below for colonies in Skidegate Inlet are from Ken's notes for those days.

**Table A1-10.** Incidental post-1990 data for seabird colonies in Skidegate Inlet. Unless otherwise indicated, records are by Ken Summers from 12 July 2009 (Flowery Islet to Bush Island) and 19 June 2009 (Burnt Island to Meyer Island).[311] Sightings were made from the water, except on Bush Island where Ken landed at the south end.

| Species | Post-1990 data |
|---|---|
| **SI-045 Skidegate - Ferry Dock** | |
| GWGU | Gulls nesting on a piling were photographed on 24 June 2008 (see Figure 42).[307] |
| PIGU | A pair was reported nesting on pilings at the dock on 27 Aug 2001, 26 birds were recorded on 13 May 2015, and 35 birds were present on 1 August 2018.[315] |
| **SI-050 Flowery Islet** | |
| BLOY | Two groups of 4 birds were seen but there was no indication of nesting. |
| GWGU | Seven nests visible with incubating adults, 1 nest with 3 young, and another 26 adults were standing on the colony. |
| PIGU | One bird. |
| **SI-060 "Kwuna" Rocks** | |
| GWGU | Only 1 gull seen on the north side. |
| **SI-070 "Alliford" Islets** | |
| BLOY | Five birds; one behaving secretively. |
| GWGU | Present but no count made. |
| PIGU | Two birds. |
| **SI-080 Bush Island** | |
| BLOY | Three pairs; all secretive. |
| GWGU | Twelve adults seen; suspected nesting under rose bushes. |
| PIGU | Counted 14 birds on the rocks. |
| **SI-090 Lillihorn Island** | |
| PIGU | Circumnavigation of the island yielded a count of 122 birds on 91 May 2013.[315] Most were paired off and sitting on rocks near nest crevices. |
| **SI-130 Gooden Island** | |
| GWGU | Nests with young were reported on 6 July 2014 on a colony across the bay from Premier Creek.[315] This record from eBird likely referred to Gooden Island but could possibly have referred to Maple Island. |
| **SI-210 Burnt Island** | |
| BLOY | Two birds on northeast rock. |
| GWGU | Four agitated adults that had been disturbed by a deer. |
| PIGU | A total of 44 birds counted: 14 on rocks and 24 on the water around northeast treed islet and 6 between eastern island and main island. Birds were flying in and out of boulders at the edge of the forest. |
| **SI-218 Weed Rock** | |
| BLOY | Three birds including a pair that was very secretive on the grassy top. |
| GWGU | Four noisy adults in the intertidal at the east end. |
| **SI-230 Meyer Island** | |
| BLOY | Pair with chick at south end. |
| GWGU | Two adults present. |
| PIGU | Six on water at south end and 7 on water along east side. |

## Masset and Juskatla Inlets Post-1990

Tony Gaston surveyed Black Oystercatchers in 2006 and 2007.[303] Results of his survey are compared with data from 1986 in Table A1-11. All but two historical nesting sites were visited in 2006/2007. At 14 sites visited in 1986 and again in 2006/2007, numbers of nesting oystercatchers declined from 35 to 25 pairs (Figure 621). No nests were found in 2006/2007 at five sites that were occupied in 1986.

**Figure 621.** At 14 sites in Masset and Juskatla inlets, including Modeets Islands (right) and Mamin Islets, the number of breeding Black Oystercatchers decreased by 10 pairs between 1986 and 2006/2007. *Photos by Michael S. Rodway, 26 June 1986.*

**Table A1-11.** Black Oystercatcher nests counted during surveys in Masset and Juskatla inlets on 24-26 June 1986 [227] and on 11 June 2006 (MI-030 to MI-110) and 22 June 2007 (MI-120 to MI-160).[303] A dash indicates that sites were not surveyed.

| Site code | Site name | 1986 | 2006/2007 |
|---|---|---|---|
| MI-010 | Sloop Islet | 1 | - |
| MI-020 | Ship Kieta Island | 0 | - |
| MI-030 | Dawson Islands | 2 | 3 |
| MI-040 | Kwaikans Island | 4 | 6 |
| MI-050 | McCreight Island | 1 | 0 |
| MI-060 | Wathus Island | 1S | 0 |
| MI-070 | Mutus Island | 4 | 9 |
| MI-080 | Learmonth Island | 4 | 0 |
| MI-090 | Ross Islets | 1 | 1S |
| MI-100 | Powell Island | 0 | 0 |
| MI-110 | Cowley Islands | 2 | 0 |
| MI-120 | Ohala Islets | 1S | 0 |
| MI-130 | Steilta Islets | 3 | 1 |
| MI-140 | Seegay Islets | 7 | 2 |
| MI-150 | Modeets Islands | 2 | 2 |
| MI-160 | Mamin Islets | 3 | 1 |
| MI-170 | Harrison Islands | 1S | - |
| **Total nesting pairs** | | **37** | **25** |

**North Coast Graham Island Post-1990**

Birds Canada reported Black Oystercatchers nesting on rocky areas in the McIntyre Beach and Rose Spit Important Bird Area.[13] This record may indicate a new nesting site for Black Oystercatchers since 1990 or it may just refer to previous nesting records at Yakan and Skonun points.

## APPENDIX 2.
## DATA CODES USED ON SUMMARY TABLES

See Key to Summary Tables in Part 1 (pages 53-56)[231] 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., x3) 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 all surface nesting species except Pelagic Cormorant, and for Horned Puffin. For all burrow or crevice nesting species except Horned Puffin, adults in burrows, including adults flying in or out of a burrow, is also considered confirmation. For Pelagic Cormorants, adults sitting on nests is also considered confirmation even if nest contents have not been determined.

**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.

**t**: Calculated population. Equals the number of occupied burrows calculated from standardized transect and occupancy sampling techniques, and measured colony areas. Considered replicable and comparable.

**Number with no code or followed by a code, e.g., 213 or 200eS:** Population estimates in breeding pairs. 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. When a total count is presented for burrow-nesting species, the total has been adjusted with a median occupancy rate to estimate total nesting pairs. One or more letter codes (e, S, or t) 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 only for Pigeon Guillemots, Common Murres, and Tufted and Horned puffins.

**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 in Tables**

Codes for species names follow Campbell and Harcombe.[40]

FTSP: Fork-tailed Storm-Petrel *Oceanodroma furcata*

LSPE: Leach's Storm-Petrel *O. leucorhoa*

PECO: Pelagic Cormorant *Phalacrocorax pelagicus*

BLOY: Black Oystercatcher *Haematopus bachmani*

GWGU: Glaucous-winged Gull *Larus glaucescens*

COMU: Common Murre *Uria aalge*

PIGU: Pigeon Guillemot *Cepphus columba*

MAMU: Marbled Murrelet *Brachyramphus marmoratus*

ANMU: Ancient Murrelet *Synthliboramphus antiquus*

CAAU: Cassin's Auklet *Ptychoramphus aleuticus*

RHAU: Rhinoceros Auklet *Cerorhinca monocerata*

HOPU: Horned Puffin *Fratercula corniculata*

TUPU: Tufted Puffin *F. cirrhata*

PEFA: Peregrine Falcon *Falco peregrinus*

## 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 622). Information on those sites is valuable for monitoring future colonizations, as well as indicating where past effort has been spent. The following table (Table A3-1) lists all recorded visits to potential nesting sites by surveyors searching for nesting seabirds as of 1990. Sources of data are the same as those for confirmed colony sites. 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 (Figure 623), feeding, or sitting on the water. Any evidence suggesting breeding is noted. Sightings and signs of small mammals are also noted. Breeding has been suspected at some sites as of 1990, and post-1990 surveys have confirmed breeding at some sites, 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 622.** There are records for 101 sites around Haida Gwaii that were surveyed for nesting seabirds but no definite evidence of breeding had been found as of 1990. These include: Kunakun Point (top left) and rocks off Tana Point (top right) on the west coast of Graham Island; Monument Rock (bottom left) on the east coast of Moresby Island; and Fraser Island in Masset and Juskatla inlets. *Photos by the authors.*

**Figure 623.** Seabirds, like this pair of Black Oystercatchers, were often seen roosting on sites where nesting by seabirds has never been documented. *Photo by R. Wayne Campbell.*

**Table A3-1.** Sites surveyed in Haida Gwaii with no record of breeding by seabirds as of 1990. Any adult seabirds, possible evidence of nesting, or mammalian predators observed at these sites are noted. New colony numbers that have been assigned for some of these sites where breeding has been observed since 1990 are in bold.

| SITE NAME | MAP GRID | LAT | LONG | DATE | COMMENTS (SOURCE[a]) |
|---|---|---|---|---|---|
| **West Coast Graham Island** | | | | | |
| Langara Rocks | 103 K/6 | 54°15'40"N | 133°01'30"W | 17 May 1977 | (314) |
| Thrumb Islet | 103 K/3 | 54°14'46"N | 133°05'02"W | 18 May 1977 | (314) |
| Lacy Island | 103 K/3 | 54°13'22"N | 133°05'20"W | 21 May 1977 | (314) |
| "Lepas North" Islets | 103 K/3 | 54°10'23"N | 133°04'20"W | 26 Jul 1977 | along N shore of Lepas Bay, N of "Lepas" Islet (314) |
| Joseph Rocks | 103 F/14 | 53°48'52"N | 133°08'21"W | 27 May 1977 | 5 GWGU, 2 PIGU (314) |
| | | | | 24 Jul 1977 | (314) |
| Beavis Islets | 103 F/11 | 53°44'46"N | 133°02'20"W | 24 Jul 1977 | 2 pairs BLOY suspected nesting; 2 GWGU (314) |
| "Fortier Hill" Islets | 103 F/11 | 53°44'35"N | 133°00'06"W | 24 Jul 1977 | 58 m islet W of Fortier Hill (314) |
| | 103 F/10 | 53°43'11"N | 132°59'57"W | 24 Jul 1977 | 47 m islet W of Fortier Hill (314) |
| "Turner Point" Islets | 103 F/10 | 53°42'29"N | 132°58'31"W | 22 Jul 1977 | W of Turner Point (314) |
| Newington Rock | 103 F/10 | 53°42'25"N | 132°58'43"W | 24 Jul 1977 | (314) |
| Louis Point | 103 F/10 | 53°41'32"N | 133°01'52"W | 22 Jul 1977 | (314) |
| Freeman Island | 103 F/10 | 53°36'00"N | 132°55'50"W | 30 May 1977 | 2 BLOY (314) |
| | | | | 22 Jul 1977 | 1 PIGU (314) |
| "Empire" Islet | 103 F/10 | 53°35'39"N | 132°54'54"W | 22 Jul 1977 | NW of Empire Anchorage; 1 BLOY (314) |
| Hippa Rocks | 103 F/10 | 53°33'47"N | 133°00'29"W | 20 Jul 1977 | wave-washed (314) |
| Marchand Point | 103 F/10 | 53°33'44"N | 132°59'30"W | 21 Jul 1977 | (314) |
| "Nesto" Islets | 103 F/10 | 53°33'47"N | 132°54'39"W | 21 Jul 1977 | Head of Nesto Inlet; 1 BLOY, 1 PIGU (314) |
| "Skelu" Rock | 103 F/10 | 53°30'59"N | 132°57'03"W | 20 Jul 1977 | W of Skelu Point (314) |
| Lauder Island | 103 F/7 | 53°28'49"N | 132°46'36"W | 20 Jul 1977 | 1 BLOY (314) |
| Skwakadanee Point | 103 F/7 | 53°28'07"N | 132°49'44"W | 20 Jul 1977 | (314) |
| Kunakun Point | 103 F/7 | 53°28'07"N | 132°53'53"W | 20 Jul 1977 | 1 BLOY, 1 GWGU (314) |
| Tartu Point | 103 F/7 | 53°26'37"N | 132°42'20"W | 20 Jul 1977 | (314) |
| Clonard Point | 103 F/7 | 53°25'59"N | 132°40'28"W | 20 Jul 1977 | (314) |
| "Givenchy" Islet | 103 F/7 | 53°18'55"N | 132°33'41"W | 19 Jul 1977 | In Givenchy Anchorage (314) |
| Cadman Island and islets | 103 F/7 | 53°17'38"N | 132°39'16"W | 20 Jul 1977 | 1 BLOY, 1 PIGU (314) |
| Tana Point and rocks | 103 F/2 | 53°11'30"N | 132°35'00"W | 18 Jul 1977 | 1 BLOY, 1 PIGU (314) |
| **West Coast Moresby Island** | | | | | |
| Tcenakun Point | 103 F/2 | 53°09'07"N | 132°35'13"W | 18 Jul 1977 | (314) |
| "Boomchain" Headlands | 103 F/1 | 53°02'16"N | 132°26'10"W | 18 May 1986 | N & S of Boomchain Bay (234) |
| "Hastings" Islet | 103 F/1 | 53°00'48"N | 132°15'00"W | 18 May 1986 | N of Hastings Point (234) |
| Horn Island | 103 C/16 | 52°46'00"N | 132°03'28"W | 25 Jul 1977 | (314) |
| Botany Island | 103 B/13 | 52°45'40"N | 131°58'15"W | 25 Jul 1977 | (314) |
| Nangwai Islands | 103 B/5 | 52°24'44"N | 131°36'38"W | 27 Jul 1977 | 2 BLOY; 10 old burrows (314) |
| "Dome" Islet | 103 B/3 | 52°07'12"N | 131°11'37"W | 3 Jul 1977 | NW of Cape Fanny (314) |
| **East Coast Moresby Island** | | | | | |
| Germania Rock | 103 B/3 | 52°07'07"N | 131°00'15"W | 5 Jun 1985 | 27 adult GWGU standing on rock (233) |
| | | | | Jun 1986 | no sign of nesting (233) |
| Ellen Island | 103 B/3 | 52°09'20"N | 131°05'42"W | 5 Jul 1977 | 4 PIGU (314) |
| | | | | 8 Jun 1986 | 4 PIGU, 80 old burrows (233) |
| | | | | Aug 1989-90 | raccoon present (155) |
| | | | | 11 Jun 2009 | 5 PIGU (315) |
| Ross Island | 103 B/3 | 52°09'45"N | 131°07'15"W | 4 Jul 1977 | (314) |
| | | | | 8 Jun 1986 | 26 PIGU offshore; raccoon present (233) |
| | | | | Aug 1989-90 | raccoon present (155) |

**Table A3-1.** cont'd

| SITE NAME | MAP GRID | LAT | LONG | DATE | COMMENTS (SOURCE[a]) |
|---|---|---|---|---|---|
| Huff Rock | 103 B/2 | 52°13'11"N | 130°58'42"W | 4 Jul 1977 | wave-washed (314) |
| "Carpenter" Islets (now designated **EM-107**)[b] | 103 B/6 | 52°14'09"N | 131°09'25"W | 5 Jul 1977 | Head of Carpenter Bay; 2 PIGU (314) |
| Oliver Rock | 103 B/6 | 52°16'33"N | 131°03'31"W | 5 Jul 1977 | wave-washed (314) |
| Goodwin Rock | 103 B/6 | 52°17'09"N | 131°04'06"W | 5 Jul 1977 | wave-washed (314) |
| Deluge Point | 103 B/6 | 52°19'32"N | 131°10'26"W | 27 May 1977 | (314) |
| Bishop Rock | 103 B/6 | 52°19'50"N | 131°09'19"W | 8 Jun 1985 | (233) |
| Harriet Island | 103 B/6 | 52°18'13"N | 131°13'40"W | 26 May 1977 | (314) |
| | | | | Aug 1989-90 | raccoon present (155) |
| "Huston" Rock | 103 B/6 | 52°17'51"N | 131°18'02"W | 7 Jul 1977 | 1 m high rock SE of Huston Point (314) |
| "Huston" Islet | 103 B/6 | 52°18'06"N | 131°18'49"W | 7 Jul 1977 | W of Huston Point; 4 PIGU; 15-20 old burrows (314) |
| "George Bay" Islets | 103 B/6 | 52°18'26"N | 131°20'18"W | 8 Jul 1977 | in George Bay (314) |
| "Tangle" Islets | 103 B/6 | 52°19'25"N | 131°20'42"W | 8 Jul 1977 | in Tangle Cove (314) |
| Burnaby Island | | | | | |
| Poole Point | 103 B/6 | 52°22'20"N | 131°14'43"W | 6 Jul 1977 | 9 BLOY; 20 old burrows (314) |
| S. of Scudder Point | 103 B/6 | 52°25'00"N | 131°15'30"W | 5 May 1985 | steep slopes 3-5 km south of point (233) |
| Scudder Point | 103 B/6 | 52°26'47"N | 131°14'21"W | 6 Jul 1977 | (314) |
| Burnaby Island shore south of Alder Island | 103 B/6 | 52°26'10"N | 131°19'25"W | 24 May 1977 | (314) |
| | | | | Aug 1989-90 | raccoon present (155) |
| Kat Island | 103 B/6 | 52°23'10"N | 131°22'40"W | 10 Jul 1971 | old burrows on NW point (262, 314) |
| | | | | Aug 1989-90 | raccoon present (155) |
| Section Island and SW rock (now designated **EM-378**)[b] | 103 B/6 | 52°25'18"N | 131°22'22"W | 10 Jul 1971 | no burrows (262, 314) |
| | | | | 8 Jul 1977 | (314) |
| | | | | Aug 1989-90 | raccoon present (155) |
| Monument Rock | 103 B/6 | 52°28'14"N | 131°21'26"W | 9 Jul 1971 | 30+ PIGU around rock (262, 314) |
| | | | | 8 Jul 1977 | 7 PECO, 3 BLOY, 6 PIGU (314) |
| | | | | 19 Jun 1986 | 1 BLOY on low rocks (233) |
| All Alone Stone (now designated **EM-422**)[b] | 103 B/6 | 52°29'04"N | 131°24'02"W | 9 Jul 1971 | 4 immature PECO, 1 partial nest; 1 pair BLOY; 14 PIGU; abundant river otter sign (262, 314) |
| | | | | 23 May 1977 | (314) |
| | | | | 8 Jul 1977 | 2 BLOY; some large, inactive burrows (314) |
| Marco Island | 103 B/12 | 52°31'15"N | 131°30'28"W | 15 Jun 1971 | no burrows on NE point (262, 314) |
| | | | | 23 May 1977 | 2 PIGU (314) |
| | | | | Aug 1989-90 | raccoon present (155) |
| Sivart Island (now designated **EM-448**)[b] | 103 B/12 | 52°32'14"N | 131°35'28"W | 23 May 1977 | 2 BLOY (314) |
| | | | | 8 Jul 1977 | (314) |
| | | | | 19 Jun 1986 | (233) |
| De La Beche Island | 103 B/12 | 52°32'22"N | 131°37'40"W | 8 Jul 1977 | 4 PIGU (314) |
| | | | | 19 Jun 1986 | 2 BLOY on NW point (233) |
| | | | | Aug 1989-90 | raccoon present (155) |
| Faraday Island (now designated **EM-535**)[b] | 103 B/11 | 52°36'20"N | 131°29'15"W | 26 Jun 1971 | ~50 PIGU off NE islet (314) |
| | | | | 23 May 1977 | 8 BLOY, 4 GWGU, 23 PIGU (314) |
| | | | | 8 Jul 1977 | 2 PIGU (314) |
| | | | | 16 May 1984 | 5 BLOY, 4 GWGU and 40 PIGU around island (233) |

**Table A3-1.** cont'd

| SITE NAME | MAP GRID | LAT | LONG | DATE | COMMENTS (SOURCE[a]) |
|---|---|---|---|---|---|
| Shuttle Island (now designated **EM-591**)[b] | 103 B/12 | 52°39'30"N | 131°42'00"W | 10 Jul 1977 | 1 empty GWGU nest on small rock (314) |
| | | | | Aug 1989-90 | raccoon present (155) |
| Stansung Islets (now designated **EM-615**)[b] | 103 B/12 | 52°44'01"N | 131°36'42"W | 7 Jun 1971 | 2 BLOY (262, 314) |
| | | | | 17 May 1977 | 14 PIGU (314) |
| | | | | 10 Jul 1977 | BLOY; 5 old burrows (314) |
| Skaga Island | 103 B/11 | 52°41'24"N | 131°23'23"W | 1 Jul 1971 | 4 BLOY, 3 PIGU (262) |
| | | | | 9 May 1982 | 1 PECO in breeding plumage and 4 BLOY (233) |
| Kunga Island (now designated **EM-631**)[b] | 103 B/13 | 52°45'50"N | 131°34'25"W | 6 Jun 1971 | checked N side of E point and E and W sides of north point (262, 314) |
| | | | | 17 May 1977 | (314) |
| | | | | 11 Jul 1977 | 3 PIGU (314) |
| | | | | 3 May 1982 | 14 PIGU on water and rocks opposite Kelo Rocks (233) |
| | | | | 22 May 1982 | 2 BLOY, 1 imm. PIGU (233) |
| | | | | 15 May 1983 | 1 BLOY, 3 GWGU and 6 PIGU around island (233) |
| Flower Pot I. | 103 B/13 | 52°47'04"N | 131°39'05"W | 7 Jun 1971 | (262, 314) |
| | | | | 16 May 1977 | 1 BLOY (314) |
| | | | | 13 May 1983 | 4 BLOY on rocks and 2 PIGU on water (233) |
| Heming Head (Talunkwan Island) | 103 B/13 | 52°50'00"N | 131°38'44"W | 12 Jul 1977 | 11 PIGU (314) |
| | | | | Aug 1989-90 | raccoon present (155) |
| Haswell Island (now designated **EM-678**)[b] | 103 B/13 | 52°51'44"N | 131°41'15"W | 12 Jun 1971 | <10 PIGU around island; 1 ANMU remains (262) |
| | | | | 13 May 1977 | 15 FTSP remains - suspect hundreds nesting (314) |
| | | | | 11 Jul 1977 | (314) |
| | | | | 13 May 1983 | 2 FTSP remains; 1 BLOY; 2 raccoons (233) |
| Kilmington Point | 103 B/13 | 52°52'02"N | 131°49'00"W | 12 Jul 1977 | 1 pair BLOY suspected nesting - 1 empty scape; also 1 PIGU and 6 old burrows recorded (314) |
| Sewell Point | 103 B/13 | 52°54'38"N | 131°53'40"W | 12 Jul 1977 | 50 very small burrows - suspect squirrels (314) |
| "Selwyn" Islet | 103 B/13 | 52°54'54"N | 131°52'39"W | 12 Jul 1977 | N of Selwyn Rocks (314) |
| Davey Islets and rock | 103 G/4 | 53°02'55"N | 131°58'40"W | 12 Jul 1977 | 8 BLOY, 28 PIGU suspected nesting on wharfs (314) |
| Duval Rock | 103 G/4 | 53°03'22"N | 131°53'21"W | 12 Jul 1977 | 2 BLOY (314) |
| Conglomerate Point | 103 G/4 | 53°03'34"N | 131°50'52"W | 12 Jul 1977 | (314) |
| McLellan Island | 103 G/4 | 53°02'45"N | 131°44'54"W | 12 Jul 1977 | 3 squirrels (314) |
| Haans Islet | 103 G/4 | 53°02'21"N | 131°41'13"W | 12 Jul 1977 | (314) |
| **Skidegate Inlet** | | | | | |
| Bare Rocks | 103 F/1 | 53°12'42"N | 132°00'21"W | 18 Jun 1974 | (314) |
| | | | | Jun-Jul 1986 | (308) |
| Transit Island (now designated **SI-088**)[c] | 103 F/1 | 53°12'11"N | 132°01'00"W | 17 Jul 1977 | (314) |
| | | | | Jun-Jul 1986 | (308) |
| "South Bay" Islets | 103 F/1 | 53°09'50"N | 132°03'55"W | 17 Jul 1977 | in South Bay (314) |
| | | | | Jun-Jul 1986 | (308) |
| Fleury Island | 103 F/1 | 53°13'25"N | 132°06'37"W | 17 Jul 1977 | (314) |
| Lina Island | 103 F/1 | 53°13'45"N | 132°07'45"W | 18 Jun 1974 | (314) |
| | | | | 17 Jul 1977 | (314) |
| "Canoe Pt." Islet | 103 F/1 | 53°12'34"N | 132°12'55"W | 17 Jul 1977 | N of Canoe Point (314) |
| "East Narrows" Islets | 103 F/1 | 53°08'51"N | 132°11'48"W | 17 Jul 1977 | at E entrance to East Narrows (314) |
| | | 53°08'46"N | 132°12'24"W | 18 Jul 1977 | (314) |
| "West Narrows" Islets | 103 F/1 | 53°09'01"N | 132°19'55"W | 18 Jul 1977 | at E entrance to West Narrows (314) |
| | | 53°09'00"N | 132°20'43"W | 18 Jul 1977 | (314) |
| | | 53°09'04"N | 132°21'04"W | 18 Jul 1977 | (314) |

**Table A3-1.** cont'd

| SITE NAME | MAP GRID | LAT | LONG | DATE | COMMENTS (SOURCE[a]) |
|---|---|---|---|---|---|
| **Masset and Juskatla inlets** | | | | | |
| Cub Island | 103 F/16 | 53°47’56”N | 132°11’44”W | 30 Jul 1977 | 2 BLOY (314) |
| Ship Island | 103 F/9 | 53°45’22”N | 132°15’34”W | 30 Jul 1977 | 7 BLOY, 26 PIGU (314) |
| Gray Island | 103 F/9 | 53°42’45”N | 132°26’30”W | 31 Jul 1977 | 4 PIGU (314) |
| Wiah Island | 103 F/9 | 53°39’55”N | 132°29’58”W | 31 Jul 1977 | (314) |
| Wharton Island | 103 F/9 | 53°40’10”N | 132°28’20”W | 31 Jul 1977 | (314) |
| Smyth Island | 103 F/9 | 53°40’15”N | 132°27’37”W | 31 Jul 1977 | (314) |
| Simpson Island | 103 F/9 | 53°40’05”N | 132°27’21”W | 31 Jul 1977 | (314) |
| Fraser Island | 103 F/9 | 53°40’30”N | 132°20’20”W | 1 Aug 1977 | (314) |
| Echinus Point | 103 F/9 | 53°40’34”N | 132°17’33”W | 1 Aug 1977 | (314) |
| “Harrison” Islet | 103 F/9 | 53°39’15”N | 132°20’58”W | 1 Aug 1977 | N of Harrison Reef (314) |
| “Begbie” Islets | 103 F/9 | 53°37’17”N | 132°27’00”W | 1 Aug 1977 | W shore Juskatla Inlet, south of Mount Begbie; 1 PIGU (314) |
| “Collinson” Islets | 103 F/9 | 53°36’55”N | 132°25’20”W | 1 Aug 1977 | SW of Seegay Islets, N of Collinson Lake (314) |
| “Stilique” Islets | 103 F/9 | 53°37’21”N | 132°21’48”W | May 1977 | along shore NE of Stilique Bay; 2 GWGU possibly nesting on 26 m islet (159) |
| **North Coast Graham Island** | | | | | |
| Maast Island | 103 K/1 | 54°00’12”N | 132°09’54”W | 30 Jul 1977 | (314) |
| Grassy Islet | 103 K/1 | 54°00’25”N | 132°10’10”W | 30 Jul 1977 | (314) |
| Striae Islands | 103 K/1 | 54°05’21”N | 132°15’23”W | 30 Jul 1977 | (314) |
| Hidden Island | 103 K/1 | 54°06’13”N | 132°17’05”W | 30 Jul 1977 | (314) |
| Refuge Island | 103 K/1 | 54°06’43”N | 132°18’24”W | 30 Jul 1977 | (314) |
| Mazarredo Islands | 103 K/2 | 54°05’22”N | 132°33’18”W | 29 Jul 1977 | 7 BLOY (314) |

[a] Numbers in parentheses refer to entries in the Literature Cited and other sources of information that begin on page 400.
[b] See Appendix 1, Table A1-6, East Coast Moresby Island, Black Oystercatcher surveys on pages 457-459.
[c] See Appendix 1, Table A1-9, Black Oystercatcher nests counted in Skidegate Inlet on page 464.

***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.*

## Index to Colony Names[a]

Colony Page



[a]Names are official,[135] except for names in quotations, which we have assigned to unnamed sites.

**Overleaf:** Glaucous-winged Gull. *Photo by Alan D. Wilson.*


Moresby Island, British Columbia

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