

ANCIENT MURRELETS BREEDING AT TRIANGLE ISLAND, BRITISH COLUMBIA, IN 1949

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Abstract

Based on two 1949 egg sets in the Royal British Columbia Museum, we confirm breeding of Ancient Murrelets (*Synthliboramphus antiquus*) at Triangle Island, in the Scott Islands off the northwestern tip of Vancouver Island, British Columbia, south of their main breeding range. Possible evidence of nesting also was found at nearby Lanz and Cox Islands, also in the Scott Islands, in 1950. Nesting by small numbers may still occur at Triangle Island without detection. However, introduced mammalian predators on Lanz and Cox Islands and reduced prey from changes in ocean climate may have led to extirpation of this small breeding population at the southern periphery of the breeding range.

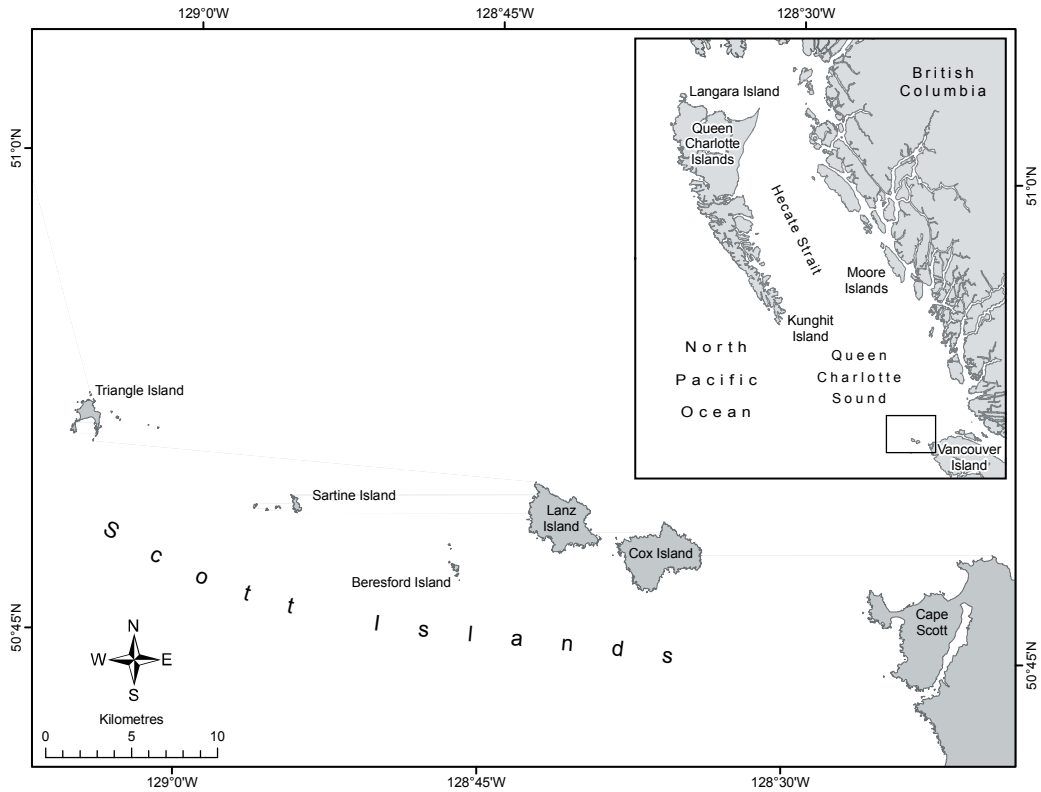


Figure 1. Map of the Scott Islands, BC, showing the respective locations of Triangle, Sartine, Beresford, Lanz, and Cox Islands and other places mentioned in the text.

In the northeastern Pacific Ocean, the Ancient Murrelet (*Synthliboramphus antiquus*) nests in large numbers on the Queen Charlotte Islands (Haida Gwaii), BC, in moderate numbers in southeast Alaska and the Aleutian Islands, and in small numbers in Russia, Japan, Korea and northern China (Rodway 1991, Gaston 1992). Kunghit Island, which comprises the southern tip of the Queen Charlotte Islands (Figure 1), is the southernmost known colony in the northeastern Pacific Ocean. South and east of the Queen Charlotte Islands, no breeding colonies are known, although single nests have been found on the Moore Islands on the north mainland BC coast in 1970, and on Carroll Island on the northwest coast of the Olympic Peninsula,

Washington, in 1924 (Hoffmann 1924, Campbell et al. 1990, Sealy and Carter 2007). These isolated nests are intriguing because many family groups of Ancient Murrelets have been observed hundreds of kilometres south of the Queen Charlotte Islands in summer, and these suggest Ancient Murrelet either disperse there rapidly after leaving their nests or nest locally in small numbers (Sealy and Carter 2007, Sealy et al., unpubl. data).

Between 2 and 9 February 2009, while examining Ancient Murrelet eggs in the collection of the Royal British Columbia Museum (RBCM) in Victoria, BC, H.R. Carter and M.C.E. McNall found a clutch of two Ancient Murrelet eggs collected at Triangle Island (Figure 2) on 1 July 1949 (RBCM #E242),



Figure 2. Triangle Island, located off the northwestern tip of Vancouver Island, BC, supports the largest aggregation of breeding seabirds in the province. August 1974 (R. Wayne Campbell).

and a single Ancient Murrelet egg collected at the same location on the same date (RBCM #E243) (see Figures 3 to 5). To find all information on these eggs, McNall also consulted older egg cards stored at the museum that were likely prepared by museum staff when the specimens were originally accessioned into the museum collection (Figures 6 and 7). These egg cards noted that both sets of eggs had been found in burrows with grass-lined nests by G.C. (Clifford) Carl, although the collector was reported as A. (Arthur) L. Meugens. Handwritten in pencil on the newer tag for RBCM #E243 in R. Wayne Campbell's (RBCM Curator of Ornithology, 1973-92) handwriting (Figure 5) was the following note: *check location. Langara sometimes called Triangle in error. Meugens was on Langara in 1949 – BCPM report.*

Carter and McNall reconfirmed the identity of these eggs as those of the Ancient Murrelet through comparison of their gray or buffy brown base colour, markings, size, and shape with other

eggs of the Ancient Murrelet and Marbled Murrelet (*Brachyramphus marmoratus*) in the RBCM collection. Egg measurements (length x width [mm]) taken by McNall were: (a) RBCM #E242 (lighter egg) - 55.5 x 38.3; (b) RBCM #E242 (darker egg) - 57.6 x 38.7; and (c) RBCM #E243 - 59.8 x 36.7. These measurements are similar to those reported from the Queen Charlotte Islands; the lighter and slightly smaller egg of RBCM #E242 may be the first egg of the clutch, based on studies at Reef Island (SE Queen Charlotte Islands) in 1984-85, where the first eggs averaged slightly smaller than second eggs (Gaston 1992, see also Sealy 1976). Below, efforts by Carter and S.G. Sealy to validate the locality of the collection of these eggs are described. We conclude that these Ancient Murrelet eggs were collected at Triangle Island in 1949, constituting the first documented breeding of this species for Triangle Island. In addition, we discuss other evidence of possible nesting at Triangle Island and the other Scott Islands in 1949-50 and later.



Figure 3. Clutch of Ancient Murrelet eggs collected on 1 July 1949 at Triangle Island, BC (RBCM #E242); lighter egg on left (Photo by M.C.E. McNall).

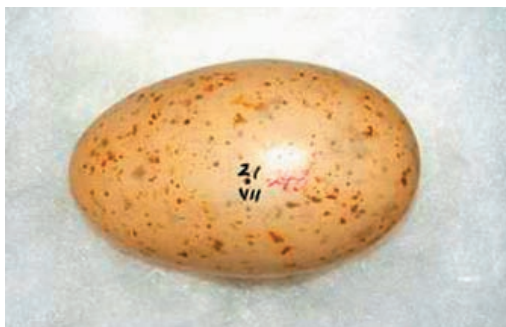


Figure 4. Ancient Murrelet egg collected at Triangle Island, BC, on 1 July 1949 (RBCM #E243) (Photo by M.C.E. McNall).

1949-50 Studies

Triangle Island (50.8°N; 128.8°W) is a highly wind-exposed, relatively small, non-forested, largely grass-covered island (about 1.2 km long and 1.2 km wide; elevation 194 m; 144 ha; see Figure 2) located about 42 km offshore from Cape Scott at the western end of the Scott Islands off the northwest tip of Vancouver Island (Carl et al. 1951). From 24 June to 1 July 1949, Carl, Charles J. Guiguet, George A. Hardy (BC Provincial Museum, Victoria, BC [now RBCM]) and Frank L. Beebe (Zookeeper, Stanley Park, Vancouver, BC) studied wildlife and plants at Triangle Island but Meugens was not with them (Carl et al. 1951). Collection of Ancient Murrelet egg specimens was not mentioned in the account for this species, although possible breeding can be inferred. This species' account (Carl et al. 1951:B44) reads as follows: *A pair* [of Ancient Murrelets] *was*

SPECIES Ancient Murrelet
 BCPM 243 DATE 1 July 1949
 LOCALITY BC: Triangle Island
 COLLECTOR A.L. Meugens
 COMMENTS
check location - over

check location, Langara
 sometimes called Triangle in
 error, Meugens was on
 Langara in 1949 - BCPM report

Figure 5. Front (left) and back side of newer egg slip for Ancient Murrelet egg (RBCM #E243) (Photo by M.C.E. McNall).

21
 (A.O.U. No.)
 Set Mark VII/243 SPECIES Synthliboramphus antiquum
 No. of Eggs 2 Ancient Murrelet
 Identity Sure Incubation Fresh
 Locality Triangle Island
 Vicinity Queen Charlotte Islands, BC
 Nest Location in burrow
 Nest Construction grass
 Size _____ Located by G.C. Carl
 Date July 1, 1949 Collector A.L. Meugens

504
 (A.O.U. No.)
 Set Mark VII/228 SPECIES Uria gaele inornata
 No. of Eggs 1 Common Murre
 Identity Sure Incubation _____
 Locality Triangle Island
 Vicinity Queen Charlotte Sound, BC
 Nest Location _____
 Nest Construction _____
 Size _____ Located by G.C. Carl
 Date June 29, 1949 Collector A.L. Meugens

Figure 6. Old egg card for Ancient Murrelet egg (RBCM #E242) (Photo by M.C.E. McNall).

21
 (A.O.U. No.)
 Set Mark VII/243 SPECIES Synthliboramphus antiquum
 No. of Eggs 1 Ancient Murrelet
 Identity Sure Incubation Fresh
 Locality Triangle Island
 Vicinity Queen Charlotte Islands, BC
 Nest Location in burrow
 Nest Construction grass
 Size _____ Located by G.C. Carl
 Date July 1, 1949 Collector A.L. Meugens

506
 (A.O.U. No.)
 Set Mark VII/229 SPECIES Uria gaele inornata
 No. of Eggs 1 Common Murre
 Identity Sure Incubation _____
 Locality Triangle Island
 Vicinity Queen Charlotte Sound, BC
 Nest Location _____
 Nest Construction _____
 Size _____ Located by G.C. Carl
 Date June 29, 1949 Collector A.L. Meugens

Figure 8. Old egg cards for Common Murre eggs (RBCM #E228, #E229) (Photo by M.C.E. McNall).

Figure 7. Old egg card for Ancient Murrelet egg (RBCM #E243) (Photo by M.C.E. McNall).

observed on the coast littoral near our camp. On several occasions during the night, calls were heard that may have been uttered by ancient murrelets. The bedlam of Cassin[']s auklet [Ptychoramphus aleuticus] calls, however, made identity uncertain. No burrows or eggs of this species had been discovered

on the island previously, and no record was obtained by us. The absence of timber may be a limiting factor with this species also. Colonies visited in the Queen Charlotte Islands were all situated in open forest with salal [Gaultheria shallon] underbrush.

Guignet's unpublished field notes from 1949

(currently housed in the British Columbia Archives, Victoria, BC) also did not mention these eggs but confirmed the intention of inferring possible breeding. The following brief notes were made: *Ancient Murrelet – probably nesting although no evidence found on parts of the island visited – family group – (2 adults & 2 young) seen on two occasions on the east side.* One or two family groups were seen at Triangle Island during this period (see also Sealy and Campbell 1979). Ancient Murrelet remains also were not found at Peregrine Falcon (*Falco peregrinus*) eyries at Triangle Island in 1949, only those of Cassin's Auklets (Carl et al. 1951, Beebe 1960).

Between 16-22 June 1950, other islands in the Scott Group also were examined by the same museum team. Lanz Island is the second largest of the group (about 3.6 km long and 2.4 km wide; elevation 212 m; 764 ha) and heavily forested (Figure 9). Between 16-20 June, many seabird burrows, possibly not used for years, were found on grassy headlands on Lanz Island, apparently due to introduction of mink (*Neovison vison*) in 1938 or 1939. No seabird eggshells were found but most burrows appeared to have been excavated by Cassin's Auklets, except on a headland on the southeast corner of the island where large burrows had likely been dug by Rhinoceros Auklets (*Cerorhinca monocerata*). Carl et al. (1951: B53) noted: *A search in the salal of the timbered slopes [on Lanz Island] revealed no sign of ancient murrelet nest-sites, although a small number of these birds were heard on three occasions passing into (or over?) the timber at night.*

Cox Island is the largest of this island group (about 4.0 km long and 1.6 km wide; elevation 312 m; 978 ha) and also is heavily forested. The little time spent on this island on 16, 17 and 20 June 1950 was devoted almost entirely to trapping small mammals but they noted: *First Mate Chaster, of the "Howay," however, reports landing on a point at the south-west side of the island where his dog uncovered several nesting birds. From his description these birds were either Cassin [']s auklets or ancient murrelets. Since Mr. Chaster's visit occurred after the introduction [probably 1938 or 1939] of raccoon [Procyon lotor], one would gather it is possible that these animals do not influence nesting pelagic birds to the same extent*



Figure 9. Forest habitats at Lanz Island, BC, showing Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), and salal (from Carl et al. 1951:B51). June 1950 (G. Clifford Carl)

as do mink.

These observations also suggest that small numbers of Ancient Murrelets might have bred in 1950 or earlier on Lanz, Cox, and possibly other smaller Scott Islands (Sartine Island – 28 ha; Beresford Island – 14 ha), where other burrowing alcids (*i.e.*, Cassin's Auklets, Rhinoceros Auklets, and Tufted Puffins [*Fratercula cirrhata*]) were breeding (Carl et al. 1951).

Verification Efforts

Although evidence of possible nesting by Ancient Murrelets was found at Triangle, Lanz, and Cox Islands in 1949-50, the lack of definite evidence of egg laying led most workers in the past to conclude that breeding did not occur in the Scott Islands (Drent and Guignet 1961, Vermeer et al. 1976, Rodway 1991, Rodway et al. 1992). Six decades later, we can no longer question Meugens, Maguire, Carl, Guignet, Hardy, Beebe, or Drent about why these three egg specimens of the Ancient Murrelet from Triangle Island were not reported by Carl et al. (1951) or Drent and Guignet (1961). By piecing together available information, we suspect that Carl, who found the eggs in burrows on their last day at Triangle Island in 1949, may not have identified them as Ancient Murrelet eggs if an adult was not seen with them. Possibly indicated by the fresh stage of incubation on 1 July (Figures 6 and 7), the three

eggs probably had been abandoned much earlier and were little incubated. Collection of the single egg (RBCM #E243) may have reflected accidental omission of a second egg, earlier hatching or loss of one egg without eggshells in evidence, abandonment of the egg prior to the laying of the second egg, or a one-egg clutch. Carl may have simply collected these eggs without informing Guiguet. Carl had been Museum Director since 1940 and was a capable naturalist but he had little experience with seabirds and probably none with Ancient Murrelets before 1949. Guiguet likely never saw these eggs in 1949-51 because he would have immediately recognized them as Ancient Murrelet eggs (given his experience, including egg collecting, in 1946-47 with nesting Ancient Murrelets in the Queen Charlotte Islands). If Guiguet had seen these Ancient Murrelet eggs in 1952-61 (after publication of Carl et al. 1951), he also would have mentioned them in Drent and Guiguet (1961) where he did mention other seabird eggs collected in 1949 at Triangle Island (see below). Beebe (1960) stated that Triangle Island was south of the breeding range of the Ancient Murrelet, which suggests he had no knowledge of Ancient Murrelet eggs collected in 1949. Hardy focused on plants and Beebe on falcons; although capable naturalists, they knew little about seabirds in 1949.

Eggs collected at Triangle Island were prepared by oologist Walter S. Maguire in New Westminster (Carl et al. 1951, also see Guiguet 1950). On 10 July 1949, Maguire (unpubl. field notes) remarked that he: *Had a large series Murre [Common Murre *Uria aalge*], Tufted Puffin as also specimens of Baird [Pelagic] Cormorant [Phalacrocorax pelagicus], Cassin's Auklet, Blk [Black] Oystercatcher [Haematopus bachmani], Bald Eagle [Haliaeetus leucocephalus], etc brought to me by Dr. Cliff Carl of Provincial Museum who sought my assistance in preparation of these on a mutual sharing basis. Aside altogether from any benefit to own Collection was glad to render such a service to the Museum. All eggs had been taken on June 28-29 on Triangle Isl...[with notes on egg contents which are largely reported in Carl et al. 1951]. Even with slow and prolonged maceration failed to do a satisfactory job on eggs of Puffin & Auklet, though Dr. Carl was apparently well pleased with result achieved.*

We have surmised that Meugens, also an oologist living in New Westminster, likely assisted Maguire in preparing this large series of eggs from Triangle Island. The three Ancient Murrelet eggs probably were identified after the trip by Meugens or Maguire during specimen preparation work in New Westminster. Maguire had visited Langara Island and collected Ancient Murrelet eggs in May 1947, and several reference sets were retained in Maguire's personal collection (Drent and Guiguet 1961). Meugens or Maguire were likely responsible for the identity being marked as sure on the old egg cards (Figures 6 and 7).

To further investigate why Meugens might have been listed as collector, we searched the RBCM specimen database and found 20 seabird egg sets, each containing one egg, from Triangle Island, collected in 1949, as follows: Common Murre (n = 15 [collector Maguire]; n = 2 [collector Meugens]); Tufted Puffin (n = 1 [collector Carl]); and Ancient Murrelet (n = 2 [collector Meugens]). Drent and Guiguet (1961) further stated: [p. 63]...*The Museum party collected 19 [Common Murre] eggs (9 of these are now in the WSM [W.S Maguire] coll., and 1 in the ALM [A.L. Meugens] coll., all taken June 29) ...; [p. 101]...The Museum party collected 3 [Cassin's Auklet] eggs (2 fully set, 1 deserted) but most burrows examined held young almost capable of flight; ...; and [p. 112]...The Museum party found 1 well-incubated [Tufted Puffin] egg tended by 1 adult in all burrows examined (no downy young yet)...One of the eggs collected is now in WSM coll. (June 28), another in ALM coll. (June 29).*

Nine Common Murre eggs and one Tufted Puffin egg, previously in the Maguire collection, are now housed in the Cowan Vertebrate Museum (UBC #787-795, #864). Each of these specimens has Maguire listed as collector. By adding RBCM and UBC specimens, we accounted for at least 26 Common Murre eggs and two Tufted Puffin eggs, more than reported elsewhere (Guiguet 1950, Carl et al. 1951, Drent and Guiguet 1961). Some seabird egg specimens from Triangle Island in 1949 clearly remained in Maguire's and Meugens's private collections, in payment for preparing eggs for Carl. Meugens's egg collection was later acquired by Campbell in the late 1960s, before being donated

to the RBCM in the 1970s (R.W. Campbell, pers. comm.). Meugens likely had the three Ancient Murrelet eggs and other Common Murre eggs in his private collection, which Guiguet did not have complete access to earlier. On the other hand, Guiguet was listed as collector for all 13 skins and skeletons of seabirds deposited in the RBCM collection, including: Tufted Puffin (n = 7); Common Murre (n = 3); and Cassin's Auklet (n = 3). Guiguet apparently was less involved in egg collecting and reporting eggs collected than Carl, likely because Guiguet was fully occupied with handling bird skins and skeletons as well as mammal specimens. Less involvement with egg collecting at Triangle Island in 1949 by Guiguet with later review of egg records would explain why Drent and Guiguet (1961) provided more detail on Cassin's Auklet and Tufted Puffin eggs collected than did Carl et al. (1951). Meugens and Maguire apparently were listed as collectors on egg slips when they actually just prepared egg specimens and had eggs in their private collections that had been collected at Triangle Island mainly by Carl.

We found no mention of Meugens collecting at Langara Island in 1949 in RBCM reports, as suggested briefly by Campbell on the egg slip for RBCM #E243 (Figure 5). Meugens's limited seabird egg collecting activities were confined to cormorants and gulls in the Strait of Georgia in southern BC of which none was noted in 1949 (Drent and Guiguet 1961) and Meugens was not mentioned in the museum annual report for 1949 (Carl 1950).

We also have not found any reference to seabird egg collecting of any kind in the Queen Charlotte Islands in 1949 (Drent and Guiguet 1961, RBCM specimen database). Maguire had collected Ancient Murrelet eggs with Guiguet at Langara Island in May 1947 and also had Cassin's Auklet eggs from Langara Island in his collection from April 1948 (Drent and Guiguet 1961). The vicinity noted as "Queen Charlotte Islands" on RBCM #E243 and #E242 was explained once old egg cards for Common Murre eggs (RBCM #E228, #E229) collected at Triangle Island in 1949 were examined (Figure 8). On these cards, "Queen Charlotte Sound," northeast of the Scott Islands (see Figure 1), was given for the vicinity. Thus, the vicinity noted on the old cards of the Ancient Murrelet egg sets appeared to be a

miscopying of the nearby vicinity of Queen Charlotte Sound. Campbell might not have seen older Ancient Murrelet or Common Murre egg cards that had more information and he apparently did not fully investigate his suspicion that the eggs might not be authentic. In retrospect, Campbell (pers. comm.) felt that his concern about confusion between Langara and Triangle Islands had stemmed from the presence of a "Cox Island" near both of these locations. While Campbell's earlier skepticism about the collection locality and collector of these eggs may have been initially appropriate, we now believe that it was misguided. However, Campbell's note on the label, likely written in the 1970s, apparently explains why museum staff and others apparently have not considered these eggs to be from nest sites at Triangle Island over the past 30-40 years. Along with Campbell's note, accidental omission of mention of Ancient Murrelet egg specimens by Carl et al. (1951) and Drent and Guiguet (1961) also likely encouraged skepticism of these specimens by museum staff and others, including ourselves, over these decades.

As outlined above, we contend that the locality of these eggs should be considered to be accurate, based on a date (1 July 1949) and nest finder (Carl) that match work conducted at Triangle Island (Carl et al. 1951), now that the incorrect collector's name and vicinity plus past omission of this record have been accounted for. These are the only verified nests of Ancient Murrelets on Triangle Island, which is only the second location with documented breeding of Ancient Murrelets south of the Queen Charlotte Islands.

Post-1950 Observations

Individuals conducting subsequent studies at Triangle Island have not found further definite evidence of breeding by Ancient Murrelets, although small numbers of birds, including family groups, have been observed in nearby waters (Vermeer et al. 1976; Sealy and Campbell 1979; Rodway et al. 1990, 1992; Rodway 1991; Sealy et al., unpubl. data). Vermeer et al. (1976:39) noted: *Ancient Murrelets...were seen occasionally and probably nest in small numbers on [Triangle] island. One downy young murrelet, accompanied by two adults, was observed on the water near the northeast end of Triangle Island on*

2 July 1974. In the 1980s, Michael S. Rodway and others noted Ancient Murrelets near Beresford Island (two adults; 11 June 1989) and Lanz Island (1 adult; 19 July 1987) but none was seen near Triangle Island (Rodway et al. 1990). In April 1994, Ian L. Jones (pers. comm.) heard Ancient Murrelets calling in flight overhead at the camp area at Triangle Island on at least three different nights (which he thought may have been non-breeding prospectors) but he found no further evidence of possible nesting. Jones (pers. comm.) also worked on Triangle Island in 1984 but did not note any vocalizations of Ancient Murrelets. Most subsequent seabird workers at Triangle Island have not been familiar with Ancient Murrelet vocalizations. However, noisy nocturnal family departures likely would have been noticed if they occurred near the camp.

Family groups of Ancient Murrelets observed near Triangle Island may represent either local breeding or rapid dispersal from colonies on the Queen Charlotte Islands (Sealy and Campbell 1979; Sealy et al., unpubl. data.). In 2006, Sealy examined a specimen of a newly hatched young (UBC #13395), collected near Triangle Island by David Hancock on 18 May 1966, which also suggested breeding at Triangle Island. Labeled a male, the chick had recently left its burrow and no post-departure development was evident. Whether the specimen had been collected or found dead at sea (or on land), or had washed ashore, was not indicated. Hancock (pers. comm.) could not recall details about this specimen. Campbell et al. (1990) referred to this and another newly hatched chick (UBC #13396) taken near Triangle Island in 1966. Neither specimen was listed in Sealy and Campbell (1979). Information on the labels confirmed the Triangle Island locality and date of collection of the first specimen, but not the second, which had been taken by Hancock on Langara Island on 5 June 1966. Assuming the location of Triangle Island on the first specimen is accurate, it is the youngest chick taken or observed far south of the Queen Charlotte Islands (Sealy et al., unpubl. data). If it did not originate from Triangle Island, it would have been amongst the earliest to leave a colony in the Queen Charlotte Islands (Sealy 1976, Gaston 1992).

Discussion

A considerable amount of work was conducted by Carl, Guiguet, Hardy, and Beebe in one week at Triangle Island in 1949, with essentially no prior knowledge of breeding seabirds at this large colony, and only Guiguet with prior experience with Ancient Murrelets and other seabirds. Confirmed egg specimens and other observations now indicate that at least small numbers of Ancient Murrelets nested at Triangle Island and possibly other Scott Islands in 1949-50. Most Ancient Murrelets may have nested on parts of this rugged island that were not visited. Relatively large numbers of Rhinoceros Auklets, subsequently known to breed at Triangle Island, also might have been missed in 1949 (Hancock 1970). Even with extensive research at Triangle Island since the mid-1970s, biologists could have overlooked isolated nests or even small numbers of breeding Ancient Murrelets, given the rugged nature of the island and avoidance of certain areas during research activities (I.L. Jones and M. Hipfner, pers. comm.). Burrows used on non-forested islands also may appear differently than those on forested islands, and Ancient Murrelets may use rock crevices, other cavities, or burrows dug by other alcids, especially Cassin's Auklets (Bendire 1895; see also Sealy and Carter 2007), which breed abundantly on Triangle Island (Rodway 1991, Rodway et al. 1992). Recognition of the possibility of breeding by small numbers of Ancient Murrelets at Triangle Island should encourage careful searching and recording of clues that may reveal current or future nesting of Ancient Murrelets in small numbers at Triangle Island, elsewhere in the Scott Islands, or elsewhere on the west coast of Vancouver Island. Special surveys are needed to determine whether Ancient Murrelets nest in the Scott Islands area. Few Ancient Murrelets seen at sea near the Scott Islands in 1974-75 and 1982-89 suggest that few if any might have bred in the vicinity 25-40 years after 1949-50, given that Ancient Murrelets regularly gather off colonies during the day (Gaston 1992).

On Lanz and Cox Islands, introduced mammals apparently have extirpated most breeding seabirds, possibly also Ancient Murrelets, in many areas on these islands (Carl et al. 1951; Drent and Guiguet 1961; Rodway et al. 1990, 1992; Rodway 1991). Or,

prey availability for planktivorous Ancient Murrelets may have been insufficient to sustain breeding in the Scott Islands area. Planktivorous Cassin's Auklets have maintained the largest colony in the world at Triangle Island, although changes in ocean climate have led to reduced availability of prey resources at the north end of the California Current over the past two decades, resulting in reproductive failures and population decline at Triangle Island (Vermeer 1981, Bertram et al. 2000, Wolf et al. 2009). As Ancient Murrelets in the northeastern Pacific Ocean are mainly restricted to breeding in northern waters within the Alaska Current, southern peripheral breeding in the Scott Islands area also may reflect periodically favourable conditions. Forested breeding habitats on Lanz and Cox Islands are more similar to those used by Ancient Murrelets in most of the Queen Charlotte Islands (Sealy 1976, Gaston 1992). A small breeding population of Ancient Murrelets in the Scott Islands, including some nests on Triangle Island, might have been primarily sustained in the past through nesting on these larger forested islands, perhaps also supported with occasional immigration from the Queen Charlotte Islands. Once breeding stopped on these larger islands, local or distant recruitment may have been insufficient to sustain a small colony on Triangle Island.

Acknowledgments

Specimens and other data were examined at the Royal British Columbia Museum (RBCM; Victoria, BC) and Cowan Vertebrate Museum, University of British Columbia (UBC; Vancouver, BC) with assistance from M.C.E. McNall, C. Adkins, and R. Kenner. M.C.E. McNall also took the photographs of the egg specimens and slips, and searched museum databases. In the 1970s, the late C.J. Guignet granted access and permission to Carter to cite his unpublished field notes, now housed at the British Columbia Archives (Victoria, BC). H. Maguire graciously provided unpublished field notes of her grandfather W.S. Maguire. Figure 1 was prepared by T. Charles (Cloverpoint Cartographics, Victoria, BC). Figure 2 was provided by R.W. Campbell. Reproduction of Carl et al. (1951:Figure 11) for Figure 9 in this paper was approved by the RBCM. Valuable comments were provided by R.W.

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About the Authors

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