

# Syesis

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## Seabirds breeding along the east coast of Moresby Island, Queen Charlotte Islands, British Columbia

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Between May 17 and July 17, 1971, a survey was conducted of the seabird colonies along the east coast of Moresby Island, Queen Charlotte Islands, British Columbia. Forty-five colony locations are described, including 70 species nesting locations (excluding those of *Cephus columba*) that were not known when Drent and Guiguet (1961) published *A Catalogue of British Columbia Sea-bird Colonies*. The numbers of active colonies and total population estimates in the survey area are as follows (additional large colonies for which estimates of numbers were not obtained are included in parentheses): fork-tailed petrel, *Oceanodroma furcata*, 10(+1)—40,000+ pairs; leach's petrel, *Oceanodroma leucorhoa*, 3(+1)—fewer than 100 pairs in the three small colonies; pelagic cormorant, *Phalacrocorax pelagicus*, 6—200 pairs; black oystercatcher *Haematopus bachmani*, 44 pairs; glaucous-winged gull, *Larus glaucescens*, 22—up to 500 pairs; pigeon guillemot, *Cephus columba*, 31—1,400 birds; ancient murrelet, *Synthliboramphus antiquum*, 10(+4)—15,000+ pairs; cassin's auklet, *Ptychoramphus aleutica*, 13(+3)—14,000+ pairs; rhinoceros auklet, *Cerorhinca monocerata*, 2—5,000 pairs; tufted puffin, *Lunda cirrhata*, 2—less than 50 pairs. These estimates are undoubtedly too low. There was much evidence of predation on burrow nesters, but predation, interspecific competition, or availability of nesting sites are not considered to be limiting numbers on these islands as a whole, although they could have an effect in individual colonies.

Syesis, 7:1-12 (1974).

### Introduction

Between May 17 and July 17, 1971, the area between Cumshewa Head and Skincuttle Inlet on the east coast of Moresby Island of the Queen Charlotte Islands was surveyed for colonies of seabirds. I used a 13-foot *Canova* inflatable boat with a 10-horsepower outboard motor. North of Burnaby Island, visits were made to all islands facing Hecate Strait that are smaller than Ramsay Island, and to islands around the perimeter of Juan Perez Sound. In Skincuttle Inlet, visits were made to most islands west of the Bolkus Islands. Exceptions were Low, Lost, Faraday, and Huxley Islands, which were all bypassed. Also included are observations made between Skincuttle Inlet and Anthony Island (via Houston Stewart Channel)

while aboard the Federal Department of Fisheries vessel *Arrow Post* on July 15 and 16, 1971.

In recent years other observers have visited the east coast of Moresby Island in search of seabird colonies (e.g., J. B. Foster in 1969 and R. H. Drent in 1970). Many of their observations, plus some made by Foster in 1960 and 1961 (British Columbia Nest Records Scheme, hereafter indicated as *BCNRS*), are included. David Ellis, who accompanied me on the 1971 survey, obtained additional records in 1972. These have also been included. I am grateful to these other observers for allowing me to include their records, which have greatly increased the completeness of this report.

Mountains forming the backbone of Moresby Island and western Graham Island of the Queen

Charlotte Islands drop abruptly into the sea on the west but descend more gradually on the east. For the east coast of the southernmost of these two big islands (Moresby Island) this results in an irregular coastline characterized by long inlets and numerous offshore islands. The shorelines of these islands consist of solid rugged rock, occasionally interspersed with small boulder, gravel, or (occasionally) sand beaches. Forest descends to the high-tide line and shows little sign of weathering; this area lacks the great surf and high winds common on the west coast. The coast of Moresby Island and its offshore islands bears a forest consisting of Sitka spruce (*Picea sitchensis*), western red cedar (*Thuja plicata*), and western hemlock (*Tsuga heterophylla*), with red alder (*Alnus rubra*) abundant on poorly drained sites and, occasionally, western crabapple (*Pyrus fusca*) in small patches adjacent to the sea. The major undergrowth species are salal (*Gaultheria shallon*) and huckleberry (*Vaccinium* sp.), which form a complete ground cover in some places. In striking contrast, the flat lands of northeastern Graham Island give rise to interior bogs and a uniform shoreline lacking offshore islands, and to a continuous sandy beach extending for over 100 miles from Skidegate Inlet on the east coast to Masset Inlet on the north coast.

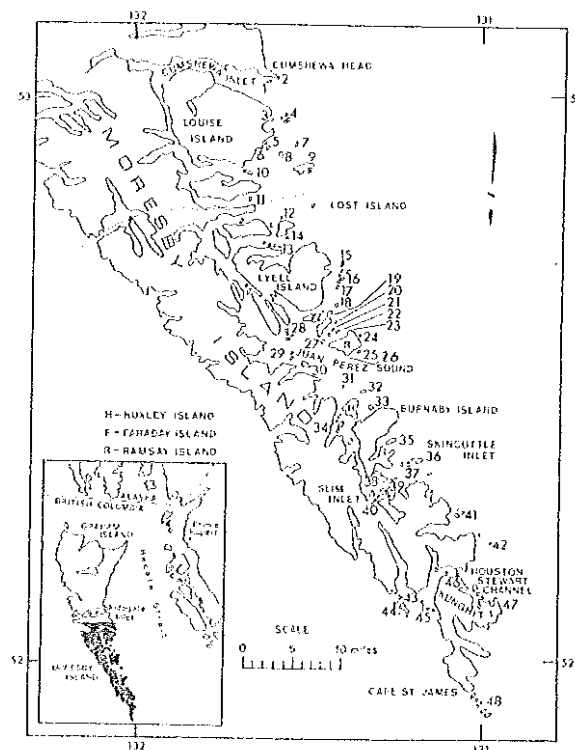


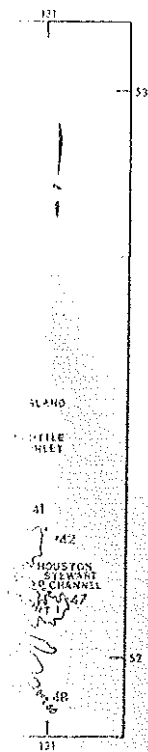
FIGURE 1. Location of seabird colonies along the east and south coasts of Moresby Island, Queen Charlotte Islands. Numbers correspond to those of the locations listed in Table I.

TABLE I  
Seabird colonies on east coast of Moresby Island, Queen Charlotte Islands

Location	Date of visit	Size (acres)	Vegetation
1. Kingui Island	May 19	13	spruce forest; dense salal
2. Cumshewa Island	May 19	6	bare rock
3. Skedans Point	May 16-31		bare rock
4. Skedans Islands (south island bypassed)	May 24-27	70	spruce forest; undergrowth sparse, to dense salal
5. Limestone Islands	May 28-29	115	spruce forest; light undergrowth
6. Vertical Point	May 29, July 16		cave in rock bluff
7. Low Island		20	spruce forest
8. South Low Island	June 3	20	spruce forest; open knolls in dense salal
9. Reef Island	May 31-June 3	420	spruce forest; undergrowth light to dense
10. Kingsway Rock	June 12	3	rocky; patches grass and herbaceous plants
11. Helmet Island	June 10		spruce forest; rock bluffs
12. Titule Island	June 5	13	spruce forest; undergrowth light to dense
13. Kul Rock	June 5	3	rocky; patches grass and herbaceous plants

TABLE I—Continued  
Seabird colonies on east coast of Moresby Island, Queen Charlotte Islands—Continued

Location	Date of visit	Size (acres)	Vegetation
14. Kelo Rocks	June 5	0.5	bare rock
15. Tuft Islets	July 1	7.5	grassy
16. Tar Islets	July 1	33	spruce forest; undergrowth medium to heavy
17. Kawas Islets	July 2	19	spruce; dense undergrowth; bare and grassy rocks
18. Agglomerate Island	July 2	41	spruce forest; light undergrowth
19. Murchison Island (island to E and NE peninsula only)	June 26		spruce forest; light to dense undergrowth
20. Rock E of Murchison Island	June 26	1	bare rock
21. Hot Spring Island chain	June 26	7.5	spruce forest; light to dense undergrowth
22. House Island	June 24–25	60	spruce forest; light to dense undergrowth
23. Andrew Point, Ramsay Island	June 27		spruce forest, light to medium undergrowth; low grassy slopes
24. Rock off mid E side of Ramsay Island	June 27	0.5	rocky; herbaceous vegetation
25. Tatsung Rock	June 27	1	rocky; patches herbaceous vegetation
26. Crombie Point, Ramsay Island	June 27		spruce forest; light undergrowth
27. Ramsay Rock	June 28	0.5	rock; patches herbaceous vegetation
28. Bischoff Islands	June 28	120	spruce forest; light to dense undergrowth
29. Hoskins Islets	June 14	7.5	spruce forest; medium to dense salal
30. Marco Rock	June 13	1	rock; patches herbaceous vegetation
31. All Alone Stone	July 9	3.5	spruce forest; dense salal; rock face
32. Arichika Island	July 9	30	spruce forest; light undergrowth
33. Alder Island	July 8	110	spruce forest; light to heavy undergrowth
34. Sels Islet	July 9	2.5	spruce forest; light to medium undergrowth
35. Howay Island		45	spruce forest
36. East Copper Island		58	spruce forest
37. Georges Island		78	spruce forest
38. Bolkus Islands	July 5	155	spruce forest; medium salal
39. Green Rock	July 5	0.25	rock; patches herbaceous vegetation
40. Boulder and Sea Pigeon Islands	July 5	17	spruce forest; light to dense salal
41. Rankine Islands		110	spruce forest
42. Garcin Rock	July 15–16	3	rock; herbaceous vegetation
43. Adams Rocks	July 15	2	rocky; grassy knolls
44. Anthony Island	July 15	300	spruce forest; undergrowth sparse to dense
large rock to NW		12	rock
45. Flat Rock Island	July 15–16		rock; grassy areas
46. Moorhead Kungit Island			spruce forest
47. Islet off Lyman Point		2	grassy slopes
48. Kerouard Islands		60	



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Table I lists all known seabird colonies and roosts. These are summarized from north to south and dates are given for those locations which were visited in 1971. Numbers correspond to those on the map in Figure 1.

### Species Account

All species of seabirds known to breed in the area described are included in the following annotated list. All colonies that were not listed in *A Catalogue of British Columbia Sea-bird Colonies* (Drent and Guiguet, 1961) are indicated by an asterisk. No breeding records for Moresby Island have been published since 1961. Estimated colony sizes are indicated after the name of each colony. Estimates were made using a combination of field records of abundance of burrows and sign, of proportions of islands covered by burrows, and in some cases of amount of nocturnal activity, and of island areas which were calculated from marine charts.

**FORK-TAILED PETREL:** *Oceanodroma furcata* (Gmelin). As is typical, burrows were under the spruce forest, either in areas of sparse vegetation or along edges of heavy undergrowth. An exception was on the Hoskins Islets where they were nesting in the thinner areas of a dense growth of salal. Although most burrows were excavated by the petrels, in some areas they were using natural cavities. Colonies are plotted in Figure 2.

#### Colonies

1. \*Kingi Island (est. up to 15 prs.). A few wings and burrows were seen at the east end.
4. Skedans Islands (est. 10,000 prs.). This colony was recorded in 1961 (BCNRS). In 1971, evening activity was intense and many burrows were located on the three islands visited. Of four active burrows checked on May 24, three had incubating adults and one contained an adult with a newly hatched chick.
7. \*Low Island. Birds were recorded as breeding here in 1970 (R. H. Drent).
16. \*Tar Islets (est. up to 15 prs.). Two remains of birds (wings) and a very few scattered burrows were seen.
18. \*Agglomerate Island (est. 10,000+ prs.). Burrows and remains of birds were very numerous throughout the interior of this island.
28. \*Bischoff Islands (est. 5,000 prs.). The small southwest island was most densely populated. Burrows were scattered on other islands, especially along the southern edges of the two southeast islands. Use of natural cavities was more evident in the latter locations.

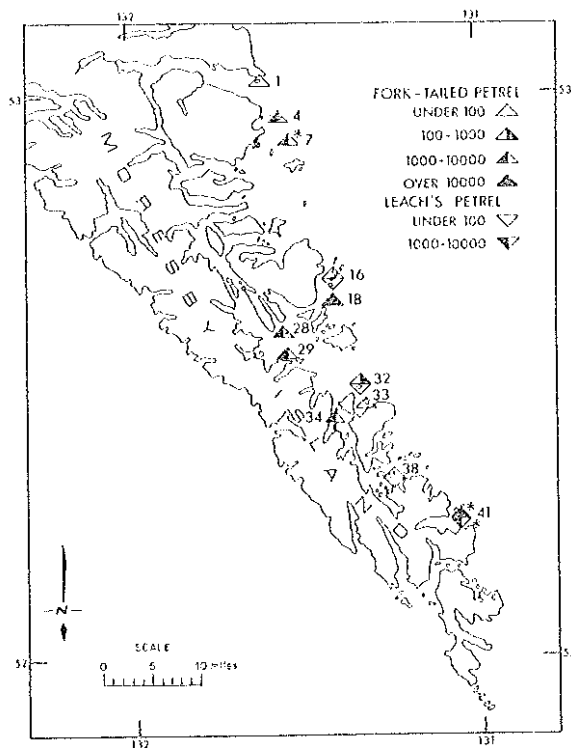


FIGURE 2. Fork-tailed and leach's petrel colonies; an asterisk (\*) indicates those colonies for which estimates were not based on 1971 observations. Only the leach's petrel colony on the Rankine Islands was known to Drent and Guiguet (1961).

29. \*Hoskins Islets (est. 2,000 prs.). The colony occupies both islets, but the east sides are most densely populated. On June 14 an adult was found incubating a pipping egg.
32. \*Arichika Island (est. 500 prs.). Most burrows were found around the edges of the island.
33. \*Alder Island (est. up to 25 prs.). Only a few remains were found on the small islet to the north.
34. \*Sels Islet (est. 1,000+ prs.). Nesting was evident throughout the interior of the islet. Petrel wings were found on the south edge of Park Island (to the north) and on the midwestern edge of Wanderer Island (to the east), but no burrows were located.
38. \*Bolkus Islands (est. 500+ prs.). Found nesting on the eastern islets in 1969 by J. B. Foster. In 1971 remains and burrows were numerous on the more western of the two centre islets and were absent from the large western island.
41. Rankine Islands. First visited in 1960 (BCNRS). Dave Ellis visited the western island in 1972 and also reported large numbers of nesting petrels. This could be the largest fork-tailed petrel colony in the area surveyed.

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LEACH'S PETREL: *Oceanodroma leucorhoa* (Vieillot). This species nests in scattered colonies along the entire west coast of British Columbia and on islands in Queen Charlotte Strait. They most commonly nest in treeless areas, except that when they are in association with fork-tailed petrels they may nest in the forest. One exception appears to have been on the Rankine Islands where in 1960 leach's petrels were plentiful in the mossy coast forest. However, in 1972 both species were present and presumably breeding on the Rankine Islands. Colonies are plotted in Figure 2.

#### Colonies

16. \**Tar Islets* (est. 15 prs.). One carcass and one lone adult in a burrow were found under the salmonberry at the western edge of the north island.

32. \**Ariehika Island* (est. 25+ prs.). These petrels were nesting within the forest edge at the north end of the island among the fork-tailed petrels. Here there was one dead petrel within a burrow and the wings of four birds.

38. \**Bolkus Islands* (est. 50 prs.). An adult was found by J. B. Foster in a burrow on the eastern islet in 1969. In 1971, wings were found on the western of the two centre islets, but not on the large western island.

41. *Rankine Islands*. In 1960, leach's petrels were nesting abundantly throughout the mossy coast forest. (BCNRS). In 1972 Dave Ellis reported large numbers of petrels after dark on the western island. This is the only large colony in the area surveyed.

PELAGIC CORMORANT: *Phalacrocorax pelagicus* (Pallas). Two colonies were previously recorded for this area: Skedans Islands (1900) and Skedans Point (1946) [Drent and Guiguet, 1961]. In 1971, both were used solely for roosting. Colonies in this area were small. However, immature birds in small roosts were attempting to nest, possibly indicating the start of new colonies.

#### Colonies

6. \**Vertical Point* (ca. 25 prs.). Nesting in a shallow cave on the south side of the point. A local resident indicated that birds were nesting here in August 1970. By July 16, 1971, the birds, which had been there on May 29, had deserted, leaving broken egg shells beneath the nests. Human disturbance is suspected. Cormorants failed to nest here in 1972 when only immature birds were present (D. Ellis).

7. \**Low Island*. A colony was recorded here in 1970 (R. H. Drent).

9. \**Reef Island* (ca. 45 prs.). Nesting on the north face near the east end of the island.

11. \**Helmet Island* (7 nests). Nesting on a small rock bluff just southeast of the island.

19. \**Murchison Island* (ca. 100 prs.). In 1969, 12 pairs nested on the south side of the northeast peninsula (J. B. Foster). In 1971 about 100 active nests were counted. This is the largest colony in the area searched.

26. \**Crombie Point, Ramsay Island* (3 prs.). Five adult and four immature cormorants were present. Three birds appeared to be incubating.

35. \**Howay Island*. D. Ellis recorded a colony here in 1972.

#### Roosts

2. \**Cumshewa Island*. A roost was first recorded here in 1970 by R. H. Drent. On May 19, 1971, at 09:00 Pacific Standard time, 150 birds were seen roosting here.

3. *Skedans Point, Louise Island*. In 1946, 100 pairs were breeding here. During the second half of May 1971 about 75 birds frequented this roost, but none were breeding.

4. *Skedans Island*. A colony was reported here in 1900. Birds were roosting here in 1971 (early morning of May 25, 100 immature birds; late evening May 26, 200 birds). Movements observed after dusk on May 24 and 25 (and on the morning of May 26) indicate that after dusk 200 or more cormorants came from the direction of Cumshewa Head to roost on the south end of the eastern island.

15. \**Tar Islets*. Fifteen immature birds were roosting on the west side of the second islet from the north. Two attempted nests may indicate the start of a new colony.

24. \**Rock off mid-east side of Ramsay Island*. In the early afternoon of June 27, 50 immature birds were present.

31. \**All Alone Stone*. Four immature birds and an incomplete nest were seen on the west side.

35. \**Howay Island*. Dave Ellis recorded a colony here in 1972.

BLACK OYSTERCATCHER: *Hamatopus bachmani* (Anderson). In the areas searched, 44 pairs were recorded from 33 locations. Although generally found nesting singly, on eight occasions two pairs harassed me simultaneously. On the Hoskins Islets two nests were found 50 feet apart; on Marco Rock four pairs (three nests were found) occupied an area of less than 100 square feet. The first and last dates on which eggs were seen were May 25 and July 5. Young were first seen on June 5.

GLAUCOUS-WINGED GULL: *Larus glaucescens* (Naumann). This is the most common species of gull nesting along the British Columbia coast. Some pairs nest singly whereas others nest in

colonies of over 2,000 pairs. However, on the Queen Charlotte Islands, and especially in the area covered by this survey, only small colonies were common. Twenty-two colonies were observed in 1971 and, in the 11 colonies searched, the mean number of nests was 18.2 per colony (range=2 to 52). In some locations in 1971, as many as half of the nests remained empty and, altogether, as many as 30 per cent of the pairs built nests but apparently did not lay eggs. The season was two weeks behind that of colonies on other areas of the Queen Charlotte Islands and on the southern coast of British Columbia. The average clutch size for those which did lay ( $n=116$  nests) was 2.8 eggs per nest, very similar to clutch size in larger southern colonies (J. Ward, *pers. comm.*). However, in 1972, Ward found that the timing and the proportion of nests containing clutches on the Queen Charlotte Islands were normal.

#### Colonies

2. (\*) *Cumshewa Island*. Twenty-five pairs were present on the island, but no check was made for nests.
4. \**Skedans Islands*. First recorded in 1970 by R. H. Drent. On May 27, 1971, there were 80 birds present on the south end of the eastern island. Only two empty nests were found.
8. \**South Low Island*. On June 3, 1971, about 20 pairs were found.
9. *Reef Island*. Nine nests were recorded in 1960 (BCNRS). In 1971 about 10 pairs were scattered around the island and one nest was reported.
10. *Kingsway Rock* (52 nests). First recorded in 1946 (Drent and Guiguet, 1961.)
13. \**Kul Rock* (11 nests).
14. \**Kelo Rock* (2 nests).
16. \**Tar Islets* (24 nests). Two colonies were present here. At least eight pairs were nesting on the island second from the north. Sixteen nests were found on the rock west of the islands.
17. \**Kawas Islets* (9 prs.). Nesting on the rock between the two islets.
18. (\*) *Agglomerate Islands*. There were 12 birds on the south end. Five of them appeared to be incubating, but no check was made for nests.
20. \**Rock east of Murchison Island* (6 nests).
24. \**Rock off mid east coast of Ramsay Island* (19 nests).
25. \**Tatsung Rock* (43 nests).
26. \**Crombie Point, Ramsay Island* (7 nests).
27. \**Ramsay Rock* (14 nests).
30. \**Marco Rock* (20 nests).

35. \**Howay Island*. In 1972, D. Ellis reported a colony here.

39. (\*) *Green Rock*. This colony was seen from 2 miles. It was probably composed of 50 pairs.

43. \**Adams Rocks*. About 10 pairs were seen on this rock. No search was made for nests, but behaviour indicated nesting.

44. \**Anthony Island*. Well over 50 pairs were present on the largest rock to the northwest, but no landing was attempted to tally nests.

45. \**Flat Rock Island*. Over 50 pairs were seen here from a distance of about 1 mile in 1971. J. B. Foster counted 12 nests here in June 1972.

PIGEON GUILLEMOT: *Cephus columba* (Pallas). Thirty-one breeding sites were recorded for this species. There were likely more suitable nesting areas which were bypassed.

MARbled MURRELET: *Brachyramphus marmoratum* (Gmelin). Although this species is common along the British Columbia coast, its nest has still not been found. Evidence strongly suggests that it nests from 1 to 25 miles inland, probably in trees (Drent and Guiguet, 1961). During this survey, birds were abundant but scattered thinly throughout all inside and outside waters... Flights to nests generally began an hour before dark (by 21:00 PST) and no birds were seen after dark (22:00). In the morning, birds were not noted until after first light (03:00) and they continued flying for half an hour to an hour. Dull weather seemed to result in an 'early start' in the evening and prolonged activity in the morning.

In addition to the birds flying high and calling, along the creek at the end of Slim Inlet others were seen flying *silently* at and below tree-top level. Here they were seen flying both inland and seaward in both the evening and morning and I believe they were nesting somewhere in this area. Fewer birds were seen below tree-top level one-quarter mile upstream than were seen at the mouth. High-flying birds were seen travelling only in an inland direction in the evening, but in both directions in the morning. Warberton (Drent and Guiguet, 1961) recorded this species flying in a seaward direction in the evening.

ANCIENT MURRELET: *Synthliboramphus antiquum* (Gmelin). Birds were seldom seen on the water during the day except near House Island in Juan Perez Sound. The first half of

June is the peak of this species (June 21 to 23, hundred were seen and forth between land, but the presence by Ramsay Rock suggested that you Small number mixed with cass and on Andrew According to three of the large and Alder Island years. The H eggs and birds breeding colony Figure 3.



FIGURE 3. Asterisks (\*) indicate colonies where mates were seen.

4. \**Skedans* the southern island was not

June is the peak departure time for the young of this species (Drent and Guiguet, 1961). On June 21 to 23, 1971, groups totalling several hundred were seen on the water and flying back and forth between House and Ramsay Islands. No birds were found in burrows on House Island, but the presence of a raft of 3,000 birds by Ramsay Rock on the evening of June 23 suggested that young were still leaving the colony.

Small numbers of ancient murrelets were mixed with cassin's auklets on Murchison Island and on Andrew Point, Ramsay Island.

According to a local Haida Indian, at least three of the largest colonies (Limestone, House, and Alder Islands) have been known for many years. The Haida people once collected the eggs and birds to supplement their diet. The breeding colonies of this species are plotted in Figure 3.

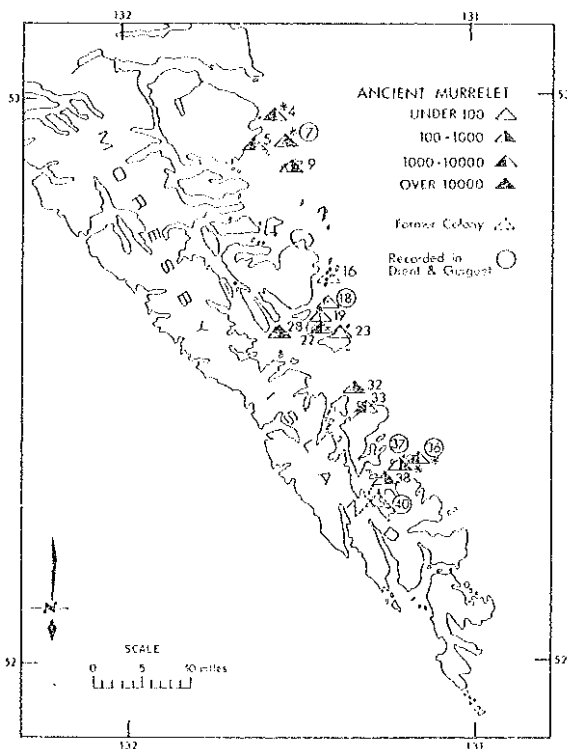


FIGURE 3. Ancient murrelet colonies; an asterisk (\*) indicates those colonies for which estimates were not based on 1971 observations.

Colonies

4. \*Skedans Islands. This species was recorded on the southern island in 1970 by R. H. Drent. This island was not searched in 1971.

5. \*Limestone Islands (est. 5,000+ prs.). This colony has been known to local residents for many years. In 1971, burrows covered both islands except for the deciduous area on the south side of the east island. Burrows checked on May 28 and 29 contained an adult on one egg (one burrow), an adult on two eggs (three burrows), an adult on two chicks (two burrows), an adult and other contents undetermined (one burrow).

7. \*Low Island. In 1970, birds were seen flying to the island after dusk (R. H. Drent).

9. Reef Island (est. 500+ prs.). First recorded in 1960 (BCNRS). In 1971, burrows were scattered sparsely beneath the spruce along the north slopes.

16. \*Tar Islets. Murrelets were recorded nesting here in 1961 by J. B. Foster. There was no evidence of nesting in 1971.

18. Agglomerate Islands (est. 25 prs.) In 1960, evidence of nesting was recorded throughout the forest (BCNRS). In 1971, the little evidence that was found was at the forest edge.

19. \*Murchison Island (est. 25 prs.). Mixed with cassin's auklets beneath the forest edge along the east side of the northeast peninsula.

22. \*House Island (est. 4,000 prs.). This colony has been known to local residents for many years. In 1971, burrows covered the entire island except for the wettest and most heavily vegetated areas. No birds were found in burrows on June 24 and 25 (see above).

23. \*Andrew Point, Ramsay Island (est. 25 prs.). Nest among the cassin's auklets beneath the edge of the coast forest.

28. \*Bischoff Islands (est. 500 prs.). Murrelets were nesting in two locations on the largest island of the group. The main colony was on the interior slopes of the northeast side of the north peninsula. On the southeast side of the south peninsula a few burrows were scattered beneath the edges of the salal.

32. \*Arichika Island (est. 500+ prs.). Burrows were located on the interior slopes beneath the spruce forest.

33. \*Alder Island (est. 4,000 prs.). This colony has been known to the local residents for many years. Burrows occupy this entire spruce-covered island. A few were also mixed with cassin's auklets on the small island to the north.

36. East Copper Island. Nesting was first recorded in 1960 (BCNRS). In 1972, D. Ellis reported large numbers burrowing here.

37. Georges Island. Murrelets were recorded as breeding here in 1960 (BCNRS).

38. \*Bolkus Islands (est. 500 prs.). Birds were breeding on the islets at the east end of the chain in 1969 (J. B. Foster). On July 5, 1971, a large young was found in a burrow at the edge of the western of the two centre islets.

40. Boulder and Sea Pigeon Islands. Many burrows covered the entire islands in 1960 (BCNRS). There was no trace of nesting in 1971.

CASSIN'S AUKLET: *Ptychoamphus aleutica* (Pallas). Although this species was found nesting abundantly along the east coast of Moresby Island, birds were only seen once on the water during the day. Unlike other burrow nesters found in the area, only the remains of one dead bird was ever found.

Colonies were typically on bare or grassy slopes at or just beneath the forest edge from just above sea-level to the crests of 300-foot cliffs (Reef Island). Only on the cliffs of Reef Island were colonies ever obscured from a view of the sea. At most colonies, burrows were found in scattered groups of one to several dozen around the edges of the islands. However, the largest colony, at Andrew Point on Ramsay Island, stretched almost continuously along half a mile of shoreline. The colony was most dense at the outer ends of the point.

According to Drent and Guiguet (1961), hatching occurs from early May onward and fledging occurs from early July onward. In 1971, eggs were incubated as late as June 1 (Reef Island, one record) and young were almost ready to fledge from early June onward. Similarly, on May 25, 1969, J. B. Foster recorded eggs and young in all stages of development on East Copper Island.

The following records fill a large gap in the apparent range on cassin's auklets (as known to Drent and Guiguet, 1961) in that on the Queen Charlotte group colonies have previously been reported only from Langara and the northwest coast of Graham Island. These new colonies are plotted in Figure 4.

#### Colonies

4. \*Skedans Islands (est. 500 prs.). Auklets were first recorded as breeding here in 1970 by R. H. Drent. In 1971 they were concentrated along the grassy slopes along the northeast side of the eastern island. Burrows checked on May 25 and 27 included two with an adult on one egg; two with an adult and a two to three-day-old chick; two with a single one-week-old chick; one with an adult, but other contents undetermined.

7. \*Low Island. Nesting recorded in 1970 by R. H. Drent.

9. \*Reef Island (est. 500 prs.). Birds were located on grassy slopes on the north side at the east end and along the southeast side. Scattered groups occurred at the tops of bluffs on the southwest and mid-northern side (grassy slopes at the base of cliffs were not checked). They were also abundant on the small

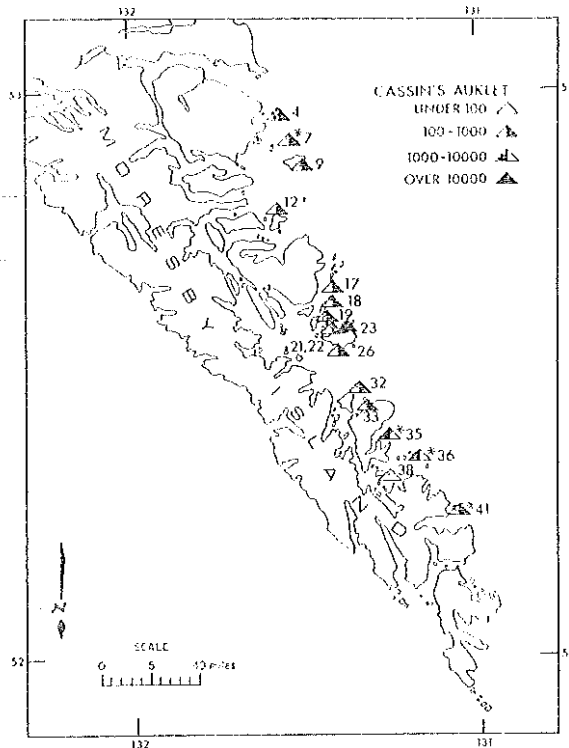


FIGURE 4. Cassin's auklet colonies; an asterisk (\*) indicates those colonies for which estimates were not based on 1971 observations.

island southeast of Reef Island. Burrows checked on June 1 contained two cold eggs (one burrow), an adult on one egg (one burrow), a two to three-week-old chick (one burrow), a large chick within two weeks of fledging (one burrow).

12. \*Titile Island (est. 200 prs.). Nesting in small groups which were scattered around the island. On June 5 a four to five-day-old chick was found in a burrow.

15. (\*)Tuft Islets. In 1961, J. B. Foster noted holes in the grass and one dead bird. In 1971, three cassin's auklet-sized burrows were found, but there was no positive evidence of nesting.

17. \*Kawas Islets (est. 300 prs.). In 1969, auklets were recorded in small numbers on the eastern islets by J. B. Foster. In 1971 they found only on the northern islet, where they occurred in small groups in grassy patches around the periphery of the island.

18. (\*)Agglomerate Island (est. 200 prs.). The size and location of burrows around the edge of the island strongly suggested that this species nested here, but there was no conclusive evidence.

19. \*Murchison Island (est. 200 prs.). A check was made of one of several likely locations along the east shore of the northeast peninsula. A few burrows were found on a grassy slope at the edge of the spruce forest.

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21. \*Hot Spring Island chain (est. 400 prs.). Burrows were most concentrated under the open forest of the two northern islets.

22. \*House Island (est. up to 50 prs.). On June 25 a chick about a week from fledging was found in a burrow on the northwest edge of the small island east of House Island.

23. \*Andrew Point, Ramsay Island (est. at least 10,000 prs.). Burrows were located beneath the forest edge along at least half a mile of shoreline. The colony was densest on the grassy slopes at the two lips of the point.

26. \*Crombie Point, Ramsay Island (est. 200+ prs.).

32. \*Arichika Island (est. 500 prs.). Burrows were located along the north, east, and south edges.

33. \*Alder Island (est. 300 prs.). On the small island to the north.

35. \*Howay Island. In 1972, D. Ellis reported large numbers of auklets nesting here.

36. \*East Copper Island. In 1969 a large colony was recorded here by J. B. Foster.

38. \*Bolkus Island (est. 100 prs.). Perhaps 100 burrows were scattered around the edges of the western of the two centre islets. None was recorded on the eastern islets when they were visited in 1969 by J. B. Foster.

41. \*Rankine Islands. In 1972, D. Ellis recorded a colony here.

**RHINOCEROS AUKLET: *Cerorhinca monocerata* (Pallas).** These birds were seen occasionally feeding in rafts in the north half of the area (over 200 in one raft east of the Skedans Islands). However, no colonies were found. On the evening of June 28, 1971, one or two birds were heard in the ancient murrelet colony on the Limestone Islands, but no burrows could be found the next day. On July 15 and 16, 1971, several hundred auklets were seen in and about four locations between Skinecuttle Inlet and Houston Stewart Channel. It is possible that these birds nest on some of the headlands along this stretch of Moresby Island.

#### Colonies

5. (\*) Limestone Islands (see above).

44. \*Anthony Island (est. 5,000+ prs.). In 1969, large numbers of auklets were nesting here (J. B. Foster). In 1971 the largest concentration was along the northern three-quarters of the east side. Burrows were absent from the south end. The area above the bluffs along the south west side was not checked. The areas used had a thick canopy of spruce and very little undergrowth.

45. Moorhead, Kunghit Island (100-150 prs.). Recorded as nesting here in 1946 (Drent and Guiguet, 1961).

**TUFTED PUFFIN: *Lunda cirrhata* (Pallas).** Because of its diurnal habits the breeding distribution of this species in British Columbia is probably better known than that of most other alcids, but only one small colony was found during this survey.

The exact location of the 1900 record in Houston Stewart Channel (Drent and Guiguet, 1961) is unknown. There are presently a few puffins nesting on the Adams Rocks west of the channel. A few puffins were seen flying from the rocks on the northeast side of Anthony Island, but no search was made for nests. Another possible nesting site for the birds seen in this area is Flatrock Island (ENE of Anthony Island). The only other sighting was of a pair seen flying seaward from the direction of Cumshewa Head on May 19, 1971.

#### Colonies

15. Tuft Islets. In 1960, burrows were found by J. B. Foster, who noted 30 birds circling the island. None was present in 1969, 1970, or 1971.

43. \*Adams Rocks (est. 12 prs.). A dozen burrows were found in the dense grass on the east side of the islet.

47. Islet off Lyman Point (Kunghit Island). In 1960, 25 pairs were estimated by J. B. Foster to be circling the burrow-riddled, steep, grassy cliff.

48. Kevouard Island. Numerous burrows were recorded in 1958 (Drent and Guiguet, 1961).

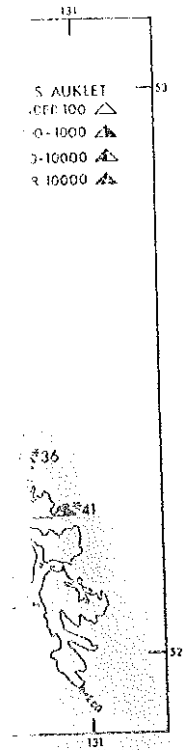
#### Discussion

Little can be said here about the reasons for the observed distributions of seabird populations along the east coast of Moresby Island. However, two matters merit brief comment.

#### Population Changes

Several changes in colony status were noted. In 1960, tufted puffins nested on the Tar Islets and ancient murrelet burrows covered Boulder and Sea Pigeon Islands. In 1961, murrelets were present on the Tar Islets. Since then, the birds have completely vacated these areas. On Sea Pigeon Island, this may have been a result of the dense growth of salal which was likely not there on the first visit.

In 1960 a large population of ancient murrelets covered Agglomerate Island. In 1971, there was very little evidence of their presence, whereas fork-tailed petrels were numerous in their place. The fork-tailed petrel will fre-



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quently use a natural cavity or the burrow of another species rather than dig its own. It is possible that the decline of murrelets created a source of readily available nesting sites for the petrels. This species also seemed to be using burrows dug by a larger species on the western Skedans Island.

In other instances there were colonies in 1971 in areas where they had not been recorded on previous casual visits in 1960, although in every instance it is possible that specific areas where they occurred were not checked. This could apply to colonies of cassin's auklets on the Agglomerate, Bolkus, and Rankine Islands, and to fork-tailed petrels on the Bischoff and Rankine Islands.

There were also several instances of two or more species intermingling, apart from overlap at the edge of adjacent colonies. On three islands (Murchison, Ramsay, and Bolkus), small numbers of ancient murrelets nested within a cassin's auklet colony. This was only determined by the presence of remains and of egg shells, as the burrows were not found.

All leach's petrels found in 1971 were mixed with fork-tailed petrels and all petrel colonies were in spruce forest. As a rule, fork-tails pre-

fer forested areas, whereas leach's nest in open grassy areas. In a mixed colony the habitat seems to most closely resemble that preferred by the most populous species. There was no obvious difference in the burrow site chosen by either species. It is possible that the leach's petrels, being too few in number to form a colony, were attracted to that of the other species. An exceptional case seems to have been on the Rankine Islands, where leach's petrels nested abundantly in the mossy coast forest in 1960 (BCNRS). In 1972, fork-tailed petrels were found there.

Pelagic cormorants showed considerable change with previously known colonies being abandoned and new colonies apparently being initiated where immature birds in roosts were attempting to nest. Two recent obvious changes are the abandonment of Vertical Point in 1971 and the increase in the Murchison Island colony from 12 pairs in 1969 to 100 pairs in 1971.

General impressions indicate that there are several available but unused locations on the islands along the east coast of Moresby Island which are suitable for nesting by seabirds. Table II lists those islands visited in 1971 which did not contain seabirds (except pigeon guillemots).

TABLE II  
Islands visited in 1971 which did not have nesting seabirds

Island	Location	Vegetation
Haswell Island	52°52'N, 131°41'W	sparse to dense salal; spruce forest
Helmet Island	52°49'N, 131°39'W	steep; spruce forest; sparse undergrowth
Flower Pot Island	52°47'N, 131°33'W	dense salal
Kunga Island	52°46'N, 131°33'W	spruce forest; sparse to dense undergrowth
Dog Island	52°44'N, 131°33'W	spruce forest; dense salal
Statung Islets	52°43'N, 131°32'W	spruce forest; dense undergrowth
Tuft Islets*	52°42'N, 131°25'W	steep grassy slopes
Scaga Island	52°41'N, 131°23'W	rock outcrops; grassy and bushy slopes
Islet NE of Faraday Island	52°36'N, 131°28'W	spruce forest; dense salal
Hotspring Island (main island)	52°35'N, 131°27'W	spruce forest; sparse to dense salal
Hutton Island	52°31'N, 131°32'W	spruce forest; dense salal
Marco Island	52°31'N, 131°31'W	spruce forest; sparse to dense undergrowth
2 small islets W of Marco Island	52°31'N, 131°31'W	spruce forest; medium salal
Nakons Islet	52°26'N, 131°21'W	medium salal
Park Island	52°26'N, 131°25'W	spruce forest; medium salal
Koga Islet	52°26'N, 131°23'W	spruce forest; dense salal
Center Islet	52°25'N, 131°24'W	spruce forest; dense salal
Wanderer Island	52°25'N, 131°24'W	spruce forest; sparse to dense undergrowth
Section Islet	52°25'N, 131°22'W	spruce forest; dense salal
Kat Island	52°23'N, 131°23'W	spruce forest; sparse to dense undergrowth
E Swan Island	52°20'N, 131°28'W	spruce forest; sparse to dense salal
Sea Pigeon and Boulder Islands*	52°18'N, 131°17'W	spruce forest; sparse to dense salal
Unnamed isl E of Boulder Island	52°18'N, 131°16'W	spruce forest; dense salal

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### Predation

Predation was observed only once. On the Skedans Islands, on May 25 at dusk, a bald eagle (*Haliaeetus leucocephalus*) was seen carrying a petrel in its talons on three separate occasions. In one instance an eagle was seen, after several attempts capturing a petrel as it attempted to rise from the water. Other signs of predation were in the form of remains of birds. These were of two kinds. (1) River otter (*Lutra canadensis*) scats with feathers were often found in colonies, although scats with fish or invertebrate remains were more common. Sealy (1972) examined river otter scats at dens on Langara Island, but found no evidence that they preyed on murrelets there. All colonies visited in 1971 showed signs of river otters. There was no evidence of any disturbance in the colonies themselves, although an abundance of petrel wings was found around an otter slide on the Hoskins Islets, and J. B. Foster has seen otter slides covered with murrelet wings (*pers. comm.*).

(2) Most remains consisted of attached or unattached wings of burrow-nesting seabirds. These remains were usually very common and were found scattered throughout the colony. Of the three most abundant burrow nesters, fork-tailed petrels, ancient murrelets, and cassin's auklets, remains were found only of the former two species (cassin's auklet remains were never found whether in a pure colony or in one which was adjacent to that of another species of which remains were found). There were no direct observations to indicate what species were responsible for bird remains, but there are two probabilities. Both peregrine falcons (*Falco peregrinus*) (Beebe, 1960) and rats (*Rattus rattus alexandrinus*) (Campbell, 1968; Sealy, 1972) will leave such remains. Peregrine falcons nest abundantly along the section of coast surveyed. Beebe has recorded their use of the three species mentioned on Langara Island. Remains were typically of pairs of attached wings which were scattered throughout the colony or found in piles at a feeding site. The wings of at least 15 ancient murrelets were found in a pile at the edge of a clearing on Alder Island. Rats have been introduced to the Queen Charlotte Islands and are fairly widespread, occurring in the wild state on some of the smaller

islands (Foster, 1965). Foster (1965) records rat predation on east coast islands as being light, where present. Sealy (1972) found a similar situation on Langara Island. I cannot say what effect rats may have had on the colonies visited in 1971.

Other potential mammalian predators are black bears (*Ursus americanus*), which seldom occur on islands smaller than Burnaby Island, although Foster (*pers. comm.*) noted evidence of bears visiting Freeman Island (west coast of Graham Island) and digging up petrels there; short-tailed weasels (*Mustela erminea*), which are very rare (Foster, 1965) and probably can be discounted as a major predator; marten (*Martes americana*), which have not been recorded from islands smaller than Louise Island; and the recently introduced racoons (*Procyon lotor*), which have not yet been recorded south of Graham Island. Other potential avian predators are northwestern crows (*Corvus caurinus*) and ravens (*Corvus corax*). Sealy had found that these species are capable of leaving remains in the form of pairs of wings. The diurnal habits of crows and ravens would rule them out as major predators of burrow-nesting species. There was very little sign of depredation of gulls' eggs. There is no evidence to suggest that predators are a major factor in governing distribution on the smaller offshore islands.

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### References

- BEEBE, F. L. (1960). The marine peregrines of the Northwest Pacific Coast. *Condor*, 62:145-188.  
 CAMPBELL, R. W. (1968). Alexandrian rat predation on ancient murrelet eggs. *The Murrelet*, 49 (30):38.

- DRENT, R. H., and GUGUET, C. J. (1961). A Catalogue of British Columbia Sea-bird Colonies. *Occas. Pap. British Columbia Prov. Mus.*, No. 12, 173p.
- FOSTER, J. B. (1965). The Evolution of the Mammals of the Queen Charlotte Islands, British Columbia. *Occas. Pap. British Columbia Prov. Mus.*, No. 14, 130p.
- SEALY, S. G. (1972). *Adaptive Differences in Breeding biology of the Marine Bird Family Alcidae*. Ph.D. thesis, Univ. of Michigan, Ann Arbor, p. 113-116.