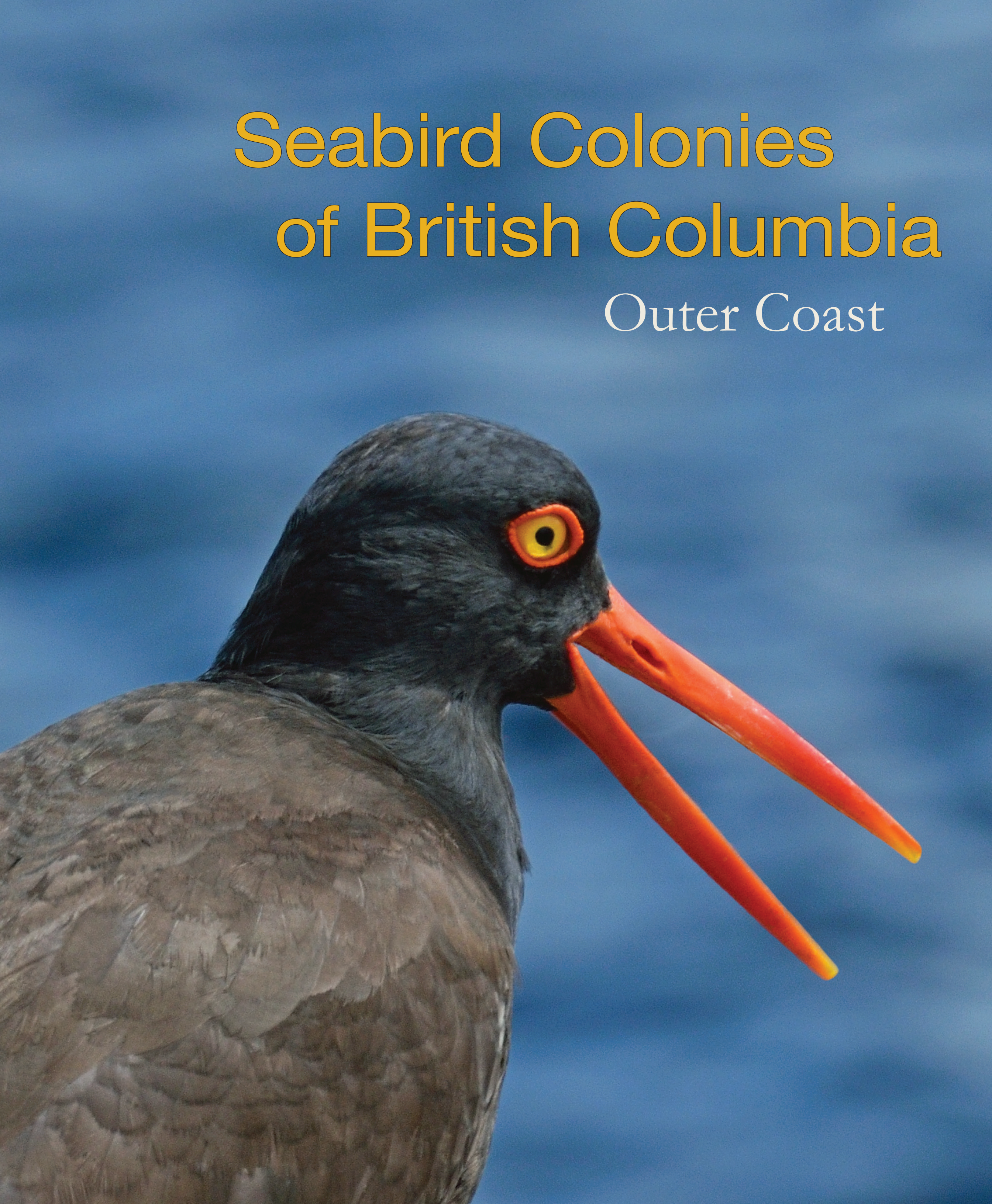
Seabird Colonies of British Columbia

Outer Coast



Northern Outer Coast, British Columbia

Seabird Colonies of British Columbia
Outer Coast

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

Triangle Island is home to most of the Common Murres breeding in British Columbia. *Photo by Michael S. Rodway.*

Three species have been added to the list of seabirds breeding along the outer coast of British Columbia since the 1961 catalogue by Drent and Guiguet. One species, Brandt's Cormorant (top), has extended its breeding range north from the coast of the United States, and two species, Thick-billed Murre (bottom left) and Black-legged Kittiwake, have moved south from their main breeding grounds in Alaska. *Photos by R. Wayne Campbell and Alan D. Wilson (murre).*

A Tribute to J. Bristol Foster – Forthcoming in Volume 4

We intended to include in this volume a tribute to Bristol Foster, who has campaigned for the conservation of the natural environment for most of his life, and who has made tremendous contributions to the study and conservation of breeding seabirds in BC. Unfortunately, we have encountered problems obtaining the information and photos that we need to complete the tribute to our satisfaction. In addition, major health issues have handicapped our second author and have further compromised our ability to complete the tribute at this time. Because the rest of this volume was ready for printing, we decided to postpone the tribute to Bristol until the upcoming fourth volume, and proceed with publication of this third volume. We hope to pay adequate tribute to his life's work in the next volume of this treatise.

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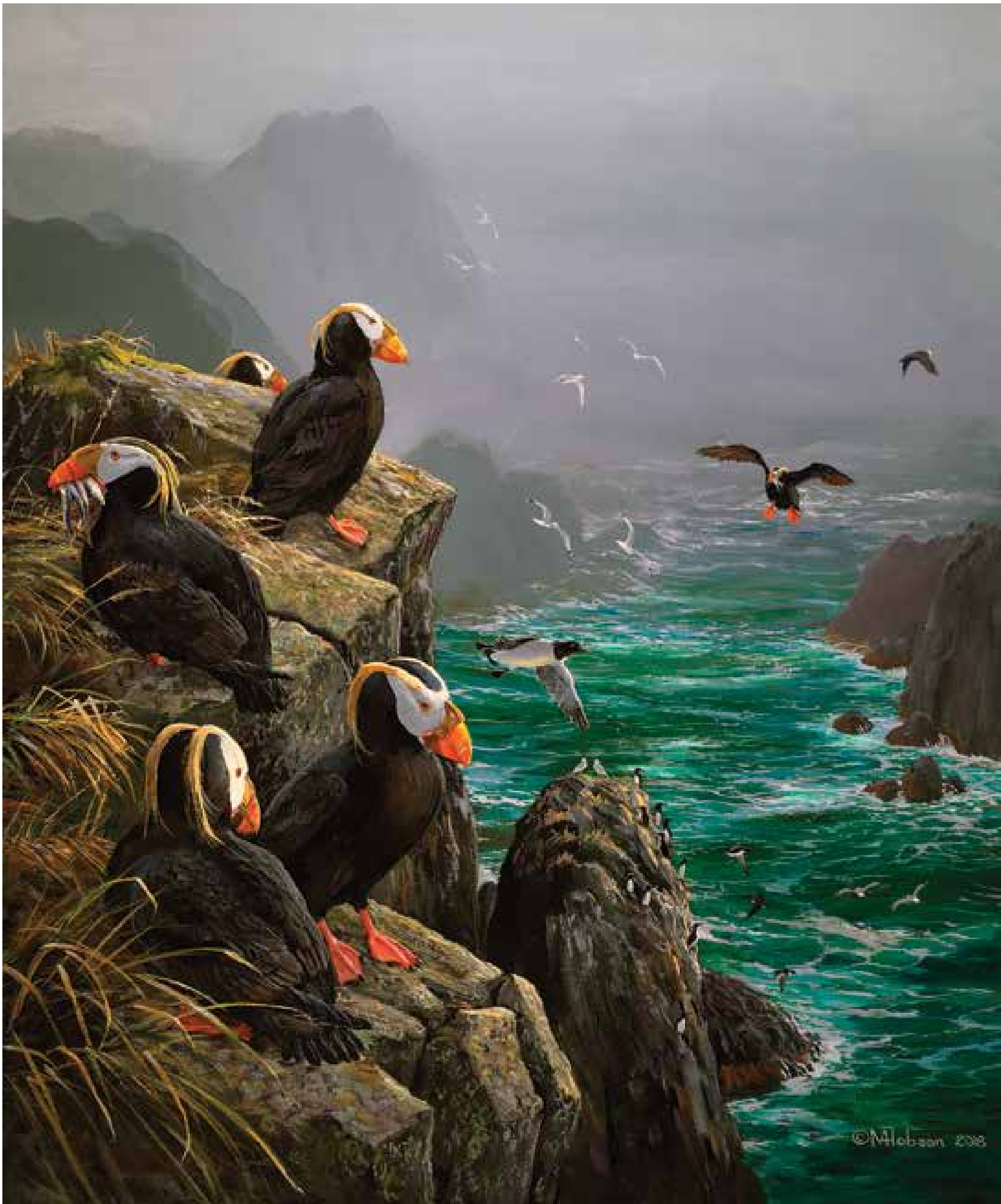
ON THE COVERS.........**Front**: Black Oystercatcher. *Photo by Mark Nyhof.*
Back: Black Oystercatcher nest. *Photo by R. Wayne Campbell.*
Inside covers: Maps prepared by HR GISolutions Inc., Victoria, B.C.
Title page: Triangle Island. *Photo by Michael S. Rodway.*



Seabird colonies are some of the most enthralling places on earth. The antics of Tufted Puffins on their breeding colonies are endlessly captivating. [Painting "Tufted Puffins: Arrivals Lounge, Coronation Island, Alaska" *courtesy Mark Hobson, Coastline Art Inc*.]

This third volume of Seabird Colonies of British Columbia includes all colonies along the outer mainland coast, from the Alaska border to the north end of the Strait of Georgia in the Salish Sea, and all colonies along the outer west coast of Vancouver Island, from Triangle Island south to Race Rocks. [Paintings “Glaucous Winged Gull: Head Honcho” (top) and “View From Black Rock: The Survivor” *courtesy Mark Hobson, Coastline Art Inc.*]

The wilderness beauty of outer coastal areas in BC attracts numerous visitors. Unfortunately, well-meaning tourists often unwittingly impact the breeding success of nesting seabirds through disturbance that flushes birds off their nests and by trampling fragile nesting habitats. [Paintings "Barkley Sound: Broken Islands Sunset" (top) and "Schooner Cove: Journey's End" *courtesy Mark Hobson, Coastline Art Inc.*]

The recovery of Bald Eagle populations in the Pacific Northwest has had consequences for nesting seabirds. In addition to directly preying on many seabird species, eagles frequently flush cormorants and gulls from their nests leaving eggs and chicks easy victims of opportunistic predators including crows, ravens, and other gulls. [Painting "Bald Eagle: Morning Catch" *courtesy Mark Hobson, Coastline Art Inc.*]

Conservation initiatives in the Carmanah valley and Clayoquot Sound on the west coast of Vancouver Island helped protect some of the last tracks of intact old-growth forest that Marbled Murrelets depend on for nesting. [Painting "Winter Wren: Singing in the Rainforest" *courtesy Mark Hobson, Coastline Art Inc.*]

This gentle giant bears no malice towards seabirds but does occasionally ingest Cassin's Auklets, Marbled Murrelets, Ancient Murrelets, and probably other species that have the misfortune to be in their path. [Painting "Grey Whale: Forced Entry" *courtesy Mark Hobson, Coastline Art Inc.*]

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SEABIRD COLONIES OF BRITISH COLUMBIA: A HISTORY TO 1990 (with appended data to 2022)

Part 3: OUTER COAST

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PREFACE

This is Part 3 in the series of publications presenting the history of British Columbia (BC) seabird colonies. In Part 1, we presented the background and introduction to the entire document and a review of provincial populations and trends (Figure 1).[188] In Parts 2-4, we present detailed accounts of every known seabird nesting site identified in BC as of 1990 (except Part 4 will include accounts for all colonies identified as of 2022). We summarize populations within 12 designated regions of the coast (see Figure 58 on page 58 in Part 1) to provide specific information required to manage local impacts and proposed developments. Part 2 presented colony accounts for Haida Gwaii (Figure 2).[189] In the present volume, we consider all known seabird colonies along the BC outer coast from the Alaska border to Race Rocks at the southern tip of Vancouver Island (see maps on inside front and back covers). We have divided this area into four regions and summarize breeding populations in each region. Part 4 will cover all colonies in the inner waters of the BC portion of the Salish Sea.

Figure 1. The first of four books on the breeding seabirds of BC was published in 2018.[188] That volume presented the background and introduction to the entire series, provincial populations and trends for each species, and an in-depth discussion of past impacts, current threats, and recommended conservation measures for breeding seabirds in the province.

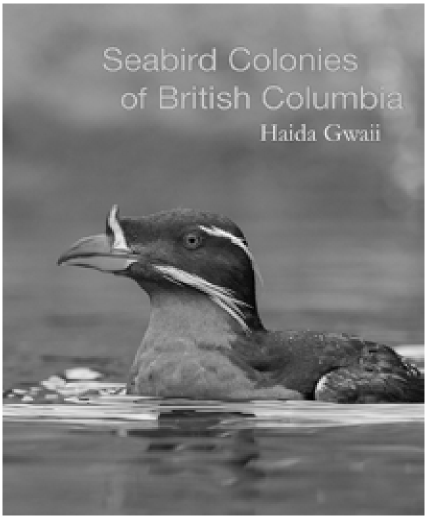


Figure 2. The second book in the series covering the breeding seabirds of BC presented detailed histories, current threats, and conservation concerns for seabird colonies in Haida Gwaii (Queen Charlotte Islands). That volume was published in 2020.[189]

Effective management responses to impacts such as oil spills or introduced predators depend on knowledge of local 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 and mining, sports fishing resorts, and ecotourism. 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, and monitoring of breeding seabirds in BC, as well as to persons interested in the natural history of the coast (Figure 3). 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.

Figure 3. The general public has an increasingly important role to play in the conservation of the province's breeding seabirds. Oil slicks in harbours or other waters, oiled seabirds washed ashore dead or alive, human disturbances at colonies, and shootings should be reported immediately to government officials. *Photo by R. Wayne Campbell, Long Beach, BC, 21 August 1969.*

In the colony accounts presented here, information as of 1990 was considered current and in the main colony accounts no attempt has been made to include data collected since. The rationale for limiting our colony histories to 1990 was presented in Parts 1 and 2.[188, 189] 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 (Figure 4); 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. The second reason is less pertinent now (see below). The 1990 and earlier survey data are still the most current for most colonies and provide our best base-line population estimates for the BC outer coast, including the only estimates available for breeding seabirds at a metapopulation scale. Since 1990, there have been few surveys of colonies along the outer coast. Incorporating such partial data into overall estimates of breeding populations may positively or negatively distort overall regional estimates and population trends, depending on which colonies are selected for repeat surveys (See Part 2 [189] for a discussion of this problem).

Although we did not include post-1990 data in our colony accounts, we have summarized more recent data known to us in Appendix 1 of this volume. Post-1990 data that we were aware of were also summarized and discussed in the Species Accounts section in Part 1. In Appendix 1, we have organized post-1990 data by region and by colony. This provides a synopsis of known changes that should be useful for those involved in research or management of seabird populations in each area. Some of the data in Appendix 1 was presented in the post-1990 portions of the species accounts in Part 1,[188] but we have added a considerable amount of data that we have obtained since the publication of that volume. In the intervening years since the publication of Part 1, we have likely gathered most quantitative data that exist for colonies along the BC outer coast, although there may still be some unreported, incidental observations by naturalists, fishers, recreational boaters, and private wildlife contractors, some data in assessment reports related to the numerous proposed and completed development projects along the outer coast, and perhaps some government surveys that we are unaware of. We have continued to add records to Appendix 1 from eBird [287] and other sources through summer 2022. More recent data are also discussed in some of the inserted anecdotes in the main text.

In Part 1,[188] we described the various survey methods used over the years to census seabird colonies in BC, and provided a detailed key to the codes used to qualify data in tables. Brief definitions of the codes used in the tables are provided in Appendix 2 of this volume. Appendix 3 lists sites along the BC outer coast that were explored during seabird surveys but where no evidence of nesting by seabirds was found.

Figure 4. The comprehensive seabird inventory program by the Canadian Wildlife Service on the BC coast ended in 1990. Data from those surveys provide the most current and reliable estimates of total seabird breeding populations for the province. Here the CWS crew is conducting surveys on Triangle Island. From left to right are: Ken Summers, Brian Carter, and Dick Grinnell. *Photo by Michael S. Rodway, 18 July 1989.*

INTRODUCTION

Unlike the geographically discrete archipelago of Haida Gwaii that was dealt with in Part 2 of this work,[189] the outer coast of BC is more arbitrarily defined and more complicated to describe. Northern and southern boundaries are political, with the American states of Alaska to the north and Washington to the south (see maps on the inside covers). Boundaries between the outer coast regions considered here and the Salish Sea regions that will be addressed in Part 4 are also somewhat arbitrary. Seabird breeding populations in the adjacent jurisdictions of Alaska and Washington are described elsewhere by others.[74, 207, 210, 220] In this volume, we have confined our presentation to seabird populations breeding in BC. However, management plans for nesting species should consider breeding populations at metapopulation scales that transcend political boundaries (Figure 5).

The Outer Coast of British Columbia – Alaska to the Southern Tip of Vancouver Island

The first of the four regions we consider on the BC outer coast, the *Northern Mainland Coast*, extends from the Alaskan border to Cape Caution and includes the waters on the east side of Hecate Strait and Queen Charlotte Sound. South of Cape Caution, the *Queen Charlotte and Johnstone Strait* region encompasses the waters between the northern end of Vancouver Island and the BC mainland. The open waters of Queen Charlotte Strait narrow to the southeast and merge with Johnstone Strait, which connects to the northern Strait of Georgia in the Salish Sea. There are a few small seabird colonies in the Johnstone Strait area and we include them in the Queen Charlotte-Johnstone Strait region. We have defined the eastern end of Johnstone Strait where it meets Discovery Passage as the boundary of this region and the Salish Sea regions considered in Part 4, although narrow channels among islands, similar in nature to the Johnstone Strait area, continue south

Figure 5. Knowledge of the distribution, status, and trends in seabird breeding populations at metapopulation scales that transcend national boundaries is often crucial to understanding and interpreting local changes in seabird breeding populations. For example, Horned Puffin (*Fratercula corniculata*), a common breeding bird in Alaska, has extended its range southward and small numbers now breed annually in BC.[38, 188] Western Gull (*Larus occidentalis*) nests from southern Washington to California and has yet to be confirmed breeding in BC. However, hybridization between Western Gull and our main nesting gull species in BC, the Glaucous-winged Gull (*L. glaucescens*), is extensive where their ranges overlap in Washington and Oregon.[295] Western-Glaucous-winged Gull hybrids have often been recorded nesting in BC, especially at colonies along the west coast of Vancouver Island.[161, 188] *Photos by Alan D. Wilson and R. Wayne Campbell* (*Western-Glaucous-winged Gull pair*).

for about 40 km past Quadra and Read islands before they reach the more open waters of the northern Strait of Georgia. The third region, the *Scott Islands*, is a distinct chain of five islands off the northwest tip of Vancouver Island. This area warrants treatment as a separate region due to its importance for breeding seabirds in BC. Finally, the *West Coast Vancouver Island* region includes all areas along the southwest side of Vancouver Island from its northwest tip to Race Rocks (Figure 6). Detailed maps showing the

Figure 6. This is the third of four volumes on the seabird colonies of British Columbia. The area covered in this outer coast volume extends from Alaska south along the BC mainland coast to Queen Charlotte and Johnstone straits and includes the west coast of Vancouver Island to Race Rocks. The area is vast, diverse, remote, and wild. Pictured here, the BC outer coast (clockwise from upper left): experiences some of BC's strongest storms and heaviest rainfall in winter; is dissected by long, narrow, steep-sided fjords and passages; supports a large population of Bald Eagles; has about 10 fishing communities like Tofino scattered along the coast; is a popular recreational area frequented by sea kayakers and other tourists; and is traversed by millions of waterbirds and shorebirds, like these Short-billed Dowitchers (*Limnodromus griseus*), during their migrations to and from northern breeding grounds. *Photos by R. Wayne Campbell.*

locations of all colonies in each region are provided at the beginning of each regional summary.

We consider Race Rocks as part of the West Coast Vancouver Island region, as did Drent and Guiguet,[77] Campbell,[32] Vermeer et al.,[238] and Ewins et al.,[84] although some authors [56, 64, 231, 240] have included Race Rocks as part of the Strait of Georgia. Officially, areas south of Carmanah Point on Vancouver Island, which includes colonies from "Parkinson" Cliff (WV-870) to Race Rocks (WV-930), are within Juan de Fuca Strait and are considered part of the Salish Sea.[88] Juan de Fuca Strait exhibits transitional characteristics between the exposed outer coast and inland waters and is influenced by discharge from the Fraser River, especially during spring runoff. Overall, however, the area between Carmanah Point and Race Rocks is more like the outer coast in terms of ocean temperatures, salinity, tidal cycles, fog, and exposure to ocean swells.[218] A glacial sill that runs across the eastern end of Juan de Fuca Strait south of Victoria arrests the penetration of colder, higher-salinity waters from the open ocean. That sill is a reasonable boundary between the outer coast and inner waters of the Salish Sea that we consider in Part 4.

The Geological History of the BC Outer Coast

The geological history of the BC outer coast is complex. Its present shape is a product of ongoing tectonic movements and collisions, volcanic intrusions, glacial and riverine sculpting and sedimentation, and changing ocean and land levels.[86, 125, 218] The parts of the earth's crust that now form the multitude of islands along the BC coast, including Vancouver Island and Haida Gwaii, likely originated in what is now northern Europe and Russia. Those terranes travelled across the Arctic to the northwest coast, docking with older terranes that form the BC interior sometime between 175 and 100 million years ago.[45, 86] During that period, a general downfolding of the crust along the Pacific coast created the Georgia-Hecate Depression that runs from Alaska to the Gulf of California. The low islands and inside waterways of the present BC coast lie in that trough. Concurrent uplift and folding of adjoining areas began the formation of the Coast Mountains and the Vancouver Island Ranges. A series of uplifts and downfoldings, accompanied by changing ocean levels and erosion patterns, continued to shape the BC coast over the next 100 million years. Over the last 1-2 million years, intense scouring and gouging by a series of massive glaciers sculpted the coast we see today (Figure 7). Glaciation during the most recent Wisconsin Glacial Episode reached its maximum extent only 16,000-21,000 years ago.[45, 198, 218]

Large changes in ocean and land levels have been associated with tectonic movements over the last 100 million years and with glacial advance and retreat over the last one million years. One period of uplift five to ten million years ago resulted in a full retreat of the ocean from the coastal trough, creating an expansive valley along the east side of Vancouver Island.[218] During glacial periods of the last million years, coastal areas were covered in glacial ice sometimes over 2 km thick (Figure 8). The weight of that ice depressed land levels as much as 250 m along the inner coast.[45, 66] It also created a crustal forebulge which uplifted areas towards the western margins of the continental shelf, including Haida Gwaii. The continental ice sheets also removed vast quantities of water from the oceans, causing sea levels to fall as much as 140 m below their present level. Immediately following retreat of the most recent Cordilleran Ice Sheet, shoreline levels along the BC outer coast varied from more than 100 m lower to as much as 200 m higher than today.[66] Subsequent shoreline levels and the evolving shape of the BC coastline have been determined by the relative magnitude of crustal rebound, which tends to lower shoreline levels, and glacial melting, which raises sea levels. Until a few thousand years ago, crustal rebound dominated and shoreline levels fell over most of the BC coast, especially in nearshore waters. In contrast, shoreline levels initially rose in offshore areas of Haida Gwaii, Queen Charlotte Sound, and parts of the west coast of Vancouver Island, in areas that had been affected by crustal forebulge and where the thickness of glacial ice and crustal subsidence had been less during peak glaciation.[66, 218] Over the last few thousand years, sea levels rose in most areas of the BC coast as global sea levels rose and local uplift ceased, although continued tectonic uplift has exceeded sea level rise along the west coast of Vancouver Island in recent years. The trend of rising sea levels will continue through the near future as global temperatures rise and ice caps continue to melt.

Figure 7. The advance and retreat of massive sheets of ice over the last million years sculpted the coastal landmass of BC into the complex topography that we see today. *Photo by Heidi M. Regehr, Llewellyn Glacier, BC, 12 September 2018.*

Figure 8. The Cordilleran Ice Sheet was in retreat when the first humans arrived on the BC coast over 13,000 years ago. The retreating tongues of ice must have been as awe-inspiring for those early humans as it is for us puny mortals today. This photo shows Michael Rodway (centre) dwarfed by the massive Llewellyn Glacier. *Photo by Heidi M. Regehr, 12 September 2018.*

A dynamic geological history combined with changing sea levels has created the BC coast we know today. The currently flooded continental margin creates a shallow continental shelf that extends westward off the BC coast to as far as 80 km off the south end of Vancouver Island. Deep, glacially-carved fjords penetrate the Coast Mountains and the insular mountains on the west side of Vancouver Island (Figure 9). Exposed along the mainland coast from Alaska to the Strait of Georgia are thousands of islands separated by thousands of kilometres of river and glacier carved channels. These channels include the series of navigable waterways that form the Inside Passage along the northern mainland coast. Along the west coast of Vancouver Island, large numbers of islands occur in some areas like Barkley, Clayoquot, and Nootka sounds, and in Checleset Bay, but other areas, especially towards the south end of Vancouver Island, have fewer islands.

Figure 9. Steep-sided and narrow, Toba Inlet, located northeast of Campbell River, is an example of the many glacially-carved fjords along the BC coastline. *Photo by Chris McNeill, July 2011.*

Habitat for Nesting Seabirds along the BC Outer Coast

Following the retreat of the recent Cordilleran Ice Sheet, most of the larger islands along the BC outer coast developed forest ecosystems (Figure 10). All areas of the outer coast considered in this volume are classified within the Coastal Western Hemlock Biogeoclimatic Zone, characterized by cool, cloudy summers, mild, high-rainfall winters, and frequent fog and drizzle throughout the year (Figure 11).[164] Tree species are predominantly western hemlock (*Tsuga heterophylla*; hereafter hemlock), western redcedar (*Thuja plicata*; hereafter redcedar), and Sitka spruce (*Picea sitchensis*; hereafter spruce; Figure

Figure 10. Vegetation communities began to develop as the Cordilleran Ice Sheet withdrew from BC land masses after reaching its peak about 16,000-21,000 years ago. *Photo by Heidi M. Regehr, Llewellyn Glacier, BC, 11 September 2018.*

12). Islands off the northwest tip of Vancouver Island, including the outer Scott Islands and Solander Island, developed treeless, wind-pruned mantles of grasses, ferns, and shrubs (Figure 13).[47] Shorelines of large islands and many small islands are rugged bedrock that has resisted erosion since being exposed after the last glacial retreat 10,000 years ago.[66, 125] Eroded shorelines occur where softer sedimentary rocks or glacial deposits have been exposed to wave action. Sea cliffs and extensive beaches along the west coast of Vancouver Island are examples (Figure 14).

Figure 11. Summer and early autumn fogs are common along the BC outer coast. Fog often develops in the morning but is generally short lived and burns off by early afternoon. However, foggy weather can sometimes settle in for days. *Photo by R. Wayne Campbell, Long Beach, BC, 30 June 1967.*

Figure 13. Triangle Island is the outermost of the Scott Island group at the northwest tip of Vancouver Island. Devoid of trees, it supports a continuous cover of grasses, ferns, and shrubs, predominantly salmonberry. *Photo by Michael S. Rodway, 23 July 2014.*

Marine ecosystems along the BC outer coast have been shaped by the interface of atmospheric and oceanic circulation patterns with the current bathymetry of the coast.[218] Productive marine areas are created wherever cold, nutrient-rich waters are brought towards the surface. Cold water upwellings are driven by two main processes: they occur where tidal and non-tidal currents are deflected upward by bathymetric features, and where cold waters rise to replace surface waters displaced by prevailing winds. Prevailing winds and currents off the BC

Figure 12. Tolerant of salt spray, Sitka spruce is the dominant tree growing at the forest edge in areas exposed to powerful Pacific storms along the outer coast. Bald Eagles often perch and nest in shoreline spruce trees. *Photo by Moira J.F. Lemon, 12 July 2016.*

Figure 14. Along the West Coast Trail, within Pacific Rim National Park Reserve, are examples of the eroded shorelines that occur along the west coast of Vancouver Island. Pictured on the left, are the sedimentary rock shelves at Pachena Point, which provide a haulout for Steller Sea Lions (*Eumetopias jubatus*). On the right, are the eroded seacliffs and the extensive beach near Tsocowis Creek, northwest of Valencia Bluffs. *Photos by Moira J.F. Lemon, May 2019.*

coast are primarily controlled by the locations and intensities of the Aleutian Low and the North Pacific High pressure systems. Winds are primarily from the southeast and southwest during winter, shifting to northwest during summer as the high pressure system builds. The main Subarctic Current that flows eastward across the North Pacific bifurcates off BC into the northward flowing Alaska Current and the southward flowing California Current. Current-driven upwellings create productive areas along the edge of the continental shelf, where the shallowing continental slope forces deep currents upward, and on the continental shelf, where shoals, underwater ridges, and narrow passages deflect waters toward the surface. Prevailing northwest winds in summer create weak regions of upwelling along the west coast, which become most developed along Vancouver Island in such areas as the entrance to Barkley Sound.

To breed successfully, seabirds require suitable substrates for nesting, access to productive feeding grounds, and protection from predators. In most areas of the BC outer coast, numerous forested islands and grassy, herbaceous, or shrubby areas on exposed and smaller islands provide abundant habitat for burrow-nesting species (Figure 15). Sea cliffs and many low, rocky, or grassy islands provide suitable habitat for surface-nesting species. However, seabirds nest on

Figure 15. Grassy headlands and interior forest of Sitka spruce with an understory of shrubs, ferns, and herbaceous vegetation provides abundant burrowing habitat for Rhinoceros Auklets on Pine Island. *Photo by Moira J.F. Lemon, 27 July 2006.*

Figure 16. Suitable nesting habitat for Common Murres occurs on Triangle Island in the Scott Islands, where most of the BC population breeds. A dearth of similar habitat on other islands may limit the distribution of breeding murres in BC. *Photo by Michael S. Rodway, 27 July 2014.*

only a tiny portion of the multitude of forested and rocky islands that occur along much of the outer coast. Nesting substrate is not likely a limiting factor in the northern mainland coast or Queen Charlotte-Johnstone Strait regions, except perhaps for Common Murres (*Uria aalge*), whose nesting distribution in BC may be limited by the availability of large islands with suitable cliff and rocky habitat (Figure 16).[61] Along the west coast of Vancouver Island, the lack of vegetated islands restricts the distribution of burrow-nesting species in the area south of Barkley Sound.

Access to productive feeding grounds is vital but probably not a determining factor in the nesting distribution of most species in BC. Cormorants (*Phalacrocorax* spp.), Black Oystercatchers (*Haematopus bachmani*; Figure 17), and Pigeon Guillemots (*Cepphus columba*; Figure 18) forage close to their colonies,[83, 104, 137] but other species travel considerable distances to forage.[1, 19, 68, 112] The non-colonial Marbled Murrelet (*Brachyramphus marmoratus*) also travels long distances to forage [248] and its breeding distribution on the BC coast is likely most limited by the availability of suitable nesting habitat.[67]

Figure 17. Black Oystercatchers require a rich and diverse intertidal environment close to their nesting sites for foraging. They rarely feed on oysters. *Photo by R. Wayne Campbell.*

Figure 18. Pigeon Guillemots forage in nearshore waters, 10 to 30 m deep, within a few kilometers of their breeding colonies. Main prey taken are small epibenthic fish like gunnels (*Pholidae*) and pricklebacks (*Stichaeidae*). *Photo by Ervio Sian, Cleland Island, BC.*

The current distribution of colonial-nesting seabirds along the BC outer coast is most related to the distribution of native and introduced mammalian predators. Unlike the situation in Haida Gwaii, where introduced predators threaten the survival of nesting seabirds at most colonies,[189] introduced predators have, as far as we know, affected only two colonies along the BC outer coast (see section below on *Impacts from Native Predators and Anthropogenic Sources*). It is the distribution of native American Mink (*Neovison vison*; Figure 19) that probably has the greatest influence on the distribution of nesting seabirds along the BC outer coast. Mink and signs of mink predation on nesting seabirds have been detected on some extant colonies. Nesting seabirds apparently can withstand brief visits by mink but are absent wherever mink are well established. Coastal mink are likely most responsible for restricting nesting seabirds, especially burrow-nesting seabirds, to isolated offshore islands. Pelagic Cormorants (*Phalacrocorax pelagicus; now Urile pelagicus* [288]), Glaucous-winged Gulls, and Pigeon Guillemots have been found nesting along inside waterways on larger islands where mink are prevalent, but nesting in these areas is often restricted to habitats on cliffs or seacaves that are inaccessible to mink.

Figure 19. The distribution of native American Mink is likely the most important factor limiting the distribution of burrow-nesting seabirds to the outer islands of the BC coast. Mink share many life-history traits with their mustelid relative, the river otter, including being semiaquatic and feeding extensively in the marine environment.[108] However, they are more likely to prey on birds, and unlike river otters, do not co-inhabit islands with nesting seabirds. *Photo by Paula Courteau.*

Figure 20. Northern Raccoons are commonly seen along the coastline where they feed on a variety of intertidal invertebrates. Their impact on nesting seabirds is abundantly clear in Haida Gwaii where they have caused the extirpation of seabirds on a number of islands after they were introduced to the archipelago. *Photo by Moira J.F. Lemon, July 2011.*

Other mammalian predators like Northern Raccoon (*Procyon lotor*; Figure 20) and weasel species other than mink would also limit the distribution of nesting seabirds. However, except for Northern River Otters (*Lontra canadensis*), mink are more common than other mammalian predators on outer coastal islands along the entire BC mainland.[108] River otters (Figure 21) are ubiquitous on seabird colonies and will also prey on nesting seabirds. Most of their diet is fish and they coexist with nesting seabirds on most colonies. However, river otters occasionally have larger impacts on seabird nesting populations (see below).

Rainfall intensity has been proposed as an important environmental variable related to the use of islands by burrow-nesting seabirds.[132] Comparison of climate data from eight colony sites and nine non-colony sites found no significant difference in total rainfall but the intensity of rainfall (measured as the amount of rain per day of precipitation) was higher at non-colony than at colony sites.[132] This effect was likely due to the locations where climate data were available. Climate variables cannot explain why seabird colonies occur on some islands but not on numerous other islands that would experience the same meteorological conditions. What distinguishes islands used by burrow-nesting seabirds from nearby islands is the distance that isolates them from source populations of coastal mink.[95] Many islands along the BC outer coast with apparently suitable habitat for burrow-nesting seabirds do not support them. We have seen mink on many of those islands (see Appendix 3).

Figure 21. Northern River Otters are common on seabird islands and generally coexist with nesting seabirds. Their diet is mainly fish, but they will prey on seabirds, especially storm-petrels. Occasionally, individuals or families become more serious seabird predators and have major impacts on nesting populations. Frequently, river otters are seen sunning on wharves in coastal towns like Tofino and Bamfield. *Photo by Mike McCammon.*

Seabirds as Ecosystem Engineers

Humans are not the only species that modify their environment; they just do it on a grander scale than others – at least in recent geological time. Probably the most massive feat of ecosystem engineering on this planet took place over two billion years ago when cyanobacteria transformed earth's atmosphere from a carbon-dioxide/ammonia brew to the oxygen-rich one that has supported all complex lifeforms since. It wasn't intentional – oxygen was simply a metabolic waste product of these bacteria, just as it is for all the photosynthetic organisms that maintain oxygen levels in our atmosphere today. Many human activities intentionally modify the environment at great cost to other species, but some of our most pressing environmental issues such as global warming and plastic pollution (Figure 22) *in the oceans are, like the cyanobacteria's effects on the atmosphere, simply a result of the waste products of human industrial civilization that are unintentionally changing the planet.*

Burrowing seabirds are also ecosystem engineers. They modify habitats through marine-to-land nutrient transfer, which can increase soil nitrogen, phosphorus levels, and soil acidity, and through physical impacts of burrowing, trampling, and uprooting, which can change soil structure and moisture, damage roots and leaves, and increase carbon levels in soil through digging-in of surface organic material. In cool, temperate climates, nutrient inputs and frequent physical disturbance by burrowing seabirds damage woody plants and generally favor fast-growing, short-lived plant species. On Triangle Island, we noticed reductions in grass cover and increases in salmonberry (Rubus spectabilis) *cover between 1989 and 2004.*[120] *Vegetation changes were concurrent with declines in the number of Cassin's Auklet* (Ptychoramphus aleuticus) *burrows and we speculated that vegetation changes were a result of reduced seabird activity. We hypothesized that increases in burrow-nesting seabird activity would reverse those changes. In 2014, we got a chance to test that hypothesis.*

Continuous declines in numbers of Cassin's Auklet burrows were found in permanent plots between 1989 and 2009 (Figure 23).[184] *That trend reversed in 2014, and for the first time in 20 years we saw an increase in the numbers of burrows on Triangle Island. Analyzing concurrent changes in vegetation within the permanent plots revealed that salmonberry cover decreased when burrow numbers increased, as hypothesized.*[197] *The study showed that Cassin's Auklets and Rhinoceros Auklets* (Cerorhinca monocerata) *are effective ecosystem engineers that can shape the vegetation community where they breed. Both auklets prefer open grassy habitat for nesting and by pushing back salmonberry shrub cover they transform the habitat to one more suitable to their needs. However, they were only capable of effecting these changes when burrowing density was high. When seabird activity was reduced during periods of declining population, salmonberry was able to spread into open nesting areas with the result that the amount of preferred habitat available for nesting was reduced* (Figure 24). *We concluded that many years of successful breeding and expanding populations would be required to re-engineer Triangle Island habitat back to the state we found it in in 1989. Unfortunately, the suggested increase in numbers of Cassin's Auklet breeding in 2014 may have been offset by a massive die-off the following winter when thousands of Cassin's Auklet carcasses washed ashore from BC to California.*[115] *Mortality was associated with a persistent warm water "blob" in the northeast Pacific that affected food availability and was likely a consequence of unintentional ecosystem engineering by humans that is changing earth's climate.*[130] *How Cassin's Auklets and other seabird species ultimately fare in the face of planetary engineering by humans only time and continued monitoring will tell.*

Figure 22. The fallout from humanity's overzealous use of plastic is a common sight along the entire BC coastline. Pictured here on one of the beaches of the West Coast Trail are fishing floats, water containers, and bottles. Although seemingly innocuous, plastic debris such as this can break down into small particles that can cause harm when ingested by seabirds and other marine life. *Photo by Moira J.F. Lemon, May 2017.*

Figure 23. Changes in Cassin's and Rhinoceros auklet burrow numbers and vegetation cover on Triangle Island are determined by surveying every five years a set of permanently-marked plots established by CWS in the 1980s. Here, Michael Rodway is measuring out the grid for one plot in which burrows are counted and vegetation cover recorded. *Photo by Heidi M. Regehr, 2 August 2009.*

Figure 24. Changes in vegetation cover can alter habitat availability for burrowing seabirds. Photos of the Rhinoceros Auklet nesting slope in "Calamity Cove" in the south bay area of Triangle Island from 1984 (left) and 2009 clearly show the expansion of salmonberry shrubs into what had previously been tufted hairgrass habitat, preferred by burrowing birds. The lighter coloured grassy areas in 1984 have been almost completely taken over by thick salmonberry 25 years later, with only a narrow band of tufted hairgrass remaining between the two rock bluffs. *Photos by Moira J.F. Lemon, July 1984 and July 2009.*

HISTORY OF SEABIRD COLONY SURVEYS ON THE BC OUTER COAST

First Nations people harvested many species of nesting seabirds and their eggs for food and were familiar with the locations of this important resource.[148] The first written record of nesting seabirds along the BC outer coast came from the early explorers, although we know of only one record confirming breeding by a seabird species along the BC outer coast from the numerous exploratory and mapping expeditions that visited the area in the 18th and 19th centuries. It was not until egg collectors began visiting colonies near the end of the 19th and early 20th centuries that records of nesting seabirds began to accumulate (Figure 25), and not until the latter half of the 20th century that investigators began to collect quantitative data on population sizes.

Early Explorers and Naturalists (1792-1860)

The first recorded visit to a seabird colony in BC was by Archibald Menzies, who made a note of the "shag" colony at Deep Sea Bluffs in 1792, during his voyage with Captain Vancouver aboard the HMS *Discovery* (page 92 of his journal).[155] Menzies was the medical doctor and naturalist on board but, other than the colony at Deep Sea Bluffs, he made little mention of seabirds in his journal, even though the expedition passed many of the main breeding areas for seabirds around Vancouver Island, including the Scott Islands.

David Lyall was the surgeon and naturalist aboard the HMS *Plumper* that, under the command of Captain H. Richards, was charting coastal waters for the British Royal Navy in 1860. Lyall obtained some Rhinoceros Auklet specimens on 22 May 1860 at Fort Rupert, close to present day Port Hardy, which Carter and Sealy [54] suspected were collected at Pine Island by First Nations people.

Expeditions from Outside the Province (1881-1934)

Henry Ezra Nichols was Lieutenant Commander of the United States Coast and Geodetic Survey steamer *Hassler* that conducted hydrographic surveys through the inland waters of BC and southeast Alaska during the summer of 1881.[219] Throughout the early 1880s, he was also an important collector of fishes for the United States National Museum (now the National Museum of Natural History, Smithsonian Institution).[5] In addition to fishes, he collected some mammal and bird specimens, including a Common Murre egg [275a] collected in the vicinity of Port Simpson near the BC-Alaska border (see Green Island account).

Figure 25. Egg collectors provided many early nesting records for seabirds along the BC outer coast. If they could arrange suitable transport, collectors looking for Bald Eagle eggs (left) would have been attracted to places where eagle nests are easy to get at, like Triangle Island, where eagles nest on the ground, or Joseph Island, where nest trees are easily scaled because Sitka spruce limbs are strong and spaced close together. *Photos by R. Wayne Campbell.*

John B. Semple from Pittsburgh made his living as an inventor and manufacturer of tracers and fuses used widely in World War I.[214] He was an avid sportsman and bird collector and mounted expeditions to various parts of North America to collect for the Carnegie Museum of Natural History, of which he was a Trustee. He visited BC in 1934 and collected hundreds of bird specimens from the areas around Courtenay, Comox, Campbell River, and Port Hardy as well as many others from the BC interior. He and George Miksch Sutton from Cornell University provided one of the earliest descriptions of a Marbled Murrelet egg, taken from the oviduct of a bird collected near Mitlenatch Island in the Strait of Georgia on 23 May 1934.[215] Other than this Marbled Murrelet egg, the only seabird breeding record from Semple was a set of Black Oystercatcher eggs [270a] and an adult female [271a] collected near Port Hardy on 25 May 1934. We were unable to determine a more precise location for that record (Figure 26).

Figure 26. When researching information for this seabird catalogue, it was often difficult and time consuming to obtain precise details on the locations of breeding sites, especially for older museum specimens such as the Black Oystercatcher eggs collected near Port Hardy by John B. Semple in 1934. *Photo by R. Wayne Campbell.*

Independent Collectors and Observers (1883-1975)

Early collectors and observers that visited colonies in Haida Gwaii were described in Part 2 of this seabird colony catalogue.[189] Many of those same individuals, including Charles F. Newcombe, Alan C. Brooks, Reverend John H. Keen, Charles de Blois Green, Reverend C. J. Young, and Solomon J. Darcus (Figure 27), also collected seabird specimens and made observations at colonies along the BC outer coast.

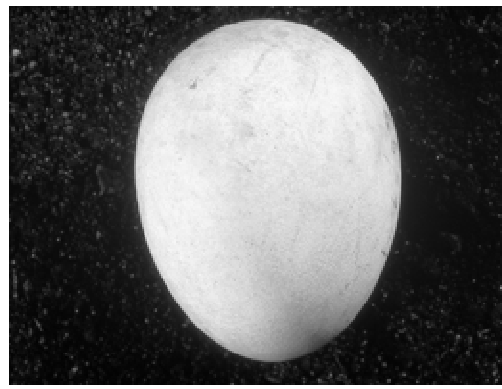


Figure 27. The earliest oologist to visit Cleland Island (Bare Island), northwest of Tofino, was Solomon J. Darcus on 18 June 1925. He collected a Fork-tailed Storm-Petrel egg that likely required searching many burrows as only a small proportion of the storm-petrel burrows on the island were occupied by this species. *Photo by R. Wayne Campbell.*

Newcombe visited Seabird Rocks in the 1890s and, with his son W.A. Newcombe, visited Triangle Island in 1913. Brooks made seabird observations around Solander Island off the west coast of Vancouver Island on 22 July 1904 [77] and spent nine days in September 1921 around the north end of Porcher Island on the northern mainland coast.[20] Keen collected a Rhinoceros egg specimen on Lucy Islands near Prince Rupert in 1907 [75] and visited there again in 1912. Green explored colonies in Queen Charlotte Strait in 1907, 1909, and 1910, collecting seabird specimens on Pine Island and Tree Islets, and may have visited Triangle Island in 1909.[53] In 1921, he spent the months of June and July exploring and collecting around the north end of Porcher Island from a base in Refuge Bay.[20] Green visited what we have assumed was Rachael Islands during his time in the area that year. Young and Darcus visited Cleland Island in 1925 and Young apparently returned there in 1932. Young spent considerable time around Pine Island in 1929, also visiting Storm Islands and Tree Islets,[251] and made subsequent visits there in 1930 and 1932. In 1932, he collected specimens in the Pine Island area on 26-28 May and at Cleland Island on 25 June. Young also collected in the vicinity of Hardy Bay on Vancouver Island in 1932 and 1933.

Other early collectors and observers that we have not previously described [189] also visited colonies along the outer coast. Walter J. Burton was an egg collector from Victoria and, according to Guiguet,[92] collected eggs on Triangle Island in 1900 and 1909. In 1909 he was accompanied by Warburton M. Pike, a well-known British explorer, author, and hunter living in the Gulf Islands near Victoria.[53] Carter and Sealy [53] expressed doubts about a visit to Triangle Island by Burton in 1900 because they could not locate the British Columbia Provincial Museum (BCPM) specimens listed by Guiguet [92] from that year, nor find any other documentation of such a trip by Burton. We prefer to accept Guiguet's records and assume that Guiguet,[92] who was curator of Birds and Mammals at the BCPM at that time, was more likely to have had access to original museum specimen records than did Carter and Sealy [53] 60 years later. Burton also accompanied Green during his visits to colonies in Queen Charlotte Strait in 1909 and 1910 [53] and likely visited Race Rocks in 1932 (see Race Rocks account).

Kenneth Racey worked as a mining executive and was an ardent naturalist and collector in his spare time. He was a member of the Vancouver Natural History Society and became a mentor for Ian McTaggart-Cowan. In 1931, Racey invited Cowan, then an undergraduate at the University of British Columbia (UBC), on a field trip to the Tofino area on the west coast of Vancouver Island.[127] During that trip, Racey and Cowan observed nesting seabirds on Monks Islet, Cleland Island, and "White" Island (Figure 28).

Figure 28. Kenneth Racey (left) invited student Ian McTaggart Cowan to accompany him on a collecting trip that included visits to seabird colonies on Monks Islet, Cleland Island, and "White" Island. Ian became friends of the family and married Racey's daughter in 1936. *Photos courtesy Ann Schau.*

Allan Mathew Tex Lyon (Figure 29) was the wharfinger at Port Hardy until he retired in 1970.[39] He was an enthusiastic bird watcher and was also influenced by Racey who introduced him to collecting and preparing bird specimens. He contributed specimens and observations to the McCabes (see below), including a nesting record for Leach's Storm-Petrels (*Oceanodroma leucorhoa*) on the Buckle Group in 1934.[77]

Figure 29. Tex Lyon, a bird enthusiast, contributed information on birds in the vicinity of Port Hardy during the preparation of *The Birds of British Columbia*.[39] He also procured bird specimens for serious collectors. *Photographer unknown.*

Thomas T. and Elinor McCabe moved from the United States to the BC interior in 1925 and lived in the wilderness home they built near Barkerville for the next 26 years.[39] They were both keen naturalists and collectors, amassing a collection of 4,700 bird specimens, as well as 1,000s of plant and small mammal specimens, from BC. From 1936 to 1939, the McCabes embarked on exploratory expeditions to many islands along the northern mainland coast and Queen Charlotte Strait in a chartered power boat. They documented nesting seabirds at several colonies in those areas, including Moore Islands, Ann Island, Armstrong Rock, and "Doyle" Rocks. Ian and Joyce McTaggart-Cowan were invited to join them in the summer of 1939, at which time Cowan recorded seabirds nesting on Mosquito Islets. The McCabes also visited Race Rocks in the fall of 1939.

Patrick W. Martin was employed as a regional game biologist in Kamloops in the 1950s, but much of his time was spent as an offshore fisherman.[39] He owned and skippered the *Sea Bird* that was chartered by the McCabes for their coastal expeditions from 1936 to 1939. He also accompanied Guiguet during his studies on Goose Island in 1948.[93] Martin made many observations of pelagic seabirds and mammals and recorded aggregations of nearshore species like Black Oystercatchers and Black-legged Kittiwakes (*Rissa tridactyla*; Figure 30).[145, 146, 296]

Figure 30. During studies by Patrick Martin in the 1970s, Black-legged Kittiwake was the most common small gull recorded in Chatham Sound in autumn, and was often seen feeding in mixed species flocks and roosting on rocky headlands at night.[296] By early November, the species had dispersed to pelagic waters. Other observations reveal the same pattern along the outer coast. Spring migrants return in late March and the species is abundant from May through September.[40] Nonbreeding birds roost on offshore rocky islets, sandbars, and headlands during summer.[297, 298] *Photo by R. Wayne Campbell.*

Theed Pearse (Figure 31) was born in England in 1871. When he was 34 years old, he became an active member of the British Ornithologists' Union, an affiliation he maintained throughout his life. He immigrated to Canada in 1914 and settled permanently in the Courtenay/Comox area on Vancouver Island. A barrister by profession, he was passionate about birds throughout his life and published extensively on his observations.[39, 299, 300] Most of his seabird-related observations were made in the Strait of Georgia, but

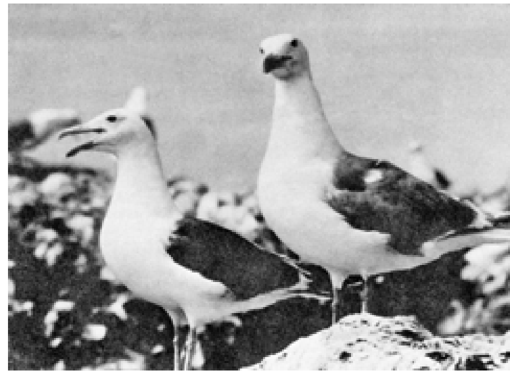


Figure 31. Theed Pearse (left) was a dedicated bird watcher and bird bander throughout his life. He was opposed to collecting birds and rather was a keen proponent of careful observation. Committed to publishing his observations, he was one of the most prolific writers in the province. His list of publications totaled 103, including a book on the early explorers who visited BC.[301] Pearse was the first to report possible hybridization of Western Gull and Glaucous-winged Gull on the outer coast of BC.[161] *BC Photo 4310.*[302] *Photo of gulls by R. Wayne Campbell, Sea Lion Rocks, BC, 8 August 1969.*

he visited colonies on the west coast of Vancouver Island in the 1940s.[160, 161] He banded Glaucous-winged Gull chicks and observed other nesting species on Bordelais Islets in 1943 and on Seabird Rocks in 1943 and 1945.

J.A. Brooks was a Fisheries Guardian in Victoria and contributed records of nesting seabirds along the southern west coast of Vancouver Island.[77] He reported Pelagic Cormorants nesting in a cave at Cape Beale in 1947 and Glaucous-winged Gulls nesting on "Sooke Bay" Islets in 1960.

Thomas Widdowson, a marine ecologist at UBC, conducted extensive surveys of intertidal habitats along the southern BC coast. During his travels he recorded nesting seabirds at Cape Beale in 1959, Deep Sea Bluff in 1962, Tree Islets in 1975, and Gillam Islands in 1975.

David Hancock has studied wildlife and native cultures on the BC and Alaska coast for most of his life. In the 1960s, he and his former wife Lyn established the Wildlife Conservation Centre on the Saanich Peninsula near Victoria on Vancouver Island where they studied and rehabilitated birds and other animals. Throughout his career, David has focused much of his efforts on research and conservation of Bald Eagles (*Haliaeetus leucocephalus*), forming the Hancock Wildlife Foundation in 2006 to further that work. In 1966 and 1968, David and Lyn visited the outer Scott Islands where they first confirmed breeding by Rhinoceros Auklets on Triangle Island [96] and identified a new nesting site for Common Murres on Sartine Island.[97] During those trips, the Hancocks collected some live Rhinoceros Auklets for the New York Zoological Society and several Common Murre eggs, two of which were incubated and hatched at the Wildlife Conservation Centre.

There are single specimen records or observations by some people for whom we have no additional information. Frederick C. Hubel was an egg collector and served as the Treasurer and Business Manager for the Bulletin of the Michigan Ornithological Club in 1905-1906. A Thick-Billed Murre (*Uria lomvia*) egg [281a] in his collection from Vancouver Island and dated 1883, if accurately identified, provides a breeding record for this species in BC 100 years earlier than previously reported (see below). We have no information about who may have collected this egg or precisely where it came from. A Common Murre egg [274a] was collected in 1889 by J. C. Rice in the Port Simpson area where Nichols had collected a murre egg in 1881 (see Green Island account). Edward Hodgson from Victoria, BC reported Glaucous-winged Gulls nesting near Dundas Island sometime before 1922.[159] G. van der

Steenhoven collected a Glaucous-winged Gull egg [278a] in 1952 from a site we have assumed was Major Brown Rock.

Some museum specimens from the late 1800s and early 1900s document breeding on the outer coast at unspecified locations. Newcombe collected Glaucous-winged Gull [277a] and Pigeon Guillemot [277b] eggs on the "west coast of Vancouver Island" in June 1892, Glaucous-winged Gull eggs on the "coast of Vancouver Island" on 3 June 1897,[282a] and a Common Murre egg on the "west coast of Vancouver Island" in June 1898.[92] Others are from unknown collectors, including records for Black Oystercatcher in Barkley Sound on 18 and 25 May 1924 [277c] and at Ahousat on 31 May 1931,[280a] Glaucous-winged Gull in Barkley Sound on 8 June 1924,[277d] and Pigeon Guillemot in Barkley Sound on 1 June 1924.[277e]

Carter and Sealy [52] discuss some of the early specimens collected by Newcombe. Their inspection of the 1892 Pigeon Guillemot egg specimens revealed a date of 8 June 1892 for one of the specimens. Others were just dated June 1892 (note that the date given in the online search of museum records is given as 1 June 1892 for all these specimens). Carter and Sealy [52] speculated that Newcombe collected all eggs dated 1892 at Mandarte Island in the Strait of Georgia rather than on the west coast of Vancouver Island as recorded. Their reasoning for this conclusion was that Newcombe and Fannin collected Black Oystercatcher eggs on 7 June 1892 on Mandarte Island and Newcombe was unlikely to have travelled from Mandarte Island to the west coast of Vancouver Island in one day. We did not agree with this conclusion. The Black Oystercatcher egg specimens referred to [275b, 282b] clearly give a location of Bare Island (a former name for Mandarte and a number of other islands), Gulf of Georgia. Given his familiarity with the site it seems unlikely that Newcombe would have mistakenly labelled other records as "west coast Vancouver Island" if indeed they were collected at Mandarte Island. Given the recorded date of June 1892 for most specimens, it seems most likely that the error was in the date (8 June) of the one Pigeon Guillemot egg specimen and not the location of the eight (five Glaucous-winged Gull and three Pigeon Guillemot) specimen records. Assuming, as we did, that the 1892 specimens collected by Newcombe were from the west coast of Vancouver Island, they may have been from Seabird Rocks as Newcombe visited there again in 1894 and 1896.[52] The Glaucous-winged Gull eggs collected by Newcombe in 1897 on the "coast of Vancouver Island" may also have been from Seabird Rocks.

Lighthouse Keepers (1910-1992)

A few keepers stationed at lighthouses along the outer coast have been keen naturalists and kept records of nesting seabirds. Alexander Dingwell served as head lightkeeper and collected some seabird eggs on Green Island from 1910 to 1918. Records also exist from other lightkeepers on Green Island, including John Thomas Moran who was keeper after Dingwell from 1919 to 1936, Mrs. Velma Bigelow, stationed on the island with her husband Lyle Dean Bigelow for 18 months in 1957-1958, and F. Gordon Hart, who was head lightkeeper from 1977 to 1979. Hart also kept records while he was head keeper at Lawyer Islands in 1979 to 1980.

Percival C. Pike arrived on Pine Island (Figure 32) as a teenager when his mother accepted a job there as a housekeeper. He became head lightkeeper in 1919 and stayed on until 1933. He observed nesting birds throughout his years on the island [77] and assisted Young when he visited the island in 1929.[251] Ralph and

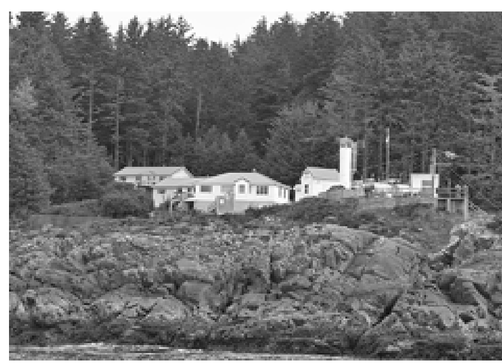


Figure 32. Pine Island light station stands above a steep rocky shore on the western side of Pine Island. Lightkeepers stationed there have been consistently generous and helpful to the many survey crews and researchers that have visited the island to study the Rhinoceros Auklets that nest in the surrounding forest. *Photo by Moira J.F. Lemon, 29 July 2006.*

Vivian Emrich were stationed on Pine Island from 1972 to 1977 and reported observations to us when we surveyed the island in 1975. Douglas, Gwen, and Lisa Fraser were lightkeepers on Pine Island from 1981 to 1992 and assisted us with our survey work in the 1980s.

Gordon Odlum grew up in Vancouver and became fascinated with the life of a lighthouse keeper after a visit to the station at Point Atkinson near Vancouver. He was stationed on Triple Islands in the Tree Nob Group from 1942 to 1952 and on Great Race Rock from 1953 to 1960. He observed and banded birds at both locations.[156, 157] After his stint on Race Rocks he returned to Point Atkinson as head lightkeeper.

Frank Glinn served as head keeper at Lucy Islands (Figure 33) from 1945 until 1963 and, via Odlum, reported Rhinoceros Auklets nesting there in 1959.[77]

Figure 33. Lucy Islands lighthouse stands on the eastern point of the largest islet in the Lucy Islands group in Chatham Sound. From 1906 until 1988 it was a manned station, but now only the automated light tower remains. *Photo by Moira J.F. Lemon, 18 July 2006.*

BC Provincial Museum Expeditions (1913-1978)

Few data on nesting seabirds along the BC outer coast were collected by the BCPM during the first 60 years after it was founded in 1886. The museum's second director, Francis Kermode, explored around Calvert Island in 1913 and recorded Glaucous-winged Gulls and cormorants nesting on what we suspect was Upward Rock.[136] James A. Munro, who collected for the BCPM, banded Glaucous-winged Gulls and made observations of nesting seabirds at Race Rocks in 1924.[149] Ian McTaggart-Cowan served as biologist at the BCPM from 1935 to 1940. As mentioned above, Cowan recorded nesting seabirds on Mosquito Islets during a trip spent exploring the northern mainland coast with Thomas and Elinor McCabe in 1939.[127]

Not until the 1940s, when G. Clifford Carl was director (Figure 34), did seabird studies along the BC outer coast begin in earnest. Carl hired Charles J. Guiguet in 1948 for the position of curator of the Birds and Mammal Division at the BCPM, a position he held until 1980. An advanced degree was required for that position and so Charles started a Master's thesis on the ecology of Goose Island on the northern mainland coast under the supervision of Ian McTaggart-Cowan, who was then an assistant professor at UBC. Guiguet gathered data on nesting seabirds in the Goose Islands area during the summer of 1948.[93] The next year, a biological expedition to the Scott Islands was mounted by Carl and Guiguet

Figure 34. Administrative duties and provincial education programs, such as those that demonstrated techniques of specimen preparation, took much of Clifford Carl's time when he was director of the BCPM. *Courtesy of Division of Visual Education, Victoria, BC, 1952.*

(Figure 35), accompanied by George A. Hardy from the BCPM and Frank L. Beebe, who was then the Zookeeper at Stanley Park in Vancouver.[47] Guiguet had proposed such an expedition several years earlier after receiving reports from fishermen describing multitudes of nesting seabirds on the islands. During his tenure at the BCPM, Guiguet documented seabirds nesting on the Goose Group, Scott Islands, Solander Island, Bunsby Islands, and numerous sites in Barkley Sound. He also participated in the BCPM coastal seabird surveys orchestrated by R. Wayne Campbell in the 1970s.

Figure 35. With financial support from the provincial Wildlife Branch, Clifford Carl and museum staff were able to explore remote seabird colonies along the outer coast. In this photo, curator Charles Guiguet is holding a Common Murre on Triangle Island. *Photo by G. Clifford Carl, June 1949.*

J. Bristol Foster was director of the museum from 1970 to 1974 and visited a few seabird colonies along the west coast of Vancouver Island during that period, sometimes accompanied by Guiguet. In January 1973, Wayne Campbell, co-author of this present work, joined the staff as assistant curator of Birds and Mammals and soon launched the comprehensive survey of the entire BC coast for nesting seabirds.[32, 34] Author Michael S. Rodway joined those surveys, an experience which sparked a life-long passion and resulted in the production of this four-volume treatise on seabird colonies in the province. We have described the genesis and execution of the BCPM survey program in detail in Parts 1 and 2 of this work.[188, 189] BCPM surveys were conducted along the west coast of Vancouver Island and in Queen Charlotte and Johnstone straits in 1975 and along the northern mainland coast in 1976. Many persons assisted with those surveys (see *Acknowledgements*).

Figure 36. As a seasonal naturalist with BC Parks Branch at Wickaninnish Provincial Park, Wayne Campbell had to give a morning walk (left) and an evening talk (right) to park visitors on five consecutive days a week. A year-end report had to be submitted with recommendations and a discussion of issues concerning park management. These duties allowed Wayne enough free time to conduct surveys of seabirds nesting on islands in the park. *Photos by Ted Underhill, August, 1968 (left) and Bill Verbrugue, August, 1969.*

Wickanninish / Pacific Rim Parks (1965-2022)

Wickaninnish Beach Provincial Park was established in 1959. It was transferred to the federal government in 1971 to form the core of the Long Beach Unit of Pacific Rim National Park Reserve (PRNPR). PRNPR also includes the Broken Group Islands Unit in Barkley Sound and the West Coast Trail Unit further south along the shore of Vancouver Island.

Seabird data have been collected by park staff since 1965 when BC Parks Branch initiated the summer naturalist interpretive program at Wickaninnish Provincial Park. Frank Buffam was hired as the first seasonal naturalist in 1965 [303] and 1966 [22] followed by Wayne Campbell (Figure 36) in 1967 [304] and 1968.[305] Surveys of all seabird colonies within the PRNPR area were carried out from 1965 to 1975, primarily by Wayne Campbell and David Hatler.[107] Periodic surveys of seabird breeding populations within PRNPR have been conducted since.[55, 158] Numbers of Black Oystercatchers nesting at 15 colonies within the park were monitored annually from 2008 to 2014 and opportunistically since.[264]

British Columbia Ecological Reserves (1974-1978)

As noted in the Haida Gwaii volume of this series,[189] Bristol Foster, as coordinator of the BC Ecological Reserves Unit, provided encouragement and financial support for the comprehensive seabird survey program launched by Wayne Campbell out of the BCPM in 1974. Bristol also personally assisted with surveys at some colonies along the west coast of Vancouver Island in the 1970s.

University Undergraduate, Graduate, and Faculty Research (1969-1994)

Data on nesting seabirds at colonies along the BC outer coast have been collected by several students and faculty from UBC, Simon Fraser University (SFU), and the University of Victoria. Since 1994, most graduate research on seabird colonies has been conducted through the Centre for Wildlife Ecology, which we describe below. Before 1994, the main sites for student research were Lucy Islands, the Goose Group, Pine Island (Figure 37), Triangle Island, and Cleland Island.

Figure 37. Pine Island was established as a provincial Ecological Reserve in 1988, mainly to protect thousands of nesting Rhinoceros Auklets. The birds breed among stands of Sitka spruce, western hemlock, and western redcedar. *Photo by R. Wayne Campbell, 12 June 1976.*

As noted above, Charles Guiguet studied the ecology of Goose Island on the northern mainland coast for his Master of Arts thesis out of UBC. He spent the summer of 1948 in the Goose Group and estimated seabird nesting populations for the entire group, including Gosling Rocks.

Rudi Drent (see tribute in Part 2 [189]) became an Assistant Professor in the Department of Zoology at UBC in 1967. He quickly began surveys and research on seabirds in various regions of the BC coast. In 1968, he surveyed several seabird colonies in Queen Charlotte Strait. In 1969, he visited colonies on the west coast of Vancouver Island. That year he also set up a base for research on Cleland Island and hired Ken Summers to assist with studies of Rhinoceros Auklets.[213] In 1970, he and Wayne Campbell surveyed the cluster of colonies west of Aristazabal Island on the northern mainland coast.

Many studies have been conducted on Cleland Island since Drent established a research base there in 1969. The island has been an attractive site for studies on Black Oystercatchers,[90, 102, 141, 166] Glaucous-winged Gulls,[113, 245] and Rhinoceros Auklets.[23, 30, 213] Pine Island is relatively easy to access and has been used for graduate studies of nesting Rhinoceros Auklets.[8, 98] Doug Bertram [8] also included Lucy Islands and Triangle Island in his M.Sc. thesis research. Before her tragic death in 1982, Anne Vallée (Figure 38) was studying Tufted Puffins (*Fratercula cirrhata*) on Triangle Island for her graduate work out of UBC.[87, 246] Many graduate studies have been conducted on Triangle Island since the formation of the Centre for Wildlife Ecology (see below).

Figure 38. Anne Vallée holds a large Tufted Puffin chick during her studies on Triangle Island in 1980-1982. *Photo by Moira J.F. Lemon, July 1982.*

Some observations of nesting seabirds were made incidentally during studies of other species. David J. Spalding, assisted by Gordon Pike (Figure 39), observed nesting seabirds in the Scott Islands during his studies of marine mammals for his Ph.D. at UBC.[208]

Figure 39. Gordon Pike (left) and David Spalding, biologists with the Fisheries Research Board of Canada, tagging a Steller Sea Lion pup on Sartine Island, BC, June 1959. *Photo courtesy David J. Spalding.*

Bamfield Marine Sciences Centre (1972-2022)

Bamfield is located on the south side of Barkley Sound on the west coast of Vancouver Island. It was chosen as the site for a marine biology station on the Pacific Coast in 1969. The station went into operation in 1972, run by the University of Victoria, UBC, SFU, University of Calgary, and University of Alberta. The name was changed from Bamfield Marine Station to Bamfield Marine Sciences Centre (BMSC) in 2001 to be inclusive of sciences outside biology. The Centre offers courses and a platform for research in coastal habitats. Summer courses have been taught by people such as Rudi Drent, Spencer Sealy, Wayne Campbell, and Alan Burger (Figure 40). Student reports often contain useful information on local nesting seabirds.[306] The nearby seabird colony on Seabird Rocks, other colonies in Barkley Sound, and sometimes Cleland Island, further north, have been visited by students and researchers from the BMSC, who have gathered data on nesting populations and aspects of seabird breeding behaviour.[4, 10, 23, 30, 70, 71, 72, 85, 206]

Figure 40. Students registered for the Marine Science 402 course at the Bamfield Marine Station, 2-21 July 1979. In the foreground are instructors Wayne Campbell (left) and Rudi Drent. *Photo by R. Wayne Campbell, July 1979*.

Pearson College UWC (1974-2022)

Pearson College UWC was founded in 1974 as Lester B. Pearson United World College of the Pacific (Canada). It was the second United World College (UWC) to be established in the world. The UWC movement was conceived in the 1950s at the height of the Cold War by Kurt Hahn, a noted educator forced to flee Germany during World War II. Hahn believed that much could be done to overcome religious, cultural, and racial misunderstanding and avoid conflict if young people from all over the world could be brought together. The first UWC, the College of the Atlantic in Wales, opened in 1962. Lester B. Pearson, Nobel Peace Laureate and former Prime Minister of Canada, became interested in the United World Colleges movement after he retired from public life, and was the driving force behind the founding of Pearson College UWC. There are now 18 United World Colleges around the world.

Pearson College is located west of Victoria at the south end of Vancouver Island. Race Rocks lie only 7 km by boat from the college and have been a site for research and educational programs since the college opened in 1974. In 1997, the college volunteered to manage the ecological reserve and facilities on Race Rocks. Monitoring of nesting seabirds and other marine life at Race Rocks is ongoing and live and archived videos of nesting seabirds are available through the college.[162]

Canadian Wildlife Service Seabird Colony Inventory and Monitoring Program (1974-2022)

Seabird population studies in BC by CWS began on the Scott Islands in 1974, when Kees Vermeer set up a research post on Triangle Island and hired Ken Summers and Daniel Bingham to assist. From 1974-1979, aspects of the breeding biology of Cassin's Auklets, Rhinoceros Auklets, and Tufted Puffins (Figure 41) were investigated on Triangle Island [222, 223, 224, 225, 228, 229, 230, 233, 234] and seabird nesting populations were estimated on Triangle and Sartine islands.[237, 242, 243] Those population surveys complemented concurrent surveys conducted by the BCPM along other areas of the outer coast and contributed to the first summary of overall seabird breeding populations in those areas.[32] Triangle Island was the first colony where systematic sampling with transects was used to estimate populations of burrow-nesting species. Data from those surveys were comparable to later systematic surveys conducted in the 1980s. Unfortunately, only data from the Cassin's Auklet survey survived to allow subsequent comparisons.[194] Vermeer also expanded his studies on Rhinoceros Auklet diet to include Lucy Islands and Pine Island during this period.[230, 233]

Figure 41. Many studies have been conducted on the breeding biology of Cassin's Auklets, Rhinoceros Auklets, and Tufted Puffins on Triangle Island since CWS scientist Kees Vermeer began research in 1974. Most studies have involved monitoring the reproductive success of breeding birds and often require checking and measuring chicks as they develop. From left to right, about-a-week-old Rhinoceros Auklet chick, a still-downy Tufted Puffin chick, and a close-to-fledging Cassin's Auklet chick. *Photos by Moira J.F. Lemon, 1981-1984.*

The Cabin Puzzle

When Kees Vermeer began his research with CWS on Triangle Island in 1974 he wanted to establish a permanent camp in South Bay, close to the Rhinoceros Auklet colony on the south slopes and to the main Tufted Puffin colony on Puffin Rock. Fortuitously, there was an abandoned, small house trailer on the top of the island near the old lightstation base, which an oil-exploration company had used in the past as its base of operations. Arrangements were made, and a large helicopter transported the trailer to the beach in South Bay. That trailer became the established Triangle Island Field station for the next 10 years.

We had stayed in the trailer during the 1982 CWS field season, but it was showing its age by that time. So in 1984, when we were heading out for another field season, we were worried about its condition. There had been no crew out there the previous year, and with some very fierce winter storms, frequently up to hurricane strength in the intervening years, and with the deteriorating condition of the trailer, we were not at all certain that it would still be in a habitable state. Hoping for the best, but preparing for the worst, we took tents and a large tarp with us to make a meager camp if need be.

The flight out to Triangle Island by helicopter is always tense, fraught with worry of fog banks that linger for days over this outermost island of the Scott Islands group off the extreme northwestern tip of Vancouver Island. As was often the case coming and going from the island, in 1984 we were grounded in Port Hardy for a couple of days until a break in the weather gave enough visibility so that the helicopter pilot was able to fly. Over those exposed coastal waters, helicopter pilots are under Visual Flight Rules and need to keep sight of at least one landmark – if they can see an island in front of them or behind them, they will proceed; if they lose sight of all land it is unsafe and they have to turn back. More than once over the years, we have loaded up the helicopter and got part way to Triangle Island, only to be turned back by a settling fog bank. Anxious as we were to get to the island, we never questioned the pilot's judgement.

We passed the familiar landmarks on our flight out to Triangle Island in July 1984. First the lightstation at Cape Scott on the northern tip of Vancouver Island fell out of view behind us, then the large forested islands of Lanz and Cox receded, tiny Beresford Island slipped away beneath us, and only Sartine and Triangle islands remained as the last specks of land before the open Pacific. Rounding the east side of Triangle, and the sea lion colony at Southeast Point, we swung into the crescent of South Bay, with the steep grassy slopes rising up to the salmonberry-encased saddle-shaped crown of the island ahead of us. Waves crashed on the shore and greeting us was the familiar view of the dense and chaotic piles of drift wood lining the shore up to the edge of the narrow apron of level *ground at the base of the slopes where the camp was. But there was no cabin to be seen! Only a flayed skeleton remained – the frame of the cabin like a small matchbox clung steadfastly to its foundations. No roof, no walls, no door, no windows – just some rather sad rotten floorboards* (Figure 42).

As the helicopter disappeared from view, we (Michael, Rob Butler, Ian Jones and I, Moira) took stock of the situation – the sun was out and it was still early in the day so we had time to create some sort of a comfortable home that could stand up to the storms that even in July can frequent this remote area. Windswept and devoid of trees, Triangle Island does not lend itself to creating shelters out of tarps, but we did have the tired framework of the old trailer to work with. On the flight in, we had spied a few bits and pieces of the old trailer scattered along the shoreline throughout South Bay. We scoured the driftwood piles lining the shoreline and searched in the dense salmonberry groves near the base of the steep slopes, gathering up all the tattered pieces of siding and roofing that had been torn off the old trailer. Like a jigsaw puzzle, we reassembled the pieces onto the frame of the old trailer, even placing windows, surprisingly intact, back in almost the original places. The door didn't quite operate in the normal fashion, but who were we to be choosy? Once everything was reassembled, we draped our large tarp over the whole structure, sandwiching a layer of beachcombed heavy fishing net between two layers of the tarp as reinforcement, then wrapped and tied it all together with polypropylene rope like a big Christmas parcel.

Throughout that month of field work, we kept finding parts of the old trailer scattered in the salmonberry thickets and thick grass tussocks all the way up the slopes of South Bay, and even over onto the other side of the island along the shores of Northeast Bay. The resurrected cabin survived the subsequent winter storms, and served as the field station for several more years, with only a few minor repairs. The robust outhouse that we had built out of drift logs in 1982, constantly had its roof torn off each winter, but was easily picked up and reattached at the start of each field season. But the years took their toll, and finally in the 1989 field season, supplied with a WeatherHaven tent for a new temporary field station, Michael and crew rendered down the remains of the old cabin in a celebratory beachfire. A few years later, the Centre for Wildlife Ecology (CWE), the co-operative venture between SFU and Environment and Climate Change Canada, began their seabird research program and a new Triangle Island Seabird Research Station was established with a sturdy new cabin. A commemorative wall of photos inside the cabin proudly showcased the evolution of the previous accommodation and a humorous re-enactment of the previous cabin's re-construction was staged 20 years later (Figure 43).

Rhinoceros Auklet. *Illustration by Rob Butler*

Figure 42. The Triangle Island cabin in 1984 – putting back together what the wind tore asunder. Clockwise from upper left: the cabin when we arrived; patching together the pieces; wrapping the final product to make a waterproof shelter; and looking down on the completed work. *Photos by Moira J.F. Lemon, July 1984.*

Figure 43. In 2007, the Triangle Island field crew staged a humorous re-enactment of the cabin re-construction event of 1984, mimicking poses and clothing of the 1984 crew (right). The pictures were pinned up on the photo board inside the SFU/CWS replacement cabin erected in 1994. *Photo by Moira J.F. Lemon.*

After completing his studies on Triangle Island, in 1980 Vermeer directed his attention to seabirds in Haida Gwaii (see Parts 1 and 2 [188, 189]). It was there that the CWS Seabird Colony Inventory Program [175, 190, 191, 192] and Permanent Monitoring Scheme [184] were launched. Survey work in Haida Gwaii was initially under Vermeer's direction until Gary Kaiser assumed responsibility in 1983 and helped expand the scope of those programs. Although colonies in Haida Gwaii were the focus of CWS survey efforts in the early 1980s, some survey work was conducted during that period on Triangle Island, at some colonies along the west coast of Vancouver Island, in Queen Charlotte and Johnstone straits, and on Lucy Islands on the northern mainland coast. More focused surveys along the outer coast were conducted in 1987-1990 after surveys were largely completed in Haida Gwaii. Moira J.F. Lemon, co-author of this present work, and Michael S. Rodway led the CWS surveys and were assisted on the outer coast by many paid students and volunteers (see *Acknowledgements*). During the 1980s, Vermeer, with the help of Ken Morgan, Peter Ewins, and others, also conducted population studies of surface-nesting species and Pigeon Guillemots in Haida Gwaii, in the Strait of Georgia, and on the west coast of Vancouver Island. The schedule of CWS surveys in the four regions along the outer coast was as follows: [181, 182, 183, 194, 195]

1982 - Queen Charlotte and Johnstone straits (complete counts of small colonies and non-systematic surveys of all large colonies except Tree Islets and Pine Island).
- Scott Islands (transect surveys for Tufted Puffins and count of murres on Triangle Island).
- West Coast Vancouver Island (complete or partial counts mainly of surface-nesting species on Gillam Islands, Clara Islet, Thomas Island, Moos Islet, Thornton Islands, Nipple Rocks, Volcanic Islets, Diver Islet, Grassy Island, McQuarrie Islets, Monks Islet, Cleland Island, Sea Lion Rocks, Florencia Islet, Starlight Reef, Great Bear Rock, Alley Rock, Baeria Rocks, and Seabird Rocks; surveys conducted by Gary Kaiser, Doug Bertram, and others; data on file in BCNRS [265]).

1983 - Northern Mainland Coast (transects on Lucy Islands).
- West Coast Vancouver Island (complete or partial counts mainly of surface-nesting species on Gillam Islands, Bunsby Islands, and Thornton Islands; surveys conducted by Gary Kaiser, Doug Bertram, and others; data on file in BCNRS [265]).

1984 - Northern Mainland Coast (count of gull nests on Lucy Islands).
- Queen Charlotte and Johnstone straits (some transects and permanent plots on Pine Island).
- Scott Islands (transect surveys for Rhinoceros Auklets, counts for surface-nesting species, and permanent plots established for Rhinoceros Auklets and Tufted Puffins (Figure 44) on Triangle Island).

1985 - Queen Charlotte and Johnstone straits (transects and burrow occupancy on Pine Island).
- Scott Islands (cormorant nest count and murre and guillemot count on Triangle Island).

1986 - Queen Charlotte and Johnstone straits (Tree Islets; burrow occupancy on Pine Island).

1987 - Northern Mainland Coast ("Baron" Cliffs, Connel Islands, Tree Nob Group, Rachael Islands, Gull Rocks, and Lawyer Islands).
- Queen Charlotte and Johnstone straits (Storm Islands, Naiad Islets, Reid Islets, and Buckle Group).
- Scott Islands (Sartine, Beresford, Lanz, and Cox islands).

1988 - Northern Mainland Coast (complete surveys of southern colonies from the south end of Banks Island to Cape Caution; counts for surface-nesting species on the northern colonies of Grey Island, Green Island, "Simpson" Rocks, Lucy Islands, Tree Nob Group, Roland Rocks, and Rachael Islands).
- West Coast Vancouver Island (all colonies from the north end of Vancouver Island south to McQuarrie Islets, plus Cleland Island, Baeria Rocks, and Seabird Rocks).

Figure 44. Most Tufted Puffins breeding in BC nest on Triangle Island. In the 1980s, CWS survey crews led by Michael Rodway and Moira Lemon established permanently marked plots within different parts of the colony to monitor long term trends in puffin burrow numbers. *Photo by R. Wayne Campbell.*

1989 - Scott Islands (transects and permanent plots for Cassin's Auklets, Rhinoceros Auklets, and Tufted Puffins on Triangle Island; photographic count, attendance patterns, and nesting chronology of Common Murres (Figure 45) on Triangle Island; counts of Pelagic Cormorant, Black Oystercatcher and Glaucous-winged Gull nests and numbers of Thick-billed Murres (Figure 46) and Pigeon Guillemots on Triangle Island; and occupancy for Cassin's Auklets and counts for surface-nesting species on Sartine and Beresford islands).

- West Coast Vancouver Island (almost all colonies for surface-nesting species and Pigeon Guillemots, but for Black Oystercatchers only data for colonies from Kutcous Islets south to Seabird Rocks were reported; many colonies surveyed only from the water; [84, 236, 238, 258]).

Figure 45. Determining numbers of Common Murres in nesting areas on Triangle Island has been a challenge for all survey crews that have visited the colony, beginning with the BCPM expedition led by Clifford Carl in 1949. *Photo by G. Clifford Carl.*

Figure 46. Separating nesting Common (right) and Thick-billed murres, especially in poor light, can be problematic. Both species breed on Triangle Island. The best distinguishing field mark is the whitish line along the upper mandible of the bill in Thick-billed Murres. *Photos by Alan D. Wilson and Michael S. Rodway.*

Since 1989, CWS has continued the Permanent Monitoring Program and has resurveyed permanent plots on Lucy Islands, Pine Island, and Triangle Island at 5-year intervals.[184, 263] Intensive studies on several breeding species have been ongoing on Triangle Island, especially since the formation of the Centre for Wildlife Ecology (see below).

Centre for Wildlife Ecology – Triangle Island Research Station and Marbled Murrelet Project (1994-2022)

Much of the seabird research in BC since the early 1990s has been conducted under the auspices of the Centre for Wildlife Ecology (CWE). The CWE is a collaborative effort between Simon Fraser University and Environment Canada. It was established in 1993, when the Natural Sciences and Engineering Research Council of Canada (NSERC), Simon Fraser University (SFU), and Environment Canada (CWS) signed a ten-year agreement to create the NSERC/CWS Chair in Wildlife Ecology at SFU. Fred Cooke directed the CWE until he retired in 2002, after which Ron Ydenberg assumed the chair. Seabird studies began in 1994 with the establishment of the Triangle Island Seabird Research Station as a base for colonial seabird studies and the launch of the Marbled Murrelet Project, which has since conducted intensive studies of that non-colonial species in various areas along the outer coast (see below). Ian Jones was the scientific director of the Triangle Island Research Station during its first years, followed by Doug Bertram until 2001 when he was selected to lead the Marbled Murrelet Recovery Team (see below). Mark Hipfner then assumed the helm of the Triangle Island Research Station to replace Doug as director and has continued in that post since (Figure 47).

Figure 47. The Triangle Island Seabird Research Station has run continuously since 1994. Ian Jones, seen here on Triangle Island in July 1984 with Rob Butler (sitting), both of whom are sporting beach-combed hard hats, was the first scientific director; Doug Bertram, pictured holding a Rhinoceros Auklet chick on Seabird Rocks in July 1997, was the second director; and Mark Hipfner, here surveying a Rhinoceros Auklet monitoring plot on Pine Island in July 2011, is the current director. *Photos by Moira J.F. Lemon.*

Although studies by the CWE have provided few updates to population estimates (see Appendix 1), the research has provided many insights into survival, foraging ecology, reproductive performance, and other aspects of the breeding biology of nesting seabirds that, in conjunction with the Permanent Monitoring Program, have helped identify population trends and set conservation goals for the area. Long-term studies revealing reduced adult survival rates of Cassin's Auklets and frequent poor reproductive success of Cassin's Auklets, Tufted Puffins, and other species in relation to warming sea-surface temperatures have been particularly important in confirming the threat that anthropogenic climate change poses for breeding seabird species.[11, 12, 14, 87, 111] An account of CWE accomplishments and publications can be found on their website.[62]

Marbled Murrelet Surveys and Research (1979-2022)

Although the non-colonial Marbled Murrelet (Figure 48) is not addressed in our seabird colony accounts, the Outer Coast area dealt with in this volume of the seabird colony catalogue encompasses important marine habitat for a large proportion of their population in BC and is adjacent to much of the coastal forest habitat used for nesting by this threatened species (Figure 49). Much of the research and conservation efforts focused on Marbled Murrelets in BC have been conducted in this area. Studies conducted on the west coast of Vancouver Island from 1979 through the 1990s were particularly important in raising concern and identifying the old-growth forest habitat requirements for nesting by this species.

Figure 48. Marbled Murrelets are an important member of the breeding seabird community along the BC outer coast but are not addressed in this catalogue of seabird colonies because they are non-colonial nesters in inland forested habitats. About 20-22% of their estimated world population nests in old-growth forest habitat adjacent to the BC outer coast regions dealt with in this book. *Photo by Tim Zurowski.*

Following Spencer Sealy's landmark studies of Marbled Murrelets at Langara Island in Haida Gwaii during the early 1970s,[201, 202, 203] Harry Carter, under Sealy's supervision, conducted some of the first studies on Marbled Murrelets on the west coast of Vancouver Island beginning in 1979. Harry and Spencer investigated at-sea distribution, foraging ecology, and fisheries-related mortality in Barkley Sound in 1979 and 1980 [50] and in 1982 developed and tested an at-sea census method that could be used to estimate population size, identify important foraging areas, and help set conservation priorities for this elusive alcid.[204]

More widespread at-sea and inland surveys for Marbled Murrelets were initiated after the species was assigned Threatened status by COSEWIC in 1990.[177] In 1991, Jean-Pierre Savard and Moira Lemon from CWS conducted at-sea and inland surveys (Figure 50) over a number of areas along the west and east coasts of Vancouver Island,[199, 200] and Alan Burger working out of the University of Victoria began a longer-term study of at-sea distribution, inland activity, and abundance measured with radar in select watersheds on the west coast of Vancouver Island.[24, 25, 27, 29] The at-sea surveys conducted by Harry Carter on the central west coast of Vancouver Island in the 1980s were repeated over a number of seasons beginning in 1992 by John Kelson and others.[134, 135] Many people have contributed to studies since.

Following international protest and lobbying to protect old-growth forest in Clayoquot Sound in 1993, and the recognition of the importance of the area to Marbled Murrelets, an intensive five-year research and inventory program was initiated there in 1995 under the direction of Trudy Chatwin from the BC Ministry of Water, Land and Air Protection.[28] Also since 1995, many studies have been conducted throughout outer coast areas as part of the CWE Marbled Murrelet Project under the direction of Fred Cooke and later David Lank at Simon Fraser University.

In response to the species being given Threatened status federally in Canada, The Marbled Murrelet Recovery Team was established in 1993 and a Recovery Plan was completed in 1994.[133] The Marbled Murrelet has been maintained at Threatened status since 1990 [67, 126] and the Recovery Strategy was revised most recently in 2014.[82] The Recovery

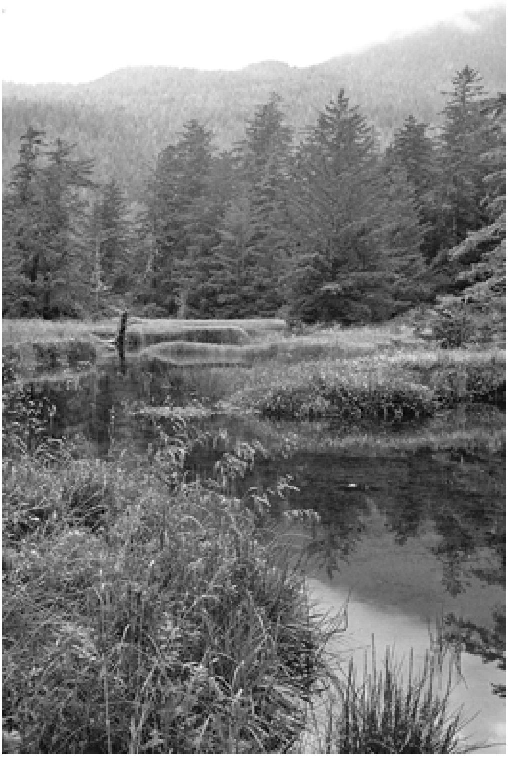


Figure 49. Old growth forests, such as this one at the mouth of the Klaskish River on the west coast of Vancouver Island, provide important nesting habitat for Marbled Murrelets. *Photo by Moira J.F. Lemon, June 1991.*

Team, chaired for many years by Doug Bertram and currently chaired by Ian Parnell of CWS, has been responsible for setting conservation priorities for the species in BC. A conservation assessment commissioned by the Recovery Team [26] and the more recent status review conducted by Alan Burger [67] provide comprehensive accounts of Marbled Murrelet research and inventory conducted by numerous people along the BC outer coast since studies began there in 1979.

Figure 50. CWS conducted inland surveys for Marbled Murrelet in many remote watersheds on Vancouver Island in 1991. In this photograph, Chris McNeill stands beneath a towering stand of Sitka spruce in the Tsitika River estuary where he recorded the early morning calls and flight activity of Marbled Murrelets. *Photo by Moira J.F. Lemon, 18 July 1991.*

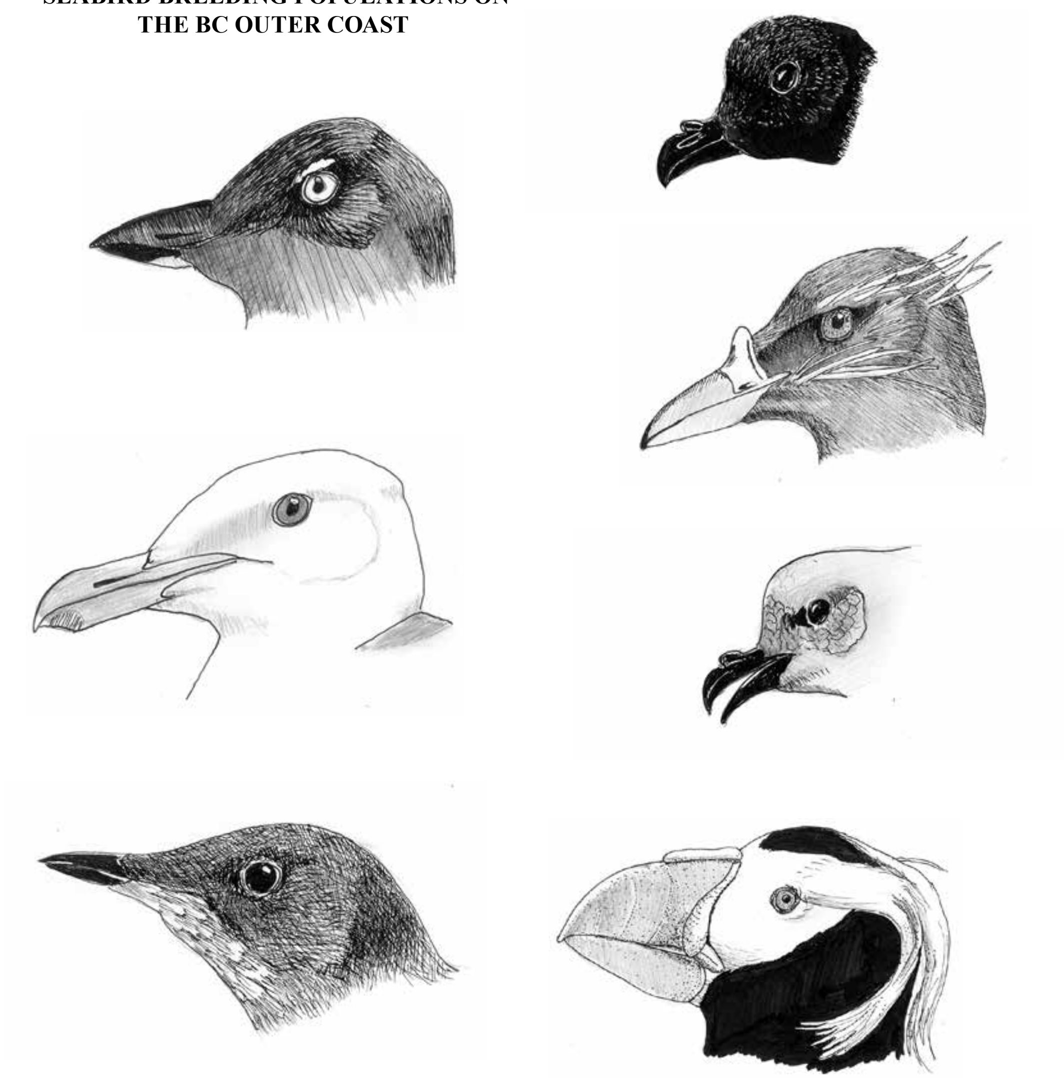
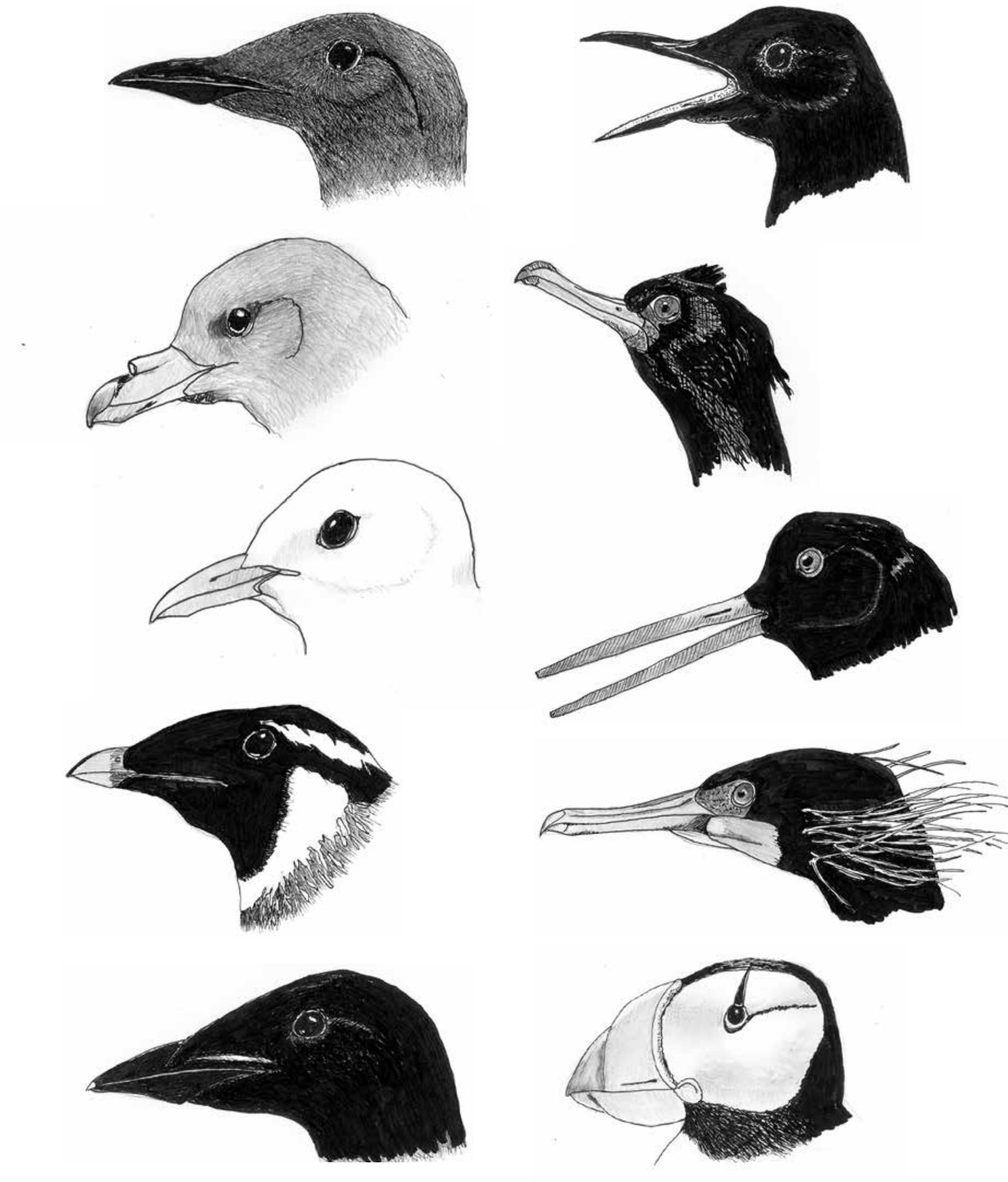


Figure 51. Thirteen colonial-nesting seabird species were breeding at 186 sites along the BC outer coast as of 1990. A 14th species, Ancient Murrelet has historically nested here. The non-colonial Marbled Murrelet nests inland in old-growth forest habitat. These 15 species, shown in order of abundance (clockwise from upper left on this page, then the following page) are Cassin's Auklet, Leach's Storm-Petrel, Rhinoceros Auklet, Fork-tailed Storm-Petrel, Tufted Puffin, Marbled Murrelet, Glaucous-winged Gull, Common Murre, Pigeon Guillemot, Pelagic Cormorant, Black Oystercatcher, Brandt's Cormorant, Horned Puffin, Thick-billed Murre, and Ancient Murrelet. Following in clockwise sequence, are Black-legged Kittiwake, which colonized the area after 1990, and Northern Fulmar, which has been suspected nesting on Triangle Island. *Artwork by Rob Butler.*



Status of Seabird Breeding Populations as of 1990

The four coastal regions included in this outer coast volume support 72% of the total seabird breeding population in BC (see summary Tables 3-5 in Part 1, pages 63-65 [188]). Excluding Marbled Murrelets, as of 1990 over 4 million individuals of 13 seabird species nest at 186 sites (Table 1; data presented in Table 1 replicate those in Tables 3-5 in Part 1 except we have added one historical Black Oystercatcher nesting record and a new colony site on Kitson Island on the northern mainland coast that we were previously unaware of). A 14th species, Ancient Murrelet (*Synthliboramphus antiquus*), has historically been confirmed nesting in the outer coast area, and a 15th species, Black-legged Kittiwake, colonized the area after 1990 (Figure 51). For most species, the outer coast regions support major proportions of total provincial populations estimated as of 1990: 72% for Fork-tailed Storm-Petrel (*Oceanodroma furcata*), 82% for Leach's Storm-Petrel (Figure 52), 100% for Brandt's Cormorant, 37% for Pelagic Cormorant, 54% for Black Oystercatcher, 40% for Glaucous-winged Gull, 98% for Common Murre, 100% for Thick-billed Murre, 30% for Pigeon Guillemot, 78% for Cassin's Auklet, 90% for Rhinoceros Auklet, 97% for Tufted Puffin, and 43% for Horned Puffin.[188]

Most (89%) of the seabirds nesting along the BC outer coast are concentrated at a few colonies in a small area around the north end of Vancouver Island. Over half nest on the three outer Scott Islands (Triangle, Sartine, and Beresford islands); most of the rest nest on five colonies (Storm, Reid, Tree, and Pine islands, and the Buckle Group) at the west end of Queen Charlotte Strait and two colonies (Gillam and Solander islands) at the north end of the west coast Vancouver Island region. These 10 colonies (the "Big Ten") are all within 90 km of the northwest tip of Vancouver Island and support 64% of the total provincial seabird nesting population (Table 2). They include the majority of BC breeding populations for seven species, over half the world population for Cassin's Auklet (Figure 53), and about a third of the world population for Rhinoceros Auklet. An environmental disaster such as an oil spill in this area during the breeding season would be catastrophic for nesting seabirds in BC. A smaller but equally vulnerable concentration of about 330,000 nesting seabirds occurs on the northern mainland coast on a cluster of seven colonies, Moore, McKenney, Whitmore, Byers, Conroy, Harvey, and Sinnett islands, located within about a 10 km-radius area off the west coast of Aristazabal Island.

Figure 52. Eighty-two percent of the Leach's Storm-Petrels (left) and 72% of the Fork-tailed Storm-Petrels breeding in BC nest at colonies along the BC outer coast. *Photos by R. Wayne Campbell.*

Table 1. Summary of seabird breeding populations in the four designated regions of the BC Outer Coast as of 1990.[a,b]

REGION	FTSP[c]	LSPE[d]	BRCO[e]	PECO[f]	BLOY[g]	GWGU[h]	COMU[i]	TBMU[j]	PIGU[k,q]	ANMU[l]	CAAU[m]	RHAU[n]	TUPU[o]	HOPU[p]	ALL SPECIES
Number of breeding seabirds (individuals) at colonies along the BC Outer Coast as of 1990															
Northern Mainland Coast	60,180	41,110		126	324	6,654			1,421	0	45,010	234,560	30	3	389,418
Queen Charlotte and Johnstone straits	120,000	553,200		72	104	1,688			433		13,420	324,300			1,013,217
Scott Islands	6,000	25,400	78	1,482	58	2,154	8,200	14	802		1,980,000	83,400	69,800	17	2,177,405
West Coast Vancouver Island	86,040	312,940	112	842	682	11,948	2		1,119		70,140	2,280	6,237	6	492,348
BC Outer Coast Total	***272,220***	***932,650***	***190***	***2,522***	***1,168***	***22,444***	***8,202***	***14***	***3,775***	***0***	***2,108,570***	***644,540***	***76,067***	***26***	***4,072,388***
Percent of all nesting seabirds on the BC Outer Coast	**7**	**23**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**52**	**16**	**2**	**0**	**100**
Percentage of the total BC Outer Coast seabird population breeding in each geographic region of the BC Outer Coast as of 1990															
Northern Mainland Coast	22	4	0	5	28	30	0	0	38	0	2	36	0	12	10
Queen Charlotte and Johnstone straits	44	59	0	3	9	8	0	0	11	0	1	50	0	0	25
Scott Islands	2	3	41	59	5	10	100	100	21	0	94	13	92	65	53
West Coast Vancouver Island	32	34	59	33	58	53	0	0	30	0	3	0	8	23	12
Number of current seabird breeding sites[r] along the BC Outer Coast as of 1990															
Northern Mainland Coast	6	7		4	44	49			45		7	9	4	2	60
Queen Charlotte and Johnstone straits	3	5		3	23	22			18		4	4	0		30
Scott Islands	2	2	1	5	3	3	1	1	4		3	1	3	3	5
West Coast Vancouver Island	4	7	2	13	78	40	1		46		3	2	8	1	91
BC Outer Coast Total	***15***	***21***	***3***	***25***	***148***	***114***	***2***	***1***	***113***	***0***	***17***	***16***	***15***	***6***	***186***

[a] Excluding Marbled Murrelet.

[b] Data in this table were extracted from Tables 3-5 in Part 1 (pages 63-65).[231]

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

[q] Note that estimated totals for Pigeon Guillemots refer to the numbers of birds counted around colonies and are not estimates of actual breeding populations (see text).

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

Table 2. Current summary of seabird breeding populations on the "Big Ten" colonies around the north end of Vancouver Island. 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 534-535 for an explanation of the letter codes used to qualify population estimates.

SITE CODE	SITE NAME	FTSP	LSPE	BRCO	PECO	BLOY	GWGU	COMU	TBMU	PIGU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
QS-030	Storm Islands	50,800t	191,000t		0	18e	61			x(111)	300eS	72,000t	E		628,469	1987
QS-050	Reid Islets		11,500t		0	1S	36			S(13)	260t				23,607	1987
QS-100	Tree Islets	8,300t	47,000t		0	1	59			x3(38)	250e	100e			111,458	1986
QS-110	Pine Island		100eS		0	1				S(36)	E	89,500t	E		179,238	1975,85
QS-120	Buckle Group	900t	27,000t		6	2e	65			S(68)	5,900t				67,814	1987
SC-010	Triangle Island	100e	200e		433	25	577e	4,100	7e(41)	x(331)	548,000t	41,700t	26,400t	S(4)	1,243,419	1989
SC-020	Sartine Island			39	168	1eS	390e	0(113)		x(176)	376,000t		6,400t	S(6)	766,178	1987, 89
SC-030	Beresford Island	2,900t	12,500t		6	3eS	110e			x(267)	66,000t		2,100t	S(7)	167,512	1987, 89
WV-010	Gillam Islands	42,000t	72,000t		0	13	477			S(45)			S(3)		229,028	1988, 89
WV-080	Solander Island	0t	70,000t		67eS	1	530eS			x(107)	34,000t		3,100t	S(6)	215,509	1989
TOTAL NESTING PAIRS		**105,000**	**431,300**	**39**	**680**	**66**	**2,305**	**4,100**	**7**		**1,030,710**	**203,300**	**38,000**		**1,816,116**	
TOTAL BREEDING BIRDS		**210,000**	**862,600**	**78**	**1,360**	**132**	**4,610**	**8,200**	**14**	**1,192**	**2,061,420**	**406,600**	**76,003**	**23**	**3,632,232**	
PERCENT OF BC POPULATION		**56**	**76**	**41**	**20**	**6**	**8**	**98**	**100**	**10**	**76**	**57**	**97**	**38**	**64**	

[a] Numbers of individuals.
[b] For sources see individual colony accounts.

Figure 53. Over half of the world's population of Cassin's Auklet breeds along the BC outer coast. *Photo by R. Wayne Campbell.*

In 1990, records for Brandt's Cormorants (*Phalacrocorax penicillatus; now Urile penicillatus* [288]) and Thick-billed Murres indicated breeding only in the outer coast area in BC. This is still the case for Thick-billed Murres that have been confirmed breeding in BC only on Triangle Island. There is an egg specimen for Thick-billed Murre collected at "Texada Island, Straits of Georgia" by M. Merring on 9 July 1896,[272a] but we have not accepted the species identification for that specimen (we discuss this record further in the upcoming Part 4 of this seabird colony catalogue). In 1990, Brandt's Cormorants were known to nest intermittently along the west coast of Vancouver Island, from Race Rocks to the Scott Islands, and possibly on the northern mainland coast. In 2013, Brandt's Cormorants were discovered breeding on Mandarte Island in the Strait of Georgia,[59] and we recently uncovered an egg specimen [280b] indicating previous breeding by Brandt's Cormorant on Mandarte Island in 1931 (we also discuss this record further in the upcoming Part 4 of this work). These records thus indicate that Brandt's Cormorant is an intermittent breeder off both the outer west and southern east coasts of Vancouver Island.

Black-legged Kittiwake was suspected of breeding near Prince Rupert in the late 1970s and throughout the 1980s. It was first confirmed breeding in BC in June 1997 on Holland Rock in Chatham Sound just south of Prince Rupert [41, 110] (see Appendix 1).

One pair of Ancient Murrelets found nesting on the northern mainland coast in 1970 is the only confirmed breeding record for this species in BC outside of Haida Gwaii (Figure 54). Evidence of breeding on Triangle Island has been presented [51] but we did not consider the evidence sufficient to confirm breeding and the record remains speculative (see Triangle Island account).

Recent population estimates for Marbled Murrelets in forested habitat adjacent to the BC outer coast areas considered in this volume range between 57,100 and 91,600 birds. These comprise 73-79% of the estimated total BC population [67] and represent about 20-22% of the estimated world population.[82]

Northern Fulmars (*Fulmaris glacialis*; Figure 55) are potential breeders on Triangle Island where they have frequently been seen prospecting cliffs. They have been listed as a breeding species in BC [41, 118] but we do not consider the available evidence sufficient to confirm breeding (see Triangle Island account and Appendix 1).

Some intriguing records have come to light that bear further investigation. A Thick-billed Murre egg specimen from 4 June 1883 with a location given

Figure 54. During our surveys of the cluster of seabird colonies off the west coast of Aristazabal Island in 1988, we would occasionally see family groups of Ancient Murrelets on the water, like this one off Byers Islands. Despite thorough explorations and surveys of all colonies in the area, we did not find any sign of nesting by this species. Subsequent studies using GPS tags showed that murrelets departing from colonies on the east coast of Moresby Island in Haida Gwaii disperse rapidly across Hecate Strait towards the mainland coast, so we were almost certainly seeing birds from those colonies. *Photo by Moira J.F. Lemon, 11 June 1988.*

Figure 55. Small numbers of Northern Fulmars have been reported on Triangle Island flying around nesting slopes, landing on cliffs, and even sitting on Pelagic Cormorant nests containing eggs. Breeding has been suspected but has not been confirmed. *Photo by R. Wayne Campbell.*

as Vancouver Island, British Columbia [281] predates the first documented nesting on Triangle Island by that species [221] by almost 100 years. The egg was described as fresh and laid on bare rock and was originally in the collection of Frederick C. Hubel. We have no additional information on this record. Common Murre eggs collected by H. Nichols in 1881 [275a] and by J.C. Rice in 1889 [274a] near Port Simpson are the only known breeding records on the northern mainland coast for that species. We suspect these eggs may have been collected on Green Island before the lighthouse was built there (see Green Island account). Finally, there is a clutch of eggs collected on Green Island by Dingwell on 19 June 1918 [282c] that are identified as Western Gull eggs. A pair of Western Gulls was suspected breeding on Seabird Rocks on the west coast of Vancouver Island in 1943 [161] and hybrid Western-Glaucous-winged Gull pairs have been occasionally observed,[188] but Western Gull has not previously been accepted as a breeding species in BC.[40, 77, 188] The 1918 record by Dingwell may also have involved hybrid birds and we do not consider it sufficient evidence to accept Western Gull as a breeding species in BC. However, it remains a possible earliest BC breeding record for that species.

Trends in Seabird Breeding Populations to 1990

Data are inadequate to determine trends for burrow-nesting species in most instances, but do indicate extirpation or decline as of 1990 of at least one species on half of the 36 colonies that historically have supported burrow-nesting seabirds (excluding Pigeon Guillemots) along the outer coast. In total, at the 18 colonies where declines could be detected (Table 3), there were 21 cases of a species abandoning the colony and four cases where a species declined, representing 50% of the 50 occurrences of confirmed breeding by individual species on those colonies. Most of the apparent declines or extirpations relate to small nesting populations. Tufted Puffins (Figure 56) have been the most frequently affected species and small nesting populations have disappeared from six colonies and been reduced on two others. Larger population declines have occurred for Leach's Storm-Petrels on Moos Islet and Thornton Islands, Rhinoceros Auklets on Rachael Islands, and likely Cassin's and Rhinoceros auklets on Lanz and Cox islands.

Table 3. Colonies of burrow-nesting seabirds on the BC Outer Coast with known declines or extirpation of at least one species as of 1990 (unless otherwise noted, only species for which past breeding at a colony has been confirmed are considered).

	Species			
Colony	**Historically Nesting**	**Abandoned**	**Declined**	**No Apparent Change or Increased**
MC-130 Rachael Is.	RHAU		RHAU	
MC-240 Dupont I.	RHAU[a]	RHAU[a]		
MC-270 Wells Rks.	FTSP, RHAU, TUPU	FTSP, RHAU, TUPU		
MC-290 Moore Is.	FTSP, LSPE, ANMU, CAAU, RHAU, TUPU	ANMU		FTSP, LSPE, CAAU RHAU, TUPU
MC-340 Byers Is.	FTSP, LSPE, CAAU, RHAU, TUPU[a]	FTSP, LSPE	TUPU[a]	CAAU, RHAU
MC-420 Fingal I.	FTSP	FTSP		
QS-030 Storm Is.	FTSP, LSPE, CAAU, RHAU, TUPU	TUPU		FTSP, LSPE, CAAU, RHAU
QS-110 Pine I.	LSPE, CAAU, RHAU, TUPU	CAAU, TUPU		LSPE, RHAU
QS-120 Buckle Grp.	FTSP, LSPE, CAAU, RHAU	RHAU		FTSP, LSPE, CAAU
SC-040 Lanz I.	CAAU[a], RHAU[a]	CAAU[a], RHAU[a]		
SC-050 Cox I.	CAAU[a]	CAAU[a]		
WV-150 Thomas I.	FTSP, LSPE	FTSP		LSPE
WV-210 Moos It.	LSPE, TUPU	LSPE, TUPU		
WV-220 Thornton Is.	LSPE		LSPE	
WV-300 Grassy I.	LSPE	LSPE		
WV-320 McQuarrie Its.	TUPU	TUPU		
WV-410 Cleland I.	FTSP, LSPE, CAAU, RHAU, TUPU		TUPU	FTSP, LSPE, CAAU, RHAU
WV-850 Seabird Rks.	FTSP, LSPE, CAAU, RHAU, TUPU	TUPU		FTSP, LSPE, CAAU, RHAU[b]

Summary of Trends for Species Nesting at the Above 18 Affected Colonies

	Number of Colonies (of the 18 affected colonies)			
Species	**Historically nesting**	**Abandoned**	**Declined**	**No apparent change or increased**
FTSP	9	4	0	5
LSPE	11	3	1	7
ANMU	1	1	0	0
CAAU	9	3	0	6
RHAU	11	4	1	6
TUPU	9	6	2	1
Total Occurrence	**50**	**21**	**4**	**25**
Percent Occurrence	100%	42%	8%	50%

[a] Breeding was never confirmed but evidence was sufficient to infer a trend.
[b] Declines in these four species have occurred since 1990.[55]

Figure 56. Small colonies of Tufted Puffins along the BC outer coast, such as Seabird Rocks, have been abandoned. The Seabird Rocks colony was impacted by human disturbance and may have been finally extirpated by disturbance and/or predation by river otters. *Photo by R. Wayne Campbell.*

Comparative data from the 1970s and 1980s [32, 84, 181, 182, 183, 194, 212, 217, 236, 238, 265] revealed some trends for Pelagic Cormorants and Glaucous-winged Gulls but were inadequate to detect trends for other surface-nesting species and for Pigeon Guillemots along the outer coast. Eruptive and erratic trends for Brandt's Cormorants were apparent at the six known historical colonies on the outer coast, one in the Scott Islands and five on the west coast of Vancouver Island, but the lack of concurrent surveys at all colonies precluded an estimation of overall population trends. Trends are best documented at the four historical colonies in the vicinity of PRNPR on the west coast of Vancouver Island that were frequently surveyed in the 1960s, 1970s, and 1980s.

As in Haida Gwaii, Pelagic Cormorant populations have decreased in most regions, except for a contrary trend over that period on Triangle Island, where a maximum number of nests was counted in 1989.[196] However, populations on Triangle Island may have declined from historically greater numbers in the late 1940s,[47] although data from that period are inconclusive.

Glaucous-winged Gull numbers over the entire outer coast area increased from the 1970s to the 1980s but contrary trends were seen in some areas and on many colonies. Increases were most apparent on the northern mainland coast and on Triangle Island in the Scott Islands (Figure 57). Counts on colonies in Queen Charlotte Strait suggested depressed numbers nesting in 1975 and little change from 1976 to the 1980s. Populations on the west coast of Vancouver Island showed some increase up to 1988 but then decreased in 1989, likely related to poor food supplies that year.[238]

Figure 57. A pair of Glaucous-winged Gulls stands near their nest within grass tussocks on Puffin Rock on Triangle Island. Breeding populations have increased on the island since the 1970s. *Photo by Michael S. Rodway, 26 July 2009.*

Predator-prey Mismatch and the Cost of Climate Change

Cassin's Auklet populations on Triangle, Sartine, and Beresford islands in the Scott Islands appeared to be thriving in 1989. That was about to change. Subsequent studies revealed serious declines in survival rates, reproductive success, and population size that likely began around 1990.[11, 12, 14, 111, 184] *By 2009, we may have lost about 800,000 Cassin's Auklets, which represents more than 20% of their world population. And we humans may have to shoulder the blame.*

One of the main problems with anthropogenic climate change is that it is happening so fast that animals do not have time to adapt. Sometimes adaptations at lower trophic levels, such as changes in the timing of life cycle events in response to higher temperatures, cannot be matched by species at higher trophic levels, resulting in a mismatch between predators and prey. Climate change increases the frequency and severity of mismatching between predator and prey.[78, 79] *For Cassin's Auklets on Triangle Island, warm ocean temperatures alter the phenology of one of their main prey species, the copepod* Neocalanus cristatus. *Normally, Cassin's Auklets are feeding their chicks when the copepods are most abundant and available in surface waters. When sea surface temperatures are elevated, peak copepod abundance occurs earlier and for a shorter duration. The copepods are then less available to Cassin's Auklets during the energetically demanding period when they are trying to feed their chicks. As a result, Cassin's Auklets at Triangle Island breed less successfully, with reduced offspring survival rates and fledging masses, in years with warmer ocean temperatures.*[14, 111, 117]

Impacts and Threats to Seabird Breeding Populations

Unlike colonies in Haida Gwaii, where introduced rats (*Rattus* spp.) and Northern Raccoons are present and threaten many colonies, introduced mammalian predators are associated with the disappearance of burrowing species on only two colonies along the outer coast. On the two largest Scott Islands, Lanz and Cox, intentionally introduced American Mink (Figure 58) and Northern Raccoons (Figure 59) may have eliminated large numbers of nesting Cassin's and Rhinoceros auklets and perhaps other species, although confirmation of historical breeding is lacking.[47]

Figure 58. American Mink are indigenous to larger islands along the BC mainland coast but do not regularly occur on outer islands where most seabirds nest. They were historically absent from all the Scott Islands until they were intentionally introduced to Lanz Island in 1938 or 1939. Large numbers of Cassin's and Rhinoceros auklets likely nested on Lanz Island previously but were extirpated soon after mink were introduced. *Photo by Paula Courteau.*

Figure 59. Northern Raccoons are resourceful predators and readily prey on nesting seabirds if they are accessible. Otherwise, they commonly feed on intertidal invertebrates and will also scavenge carcasses. *Photo by R. Wayne Campbell.*

Figure 60. Predation by a family of Northern River Otters was blamed for the disappearance of most burrowing seabird species from Seabird Rocks on the west coast of Vancouver Island by 2011. Human disturbance also likely contributed to seabird declines. *Photo by Paula Courteau.*

Native mammals are associated with declines on about a third of affected colonies listed in Table 3. Mink that presumably have dispersed naturally have been recorded on three colonies (Rachael, Thomas, and Cleland islands) and were suspected on another (Seabird Rocks) where declines of burrow-nesting species have been detected. Mink have also been observed on Connel Islands where Rhinoceros Auklets were suspected nesting in 1976. Intense predation by river otters may have been responsible for declines of storm-petrels on Moos and Thornton islands. More recently, river otters were also suspected culprits in the disappearance of burrowing species from Seabird Rocks (Figure 60).[55] Other suspected causes of population declines for burrow-nesting species at these sites include human disturbance, erosion of nesting habitat, and displacement of Cassin's Auklets by Rhinoceros Auklets.

Population declines seen at several Glaucous-winged Gull colonies along the northern mainland coast and in Queen Charlotte Strait may have been related to egg harvesting by First Nations people as well as predation by Bald Eagles and mink.

Recreational traffic is increasing throughout coastal regions and is of particular concern along the west coast of Vancouver Island where the beauty and accessibility of coastal habitats draw many visitors. Islands in the Broken Group in Barkley Sound receive high volumes of tourist traffic, and the area around the Brooks Peninsula and Checleset Bay, including the Bunsby Islands, is a favoured remote destination for adventurous boaters. The area around Gillam Islands at the mouth of Quatsino Sound is also an attractive destination for recreational boaters seeking more remote locales. In Queen Charlotte Strait, Broughton Archipelago Marine Provincial Park is extremely popular with sea kayakers from around the world. Disturbance to nesting seabirds from burgeoning numbers of boaters and kayakers may have contributed to declines in Pelagic Cormorant nesting populations, especially in Barkley Sound.[57]

Chronic and catastrophic oil spills are a constant threat and source of seabird mortality along the entire outer coast. The threat is especially severe where large concentrations of breeding or foraging seabirds occur. Thousands of dead, oiled seabirds washed up along the west coast of Vancouver Island following the well-publicized Nestucca oil spill that occurred on 23 December 1988 (Figure 61).[193] Common Murres and Cassin's Auklets were the most frequent casualties. Interactions with commercial and sport's fisheries and mariculture installations also impact seabirds along the outer coast.

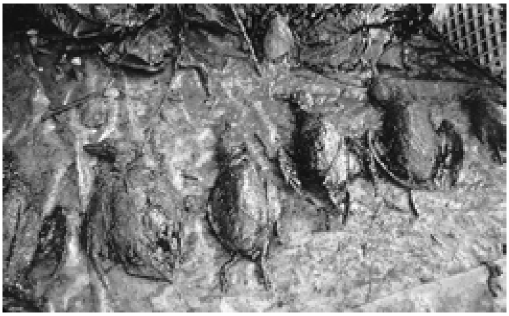


Figure 61. Barely recognizable as birds, these four oil-coated Cassin's Auklet carcasses are a few of the many that were found and identified following the Nestucca oil spill. They illustrate how devastating an oil spill can be to seabirds and other marine life. *Photo by Moira J.F. Lemon, January 1989.*

Protective Status for Seabird Colonies on the BC Outer Coast

BC Parks and Ecological Reserves.

Most major seabird colonies along the BC outer coast have protective status as Ecological Reserves, including nine of the "Big Ten" colonies around the north end of Vancouver Island (see Table 2, page 58) and most of the important cluster of colonies off the west coast of Aristazabal Island on the northern mainland coast. Gillam Islands is the only one of the "Big Ten" colonies that does not have Ecological Reserve status, although they have been identified as an Important Bird Area (see below). Colonies within designated Ecological Reserves off Aristazabal Island include the southern Moore Islands (the north island is an Indian Reserve), McKenney Islands, Whitmore Islands, Byers Islands, Conroy Island, Harvey Islands, Sinnett Islets, and "Lone" Rock (Figure 62). Further north on the mainland coast, the small seabird colonies on MacDonald Island, "Porter" Rocks, and Glide Islands are also designated Ecological Reserves. In the Queen Charlotte Strait region, the Duke of Edinburgh Ecological Reserve encompasses the cluster of six colonies at the western entrance to the strait, including Storm Islands, Reid Islets, Naiad Islets, Tree Islets, Pine Island, and the Buckle Group (Figure 63). All three main colonies in the Scott Islands (Triangle, Sartine [Figure 64], and Beresford islands), and Solander Island, Cleland Island, all the colonies in Checleset Bay (Yule Rock, O'Leary Islets, Cuttle Islets, Skirmish Islets, Bunsby Islands, Clara Islet, Thomas Island, and "St. Pauls" Islets), Baeria Rocks in Barkley Sound, and Race Rocks along the west coast of Vancouver Island, have protected status as Provincial Ecological Reserves.

Figure 62. This chain of small islets is part of the Moore Islands and supports nesting storm-petrels, Cassin's and Rhinoceros auklets, Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots. It has protective status as an Ecological Reserve. *Photo by Moira J.F. Lemon, 20 June 1988.*

Figure 63. View from Tree Islets towards the south shore of Pine Island. These seabird colonies are protected within the Duke of Edinburgh Ecological Reserve. *Photo by Moira J.F. Lemon, 15 July 1986.*

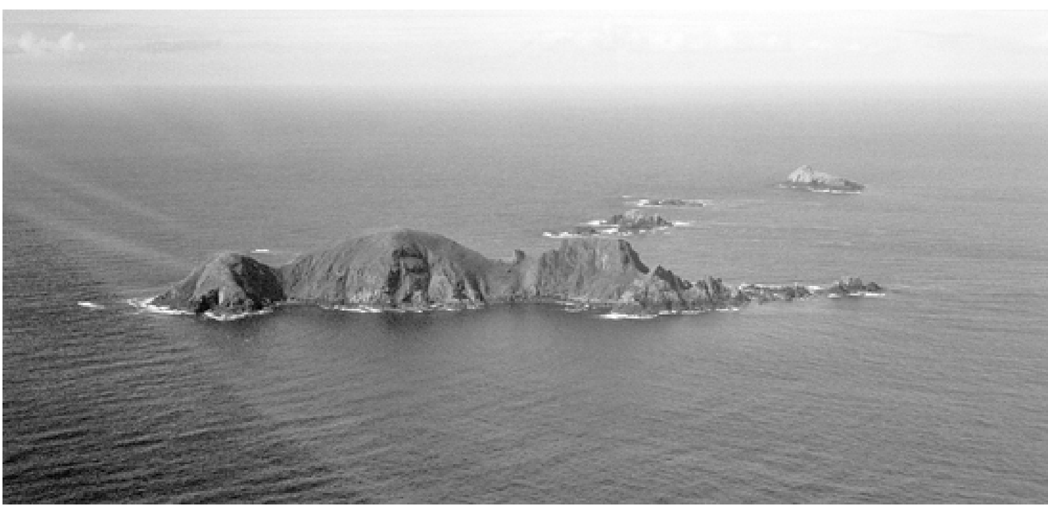


Figure 64. Sartine Island, along with Beresford and Triangle islands, are within the Anne Vallée Ecological Reserve. *Photo by Moira J.F. Lemon, July 1994.*

A number of small seabird colonies are encompassed within BC Provincial Parks. Kitson Island on the northern mainland coast is part of Kitson Island Marine Provincial Park. In Queen Charlotte Strait, Crane Islands are part of God's Pocket Marine Provincial Park. Most colonies from Coach Islets (QS-250) to Surge Islands (QS-300), except "Seabreeze" Rock and the eastern "Ridge" Rocks, lie within Broughton Archipelago Marine Provincial Park, BC's largest marine park. Plumper

Islands and Stephensen Islet (except for the northwest rock off Stephensen Islet) are part of Cormorant Channel Marine Provincial Park. In the Scott Islands, Lanz and Cox islands, including a 1 km foreshore area around the islands, have been given Provincial Park status. On the west coast of Vancouver Island, the small colony on White Rock is within Catala Island Marine Provincial Park, and the nearby Ensanada Islet lies within Nuchatlitz Provincial Park. Maquinna Marine Provincial Park includes the "Kanim" Coast colony, and Kutcous Islets and Tibbs Islet are part of Flores Island Provincial Park. Seabird colonies off the west side of Vargas Island from Burgess Islet (WV-394) to La Croix Group (WV-420) are within Vargas Island Provincial Park, which surrounds the Cleland Island Ecological Reserve (WV-430 Clayoqout Spit east of Vargas Island is not in the park). At the southern end of the west coast Vancouver Island region, "Parkinson" Cliff and San Simon Point are within Juan de Fuca Provincial Park.

Pacific Rim National Park Reserve.

Many of the colonies in and north and south of Barkley Sound are included in Pacific Rim National Park Reserve: all colonies from Gowlland Rocks (WV-440) to Florencia Islet (WV-520) are within the Long Beach Unit of the park (Figure 65); Hankin Island (WV-580) to Swale Rock (WV-690) are in the Broken Island Unit; and Lawton Point (WV-830) to Whyac (WV-860) are in the West Coast Trail Unit.

BC Parks Conservancy Areas.

Many colonies that are not protected as Ecological Reserves, Provincial Parks, or National Parks have been given some protected status as Heritage Sites/Conservancy Areas under the BC Parks system. At the northern end of the mainland coast, the Lax Kwaxl/Dundas and Melville Islands Conservancy includes the small colonies on Zayas Island and "Dundas" Rocks. Lucy Islands have also been given Conservancy status. The Ksgaxl/

Figure 65. The islets in the top of the photo are Sea Lion Rocks, the first documented nesting site for Brandt's Cormorants in the province. The rocks are protected within Pacific Rim National Park Reserve. *Photo by R. Wayne Campbell, Green Point, Long Beach, BC, 11 August 1969.*

Stephens Island Conservancy includes the Tree Nob Group and Roland Rocks, and the colonies on Northwest Rocks and North Rock lie within the Lax Kul Nii Luutiksm/Bonilla Conservancy. Four small colonies, "Limit" Rocks, Fingal Island, Guano Rocks, and "Fitzmelon" Rock, are part of the Outer Central Coast Islands Conservancy. Just south of the Outer Central Coast Islands Conservancy, the Hakai Lúxvbálís Conservancy is the largest provincial marine protected area on the BC coast, encompassing seabird colonies from the Goose Group (MC-450) to North Pointers Rocks (MC-520). Contiguous with the Hakai Lúxvbálís Conservancy, the Calvert Island Conservancy contains the small seabird colony on Upward Rock. The three adjacent Conservancy areas, the Outer Central Coast Islands Conservancy, the Hakai Lúxvbálís Conservancy, and the Calvert Island Conservancy, thus bracket the 13 seabird colonies from "Limit" Rocks (MC-410) to Upward Rock (MC-530).

In Queen Charlotte Strait, the Mahpahkum-Ahkwuna/Deserters-Walker Conservancy includes seabird colonies on Joan Island, Deserters Island, Barry Islet, and Bleach Rock.

Scott Islands Protected Marine Area.

Partial protection for breeding, staging, and foraging seabirds around the Scott Islands has recently been provided by the 11,546 km^2 Scott Islands Protected Marine Area (also called the Scott Islands marine National Wildlife Area), established on 27 June 2018. Although this is a positive move to protect breeding and migratory birds in this important region, the legislation falls short in its regulations. Under the current legislation [44] it is prohibited to:

(a) carry out any activity that is likely to disturb, damage or destroy wildlife or its habitat in the Protected Marine Area or to remove wildlife or its habitat from the Protected Marine Area;

(b) dump or discharge any waste material or substance that is likely to harm wildlife or degrade the quality of wildlife habitat in the Protected Marine Area;

(c) introduce any living organism that is likely to harm wildlife or degrade the quality of wildlife habitat in the Protected Marine Area;

(d) fly an aircraft [over the islands] …at an altitude that is below 3,500 feet above mean sea level;

(e) be within 300 metres of the low water mark of the Triangle, Sartine or Beresford Islands; or

(f) anchor a vessel of more than 400 gross tonnes within one nautical mile (1,852 metres) of the low water mark of the Triangle, Sartine, or Beresford islands.

The first two restrictions (a and b) do not apply in respect of: fishing carried out in accordance with the Coastal Fisheries Protection Act and the Fisheries Act; the navigation of a vessel in accordance with the Canada Shipping Act, 2001; or the navigation of a vessel that belongs to a foreign military force or that belongs to or is under the command of the Canadian Forces. Thus, the current legislation does little to safeguard nesting seabirds from the impacts of chronic and catastrophic oil spills, entanglement and bycatch in fishing gear, or disruption of foraging and social activities that occur more than 300 m from shore. Added restrictions are being considered to prohibit fishing of important prey species for seabirds and to reduce accidental bycatch,[81] but a much wider exclusion zone for all vessel traffic around these islands is required to make these waters safe for seabirds (Figure 66).

Figure 66. Northern Fulmar feeding near Triangle Island. The Scott Islands Protected Marine Area falls short in its regulations that do little to reduce the risks to seabirds of chronic and catastrophic oil spills, entanglements and bycatch in fishing gear, and disturbance to foraging birds in offshore areas. *Photo by R. Wayne Campbell.*

What the $@xx??!

Seabird colonies are one of the most magical places on planet Earth. The intensity of life on a colony like Triangle Island that supports over two million birds of 13 different species is endlessly captivating. And the elemental beauty of these wild, remote islands is awe inspiring. Being able to work for extended periods immersed in the fever of activity of so many lives in these exotic places is exhilarating and addictive. But we always must remember that we humans are foreign invaders into the lives of these birds. And we are not welcome. One adult Bald Eagle made sure that I (Michael) would never forget that!

Unlike on the Galapagos Islands and some other remote locales where nesting seabirds may show little reaction to invading humans, species nesting on BC colonies have an immediate aversion to human presence. Reactions by many species, including cormorants, murres, and puffins, are to flee when humans come close, abandoning eggs and chicks. Glaucous-winged Gulls are more aggressive, and though they will leave their nests, they will dive, scream, drop feces, and strike at intruders to try and drive them off. Thus, it is dangerous to enter a gull colony and you need to protect your head from possible impacts. Raptors nesting on Triangle Island elevate the danger to a higher level.

Bald Eagles and Peregrine Falcons also dive and attempt to hit human intruders that approach their nesting territories. On Triangle Island where there are no trees for cover, eagles and falcons can scream past your head with impunity. Holding a stick above your head is prudent protection from gulls and raptors, but if you are climbing one of the steep grassy slopes to check for burrowing seabirds in the vicinity of an eagle nest or falcon eyrie, you still have to keep an "eagle" eye and flatten yourself against the slope when they stoop upon you. It is an unnerving experience!

One eagle nest that is occupied most years on Triangle Island is located on a narrow rock ridge at the southwest corner of the island (Figure 67). *That knife-edge ridge has to be crossed to get from South to West bay. There is a steep route over the ridge that we call "Khyber Pass". It crosses the ridge about 100 m from the eagle nest and you must always carry a stick above your head to fend off eagles that invariably dive-bomb you as you are making your way over the trail. Once the nesting season is over and eaglets have fledged, activity around the eagle nest peters out. Eagles are rarely seen around that nest late in the season. So it was that near the end of our stay on the island in 1984 I became nonchalant. Big mistake.*

Just Moira and I were on the island at the time. One evening after a day's work I decided to take a stroll from our base camp in the middle of South Bay to watch the sunset from "Khyber Pass". I saw no eagles in the vicinity and so was blissfully standing on the narrow ridge top, lost in the beauty looking out over the ocean waves in the setting sun. Suddenly, I was clobbered by what felt like a two-by-four smashed with full force upon my head. The impact crumpled me to my knees and I think I blacked out for a second. It took me a moment to realize what had happened to me – an adult eagle had swooped down at full speed from behind and hit me with both feet. If the eagle had hit me more from behind it would have toppled me over the cliff face. So I was lucky that the force of impact was almost straight down. Dazed, I climbed back down the trail and made my way back to base camp. Poor Moira – I looked quite a fright. The eagle had hit me with all talons out and so had inflicted several deep lacerations in my scalp. Blood was streaming down my face. Thank goodness for Moira's first aid skills and a well-stocked first-aid kit. It was one of my most memorable sunsets and was a good reminder of who these islands properly belong to!

Figure 67. Since there are no trees growing on Triangle Island, Bald Eagles must build their nests on the ground, often on the tops of rocky pinnacles. This eagle nest is located above the narrow exposed pass (dubbed "Khyber Pass") between the south and west bays of Triangle Island; this is a daunting area to hike through with an ever vigilant and often hostile eagle nesting on the pinnacle above. *Photo by Moira J.F. Lemon, July 2004.*

Important Bird Areas.

Many Important Bird Areas (IBAs) have been identified along the BC outer coast. Designated IBAs on the northern mainland coast that contain seabird colonies include: Grey Islet and Green Island, Lucy Islands, Moore and Byers Islands and Banks (which includes all islands around Moore and Byers Islands off the west coast of Aristazabal Island), Goose Island Group, Major Brown Rock, and Smith Sound Islets. In Queen Charlotte Strait, the Duke of Edinburgh Ecological Reserve has been identified as an IBA. The Scott Islands Group IBA includes all five Scott Islands. Along the west coast of Vancouver Island, IBAs that contain seabird colonies include: Gillam Islands, Solander Island (Figure 68) and Brooks Bay, Checleset Bay, Kyuquot Channel Islets, Cleland Island and Southeast Clayoquot Sound, and Barkley Sound. Many of the seabird colonies within IBAs have protective status as BC Ecological Reserves or are within Pacific Rim National Park Reserve (see above).

Figure 68. Solander Island, a steep, precipitous, and grassy island, has been identified as an Important Bird Area for breeding seabirds. Seven seabird species are known to nest on the island. *Photo by R. Wayne Campbell, 17 June 1975.*

COLONY ACCOUNTS AND REGIONAL SUMMARIES

Data Presentation and Organization

We have divided the Outer Coast into four geographic regions (Figure 69; also see Figure 58 on page 58 in Part 1 [188]). Regional summaries and individual colony accounts are presented for each region. Colony accounts are presented in north-to-south order following our previous numbering scheme.[178, 181, 182, 183, 194] Geographically-ordered colony identity numbers were assigned at intervals of 10 to allow future insertion of newly discovered colonies in geographic sequence. New identity numbers have been inserted where historical data have become available or been reinterpreted since initial reports were published. Location names are from BC Geographical Names,[88] except for names in quotations, which we have assigned to locations without gazetteered names to avoid confusing lists of unnamed colonies.

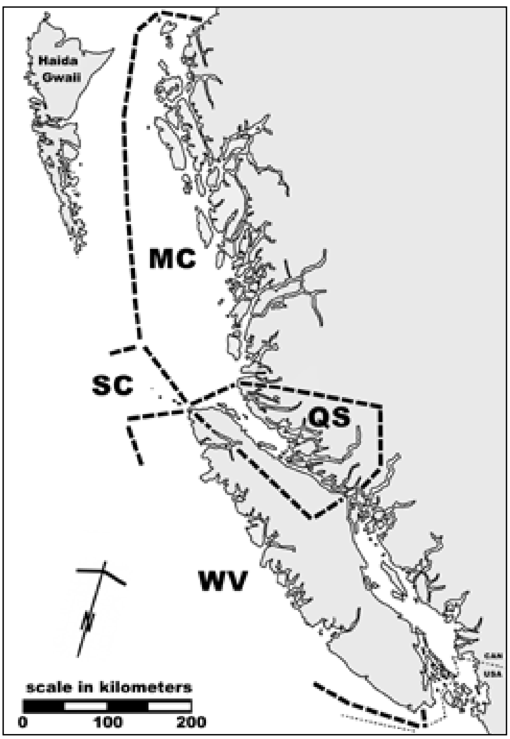


Figure 69. We have divided the BC Outer Coast into four geographic regions used to summarize seabird breeding populations. From north to south, these are: Northern Mainland Coast (MC), Queen Charlotte and Johnstone straits (QS), Scott Islands (SC), and West Coast Vancouver Island (WV).

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

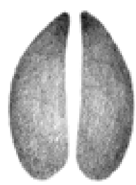
Each colony account is divided into three or four sections: *Location*, *Description*, and *Historical Summary*, plus a *Remarks* section if pertinent. *Location* includes latitude and longitude, National Topographic System (NTS) map grid number, a verbal description of the colony location, and previous or alternate names for the site if applicable. Designated colonies generally correspond to gazetteered [88] locations, and may encompass a single island or an island group. However, many islands or island groups with gazetteered names have unnamed islets or rocks nearby that we have associated with the named colony. We verbally describe the location relative to the named site of any such nearby, unnamed islets that we have included as part of the colony. For sites without gazetteered names, and for which we assigned names in quotations, we decided which island or group of islands would be included in the colony. 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.[153] Latitudes and longitudes previously given in CWS Technical Reports [181, 182, 183, 194] 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: total area and maximum elevation of island colonies, and maximum elevation of cliffs for cliff colonies, if available; a dominant habitat category (e.g., Forested, Grassy rock, Bare rock, Cliffs); and a brief description of the site. Total areas given are those measured from air photos and detailed topographic maps during the 1980s CWS surveys [181, 182, 183, 194] 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.[153] Habitat categories overlap and only indicate the most prevalent habitat types. Multiple habitat categories may be listed, especially for colonies that include groups of islands. Forested islands almost always have rocky shorelines, often with areas of grassy or herbaceous vegetation, and may have some cliff habitat. The "Forested" habitat category thus indicates islands that often also have habitats like the categories of "Grassy rock" and "Bare rock" and perhaps "Cliffs." The "Grassy rock" category includes any rocky island with substantial areas of grass or other herbaceous vegetation; shrubs may also be common and there may be a couple of scattered trees. "Bare rock" refers to a habitat type that has no vegetation or sparse vegetation and virtually no soil accumulation. The "Forested," "Grassy rock," and "Bare rock" categories are thus somewhat nested; grassy rocks lack forested habitat, and bare rocks lack forested and grassy habitats. "Cliffs" are near vertical rock faces with variable amounts of vegetation. We also use other habitat categories that are self-explanatory, including "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, except we note under *Location* colonies located within Pacific Rim National Park Reserve (PRNPR). Colonies within larger protected areas are also identified 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 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 (*Falco peregrinus*), and mammalian predators (Figure 70) on a colony. Records for other species such as Common Ravens

Figure 70. (following page) Sometimes the only clue to a mammal's presence on a seabird colony is a footprint. Northern River Otter, Northern Raccoon, and American Mink are the three main mammalian predators that have been recorded on seabird colonies along the BC outer coast. Black-tailed Deer (*Odocoileus hemionus*) may also occur on colony islands. Other large-mammal species, including Grey Wolf (*Canis lupus*) and American Black Bear (*Ursus americanus*), are present along the outer coast and could occur on seabird colony islands. It is important that seabird surveyors are able to identify tracks of different mammalian species that they may encounter (clockwise from top left): Grey Wolf [67-127 mm (2.6-5.0 in) wide; 95-146 mm (3.7-5.7 in) long; 4 symmetrical toes with claws; and single lobe on front of foot pad]; American Black Bear [83-152 mm (3.3-6.0 in) wide; 95-225 mm (3.7-8.9 in) long; 5 rounded toes; large blunt claws; asymmetrical track; palm pad wide and curved; hind track larger than front]; Northern Raccoon [38-83 mm (1.5-3.3 in) wide; 44-102 mm (1.7-4.0 in) long; hand-shaped; five finger-like toes on front and hind feet, sometimes showing claws; hind feet may show palm or heel pad]; Northern River Otter [48-95 mm (1.9-3.7 in) wide, 54-102 mm (2.1-4.0 in) long; may show heel pad and toes; toes fan out widely; tail marks often present]; American Mink [22-44 mm (0.9-1.7 in) wide, 21-47 mm (0.8-1.9 in) long; feet with 5 toes; claw marks tear-drop shape; may show small heel pad]; and Black-tailed Deer [38-70 mm (1.5-2.8 in) wide, 51-102 mm (2.0-4.0 in) long; heart-shaped track with pointed toes; may show dewclaws, especially when stotting (left group)]. *Drawings reproduced from Eder and Pattie,*[307] *with permission of Shane Kennedy, Lone Pine Publishing, Edmonton, AB; measurements from Elbroch.*[308]



(*Corvus corax*; Figure 71) and Northwestern Crows (*C. caurinus*), which are common on many BC seabird colonies, are mentioned mainly when 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 [188] in the species summary tables in the Species Accounts section. Those details are not repeated in the colony accounts presented here. Several publications present more detail on the CWS surveys. [84, 176, 181, 182, 183, 194, 236, 238] CWS Technical Reports [176, 181, 182, 183, 194] are available online.

In some colony accounts we provide details about transects and quadrats sampled during the

Figure 71. Common Ravens are common on larger islands in BC and are natural predators of seabirds within nesting colonies. They are capable of digging into the burrows of Cassin's and Rhinoceros auklets as well as raiding the nests of surface-nesting species. *Photo by Mark Nyhof.*

Figure 72. BCPM seabird surveys in the 1970s were conducted with limited funding and with the objective of covering the entire BC coast in only a few years. Time was not available to survey burrow-nesting seabirds using transects and sample quadrats to obtain statistically robust population estimates. However, BCPM crews were able to subsample some colonies to help generate rough estimates of population sizes. In this photo, the BCPM crew is surveying sample quadrats in the Rhinoceros Auklet colony on Pine Island. From left to right are: Teresa Shepard, Keith Taylor, Michael Rodway, and Marilyn Paul (now Lambert). *Photo by R. Wayne Campbell, 15 June 1976.*

earlier BCPM surveys, especially when those details help to evaluate possible historical changes. Even though population estimates derived using transect data from BCPM surveys (Figure 72) 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.

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 presented as 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 [188]). 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 codes to indicate and qualify the kinds of data presented. Those were described in detail in Part 1 [188] 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*.

We have reviewed original data sources in preparing the colony histories presented here and have found mistakes in previous publications. Where differences in specific data occur between this release and past publications, including BCPM publications [32] and CWS technical reports [176, 181, 182, 183, 194] and publications,[84, 178, 236, 238] the data here should be considered correct.

NORTHERN MAINLAND COAST

Of the hundreds of islands along the mainland coast between the Alaska border and Cape Caution, only 59 are known to support nesting seabirds (Figure 73). The presence of mink on most islands likely limits the distribution of nesting seabirds. As of 1990, nine species were known to nest in this region. Rhinoceros Auklets (Figure 74) are the most abundant nesting species, comprising 60% of the total nesting population of about 390,000 birds (Table 4). Fork-tailed Storm-Petrels, Leach's Storm-Petrels, and Cassin's Auklets compose another 38%. Ninety-eight percent of the nesting birds are concentrated in two clusters of colonies. Islands off the west coast of Aristazabal Island in the vicinity of the Moore Islands support over 332,000 birds (85%), and Lucy and Rachael islands in central Chatham Sound support almost 52,000 birds (13%). Most of the birds nesting in the region could be endangered by local environmental contamination in proximity to those concentrations.

Figure 74. Rhinoceros Auklets comprise 60% of the total seabird nesting population on the Northern Mainland Coast. Their most important colonies in this region are on the Moore, Byers, and Lucy islands. *Photo by Jared Hobbs.*

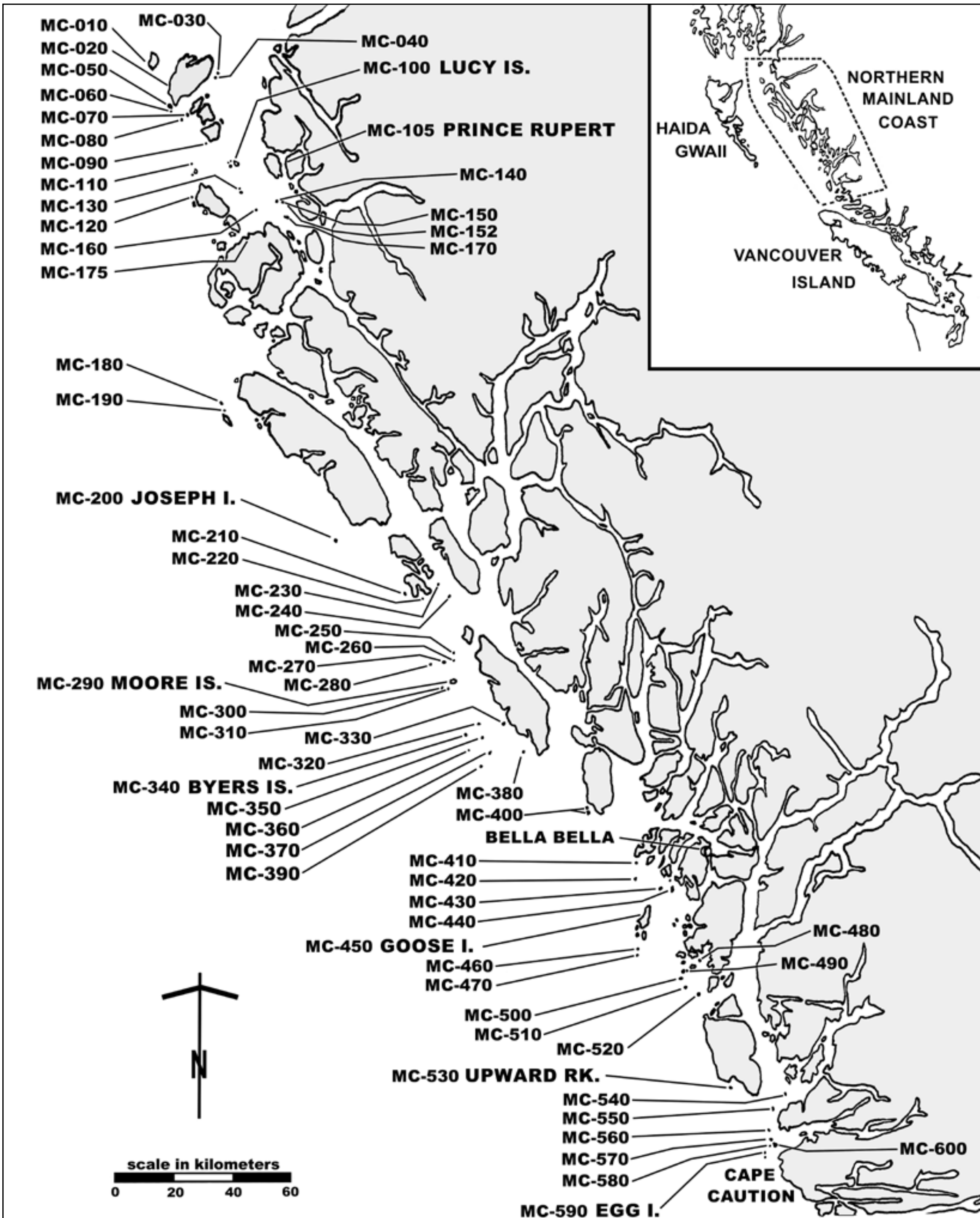


Figure 73. Locations of seabird colonies on the northern mainland coast (modified from Rodway and Lemon [182]).

Table 4. Estimates of seabird breeding populations on the northern mainland coast 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 534-535 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]
MC-010	Zayas Island					1	(3)						5	1976
MC-020	"Dundas" Rocks					7							14	1976
MC-030	Grey Islet				2	108	x						222	1988
MC-040	Green Island				2	248	S(35)						535	1988
MC-050	"Prince Leboo" Rocks					59							118	1976
MC-060	Chearnley Islet				1		(6)						8	1976
MC-070	"Baron" Cliffs						x(55)						55	1987
MC-080	Connel Islands				1	0	S(12)			0			14	1987
MC-090	"Simpson" Rocks				1eS	178	S(25)						383	1988
MC-100	Lucy Islands				4S	59	x(197)			25,300t			50,923	1983, 88
MC-105	Prince Rupert						3						6	1976
MC-110	Tree Nob Group			22	0	60e	(0)						164	1988
MC-120	Roland Rocks					88	(0)						176	1988
MC-130	Rachael Islands				3	25	S(42)			300S			698	1987, 88
MC-140	Greentop Islet				2eS	6	S(12)						28	1979
MC-150	Holland Rock				1	8	x(10)						28	1979
MC-152	Kitson Island				1								2	1978
MC-160	Gull Rocks					39eS	S(6)						84	1987
MC-170	Lawyer Islands				4	0							8	1987
MC-175	Porcher Island - North				x	x	x						-	1921
MC-180	Northwest Rocks				1	36	x4(47)						121	1976
MC-190	North Rock				1eS	27	x3(29)						85	1976
MC-200	Joseph Island				2eS	245	S(75)					(0)	569	1988
MC-210	MacDonald Island				1eS	6	S(4)						18	1988
MC-220	"Porter" Rocks				0	12							24	1988
MC-230	Glide Islands				1	12	S(2)						28	1988
MC-240	Dupont Island	50eS	50eS		3S					0			206	1988
MC-250	Beaven Islands				1								2	1976
MC-260	Anderson Islands				0								0	1988
MC-270	Wells Rocks	0			7	83	x4(19)			0	0(0)		199	1988
MC-280	Isnor Rock				1	1S	x2(18)						22	1988
MC-290	Moore Islands	8,900t	6,000t		21e	150	x2(187)	0	400eS	40,500t	3(6)		112,135	1988
MC-300	McKenney Islands	1,500t	2,900t		8e	92	x(14)		40eS	130eS			9,354	1988
MC-310	Whitmore Islands	340t	230t		5	19	x(60)			12,400t			26,048	1988
MC-320	"Lone" Rock				1eS	20							42	1988
MC-330	Bowden Islands				0	18							36	1988
MC-340	Byers Islands	E	E		10	112	x4(88)		18,800t	37,900t	3(6)	(1)	113,739	1988
MC-350	Sinnett Islets	19,200t	11,200t		7	93	x3(43)		2,100t		1S(1)	(0)	65,245	1988
MC-360	Conroy Island		75e		7	208	x2(148)		450eS	500eS	8(6)	1S(2)	2,646	1988
MC-370	Harvey Islands	100eS	100eS		12	93	x2(24)		710e	160eS			2,374	1988
MC-380	Rogerson Rock				1	52	x2(6)						112	1988
MC-390	Steele Rock			0	1eS	0	S(3)						5	1988

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]
MC-400	"Price" Rocks				1	82	(0)						166	1988
MC-410	"Limit" Rocks				1S	1	x3(14)						18	1988
MC-420	Fingal Island	E			3	48	x2(25)						127	1988
MC-430	Guano Rocks				0	11	x2(4)						26	1988
MC-440	"Fitzmelon" Rock					3							6	1988
MC-450	Goose Group				2		(4)						8	1988
MC-460	Gosling Rocks				9	83	x7(31)						215	1988
MC-470	Currie Islet				3eS	32	S(4)						74	1988
MC-480	Mosquito Islets					0	(0)						0	1976
MC-490	"Triquet" Rock				2	1eS	x(3)						9	1988
MC-500	Blenheim Island			17	1eS	68	x3(15)						187	1988
MC-510	Airacobra Rock					6							12	1988
MC-520	North Pointers Rocks			0	0	119	S(8)						246	1988
MC-530	Upward Rock				2eS	29	S(17)						79	1988
MC-540	Major Brown Rock			0	5	319	S(1)						649	1988
MC-550	Dugout Rocks			18	3S	141	x2(9)						333	1988
MC-560	Ruby Rocks			6	3	69	S(28)						184	1988
MC-570	Ann Island						x(40-50)						40	1937
MC-580	Armstrong Rock				8	8	(4)						36	1976
MC-590	Egg Island				0	2	x3(18)		5S	90			212	1988
MC-600	Egg Rocks				6e	140	x(18)						310	1988
	TOTAL NESTING PAIRS	**30,090**	**20,555**	**63**	**162**	**3,327**		**0**	**22,505**	**117,280**	**15**	**1**		
	TOTAL BREEDING BIRDS	**60,180**	**41,110**	**126**	**324**	**6,654**	**1,421**	**0**	**45,010**	**234,560**	**30**	**3**	**389,418**	
	TOTAL CURRENT SITES	6	7	4	44	49	45	0	7	9	4	1[c]	60	
	Confirmed on last survey	4	5	4	30	46	27		2	5	3	0	58	
	Confirmed on any survey	4	5	4	38	48	34		4	6	4	0	59	
	Unconfirmed	2	2	0	6	1	11		3	3	0	1	1	
	TOTAL HISTORICAL SITES	9	8	7	52	54	50	1	7	12	5	1	63	
	Confirmed	6	6	7	45	53	38	1	4	6	5	0	62	
	Unconfirmed	3	2	0	7	1	12	0	3	6	0	1	1	
	CURRENTLY ABANDONED SITES[d]	3	1	3	7	4	4	1	0	3	1	0	2	
	Previously confirmed	2	1	3	6	4	3	1		0	1		2	
	Previously unconfirmed	1	0	0	1	0	1	0		3	0		0	

[a] Numbers of individuals.

[b] For references see individual colony accounts.

[c] Horned Puffins have been sighted around four colonies but only suspected nesting at one. We erroneously reported two unconfirmed current and historical sites for Horned Puffin in Tables 5 and 6 in Part 1 (pages 65-67).[188]

[d] Numbers of abandoned sites do not always equal the differences between total historical sites and total current sites because records were inadequate to define the current status of the Porcher Island North colony.

Four other species may have been nesting on the northern mainland coast in 1990. A single pair of Ancient Murrelets was discovered nesting in the Moore Islands in 1970. Ancient Murrelets have not been found nesting on the mainland coast since 1970 but isolated nesting pairs could easily go undetected. Horned Puffins were sighted around four colonies during surveys in the 1970s and 1980s and one pair was suspected nesting on Conroy Island in 1988. Present breeding by that species is likely. Eight Brandt's Cormorants in breeding plumage and a possible Brandt's Cormorant egg were observed on Steele Rock in 1976, but only immature Brandt's Cormorants were present there in 1988. Nesting by Brandt's Cormorants has not been confirmed or further suspected on the northern mainland coast, but it remains a possibility given intermittent breeding at colonies further north in Alaska.[244] As of 1990, breeding by Black-legged Kittiwake in BC was suspected but not confirmed. Nesting was confirmed on Holland Rock in 1997 (see Appendix 1). One additional species, Western Gull (Figure 75), may have previously nested on the northern mainland coast; an egg specimen identified as that species was collected on Green Island in 1918 (see Green Island account).

Figure 75. The nominate adult Western Gull, one of the largest gulls on the Pacific Coast of North America, has a heavy bill, pink legs, a dark gray back, and an orange ring around the eye. In southern BC, it may hybridize with the abundant Glaucous-winged Gull. *Photo by R. Wayne Campbell, Point Reyes, CA, 27 March 2006.*

We were uncertain of the locations of two breeding sites near Bella Bella (map grid 103 A/1) listed by Drent and Guiguet [77] and have not included them in the colony accounts: Glaucous-winged Gulls were reported nesting on "Burial Island, bay at New Bella Bella" (eggs found on 31 May 1959); and Pigeon Guillemots were reported nesting on rocks at the south end of "Cooper Island" (29 May 1959). Approximate latitudes and longitudes for these sites given by Drent and Guiguet suggest that the two sites may have referred to Narrows Island and Meadow Island, respectively, but there are other candidate locations within the given coordinates as well. We have no other survey records for this area, but those two breeding sites were located well away from the outer coast and suggest that there may, at least historically, have been other nesting sites located along some of the inside passageways among the mainland islands that remained undiscovered. Campbell observed a Pigeon Guillemot swimming under the wharf at Namu on 20 June 1976 and suspected nesting.[33] Namu is also located away from the outer coast, south of Bella Bella (see Appendix 1 for confirmed breeding since 1990 at sites located far from the outer coast).

Surveys in the late 1970s by the BCPM and by CWS in the late 1980s (Figure 76) provide comparative data for surface-nesting species at most colonies. Twelve small colonies surveyed by the

Figure 76. Dick Grinnell, Norm Holmes, Heather Hay, and Michael Rodway shelter under a tarp during a rainstorm at a campsite on Dundas Island during the CWS seabird surveys in 1987. *Photo by Moira J.F. Lemon, 15 May 1987.*

BCPM were not resurveyed by CWS (Zayas Island, "Dundas" Rocks, "Prince Leboo" Rocks, Chearnley Islet, Prince Rupert, Greentop Islet, Holland Rock, Northwest Rocks, North Rock, Beaven Islands, Mosquito Islets, and Armstrong Rock), and five colony locations were identified during CWS surveys that were not surveyed during BCPM surveys ("Baron" Cliffs, Gull Rocks, "Lone" Rock, "Fitzmelon" Rock, and Airacobra Rock). The colony on Ann Island has not been visited since McCabe observed Pigeon Guillemots nesting in 1937.[77]

Comparing data from BCPM and CWS surveys indicates changes in the nesting populations or distribution of some species over the intervening decade. A total of 2,265 pairs of Glaucous-winged Gulls were found nesting at 47 sites in the late 1970s.[212, 217, 265] The current estimate of 3,327 pairs nesting at 49 sites (Table 4) includes 3,175 pairs found at 41 sites surveyed in the late 1980s, plus 152 pairs from eight colonies that have not been surveyed since the 1970s.[182] This suggests an increase of almost 50% in nesting gull populations. These totals were derived over two or more seasons during each period and a more reliable comparison can be made for colonies surveyed in the same year. At 37 colonies surveyed in 1976 and then again in 1988, numbers increased by 41%, from 1,975 pairs to 2,788 pairs. Contrary trends were seen at a number of colonies and high levels of predation on gull eggs, likely by eagles, ravens, and crows (Figure 77), have been observed in some areas (e.g., McKenney Islands). First Nations groups also have regularly harvested gull eggs from colonies such as Green Island and Moore Islands. Proportions of empty nests were similar in 1976 and 1988: of 1,859 nests whose contents were determined in 1976, 1,217 (65%) contained eggs or young, compared to 1,898 (62%) of 3,074 nests inspected in 1988.

Numbers of nesting Pelagic Cormorants and Tufted Puffins have decreased. All seven known cormorant nesting sites were visited in 1976/77 and 1988. Cormorants declined from 245 nesting pairs at seven sites in 1976/77 (six of the colonies were surveyed in 1976; only Major Brown Rock with 8 nests was surveyed in 1977), to 63 pairs at four sites in 1988. Three small colonies were unused in 1988 and the major colony on Dugout Rocks decreased from 148 pairs to 18 pairs. This parallels the trend observed in Haida Gwaii.[175, 189] Puffins have not been observed nesting on Wells Rocks since 1970, and only three pairs remained on Byers Islands in 1988, where 65 were estimated nesting in 1976. Those two sites showed signs of past erosion caused by burrowing birds and decreased numbers may have been associated with loss of nesting habitat.

Mink are present and likely associated with declines in nesting populations on a number of colonies. Mink have reached or been introduced to the Goose Group since 1948, and the Pigeon Guillemots, Glaucous-winged Gulls, and Black Oystercatchers (Figure 78) reported nesting by Guiguet [93] are no

Figure 77. Along the BC outer coast, Northwestern Crows feed primarily on intertidal invertebrates, like this shore crab (*Hemigrapsus* spp.). Crows also visit seabird colonies where they prey on eggs and nestlings of surface-nesting species. *Photo by R. Wayne Campbell.*

Figure 78. American Mink have reached or been introduced to the Goose Group since 1948 and are likely responsible for the loss of Black Oystercatchers that used to nest there. *Photo by R. Wayne Campbell.*

longer present. Mink may also be responsible for an apparent decline in the Rhinoceros Auklet population on Rachael Islands.

Small colonies of storm-petrels on Byers Islands and Fingal Island have been abandoned. River otters or mink were inflicting heavy mortality on storm-petrels on McKenney Islands in 1976, but predation was minimal in 1988. We suspect the culprits in 1976 were river otters because no signs of mink were encountered in 1988. Overall increases in population estimates for burrow-nesting species cannot be evaluated because of differences in survey techniques.

Most of the cluster of major colonies off the west coast of Aristazabal Island is protected as BC Ecological Reserves. Reserve No. 23, established in 1971, includes the southern Moore Islands (the north island is an Indian Reserve), McKenney Islands, and Whitmore Islands. Reserve No. 103, established in 1981, includes Byers Islands, Conroy Island, Harvey Islands, Sinnett Islets, and "Lone" Rock. Further north, MacDonald Island, "Porter" Rocks, and Glide Islands are part of Reserve No. 25, established in 1971.

MC-010 ZAYAS ISLAND

Location: *54°36'30"N 131°04'30"W; 103 J/11.*
Northwest of Dundas Island, south of the Alaska border.

Description: *1,120 ha; 71 m high; Forested; Bare rock.*
Zayas is a large, forested island (Figure 79), but nesting has been recorded only in the rocky area at the south end. BC Parks designated this area part of the Lax Kwaxl/Dundas and Melville Islands Conservancy in 2008.

Historical summary: A Glaucous-winged Gull nest with one egg was found in 1976 (Table MC-010). Three Pigeon Guillemots were present, but no evidence of nesting was reported. A flock of 27 Black Oystercatchers was seen. The area has not been surveyed since.

Figure 79. While searching heavily wooded islands for nesting seabirds, interesting pieces of driftwood, like this "heron," were frequently found on shore and collected by field crews. *Photo by R. Wayne Campbell.*

Table MC-010. Seabird nesting records for Zayas Island. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
3 Jul 1976	1	(3)	265

Remarks: There was one Bald Eagle nest with three young on the south side of the island in 1976. Five adult and three immature eagles were seen on the island.

MC-020 "DUNDAS" ROCKS

Location: *54°32'12"N 130°58'45"W; 103 J/10.*
Mid-west side of Dundas Island, about 8.4 km north of the northern tip of Prince Leboo Island.

Description: *0.9 ha; Bare rock.*
Dundas Island and surrounding islets and rocks are part of the Lax Kwaxl/Dundas and Melville Islands Conservancy designated in 2008.

Historical summary: Glaucous-winged Gulls were nesting on two adjacent, small rocks in 1976 (Table MC-020). Three and four nests were found on the northern and southern of those rocks, respectively. Two Black Oystercatchers were present, but no evidence of nesting was reported (Figure 80). These rocks were not visited by CWS survey crews in the 1980s.

Figure 80. The behaviour of this pair of Black Oystercatchers suggests that they were loafing and not nesting. *Photo by R. Wayne Campbell.*

Table MC-020. Seabird nesting records for "Dundas" Rocks. See Appendix 2 for codes.

DATE	GWGU	SOURCE
3 Jul 1976	7[5]	265

MC-030 GREY ISLET

Location: *54°34'49"N 130°41'50"W; 103 J/10.*
East of Dundas Island, north of Green Island.

Description: *1.1 ha; 9 m high; Grassy rock.*
This small rocky islet has grass on higher sections.

Historical summary: Numbers of Glaucous-winged Gulls nesting increased between 1976 and 1988. Contents of 48 gull nests were determined in 1976, of which 23 held eggs and 25 were empty (Table MC-030). An additional 27 pairs of gulls were estimated nesting. A greater proportion of gull nests held eggs in 1988. Of 15 Pigeon Guillemot nests found in 1976, 14 were under tall grasses and forbs, including American dune grass (*Leymus mollis*), cow parsnip (*Heracleum maximum*), and water hemlock (*Cicuta douglasii*); one was under a log. One guillemot nest with one egg was found in 1988. Black Oystercatchers were not recorded in 1976; two nests with eggs were found in 1988.

Table MC-030. Seabird nesting records for Grey Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
3 Jul 1976	0	75e	x15(53)	265
17 Jun 1988	2[2]	108[84]	x	182

Remarks: Fourteen broken gull eggs were found in 1976 (Figure 81).

Figure 81. Common Ravens can readily carry away a whole Glaucous-winged Gull egg, but Northwestern Crows have trouble carrying an intact egg and generally feed on gull eggs on site, leaving shell fragments behind. *Photo by R. Wayne Campbell.*

MC-040 GREEN ISLAND

Location: *54°34'07"N 130°42'28"W; 103 J/10.*
East of Dundas Island on the west side of Oriflamme Passage.

Description: *1.8 ha; 19 m high; Grassy rock.*
Grass covers higher portions of the main island (Figure 82). Rocks off the northwest corner are connected to the main island at low tide. A manned light station was built on the main island in 1905. The original wooden light tower was replaced by a concrete tower in 1957. The station is still manned.

Figure 82. East end of Green Island, showing grassy areas and bleached drift logs tossed up by winter storms. *Photo by R. Wayne Campbell, 3 July 1976.*

Historical summary: Two Common Murre egg specimens (Figure 83) suggest historical breeding by this species on Green Island. The first was collected by Nichols in August 1881 with the locality given as "Port Simpson." [275a] The second egg was collected by J.C. Rice on 1 June 1889 with the locality given as "Port Simpson, 5 mi from Alaskan Coast." [274a] Green Island is the most likely seabird colony site fitting those descriptions. Rice described the incubation stage of the egg as "fresh." Those two egg specimens constitute the only confirmed breeding by Common Murre on the northern mainland coast and suggest that murres may have nested on Green Island before the lighthouse was built. Two Pigeon Guillemot egg specimens collected at the beginning of July 1916 "near Port Simpson" [270b, 281b] may also have been taken on Green Island.

Alexander Dingwell, who served as head lightkeeper from 1910 to 1918, collected a Black Oystercatcher egg (on 17 June) and two Pigeon Guillemot eggs (one on 20 June and one on 26 June) in 1918 (Table MC-040). Oystercatchers and guillemots were regularly observed nesting in subsequent years. Dingwell also collected a clutch of eggs on 19 June 1918 that he identified as Western Gull.[282c] This record has not been accepted as confirmation of breeding by that species in BC and may have involved hybrid Western-Glaucous-winged Gulls. However, if valid, this record would be the only confirmation of breeding by that species in the province. No evidence of breeding by Western Gulls has been recorded since. Other lightkeepers, John Moran, Mrs. Velma Bigelow, and F. Gordon Hart (Figures 84 and 85), kept records of birds nesting in 1920, 1957, and August 1977 to March 1979, respectively.

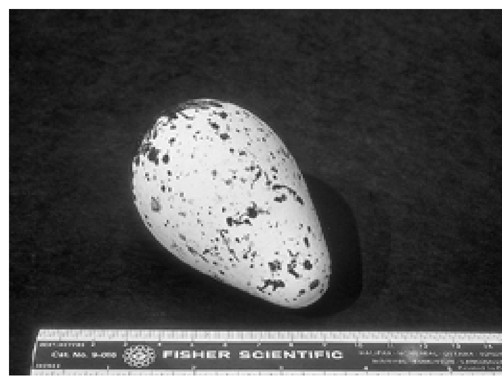


Figure 83. Common Murre lays a single large pyriform-shaped egg that measures, on average, 81 x 50 mm.[309] The egg was prized by egg collectors because of its varied shell pattern. *Photo by R. Wayne Campbell.*


Figure 84. Communications and field notes of observant lightkeepers have been invaluable sources of information on nesting seabirds in the province. For example, during his 20-month stint as lightkeeper on Green Island in 1977 to 1979, Gordon Hart provided details on the breeding chronology of Black Oystercatchers (left photo) on the island. His notes showed that: nesting pairs first appeared on 2 April; copulating birds were seen between 14 and 20 May; clutches of three eggs were found on 26 May; young were first observed in nests on 13 June; and oystercatcher families were last seen together on 6 August, in total indicating a nesting season of 96 days. Hart also observed relaying by one oystercatcher pair whose two eggs were collected by First Nations gatherers on 3 June 1978: a replacement clutch was laid in the same nest 15 days later. A typical oystercatcher nest on Green Island is this one (right photo) found by the BCPM crew on 3 July 1976. The nest, composed of barnacle fragments, held two eggs in an advanced stage of incubation. *Photos by R. Wayne Campbell.*

Figure 85. Green Island lightkeeper Gordon Hart provided records of many species, in addition to seabirds, for *The Birds of BC* project. Many of his sightings were the northernmost for coastal BC. His observations of feeding Black Turnstones (*Arenaria melanocephala*) revealed that they compete with Black Oystercatchers for intertidal invertebrates like limpets, chitons, and mussels. *Photo by R. Wayne Campbell.*

Edward Hodgson of Victoria, BC reported to Patch [159] that Glaucous-winged Gulls were nesting on "Jacac" Island, described as northeast of Graham Island and near Dundas Island. We have been unable to find any other reference to "Jacac" Island, but Green Island is perhaps the most likely candidate for the gull colony to which Hodgson was referring. Other possible locations of gull colonies close to Dundas Island include Grey Island, "Prince Leboo" Rocks, and Connel Islands.

Numbers of Glaucous-winged Gull nests increased between the late 1970s and 1988. In 1976, of 59 gull nests counted on the western (50 nests) and eastern (9 nests) of the northwest rocks, 37 held eggs and 22 were empty. Observers estimated an additional 25 nests on the main part of the island with the lighthouse. In 1978, Hart tallied 50-60 nests on the western and 26 nests on the eastern of the northwest rocks, and 38 nests on the main island. In 1988, there were 130 gull nests on the northwest rocks and 118 nests on the main island.

Table MC-040. Seabird nesting records for Green Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
20, 26 Jun 1918	x		x	274b, 279a, 283a
1920		x		147
1957		60-80e		77
1958		x		77
May-Jul 1966	2[2]	x	x	265
3 Jul 1976	1	84e	x3	265
Aug-Sep 1977	3[3]	100's	x	101, 265
Apr-Aug 1978	3[3]	120e	20+e(90)	265
17 Jun 1988	2[2]	248[223]	S(35)	182

Remarks: Fred Dingwell, young son of head lightkeeper Alexander Dingwell, often searched for gull eggs to supplement the family's food supplies during the years they were on the island.[143] First Nations groups also frequently harvested eggs: Hart observed native people harvesting gull eggs on five different days between 3 and 17 June 1978.[265] Only 13 of 37 nests with eggs found on the northwest rocks in 1976 contained full clutches, which, along with the number of empty nests found, suggests that egg harvesting may also have occurred in 1976. However, observers in 1976 noted that a dog was taking gull eggs on the main section of the island. They also found 13 broken eggs on the northwest rocks. In 1988, five depredated and one buried gull egg were found, but most gull nests contained eggs, and the majority of those held full clutches, suggesting that egg harvesting was not occurring that year. Perhaps depredations by lighthouse pets and egg harvesting depressed gull populations in the 1970s, and the larger numbers counted in 1988 reflect some relief from those impacts.

A few gull nests were washed out by high tides in 1978. Hart noted that a pair of ravens were the main predators and daily stole gull eggs and chicks and likely were responsible for the disappearance of a half-grown oystercatcher chick later in the season.[101] He also witnessed another half-grown oystercatcher chick being "stolen" by a Peregrine Falcon,[265] a type of predation on oystercatchers that has not been reported elsewhere.[310]

MC-050 "PRINCE LEBOO" ROCKS

Location: *54°28'15"N 130°59'35"W* (west rock)*; 103 J/7.*
North of Prince Leboo Island off the southwest tip of Dundas Island.

Description: *10 m high; Bare rock.*
These rocks are part of what is collectively known as the Dundas Islands. The area was designated as part of the Lax Kwaxl/Dundas and Melville Islands Conservancy in 2008.

Historical summary: In 1976, Harry Carter and Keith Taylor from the BCPM explored all the islets surrounding Prince Leboo Island. They found Glaucous-winged Gulls nesting on two rocks located 1.1 km (western rock; 49 nests) and 1.2 km (eastern rock; 10 nests) north of the north tip of the island (Table MC-050). The area has not been surveyed since.

Table MC-050. Seabird nesting records for "Prince Leboo" Rocks. See Appendix 2 for codes.

DATE	GWGU	SOURCE
3 Jul 1976	59[59]	265

MC-060 CHEARNLEY ISLET

Location: *54°26'29"N 130°59'10"W; 103 J/7.*
South of Prince Leboo Island at the southwest tip of Dundas Island.

Description: *14 m high; Bare rock.*
This islet is part of the Dundas Islands and was included within the Lax Kwaxl/Dundas and Melville Islands Conservancy designated in 2008.

Historical summary: The single Black Oystercatcher nest found in 1976 contained one chick (Table MC-060). Six Pigeon Guillemots were present, but no evidence of nesting was reported. The islet was not surveyed by CWS crews in the 1980s.

Table MC-060. Seabird nesting records for Chearnley Islet. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
3 Jul 1976	1	(6)	265

MC-070 "BARON" CLIFFS

Location: *54°27'04"N 130°51'41"W and 54°26'21"N 130°53'55"W; 103 J/7.*

On the north ends of two, densely-forested islets with elevations of 62 m and 70 m off the southwest end of Baron Island (Figure 86).

Description: *30 m high; Cliffs.*
The cliffs are overhung with thick salal (*Gaultheria shallon*) and some grass. Baron Island and all the surrounding islands are officially part of the Dundas Islands and are included within the Lax Kwaxl/Dundas and Melville Islands Conservancy established in 2008.

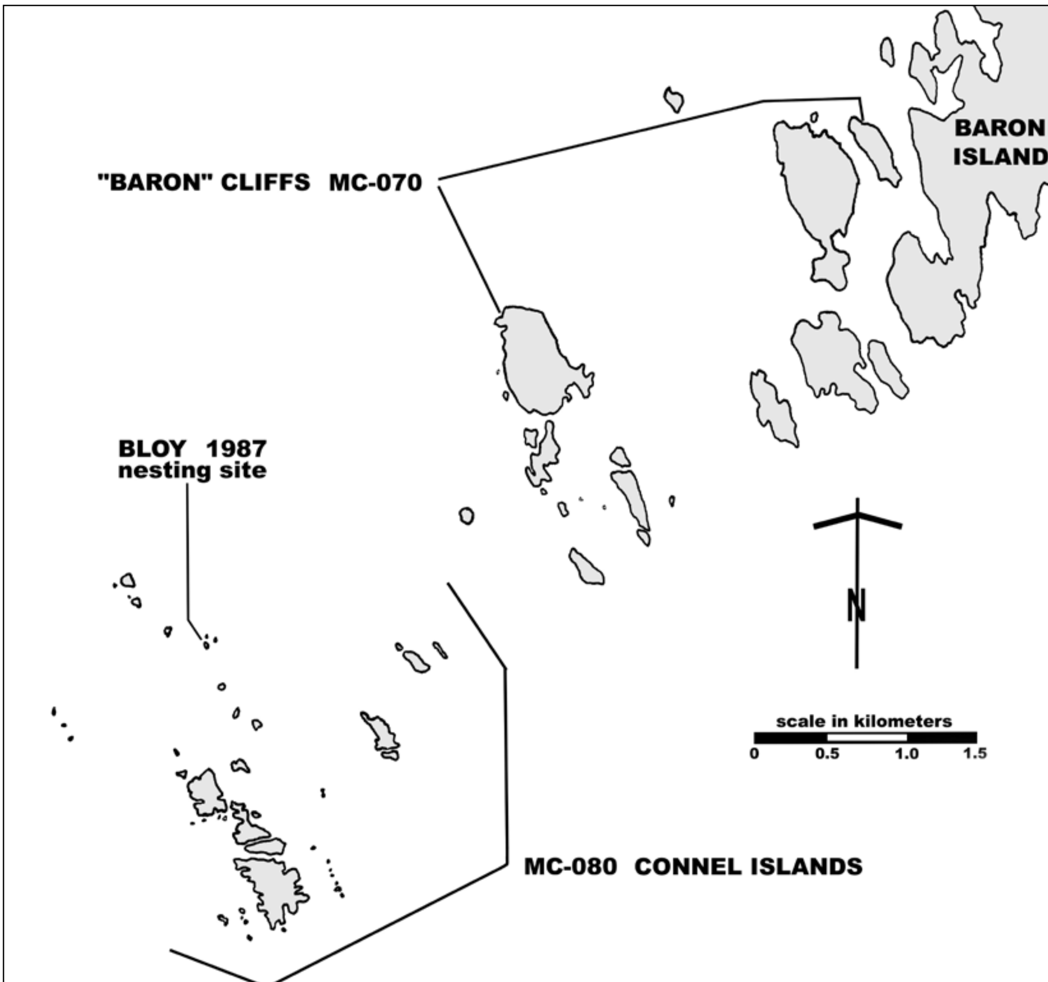


Figure 86. Locations of seabird nesting sites on "Baron" Cliffs and in the Connel Islands.

Historical summary: The only survey data for these cliffs are from 1987 (Table MC-070; Figure 87). Pigeon Guillemots were found nesting in crevices on the cliffs on both islets and in burrows under overhanging grass tussocks at the top of the cliffs on the eastern of the two islets. Fifteen and 40 birds were present around the eastern and western islets, respectively. Seven Pelagic Cormorants, three in breeding plumage, and one pair of Glaucous-winged Gulls were roosting on the west side of the cliffs on the western islet, but no evidence of nesting was observed.

Figure 87. Small inflatable boats were indispensable for exploring remote islands and transporting us between our basecamps. Here, on a calm sunny day during the 1987 CWS seabird surveys, from left to right, Dick Grinnell, Rosalind Chaundy, Michael Rodway, and Brian Carter cruise along in our trusty 16 foot Canova on the way to "Baron" Cliffs. *Photo by Moira J.F. Lemon, 18 May 1987.*

Table MC-070. Seabird nesting records for "Baron" Cliffs. See Appendix 2 for codes.

DATE	PIGU	SOURCE
15 May 1987	x(55)	182

MC-080 CONNEL ISLANDS

Location: *54°24'18"N 130°55'15"W; 103 J/7.*
South of Dundas Island and southwest of Baron Island, at the west entrance to Hudson Bay Passage (Figure 86).

Description: *28 ha; 49 m high; Forested; Bare rock.* These granitic islands include higher forested islands and lower grassy and bare rocks. There are rock bluffs and cliffs on larger islands, and a sand dune between two central islands (Figure 88). Much of the vegetated area is covered with thick salal and other shrubs under a spruce forest, but open areas of grass, forbs, moss, or bare litter are frequent. The islands are part of the Lax Kwaxl/Dundas and Melville Islands Conservancy designated in 2008.

Figure 88. The sparsely vegetated sand dune in the foreground contrasts with the granitic shoreline bluffs in this view of the Connel Islands. *Photo by Moira J.F. Lemon, 18 May 1987.*

Historical summary: Black Oystercatcher and Glaucous-winged Gull nests were found on the same island in 1976 (which island is not known; Table MC-080). In 1987, an oystercatcher nest was found on a small rock at the north end of the islands (see Figure 86). One Pigeon Guillemot nest containing one egg was located in a rock tunnel in 1976. Guillemots were seen in the northeast bay of the large, south island in 1987.

Suspected Rhinoceros Auklet burrows were found among tree roots in 1976. No evidence of nesting by this species was found in 1987. However, many similar-sized mink burrows were seen on forested islands.

Table MC-080. Seabird nesting records for Connel Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	RHAU	SOURCE
3 Jul 1976	1	1	<10e	<25S	265
18 May 1987	1	0	S(12)	0	182

Remarks: A mink was seen on one of the islands in 1976 and signs of mink were abundant in 1987. In 1987, we found many mink burrows containing crab shells, often with scats composed of crab shell at their entrances. Old chewings by American Beaver (*Castor canadensis*) were encountered on larger islands (Figure 89). Many river otter runs, dens, and scats of fish were recorded in 1987. We located three Bald Eagle nests in 1976, one with two young. Five eagle nests, at least four of which appeared active, and a Common Raven nest were found in 1987.

Figure 89. On one of the larger Connel Islands, interior forest with a ground cover of false lily-of-the-valley (*Maianthemum dilatatum)* provides characteristic habitat for burrow-nesting seabirds. However, the presence of mink on the islands deters nesting seabirds. American Beavers also occur on these islands and created the trails visible in this photo. *Photo by Moira J.F. Lemon, 18 May 1987.*

MC-090 "SIMPSON" ROCKS

Location: *54°21'00"N 130°47'01"W; 103 J/7.*
Just north of Simpson Rock off the southwest corner of Melville Island.

Description: *6 m high; Bare rock.*
These rocks are part of the Dundas Islands (Figure 90) and were included in the Lax Kwaxl/Dundas and Melville Islands Conservancy established in 2008.

Figure 90. We have given these small, bare rocks the name "Simpson" Rocks, although officially they are part of the large Dundas Islands group. *Photo by R. Wayne Campbell, 3 July 1976.*

Historical summary: A Black Oystercatcher nest with one egg was found in 1976 (Table MC-090). A pair of oystercatchers was suspected nesting, but no nest was found in 1988. More Glaucous-winged Gull nests were counted in 1988 than 1976, and almost all nests contained eggs in 1988. Pigeon Guillemots have not been confirmed nesting, but similar numbers were counted around the rocks in both survey years.

Table MC-090. Seabird nesting records for "Simpson" Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
3 Jul 1976	1	155[138]	S(31)	265
20 Jun 1988	1eS	178[173]	S(25)	182

Remarks: Seventeen broken gull eggs were found in 1976.

MC-100 LUCY ISLANDS

Location: *54°17'40"N 130°36'50"W; 103 J/7.* West of Prince Rupert in central Chatham Sound.

Description: *24.0 ha; 59 m high; Forested; Bare rock.* Most islands of this group are connected by small sandy beaches and tidal mud flats; there are a few isolated islets offshore (Figure 91). The topography is generally low and undulating, with some steep slopes on perimeter areas above rocky shores. Islands #1-6 are at least partially forested, primarily with spruce, mixed with hemlock in the interior of larger islands (Figure 92). Pockets of red alder (*Alnus rubra*) occur on some islets. Nesting Rhinoceros Auklets keep much of the ground bare, but interior areas are mossy with scattered shrubs (Figure 93). Grass and forbs grow along perimeter fringes. Several of the smaller, outer islands are bare rock. Island #8 has a large patch of grass.

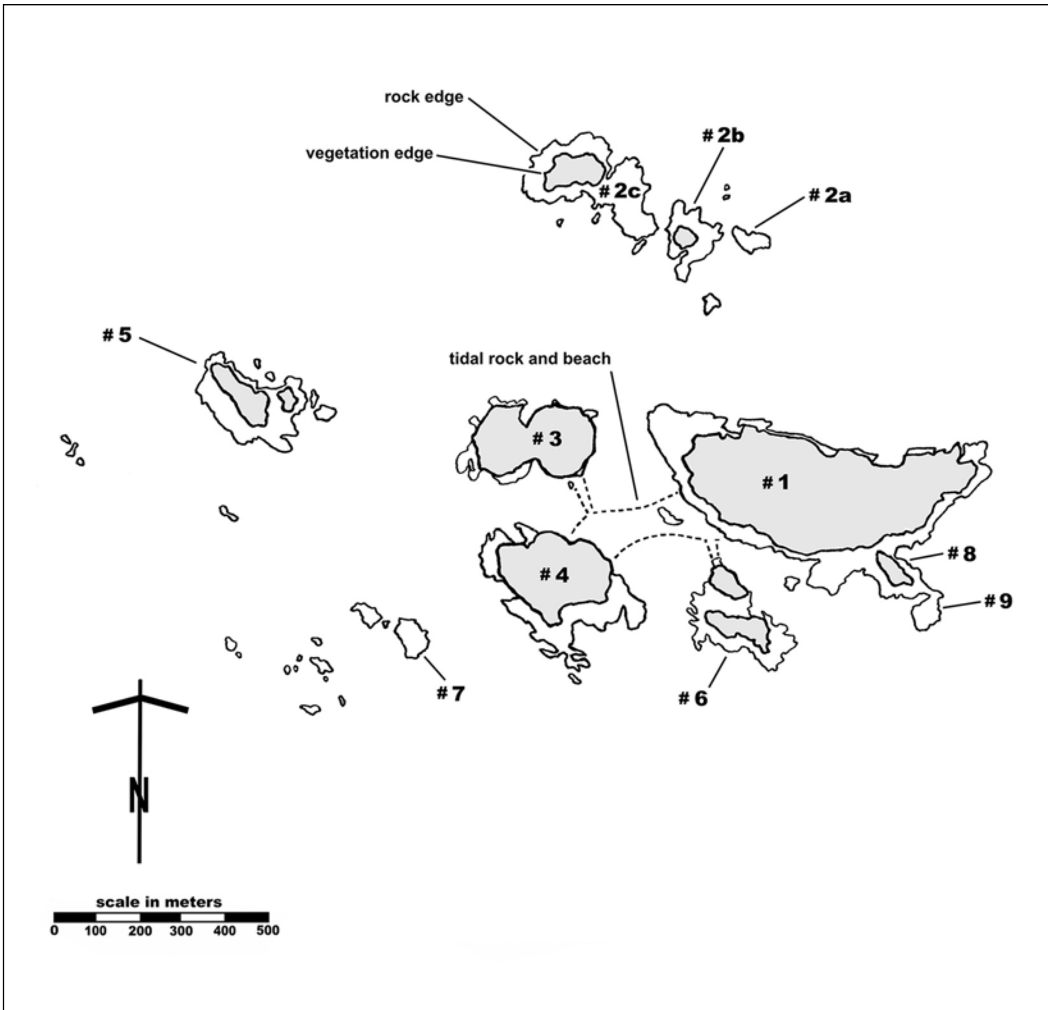


Figure 91. Numbered islands in the Lucy Islands referred to in the text.

Figure 92. View from the sandy beach of islet #1 of the Lucy Islands group showing forested islets #3 (right) and #4. *Photo by Moira J.F. Lemon, 16 July 2011.*

Figure 93. Perimeter areas of bare ground with patches of moss and scattered shrubs are riddled with Rhinoceros Auklet burrows on Lucy Island. *Photo by Michael S. Rodway, 12 May 1977.*

A manned lighthouse was built on the east point of the main island in 1906. It was dismantled in 1988. BC Parks established the Lucy Islands Conservancy in 2008.

Historical summary: Seabirds have been found nesting on virtually all forested and rocky islands in the group since Reverend J.H. Keen first documented nesting by Rhinoceros Auklets in 1907 and Black Oystercatchers in 1912 (Table MC-100). Drent [75] discussed the previous confusion regarding the location of those records by Reverend Keen. There is no evidence of change in numbers for any nesting species.

Munro and Cowan [151] mentioned Glaucous-winged Gulls on Lucy Islands and nesting was presumed at that time.[77] Numbers of gull nests on each island were tallied separately in 1976, 1983, and 1984. Nine different areas have been used for nesting by gulls over those years. Most nests were found on the rocky portions of island #2a, 2b, and 2c in 1976 (36 nests), 1983 (55 nests), and 1984 (29 nests). The use of other islands has varied: west side of island #3 (5 nests in 1976); east side of island #4 (1 nest in 1976); east side of island #5 (10 nests in 1976; 7 nests in 1983); island #7 (16 nests in 1984); west side of island #8 (5 nests in 1976); and island #9 (7 nests in 1983; 3 nests in 1984). In 1977, gull nests were counted only on the small grassy rock (island #8) connected to the main island.

One Black Oystercatcher nest with two eggs was found in 1976, but pairs were sighted and suspected nesting on four different rocks (east side of #2c, west side of #3, east side of #4, and west side of #8). Eight birds were seen in 1983 and four pairs and four empty nests were recorded in 1988.

Pigeon Guillemots were found nesting on three of the rocky islands (east side of #2c, west side of #3, and west side of #8) in 1976. In 1977, Ian McGregor and Ed Good found two nests just below the lighthouse on the main island (#1) and two nests on island #8. All nests were in crevices. Guillemots were sighted around a number of the islands in 1983 and were also present around the northern (#2) and western islands (#5 and 7) in 1984. Only partial counts of Pigeon Guillemots were made in 1984 and 1988, making the 1983 count most current.

Rhinoceros Auklets were found burrowing around the perimeter of all southern vegetated islands (#1, 3-6, and 8) during the thorough explorations in 1976 and 1983 (Figure 94). In 1976, 50 burrows were also estimated around the edges of island #2b, where none were reported in 1983 (Figure 95).

Figure 94. False lily-of-the-valley carpets the forest floor within the Rhinoceros Auklet colony on Lucy Islands. Here, measuring tapes mark the edges of one of the CWS burrow monitoring plots that are surveyed every five years. *Photo by Moira J.F. Lemon, 16 July 2006.*

Figure 95. Rhinoceros Auklet burrows can be a challenge to locate and examine in dense coniferous forests. Some burrow entrances may be partially obstructed by vegetation (left); many burrows wind around tree roots and are often impossible to explore to their ends to determine whether a nesting bird is present. *Photos by R. Wayne Campbell, 7 June 1970.*

Table MC-100. Seabird nesting records for Lucy Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	RHAU	SOURCE
Jun 1907				x	75
12 Jun 1912	x				269a
1959				x	77
2 Jul 1976	4e	57[28]	x2(4)	26,000e	265
9 Jul 1977	S	9+	x4(100-200)	1,000s	265
20-27 Jul 1983	S	69[38]	x(197)	25,300t	182, 265, 277f
16, 18 Jul 1984		52[52]	S(54+)		182
8 Jul 1987			(70)		266
18 Jun 1988	4S	59[25]	x		182

Remarks: Lucy Islands are the only major colony of burrow-nesting seabirds in the northern half of the mainland coast region. They remain free of all mammalian predators except river otters. Eagles were not nesting on the island but as many as 30 adult and immature eagles were seen flying to the island at dusk and gathering in the Rhinoceros Auklet colony in 1988.[131] More than 20 Rhinoceros Auklet feather piles and three eagle pellets containing Rhinoceros Auklet remains were found. Eagles and crows (Figure 96) were seen raiding the gull colony in 1988. Before the light station was dismantled, numerous birds died each season flying into it.

Figure 96. Human settlements along the BC outer coast, including large communities such as Prince Rupert, Tofino, and Ucluelet, and smaller settlements like lighthouses, attract Northwestern Crows, which frequently forage in nearby seabird colonies where they prey on eggs and small young of Glaucous-winged Gulls and other surface-nesting species. *Photo by R. Wayne Campbell.*

The Lucy Islands colony has been part of comparative three-island studies by Vermeer [230, 233] and Bertram.[8, 9, 13] Vermeer investigated characteristics of prey fishes in nestling diets in 1979 and 1980, and Bertram studied growth and provisioning of Rhinoceros Auklet chicks from 1983 to 1987 (Figure 97).

Figure 97. CWS has continued with studies begun in 1979 of nestling diet on three of the major Rhinoceros Auklet colonies in BC. Here, in the comfort of the sandy beach campsite on Lucy Islands, Glen Keddie, Valerie LaBreque, and Courtney Albert measure fish from Rhinoceros Auklet food samples collected in 2006. *Photo by Moira J.F. Lemon, 16 July 2006.*

MC-105 PRINCE RUPERT

Location: *54°17'51"N 130°21'14"W* (ferry dock)*; 103 J/7.*
At present, nesting has been recorded only at the ferry dock located south of Pillsbury Point, southwest of the city centre. However, for future consideration, we would include the entire City of Prince Rupert in this colony (Figure 98).

Description: *Wharf.*

Historical summary: Pigeon Guillemots were seen flying to nesting ledges under the wharf in 1976 (Table MC-105).

Figure 98. Participants in the BCPM surveys in the mid-1970s had the luxury of working from a mothership, the MV *Tedmac*. However, after weeks without a shower or fresh food, Prince Rupert was a welcome port where the crew could clean up, dry out, and re-provision. In these images, skipper and owner of the *Tedmac*, Dr. Harold Carter Sr., otherwise known as “Doc” Carter, is on the boat amongst drying sleeping bags (left) and one of the crew, Marilyn Paul (now Lambert), is shoveling ice into the hold used for storage of fresh food supplies. *Photos by R. Wayne Campbell.*

Table MC-105. Seabird nesting records (nests) for Prince Rupert.

DATE	PIGU	SOURCE
5 Jul 1976	3+	33

MC-110 TREE NOB GROUP

Location: *54°17'14"N 130°52'52"W* (rocks south of Triple Islands)*; 54°16'16"N 130°52'39"W* (rocks southwest of Osborne Islands)*; 103 J/7.*
Northwest of Stephens Island; south side of Brown Passage. The Tree Nob Group includes Triple Islands, Osborne Islands, Rushton Island and all surrounding islets (Figure 99).

Description: *51 m high; Forested; Grassy rock.*
Forests of spruce, hemlock, and redcedar cover most islands. Dense salal and other shrubs form much of the understory. Open patches of grass and forbs occur around forest perimeters and extensive areas of bare litter occur in the interior of Rushton Island. Trees and shrubs are windswept on exposed slopes. Small outer islets are bare or grassy rocks (Figure 100).

A manned lighthouse is perched on the northern of the Triple Islands and there is a navigational beacon on the east point of the Osborne Islands. The Tree Nob Group is included in the Ksgaxl/Stephens Island Conservancy designated by BC Parks in 2008.

Historical summary: Except for a Black Oystercatcher nest on Triple Islands in 1950 (Table MC-110), nesting by seabirds has been observed only on small outer rocks at the north end of the group, west and south of Osborne Islands (Figure 99). In 1950, one oystercatcher chick hatched from the nest on Triple Islands on 26 July and was banded by Odlum on 6 August.[156] In 1976, two oystercatcher nests with eggs were found on separate rocks, likely two of the same rocks described below where Glaucous-winged Gulls were nesting in 1976. No evidence of nesting by oystercatchers was seen in 1987 and 1988, although two oystercatchers were seen flying southwest of Osborne Islands in 1987.

Odlum reported Pelagic Cormorants and Glaucous-winged Gulls nesting on a rocky islet south of Triple Islands on 1 July 1950. This islet is a cluster of three tidally-connected rocks lying 0.8 km due south of Triple Islands. Cormorants and gulls were found nesting on these rocks again in 1976 and 1988. In 1976, cormorants were nesting on the northern (10 nests) and middle (20 nests) rocks of that cluster. Gulls were also nesting on those same two rocks: 20 nests on the northern rock and 12 nests on the middle rock (all nests with eggs). In 1988, four cormorant nests with eggs and an estimated 34 gull nests were found on these rocks. The cormorant nests and 24 gull nests (23 with eggs) were located on the middle rock. We were unable to land on the northern and southeast

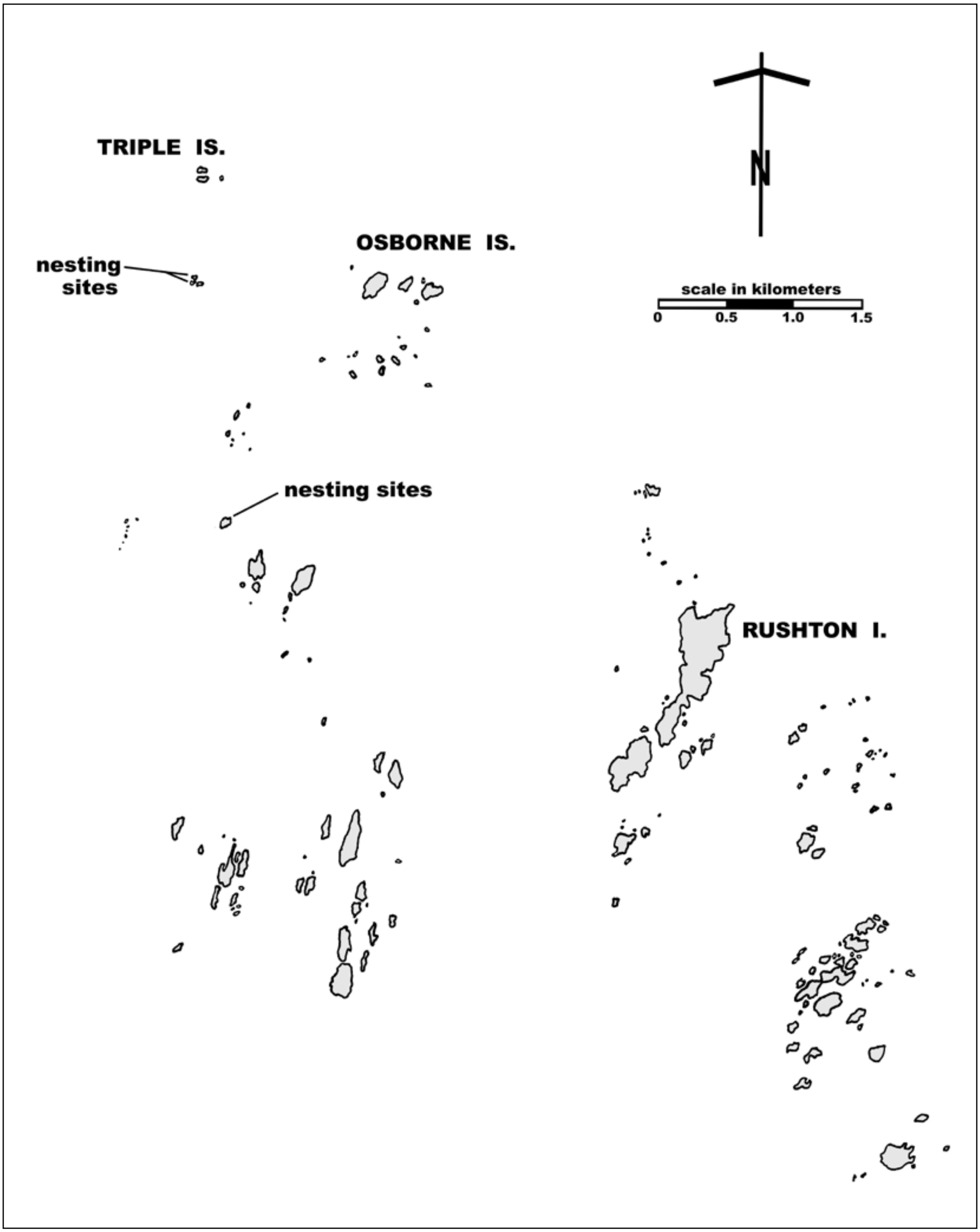


Figure 99. Overview of and location of seabird nesting sites in the Tree Nob Group.

Figure 100. Some of the islets in the Tree Nob Group with their steep granitic shores and windswept crowns of shrubs and trees. *Photos by R. Wayne Campbell, 30 June 1976 (left) and Moira J.F. Lemon, 20 May 1987.*

rocks of this cluster; we estimated 10 pairs of gulls nesting on those rocks.

Glaucous-winged Gulls were also nesting on a 7 m-high rock, 2.0 km southwest of Osborne Islands in 1976, and both Pelagic Cormorants and gulls were nesting there in 1988. We counted 34 gull nests (27 with eggs) on that rock in 1976. In 1988, 18 cormorant nests (7 with eggs) and 26 gull nests (17 with eggs) were found. We saw 54 adult gulls on this rock in 1987 but no nests had yet been built at the time of our visit.

In 1976, two Pigeon Guillemot nests with eggs were found and four adults were seen on the rocks south of Triple Islands, and 11 Pigeon Guillemots were recorded around Osborne Islands. No guillemots were seen in 1987 or 1988.

Table MC-110. Seabird nesting records for Tree Nob Group. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
Jul 1950	12e	1	25e		77, 156
30 Jun 1976	30[16]	2[2]	66	x2(15)	265
19-22 May 1987		0	S	(0)	182
20 Jun 1988	22[11]	0	60e	(0)	182

Remarks: Five broken gull eggs were found in 1976. In 1987, mink, and burrows occupied by mink (Figure 101), were encountered on many islands. There were four active Bald Eagle nests (Figure 102) and a Common Raven nest. One Peregrine Falcon was seen flying over the southeast islands. Some river otter trails were seen on one of the southwest islands but there was little sign of recent activity by river otters.

Figure 101. American Mink burrows can sometimes be hard to distinguish from seabird burrows as they are similar in size to burrows of Cassin's or Rhinoceros auklets and are often active throughout the seabird breeding season. Mink burrows are circular, about 10 cm (4 in) in diameter and may extend at least 3 m (10 ft) to a depth of 60 cm (2 ft). Often a musky smell can be detected at the clean burrow entrance. *Photo by R. Wayne Campbell.*

Figure 102. Bald Eagle nests can be easily spotted when approaching an island. The large nest in this photo (left of centre) is saddled on a limb of a large Sitka spruce. *Photo by R. Wayne Campbell, Tree Nob Group, BC, 30 June 1976.*

West Coast Luxury

After days and days of clambering around islands through bushes and slippery rocks, crawling on the ground to stick your arm in dirty burrows, getting attacked and bombed by angry gulls, suffering rain, wind, and salt spray in your face, trying to dry your boots in the evening around the fire so they are not soggy when you put them on again the next morning, and eating less than gourmet camp food night after night, one begins to dream about some of the luxuries back home. Talk of fresh apple pies and chocolate cake becomes more frequent and the idea of soaking in a lovely hot bath is fondled like a remote fantasy. Thus it was, after being out for almost two weeks without a break at the beginning of the 1987 field season, that when I (Michael) promised the three ladies on our crew, Rosalind Chaundy, Moira Lemon, and Christine Rodway, a hot bath when we got to our next camp, they assumed I was teasing and tormenting them. I wasn't.

Our destination was the beautiful sandy bay on the west coast of Porcher Island – Oval Bay. After a full day of exploring islands we pulled the inflatable boats ashore near a creek at Oval Point around 18:30 hr. As soon as the gear was ashore and the campsite established, me and my stalwart "musketeer" helpers, Dick Grinnell and Brian Carter, began the process to make good on my promise. Not too far from the little creek, we began digging a large, bathtub-sized hole in the sand. When it was deep enough, we lined the hole with a plastic tarp and then placed a layer of sand on the tarp. The sand layer served to keep the tarp in place and to protect the tarp from the red-hot rocks we were about to throw in. We then erected another tarp around the hole to make it private. With buckets, we filled the lined hole with water from the creek. Driftwood from the beach made a blazing fire nearby. We collected rocks which we heated in the fire and then, using pieces of driftwood like tongs, carefully carried the red-hot rocks and threw them in the tub until the water was steaming!

The ladies went first. If the water cooled down, we threw in more hot rocks. We guys, of course, enjoyed it just as much. Eventually, we all got our turn at a little west coast luxury and went to bed feeling guiltily clean and relaxed. If only there had been a fresh-baked apple pie to finish off the fantasy...

MC-120 ROLAND ROCKS

Location: *54°10'10"N 130°50'33"W; 103 J/2.*
West of Stephens Island, south of Archibald Islands.

Description: *9 m high; Bare rock.*
This group of rocks (Figure 103) is part of the Ksgaxl/ Stephens Island Conservancy established in 2008.

Historical summary: Glaucous-winged Gulls were nesting on five rocks in 1976: three 5 m-high (16′, 16′ and 15′ high) south rocks, from east to west with 18, 12, and 10 nests, respectively; the middle, 9 m-high (30′) rock with 16 nests; and the northern 6 m-high (20′) rock with 31 nests (Table MC-120). Counts from 1988 were not separated for each rock, but total numbers were almost identical.

A Pigeon Guillemot nest with one egg was found and two adults were present on the middle rock in 1976. Two other adults were seen on the southeast rock. None were recorded in 1988. Two Black Oystercatchers were sighted in 1976 but no evidence of nesting was reported.

Table MC-120. Seabird nesting records for Roland Rocks. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
30 Jun 1976	87[78]	x(4)	265
20 Jun 1988	88[80]	(0)	182

Remarks: Eight broken gull eggs were found in 1976.

Figure 103. Roland Rocks is a series of bare rocky islets that vary in height and size. They are used by two species of nesting seabirds. *Photos by R. Wayne Campbell, 30 June 1976.*

MC-130 RACHAEL ISLANDS

Location: *54°12'00"N 130°33'15"W; 103 J/2.* Southern Chatham Sound, northeast of Stephens Island.

Description: *48.4 ha; 67 m high; Forested.* Rachael Islands are comprised of two main forested islands (Figure 104), plus a few small, tidally connected islets and rocks. Except for a beach at the northwest corner of the south island, the shorelines are rocky, with many small knolls and valleys. Forests are a mix of hemlock, spruce and redcedar. False lily-of-the-valley, grass and moss are common on perimeter knolls and slopes, and bare litter occurs under dense stands of young hemlock and spruce. Salmonberry, huckleberry (*Vaccinium* sp.), and false azalea (*Menziesia ferruginea*) grow on low ground, and are dense in some areas.

In 1987, we noted that a number of large trees had been cut in the past in a bay on the north side of the south island. There are navigational beacons on the north and south ends of the islands.

Figure 104. The forested parts of Rachael Islands provide abundant nesting habitat for Rhinoceros Auklets and supported a large colony of that species in the 1920s. Numbers have declined since, likely due to predation by American Mink. Three other seabird species also nest on the islands. *Photo by R. Wayne Campbell, 2 July 1976.*

Historical summary: C. de B. Green in 1921 reported a large colony of Rhinoceros Auklets on an island 10 miles from Refuge Bay on Porcher Island.[20] We assume he was referring to Rachael Islands as they are almost precisely 10 miles from Refuge Bay. Lucy Islands, the only other known colony in the vicinity, is 15 miles away. Numbers of Rhinoceros Auklets nesting appear to have decreased since Green visited the area in 1921 (Table MC-130). Observers in 1976 estimated 2,000 and 1,500 burrows on the main north and south islands, respectively. Burrows were located mainly on headlands. Of 865 burrows counted in 1987 (247 on the north island, 601 on the south island, and 17 on the middle islets), 560 were unused, with cobwebs and vegetation obscuring their entrances. A higher proportion of burrows were unused on the southern than northern island.

Small numbers of Rhinoceros Auklets were observed staging 0.8 to 1.5 km off the north and west sides of the north island in 1987. A total of 72 birds were counted in those areas on 27 May.

Black Oystercatchers were found nesting on one of the small islets in 1976 (Figure 105). Five nests were found in 1987, located at the southeast and southwest corners of the large south island and on the small islets between the two large islands.

Figure 105. A Black Oystercatcher nest with a full complement of eggs was found on one of the small islets of the Rachael Islands in 1976. Eggs were laid on bare rock with only a few chiton plates for a nest. *Photo by R. Wayne Campbell, 2 July 1976.*

Glaucous-winged Gulls were reported nesting on what observers called "small Rachael island" in 1976 and were nesting on the small rocky islets located between the two large islands in 1987 and 1988. We are unsure whether the "small Rachael island" referred to in 1976 was the north island or one of the smaller islets just north of the main south island. Pigeon Guillemots were noted nesting in 1976 in burrows on the "small Rachael island" and were suspected nesting along the south side of the north island in 1987.

Table MC-130. Seabird nesting records for Rachael Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	RHAU	SOURCE
Jun-Jul 1921				x	20
2 Jul 1976	1	16[10]	x(42)	3,500e	265
26-28 May 1987	5[4]	10S	S(42)	300S	182
20 Jun 1988	3[3]	25[14]	S(8)		182

Remarks: The presence of mink may be related to the decline in numbers of nesting Rhinoceros Auklets. Observers in 1976 reported signs of mink on the islands but made no mention of predation on nesting birds. In 1987, bones and feather piles of Rhinoceros Auklets were frequently encountered, especially on the north island. Many bones were found where there were also concentrations of northern abalone (*Haliotis kamtschatkana*) and limpet (*Lottia* spp.) shells. Numerous scats found along perimeter trails were composed of crab shell. We suspected that mink were responsible for the widespread predation. In addition, some seabird skulls were found around a raven nest on the north island.

Signs of river otter were also seen in 1976 and 1987. All river otter scats seen in 1987 were composed of fish.

MC-140 GREENTOP ISLET

Location: *54°10'38"N 130°24'40"W; 103 J/1.*
North of Porcher Island, south of Kinahan Islands.

Description: *1.0 ha; 11 m high; Grassy rock.*
Grass and forbs occur on higher portions at the western end of the islet; elsewhere is bare rock. There is a navigational beacon on the highest point.

Historical summary: Richard Cannings confirmed nesting by Glaucous-winged Gulls and suspected nesting by Black Oystercatchers and Pigeon Guillemots in 1979 (Table MC-140). Two pairs of oystercatchers were agitated but no nests were found. Hidden young were likely present. The islet was not surveyed by CWS in the 1980s.

Table MC-140. Seabird nesting records for Greentop Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
4 Jul 1979	2eS	6[6]	S(12)	265

MC-150 HOLLAND ROCK

Location: *54°10'14"N 130°20'59"W; 103 J/1.*
Northwest of Smith Island in southeastern Chatham Sound.

Description: *0.1 ha; 6 m high; Bare rock.*
There are cliffs on the northwest side of this small rock. A manned lighthouse was built on the rock and went into operation in 1913. A fire destroyed the lighthouse in 1946 leaving a pile of rubble and the concrete pier. An automated beacon was installed on the old pier in 2010.

Historical summary: Prior to 1990, the only recorded survey of the islet was by Richard Cannings in 1979 (Table MC-150). A Pigeon Guillemot nest was found in a rock crevice on the north end rocks, and some guillemots were suspected nesting amongst the ruins of the old lighthouse on the south end. The Black Oystercatcher and Glaucous-winged Gull nests were located on the north end rocks.

Since 1990, Holland Rock became the first confirmed breeding site for Black-legged Kittiwakes in BC (see Appendix 1).

Table MC-150. Seabird nesting records for Holland Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
4 Jul 1979	1	8[8]	x(10)	265

Remarks: Ruins of the lighthouse litter the south end of the rock.

MC-152 KITSON ISLAND

Location: *54°10'32"N 130°18'59"W; 103 J/1.* Southeastern Chatham Sound, northwest of Smith Island, west of Lelu Island at the mouth of the Skeena River.

Description: *13.8 ha; 52 m high; Forested.* There is a lovely sandy beach on the southeast side of this forested island. Otherwise the shoreline is rocky. Flora Bank is an extensive estuarine mudflat of the Skeena River that extends offshore to Kitson Island and tidally connects it to Kitson Islet and Lelu Island to the east. The site is part of the Kitson Island Marine Provincial Park established in 1993.

Historical summary: We have no record of BCPM or CWS crews visiting these rocks. In 1978, D.I. Comfort and G.S. Hackman from Terrace, BC recorded one Black Oystercatcher nest with two eggs on top of a rocky point at the south end of the island (Table MC-152). We were not previously aware of this record and this colony site was not included in the summary tables presented in Part 1 of this seabird catalogue.[188]

Table MC-152. Seabird nesting records (nests) for Kitson Island.

DATE	BLOY	SOURCE
28 May 1978	1	265

Remarks: The sandy beach on Kitson Island is an attractive stop and campsite for recreational boaters in the area (Figure 106). A previous proposal for a natural gas liquefaction facility on nearby Lelu Island with a marine terminal near Kitson Island was abandoned in July 2017.

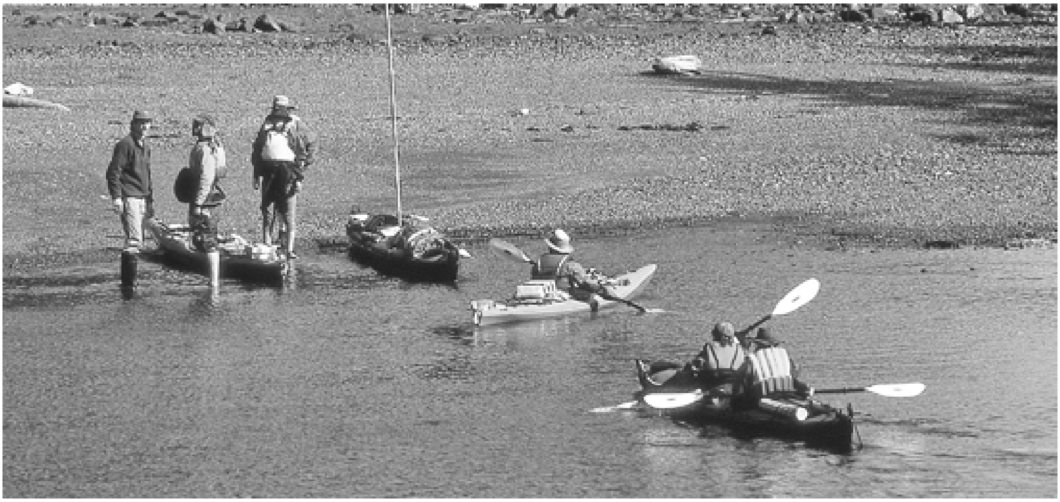


Figure 106. Sea kayaking is a popular pastime for adventure-seeking humans and seabird colonies can be attractive destinations. Unfortunately, and unknowingly by recreational boaters, brief disturbances and especially prolonged visits, including camping overnight, can directly impact nesting seabirds. *Photo by R. Wayne Campbell.*

MC-160 GULL ROCKS

Location: *54°07'56"N 130°31'17"W; 103 J/2.*
South end of Chatham Sound, east of Stephens Island, north of Porcher Island.

Description: *Bare rock.*
There is a navigational beacon on the main rock.

Historical summary: We have no record of BCPM crews visiting these rocks. Glaucous-winged Gulls were just building nests when we surveyed the rocks in 1987 (Figure 107); we found eight nest starts (Table MC-160).

Figure 107. At northern colonies like Gull Rocks, some Glaucous-winged Gulls are still claiming territories and building nests in late May. *Photo by R. Wayne Campbell.*

Table MC-160. Seabird nesting records for Gull Rocks. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
27 May 1987	39eS	S(6)	182

Remarks: Old battery cases were strewn about the main rock in 1987.

MC-170 LAWYER ISLANDS

Location: *54°06'43"N 130°20'30"W; 103 J/1.*
Northeast of Porcher Island between Malacca and Marcus Passages.

Description: *13.6 ha; 43 m high; Forested.*
The three main islands of this small chain are mostly forested. Shorelines are rocky and several rocky knobs are tidally separated from the main shores. In 1987, it was obvious that much of the forest had been cut in the past; stands of young spruce, hemlock, and redcedar covered the cut areas. Ground cover is bare litter under a dense canopy in the interior of forested areas. Along open perimeters, forbs, grass, and moss alternate with patches of salal, salmonberry, and other shrubs.

A manned lightstation built on the northwest corner of the main island went into operation in 1901. A new light tower was built on the highest point of that island in 1909 to improve the visibility of the light beacon. The station was de-staffed in 1988 and the tower was later dismantled to be replaced by flashing beacons at the north and south ends of the islands.

Historical summary: Gordon Hart was stationed at the lighthouse and submitted nest records in 1979 (Figure 108), and CWS crews surveyed the islands in 1987 (Table MC-170). Nesting has been recorded only on the rocky shoreline and small rocky knobs. Exact locations of nests found in 1979 were not reported. One Glaucous-winged Gull nest found that year was located at the end of a 0.5 m-long tunnel in the vegetation. The nest held three eggs on 11 July and two young were beginning to fly on 8 September. Hart also observed a second pair nesting about 500 m away on the other side of the island. No gull nests were found in 1987.

Black Oystercatchers were nesting at three locations in 1987: two nests with eggs on the rock near the helicopter pad at the northwest corner of the largest island; one nest with eggs on a rock along the east side of the largest island; and one empty nest on the small islet north of the 33 m-high island at the south end of the chain.

Figure 108. The entire population of Surfbirds (*Aphriza virgata*) migrates and winters along the Pacific coast from Alaska to Tierra del Fuego. Lightkeeper Gordon Hart recorded migration times and feeding activities for this stocky shorebird while he was stationed on Lawyer Islands in 1979. *Photo by R. Wayne Campbell.*

Table MC-170. Seabird nesting records for Lawyer Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
May-Sep 1979	3[2]	2	265
27 May 1987	4[3]	0	182

Remarks: Observers in 1987 suspected the presence of mink from trails, burrows, and shells encountered. River otter dens, runs, and scats of fish were also recorded (Figure 109). There was one active Bald Eagle nest.

Figure 109. Michael Rodway records the data while Dick Grinnell, looking like a biblical figure with a clay tablet, dictates his notes from a wooden plank which he used as a temporary notebook after a day of fieldwork when he forgot his regular notebook at camp. *Photo by Moira J.F. Lemon, 25 May 1987.*

MC-175 PORCHER ISLAND - NORTH

Location: *54°03'25"N 130°33'10"W; 103 J/2.*
South end of Chatham Sound, south of Stephens and Prescott islands.

Description: *Rocky shoreline; Forested.*

Historical summary: In 1921, Charles de B. Green spent the months of June and July and Alan Brooks spent nine days in September exploring and collecting around the north end of the island from a base in Refuge Bay.[20] Green reported nesting by Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots (Table MC-175). Brooks [20] provided no details about numbers of birds nesting or specific locations where Green found nests other than the "north end" of the island. We assume nests were found along the shore of Porcher Island or on adjacent rocks. These records were overlooked in previous compilations [77, 182] but we see no reason not to accept them as valid breeding records for this area. There was no sign of nesting by seabirds on the outer Creak Islands to the east of Refuge Cove in 1987 (Appendix 3); there are no other survey data since 1921 for the shoreline of Porcher Island.

Table MC-175. Seabird nesting records for Porcher Island - North. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
Jun-Jul 1921	x	x	x	20

Remarks: Brooks noted that mink were common on Porcher Island.[20] We saw mink burrows on the nearby Creak Islands in 1987 (Appendix 3).

MC-180 NORTHWEST ROCKS

Location: *53°32'52"N 130°38'07"W; 103 G/10.*
North of Bonilla Island off the northwestern end of Banks Island.

Description: *16 m high; Grassy rock.*
There is a navigational beacon on the highest rock. These rocks are included in the Lax Kul Nii Luutiksm/Bonilla Conservancy established by BC Parks in 2007.

Historical summary: Rudi Drent and Wayne Campbell confirmed Black Oystercatchers and Glaucous-winged Gulls nesting on these rocks when they made their trip to the central mainland coast

Figure 110. Glaucous-winged Gulls were just beginning to lay eggs when Northwest Rocks was visited by Rudi Drent and Wayne Campbell on 6 June 1970. Gulls were disturbed from their territories during the survey, but immediately returned to their nests afterwards. *Photos by R. Wayne Campbell.*

in 1970 (Table MC-180). It was the most northerly site they visited. Gull nests had been built, but gulls were just beginning to lay eggs and most nests were empty at the time of their visit (Figure 110). In 1976, Pigeon Guillemot nests with eggs were found under rocks (2 nests), in a crevice (1 nest), and in a burrow (1 nest). The area was not surveyed by CWS crews in the 1980s.

Table MC-180. Seabird nesting records for Northwest Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
6 Jun 1970	3[2]	93[2]	25eS	265
29 Jun 1976	1	36[14]	x4(47)	265

Remarks: River otter runways and scats were seen in 1976.

MC-190 NORTH ROCK

Location: *53°30'44"N 130°36'38"W; 103 G/10.*
North of Bonilla Island, southeast of Northwest Rocks.

Description: *6 m high; Grassy rock.*
North Rock is part of the Lax Kul Nii Luutiksm/ Bonilla Conservancy established by BC Parks in 2007.

Historical summary: The BCPM crew confirmed nesting by Glaucous-winged Gulls and Pigeon Guillemots and suspected that a pair of Black Oystercatchers was nesting in 1976 (Table MC-190). This site was not visited by CWS during the 1980s.

Table MC-190. Seabird nesting records for North Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
29 Jun 1976	1eS	27[23]	x3(29)	265

Remarks: Two broken gull eggs were found in 1976.

To Joseph Island – an Expedition within an Expedition

Surveys of seabird colonies along the northern mainland coast by CWS were conducted mainly in 1987 and 1988. In 1987, we surveyed northern colonies as far south as Lawyer Islands off the north side of Porcher Island. During the 1988 field season, we surveyed southern colonies from Caamaño Sound to Cape Caution. Our main focus that season was the cluster of seabird colonies off the west coast of Aristazabal Island, and we began surveys there on the Moore Islands on 17 May. Between the Lawyer Islands and the Moore Islands was a stretch of coastline about 170 km long, where previous surveys had found a few small, scattered seabird colonies. We had hoped to reach at least some of those colonies in 1988, especially Joseph Island, a lone outpost sitting well off the south end of Banks Island, quite a distance from any of the other areas we were surveying. With a substantial Glaucous-winged Gull colony and the potential for some new discoveries, Joseph Island became an alluring and exciting quest, partly because it was so isolated. One way or another we were going to get there, despite its great distance from our campsites in the islands to the south.

After arriving at the Moore Islands in 1988, we conducted surveys in that area and then moved our base camp south to Byers Islands, all the while keeping Joseph Island in the back of our minds, even though it was getting farther away. Finally, in mid-June on my (Moira) birthday (which was always a good excuse for an adventure), we decided that the time was right for an expedition to Joseph Island - the weather forecast was reasonable with only a little wind predicted.

The distance from Byers Islands to Joseph Island was about 50 nautical miles or 80 km, too long a journey to get there and back in one day, so the four of us (Michael, Brian Carter, Mike Force and I) headed off northwards in one zodiac packed with bivouac gear for a light camp. Equipped with chart and compass (no GPS in those days), we took a direct bearing from Byers Islands to Joseph Island which first took us through the incredibly rich feeding grounds off the west coast of Aristazabal Island. Rhinoceros Auklets flew back and forth and shearwaters soared by, clipping the waves in the rich shallow waters of the region. Onwards into the open Hecate Strait, we watched the Moore Islands drop below the horizon. With only the open ocean *surrounding us, we were far from shore, but tops of larger islands and mountains held form and we were able to pick out a few landmarks along the way. We ran in and out of small sections of wind; sometimes the ride was a bit bouncy, at other times we travelled easily over long smooth swells. A rain cloud on the horizon to the northwest came closer and soon was upon us, but fell away behind as we continued on our way. Joseph Island still lay somewhere ahead as the odd shape of Bonilla Island slowly rose into view. For a while it was hard to pick out where Joseph Island should be, since points and headlands of Banks Island appeared for a while like separate islands in the sea. Our navigation by compass and dead-reckoning proved spot-on and we finally arrived at Joseph Island. However, after about four straight hours of boating, we were rather wet and cold, the swells were breaking quite heavily on the shores, and everything for some reason seemed a bit intimidating. We ate a late lunch in the boat and decided to explore the island the next day.*

There was no place to camp on Joseph Island, but an ideal campsite awaited us just north of Terror Point on Banks Island, where a drying channel behind a small island allowed access to a calm quiet cove with a sand and shell beach. Pulling the boat well up with its nose in the bushes, we set about to find our bivouac spot. Although the forest was a bit dense it soon opened into a beautiful moss and cedar forest. We found a wonderfully comfortable spot in the shelter of the huge trees that fit the four of us quite nicely. With the kitchen set up under an overhanging log, and a small fire lit, we retired to bed after dinner with the rain pattering down on the sheltering tarp.

In the morning, clear skies were coming our way across Hecate Strait, so we packed up our brief camp and headed back out to Joseph Island, our excitement returning to explore this isolated outpost. The heavy swells of the previous day had eased and we landed uneventfully. We set about to survey the island for its nesting birds, admiring the beautiful array of flowers at the edge of the high rocky shore where the gulls were nesting. The island is an amazing complex of crevices and canyons which in the forest form a maze of dark pathways and caverns under rock overhangs. A thin coating of moss covers interior rock bluffs and dense salal carpets much of the interior forest. We found no sign of seabird burrows within this tangled forest, but we did find a dead downy Ancient Murrelet chick lying on the shore rocks – where it might have come from was a tantalizing mystery. Could it have been part of a family group that had swum all the way from Haida Gwaii, only to be plucked from the ocean by an avian predator, or could it possibly have hatched here?

The morning on Joseph Island was lovely, but strong southwest winds were billed for the afternoon and rising ocean swells confirmed that a weather front was on its way. So, with our long-standing ambitions of reaching the island satisfied, we hastily started out on the return leg of our big expedition, planning to survey a number of small colonies on the way back. First to MacDonald Island, then on to several small rocks with nesting gulls, before ominous clouds looming on the horizon signaled the approaching storm as we neared Glide and Dupont islands. We dropped some crew members on Dupont Island, but got worried when huge swells on the south point of Dupont island started reflecting back on each other to create larger compound waves that swept up the sloping shore. Fortunately there were calmer periods that allowed us to pick up the brave crew members who had leapt ashore to count the storm-petrel burrows scattered along the edge of the forest. Sneaking into the calm waters and gently rolling swells on the inside of Rennison and Anderson islands we made a stop for gas at our gear stash at "Mud camp" on the Moore Islands where we had first started our surveys about a month earlier.

A forecast of rain and wind made the decision to "head for home" easier, and the remainder of the gull colonies to be surveyed were left for later when some calm weather would once more come our way. We didn't fancy bivouacking again with our meager supplies and only wet wood for a fire, for who knew how long. We pulled into the shelter of our Byers Islands camp about 20 minutes before dark, passing through clouds of Rhinoceros Auklets on the water along the west side of the islands. Waking the next morning to heavy rain and a southeast gale, we were glad we were back home, enjoying a "bath" and boiling our socks, even though particularly strong gusts of wind kept driving rain under the shelter of our kitchen tarp!

MC-200 JOSEPH ISLAND

Location: *53°08'40"N 130°02'30"W; 103 G/1.*
West of the south end of Banks Island.

Description: *37 m high; Forested.*
Joseph is a precipitous, dissected granitic rock with a forested crown (Figure 111). Extensive bare, rocky knolls surround most of the island, rising to 30 m elevation without vegetation. There are cliffs on the west side. Windswept, krumholz spruce border the central forested area. Dense salal forms most of the forest understory, with bare litter in some interior gullies, and grass and forbs on perimeters where soil is shallow.

Historical summary: Four Black Oystercatcher nests with small young were found in 1976 (Table MC-200). In 1988, three adults were present and suspected nesting, but no nests were found. Most Glaucous-winged Gull nests contained eggs in 1976 (Figure 112). In 1988, over twice as many gull nests were counted but fewer nests held eggs than in 1976. Nests were distributed all along the east side of the island in 1988, but most eggs found were in nests towards the south end. Many nests near the north end were empty and the number of eggs in nests increased from north to south. There was no evidence of egg predation and we were puzzled by what appeared to be a very local gradation in the timing of laying. Pigeon Guillemots were nesting under rocks in 1976. One Horned Puffin was seen in the vicinity of the island in 1976.

Table MC-200. Seabird nesting records for Joseph Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	HOPU	SOURCE
28 Jun 1976	4[4]	115[103]	x5(24)	(1)	38, 265
15 Jun 1988	2eS	245[80]	S(75)	(0)	182

Remarks: There was an active Bald Eagle nest in 1976 and 1988. Remains of Cassin's and Rhinoceros auklets, Fork-tailed Storm-Petrel, and Sooty Shearwater (*Ardenna grisea*) were found around the eagle nest in 1976 (Figure 113). In 1988, an immature Peregrine Falcon was flushed out of a crevice where it had been scavenging a gull carcass. Remains of several Glaucous-winged Gulls, an Ancient Murrelet adult and downy chick, a Cassin's Auklet, and a shearwater were found on the island in 1988. A nesting pair of ravens and river otter runs and scats were also observed in 1988.

Figure 111. Joseph Island has a forested crown and bare, rocky knolls around its perimeter. *Photos by R. Wayne Campbell, 28 June 1976.*

Figure 112. On Joseph Island in 1976, Glaucous-winged Gull nests were mainly constructed of grasses and most held two or three eggs (left). Clutches of four and five eggs were also seen, which may have been dump nests. *Photos by R. Wayne Campbell, 28 June 1976.*

Figure 113. Locating Bald Eagle nests and identifying prey remains below nest trees provided added value to the data collected during seabird surveys. Finding remains of Sooty Shearwater, a pelagic species, under an eagle nest on Joseph Island was a surprise. *Photo by R. Wayne Campbell.*

MC-210 MacDONALD ISLAND

Location: *52°58'45"N 129°41'37"W; 103 A/13.*
Off the west side of Dewdney Island at the south end of the Estevan Group.

Description: *26 m high; Forested; Rocky knolls.*
This is a steep, dome-shaped (Figure 114), granitic island, with a small ridge at the northwest corner isolated from the main body by a deep crevice. There is a large rocky knoll at the south end of the island. Open herbaceous vegetation covers perimeter slopes above the shore rock, changing to predominantly salmonberry shrub on higher interior slopes under an open spruce forest (Figure 115).

MacDonald Island is included in Ecological Reserve No. 25.

Figure 114. The silhouette of MacDonald Island is unmistakable due to its domed shape. *Photo by R. Wayne Campbell, 26 June 1976.*

Figure 115. Higher portions of MacDonald Island are covered with an open Sitka spruce forest. *Photo by R. Wayne Campbell, 26 June 1976.*

Historical summary: Two Black Oystercatchers and an empty nest scrape (Figure 116) were seen in 1976 (Table MC-210). In 1988, a pair of oystercatchers was present and suspected nesting on the south rock, but no nest was found. Two Glaucous-winged Gull nests, one with one egg and one empty, were found and an additional three pairs were estimated nesting in 1976. Gulls were nesting only on the northwest ridge in 1988. One Pigeon Guillemot nest found in 1976 contained two eggs.

Table MC-210. Seabird nesting records for MacDonald Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
28 Jun 1976	1S	5e	x(8)	265
15 Jun 1988	1eS	6[6]	S(4)	182

Remarks: Signs of mink were seen in 1976 and mink-sized trails and denning sites were encountered on the northeast corner in 1988. There was one active Bald Eagle nest and many river otter runs and scats in 1988.

MC-220 "PORTER" ROCKS

Location: *52°56'43"N 129°34'19"W; 103 A/13.* Southwest of Porter Island at the south end of Dewdney Island, east of Jacinto Islands.

Description: *7 m high; Bare rock.*
These rocks are within Ecological Reserve No. 25.

Historical summary: Drent and Campbell found 10 Glaucous-winged Gull nest starts in 1970 (Table MC-220). Seven of the nests seen in 1988 were also still being built. No Black Oystercatcher nests have ever been found, although two oystercatcher pairs were present in 1970. A flock of five oystercatchers was seen but no evidence of nesting was found in 1976, and no oystercatchers were recorded in 1988.

Table MC-220. Seabird nesting records for "Porter" Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
2 Jun 1970	2eS	15eS	265
28 Jun 1976	0	9[7]	265
15 Jun 1988	0	12[4]	182

MC-230 GLIDE ISLANDS

Location: *52°57'51"N 129°28'54"W; 103 A/14.* Southeast of Dewdney Island.

Description: *2.5 ha; 61 m high; Forested; Grassy rock.*
Spruce forest covers most areas on these islands. False lily-of-the-valley and grass grow along the forest edges, and tall salmonberry dominates the interior. The lower northeast islets are mostly bare rock with some herbaceous vegetation.

Glide Islands were established as part of Ecological Reserve No. 25 in 1971.

Historical summary: Nesting has been recorded on the northeast rock where Black Oystercatcher chicks (Figure 117) and Glaucous-winged Gull nests were found in 1976 (Table MC-230). Gull nests were mostly completed but egg-laying had just started in 1988. Pigeon Guillemots have not been confirmed nesting.

Figure 116. An empty Black Oystercatcher nest scrape made of limpet and chiton shells was seen on MacDonald Island in 1976; no eggs or chicks were found. *Photo by R. Wayne Campbell, 26 June 1976.*

Figure 117. Black Oystercatcher chicks may leave the nest only a day after hatching and surveyors typically find them hiding away from nests. This older chick was moulting. *Photo by R. Wayne Campbell.*

Table MC-230. Seabird nesting records for Glide Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
28 Jun 1976	1	11[9]	S(40)	265
15 Jun 1988	1	12[3]	S(2)	182

Remarks: There was one Bald Eagle and one Peregrine Falcon nest in 1988, both located in trees.

MC-240 DUPONT ISLAND

Location: *52°56'23"N 129°26'22"W; 103 A/14.*
Southeast of Dewdney Island at the entrance to Estevan Sound.

Description: *3.0 ha; 56 m high; Forested.*
Perimeter slopes are steep in some areas, but most of the island has moderate slopes. False lily-of-the-valley covers extensive areas under the spruce forest (Figure 118), with salmonberry more abundant inland. Grass and other forbs grow on fringes, and there is a pocket of fireweed (*Epilobium angustifolium*) in a gorge on the north end. Trees have been cut down around the navigational beacon on the east point.

Historical summary: Drent and Campbell found Rhinoceros Auklet burrows scattered along the east shore under spruce roots or fallen trees in 1970 (Table MC-240). Fresh feathers and signs of recent digging were seen around some burrows. No burrows were recorded in 1976. We found no auklet burrows in 1988 but did find sporadic storm-petrel burrows at the north and south ends and on the east point. Feathers of both Fork-tailed and Leach's storm-petrels were found at burrow entrances and the musty odour of petrels was obvious, although nesting was not confirmed for either species. Two pairs of Black Oystercatchers were suspected nesting in 1970, two nests were found in 1976 (Figure 119), and three empty nest scrapes and six oystercatchers were seen in 1988.

Figure 119. In 1976, two Black Oystercatcher nests, both with scant nesting materials, were found on Dupont Island. This photo shows one nest where an egg was laid on bare ground, ringed with two mussel and eight limpet shells. *Photo by R. Wayne Campbell, 28 June 1976.*

Figure 118. Sitka spruce forest covers most of Dupont Island. *Photo by R. Wayne Campbell, 28 June 1976.*

Table MC-240. Seabird nesting records for Dupont Island. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	RHAU	SOURCE
8 Jun 1970			2S	50eS	265
28 Jun 1976			2[2]		265
15 Jun 1988	50eS	50eS	3S	0	182

Remarks: There was one Bald Eagle nest attended by two adults in 1976. River otter runs and a den were seen in 1988.

MC-250 BEAVEN ISLANDS

Location: *52°47'30"N 129°23'25"W; 103 A/14.*
At the northwest end of the Anderson Islands, southwest of Rennison Island. Officially, these islands are part of the Anderson Islands.

Description: *Forested; Bare rock.*
Larger islands are partially wooded and have rocky shorelines (Figure 120). The north rock is bare.

Figure 120. Small clusters of trees are found on the top of most of the Beaven Islands. *Photo by R. Wayne Campbell, 28 June 1976.*

Historical summary: A Black Oystercatcher nest with one egg was found on the northern rock in 1976 (Table MC-250). Beaven Islands were not explored by CWS crews in 1988.

Table MC-250. Seabird nesting records (nests) for Beaven Islands.

DATE	BLOY	SOURCE
28 Jun 1976	1	265

MC-260 ANDERSON ISLANDS

Location: *52°47'N 129°21'W; 103 A/14.*
West of the northern end of Aristazabal Island. These islands plus Rennison Island were labelled Tide Rip Islands on maps in the 1950s.

Description: *59 m high; Forested; Bare rock.*
This is a group of many islands, most of which are forested. Salal is the predominant understory, but herbaceous growth is extensive in some areas. There are many smaller rocks and rocky headlands.

Historical summary: A Black Oystercatcher nest with one egg (Figure 121) was found on a rocky headland in 1976 (Table MC-260). We are unsure of its exact location. CWS crews explored the outer, southwestern islands in 1988, but no seabirds were found nesting. One Pigeon Guillemot was sighted offshore to the west of the island group in 1988.

Figure 121. In the Black Oystercatcher nest found on Anderson Islands in 1976, an egg was laid on a pad of small pebbles, with a single mussel and limpet shell nearby. *Photo by R. Wayne Campbell, 28 June 1976.*

Table MC-260. Seabird nesting records (nests) for Anderson Islands.

DATE	BLOY	SOURCE
28 Jun 1976	1	265
6 Jun 1988	0	182

Remarks: Signs of mink were abundant on the islands explored in 1988. Mink were seen running in and out of burrows on a small, outer, southwestern islet. One active Bald Eagle nest was found.

MC-270 WELLS ROCKS

Location: *52°45'06"N 129°28'11"W; 103 A/11.*
West of Anderson Islands, north of Moore Islands.

Description: *7 m high; Grassy rock.*
The smaller of these metamorphic rocks are mostly bare, with tufts of grass and forbs in cracks (Figure 122). Higher rocks are covered with luxuriant grasses. Contorted spruce trees decorate the highest points.

Figure 122. The mix of bare rock, grass, and herbaceous vegetation on Wells Rocks currently provides nesting habitat for Glaucous-winged Gulls, Black Oystercatchers, and Pigeon Guillemots. Tufted Puffins used to nest here in the past. The Moore Islands appear on the horizon to the south**.** *Photo by Moira J.F. Lemon, 20 June 1988.*

Historical summary: Burrow-nesting species have disappeared from the island since records confirmed breeding in 1970, but the reported history of nesting is complex (Table MC-270). Drent and Campbell reported many Fork-tailed Storm-Petrel burrows in 1970 but made no estimate of numbers. Fresh down feathers were scattered about burrows. They found the crown of the island honey-combed with Tufted Puffin burrows (Figure 123). Many puffin burrows did not appear in use, and they suspected the population had been larger in the past. Some loss of turf through erosion was noted. Two adult puffins were flushed from burrows and a maximum of nine were counted on the water. Observers in 1976 saw two Tufted Puffins flying but reported no evidence of nesting by puffins. Burrows seen that year were identified

Figure 123. Rudi Drent searching grass tussocks for Tufted Puffin burrows on Wells Rocks in 1970. Many burrows appeared unused and it was suspected that historically puffin numbers were much greater. *Photo by R. Wayne Campbell, 1 June 1970.*

as Rhinoceros Auklet based on burrow size and on the discovery of one broken Rhinoceros Auklet egg and two depredated adults. In 1988, we found old, up to 2 m high grass tussocks on the northern grassy rock. These were likely old burrowed areas where the tunnels had eroded away (Figure 124). There was no sign of active burrowing by any species.

Figure 124. On Wells Rocks in 1988, Michael Rodway surveys the steep herbaceous shoreline vegetation where Tufted Puffin burrows had been found in previous years. *Photo by Moira J.F. Lemon, 20 June 1988.*

Six pairs of Black Oystercatchers were suspected nesting in 1970. In 1976, three nests with eggs were found on the main cluster of rocks, and one nest with one dead chick was found on the rocks west of the main group (Figure 125). In 1988, oystercatchers were nesting on all higher rocks, including the west rocks.

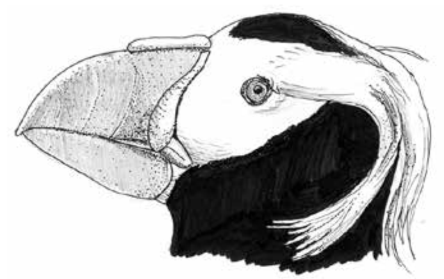
Figure 125. One of four Black Oystercatcher nests found on Wells Rocks in 1976. In this nest (left), positioned next to a driftlog, eggs were laid on clam, mussel, and black turban shells. A dead downy chick (centre of right photo) was also found. *Photos by R. Wayne Campbell, 26 June 1976.* BC Photo 4311.[302]

Glaucous-winged Gulls were still building nests at the time of the visit in 1970. Thirty-one empty nests were tallied on the southeast rock and the highest central rock. The other rocks were not landed on and numbers were estimated from the water (Figure 126). Gulls were nesting on all higher rocks in 1976 and 1988, including the west rocks. Fewer nests were counted in 1988 than in 1976: 107

Figure 126. Most small islets do not have beaches or other safe locations to leave small inflatable boats during surveys for nesting seabirds. Rocky shorelines covered with barnacles pose a danger of punctures or other damage to the boats. To get ashore, people must leap from the bow of the boat onto the rocks, which requires good co-ordination between the jumper and the boat driver. Here one of the CWS crew jumps from the shore of Wells Rocks back into the boat during a pick-up. *Photo by Moira J.F. Lemon, 20 June 1988.*

and 57 on the eastern cluster of rocks; and 32 and 26 on the west rocks in 1976 and 1988, respectively.

Over the years, Pigeon Guillemots were found nesting in crevices, under driftwood, and under rocks on the northern and southeastern of the higher, main Wells rocks.



Remarks: Fifteen Bald Eagles were seen in 1970. In 1988, eagle droppings, feathers, and pellets were observed around the eroded grass tussocks, where eagles had been obviously perching, and two eagles were present. Broken gull eggs were found in 1976 (32) and 1988 (11). Eagle predation may have been responsible for the large proportion of empty gull nests observed in 1976 and 1988.

Wells Rocks, like many low rocky islets along the BC outer coast, are traditional haul-out sites for Harbour Seals (*Phoca vitulina*) and may be used as birthing sites (Figure 127).

Table MC-270. Seabird nesting records for Wells Rocks. See Appendix 2 for codes.

DATE	FTSP	BLOY	GWGU	PIGU	RHAU	TUPU	SOURCE
1 Jun 1970	S	6eS	90eS	15-20eS		20e(9)	265
26 Jun 1976	0	4[4]	139[59]	x2	100eS	(2)	265
20 Jun 1988	0	7[6]	83[34]	x4(19)	0	0(0)	182

Figure 127. Harbour Seals are a common sight along the BC coast. Adults escape to safety when alarmed (left), often leaving pups alone on haul-out rocks like here on Wells Rocks. *Photos by R. Wayne Campbell, 26 June 1976.* BC Photo 4312.[302]

MC-280 ISNOR ROCK

Location: *52°44'09"N 129°31'41"W; 103 A/11.*
Northwest of Moore Islands, west of Wells Rocks.

Description: *18 m high; Bare rock* (Figure 128).

Figure 128. A calm day makes for an easy approach to the steep rocky shore of Isnor Rock. *Photo by Moira J.F. Lemon, 20 June 1988.*

Historical summary: Glaucous-winged Gulls were confirmed nesting in 1976 (Table MC-280). In 1988, we found one gull nest start and saw one adult carrying nesting material to the rock, but no gulls were holding territories. No Black Oystercatchers or Pigeon Guillemots were seen in 1976. In 1988, there was one downy young in the single oystercatcher nest found, and guillemots were nesting in crevices.

Table MC-280. Seabird nesting records for Isnor Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
26 Jun 1976	0	4[3]	(0)	265
20 Jun 1988	1	1S	x2(18)	182

Remarks: One Bald Eagle was present and one broken gull egg was found in 1976.

MC-290 MOORE ISLANDS

Location: *52°40'46"N 129°25'08"W; 103 A/11.*
West of Kettle Inlet on the northern west side of Aristazabal Island. All the islets along the west side of the two large Moore Islands, including those between the main Moore and the main Whitmore islands, have been included in the Moore Islands group (Figure 129). Records for the islets between Moore and Whitmore have previously been listed for Whitmore Islands [212, 265] but we now include them with the Moore Islands (see Whitmore Islands account). The main Moore Island used to be called Large Gander Island, and the islets along the west side have been referred to as the Gander Group, or the north Ganders Islets. Records have been confused in the past; those islets have sometimes been wrongly associated with the Goose Island group further south.

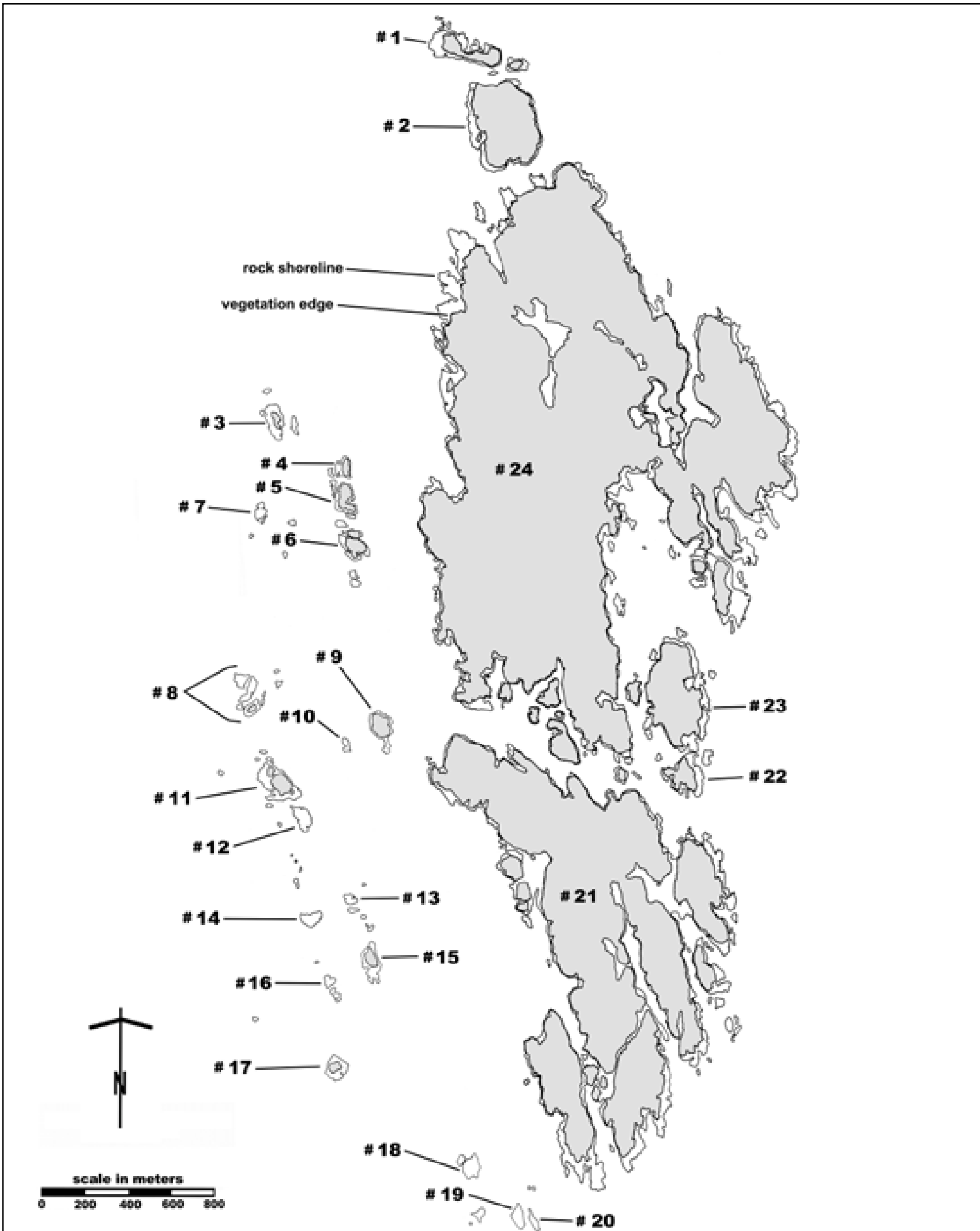


Figure 129. Numbered islands in the Moore Islands referred to in the text.

Description: *427 ha; 58 m high; Forested; Bare rock.* The Moore Islands are low and gently undulating, except for a few steep portions along rocky perimeters (Figure 130). The shoreline of the large islands is convoluted with many shallow bays and tidal channels. There are small lakes and extensive sphagnum (*Sphagnum* spp.) bogs in the interiors (Figure 131). Spruce is the dominant tree species around the perimeters of the large islands, and on all small, treed islets. Hemlock and redcedar are more common inland, and dwarf shore pine (*Pinus contorta*) grow around interior bogs. Open areas of moss, grass, false lily-of-the-valley, and other forbs are frequent along edges and over much of the small islets. Thickets of salmonberry or salal often border herbaceous areas, becoming extensive along shore in some areas, especially at the heads of inner bays. Tall elderberry (*Sambucus racemosa*), huckleberry, and salmonberry occur in sparse stands over mossy slopes at the north end of the largest island. Bare litter covers the forest floor in interior areas. Smaller western islets are bare rock with little vegetation.

The large, northern island is an Indian Reserve. The south island and the small islets along its west side are part of Ecological Reserve No. 23, established in 1971.

Figure 130. The Moore Islands is a group of low islands with rocky shorelines. Most islands are forested; smaller western islets are bare rock with few patches of vegetation. *Photos by R. Wayne Campbell, 26 June 1976.*

Figure 131. The interior bog area of the Moore Islands provided a comfortable bed of sphagnum moss for a welcome relaxing nap for the CWS crew in 1988. From the left, clad in their almost-permanent rain gear attire, are Mike Force, Dick Grinnell, Matthew Grinnell, Michael Rodway, and Brian Carter**.** *Photo by Moira J.F. Lemon, 25 May 1988.*

In Search of the Perfect Campsite

During the CWS seabird surveys in the 1980s, we would often move our base camp several times during the season to efficiently cover the area we had planned to explore. In the frenzied days of preparation and packing in town, I (Moira) would pore over airphotos and marine charts, scouting for potential locations that would provide a comfortable campsite for our crew for several weeks. We preferred our campsites to be on one of the islands we intended to survey, thus allowing us to work close to our base camp when the weather prevented us from heading out in the boats. A clear opening at the edge of the forest, with soft level places for the tents, good ocean access with a safe, sheltered place to either anchor or tie the boats to shore, and of course a great view and perhaps even running water, was the ideal site. Over the years, we found many wonderful campsites.

The most difficult time we had finding a good campsite was in 1988, when we were surveying the group of islands off the west coast of Aristazabal Island in Hecate Strait. We were transported from Port Hardy on Vancouver Island to the Moore Islands to begin our surveys in that area by the Fisheries Research vessel Tanu. *We had little choice in the location of our first campsite – most of the channels surrounding the Moore Islands were fraught with uncharted rocks and the* Tanu *dropped us off in the only location that was safe to offload our supplies. Our first camp on the Moore Islands thus turned out to be a damp lagoon area at the head of a twisting narrow inlet on the east side of the island that the tide inundated on a regular basis. It became affectionately known as "Mud Camp." One night in that camp was sufficient to send us on a day-long search for a better location.*

We searched through the complexity of islets and tidally-linked shallow bays and channels that comprise the Moore Islands, to find that most access channels turned into long stretches of mud at low tides and had no potential campsites at their head. In other spots, what on the airphoto had looked like lovely sandy beaches in protected bays, would turn out to be huge piles of drift logs, with no space to establish a camp. But finally, despairing of ever finding a decent site, we found a lovely little bay on the mid-west side of the largest island that provided the ultimate campsite. It was a northwest facing bay with a beach of sand and cobbles that led up to a beautiful forest with a carpet of false lily-of-the-valley stretching far back from shore, a small stream in the corner, and Rhinoceros Auklet burrows on the nearby ridges. Wonderful! We gratefully packed everything up for the move to our new home, and "Mud Camp" was gladly abandoned. It did prove useful however, as a storage location for our drums of fuel and other gear, which we stashed under a large spruce tree whose thick branches swept down to the ground, hiding everything from view and the weather, and the anchoring system we had left in place provided a secure and convenient location to leave the boat while surveying that section of the island (Figure 132).

Figure 132. Dick Grinnell checking on the boat anchoring system in the bay of our CWS Moore Islands field camp in 1988. *Photo by Moira J.F. Lemon, 30 May 1988.*

Historical summary: McCabe visited these islands in 1936 and documented nesting by four species (Table MC-290). In 1970, Drent and Campbell identified all species currently known to nest on the islands. They also discovered the only nest of Ancient Murrelets in BC ever confirmed outside Haida Gwaii:[40] on 30 May 1970, an adult and an egg were pulled from a burrow in soft ground under false lily-of-the-valley on a rocky islet with a grassy and sparsely treed crown. The location of this islet was described as "in the Ganders Islets off the Moore Islands,"[265] which undoubtedly refers to one of the islets off the west side of the Moore Islands. Many other burrows were checked in this area, but no other Ancient Murrelets were found. Drent and Campbell speculated that perhaps other nesting Ancient Murrelets had already left with their chicks from some of those other burrows, but they also thought that the other burrows could have been Cassin's Auklet burrows. Two adult Ancient Murrelets were seen on the water within 5 m (15′) of this islet. No evidence of nesting by Ancient Murrelets has been found since. None were heard or seen on the islands during the period from 17 May to 6 June that CWS crews were present on the islands in 1988, although on three occasions several adults were seen on the water north and south of the islands.

There is no evidence of population or distribution changes for other burrow-nesting species, except perhaps for Tufted Puffins. Not all areas were explored during early surveys and the CWS survey in 1988 provides the only robust population estimates for burrow-nesting species. Storm-petrels and Cassin's Auklets have been found nesting only on the west islets. Storm-petrels were nesting on nine of the west islets (#3-6, 8, 9, 11, 15, and 17) in 1988. They were found on two and five of those same islets in 1970 and 1976 (Figure 133), respectively. Cassin's Auklet burrows were recorded on two of the west islets in 1970 and 1976 and on six islets (#3, 6, 8, 11, 15, and 17) in 1988.

Table MC-290. Seabird nesting records for Moore Islands. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	GWGU	PIGU	ANMU	CAAU	RHAU	TUPU	SOURCE
2, 6 Jun 1936				x	40-50e			x	x(4)	77
30-31 May 1970	x	100e	3S	35eS	200e(567)	1	50e	100's	S(12)	265
25-26 Jun 1976	x[a]	5,700e[a]	8[8]	69[14]	x8(131)	0	50eS	250+S		265
May, Jun 1988	8,900t	6,000t	21e	150[88]	x2(187)	0	400eS	40,500t	3(6)	182

[a] Mix of FTSP and LSPE.

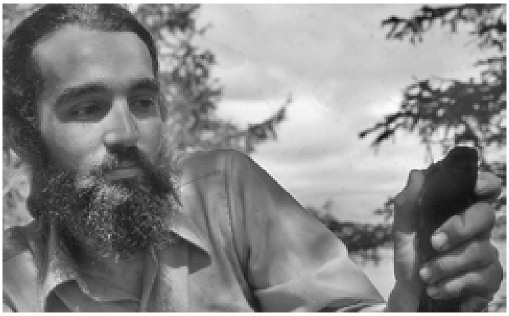


Figure 133. Michael Rodway holding a Leach's Storm-Petrel extracted from a burrow on one of the western islets of the Moore Islands in 1976. *Photo by R. Wayne Campbell, 26 June 1976.*

In 1936, McCabe was told by native fishermen that Rhinoceros Auklets nested on the islands. In 1970, Drent and Campbell estimated several hundred pairs of Rhinoceros Auklets nesting around the main islands at the edge of the forest. Most burrows were located under tree roots just above the shore. They noted about 50-60 burrows a little further inland on forest slopes at the "northern outside tip" of the islands, which we assume referred to island #2, where we found burrows extending inland as far as 70 m in 1988 (Figure 134). They heard birds arriving at night along the west side of the main islands in 1970. In 1976, Rhinoceros Auklet burrows were found: on the north tip of the largest island (#24); on the adjacent, smaller, northern island (#2); on the island (#23) off the southeast corner of the largest island; and on two of the western islets (#15 and 17) near Whitmore Islands (Figure 135). Population size was not estimated. In 1988, we found Rhinoceros Auklets nesting along almost all perimeter vegetated habitat on the main islands (#21-24) and the larger northern and western islets (#1-6, 8, 9, 11, 15, and 17). Some burrows were located on minimal slopes near the heads of long tidal bays hundreds of meters from the open ocean. The large Rhinoceros Auklet population estimate in 1988 was generated from a thorough exploration and colony survey. No staging concentrations were observed around the islands, but small groups of 20 and 37 birds were seen on the water to the northeast on 17 May and 6 June 1988, respectively.

Figure 134. Rhinoceros Auklet nesting habitat is extensive around the shorelines of the Moore Islands. This steep slope on the forest perimeter is on one of the complex of islands around the larger Moore Islands. *Photo by Moira J.F. Lemon, 4 June 1988.*

Tufted Puffins were found nesting on the westernmost vegetated islet (#8) lying west of the channel between the two main islands in 1936, 1970, and 1988. Drent and Campbell described the grassy area on this islet as "riddled with burrows" in 1970. They also suspected a few pairs nesting on the islet (#17) closer to Whitmore Islands west of the southern end of the main south Moore island. Burrows were seen in grassy slopes on both islets, but birds were only seen on the water around the northern islet. No Tufted Puffins were recorded in 1976. Five burrows and six adults were seen in 1988.


Figure 135. Rhinoceros Auklet nesting habitat in Sitka spruce forests on islands #21 (left) and #23 in the Moore Islands. *Photos by R. Wayne Campbell, 26 June 1976.*

Surface-nesting species appear to have increased. Changes since 1970 cannot be evaluated because, at the time of the survey in 1970, Glaucous-winged Gulls were just building nests and only 25 empty nests were found on three northern islets. However, over twice as many Black Oystercatchers and Glaucous-winged Gulls were found nesting in 1988 than in 1976. We are confident that the indicated changes in gull numbers are real because surveyors in both 1976 and 1988 would have searched any areas where gulls were visible. Black Oystercatcher nests were more likely missed in 1976 (Figure 136), especially around the extensive shorelines of the main islands. Oystercatchers were found nesting on eight of the west islets in 1976, and at 20 locations on the main islands (4 locations on island #24 and 6 locations on island #21) and on the west islets (10 locations) in 1988.[182] Of 16 oystercatcher nests found in 1988, 13 contained eggs; pairs were suspected nesting at five other locations. Glaucous-winged Gulls were found nesting on seven of the west islets in 1976 and on 11 of the islets when they were surveyed on 20 June 1988. In addition, one gull nest start was found near the north end of the largest island (#24) in 1988. A total of 85 nests were counted in 1988 on the seven islets where nesting had been recorded in 1976, and 65 nests were counted at other locations.

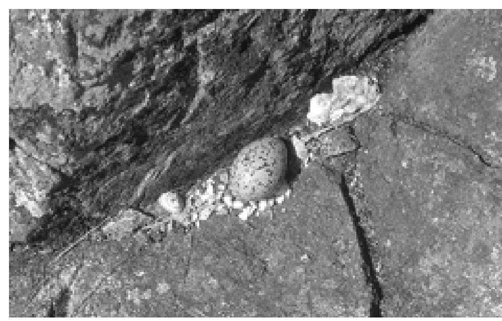


Figure 136. It is likely that some Black Oystercatcher nests were missed during surveys of the Moore Islands. This nest found in 1976, with a single egg, was located in a narrow rock crevice. *Photo by R. Wayne Campbell, 26 June 1976.*

Pigeon Guillemots have been recorded nesting predominantly in burrows at the edge of the vegetation around the larger islands. McCabe saw them flying in and out of nesting holes at the southeast corner of the largest, main island (#24) in 1936. The highest, historical count of 567 guillemots in 1970 was of birds around that island. Guillemots were seen around the main islands and a number of the western islets in 1976 and 1988 (Figure 137). Some were observed nesting in rock crevices in the latter two years.

Figure 137. One of the small islets in the chain of islets on the west side of Moore Islands. Storm-petrels, Cassin's and Rhinoceros auklets, Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots have been found nesting here. *Photo by Moira J.F. Lemon, 4 June 1988.*

Sparrows in Isolation

*During his visit to the Moore Islands with Rudi Drent in 1970, Wayne Campbell noticed that two resident passerine species, Fox Sparrow (*Passerella illiaca*) and Song Sparrow (*Melospiza melodia*), were unusually dark compared to mainland birds. Campbell speculated that the sparrow populations isolated on the islands may have diverged from their mainland counterparts, perhaps into a new subspecies. Currently, three western races of Fox Sparrow are recognized in BC and nine subspecies of Song Sparrows occur in Alaska and the Pacific Northwest.[41, 312] Further research is warranted to determine the taxonomic status of the island populations of these two sparrow species.*

Remarks: McCabe, in 1936, noted that First Nations people regularly went egging in this island group. Most gull nests were empty in 1976. Many were empty and only a third of nests with eggs had full clutches in 1988. Nine broken gull eggs were found in 1976 and five were found in 1988. Egging may still occur on these islands.

A Peregrine Falcon and a Bald Eagle were sighted in 1976. In 1988, there were at least seven active Bald Eagle nests and two Peregrine Falcon eyries. Evidence of predation in colony areas was minimal, but remains of about 60 Rhinoceros Auklets and several Fork-tailed and Leach's storm-petrels and Cassin's Auklets were found during explorations in 1988. Some everted and decapitated carcasses found were likely the work of Peregrine Falcons. River otter runs and scats were seen in 1988.

Wet Days in the Moore Islands

Spring weather along the coast can be quite unpredictable, and work plans change daily according to what kind of weather you wake up to. In 1976, the BCPM survey crew had a mothership that provided shelter and respite during stormy weather (Figure 138). We had no such haven during the CWS surveys in 1988. Excerpts from my (Moira's) journal paint a picture of a rather uncomfortable stretch of unsettled wet weather in 1988 when we were surveying the clusters of islands off the west coast of Aristazabal Island in Hecate Strait while camped on Moore Islands.

May 21 …..SE gale and torrential rain began last night …..cancel work for the day and create fruit crepes instead. Rain continues all day – rivers pour out from under the bank at the beach edge and carve canyons through the sand. Walk around the point to the west side – sheets of rain blown horizontally between here and the outer islets…..

May 25 .....Strong SW-SE wind rises and engulfs us with saltspray as we boat over to the McKenneys.....
May 26 .....SE gale rose from the strong SE wind of yesterday, rain pounded on the tent all last night and into the morning, wind howling through the trees in the ridge above camp, and waves are curling around the point and surging up onto our beach .....it's wet .....getting up and working doesn't seem like a great idea .....the guys have a sock washing day, stirring all their socks in a big pot over the monstrous blaze of a beach fire (Figure 139). A line is set up over the fire to dry the socks – it will probably take at least a week for them to dry .....every available line on the tarps is hung with various sodden articles of clothing, and everything we own is taking on a damp feeling .....the puddles on the soaked floor of my tent are encroaching on my ensolite sleeping pad .....go to sleep to the sound of torrential rain on the tent fly .....glad we are not in "Mud camp"!
May 27 .....doesn't look much different from yesterday, with the exception that it is raining harder! .....as the morning progressed it appeared to get a bit better, so we emerge from our tents and put on fruit pancakes for breakfast .....decided we better do some transects, so head out in full rain gear, and as we start, the rain takes on torrential proportions .....head into the dripping huckleberry encased in floater jackets and heavy raingear – our world of water, we can't get away from it (Figure 140). Drips on the notebook, wet pockets, wet hands, everywhere is wet .....we buzz though quite a few transects until a particularly drenching rainshower begins, so back to camp for a hot lunch .....sit for a while since the rain doesn't let up, then out again about 3 pm .....at 5:30pm rain increases to torrents hissing off the ocean surface til sea, sky, and rain are all one grey ocean .....home to hot tea!
May 28 .....a day that dawns not too bad, though the bush is phenomenally wet – huckleberry bushes hold an inordinate amount of water in their profuse amount of leaves .....have to wear full raingear regalia .....with cedar measuring stick in hand, in gumboots and floater and carrying my plastic bag of bush rain jacket, I overhear the guys refer to me as a "bag lady" – I guess I must have looked a bit odd! .....after 9 hours of work, since the sun was shining we go back to camp and spread everything including sleeping bags out on the rocky point to do a bit of drying in the last ergs of power from the sun – what a treat! First time we've been able to do this!
May 29 .....the promise of a good day before a front moved in, diminished slightly as we heard rain on the tent roof and wind in the trees .....but the sun does come out, so we load up the boats and head down to the Byers complex for a preliminary exploration .....chop is fiercely short between the crests of the waves so it's a wet ride .....feel like a piece of flotsam encased in wetness .....have lunch on shore in the shelter of the Byers north point .....a great dark cloud comes swiftly into view, so we seek shelter under a huge pile of suspended drift logs on the high rocks, and crouch in their protection as a particularly heavy deluge passes.....
May 30 .....SE gale rises overnight and torrential rain greets us in the morning and lasts all day .....cancel the day of work in the bush in favor of updating notes in the tent....
June 2 .....a storm is forecast for later today, but presently it is sunny and the wind is not yet strong – decide to do some Rhino occupancy til the storm arrives .....after lunch the NE wind howls and the sky which has been gathering high cirrus clouds all day begins to open up .....soon we are wet and muddy and it is good to return to camp .....on the weather station we hear that it is blowing 48 knots and gusting 62 knots at Cape St. James and Egg Island .....the storm approaches....
June 3 .....wind rises during the night – head out at 3 am to check the boat at high tide .....waves crash on the beach and have swept it clear of driftwood! Boat survives well .....storm force winds and heavy rain begin mid-morning .....watch the williwaws hit the bay and pick water up in streams .....waves surge and envelop the offshore rocks, funnels of water twist over the surface of the sea.
June 4 .....the storm has passed, though big swells remain in the passage between the Moore and McKenney islands .....today we do transects on all the small islets and storm-petrel occupancy as well as finishing some Rhino burrow occupancy.....
And on it went for the rest of the month. But the sun always shines eventually, and the cold and wet days receded into hazy memories and evolved into humorous and intrepid tales of yesteryear.

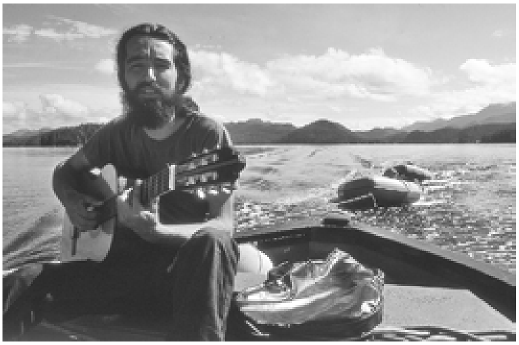


Figure 138. In 1976, the BCPM survey crew travelled in relative luxury with an accompanying mothership, the MV *Tedmac*. Throughout the field trip, we had dry spaces to change wet clothes, hot meals with fresh ingredients, and live music. Members of the crew shown here in the left photo included (left to right): Harry Carter, Michael Rodway, and Marilyn Paul (now Lambert). When travelling between anchorages aboard the *Tedmac*, Michael Rodway frequently strummed his guitar. *Photos by R. Wayne Campbell.*

Figure 139. Matthew Grinnell (left), Michael Rodway (with stick), and Dick Grinnell boil their socks in a large pot over a beach campfire on a stormy day at the Moore Islands in 1988. *Photo by Moira J.F. Lemon, 26 May 1988.*

Figure 140. For the CWS crew in 1988, full rain gear and often marine floater coats were the required outfit to work in the frequent stormy weather. Here, Brian Carter (top) and young Matthew Grinnell stalwartly investigate Rhinoceros Auklet burrows on the Moore Islands colony. *Photos by Moira J.F. Lemon, 1 June 1988.*

MC-300 McKENNEY ISLANDS

Location: *52°39'03"N 129°28'56"W; 103 A/11.* West of Moore Islands off the west side of Aristazabal Island.

Description: *28.7 ha; 18 m high; Forested; Bare rock.* The larger of these low rocky islands are forested with spruce (Figure 141). The highest eastern rock (island #5) is bare on its south face and has lush grass on its north side and top. Salmonberry forms dense

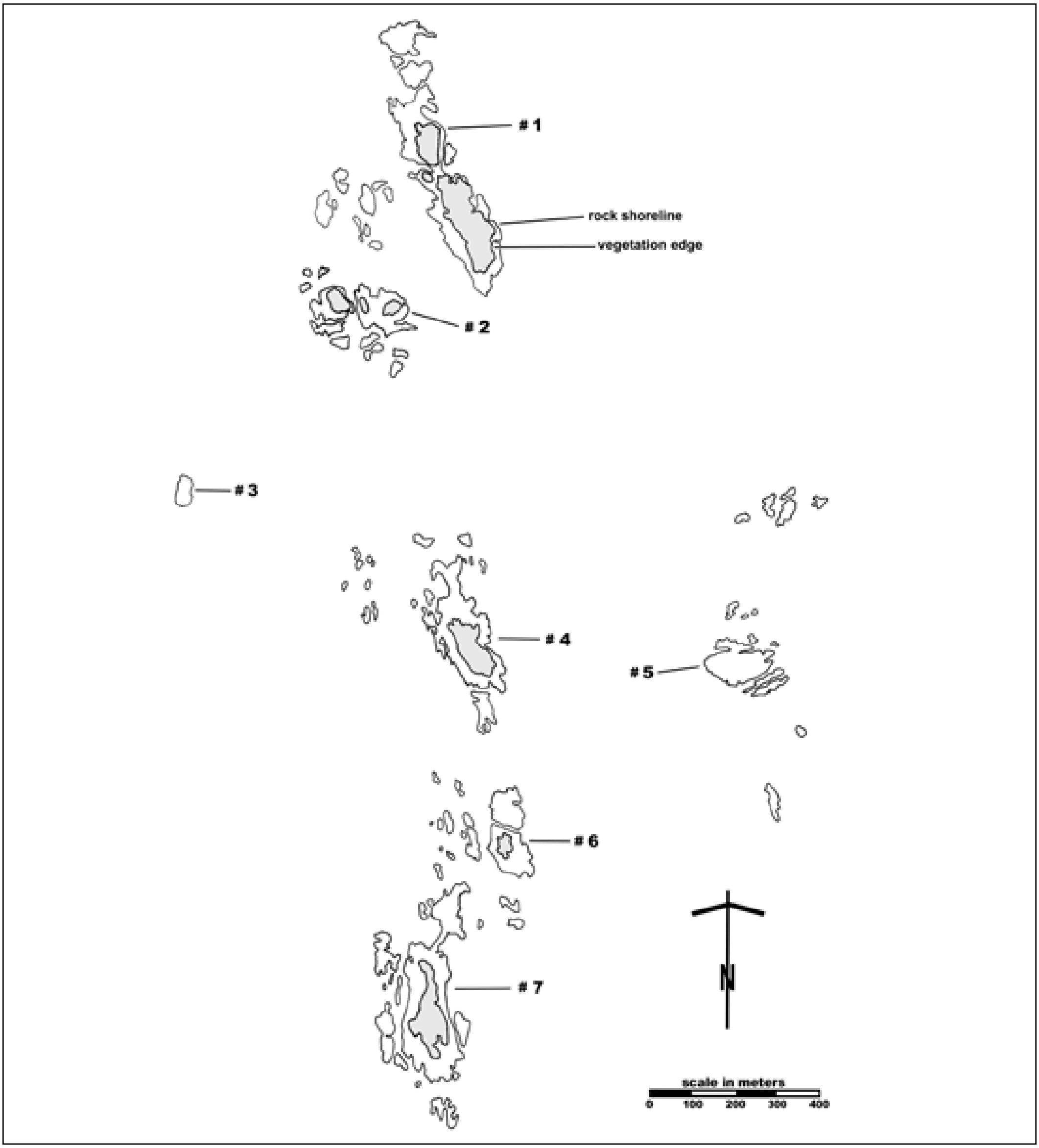


Figure 141. Numbered islands in the McKenney Islands referred to in the text.

Figure 142. The variety of habitats on the McKenney Islands include Sitka spruce forests, rocky bluffs, low, bare rocky islets, and patches of grasses and forbs. *Photos by R. Wayne Campbell, 25 June 1976.*

thickets on most islands, with open patches of grass, forbs, and moss occurring near shore (Figure 142). Only 4.4 ha of the islands are vegetated.

In 1988, the trees and understory vegetation on the northern island (#1) appeared sickly, with many dead snags and recently dead and dying trees. Moss, ferns, false lily-of-the-valley and other forbs, and the short scattered salmonberry that comprised most of the ground cover, had yellowed leaves and stunted growth. Pictures from 1976 show a healthy forest on this island.

Trees on the large, middle island (#4) in the group were cut in the past, possibly during the Second World War, as there is telegraph wire and the remains of buildings scattered around (Figure 143). Thick salmonberry and small pockets of young, windswept spruce now cover the island. McKenney Islands received Ecological Reserve status in 1971.

Figure 143. Remains of long-abandoned buildings, possibly from a station established during World War II, are scattered around island #4 of the McKenney Islands. *Photo by R. Wayne Campbell, 25 June 1976.*

Historical summary: CWS surveys were conducted on 25 May, and 1, 4, and 20 June 1988. Records from 1976 and 1988 indicate population increases for several species (Table MC-300), but in most cases our confidence is low that trends are real.

Although population estimates for storm-petrels were much lower in 1976 than in 1988, the distribution of burrows was similar, occurring on four islands (#1, 2, 4, and 7) in each year, and numbers of breeding birds may not have changed significantly since 1976. Many storm-petrel burrows were depredated in 1976 (see below), which may in part account for the lower estimate that year.

A few Cassin's and Rhinoceros auklet burrows were found in 1988 in perimeter areas of two (#2 and 7) and four (#1, 2, 4, and 7) of the vegetated islands, respectively. One suspected Cassin's Auklet burrow was found on island #1. Those islands were explored and storm-petrels were found nesting in 1976, but no Cassin's or Rhinoceros auklet burrows were reported. Data thus suggest that Cassin's and Rhinoceros auklets colonized the islands since then, although it is possible that a few scattered burrows of those species were missed in 1976.

One Tufted Puffin was seen on the water near island #5 in 1976. We saw one fly by the west rock (#3) in 1988. No evidence of nesting by puffins has been reported.

Numbers of Black Oystercatchers nesting were the same in 1976 and 1988. They were nesting on six islands in both years. All nests found held eggs or young in 1976 (Figure 144). In 1988, six nests were found, three with eggs (on islands #3 and 5) and three empty (on islands #1, 2, and 7), and two pairs were suspected nesting but we did not find nests (on islands #4 and 7). More Glaucous-winged Gull nests were counted on 20 June 1988 than in 1976 and the indicated population increase may be real for this species, although numbers of nests containing eggs were similar in the two years. Nests were found mainly on islands #3 (17 nests in 1976; 8 nests in 1988) and #5 (40 nests in 1976; 84 nests in 1988), plus two nests with eggs were found on island #7 in 1976. Numbers of Pigeon Guillemots seen were similar in 1976 and 1988. Nests with eggs were found on island #3 in 1976 and island #5 in 1988 (Figure 145).

Figure 145. Pigeon Guillemot nest with two eggs located in a rock crevice on the McKenney Islands in 1988. *Photo by Moira J.F. Lemon, 20 June 1988.*

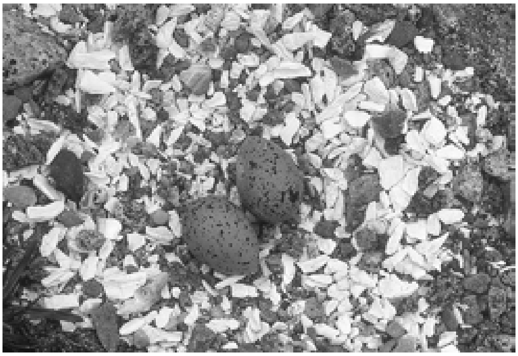


Figure 144. On 25 June 1976 on McKenney Islands, well-incubated Black Oystercatcher eggs (left) were beginning to hatch, and a downy chick (top of right photo) blends into the rocks. *Photos by R. Wayne Campbell.*

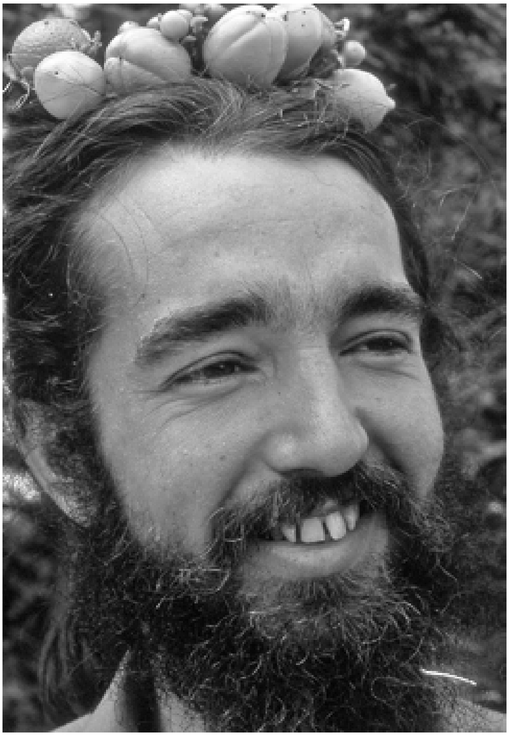
Table MC-300. Seabird nesting records for McKenney Islands. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	GWGU	PIGU	CAAU	RHAU	TUPU	SOURCE
25 Jun 1976	100e	50eS	8[8]	59[26]	x(16)			(1)	265
May, Jun 1988	1,500t	2,900t	8e	92[29]	x(14)	40eS	130eS		182

Remarks: In 1976, we counted 59 storm-petrel carcasses and 13 wings, and estimated that 90% of the burrows on island #1 had been dug up. A freshly killed Fork-tailed Storm-Petrel was found still on an egg in its burrow on island #7. Either mink or river otter were likely responsible; we saw trails and dens on the island that could have belonged to either species. Only a few remains of storm-petrels and no dug-up burrows were found in 1988. River otter runs and scats but no signs of mink were seen in 1988.

Many depredated Glaucous-winged Gull eggs and many empty nests were found in both 1976 and 1988. In 1988, some gull eggs still in nests had been pecked open and one broken Pigeon Guillemot egg was also found. Bald Eagles, Common Ravens, and Northwestern Crows may have been responsible. In 1976, seven adult eagles and one nest were recorded. A total of 65 crows were counted and two nests and four young were found. In 1988, there were five immature and one subadult eagle perched on the east rock where most gulls were nesting. One raven was also flying around. One eagle, raven, and crow nest were found on the forested islands.

Figure 146. Beachcombing during the BCPM surveys in 1976: Marilyn Paul (now Lambert) standing on a large navigation buoy (this page); Marilyn finding two glass floats among driftlogs (next page, top); Keith Taylor, Marilyn, and Michael Rodway with some beachcombing treasures (bottom right, from left to right); and Michael wearing a halo of plastic fruit. *Photos by R. Wayne Campbell, 25 June 1976.*



Beachcombers Delight

Visiting remote and uninhabited islands along the BC outer coast is a beachcomber's fantasy. A variety of discarded items from human civilization end up in the ocean and get caught in the large North Pacific Ocean gyre known as the Kuroshio Current. Debris circulates, sometimes for many years, until detached from the circulating gyre by local weather patterns. Once dislodged from the gyre, all sorts of items make their way to destinations along the Pacific Coast of North America. Here they become treasures for beachcombers. During seabird surveys, we often indulged in a little beachcombing whenever an opportunity arose (Figure 146).

MC-310 WHITMORE ISLANDS

Location: *52°38'39"N 129°26'32"W; 103 A/11.* Southwest of Moore Islands off the west side of Aristazabal Island. Colony includes the islets close to the north ends and off the south ends of the two main Whitmore Islands (Figure 147). All small islets to the northeast of the main Whitmore Island have been included with Moore Islands. Those northeast islets are part of what used to be called the Ganders Group and are more logically associated with the Moore Islands (see Moore Islands account above).

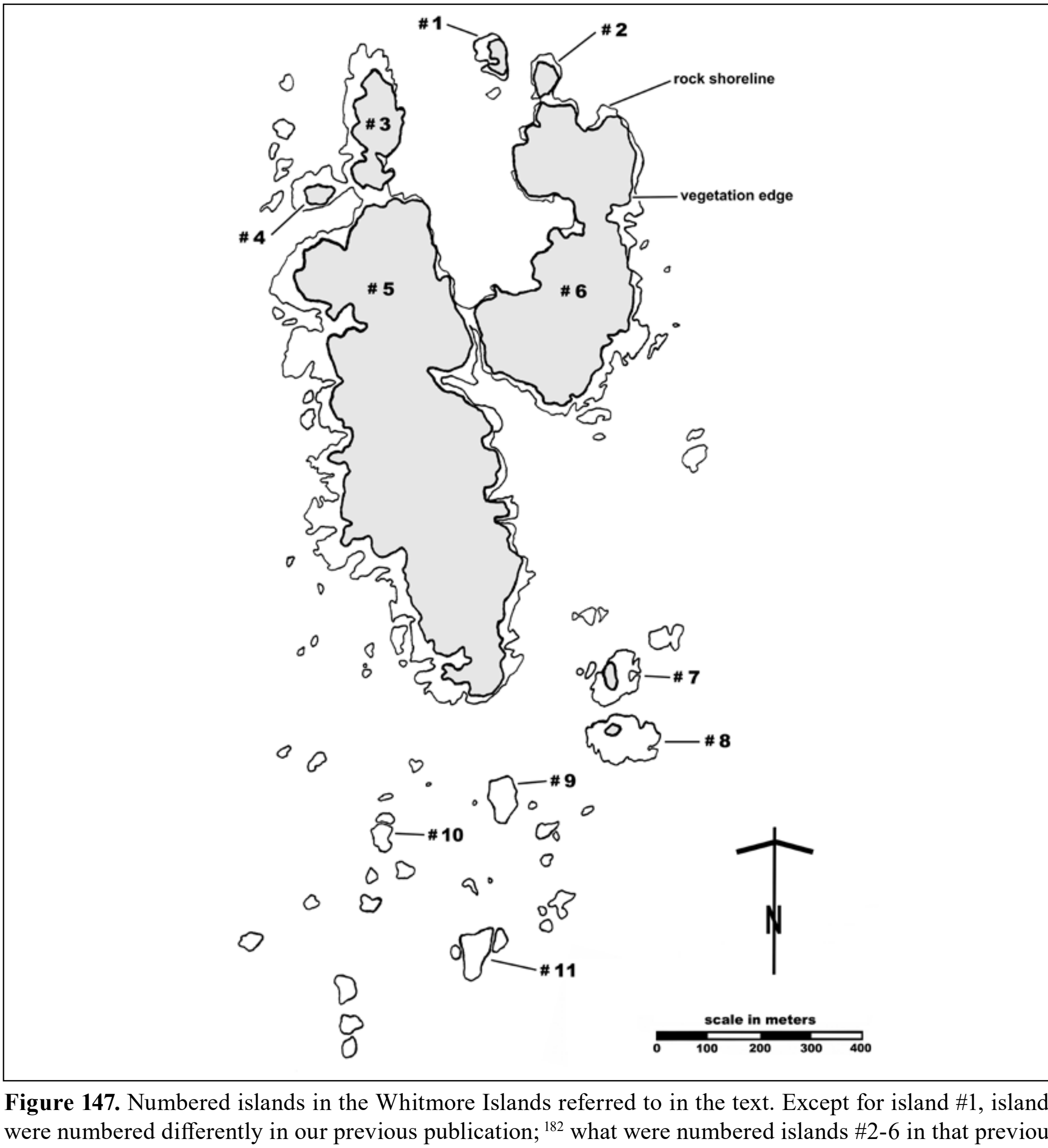


Figure 147. Numbered islands in the Whitmore Islands referred to in the text. Except for island #1, islands were numbered differently in our previous publication;[182] what were numbered islands #2-6 in that previous publication [182] are now numbered islands #7-11.

Description: *43.0 ha; 43 m high; Forested; Bare rock.* The topography of these islands is gently undulating except along rocky shorelines where small rock bluffs are frequent. The two main islands and the four northern islets (islands #1-6) are mostly forested, whereas the southern islets (#7-11) are mostly bare rock, except that there are small patches of vegetation on islands #7 and 8. Salmonberry and other shrubs form the predominant understory in the interior of the spruce forest, but extensive areas of false lily-of-the-valley, moss, and grass occur near shore, especially on raised, rocky knolls and exposed slopes (Figure 148). Small swaths of old and recent windfall were encountered in 1988.

Figure 148. Whitmore Islands are a diverse group of forested and bare islands. Forested islands have rocky shorelines and interior habitats of Sitka spruce, shrubs, and ferns. Marilyn Paul (now Lambert) is shown reviewing field notes on the rocky shore of one of the islands in 1976. *Photos by R. Wayne Campbell, 26 June 1976.*

Whitmore Islands are protected as part of Ecological Reserve No. 23, established in 1971.

Historical summary: Records from the BCPM survey in 1976 that pertained to the small islets northeast of the main Whitmore Islands have now been included in Table MC-290 for the Moore Islands (see above). This included all nesting records from 1976 for storm-petrels, Glaucous-winged Gulls, Pigeon Guillemots, and Cassin's Auklets, and some of the records for Black Oystercatchers and Rhinoceros Auklets that were previously listed for Whitmore Islands.[212, 265] CWS surveys were conducted on 23 May and 1, 5, and 20 June 1988 (Table MC-310).

Storm-petrels were nesting only on islet #7 off the southeast corner of the main island in 1988. They were not reported there in 1976. Rhinoceros Auklet burrows were noted around the main island in 1976, and occurred around the entire perimeter, except in low, level ground at the heads of bays, of all larger islands (#1-7) in 1988 (Figure 149).

Black Oystercatchers have been recorded nesting at five locations. In 1976, one nest was found on the most southerly rock (island #11; Figure 150). In 1988, nests were found on islands #7, 8, and 10 and on a rocky knob located in the south-facing bay formed where the two main islands (#5 and 6) join. Glaucous-winged Gulls were nesting on island #8 (17 nests) and on islands #9 and 10 (1 nest each) in 1988. None were recorded nesting on those islands in 1976. In 1988, Pigeon Guillemots were nesting in crevices and burrows on island #1 and were seen and suspected nesting on island #8.

Figure 149. A ground cover of false lily-of-the-valley conceals Rhinoceros Auklet burrow entrances at the edge of the forest on one of the main Whitmore Islands. *Photo by Moira J.F. Lemon, 23 May 1988.*

Figure 150. Black Oystercatcher nest among a patch of *Potentilla* sp. found on the southern rock of the Whitmore Islands in 1976. *Photo by R. Wayne Campbell, 26 June 1976.*

Table MC-310. Seabird nesting records for Whitmore Islands. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	GWGU	PIGU	RHAU	SOURCE
26 Jun 1976			1	0	(0)	1,500eS	265
May, Jun 1988	340t	230t	5[3]	19[13]	x(60)	12,400t	182

Remarks: Tree-nesting Peregrine Falcons were recorded in 1976 [42] and 1988. One unused Bald Eagle nest was found in 1976 (Figure 151), and we suspected one eagle nest was active in 1988. Eagles and falcons were preying on Rhinoceros Auklets in both years. Decapitated and everted Rhinoceros Auklet carcasses had likely been preyed on by falcons (Figure 152), but eagles were considered responsible for most feather piles and other prey remains found in colony areas.

Figure 151. Marilyn Paul (now Lambert) perched in a low, unused Bald Eagle nest found on the Whitmore Islands in 1976. *Photo by R. Wayne Campbell, 26 June 1976.*

River otter runs and scats containing fish were seen in 1988.

Figure 152. The bare sternum of this Rhinoceros Auklet carcass found on Whitmore Islands suggests that it was eaten by a Peregrine Falcon. *Photo by R. Wayne Campbell, 26 June 1976.*

MC-320 "LONE" ROCK

Location: *52°34'06"N 129°20'34"W; 103 A/11.*
East of Byers Islands, north of Sinnett Islets.

Description: *8 m high; Bare rock.*
This rock lies within Ecological Reserve No. 103, established in 1981.

Historical summary: There is no record of the BCPM visiting this rock in 1976. In 1988, no Black Oystercatcher nests were found but one pair of excited adults was present and hidden young were suspected (Table MC-320). Glaucous-winged Gull nests were built predominantly of seaweed.

Table MC-320. Seabird nesting records for "Lone" Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
19 Jun 1988	1eS	20[19]	182

Remarks: One depredated gull egg was found in 1988.

MC-330 BOWDEN ISLANDS

Location: *52°33'52"N 129°13'00"W; 103 A/11.*
West of Normansell Islands off the mid-west coast of Aristazabal Island. Bowden Islands were previously known as Sentinel Islands.

Description: *7.3 ha; 56 m high; Forested.*
The main island has a dissected, rocky shoreline with steep bluffs and crevices. There is an extensive rocky promontory at the southwest corner. Salal and salmonberry under a spruce forest cover much of the area (Figure 153); there are some open sections of grass and forbs. Some of the new growth of the young spruce had browning tips in 1988.

Historical summary: A Black Oystercatcher nest with three eggs (Figure 154) was found on the south rocks in 1976 (Table MC-330). No oystercatchers were seen in 1988. Glaucous-winged Gulls were nesting on the southwest rocks in 1976 and 1988, except one nest was found at the south end of the main island in 1976. More gulls were nesting in 1988 than in 1976.

Table MC-330. Seabird nesting records for Bowden Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
24 Jun 1976	1	3[2]	265
24 Jun 1988	0	18[10]	182

Figure 154. Black Oystercatcher nest found on the Bowden Islands in 1976. Eggs were laid on a sparse scrape of a few periwinkle, limpet, chiton, and mussel fragments. *Photo by R. Wayne Campbell, 24 June 1976.*

Remarks: One Bald Eagle was present in 1976. In 1988, we saw one active Bald Eagle nest and suspected that Peregrine Falcons were also nesting. There was little sign of predation on seabirds in either year. Three river otter dens and two slides were noted in 1976. Small trails, and some scats composed of crab shell found at the entrance to a burrow, may have indicated the presence of mink on the island in 1988.

Figure 153. A Sitka spruce forest covers most of the main island of the Bowden Islands. There are a few steep rocky bluffs around the perimeter. *Photo by R. Wayne Campbell, 24 June 1976.*

The Sea Provides

One of the bonuses of seabird surveys along the BC coast is the lure of searching through the flotsam and jetsam that washes up along remote island shores for some treasure that can be taken home at the end of the season. Natural items like seashells and animal skulls are always desirable (Figure 155), as are the much coveted (but man-made) ethereal glass balls that are washed in from the open Pacific. However, the flotsam and jetsam washed in from the sea often provides more practical items as well, and we have often gone to the shore to search for items that we wanted for a particular purpose, much like you might go to the hardware store in town when you need building materials. In some cases, items found proved to have even more worth than we initially thought, becoming a welcome and even necessary commodity as the field season progressed.

In 1988, after three weeks at the beautiful campsite we had found on the Moore Islands, we headed south to the Byers Islands. With our two inflatable boats fully loaded with our gear and our beach-combed treasures, we bounced over the waves at full tilt in order to keep the boats planing. As we drew closer to Byers Islands we could see that many trees were dead; the islands presented a ghostly appearance with a forest of dead snags standing like sentinels of a forgotten time. When we reached the islands, we had to navigate into the bay on the west side of the largest island that we had chosen as a suitable campsite. Many of the channels through the islands are a menace, with uncharted rocks in the shallow areas. We found a path through the kelp beds and nipped in between two shallow rocks to emerge into a calm but shallow passage to our chosen bay, arriving exactly at high tide, as we had planned, to make offloading our gear easier. Then our troubles started.

In the area where we thought we would camp, recent storm waves had tossed seaweeds and logs into the fringes of vegetation at the forest edge, covering any potential beach area. Above the beach, Cassin's and Rhinoceros Auklet burrows riddled the ground, false lily-of-the-valley and saxifrage spread in carpets over moss hummocks and old stumps, and thick growths of elderberry and salmonberry shrubs crowded beneath the dead skeletons of the past forest, leaving no place to set up a camp. The treasures from the sea provided our salvation.

As we had come into the shore we noticed a shipwrecked load of lumber strewn along the high tide line. There was more than enough lumber to create any wooden structure that we wanted - we would build ourselves a place to camp! After some consideration, we decided to build our camp on top of the massive piles of driftwood on the shore. We all gathered planks and Brian Carter heroically sawed up enough of the storm-tossed 2x12s to make platforms for our tents (Figure 156). We even built boardwalks to make easy paths from the beach rocks below and to the site of our kitchen tarp. And we found uses for our previous beach-combed treasures – during a spell of storm-bound induced ingenuity, we laid a sturdy length of plank across a channel that was just a bit too wide to jump and a bit too deep to wade, then used a pike pole that we had found around the Moore Islands as a balancing pole to make the crossing safe.

The location was not an easy place to bring the boats ashore, so we tied them across the narrow south facing access channel such that they always remained afloat (Figure 157). Several storms swept through during the time we were camped there, and we were concerned that the lines from boat to shore would fray against the rocks as the wind and waves blew in from the south. But once again, flotsam and jetsam came to the rescue, and I (Moira) found a perfect length of rubber tubing that would fit over the lines and withstand any abrasion that the rocks might inflict.

Figure 155. Searching tangled piles of seaweeds washed ashore can reveal seashells, goose-neck barnacles, fish skeletons, and even small fishing floats from Japan. *Photo by R. Wayne Campbell.*

Figure 156. Not being able to find a suitable campsite on Byers Islands in 1988, the CWS crew beach-combed a load of lumber that had washed ashore and built platforms for their tents over the piles of driftwood on the beach. *Photo by Moira J.F. Lemon, 21 June 1988.*

Figure 157. Boats were tied across a narrow channel on Byers Islands in 1988. The mooring was secure despite being exposed to southern gale-force winds. *Photo by Moira J.F. Lemon, 21 June 1988.*

MC-340 BYERS ISLANDS

Location: *52°33'42"N 129°24'29"W; 103 A/11.* West of Aristazabal Island, south of Moore Islands. Byers Islands were known as the Middle Ganders in the past.

Description: *32.6 ha; 50 m high; Forested; Bare rock.* These are low, undulating islands with moderate slopes. Few steep, rocky sections occur on the west side of the main island (#3), where crevices and tidal channels separate outer knobs from the main body of the island (Figure 158). False lily-of-the-valley, moss, grass, and profuse patches of saxifrage (*Saxifraga* spp.) grow in open areas near shore, but most of the interior of the main islands is dense salmonberry with sporadic elderberry under a spruce forest (Figure 159). There are grassy and rocky knolls on islands #4-6, located off the southwest corner of the main island (#3). Several smaller islands (#1, 7, 9, 10, and 11) on the north and east sides of the group are mostly bare rock.

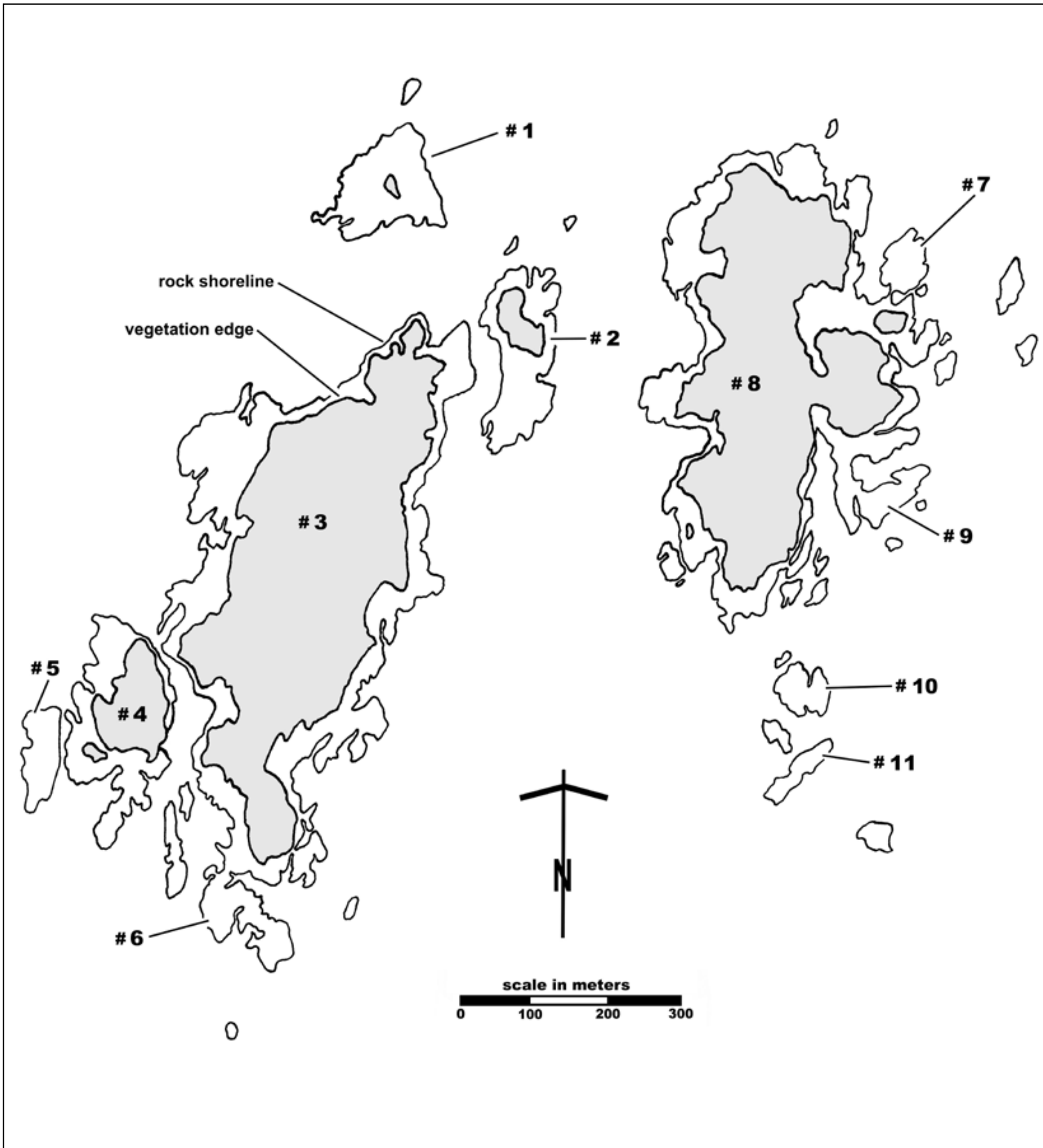


Figure 158. Numbered islands in the Byers Islands referred to in the text.

Figure 159. Byers Islands are mostly forested. Rock bluffs and many rocky knolls with patches of vegetation occur at the forest edge (shown here in three photos from island #4). Dense salmonberry is the main ground cover under a Sitka spruce forest (photo from island #8). *Photos by R. Wayne Campbell, 27 June 1976.*

In 1988, most of the forest was dead or dying, and silvered snags were more abundant than green trees (Figure 160). Young, 3-5m spruce were growing in many areas within salmonberry thickets. The mature forest appears healthy in 1976 pictures (see Figure 159).

Byers Islands were established as part of Ecological Reserve No. 103 in 1981.

Historical summary: CWS surveys were conducted on 29 May and 6-13 and 16-24 June 1988. Records suggest a number of changes in nesting populations between 1976 and 1988: storm-petrels may have disappeared, Tufted Puffins have declined, and Glaucous-winged Gulls and perhaps Rhinoceros Auklets have increased (Table MC-340). Surveyors in 1976 confirmed nesting (adults in burrows) by both species of storm-petrels on island #4 but noted only a few pairs nesting. No storm-petrel burrows were found in 1988, although we heard both species calling on several nights from our camp on the west side of the main island (#3).

Table MC-340. Seabird nesting records for Byers Islands. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	GWGU	PIGU	CAAU	RHAU	TUPU	HOPU	SOURCE
27 Jun 1976	x	x	8[8]	61[33]	x5(78)	7,000e	1,500eS	65eS(11+)		265
May, Jun 1988	E	E	10[9]	112[86]	x4(88)	18,800t	37,900t	3(6)	(1)	182

Figure 160. A forest of dead snags on Byers Islands can be seen in this view from the water in 1988. We found similar conditions on a number of nearby islands such as the McKenney Islands. *Photo by Moira J.F. Lemon, 20 June 1988.*

Many Tufted Puffins were flying about island #4 in 1976. Observers counted 14 puffin burrows and estimated a total of 65 burrows on the grassy slopes of that island. In 1988, the vegetated area of island #4 was heavily eroded; there was much bare ground and some old dead grass tussocks. Only a few Cassin's Auklets and Pigeon Guillemots were burrowing in the area. A maximum of six puffins were observed around the island, and only three burrows were located. Single puffins were seen flying into and out of those burrows. One Horned Puffin was recorded on two different days in 1988 flying and on the water near the area where Tufted Puffins were nesting.

Cassin's Auklet burrows were abundant on perimeter slopes of forested islands in 1976 and 1988. In 1976, Rhinoceros Auklets burrows were noted on both main islands (#3 and 8) but estimated numbers were much less than for Cassin's Auklets. The reverse was the case in 1988, when we estimated twice as many Rhinoceros Auklet as Cassin's Auklet burrows. Rhinoceros Auklet burrows were found around all forested islands (#2, 3, 4, and 8) in 1988. Different survey techniques confound the comparison, but observations suggest an increase in Rhinoceros Auklet numbers since 1976.

In 1988, Rhinoceros Auklets regularly foraged and staged within a 2 km radius of Byers Islands. Staging concentrations of more than 2,000 birds were seen off all sides of the islands. Birds gathered at staging areas as early as 16:00 hr, but generally later, between 19:30 and 22:00 hr.

Black Oystercatchers and Glaucous-winged Gulls have been found nesting on many of the rocky knobs and islets around the main islands. Oystercatcher nests were recorded at six locations in 1976 (Figure 161) and 1988. The distribution of oystercatcher nests was similar in the two years, except two nests with eggs were found in 1976 on the northern rock (island #1), where none were found in 1988, and two nests were found in 1988 on the northwest rocks of the main island (#3), where none were reported in 1976.

Glaucous-winged Gulls were nesting at more locations in 1988 than 1976. In 1988, gulls were nesting on the west rocks of island #3 (2 nests), island #2 (2 nests), and islands #10 and 11 (4 nests), where none were found nesting in 1976. Numbers of nesting gulls also increased and almost twice as many nests were found in 1988 than in 1976. Numbers increased at two locations used in both years: from 25 to 47 nests on the rocky areas of island #4; and from 30 to 56 nests on island #6. In contrast, six nests were found on rocks around the main east island (islands #7-9) in 1976, but only one incomplete nest was found in that area (on island #9) in 1988. No gulls have been found nesting on island #1 (Figure 162), although four adults were standing on those rocks in 1976.

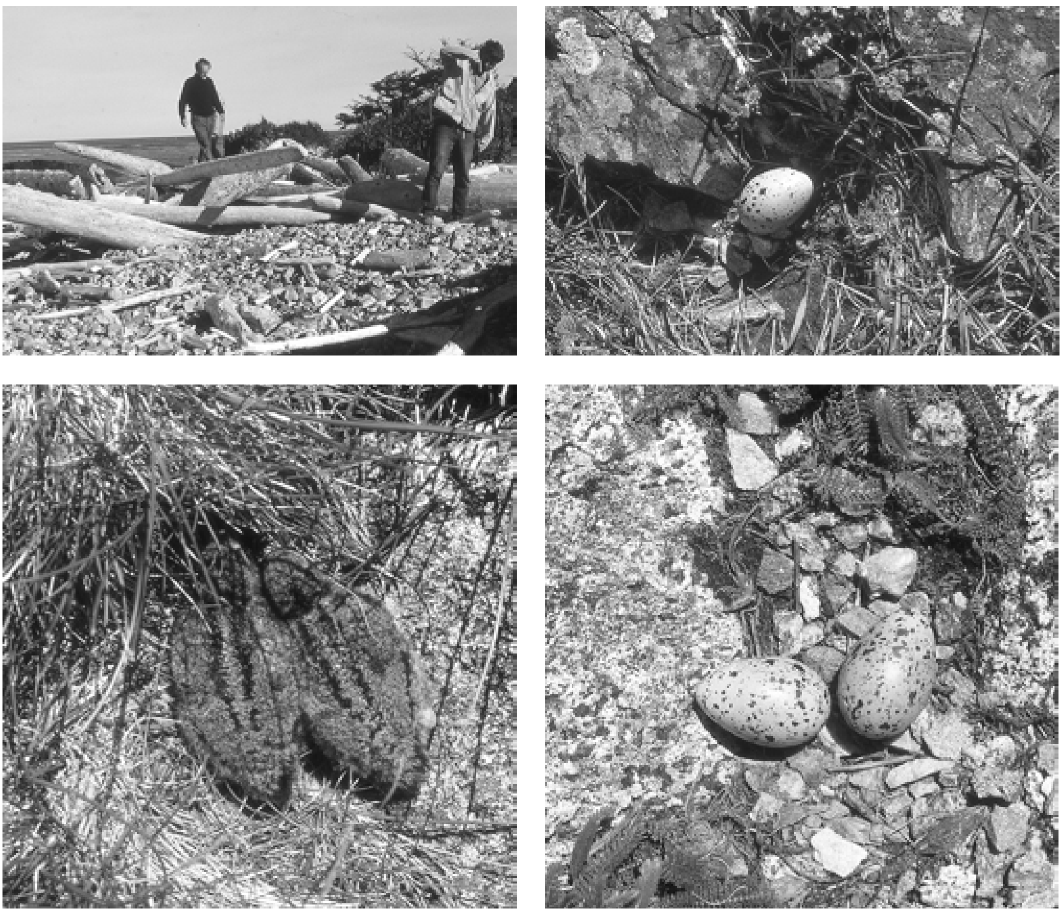


Figure 161. Nesting Black Oystercatchers were about mid-way through their breeding cycle on Byers Islands in late June 1976. Eight nests were found that contained eggs or young, four of which are illustrated here (clockwise from top left): Keith Taylor pointing a nest out to Dr. Harold Carter Sr. on the upper beach of island #1; one egg in a scrape with scant nest material at the edge of the forest; eggs laid on a few rock pebbles; and chicks hiding in vegetation. *Photos by R. Wayne Campbell, 27 June 1976.*

Figure 162. One lone tree grows on island #1 at the north end of the Byers Islands. Black Oystercatchers have been found nesting here (in 1976) but not Glaucous-winged Gulls, although the habitat appeared suitable. *Photo by Moira J.F. Lemon, 29 May 1988.*

Pigeon Guillemots were seen in several areas around the islands in 1976 and 1988. Nests with eggs were found in burrows and rock crevices on islands #4-6 in both years.

Remarks: Three Bald Eagle nests and one Peregrine Falcon nest were found in 1976. There were two Bald Eagle nests, one Peregrine Falcon nest, and one Common Raven nest in 1988. Falcons were nesting in trees in both years (Figure 163). Eagles and falcons were delivering Cassin's Auklets and Rhinoceros Auklets to nestlings in 1988. Few depredated remains were found on the colony in either year: two pairs of Leach's Storm-Petrel wings were found in 1976; and a few feather piles and wings of Cassin's and Rhinoceros auklets were found in 1988. Most foraging by eagles and falcons likely took place off the colony on the surrounding waters. Ravens were observed digging up burrows and preying on nesting birds in 1988. Surveyors found eight broken gull eggs in 1976 and two in 1988. Signs of river otter were seen in 1976 and 1988.

Figure 163. The first tree-nesting Peregrine Falcons in BC were discovered on Byers Islands in 1976.[42] The falcons were using an old Bald Eagle nest. *Photo by R. Wayne Campbell, 27 June 1976.*

MC-350 SINNETT ISLETS

Location: *52°32'27"N 129°20'10"W; 103 A/11.* Southwest of Byers Islands, north of Harvey Islands. Sinnett Islets were previously called South Gander Island.

Description: *5.2 ha; 15 m high; Forested; Bare rock.* Sinnett Islets are a cluster of small rocky and wooded islets (Figure 164). Understory of the spruce forest includes patches of luxuriant forbs, grass, and wood fern (*Dryopteris expansa*), alternating with thickets of salmonberry, currant (*Ribes* spp.), and elderberry shrubs (Figure 165). Much of the forest on the southwest islet (#7) was dead or dying in 1988.

Figure 164. Numbered islands in the Sinnett Islets referred to in the text.


Figure 165. Sinnett Islets are a group of small, forested and rocky islets. *Photos by R. Wayne Campbell, 27 June 1976.*

Sinnett Islets are part of Ecological Reserve No. 103, established in 1981.

Historical summary: Population estimates from 1976 and 1988 suggest dramatic increases for storm-petrels (Figure 166) and Cassin's Auklets, but improved survey technique and more thorough exploration may account for much of the difference in the estimates (Table MC-350). Storm-petrels and Cassin's Auklets were reported nesting on all vegetated islets with suitable burrowing habitat in both 1976 and 1988 (Figure 167).


Figure 166. Michael Rodway holding a Fork-tailed Storm-Petrel (left) and a Leach's Storm-Petrel and egg extracted from burrows on the Sinnett Islets in 1976. *Photos by R. Wayne Campbell, 27 June 1976.*

Figure 167. On the Sinnett Islets, storm-petrels nest throughout vegetated shoreline and interior forested areas, while Cassin's Auklets nest primarily within the grass, forb, and shrub perimeter. Glaucous-winged Gulls can be seen perched in trees in this picture of the northern (#2) islet. *Photo by Moira J.F. Lemon, 19 June 1988.*

Numbers of Glaucous-winged Gulls nesting more than doubled between 1976 and 1988. Gulls were also nesting on more islets: four in 1976 (islets #1, 4, 10, 11) and all 11 numbered islets in 1988. Nests were most abundant in both years on the outer northwest rock (islet #1; 25 nests in 1976 and 43 nests in 1988) and on the rock east of the northern vegetated islet (islet # 4; 11 nests in 1976 and 18 nests in 1988). Many nests were empty, especially in 1976. Black Oystercatchers were nesting in similar numbers and on most rocky islets in 1976 (Figure 168) and 1988. Pigeon Guillemots were also observed around many of the islets in both years. Guillemot nests were found under rocks and in burrows.

A Tufted Puffin was flushed from a burrow on the south tip of the northern grassy islet (#2) in 1976, and one suspected puffin burrow was found in the same location in 1988. Two Tufted Puffins and one Horned Puffin were recorded in 1976 and one Tufted Puffin was seen on the water in 1988.

Remarks: There was one active Bald Eagle nest on islet #5 in 1976 and 1988, and a male and female Peregrine Falcon were seen chasing eagles in 1976. Prey remains in the eagle nest in 1976 included Fork-tailed and Leach's storm-petrels and Cassin's and Rhinoceros auklets. Evidence of predation in colony areas was minimal in 1976 and 1988. Six depredated gull eggs were found on the northwest rocks in 1976, and four were found in 1988. River otter runs and scats of fish were seen in 1988.

Figure 168. It is unusual to find Black Oystercatcher eggs in a nest of grasses. This nest, found on Sinnett Islets #7 in 1976, may have been constructed earlier by a Glaucous-winged Gull. *Photo by R. Wayne Campbell, 27 June 1976.*

Table MC-350. Seabird nesting records for Sinnett Islets. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	GWGU	PIGU	CAAU	TUPU	HOPU	SOURCE
27 Jun 1976	450eS	720e	7[7]	40[12]	x2(24)	290eS	1(2)	(1)	38, 265
19 Jun 1988	19,200t	11,200t	7[5]	93[65]	x3(43)	2,100t	1S(1)	(0)	182

MC-360 CONROY ISLAND

Location: *52°31'30"N 129°24'30"W; 103 A/11.* West of Harvey Islands, south of Byers Islands. Colony includes the islet off the southeast corner. Conroy Island has been known as Cha Chekwas and Gander Island and was also identified as South Gander Island on early charts.

Description: *63.9 ha; 50 m high; Forested; Grassy rock.* This low, undulating, forested island has rocky shores and extensive tidal rock shelves off the southeast side (Figure 169). Small lagoons and inner beaches have formed along the upper edges of the rock shelves (Figure 170). Dense salal, salmonberry, and devil's club (*Oplopanax horridus*) occur under the spruce forest in many perimeter areas but open fringes of false lily-of-the-valley, moss, and grass are also frequent. Trees and shrubs along exposed western edges are windswept. Bare litter and moss occur inland. American glasswort (*Salicornia pacifica*) and sea plantain (*Plantago maritima*) are common around the lagoons.

The southeast rock is grassy (mostly dune grass), with angelica (*Angelica* spp.), montia (*Montia* spp.), false lily-of-the-valley, and some salmonberry in the interior. All but one of a small cluster of stunted spruce on the top of the rock were dead in 1988.

Conroy Island is included in Ecological Reserve No. 103, established in 1981.

Figure 170. Beach and inner lagoon on the southeast side of Conroy Island. *Photo by Moira J.F. Lemon, 29 May 1988.*

Figure 169. A view from sea of low and heavily forested Conroy Island. *Photo by R. Wayne Campbell, 27 June 1976.*

Historical summary: CWS surveys were conducted on 29 May, 12 June, and 13 June 1988. Records suggest some change in numbers and distribution of nesting species between 1976 and 1988 (Table MC-360). Glaucous-winged Gulls were nesting on the north and southeast rocks in both years, and total numbers more than doubled between 1976 and 1988. However, contrary trends occurred in the two nesting areas: numbers on the southeast rocks increased dramatically (from 50 to 194 nests), whereas numbers on the north rocks declined (from 47 to 14 nests) between 1976 and 1988. The trend for Black Oystercatchers was opposite that of gulls: only half as many nests, many of which were empty, were found in 1988 compared to 1976 (Figure 171).

No puffins were seen or suspected nesting in 1976 and they appear to have colonized the islet since. We confirmed Tufted Puffins nesting in 5 of 10 burrows found on the southeast islet and suspected a pair of Horned Puffins nesting in the same area in 1988. A pair of Horned Puffins were flying around and sitting on the water near the southeast islet the entire time we were present in 1988. Puffins declined between 1976 and 1988 on nearby Byers Islands (see above), suggesting possible movement between these colonies.

Leach's Storm-Petrel and Cassin's and Rhinoceros auklet burrows were scattered around the edges of the vegetation in 1976. More Cassin's and Rhinoceros auklet burrows were counted in 1988 than 1976, but this may be due to a more thorough inspection of the entire perimeter of the main island in 1988. Leach's Storm-Petrel burrows were found only on the southeast rock in 1988. Records are inadequate to determine whether the distribution of these three species has changed.

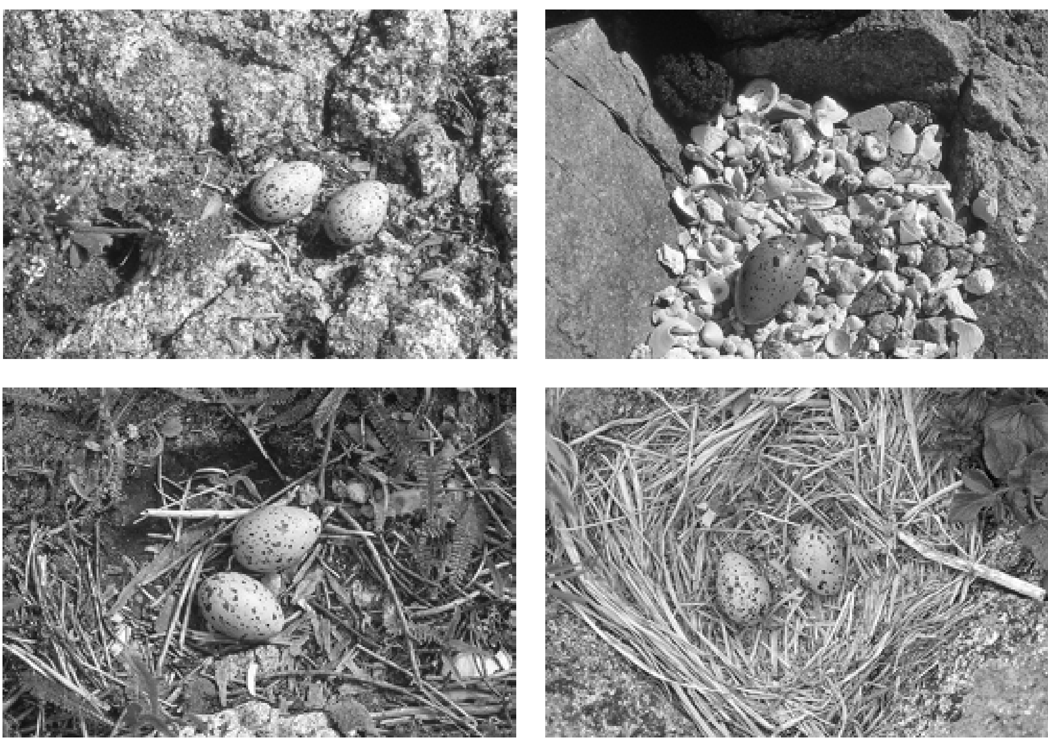


Figure 171. On Conroy Island, Black Oystercatchers lay eggs on a wide variety of substrates including (clockwise from top left): bare ground; shell fragments; grasses; and wood chips. *Photos by R. Wayne Campbell, 27 June 1976.*

Rhinoceros Auklets gathered on the water off the north and east sides of the island in 1988: 200 to the north on the evening of 29 May, and 600 to the east on the morning of 13 June.

Pigeon Guillemots were concentrated around the southeast islet, especially in 1988, and nests were found under rocks there in both 1976 and 1988.

Table MC-360. Seabird nesting records for Conroy Island. See Appendix 2 for codes.

DATE	LSPE	BLOY	GWGU	PIGU	CAAU	RHAU	TUPU	HOPU	SOURCE
27 Jun 1976	50e	14[14]	97[54]	x(15)	50eS	50eS			265
May, Jun 1988	75e	7[3]	208[107]	x2(148)	450eS	500eS	8(6)	1S(2)	182

Remarks: Six Bald Eagles were sighted in 1976 and we found one active eagle nest in 1988. Five broken gull eggs were found in 1976 and 16 were found in 1988. Otherwise, there was little sign of predation.

MC-370 HARVEY ISLANDS

Location: *52°31'06"N 129°19'06"W; 103 A/11.*
West of Arriaga Islands off the southwest coast of Aristazabal Island. Harvey Islands used to be known as Southeast Ganders.

Description: *39.0 ha; 45 m high; Forested; Bare rock.* Tidal rock and mud flats join this cluster of low islands (Figure 172). Rocky knobs and ridges occur along shorelines, but most of the area on these islands is flat with little slope. Spruce dominates the forest on small islands, mixing with hemlock and redcedar on larger islands (Figure 173). Dead snags are scattered throughout interiors, and some spruce on the northeast corner of the main island (island #3) appeared diseased in 1988. Pacific crabapple (*Malus fusca*) is common on perimeters. Thick shrubs, primarily salal or salmonberry, form most of the understory on forested islands, although robust twinberry (*Lonicera involucrata*) and other species are abundant along the east side of the largest island (#3). Fringes of grass and moss occur around the main island, and herbaceous areas are more extensive on some of the smaller islands. Some of the small northwest (#2) and southern islets (#10 and 11) are bare.

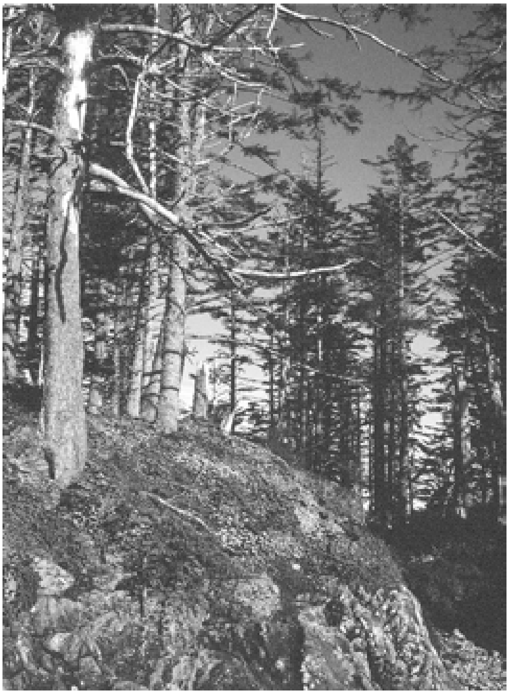


Figure 173. Open spruce forest on the northwest end of islet #6 is typical of the forest cover on the small islets within the Harvey Islands complex. *Photo by Moira J.F. Lemon, 13 June 1988.*

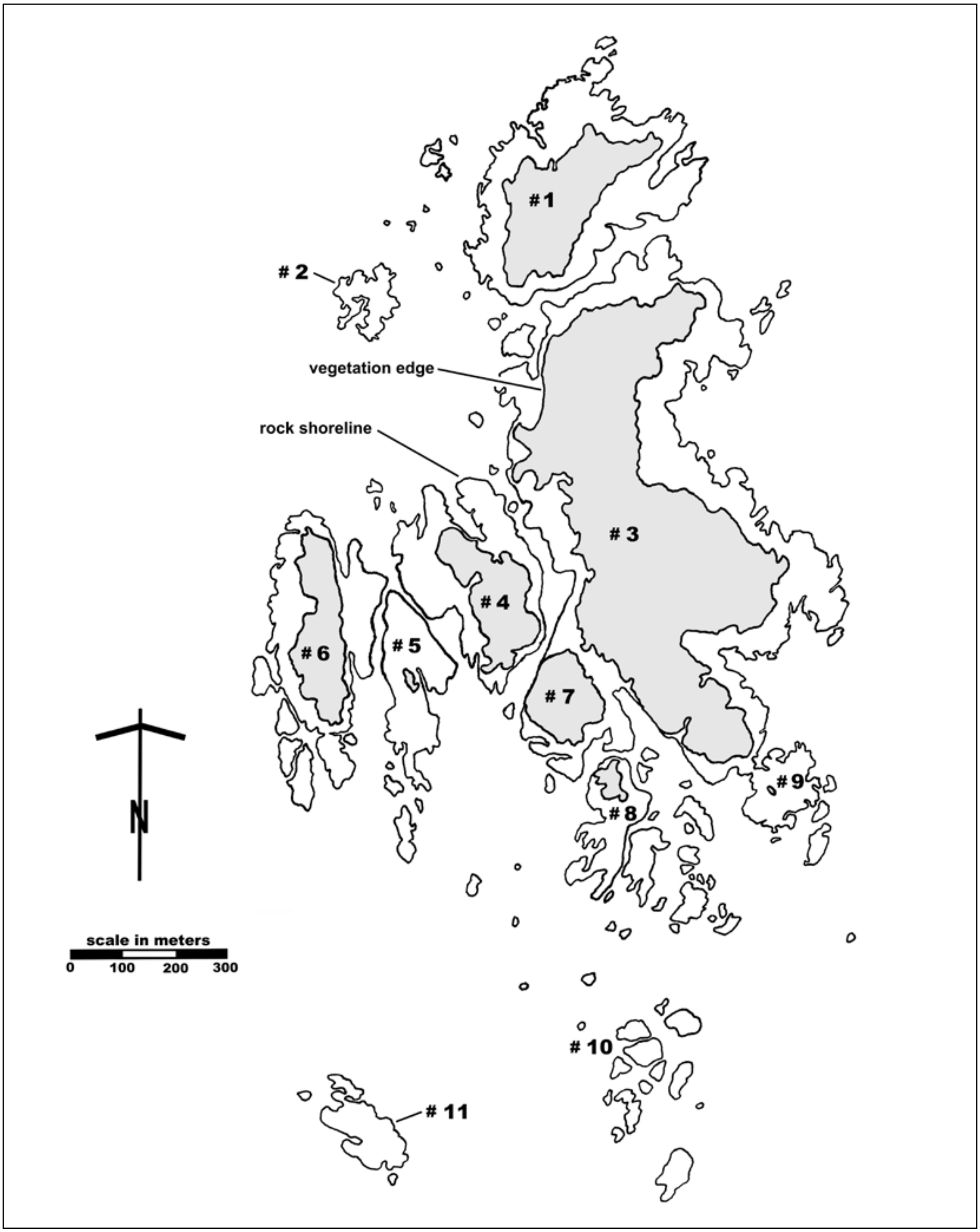


Figure 172. Numbered islands in the Harvey Islands referred to in the text.

Figure 174. Glaucous-winged Gull nesting area and nest on one of the southern rocks in the Harvey Islands in 1976. *Photos by R. Wayne Campbell, 24 June 1976.*

Historical summary: Glaucous-winged Gulls (Figure 174) and Black Oystercatchers (Figure 175) were nesting in several rocky areas around the islands in 1976 and 1988 (Table MC-370). As on other nearby islands, numbers of nesting gulls doubled between 1976 and 1988. Most gull nests were found on the southern rocks, islands #10 (14 and 50 nests in 1976 and 1988, respectively) and #11 (31 and 40 nests in 1976 and 1988, respectively). Single gull nests were found on island #5 in 1976 and 1988 and on islands #3 and #6 in 1988. More oystercatcher nests were also found in 1988 than 1976, but a total of 16 adult oystercatchers were present on various rocky areas around four of the islands in 1976, and more pairs may have been nesting. Oystercatcher nests were found on seven islands (#2, 3, 4, 5, 6, 8, and 9) in 1988. The opposite trend in oystercatcher numbers was seen on nearby Conroy Islands; perhaps there was some movement of birds between the two island groups.

Pigeon Guillemot nests were found under logs (on island #5 in 1976) and in burrows (on island #7 in 1988). Birds were seen around the north and west sides of the island group in 1988.

Cassin's and Rhinoceros auklets were found burrowing sporadically around the islands in both 1976 and 1988. In 1976, Cassin's (Figure 176) and Rhinoceros auklet burrows were found in perimeter areas around the north and west sides of the main island (#3), and a few Cassin's Auklet burrows (less than 20) were seen around islands #4 and 7. In 1988, Cassin's Auklet burrows were found around all islands with vegetated habitat (islands #1, 3, 4, 5, 6, 7, and 8), and they were mixed with Rhinoceros Auklet burrows around some sections of islands # 1, 3, 4, and 7. No evidence of storm-petrels nesting was reported in 1976. In 1988, all storm-petrel burrows were located on the westernmost island (#6), except for nine counted on the southeast islet (#9).

Figure 175. Black Oystercatcher nest with one egg located in a rock crevice on the western side of the Harvey Islands in 1976. *Photo by R. Wayne Campbell, 24 June 1976.*

Table MC-370. Seabird nesting records for Harvey Islands. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	GWGU	PIGU	CAAU	RHAU	SOURCE
24 Jun 1976			3[3]	46[35]	x(9)	170e	25eS	265
13 Jun 1988	100eS	100eS	12[8]	93[66]	x2(24)	710e[a]	160eS[a]	182

[a]Estimates for Cassin's and Rhinoceros auklets in 1988 were recalculated (using the BC median occupancy rate) from those previously presented.[182]

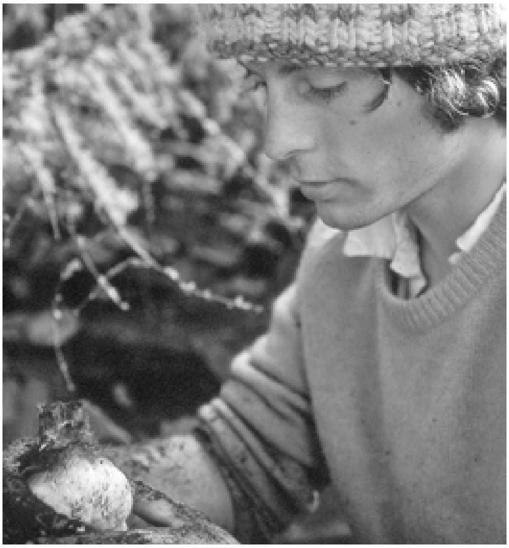


Figure 176. Harry Carter with an adult Cassin's Auklet found in a burrow on the Harvey Islands in 1976. *Photo by R. Wayne Campbell, 24 June 1976.*

One solitary Ancient Murrelet chick about 2 weeks old was seen swimming near shore along the outer southwest islands in 1988. However, there is no evidence of Ancient Murrelets nesting on Harvey Islands.

Remarks: We saw eight Bald Eagles in 1976 and found three eagle nests and one Peregrine Falcon tree nest in 1988. Remains of a Cassin's Auklet were found in 1976, and a few remains of Fork-tailed Storm-Petrels, Cassin's and Rhinoceros auklets, and Ancient Murrelets were found in 1988. A fresh Pigeon Guillemot carcass was encountered on the water in 1988. We suspected it had just been killed by a Peregrine Falcon. Signs of river otter were seen in 1976, and runs, a den, and scats were noted in 1988.

MC-380 ROGERSON ROCK

Location: *52°29'17"N 129°05'43"W; 103 A/6.*
West of Weeteeam Bay at the south end of Aristazabal Island.

Description: *15 m high; Bare rock* (Figure 177).

Figure 177. MV *Tedmac* waiting off Rogerson Rock while it was being surveyed in 1976. *Photo by R. Wayne Campbell, 24 June 1976.*

Historical summary: Black Oystercatcher (Figure 178) and Pigeon Guillemot nests found in 1976 and 1988 contained eggs but most Glaucous-winged Gull nests were empty in both years (Table MC-380).

Table MC-380. Seabird nesting records for Rogerson Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
24 Jun 1976	2[2]	37[4]	x2(4)	265
24 Jun 1988	1	52[16]	x2(6)	182

Remarks: Evidence of egg predation was seen in 1976 and 1988: 10 broken gull eggs were found in 1976 and 26 depredated eggs were found in 1988. No sign of predators was recorded in either year.

Figure 178. Black Oystercatcher nest of cockle, chiton, and turban shells found on Rogerson Rock in 1976. *Photo by R. Wayne Campbell, 24 June 1976.*

MC-390 STEELE ROCK

Location: *52º27'51"N 129º22'11"W; 103 A/6.*
South of Conroy and Harvey Islands, west of the south end of Aristazabal Island.

Description: *16 m high; Bare rock.*
Vertical basaltic blocks make Steele Rock look like a giant stairway ascending from the south end, bounded on the other three sides by precipitous faces (Figures 179 and 180).

Figure 179. A silhouette view of Steele Rock from the water. *Photo by R. Wayne Campbell, 27 June 1976.*

Figure 180. Vertical basaltic columns on Steele Rock make exploring the island a challenge. *Photo by R. Wayne Campbell, 27 June 1976.*

Historical summary: In 1976, nine Pelagic Cormorant nests had been built but only two breeding birds were present and only two nests contained eggs (Table MC-390). One of the nests contained a large egg that Harry Carter and Keith Taylor suspected belonged to a Brandt's Cormorant (Figure 181). Eight Brandt's Cormorants in breeding plumage were present. We have not considered this record as confirmation of breeding by Brandt's Cormorant in this region, but it remains a possibility given

Figure 181. The identification of this cormorant egg found on Steele Rock in 1976 remains inconclusive. Observers suspected that it was a Brant's Cormorant egg because of its shape and size, but it was found in what appeared to be a typical Pelagic Cormorant nest. Observers were not able to take measurements that could help distinguish eggs of the two cormorant species. *Photo by R. Wayne Campbell, 27 June 1976.*

Table MC-390. Seabird nesting records for Steele Rock. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
27 Jun 1976	9[2]	1	4[3]	(1)	265
12 Jun 1988	0	1eS	0	S(3)	182

intermittent breeding at colonies further north in Alaska.[244] Black Oystercatchers (Figure 182) and Glaucous-winged Gulls were confirmed breeding in 1976.

Figure 182. Finding a Black Oystercatcher nest on Steele Rock was a daunting but ultimately rewarding task. *Photo by R. Wayne Campbell, 27 June 1976.*

In 1988, there were 116 immature Brandt's Cormorant and 14 non-breeding Pelagic Cormorants roosting on the rocky shores. Eleven adult Glaucous-winged Gulls were standing on the top of the rock but there was no sign of nests. A pair of Black Oystercatchers was very excited on the top of the rock and we suspected nesting but no nest was found; there may have been hidden chicks. Three Pigeon Guillemots flushed off the north end of the rock as we approached.

Remarks: Two broken Pelagic Cormorant eggs were found in 1976. In 1988, the top of the rock was littered with old and recent depredated remains, predominantly of shearwaters, though one Pelagic Cormorant skull was found. Two large Bald Eagle pellets accompanied the remains.

MC-400 "PRICE" ROCKS

Location: *52°18'08"N 128°44'06"W* (west of northern two rocks)*; 52°17'57"N 128°43'34"W* (east of northern two rocks)*; 52°16'21"N 128°43'20"W* (southern rock)*; 103 A/7.*
This colony includes unnamed rocks located west of the south end of Price Island, north of McInnes Island. Nesting has been recorded on three of those rocks.

Description: *12 m high; Bare rock.*
The northern two of these granitic rocks have corrugated surfaces. The southern rock is dome-shaped with steep sides.

Historical summary: Black Oystercatcher nests have been found only on the west of the northern rocks (1 nest in 1976 and 1988; Table MC-400). Glaucous-winged Gulls were nesting on all three rocks: 3 and 1 nest on the west north rock, 35 and 21 nests on the east north rock, and 38 and 60 nests on the south rock in 1976 and 1988, respectively. Most gull nests were empty in 1988. Pigeon Guillemot was included on a list of observed species in 1976 but no count or other information was provided. No guillemots were seen in 1988.

Table MC-400. Seabird nesting records for "Price" Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
23 Jun 1976	1	76[71]	(≥1)	265
24 Jun 1988	1	82[23]	(0)	182

Remarks: No signs of predation were noted in 1976, but in 1988 most gull nests were empty and 13 depredated gull eggs were found.

MC-410 “LIMIT” ROCKS

Location: *52°06'45"N 128°28'58"W; 103 A/1.*
Southwest of Limit Island, south of Athlone Island.

Description: *6 m high; Bare rock.*
These irregular granitic rocks have tufts of vegetation in higher clefts. They are within the Outer Central Coast Islands Conservancy established by BC Parks in 2005.

Historical summary: Glaucous-winged Gull nests were found on two rocks in 1976 (Table MC-410). The number of nesting gulls had declined by 1988 when we found only one nest with a depredated egg. Five Black Oystercatchers were noted in 1976 but no evidence of nesting was reported. In 1988, one pair of oystercatchers was attending an empty nest. Pigeon Guillemot nests were found under rocks and in a rock crevice in 1988.

Table MC-410. Seabird nesting records for “Limit” Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
21 Jun 1976		27[18]	(0)	265
28 Jun 1988	1S	1	x3(14)	182

Remarks: No evidence of predation was seen in 1976, but 10 Northwestern Crows were noted. As soon as we arrived in 1988, two crows flew to the rock where seabirds were nesting. It was unknown whether they were responsible for the depredated gull egg in 1988 or whether they may have been associated with the decline in gull numbers since 1976.

MC-420 FINGAL ISLAND

Location: *52°04'43"N 128°26'51"W; 103 A/1.*
Southwest of Thompson Bay, northwest of McMullin Group.

Description: *3.1 ha; 40 m high; Forested.*
Fingal Island is formed of fantastical columnar basalt (Figure 183). Northeast faces are precipitous, while the southwest side is gently stepped. There is a beach joining the northeast rocks to the main island. The top of the island has a spruce forest, with a lush understory of grasses and forbs (Figure 184). There are some patches of salmonberry in the interior. The southeast knob has a small stand of spruce surrounded by grass and forbs. Lower rocks are bare.

Figure 183. Columnar basalt formations are a striking feature of Fingal Island. Glaucous-winged Gulls that nest on the island roost on the rocks and in the tree tops. *Photo by Moira J.F. Lemon, 28 June 1988.*

The island lies within BC Parks' Outer Central Coast Islands Conservancy, established in 2005.

Historical summary: Guiguet discovered a small colony of Fork-tailed Storm-Petrels in 1948 (Table MC-420). No evidence of nesting by storm-petrels was observed on subsequent visits.

Black Oystercatcher nests were found on the west end of the main island, the north rock, and the southeast rock in 1988. Glaucous-winged Gulls were nesting mainly on the southeast rock. One gull nest was located on the north rock in 1976 and 1988. Guiguet and Martin noted several Pigeon Guillemot

Figure 184. Fingal Island's open spruce forest has a lush understory of grasses, false lily-of-the-valley, and many other flowering plants**.** *Photo by Moira J.F. Lemon, 28 June 1988.*

burrows in 1948. Pigeon Guillemots were seen around the southeast rock in 1976 and 1988 and nests were found under rocks there in 1988.

Table MC-420. Seabird nesting records for Fingal Island. See Appendix 2 for codes.

DATE	FTSP	BLOY	GWGU	PIGU	SOURCE
4 Aug 1948	x		30e	S(12)	93, 265
21 Jun 1976		1	51[10]	S(32)	265
28 Jun 1988	E	3[2]	48[35]	x2(25)	182

Remarks: Signs of river otter were noted in 1976 and the northwest end of the island showed heavy use by river otters in 1988. Scats were composed of fish. There was one Bald Eagle nest in 1976 and 1988. Three broken gull eggs were found in 1976 and one depredated egg was found in 1988.

MC-430 GUANO ROCKS

Location: *52°02'54"N 128°21'35"W; 103 A/1.*
At the north end of Queen's Sound, west of the Tribal Group.

Description: *8 m high; Bare rock.*
These rocks are within BC Parks' Outer Central Coast Islands Conservancy, established in 2005.

Historical summary: A Black Oystercatcher nest with three eggs was found in 1976 but no oystercatchers were present in 1988 (Table MC-430). Similar numbers of Glaucous-winged Gull nests were counted in 1976 and 1988 but more nests were empty in 1988. Pigeon Guillemots were nesting under rocks in 1988.

Table MC-430. Seabird nesting records for Guano Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
21 Jun 1976	1	13[9]		265
28 Jun 1988	0	11[5]	x2(4)	182

MC-440 “FITZMELON” ROCK

Location: *52°02'16"N 128°17'24"W; 103 A/1.*
Off the mid-east side of Athabaskan Island, north of Tide Rip Passage.

Description: *3 m high; Bare rock.*
This small rock lies at the eastern boundary of the Outer Central Coast Islands Conservancy established by BC Parks in 2005.

Historical summary: We have no record of this rock being visited by BCPM crews in 1976. We found Glaucous-winged Gulls nesting in 1988 (Table MC-440).

Table MC-440. Seabird nesting records for “Fitzmelon” Rock. See Appendix 2 for codes.

DATE	GWGU	SOURCE
28 Jun 1988	3[2]	182

Remarks: One depredated gull egg was found in 1988.

MC-450 GOOSE GROUP

Location: *51°58'N 128°26'W; 103 P/16.*
West side of Queen’s Sound. The Goose Group includes Goose, Gosling, Duck, Swan, Gull, and Snipe islands. The group was formerly known as Goose Islands; the name was changed to Goose Group in 1948.

Description: *2,326 ha; 66 m high; Forested.*
These are low islands with extensive rocky shores, sandy bays, and tidal flats. Most perimeter habitat is dense salal under spruce, hemlock, and redcedar, though mossy ground occurs in interior areas. The small grassy islet off the mid-west coast of Goose Island is surrounded by beach and tidal rock (Figure 185). The ecology of the islands has been described in detail by Guiguet (Figure 186).[93]

Goose Island is part of the Hakai Lúxvbálís Conservancy established by BC Parks in 2008.

Historical summary: Guiguet spent the summer of 1948 in the Goose Group and estimated nesting populations for the group as a whole (Table MC-450).

Figure 185. Extensive shallow-sloping rock connects the small offshore islet to the west side of Goose Island at low tide. *Photo by Moira J.F. Lemon, 27 June 1988.*

Figure 186. Charles J. Guiguet studied the ecology of Goose Island on the northern mainland coast for his Master's thesis [93] under the supervision of Ian McTaggart-Cowan at UBC. This photo shows the professor, Dr. Cowan (left), and student, Guiguet, atop a mountain looking for Vancouver Island Marmots. While both contributed to seabird studies in BC, Guiguet, as Curator of the Birds and Mammals Division at the BC Provincial Museum, spent much of his professional life investigating marine birds. Guiguet gathered much of the early information on nesting seabirds presented in the first catalogue of BC seabird colonies written by Rudi Drent.[77] *Photo by James F. Bendell, 29 August 1950.*

He included Gosling Rocks within his study area. Gosling Rocks are not officially part of the Goose Group and we present a separate colony account for them below.

Guiguet indicated that Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots were nesting in the Goose Group, but he did not specify how many. We have listed his population estimates for all species under Gosling Rocks, as he states that nesting gulls were concentrated there. In the Goose Group, he reported oystercatchers nesting on rocky headlands around the islands. He also described and photographed Pigeon Guillemot nesting sites (p. 62 in Guiguet [93]) and noted a concentration of 98 guillemots around Gosling Island in the third week of May. Guillemots were nesting in crevices in slab rock, under large driftwood on the shore, and in burrows at the edge of the vegetation above rock faces.

Guiguet collected Fork-tailed and Leach's storm-petrels with brood patches in the vicinity of Goose Island and suspected nesting in the area but found no signs of burrows on the Goose Group.

BCPM crews likely boated by parts of the Goose Group in 1976 but no observations were recorded. In 1988, oystercatchers were nesting on the small islet off the mid-west side of Goose Island, but no other evidence of nesting was observed around the island group (Figure 187).

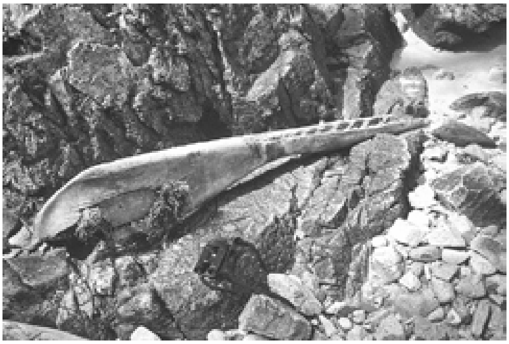


Figure 187. The shorelines of remote islands along the BC coast often yield up secrets of the deep. During our explorations within the Goose Group in 1988, we found this six foot long jawbone of a toothed whale on the west side of Goose Island. A pair of binoculars seen below the bone provides scale. *Photo by Moira J.F. Lemon, 26 June 1988.*

Table MC-450. Seabird nesting records for the Goose Group. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
May, Jun 1948	x[a]	x(98+)[a]	93
27 Jun 1988	2	(4)	182

[a] Population estimates for 1948 are listed for Gosling Rocks; see text.

Remarks: Guiguet found no evidence of river otter, mink, or Sitka Black-tailed Deer (*Odocoileus hemionus sitkensis*) in the Goose Group in 1948. Those animals were common in 1988: we saw families of river otters and deer, individual mink, and abundant scats and trails of all three species. A local First Nations person, camping on the island, informed us that deer were introduced by First Nations people in the 1950s (Figure 188).

Figure 188. The Sitka Black-tailed Deer occurs west of the Coast Mountains in BC and is present on offshore islands off northern parts of the outer coast. It was absent from the Goose Group when Guiguet conducted his studies in 1948 [93] and was apparently introduced to these islands by First Nations people in the 1950s. It was common on the islands in the 1980s. *Photo by R. Wayne Campbell.*

Guiguet suspected crow predation on oystercatcher eggs in 1948 (see Gosling Rocks). A family of ravens were harassing nesting oystercatchers and were seen carrying off eggs in 1988. Guiguet noted that Bald Eagles were "extremely numerous" around the islands and found four nests in 1948 (Figure 189). There were six active Bald Eagle nests in 1988.

Figure 189. Bald Eagles often perch in trees on the Goose Group when they are not off foraging. *Photo by Alan D. Wilson.*

MC-460 GOSLING ROCKS

Location: *51°52'13"N 128°27'35"W; 103 P/16.* South of the Goose Group. Colony includes all islets between Gosling Island and Currie Islet (Figure 190).

Description: *12 m high; Grassy rock; Bare rock.*

Most of the Gosling Rocks are bare. Three rocks in cluster #4 and one rock in cluster #7 (Figure 190) have grassy patches on higher sections. A small clump of windswept spruce has grown on the highest rock of cluster #4 (Figure 191). Those trees were alive in 1976 but were just snags in 1988 (Google Earth shows live trees there again in 2020).

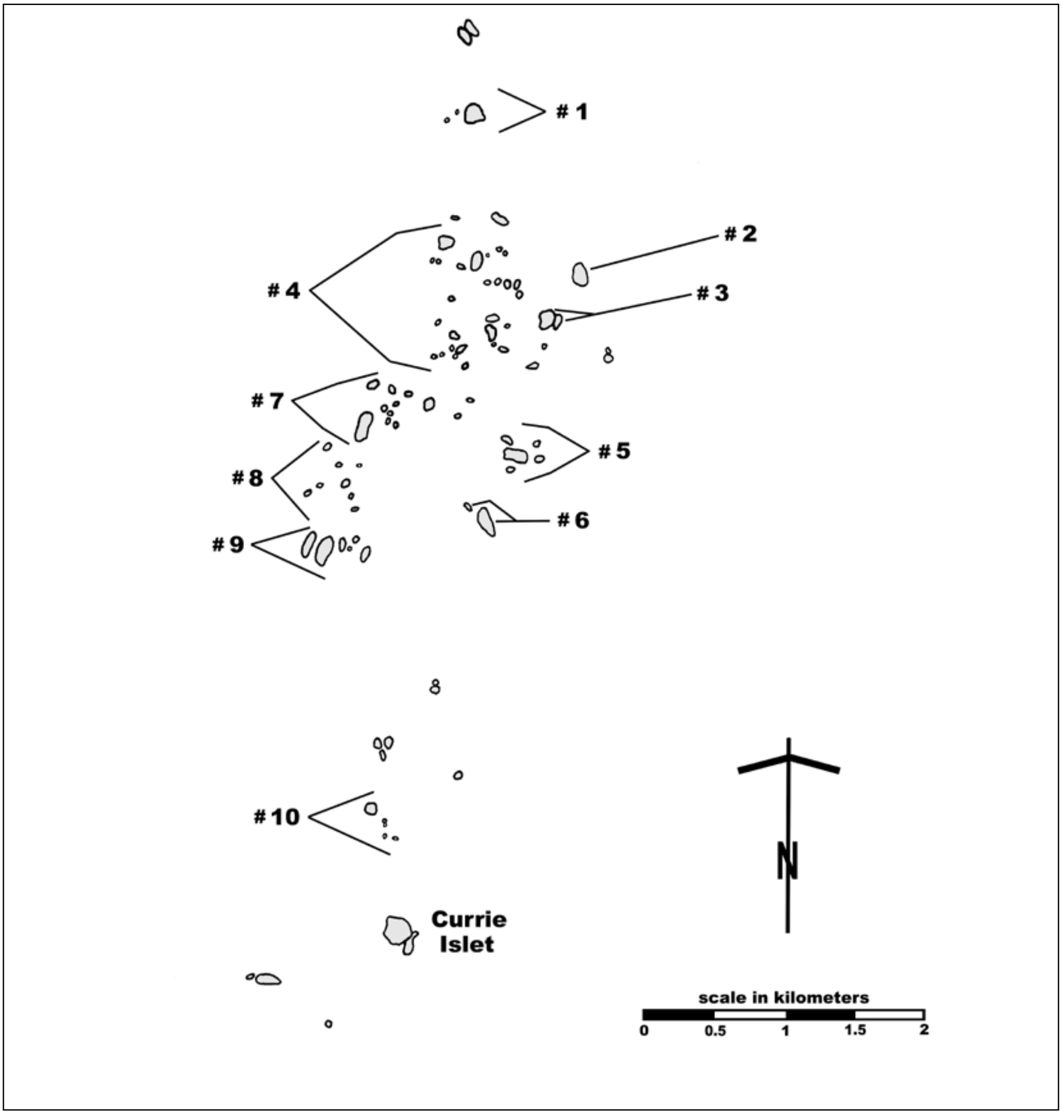


Figure 190. Numbered clusters of rocks in the Gosling Rocks referred to in the text.

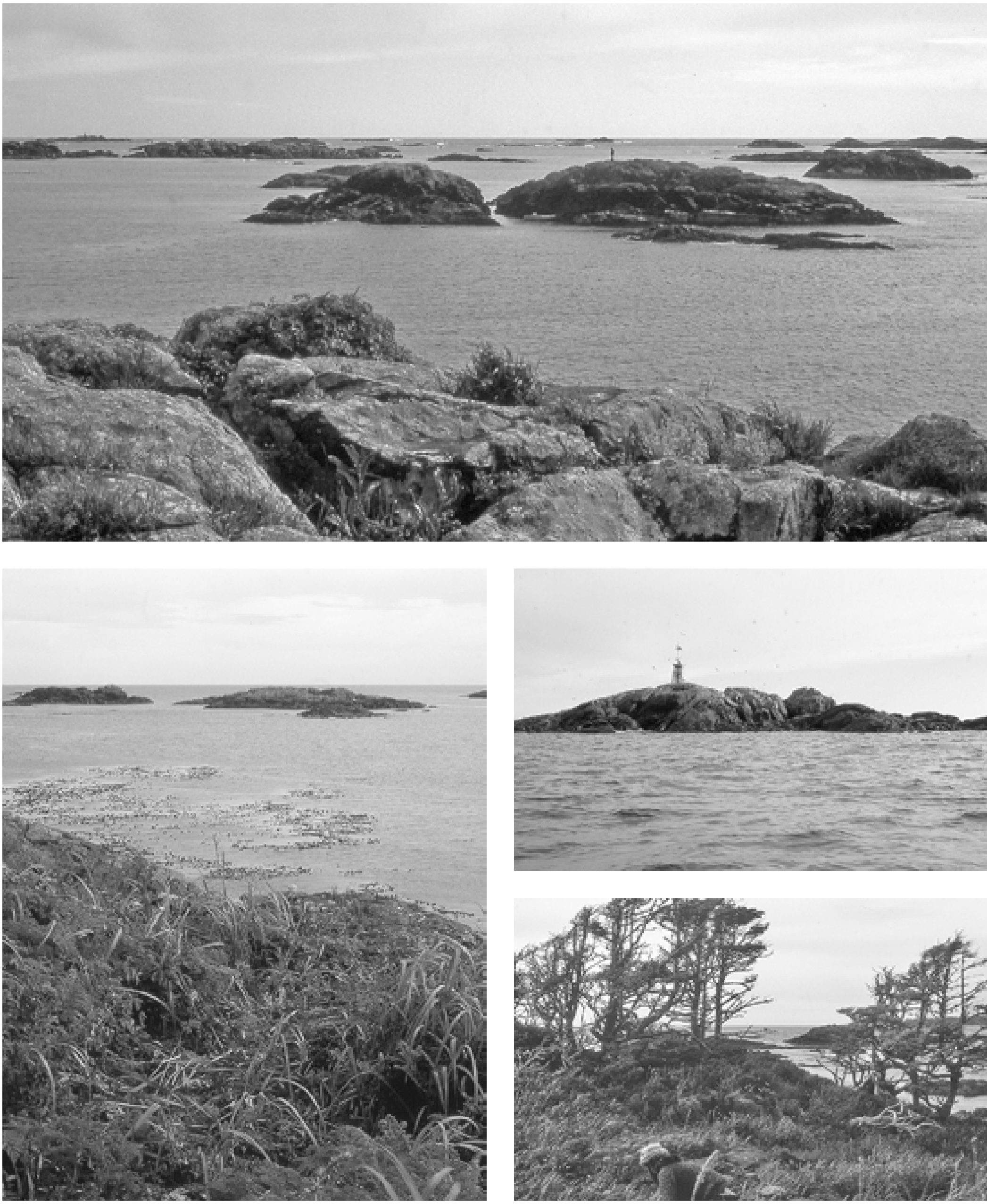


Figure 191. Most of the Gosling Rocks are bare rocky islets. In 1976, a small group of wind-blown spruce trees crowned the highest rock. Those trees had died off by 1988, but live trees were growing there again in 2020. *Photos by R. Wayne Campbell, 20 June 1976.*

Gosling Rocks are encompassed by the Hakai Lúxvbálís Conservancy, established in 2008.

Historical summary: Guiguet's [93] estimated nesting populations for the entire Goose Islands group (including Gosling Rocks) in 1948 have been listed here (Table MC-460), though some of that population nested at other locations in the group (see Goose Group account above). Black Oystercatchers were found nesting on eight rocks in 1976 (Figure 192) and seven rocks in 1988. Two unusual oystercatcher nests located in cavities in old tree roots that had washed ashore were found on rock #7 in 1988. Birds had lined the cavities with shells. Glaucous-winged Gulls nested on seven rocks in 1976 and nine rocks in 1988. In 1988, gulls were nesting on rocks in all numbered clusters except #1. Gull numbers were much reduced in 1976 relative to the 1948 estimate. Numbers of nests counted increased dramatically between 1976 and 1988, but most nests were empty or only partially constructed in 1988.

Guiguet estimated a large nesting population of Pigeon Guillemots in the Goose Islands group during his extensive stay in 1948. He noted concentrations gathered during the third week of May at six locations around the rocky islands. As noted, only part of that population occurred around Gosling Rocks. We recorded no guillemots in 1976, but confirmed nesting on four islets (#4, 5, 8, and 9) in 1988. Data are not adequate to conclude that Pigeon Guillemot nesting populations have declined since 1948. Repeated surveys at times of maximum concentration are required to determine if populations comparable to those observed by Guiguet still occur on the islands.

Table MC-460. Seabird nesting records for Gosling Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
May-Aug 1948	17[a]	150e[a]	500e(1,000)[a]	77, 93
20 Jun 1976	12[11]	12[11]	(0)	265
27 Jun 1988	9[5]	83[24]	x7(31)	182

[a] Some of these birds were nesting in the Goose Group; see text.

Remarks: Guiguet, in June 1948, noted that few oystercatcher nests contained eggs and found one oystercatcher egg with evidence of crow predation. He suspected that the large population of about 80 crows he observed around the islands was responsible for the many empty oystercatcher nests he found. Guiguet also noted that crows and native fisherman regularly raided the gull colony in 1948, collecting most of the eggs. Nine depredated gull eggs were found in 1988.

Two adult and one immature Bald Eagle were seen in 1976, and there was one Bald Eagle nest containing one large young on the treed islet in 1988. River otter runs through grassy areas were seen in 1976 and 1988. We saw a Sea Otter (*Enhydra lutris*) swimming among the islands in 1988.

Figure 192. Black Oystercatchers were found nesting on eight islets of the Gosling Rocks in 1976. In these two nests, eggs were laid on sea shells (left) and bare ground. *Photos by R. Wayne Campbell, 20 June 1976.*

Where's Our Boat, Dude?

As we've mentioned before, Dr. Harold "Doc" Carter (Figure 193), an orthopedic surgeon by trade, bought the Tedmac *to serve as the mothership for the BCPM surveys in the 1970s. He and his first-mate son Harry took courses to learn what they needed to know to skipper the boat through the remote coastal waters of BC. But with no previous practical experience, "Doc" mastered the art of being a captain as we went. Unbelievably, we never broke down, never hit a rock, and never ran dry on a sandbar. Considering the inexperience of the crew and the challenging waters we travelled through in the three years using the* Tedmac*, it was amazing that there were no major mishaps or life-threatening incidents. Except one.*

The first year with the Tedmac *was spent along the west coast of Vancouver Island in the summer of 1975. Surveys along the mainland coast were the second year of working from the boat. By this time we had developed a familiar routine. Leaving the skipper and often one other person on board the* Tedmac *to motor north to the next anchorage, the rest of the crew in the two zodiacs would leave the mothership in the morning, stop off at the various islands that we were surveying that day, and rendezvous with the* Tedmac *at the pre-arranged meeting place in the evening. We generally tried to get back to the boat well before dark in time for supper that Doc had often prepared for us – we were spoiled. But it was often difficult to predict how long surveys of particular islands would take and sometimes we were late.*

One day we were particularly late and it was getting dark by the time we approached our rendezvous point. When we got there, there was no boat. We were stunned. We had no camping gear, no food except bits of leftover lunch, and no idea how well we might survive a night out without our mothership. The inlet where we thought we were supposed to meet was not conducive to landing, let alone to having a nice roaring bonfire to keep us warm through a night ashore – the shoreline was steep and densely forested with no place to pull the zodiacs safely ashore. And besides we didn't know what had become of Doc and Marilyn Paul (Marilyn had stayed behind that day to assist Doc and keep him company), nor where the Tedmac *might be. We scrambled to make a plan in the falling darkness.*

Safe anchorages are often far apart along the outer coast. In dim light, we studied our charts to try and guess where Doc might have ended up. We assumed he had kept going further north. The next possible anchorage seemed to be about 20 miles away in the next inlet. We checked our gas tanks. We didn't carry a lot of extra fuel on each day's outing and we figured we would have to be lucky to make it all the way to the next anchorage before running out of fuel. We had no choice but to run in the dark – always a risky undertaking when you cannot see logs, deadheads, or other floating debris. And we couldn't go slowly - zodiacs burn much more fuel going slow than when they are up planing over the water at high speed. So like pirates in the night, we flew through the darkness with the wind in our faces and hoped fate would not deal us a deadly blow. Indeed, the Fates were ultimately kind to us that night.

After almost two hours we approached where we anticipated the Tedmac *might be. Our spirits soared when we could see its anchor lights, serving as friendly beacons to guide us home. When we pulled up to the* Tedmac*, Marilyn ferociously hugged us all – she had been so worried that we were all lost! In the end there was only one serious consequence of our mishap – our dinner was cold!*

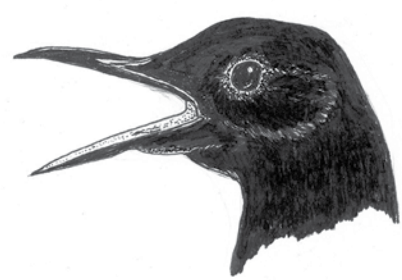


Figure 193. "Doc" Carter was an integral part of the BCPM team during surveys of the BC outer coast. He is shown here on 26 June 1976 (clockwise from top left): preparing freshly-caught rockcod for dinner at the Moore Islands; erecting an Ecological Reserves sign on the Moore Islands; and pretending to be a nest-building Bald Eagle in an old nest in the Whitmore Islands. *Photos by R. Wayne Campbell.*

MC-470 CURRIE ISLET

Location: *51°51'04"N 128°27'26"W; 103 P/16.*
At the south end of Gosling Rocks in the Goose Group (see Figure 190).

Description: *0.6 ha; 8 m high; Bare rock.*
There is a navigational beacon on this rock, which is within the Hakai Lúxvbálís Conservancy established in 2008.

Historical summary: One Black Oystercatcher nest with one egg was found (Figure 194), and two other pairs of oystercatchers were suspected nesting in 1976 (Table MC-470). Three pairs of oystercatchers were also suspected nesting in 1988 but no nests were found. As on Gosling Rocks, most Glaucous-winged Gull nests were empty in 1988. A Pigeon Guillemot nest with one egg was found under a rock in 1976.

Figure 194. A Black Oystercatcher nest with one egg was found on Currie Islet in 1976. The egg was laid on bare ground between two rocks. *Photo by R. Wayne Campbell, 20 June 1976.*

Table MC-470. Seabird nesting records for Currie Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
20 Jun 1976	3e	27[12]	x(6)	265
27 Jun 1988	3eS	32[8]	S(4)	182

Remarks: Six broken gull eggs were found in 1976 and eight were seen in 1988, some still in nests. One immature Bald Eagle was seen feeding on a Harlequin Duck (*Histrionicus histrionicus*) in 1976 (Figure 195). One immature eagle was also present in 1988.

Figure 195. Bald Eagles are a major predator of Harlequin Ducks along the BC outer coast.[313] *Photo by R. Wayne Campbell.*

Twenty-three Steller Sea Lions (one male and 22 females or immatures) were hauled out on Currie Islet in 1976.

MC-480 MOSQUITO ISLETS

Location: *51°50'05"N 128°09'49"W; 103 P/16.*
Kildidt Sound, south of Hunter Island, west of Clare Island.

Description: *1.2 ha; 27 m high; Forested; Bare rock.*
The main two higher islets are forested with rocky shorelines. Smaller adjacent islets are rocky. All are part of the Hakai Lúxvbálís Conservancy established in 2008.

Historical summary: Cowan recorded Glaucous-winged Gulls and Pigeon Guillemots nesting in 1939 (Table MC-480). No nesting seabirds were seen in 1976. These islets were not visited by CWS crews in 1988.

Table MC-480. Seabird nesting records for Mosquito Islets. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
9 Jul 1939	30-40e	x	77
20 Jun 1976	0	(0)	265

MC-490 "TRIQUET" ROCK

Location: *51°47'56"N 128°13'26"W; 103 P/16.*
East of Triquet Island, west of Kidney Island. Part of the Breadnor Group.

Description: *10 m high; Bare rock.*
This rock is within the Hakai Lúxvbálís Conservancy established in 2008.

Historical summary: Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots were confirmed nesting in 1976 (Table MC-490). In 1988, a pair of gulls was sitting on the top of the rock on two consecutive days, but no nest was found. Guillemots were nesting in a crevice under a rock in 1988.

Table MC-490. Seabird nesting records for "Triquet" Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
20 Jun 1976	3[3]	1	x(14)	265
1 Jul 1988	2[1]	1eS	x(3)	182

Remarks: One depredated Pigeon Guillemot egg was found in 1988.

MC-500 BLENHEIM ISLAND

Location: *51°46'50"N 128°15'10"W; 103 P/16.*
South of Triquet Island in the northwest corner of Kildidt Sound. Colony includes the unnamed rock 1 km to the northeast. Blenheim Island was previously known as White Cliff Island.

Description: *3.7 ha; 72 m high; Forested; Bare rock.*
Blenheim Island and the rock northeast of it are precipitous blocks of granite with many deep crevices. The rock is bare, but Blenheim Island itself is forested on top (Figure 196). Grass, forbs and moss cover perimeter areas, and salmonberry and young spruce are more abundant in the interior.

Figure 196. Blenheim Island is forested on top (left) with an open stand of Sitka spruce trees. *Photos by R. Wayne Campbell, 20 June 1976.*

The island and associated rock are within the Hakai Lúxvbálís Conservancy established in 2008.

Historical summary: Guiguet recorded Pelagic Cormorants nesting here during his studies in the Goose Islands group in 1948 (Table MC-500). In 1976, cormorants were nesting on the cliffs on the north side towards the west end of Blenheim Island (Figure 197). Most nests were also located there in 1988, except for one nest on the western bluff and two nests found on an interior cliff between east and west sections of the northeast rock. Single eggs were seen in 8 of 9 cormorant nests whose contents were determined in 1976, and birds were sitting on all nests in 1988.

Figure 197. A messy Pelagic Cormorant nest constructed of grasses and marine plants on Blenheim Island in 1976. Streaks of whitewash are typical on most nests. *Photo by R. Wayne Campbell, 20 June 1976.*

Black Oystercatchers were recorded nesting on the northeast rock in 1976 and 1988. A nest was found in 1976 and a pair was suspected nesting in 1988. Glaucous-winged Gull nests were located on the northeast rock, except in 1988 we found three nests on the bluffs at the east end of the main island and two nests on the rock at the east end of the main island. Pigeon Guillemots were nesting in crevices and under rocks on the northeast rock in 1976 and 1988, except one nest was found in a crevice on the east end of the main island in 1988.

Table MC-500. Seabird nesting records for Blenheim Island. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
28 Jul 1948	35e				93
20 Jun 1976	39	1	72[61]	x5(47)	265
29 Jun 1988	17	1eS	68[31]	x3(15)	182

Remarks: Two broken gull eggs were seen in 1976 and eight depredated eggs and the remains of an adult Glaucous-winged Gull were found in 1988. Two Bald Eagles were present, and we found one eagle nest in 1976. No eagles were recorded in 1988. One female Peregrine Falcon was agitated and screaming throughout our visit in 1976 and one Peregrine Falcon eyrie was seen in 1988. River otter runs and scats containing fish were noted in 1988.

MC-510 AIRACOBRA ROCK

Location: *51°45'35"N 128°13'12"W; 103 P/16.*
Kildidt Sound, west of Stirling Island, southeast of Blenheim Island.

Description: *0.3 ha; 14 m high; Bare rock.*
This rock is within the Hakai Lúxvbálís Conservancy established in 2008.

Historical summary: There is no record of BCPM crews visiting this rock in 1976. Fifteen adult Glaucous-winged Gulls were present on the rock and we saw one adult Tufted Puffin (Figure 198) offshore in 1988 (Table MC-510). One gull nest contained a single egg, the rest were empty.

Figure 198. Single Tufted Puffins are frequently seen offshore by survey crews. *Photo by Alan D. Wilson.*

Table MC-510. Seabird nesting records for Airacobra Rock. See Appendix 2 for codes.

DATE	GWGU	SOURCE
1 Jul 1988	6[1]	182

MC-520 NORTH POINTERS ROCKS

Location: *51°43'23"N 128°07'52"W* (southeast rock #1)*; 103 P/9.*
South side of Kildidt Sound, southwest of Stirling Island. Colony includes all nearby rocks off the southwest end of Stirling Island and west of the Breaker Group.

Description: *0.8 ha; 12 m high; Bare rock.*
These rocks lie within BC Parks' Hakai Lúxvbálís Conservancy established in 2008.

Historical summary: Nesting has been recorded on five rocks in this group: #1) the southeast, 12 m (40') high rock; #2) the 8 m (25') rock northwest of #1; #3) the 9 m (30') rock north of #2; #4) the western, 11 m (35') rock; and #5) the 5 m (17') rock north of #4. In 1976, three Pelagic Cormorant nests, one with one egg and two empty, were found on rock #2, and observers noted "a few breeding" on rock #4, where 18 adults were present (Table MC-520). There was no evidence of nesting by cormorants in 1988.

Black Oystercatcher nests with eggs were found on rocks #1 and #2 in 1976. No oystercatchers were seen in 1988. Similar numbers of Glaucous-winged

Gulls were reported nesting on three rocks in 1976 and 1988. In both years, nests were recorded on rocks #1 (57 nests in 1976 and 69 nests in 1988) and #2 (50 nests in 1976 and 24 nests in 1988). However, nests reported for rock #2 in 1976 may have included nests on rock #3, where 26 nests were found in 1988. In addition, 15 nests were counted on rock #5 in 1976. Sixteen adult gulls were standing on a low, 5 m (16') high rock in the middle of the group between rocks #3 and #4 in 1988, but we were unable to land on it due to the size of the swells. We did not include them in the population estimate because we thought the rock might have been wave-washed, but it is similar in height to rock #5 where nests were reported in 1976.

Pigeon Guillemots were present on rock #1 (6 birds) and rock #3 (2 birds) in 1988.

Table MC-520. Seabird nesting records for North Pointers Rocks. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
19 Jun 1976	3+	2[2]	122[83]	S(7)	265
1 Jul 1988	0	0	119[64]	S(8)	182

Remarks: Observers recorded depredated gull eggs on rock #1: 12 in 1976 and seven in 1988. Two adult Bald Eagles were sitting on the top of the highest, outer west rock in 1988.

MC-530 UPWARD ROCK

Location: *51°27'00"N 128°00'57"W; 103 P/8.*
Off the southwest coast of Calvert Island, south of Stafford Point.

Description: *0.3 ha; 11 m high; Grassy rock.*
Upward Rock (Figure 199) is mostly bare, with some patches of grass and angelica. It lies within the Calvert Island Conservancy established by BC Parks in 2006.

Historical summary: We suspect that Upward Rock was the "Bird Rock" visited by Kermode during his explorations around Calvert Island in 1913.[136] He mentioned Glaucous-winged Gulls and Pelagic Cormorants nesting. No cormorants have been recorded on subsequent surveys. Many more gulls were nesting in 1988 than in 1976 (Table MC-530). Four Black Oystercatchers were present and suspected nesting, but no nests were found in 1988 (Figure 200).

Figure 199. View of Upward Rock from the sea. *Photo by R. Wayne Campbell, 19 June 1976.*

Figure 200. Surveyors can usually infer nesting by Black Oystercatchers if the birds become agitated and vocal when likely nesting territories are approached. Quiet, roosting birds, especially in intertidal areas, and birds that fly away, are unlikely to be nesting. *Photo by R. Wayne Campbell.*

Table MC-530. Seabird nesting records for Upward Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
19 Jun 1976	0	4[3]	(0)	265
2 Jul 1988	2eS	29[26]	S(17)	182

Remarks: Broken gull eggs were found in 1976 (3 eggs) and 1988 (1 egg).

MC-540 MAJOR BROWN ROCK

Location: *51°25'26"N 127°41'59"W; 92 M/5.*
Mouth of Rivers Inlet, northwest of Goose Bay.

Description: *1.1 ha; 12 m high; Grassy rock.*
Much of Major Brown Rock is extensive, low, bare rock. On the northwest side is a higher section vegetated with dune grass, cow-parsnip, Pacific hemlock-parsley (*Conioselinum gmelinii*), monkey-flower (*Mimulus* spp), and other forbs, and a pocket of salmonberry and currant. There is a navigational beacon on the higher section, and a large, abandoned marker buoy cemented to the rocks on the northwest corner (see Remarks).

Historical summary: G. van der Steenhoven collected a Glaucous-winged Gull egg in 1952 (Table MC-540). He listed the site as "Zero Rocks" off the southerly mouth of Rivers Inlet. Zero Rock is a local name for a fishing hot spot just off Major Brown Rock and we think there is no other possible location for this record. This egg was originally in the Royal Ontario Museum and we have a copy of the original record card but we cannot locate the egg now.

BCPM crews did not visit Major Brown Rock in 1976 but Harry Carter surveyed it in 1977. Pelagic Cormorants were nesting on large ledges not far above high tide level in 1977. No breeding cormorants were present in 1988. Glaucous-winged Gull numbers more than doubled between 1977 and 1988. Pigeon Guillemots were nesting in rock crevices in 1977.

Table MC-540. Seabird nesting records for Major Brown Rock. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
20 Jun 1952			x		278a
9 Aug 1977	8[8]	4[4]	136[74]	x2(22)	265
2 Jul 1988	0	5[5]	319[228]	S(1)	182

Remarks: One dead, adult Glaucous-winged Gull and one that had been shot and had a broken wing were seen in 1977. One dead young was also found. Twenty depredated gull eggs were found in 1988.
The metal marker buoy has a 50 cm hole in the top, through which many birds have entered and then been unable to get out. There were carcasses and skeletons of cormorants, gulls, and guillemots lining the bottom of the chamber in 1988. We plugged the hole with pieces of discarded timbers, which will temporarily obstruct access.

MC-550 DUGOUT ROCKS

Location: *51°22'01"N 127°48'28"W; 92 M/5.*
Northwest of Kelp Head, entrance to Rivers Inlet.

Description: *1.0 ha; 15 m high; Bare rock.*
Dugout Rocks is an irregular block of granite which is steep on the south side (Figure 201). It is mostly bare, with pockets of grass and forbs in higher cracks and seams. There is a navigational beacon, with accompanying debris scattered over the top of the rock.

Figure 201. Dugout Rocks is a mostly bare, granitic rock. *Photo by R. Wayne Campbell, 18 June 1976.*

Historical summary: This was a large Pelagic Cormorant colony in 1976, with birds nesting all along the south side (Table MC-550). Nest contents were not determined. In 1988, there were only six nests on the south side. The remaining few nests were on cliffs at the northwest corner (10 nests) and on a small, 2 m-high, interior rock face on the north side (2 nests). All cormorant nests and most Glaucous-winged Gull nests were empty in 1988, although total numbers of gull nests were similar in 1976 and 1988.

Only two of the six Black Oystercatcher scrapes found in 1976 held eggs; 10 adults were present. Three pairs of Black Oystercatchers were defending three empty nests in 1988. Pigeon Guillemot nests were found under rocks in 1988.

Table MC-550. Seabird nesting records for Dugout Rocks. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
18 Jun 1976	148	6[2]	133[103]	x2(52)	265
2 Jul 1988	18[0]	3S	141[54]	x2(9)	182

Remarks: We found 23 depredated gull eggs in 1976, and 38 depredated gull eggs and the remains of two depredated adults in 1988. We (Figure 202) found no evidence that identified the predators in either year.

Figure 202. Marilyn Paul (now Lambert) dressed for sea travel during the BCPM survey of Dugout Rocks in 1976. *Photo by R. Wayne Campbell, 18 June 1976.*

MC-560 RUBY ROCKS

Location: *51°18'24"N 127°49'17"W; 92 M/5.*
On the north side of the entrance to Smith Sound, west of Brown Island.

Description: *1.0 ha; 9 m high; Bare rock.*
The southern of these two bare rocks has higher rock faces on the west end, and an area of boulders and a tiny shell beach on the lower east section.

Historical summary: All Pelagic Cormorant nests were empty in 1976 (Table MC-560; Figure 203). Cormorants were nesting on small interior-facing bluffs on the low east end of the south rock in 1988. Nests were not visible from the water.

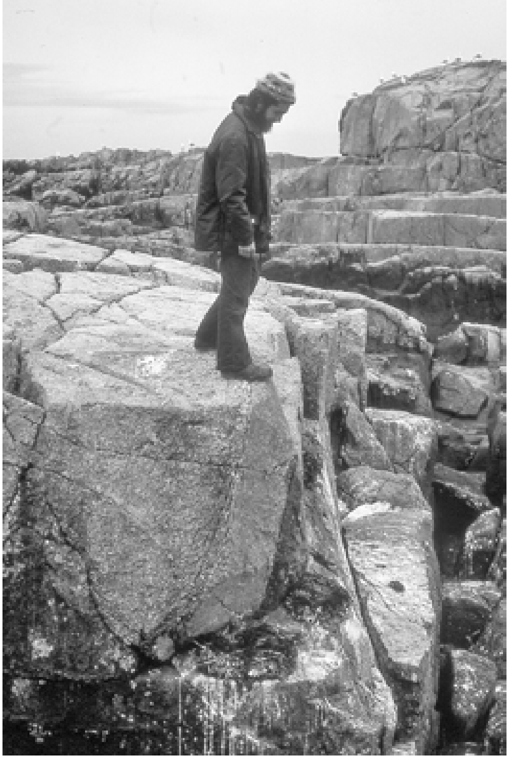


Figure 203. All Pelagic Cormorant nests being checked by Michael Rodway on Ruby Rocks in 1976 were empty. *Photo by R. Wayne Campbell, 17 June 1976.*

Black Oystercatchers were nesting on both rocks in 1976 (Figure 204) and 1988: 4 nests (3 empty) on the north rock and 5 nests (2 empty) on the south rock in 1976; and 1 empty nest on the north rock and 2 nests (1 empty) on the south rock in 1988. Glaucous-winged Gull nests were also counted on both rocks in both years: 13 nests (2 empty) on the north rock and 40 nests (10 empty) on the south rock in 1976; and 30 nests (1 empty) on the north rock and 39 nests (6 empty) on the south rock in 1988. Pigeon Guillemots were sighted around the south rock in 1988.

Figure 204. This Black Oystercatcher nest found on Ruby Rocks in 1976 held a full complement of eggs. The nest was a collection of chiton and mussel shells. *Photo by R. Wayne Campbell, 17 June 1976.*

Table MC-560. Seabird nesting records for Ruby Rocks. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
17 Jun 1976	8[0]	9[4]	53[41]	(0)	265
3 Jul 1988	6[2]	3[1]	69[62]	S(28)	182

Remarks: Seven depredated gull eggs were found in 1988.

MC-570 ANN ISLAND

Location: *51°16'26"N 127°48'37"W; 92 M/5.*
On the north side of Table Island, in the entrance to Smith Sound.

Description: *12.0 ha; 55 m high; Forested.*

Historical summary: McCabe observed Pigeon Guillemots flying in and out of nest sites in columnar rock in a cove on the southeast side of Ann Island in 1937 (Table MC-570). No subsequent visits have been recorded.

Table MC-570. Seabird nesting records for Ann Island. See Appendix 2 for codes.

DATE	PIGU	SOURCE
5-9 Jul 1937	x(40-50)	77

MC-580 ARMSTRONG ROCK

Location: *51°16'03"N 127°49'01"W; 92 M/5.*
West side of Table Island in the entrance to Smith Sound. Colony includes the unnamed islet northeast of Armstrong Rock.

Description: *2.1 ha; 12 m high; Grassy rock.*
Armstrong Rock and the unnamed islet are mostly bare rock. There are some grassy patches on the highest part of Armstrong Rock, and the northeast islet has a section of grass and a small clump of spruce on top. Both rocks have shell beaches.

Historical summary: McCabe found completed but empty Glaucous-winged Gull nests on the unnamed islet in 1937 (Table MC-580). In 1976, gulls were nesting only on Armstrong Rock. Most gull nests were empty. Black Oystercatcher nests were found on Armstrong Rock (6 nests) and on the unnamed islet (2 nests); all contained eggs. One empty oystercatcher scrape was also found on Armstrong Rock, but it was not considered a separate nesting territory. Pigeon Guillemots were seen around Armstrong Rock in 1976 but no other information on nesting was recorded. We boated past to the west of Armstrong Rock on 3 July 1988. No gulls were visible, but the rock was viewed from a distance.

Table MC-580. Seabird nesting records for Armstrong Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
5-9 Jul 1937		S		77
17 Jun 1976	8[8]	8[2]	(4)	265

MC-590 EGG ISLAND

Location: *51°15'00"N 127°50'03"W; 92 M/4,5.* Southwest of Table Island across Loran Pass.

Description: *14.3 ha; 84 m high; Forested.* Rocky shores and perimeter forested slopes are steep, rounding to a flatter interior (Figure 205). Dense salal under a spruce, redcedar, and hemlock forest covers most of the vegetated area, but open patches of grass, false lily-of-the-valley, and bare ground occur along edges. Trees have been cut around the manned lightstation on the west side.

Historical summary: Suspected Rhinoceros Auklet burrows were observed on the north side in 1976 (Table MC-590; Figure 206). In 1988, most burrows were located along the northeast and east shore, but three were found just south of the light on the west side. Cassin's Auklet burrows were found at the south end. Breeding was not confirmed for Cassin's Auklet, but the five burrows found had obvious signs of breeding activity, including fecal streaking, characteristic odor, and abdominal feathers.

Figure 206. Suspected Rhinoceros Auklet burrows were found along the forested perimeter on the north side of Egg Island in 1976. *Photo by R. Wayne Campbell, 17 June 1976.*

Black Oystercatcher nests contained eggs in 1976. Two oystercatchers were roosting on the west reef but there was no evidence of nesting in 1988. Pairs of Glaucous-winged Gulls were counted along the north (12 pairs) and west (11 pairs) sides

Figure 205. A tangled forest crowns the top of the steep-sided south end of the eastern portion of Egg Island. *Photo by Moira J.F. Lemon, 3 July 1988.*

Table MC-590. Seabird nesting records for Egg Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	CAAU	RHAU	SOURCE
17 Jun 1976	2[2]	23eS	(0)		S	265
3 Jul 1988	0	2[1]	x3(18)	5S	90	182

in 1976. Nests were not inspected. Only two pairs were nesting on the northwest corner in 1988. Pigeon Guillemots were nesting in burrows at the edge of the vegetation above the steep shore rock on the east side in 1988.

Remarks: One Bald Eagle nest and one Common Raven nest were noted in 1976. A river otter den with six pups was found in 1976, and runways and scats containing fish were recorded in 1988.

MC-600 EGG ROCKS

Location: *51°14'33"N 127°50'03"W; 92 M/4.*
South of Egg Island, entrance to Alexander Passage.

Description: *1.4 ha; 14 m high; Grassy rock.*
The higher of these domed islets have lush pockets of herbaceous growth amongst projecting blocks and ridges of rock (Figure 207).

Figure 207. Egg Rocks are mostly bare, with some patches of herbaceous vegetation on higher sections. *Photo by R. Wayne Campbell, 17 June 1976.*

Historical summary: Black Oystercatchers and Glaucous-winged Gulls were nesting on the north and south sections of the main rock and on the most southern rock in 1976 and 1988 (Table MC-600). In 1976, six oystercatcher nests were found but two empty nests found likely belonged to only one pair. Nests with eggs were found on the north and south sections of the main rock and on the southern rock. In 1988, five oystercatcher nests were found, four with eggs or associated young, and one that was empty but around which we suspected there were hidden young. Nests were on the north (3 nests) and south (2 nests) sections of the main rock. There was one agitated oystercatcher pair on the south rock in 1988 but no nest was found.

The distribution of gull nests was similar in 1976 and 1988: 87, 28, and 7 nests in 1976 and 98, 35, and 7 nests in 1988 on the north and south sections of the main rock, and on the south rock, respectively. Pigeon Guillemots were seen around the main rock in 1976 and 1988. Nests were found on the northern section in 1976 and on the southern section under a boulder in 1988.

Table MC-600. Seabird nesting records for Egg Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
17 Jun 1976	5[4]	122[73]	x2(7)	265
3 Jul 1988	6e	140[108]	x(18)	182

QUEEN CHARLOTTE AND JOHNSTONE STRAITS

The Queen Charlotte-Johnstone Strait region encompasses all coastal waters between the northeast end of Vancouver Island and the BC mainland, from Cape Caution at the north end of Queen Charlotte Strait, south to Chatham Point at the southeast end of Johnstone Strait (Figure 208). The islands at the mouth of Queen Charlotte Strait (Figure 209) are the most important breeding areas for storm-petrels and Rhinoceros Auklets in BC (Figure 210). They support 37% of the Fork-tailed Storm-Petrels, 53% of the Leach's Storm-Petrels, and 45% of the Rhinoceros Auklets nesting in the province (see summary Table 4 on page 64 in Part 1 [188]). Of the 30 extant colonies in the Queen Charlotte-Johnstone Strait region, the cluster of six colonies at the western entrance to the strait, including Storm Islands, Reid Islets, Naiad Islets, Tree Islets, Pine Island, and the Buckle Group, supports almost all (99.8%) of the over one million seabirds nesting in the region (Table 5). These islands were designated the Duke of Edinburgh Ecological Reserve in 1988. By seabird population size, of the 12 geographic regions we have used to summarize seabird breeding populations in BC (see Figure 58 on page 58 in Part 1 [188]), the Queen Charlotte-Johnstone Strait region is second in importance only to the nearby Scott Islands.

Figure 208. The Queen Charlotte Strait-Johnstone Strait region of BC is internationally known for its scenic waterways, recreational opportunities, and wilderness values. Within the region are: many large, forested islands; numerous small islets and rocks; long, deep fiords; and a maze of channels and narrow passageways. The connected waters of Johnstone and Queen Charlotte straits are part of the "Inside Passage," a semi-protected, navigable route along much of the BC coast that links ports from Washington State to Alaska, although the northwestern portions of Queen Charlotte Strait are some of the most exposed waters along that route and islands in that area are subject to intense storms. Images of this region include: forested islands off the northeast shore of Vancouver Island (previous page); a BC ferry navigating the "Inside Passage"; a grizzly bear (*Ursus arctos*); and a killer whale (*Orcinus orca*). Bears and whales are sought out by tourists on wildlife excursions that are part of the lucrative wildlife viewing and wildlife-associated recreational activities that are now generating more revenue in the USA than sports fishing and hunting together.[315] *Photos by R. Wayne Campbell.*

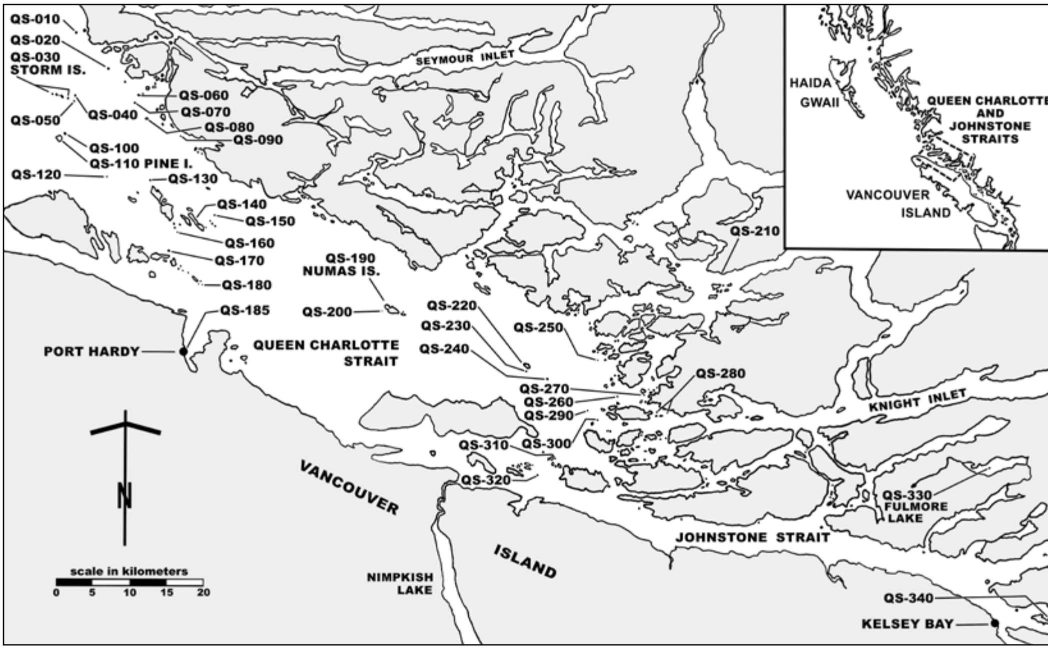


Figure 209. Locations of seabird colonies in Queen Charlotte and Johnstone straits (modified from Rodway and Lemon [183]).

Figure 210. The islands at the mouth of Queen Charlotte Strait are the most important breeding areas for storm-petrels and Rhinoceros Auklets in BC (clockwise from left): downy chicks of Leach's Storm-Petrel; Rhinoceros Auklet; and Fork-tailed Storm-Petrel. *Photos by R. Wayne Campbell.*

Table 5. Estimates of seabird breeding populations in Queen Charlotte and Johnstone straits 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 534-535 for an explanation of the letter codes used to qualify population estimates.

SITE CODE	SITE NAME	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	RHAU	TUPU	ALL SPECIES[a]	SURVEY YEAR[b]
QS-010	Bremner Islet			16		144	x6(29)				349	1982
QS-020	McEwan Rock			14		44					116	1982
QS-030	Storm Islands	50,800t	191,000t	0	18e	61	x(111)	300eS	72,000t	E	628,469	1987
QS-040	Naiad Islets				1	54	S(13)				123	1987
QS-050	Reid Islets		11,500t	0	1S	36	S(13)	260t			23,607	1987
QS-060	Emily Group				1		1(2)				4	1982
QS-070	Rogers Islands				2	138	S(2)				282	1982
QS-080	Harris Island				2	28	S(2)				62	1982
QS-090	Annie Rocks				1	7S					16	1982
QS-100	Tree Islets	8,300t	47,000t	0	1	59	x3(38)	250e	100e		111,458	1986
QS-110	Pine Island		100eS	0	1		S(36)	E	89,500t	E	179,238	1975,85
QS-120	Buckle Group	900t	27,000t	6	2e	65	S(68)	5,900t			67,814	1987
QS-130	Joan Island				0	0					0	1982
QS-140	Deserters Island				1S	0					2	1982
QS-150	Barry Islet				0	0					0	1982
QS-160	Bleach Rock				1	0					2	1975,82
QS-170	Crane Islands					0					0	1982
QS-180	"Doyle" Rocks					0					0	1982
QS-185	Port Hardy						1				2	1975
QS-190	Numas Islands				5	65	x9(41)		550		1,281	1982
QS-200	Staples Islet				1eS	5					12	1982
QS-210	Deep Sea Bluff			0		0	(0)				0	1982
QS-220	Foster Island				2	3	x(28)				38	1982
QS-230	Twin Islets				3e	5	S(5)				21	1982
QS-240	Penfold Islet				1S	53					108	1982
QS-250	Coach Islets				1		(0)				2	1982
QS-260	Green Rock				1	32	1(1)				68	1982
QS-270	"Seabreeze" Rock				1S	1					4	1982
QS-280	"Ridge" Rocks				1	11					24	1982
QS-290	White Cliff Islets				1						2	1982
QS-300	Surge Islands					1					2	1982
QS-310	Plumper Islands						x(7)				7	1982
QS-320	Stephenson Islet				3	25	S(26)				82	1982
QS-330	Fulmore Lake					1					2	1982
QS-340	"Goat" Island					6	x2(8)				20	1982
TOTAL NESTING PAIRS		**60,000**	**276,600**	**36**	**52**	**844**		**6,710**	**162,150**			
TOTAL BREEDING BIRDS		**120,000**	**553,200**	**72**	**104**	**1,688**	**433**	**13,420**	**324,300**	**0**	**1,013,217**	
TOTAL CURRENT SITES		3	5	3	23	22	18	4	4	0	30	
Confirmed on last survey		3	4	3	18	21	10	3	4	0	29	
Confirmed on any survey		3	5	3	20	21	15	4	4	0	30	
Unconfirmed		0	0	0	3	1	3	0	0	0	0	
TOTAL HISTORICAL SITES		3	5	8	25	29	20	5	4	2	35	
Confirmed		3	5	7	22	28	16	5	4	2	35	
Unconfirmed		0	0	1	3	1	4	0	0	0	0	
CURRENTLY ABANDONED SITES		0	0	5	2	7	2	0	0	2	5	
Previously confirmed				4	2	7	1	0		2	5	
Previously unconfirmed				1	0	0	1	0		0	0	

[a] Numbers of individuals.
[b] For sources see individual colony accounts.

Population trends are apparent for some species but data are inadequate to determine trends for most species. Rhinoceros Auklet populations may have increased dramatically in the region since Young visited the area in 1929.[251] Young recorded large numbers nesting on Pine Island, but stated that there were none nesting on nearby Storm Islands or Tree Islets at that time. After Young's visit, there were no surveys of Storm Islands until 1975, at which time Rhinoceros Auklets were nesting on most islands in that group. Subsequent records suggest that numbers nesting on Storm Islands continued to increase through to 1987, although survey data from 1975 to 1987 are not reliably comparable (see Storm Islands account). If Young's explorations of Storm Islands were thorough, nesting populations there exploded over a 50-60 year period to the 72,000 pairs estimated nesting in 1987. Further evidence of increasing Rhinoceros Auklet populations in the region comes from Tree Islets. Surveys on Tree Islets in 1968, 1975, and 1976 also found no Rhinoceros Auklets nesting. Rhinoceros Auklets were confirmed nesting there in 1986, and available data suggest that they colonized Tree Islets sometime between 1976 and 1986.

Tufted Puffins appear to have been extirpated in this region (Figure 211). They were not recorded nesting during surveys in the 1970s and 1980s but had been recorded previously. Young reported nesting by Tufted Puffins on Storm Islands in 1929,[251] and collected a puffin egg from Pine Island in 1930. There have been no records of Tufted Puffins nesting in the region since 1930. Harvesting of eggs and adults by local First Nations people may have contributed to their extirpation.[251]

An earlier Tufted Puffin egg record suggested historical breeding at a third location in the Queen Charlotte-Johnstone Strait region. However, we are uncertain of the location of this record, as were Drent and Guiguet.[77] Walter Raine collected an egg specimen [77, 269b] on 28 June 1890 at a location given as "Rock Island, Queen Charlotte Sound." Carter and Sealy speculated that the location may have been Flatrock Island in Haida Gwaii (i.e., in the formerly named "Queen Charlotte Islands" instead of Queen Charlotte Sound).[54] The Canadian Museum of Nature has mapped the location as Rock Island (51°11'30"N 127°20'W) in Mereworth Sound north of Belize Inlet.

Figure 211. Tufted Puffins were last recorded nesting in Queen Charlotte Strait in 1930. Harvesting of eggs and adults for food and adornment by First Nations people may have contributed to the demise of nesting puffins in this region. *Photo by R. Wayne Campbell.*

This location is a long way up the coastal fiords, about 25 km as the crow flies inland from the outer coast of Queen Charlotte Strait and 32 km from the nearest known nesting location on Storm Islands. It is a very unusual location for any colonial-nesting alcid. We have not listed it as a breeding site, although the record remains a curiosity and the site has not been investigated.

Comparative data are poor for surface-nesting species in this region but do indicate declines for Pelagic Cormorants (Figure 212) from the 1970s to the 1980s. Most data are from 1975 and 1982, but some colonies were visited in 1976, 1986, and 1987. For Pelagic Cormorants, five of eight historical breeding sites were surveyed in 1975 [32] and six were visited in 1982,[183] but only three (Storm Islands, Reid Islets, and Buckle Group) were visited in both years.

Figure 212. Repeat surveys indicated declines in Pelagic Cormorant breeding populations from the 1970s to the 1980s in the Queen Charlotte-Johnstone Strait region. *Photo by R. Wayne Campbell.*

The Pelagic Cormorant colony at Deep Sea Bluffs in Simoom Sound was not surveyed in the 1970s. The estimate given by Campbell [32] of 53 pairs was from a 1962 count. That site was abandoned when it was next surveyed in 1982. At the three colonies surveyed in 1975 and 1982, numbers declined from 68 pairs nesting at the three sites in 1975 to 16 pairs at one site (Buckle Group) in 1982. There were only six pairs nesting on the Buckle Group when it was surveyed again in 1987. The small colony on Tree Islets with seven nests in 1975 was abandoned in 1976 and 1986. Thirty pairs of Pelagic Cormorants were nesting on Bremner Islet and McEwan Rock in 1982 but there are no comparative data from other years for those sites.

Data from the 1970s and 1980s were inadequate to determine overall trends for Black Oystercatchers. Oystercatchers were found nesting at more sites in the 1980s than the 1970s, but differences likely reflect the amount of time spent exploring colonies and stormy weather that prevented landing at several sites in 1975. Forty-three Black Oystercatcher nests (39 with eggs or young) were found plus one pair was suspected nesting at 13 sites in 1975/76, and 54 nests (35 with eggs or young) plus three pairs suspected nesting were found at 21 sites in 1982-87. At the Storm Islands, repeat surveys suggested a possible decline since 1976, when 23 oystercatcher nests with eggs or young were found (Figure 213).

Figure 213. Historical data could not detect overall trends in the numbers of Black Oystercatchers nesting in the Queen Charlotte-Johnstone Strait region. However, repeat surveys suggested a possible decline in numbers nesting on the Storm Islands. *Photo by R. Wayne Campbell, Storm Islands, BC, 13 June 1976.*

Glaucous-winged Gull trends were also difficult to interpret (Figure 214). Nests were counted at 18 sites and estimated at seven other sites in 1975, and were counted at 28 sites in 1982. Only one historical nesting site, Tree Islets, was not surveyed in 1982; it was surveyed in 1986. At 17 sites where nests were counted in both 1975 and 1982, numbers of nests increased by 49% from 217 nests (113 [52%] with eggs or young) at 13 sites in 1975 to 323 nests (194 [60%] with eggs or young) at 11 sites in 1982. However, the few colonies surveyed in both 1975 and 1976 had higher numbers of gulls in 1976, which suggested that 1975 was a poor year for gulls in the region. Four of the largest gull colonies were surveyed in both 1976 and 1982. Numbers of nests declined slightly from 295 nests (153 [52%] with eggs or young) in 1976 to 269 nests (229 [85%] with eggs or young) in 1982 at those four sites. Declines were most apparent on the Storm Islands. The contrary trend between the 17 sites surveyed in both 1975 and 1982 (increasing trend) and the four largest colonies surveyed in 1976 and 1982 (decreasing trend) makes it difficult to interpret overall changes but suggests that gull population sizes may have been similar in the 1970s and the 1980s, with 1975 being a depressed year. Though overall numbers of nesting gulls may have been similar, several colonies had smaller populations in the 1980s, and four small colonies located in 1975 were not used in 1982; larger numbers at other colonies, and new sites found in 1982, compensated for those declines. More frequent population counts on Storm Islands, Naiad Islets, and the Buckle Group suggest that nesting gull numbers have fluctuated. Fluctuations may be related to egg harvesting by First Nations groups on these colonies.

Glaucous-winged Gulls were found breeding inland in this region on a small islet in Fulmore Lake. This is the only known inland nesting site adjacent to the BC outer coast area considered in this volume. As noted in the Haida Gwaii accounts, [189] Glaucous-winged Gulls have historically been reported nesting inland on Langara Island and Graham Island. Nesting has also been reported on Capilano Lake in the North Vancouver area,[165] and on Cowichan [316] and Long [265] lakes on eastern Vancouver Island (see upcoming Salish Sea volume of this seabird catalogue). Many coastal lakes and interior areas of coastal islands have never been surveyed for nesting seabirds and inland breeding by Glaucous-winged Gulls may be more widespread.

Figure 214. Incubating adult Glaucous-winged Gull. Numbers of Glaucous-winged Gulls nesting in the Queen Charlotte-Johnstone Strait region have fluctuated and overall trends during the 1970s and 1980s were difficult to interpret. Inter-annual fluctuations during that period may have been related to weather, predation, egg harvesting, and human disturbance. *Photo by R. Wayne Campbell, July 1964.*

Surveys are needed to detect and map staging areas for Rhinoceros Auklets around the major colonies on Pine and Storm islands so that measures can be instituted to protect staging birds. The concentration of nesting Rhinoceros Auklets on these colonies means that globally significant populations are at risk from chronic and catastrophic oil spills and other environmental perturbations in this area.

QS-010 BREMNER ISLET

Location: *51°05'52"N 127°41'24"W; 92 M/4.* Southwest of Bremner Point at the south end of Burnett Bay.

Description: *0.9 ha; 17 m high; Grassy rock; Cliffs.* There are a few stunted trees on the crown of this grassy rock (Figure 215).

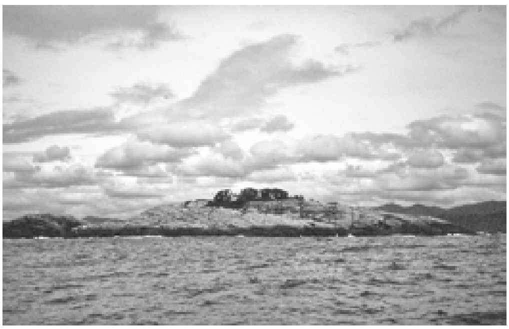


Figure 215. Bremner Islet has been surveyed for nesting seabirds only in 1982. At that time, Glaucous-winged Gulls were nesting over the upper portions of the rock, Pelagic Cormorants were nesting on interior cliffs faces on the west side of the islet, and Pigeon Guillemots were nesting in crevices and under rocks. *Photo by Michael S. Rodway, 7 July 1982.*

Historical summary: Bremner Islet was not surveyed by the BCPM in 1975 because of stormy weather. In 1982, Pelagic Cormorants were nesting on cliff faces of a cleft that runs north-south across the west side of the islet (Table QS-010). Six Black Oystercatchers were present, but no nests were found (Figure 216). Glaucous-winged Gulls were nesting on the rocky areas and Pigeon Guillemots were nesting in crevices and under rocks.

Table QS-010. Seabird nesting records for Bremner Islet. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
5, 7 July 1982	16[10]	144[129]	6(29)	183

Figure 216. Black Oystercatchers present on Bremner Islet in 1982 were likely nonbreeding birds. *Photo by R. Wayne Campbell.*

QS-020 McEWAN ROCK

Location: *51°03'31"N 127°37'54"W; 92 M/4.* Southwest of McEwan Point on Bramham Island.

Description: *0.4 ha; Bare rock* (Figure 217).

Historical summary: We landed but only briefly explored this colony in 1975 because of heavy rain. We estimated 150 Glaucous-winged Gulls on the rock and observed two nests containing one and two eggs each (Table QS-020). No Pelagic Cormorants were recorded in 1975 but heavy seas and rain compromised a thorough inspection and it is possible that they were missed. Cormorants were nesting on the rock face on the north side in 1982. Contents of nine cormorant nests were determined; six contained eggs and three were empty.

Table QS-020. Seabird nesting records for McEwan Rock. See Appendix 2 for codes.

DATE	PECO	GWGU	SOURCE
18 July 1975		75e	32, 265
7 July 1982	14	44[41]	183

Figure 217. McEwan Rock is a bare rock where Pelagic Cormorants and Glaucous-winged Gulls were found nesting in 1982. *Photo by Michael S. Rodway, 7 July 1982.*

QS-030 STORM ISLANDS

Location: *51°01'34"N 127°43'30"W; 92 M/4.*
On the north side of Europa Passage, north of Pine Island.

Description: *60 ha; 70 m high; Forested; Bare rock.* The Storm Islands are a compact chain of 23 islands and rocks at the western entrance of Queen Charlotte Strait (Figure 218). The shores of the islands are steep rock, with no beaches except for three small

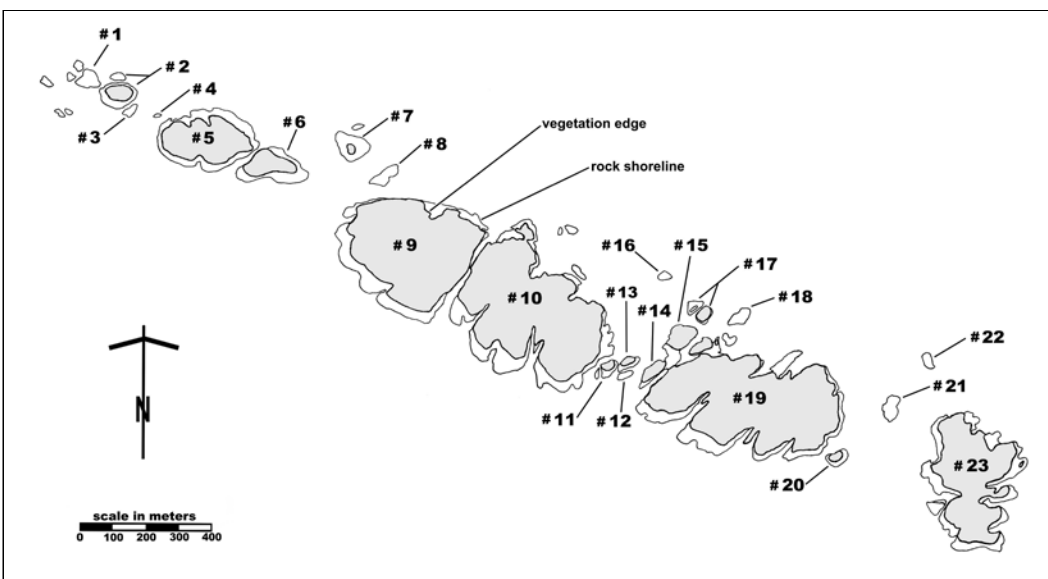


Figure 218. Numbered islands in the Storm Islands referred to in the text.

pockets on the largest island. The larger islands are cut and separated by gorges and crevices running perpendicular to the length of the chain, but there are few cliffs outside of these gorges. Interiors of the three large, central islands (#9, 10, and 19) are covered primarily with salal under a hemlock, redcedar, and spruce forest. Perimeter areas of these central islands, especially towards the east and west ends, and much of the area on the smaller vegetated islands, are covered with dense salmonberry under spruce. Open patches of grass and other herbaceous growth occur along the edges of many of the smaller vegetated islands. Islands #1, 3, 4, 8, 16, 21, and 22 are bare rock except for a few tufts of grass on islands #1, 8, and 21 (Figure 219).

Except for the area within Ta-a-ack Indian Reserve No. 5, these islands became part of the Duke of Edinburgh Ecological Reserve in 1988.

Historical summary: Young [251] found Leach's Storm-Petrels nesting and secured three Tufted Puffin eggs from First Nations people camped on the Storm Islands in 1929 (Table QS-030). He saw a few puffins flying around and stated that puffin numbers were larger in the past, having declined due to the annual harvest of many eggs and adults by the First Nations people. No puffins have been found nesting or seen during recent surveys. Rough seas (Figure 220) prevented landing on the northwestern-most islands (islands #1-5) in 1975, which affected total counts for some species.

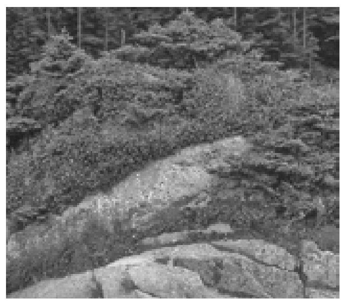
Table QS-030. Seabird nesting records for Storm Islands. See Appendix 2 for codes.

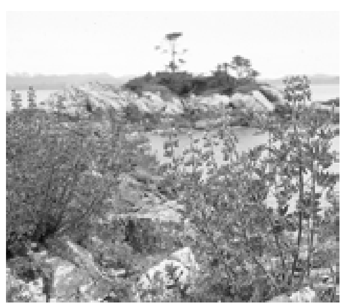
DATE	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	RHAU	TUPU	SOURCE
1 Jun 1929		x						0	x	251
14-18 Jul 1975	S	1,250e	9[0]	6[5]	23e	50e(68)	200eS	2,000e	E	32, 265
13 Jun 1976	16,000e	23,000e	6[1]	23[23]	95[61]	x(46)	700e	17,000e		265
4-7 Jul 1982	3,800e	34,500e	0	15[12]	39[36]	x(56)	300eS	59,300e		265
22-31 Jul 1987	50,800t	191,000t	0	18e	61[35]	x(111)	300eS	72,000t		183

Figure 219. The Storm Islands are a chain of 23 islands oriented along a northwest to southeast axis. The islands are located at the western entrance of Queen Charlotte Strait and are exposed to the full brunt of Pacific storms. They are one of the most important colonies in BC for Fork-tailed and Leach's storm-petrels and Rhinoceros Auklets. Islands vary in size and elevation and habitats are diverse. Photos here show (next page, ordered left to right in top, middle, and bottom rows): Rhinoceros Auklet burrowing habitat in an open coniferous forest of western hemlock, western redcedar, and Sitka spruce in the interior of one of the larger islands; Rhinoceros Auklet burrows among tree roots; spruce forest with an understory of predominantly salmonberry common around the perimeters of larger islands and on smaller, vegetated islands where storm-petrels and Rhinoceros Auklets nest; convoluted waterways among some of the smaller islands between islands #10 and 19; dense patches of salal under spruce found on some smaller islands with burrows; steep, rocky shoreline typical of most islands in the chain; a young stand of regenerating forest where no burrows were found; patches of Nootka lupine (*Lupinus nootkatensis)*, common red paintbrush (*Castilleja miniata*), and villous cinquefoil (*Potentilla villosa*) brightening one of the smaller islands in mid-June; and one of the bare rocks towards the east end of the chain. *Photos by the authors.*







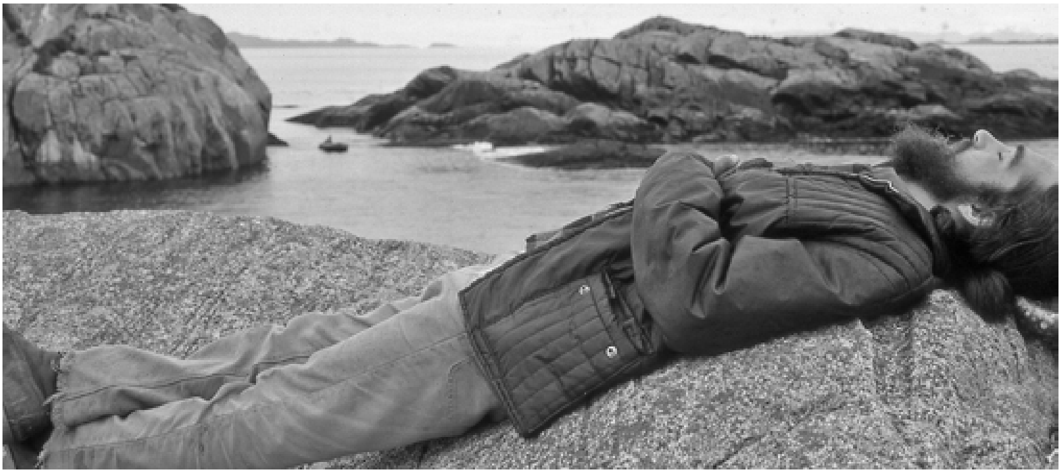



Figure 220. Agility is an important trait for seabird surveyors, who must deal with ocean swells, rough water, and difficult terrain. Patience is also sometimes required. Here, during surveys in the Storm Islands in 1976 (clockwise from top left): Keith Taylor waits in the inflatable boat while others are surveying one of the islands; Keith Taylor navigates the boat to let Teresa Shepard (left) and Marilyn Paul (now Lambert) jump to a calm spot; and Michael Rodway meditates on a rock. *Photos by R. Wayne Campbell, 13 June 1976.*

The Storm Islands currently house the largest nesting colonies of Fork-tailed and Leach's storm-petrels and the second largest colony of Rhinoceros Auklets in BC. Young stated that no Rhinoceros Auklets were nesting on the Storm Islands in 1929. If his exploration of the islands was thorough, it appears that Rhinoceros Auklets colonized the islands, and their population exploded during the last 50 years (Figure 221). In 1975, we estimated a total of 6,000-7,000 Rhinoceros Auklet burrows on all the islands. Most burrows appeared worn and used that year but only one of six burrows excavated contained a downy chick; five were empty. We also did not see or hear concentrations of birds around the island. We thus estimated about 2,000 pairs nesting. Records from 1975 to 1987 also suggest a rapidly increasing population, although estimates cannot be reliably compared. Burrows were found in similar areas on all surveys, and differences in estimates may be largely due to observer experience and survey technique, although the senior author was involved in each survey. Rhinoceros Auklet burrows were found on 13-14 of the islands in 1975, 1982, and 1987 (islands were numbered differently in 1976 making direct comparisons more difficult). However, observations on two islands suggest that burrowing may not have been as extensive in 1975 as in later years. First, on the large, western island (#9), we noted in 1975 that burrowing never extended more than 50 ft (15 m) inland, whereas in 1987, burrowing often extended more than 50 m inland. Second, on the largest island (#19), we noted in 1975 that "…many areas that seemed like good burrowing habitat were devoid of burrows", and further, "…the birds had not extended their nesting into the interior of the island at all". Thus, it is possible that some of the indicated increase in nesting populations from 2,000 pairs in 1975 to 72,000 pairs in 1987 is real.

Staging concentrations of Rhinoceros Auklets have not been recorded around the Storm Islands, but thorough surveys for staging birds have not been conducted.

Storm-petrels were found nesting on most of the smaller vegetated islands on each survey from 1975 (found nesting on 8 islands and suspected on two others that were not landed on but had suitable habitat) to 1987 (found nesting on 13 islands). Differences in population estimates are likely largely due to observer experience, survey technique, and more time spent on the islands in 1987. Storm-petrels were generally absent from the larger islands, except for a few, sporadic burrows that were found on the western end of island #9 (in 1987) and on the eastern end of island #19 (in 1982 and 1987).

In 1987, we found a difference in the distribution of Fork-tailed and Leach's storm-petrels. Leach's Storm-Petrels were found in burrows throughout the island chain but Fork-tailed Storm-Petrels (Figure

Figure 221. Rhinoceros Auklets may have colonized the Storm Islands since 1929, and the nesting population may have increased dramatically since the mid-1970s. Shown here during the survey in 1976 are (clockwise from top left): burrowing habitat under salmonberry; Keith Taylor (front) and Marilyn Paul (now Lambert) scrambling down a grassy slope; Teresa Shepard checking a burrow; and Michael Rodway reaching into a burrow under a tree root. *Photos by R. Wayne Campbell, 13 June 1976.*

222) were found only on the northwestern islands (islands #2, 5, and 6; Figure 223), except for one burrow containing an incubating Fork-tailed Storm-Petrel on island #17 (one burrow containing a Fork-tailed Storm-Petrel chick was also found on island #17 in 1982). In 1975, we were unable to land on the northwestern-most islands (islands #2 and 5), and only one burrow, containing a Leach's Storm-Petrel, was checked on island #6. This likely explains why no Fork-tailed Storm-Petrels were discovered that year. Nine burrows explored on other islands in 1975 all contained Leach's Storm-Petrels. The majority of storm-petrel burrows that have been explored were occupied by Leach's Storm-Petrels in all survey years (ratio of Fork-tailed to Leach's storm-petrels was 7:12, 2:20, and 9:34 in 1976, 1982, and 1987, respectively). Differences in the distribution of the two species appear to extend beyond the Storm Islands, as only Leach's Storm-Petrels have been recorded nesting on nearby Reid Islets off the southeast end of the Storm Islands.

Cassin's Auklets have been confirmed nesting on the Storm Islands only once in 1976 (Figure 224), although droppings and regurgitated food found at burrow entrances left no doubt that some nesting occurred on other islands and in other years. Sporadic burrowing has been seen on seven of the islands.

Figure 222. A newly hatched, downy Fork-tailed Storm-Petrel chick found on the Storm Islands in 1976. *Photo by R. Wayne Campbell, 13 June 1976.*

Figure 223. A view of the steep, rocky, western shore of island #2 in the Storm Islands chain. In contrast to Leach's Storm-Petrels that were found nesting throughout the island chain in 1987, Fork-tailed Storm-Petrels were concentrated only on this island and the two other northwestern-most islands in the chain. Rhinoceros Auklets also nested on island #2 as well as on all other forested islands in the chain. *Photo by Moira J.F. Lemon, 31 July 1987.*

Burrows identified as Cassin's Auklet were found on island #6 in 1975, on three of the northwestern islands in 1976, on islands #15, 19, 20, and 23 in 1982, and on islands #6 and 23 in 1987. Only a few hundred pairs have been estimated nesting on all surveys from 1975 to 1987.

Figure 224. Cassin's Auklet chick extracted from a burrow on one of the northwestern islands of the Storm Islands in 1976. *Photo by R. Wayne Campbell, 13 June 1976.*

Populations of surface-nesting species appear to have declined since the mid-1970s. Pelagic Cormorants were recorded nesting at three locations in 1975/1976 but have not been seen nesting on subsequent surveys (Figure 225). In 1975, seven nests were found on the southern rock face of island #18. No birds were attending those nests on 16 July, but five adults were sitting above the nests on 17 July, and adults were sitting on three nests on 18 July. We also found two cormorant nests in a crevice on the south side of island #17 on 16 July but no adults were present. In 1976, Pelagic Cormorants were found nesting only on what observers called the north-most forested island (probably islands #5 and 6), but only one nest held an egg.

Figure 225. Pelagic Cormorants have not been recorded nesting on the Storm Islands since 1976. *Photo by R. Wayne Campbell, 13 June 1976.*

Highest numbers of Black Oystercatcher and Glaucous-winged Gull nests were counted in 1976. Numbers were much higher in 1976 than in 1975, and fewer nests of both species have been counted since 1976. Some nests were likely missed in 1975 on the northwestern islands that were not landed on, but total numbers nesting in 1975 were still likely less than in the following year, especially for gulls. Data indicating declines since 1976 are most reliable for Glaucous-winged Gulls, but may also reflect real trends for Black Oystercatchers. Black Oystercatcher nests were found on 14 islands in 1976 (Figure 226), whereas nests were found or pairs were suspected nesting on nine and 10 islands in 1982 and 1987, respectively. No empty nests were recorded in 1976 and the total number of nesting pairs was probably greater than the 23 nests reported. In 1982, fewer nests were found and only 12 contained eggs or young. In 1987, 13 nests were found and five additional pairs were suspected nesting. Six of the 13 nests found contained eggs or chicks; and hidden young were suspected around five of the seven empty nests found, and around three of the five pairs that were suspected nesting but no nests were found.

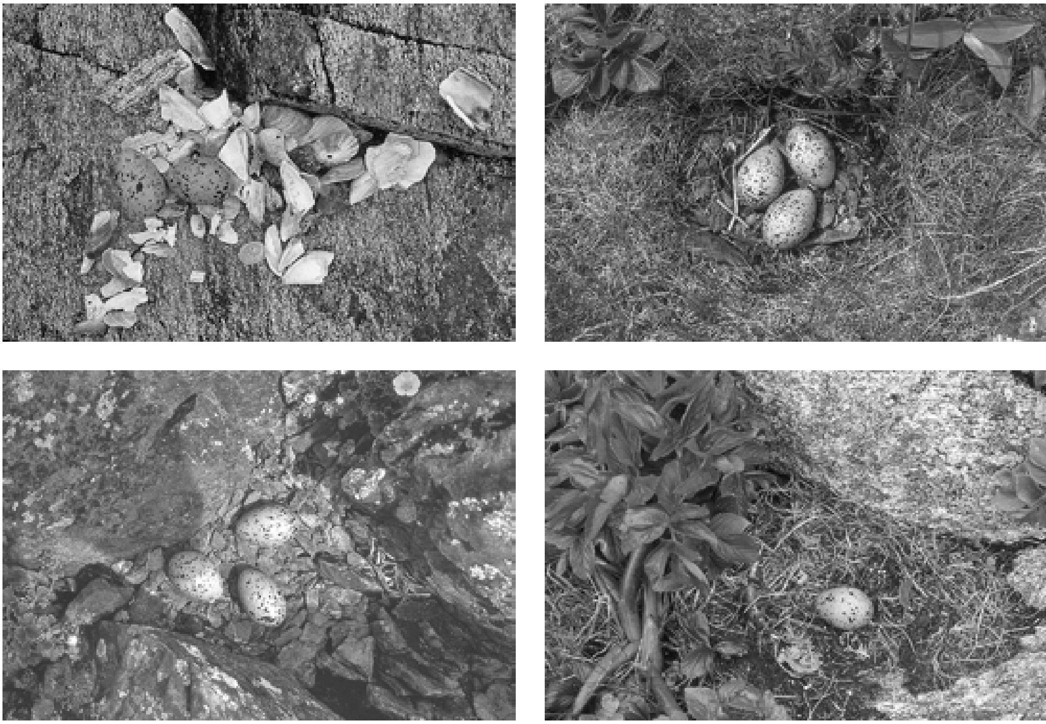


Figure 226. Black Oystercatchers nesting on the Storm Islands in 1976 laid eggs on a wide variety of substrates, including (clockwise from top left): mussel and limpet shells; wood chips; grasses; and rock pebbles. *Photos by R. Wayne Campbell, 13 June 1976.*

Glaucous-winged Gulls were nesting on six islands in 1975, seven islands in 1976 and 1987, and on only three islands in 1982. Overall, nests have been found on eight islands. In 1975, 13 nests were inspected (6 held eggs and/or young) and 10 pairs were estimated nesting on island #3 where we were unable to land. More nests were counted in 1987 than in 1982, but numbers of nests with eggs or young were similar and were almost half the number seen in 1976.

The distribution of gull nests has varied. In all years except 1976, most gull nests were located on the northwestern islands, with only a scattered few on eastern islands. In 1976, half (48) of all nests counted were on three of the eastern rocks (Figure 227).

Figure 227. Glaucous-winged Gull nest made of a sparse collection of plant stems and grass blades found on one of the eastern of the Storm Islands in 1976. *Photo by R. Wayne Campbell, 13 June 1976.*

Pigeon Guillemots have been sighted around many of the islands and have been confirmed nesting in rock crevices and in burrows at the edge of the vegetation above steep shore rock on at least 13 of the smaller islands (Figure 228). Birds were seen flying out of five burrows in 1975. Eggs were found in three of four other burrows whose ends could be reached. No nests were recorded in 1976 but one broken egg was found. Nests with eggs were found in burrows and crevices in 1982 and 1987.

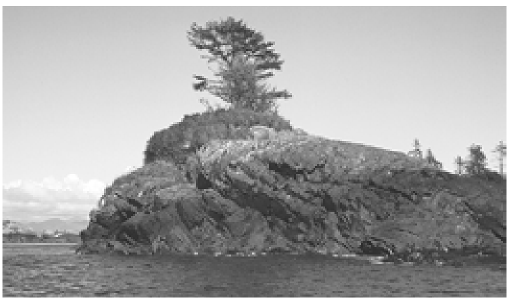


Figure 228. Like many of the smaller islands in the Storm Island chain, island #20 at the southeast end provides nesting habitat for Pigeon Guillemots in rock crevices and under overhanging vegetation. *Photo by Moira J.F. Lemon, 31 July 1987.*

Remarks: Several Rhinoceros Auklet feather piles, one decapitated Rhinoceros Auklet, and a few wings and feathers of Leach's Storm-Petrels were found in 1975. Little evidence of predation was found in other years. Two active Bald Eagle nests were seen in 1976. Four Bald Eagle nests found in 1987 did not appear used that year. A pair of Peregrine Falcons was present in 1987, and falcons were observed catching Northern Phalaropes (*Phalaropus lobatus*) feeding in the area.

First Nations people were collecting gull eggs when we were present in 1976. It is possible that fluctuating numbers and the changing distribution of gull nests are related to the intensity of egging on these islands.

Observers reported mink scat on the northwestern-most island in 1976. Signs of river otter were noted on islands #8, 9, 11, and 14 in 1975, and a river otter consuming a Rhinoceros Auklet was seen in 1976.

QS-040 NAIAD ISLETS

Location: *51°01'30"N 127°41'23"W; 92 M/4.*
Northeast of the east end of the Storm Islands, north of Reid Islets.

Description: *16 m high; Grassy rock.*
These islets are mostly bare rock, but the highest islet has a lush growth of grass and forbs over shallow soil (Figure 229). The islets are included as part of the Duke of Edinburgh Ecological Reserve that protects the nearby seabird colonies on Storm, Reid, Tree, and Pine islands and the Buckle Group.

Figure 229. The Naiad Islets are mostly bare rock, with a small patch of vegetation on the crown of the highest islet. *Photo by Michael S. Rodway, 18 July 1975.*

Historical summary: Drent estimated 100 pairs of Glaucous-winged Gulls nesting in 1968 (Table QS-040). We did not land due to rough weather in 1975. From the water we counted 79 gulls on territory on one side of the islets. Another 30 adults and 70 immatures were roosting. We estimated 50 pairs nesting. Tallies were not separated by islet in 1976, but in 1982 there were 48 gull nests on the main, west islet and 30 nests on the east rocks. In 1987, there were 36 and 18 nests on the west islet and east rocks, respectively; half of the nests on the main rock were empty but only two of the 18 nests on the east rocks were empty.

Black Oystercatchers were nesting on the larger, grassy islet in 1976 (Figure 230), 1982, and 1987. Pigeon Guillemot nests were found under rocks on the main islet in 1982 and birds were sighted only around that islet in 1987.

Figure 230. Two Black Oystercatcher nests found on Naiad Islets in 1976 were composed of grasses and forbs. *Photos by R. Wayne Campbell, 13 June 1976.*

No burrows have been found in the grassy areas on any survey.

Table QS-040. Seabird nesting records for Naiad Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
4 Jul 1968		100e		265
18 Jul 1975		50eS		32, 265
13 Jun 1976	2[2]	65[44]	(4)	265
5 Jul 1982	3[2]	78[75]	x2(8)	265
2 Aug 1987	1	54[34]	S(13)	183

Remarks: The large proportion of empty gull nests on the main rock in 1987 may have been due to egg harvesting.

QS-050 REID ISLETS

Location: *51°01'06"N 127°41'32"W; 92 M/4.*
Off the southeastern end of the Storm Islands.

Description: *1.7 ha; 27 m high; Forested; Grassy rock.*
Dense salmonberry covers most of the main islet. There is a stand of spruce trees on top and a grassy fringe above the shore rock (Figure 231). The other four islets are mostly bare, with grassy patches. Reid Islets are included in the Duke of Edinburgh Ecological Reserve established in 1988.

Figure 231. Smaller islets of the Reid Islets are rocky with grassy patches. The larger island has a dense cover of salmonberry and a patch of forest on top, with a grassy fringe above the steep rocky shoreline. *Photo by Michael S. Rodway, 18 July 1975.*

Historical summary: Drent confirmed nesting by Leach's Storm-Petrel and Cassin's Auklet on the main islet in 1968 (Table QS-050). Rough seas prevented landing on the smaller rocks and he counted other species from the water. Drent reported Glaucous-winged Gulls and Black Oystercatchers nesting on low rocks devoid of vegetation, but no nests were examined. He observed occupied Pelagic Cormorant nests on a low cliff on the north-most rock. In 1975, Pelagic Cormorants were nesting on the west face of the southeast rock. Seven birds were sitting on nests. No evidence of nesting by cormorants has been seen since.

In 1975, the largest, partially wooded islet was explored on foot but the smaller islets where gulls and cormorants were nesting were not landed on because we were concerned about young chicks becoming drenched in heavy rains. No signs of Cassin's Auklets nesting were found in 1975 but our explorations were compromised by stormy weather and torrential rains and we were unwilling to conclude that they were absent. Transect surveys in 1987 confirmed continued nesting by Cassin's Auklets and revealed large numbers of Leach's Storm-Petrels nesting throughout vegetated areas, including under dense salmonberry (Figure 232).

Glaucous-winged Gulls have been recorded nesting in four areas: the west rocks (15 pairs estimated nesting in 1975, 12 nests in 1982, and 15 nests in 1987); the south rocks (7 pairs estimated in 1975, 12 nests in 1982, and 13 nests in 1987); the east rocks (10 pairs estimated in 1975, 7 nests in 1982, and 8 nests in 1987); and the partially vegetated rock on the southeast side of the main islet (5 nests found in 1982, none reported in other years). Black Oystercatcher nests were found on the latter three areas in 1982; six empty nests were found but only three pairs were suspected nesting. In 1987, one empty oystercatcher nest was found on the vegetated islet on the southeast side of the main islet. Adults were very agitated around that nest and hidden young were suspected.

Pigeon Guillemots were present around the main islet in 1975 and around the south rock in 1987. Nesting has not been confirmed.

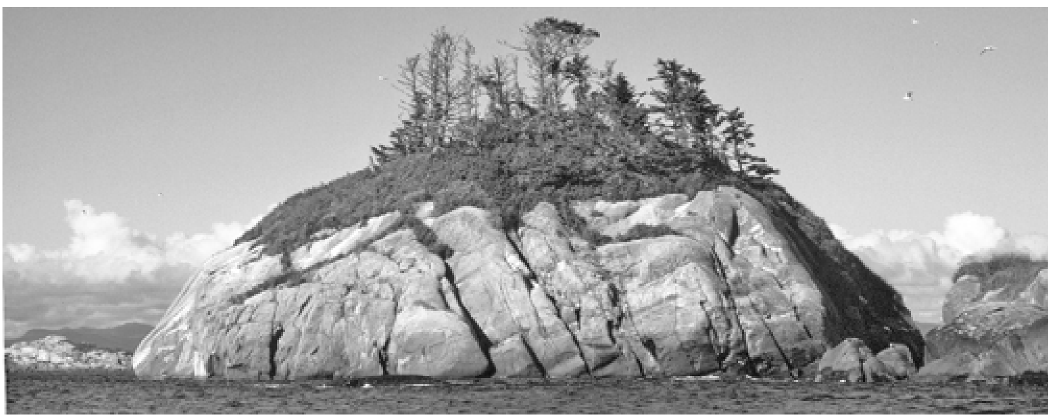


Figure 232. Despite an almost impenetrable undergrowth of salmonberry, surveys in 1987 recorded a dense nesting colony of Leach's Storm-Petrels on Reid Islets. This view of the northwest side of the main islet shows the steep shoreline rising abruptly to the vegetated crown. The circling Glaucous-winged Gulls in the picture nest on the small rocky islets in the group**.** *Photo by Moira J.F. Lemon, 31 July 1987.*

Table QS-050. Seabird nesting records for Reid Islets. See Appendix 2 for codes.

DATE	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	SOURCE
4 Jul 1968	100's	6	1S	30eS		100's	265
17, 18 Jul 1975	1,000e	7		32eS	S(19)		32, 265
7 Jul 1982	1,500eS	0	3S	36[33]	S(4)	50eS	265
2 Aug 1987	11,500t	0	1S	36[19]	S(13)	260t	183

Remarks: One pair of Fork-tailed Storm-Petrel wings was found in 1987 but there has been no evidence of nesting by that species. Bald Eagles were nesting in a low spruce on the main island in 1982 and 1987. One Peregrine Falcon and one Tufted Puffin flew by during our survey in 1987.

QS-060 EMILY GROUP

Location: *51°01'44"N 127°34'00"W; 92 M/4.*
South of Bramham Island, west of Allison Harbour.

Description: *6.4 ha; 53 m high; Forested.*
These six wooded islets have a salal understory and rocky perimeters (Figure 233). Rocky habitat is more extensive around the smaller islets.

Figure 233. Islets in the Emily Group are forested, with rocky perimeters. *Photos by Michael S. Rodway, 18 July 1975.*

Historical summary: Eight Black Oystercatchers were present in 1975 but no nests were found (Table QS-060). Birds were displaying, repeatedly bowing to each other, and we suspected they were a group of immature or nonbreeding birds (Figure 234). Two pairs of Pigeon Guillemots also were engaged in repeated displays of bowing, craning necks, and walking around each other. Two old, wet, Pigeon Guillemot-sized burrows were found in eroded faces of soil at the edge of the vegetation, but no sign of recent burrowing was encountered. In 1982, an oystercatcher nest with one egg was found on the easternmost islet, and one Pigeon Guillemot flew out of a burrow above a rock bluff on the southwest side of the large western island.

Figure 234. It may take five years for a Black Oystercatcher to reach sexual maturity. During that period, it may engage in a variety of pseudo displays.[310] *Photo by R. Wayne Campbell.*

Table QS-060. Seabird nesting records for Emily Group. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
18 Jul 1975	0	2S(5)	32, 265
7 Jul 1982	1	1(2)	183

Remarks: We noted pathways by either mink or river otter through the shrubbery in 1975.

QS-070 ROGERS ISLANDS

Location: *51°01'06"N 127°35'00"W; 92 M/4.* Southwest of Allison Harbour, northwest of the Southgate Group.

Description: *1.0 ha; 16 m high; Two grassy rocks.*

Historical summary: We did not land due to rough seas in 1975. From the water we counted a pair of Black Oystercatchers and 99 Glaucous-winged Gulls sitting on territories on the western island (Table QS-070). There were 115 Glaucous-winged Gulls (mostly adults) on the eastern island, but most were roosting and only 8 were possibly on territories. We estimated 50-75 pairs of gulls nesting. In 1982, there was an oystercatcher nest on each rock, 83 gull nests on the west rock, and 55 gull nests on the east rock (Figure 235).

Figure 235. Glaucous-winged Gulls were obviously nesting on Rogers Islands in 1975, but due to rough weather we could not land to count nests. A full count of nests was made in 1982. Here, a young downy chick hides in a rock crevice near its nest. *Photo by Moira J.F. Lemon.*

Table QS-070. Seabird nesting records for Rogers Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
18 Jul 1975	1eS	75eS		32, 265
7 Jul 1982	2[2]	138[118]	S(2)	183

Remarks: We found one dead Black Oystercatcher on the west island in 1982.

QS-080 HARRIS ISLAND

Location: *51°00'01"N 127°33'49"W; 92 M/4.* West of the Southgate Group.

Description: *0.3 ha; 12 m high; Grassy rock.* There is a navigational beacon on this rock (Figure 236).

Figure 236. Harris Island is a rock with grassy patches on the crown. *Photo by Michael S. Rodway, 18 July 1975.*

Historical summary: Rough weather prevented landing in 1975. From the boat we counted 38 Glaucous-winged Gulls sitting on territories and estimated 20 pairs nesting (Table QS-080). One Pigeon Guillemot flew out of a crevice. Gull nests were counted in 1982. Only one empty Black Oystercatcher nest was found in 1982, but single chicks were found in two separate locations (Figure 237) and two pairs of adults were attentive. We assumed the chicks were from separate nests.

Figure 237. Once hatched, Black Oystercatcher chicks leave the nest and hide in rock crevices or under vegetation when the adults sound the alarm. With their cryptic camouflage, they are difficult to find when conducting surveys of nesting birds. *Photo by Moira J.F. Lemon, 27 June 2005.*

Table QS-080. Seabird nesting records for Harris Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
18 Jul 1975		20eS	1(1)	32, 265
7 Jul 1982	2[2]	28[26]	S(2)	183

Table QS-090. Seabird nesting records for Annie Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
18 Jul 1975		5eS	32
7 Jul 1982	1	7S	183

QS-090 ANNIE ROCKS

Location: *50°58'43"N 127°29'55"W; 92 L/14.*
Southeast of the Southgate Group, northwest of Shelter Bay.

Description: *7 m high; Bare rock.*

Historical summary: Stormy weather prevented landing in 1975. From the water we could see 10 adult Glaucous-winged Gulls sitting on territories and estimated five pairs nesting (Table QS-090). Ten adult gulls were also present in 1982 when we counted seven nests. All nests were empty. The Black Oystercatcher nest held one egg.

Remarks: Egg harvesting may have been responsible for the empty gull nests seen in 1982.

QS-100 TREE ISLETS

Location: *50°58'59"N 127°42'43"W; 92 L/13.*
Northeast of Pine Island on the south side of Europa Passage.

Description: *6.9 ha; 40 m high; Forested; Grassy rock.*
The main islet has a spruce forest with a predominantly shrub understory, including salmonberry, elderberry, and currant. Open areas of false lily-of-the-valley, fern, and grass occur on the perimeter and in some interior areas (Figure 238). The three smaller, northeast islets are bare, with grassy patches.

Figure 238. The main islet of the Tree Islets is forested with Sitka spruce. Ground cover in perimeter areas above the shoreline rock is a lush mix of grasses and herbaceous plants (top) while interior areas are covered with salmonberry and other shrubs (middle), with some open patches of wild lily-of-the-valley. *Photos by Moira J.F. Lemon, 15 July 1986 (top) and Michael S. Rodway, 14 July 1975.*

Tree Islets became part of the Duke of Edinburgh Ecological Reserve in 1988.

Historical summary: Green and Burton collected Fork-tailed and Leach's storm-petrel eggs (Figure 239) from Tree Islets in 1910 (Table QS-100). The collection date for these eggs was previously given as 24 May 1909 [39] but was revised based on information gathered by Carter and Sealy.[53] Young visited the islets during his stay on Pine Island in 1929 and confirmed nesting by five species. Drent explored the area in 1968.

Figure 239. Leach's Storm-Petrel egg. Storm-petrel eggs were collected from Tree Islets by Charles de Blois Green and Walter J. Burton in the early 1900s.[53] *Photo by R. Wayne Campbell.*

Rhinoceros Auklets appear to have recently colonized Tree Islets. Young stated that there were no Rhinoceros Auklets nesting on Tree Islets in 1929,[251] and none were recorded in 1968, 1975, or 1976. We confirmed nesting in 1986 around the perimeter of the main islet. Cassin's Auklets also nested in the same perimeter areas. Drent noted Cassin's Auklet and Pigeon Guillemot burrows mixed together along those perimeter areas in 1968. We noted the same pattern in 1975 but did not confirm the presence of Cassin's Auklets that year.

The apparent increase in storm-petrel numbers can be attributed to improved survey technique. In 1975, we noted that storm-petrels were nesting at high density in all vegetated habitat except under thick salmonberry where there were few burrows. A similar distribution was seen in 1986, when most burrows were found in more open areas and 10% were found under shrubbery (Figure 240). The ratio of Fork-tailed to Leach's storm-petrels (3:11) found in 16 burrows explored in 1975 was similar to the ratio (5:28) determined in 39 burrows examined in 1986.

Table QS-100. Seabird nesting records for Tree Islets. See Appendix 2 for codes.

DATE	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	RHAU	SOURCE
25 May 1910	x	x							53[a]
Jun 1929		x		3[3]	1	x3	x	0	251
4 Jul 1968		100's		1	10[7]	30e(60)	100e		265
24 Jun 1975			4						265
14 Jul 1975	2,500e	5,000e	7[3]	1	54[25]	10e(12)	S		32, 265
12 Jun 1976	50e	12,500e	0	3[3]	67[36]	x(73)	100e		265
17-19 Jul 1986	8,300t	47,000t	0	1	59[19]	x3(38)	250e	100e	183

[a] See text regarding the previous date of 1909 reported for these specimen records.

Pelagic Cormorants were found nesting only in 1975 (Figure 241). From the water, Widdowson observed cormorants sitting on four nests on moderately sloped rock of the eastern islet in June. He counted 22 birds and noted that there may have been more nests. We confirmed eggs in three of seven nests later that season in July and described the location as along a crevice on the southeast side of the most eastern rock. Eight adults in breeding plumage and 31 immature birds were present. Only 16 immature Pelagic Cormorants were present in 1976 and none were seen in 1986.

Figure 240. The main islet of Tree Islets seen from the east shore of neighbouring Pine Island. The main islet supports a large population of storm-petrels nesting throughout vegetated areas. Cassin's Auklets and Rhinoceros Auklets nest in small numbers around the perimeter of the islet. *Photo by Moira J.F. Lemon, 27 July 2006.*

Figure 241. Checking for cliff-nesting species, like Pelagic Cormorant, is hazardous. Here, Michael Rodway (left) is navigating dangerous cliffs looking for nests on Tree Islets on 12 June 1976. No cormorant nests were found in 1976 where Rodway had previously found nests on 19 July 1975 (right). *Photos by R. Wayne Campbell (left) and Michael S. Rodway.*

One to three pairs of Black Oystercatchers have been found nesting since Young [251] confirmed nesting in 1929. One nest with eggs and young was found on the rocky shore of the main islet in 1975. Two empty scrapes and eight birds were seen on the most eastern islet, but birds did not seem to be nesting. One empty scrape but no birds were also found on the northern of the east islets. In 1976, two nests were found on the main islet; the location of a third nest found was not specified (Figure 242). The one nest found in 1986 was on the northern of the east islets.

Young noted few Glaucous-winged Gulls nesting and found only one nest on Tree Islets in 1929.[251] Drent found 10 nests in 1968 and greater numbers were nesting in the 1970s and 1980s. In 1975, gulls were nesting on the most eastern islet (17 nests), the middle-east rock (20 nests), and the north-east islet (16 nests). One empty nest was found on the main islet but it was unattended. In 1976, there were 42, 5, and 20 nests on those three islets, respectively (Figure 243). Gulls were nesting only on the most eastern (39 nests) and the north-east (20 nests) islets in 1986.

Figure 242. Black Oystercatcher nest found on the main islet of the Tree Islets in 1976. The nest with two eggs has a few limpet and mussel shells and is partially hidden by *Potentilla* sp. *Photo by R. Wayne Campbell, 12 June 1976.*

Figure 243. Glaucous-winged Gull nesting habitat on the eastern islets of the Tree Islets in 1976. *Photo by R. Wayne Campbell, 12 June 1976.*

Pigeon Guillemot nests have been found in burrows at the edge of the vegetation at the top of rock faces, in rock crevices, and under boulders. Nests were found on the main island in 1975 and 1986 and on the eastern rock in 1975 and 1976.

Remarks: Young attributed declines in numbers of nesting gulls to harvesting by native fishermen that gathered large numbers of eggs from colonies in this area.[251] In 1986, gulls had abandoned the middle rock; many gull nests were empty, there were no young, and three broken eggs were found. This also may have been a result of egg harvesting. We found very little evidence of predation in 1975 and 1986. One immature Bald Eagle was sighted in 1975 and 1986 and there was an eagle nest on the main islet in 1986. There were some signs of river otter in 1975.

QS-110 PINE ISLAND

Location: *50°58'37"N 127°43'27"W; 92 L/13.* Marking the western entrance to Queen Charlotte Strait, south of Storm Islands.

Description: *56 ha; 85 m high; Forested.* Pine Island is a heavily forested, circular island, with a steep rocky shoreline cut by gorges and crevices. Much of the interior vegetation is dense salal and salmonberry under a forest of spruce, hemlock, and redcedar, but extensive perimeter areas are open, covered with moss, grass, and forbs. Nesting Rhinoceros Auklets erode surface vegetation in many of those areas. A manned lightstation was built on the southwest corner of the island and went into operation in 1908. A fifty-foot rogue wave,

Figure 244. Of all of the seabird colonies in Queen Charlotte-Johnstone straits, Pine Island has been the most visited by bird collectors, researchers, and survey teams because it is easily reached from Port Hardy. It is the largest Rhinoceros Auklet colony in BC. Photos here show (clockwise from top left): the forested island with its steep rocky perimeter (note lighthouse on rock bluff on left); shrub growth that dominates the interior ground cover under mixed conifers; herbaceous plants and grasses on slopes above the shoreline rock; and areas where the surface vegetation has been eroded by burrowing Rhinoceros Auklets. *Photos by R. Wayne Campbell, 12 June 1976 (top two) and Michael S. Rodway, 13 July 1975.*

generated by 100-mile-an-hour winds, obliterated the lightstation on 18 February 1967.[314] Fortunately, the families all survived by running into the forest. The lightstation was rebuilt and remains in service as of 2022 (Figure 244).

The island was established as part of the Duke of Edinburgh Ecological Reserve in 1988, excluding the area within a 300 m radius of the light tower.

Historical summary: Lyall, the surgeon and naturalist aboard the HMS *Plumper*, obtained four adult and one large young Rhinoceros Auklets on 22 May 1860 at Fort Rupert, close to present day Port Hardy. The young bird was a near-fledgling chick in juvenile plumage with only a trace of down. Carter and Sealy suspected that these specimens had been collected at Pine Island.[54] The fledgling chick would constitute the earliest documented breeding record for the species in BC [54] but is questionable because 22 May is an extremely early date for such a specimen (22 May is three weeks earlier than the earliest hatch date at Washington colonies [249] and two months earlier than the earliest fledging date reported in BC [40]). The first confirmed breeding by Rhinoceros Auklets at Pine Island is an egg collected on 31 May 1901 (Table QS-110; Figure 245). Green documented nesting by Rhinoceros Auklets in 1907 and by Leach's Storm-Petrels and Cassin's Auklets in 1909. Burton also collected on the island in 1909 [251] and 1910.[77] Pike, the lightkeeper on Pine Island between 1915 and 1933, made observations of the nesting birds, and assisted Young when he visited the island in 1929. Pike recalled many Leach's Storm-Petrels, Pigeon Guillemots, and Cassin's Auklets nesting and remembered large numbers of Rhinoceros Auklets nesting during his stay on the island.[77] Young noted a number of Black Oystercatchers on rocky areas but did not think they were breeding in 1929.[251] Young [251] stated that he saw no Tufted Puffins during his visit in 1929 but apparently collected an egg [280c] identified as this species from a burrow under tree roots in 1930.[77] That is the only record of puffins nesting on Pine Island and its veracity was questioned by Drent and Guiguet.[77] We saw no puffins in 1975 and the lightkeepers at that time, Ralph and Vivian Emrich, said they had never seen any around the island. One puffin was sighted on the water off the lightstation on 11 July 1986 but nesting was not suspected. Young visited the island again in 1932 and collected a Cassin's Auklet egg.[77]

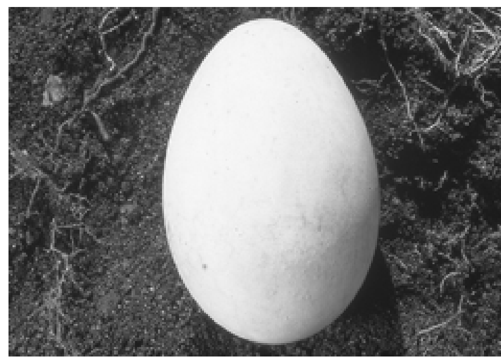


Figure 245. A well-incubated, nest-soiled Rhinoceros Auklet egg from a burrow on Pine Island in 1975 (top), and a Rhinoceros Auklet egg cleaned for an oological collection. *Photos by Michael S. Rodway, 13 July 1975 (top) and R. Wayne Campbell.*

Although Young provided no details, he included Pelagic Cormorants in his list of birds that he observed and that bred at Pine Island.[251] We have included this record as suspected breeding, although we have some uncertainty about its veracity because Young also included Black Oystercatchers in his list of birds breeding, but then later in the same paper stated that he did not think they were breeding on Pine Island. We saw signs of cormorants roosting on the south side cliffs but no sign of nesting or birds in 1975. One Pelagic Cormorant flew out from the cliffs on the northeast corner of the island on 19 July 1985

Table QS-110. Seabird nesting records for Pine Island. See Appendix 2 for codes.

DATE	LSPE	PECO	BLOY	PIGU	CAAU	RHAU	TUPU	SOURCE
31 May 1901						x		54
14 May 1907						x		53, 277g
24 May 1909	x				x	x		251, 265[a]
25 Jun 1909						x		53, 277h
1910						x		77
1915-33	x			x	x	x		77
May 1922						x		251
1-18 Jun 1929	x	S	0	3+	x	x	0	251
16 Jul 1930							x[b]	77
28 Apr 1932					x			77
1957						S		77
12-14 Jul 1975	100e	0	1	x6(25)	1,500e	45,000e[c]	E	32, 265
12-16 Jun 1976						39,500t		36
6-7 Aug 1982				(2)		x		265
10-25 Jul 1985	100eS			S(36)	E	89,500t	E	183
6-23 Jul 1986				S(25)		x		183

[a] There are records in the BCNRS [265] of Leach's Storm-Petrel and Cassin's Auklet eggs collected by Green but the present location of those eggs is unknown.
[b] This record has been questioned - see text.
[c] Revised from Campbell.[32]

but the cliffs were not inspected for nests (nesting was confirmed in 2014; see Appendix 1).

Cassin's Auklets, which were recorded nesting from 1909 to 1975, were not found during the thorough survey in 1985 (Figure 246). In 1975, we found Cassin's Auklet burrows mixed with Rhinoceros Auklet burrows and found one, almost-fully-feathered young in a burrow. It is possible that Cassin's Auklets have been displaced by Rhinoceros Auklets.

Both Fork-tailed and Leach's Storm-Petrels were heard flying around Pine Island in 1985 and 1986, but only Leach's Storm- Petrels have ever been confirmed nesting. The area on the northeast shore of the island where storm-petrels were found nesting faces Tree Islets, and flying birds could originate from there.

Population estimates for Rhinoceros Auklets (Figure 247) in 1976 and 1985 were both derived from line transect survey methods. However, sampling was more intensive in 1985 than 1976, and methods used in 1976 for calculating colony area (island circumference multiplied by the average inland extent of burrowing along transects) and occupancy rate (determined from knock-down sticks placed in burrow entrances) were unreliable.[36, 183] Calculated burrow density was higher in 1976 than 1985, but estimated occupancy rate was lower in 1976 and estimated colony area was half that measured in 1985, resulting in a lower population estimate. Actual measured extent of burrowing along transects was similar in the two years, and nesting populations were probably similar in size. Pine Island houses the largest Rhinoceros Auklet colony in BC.

Figure 246. Surveys of nesting seabirds on Pine Island were conducted by the BCPM in the 1970s and by CWS in the 1980s. Some of the enthusiastic participants in the BCPM (first three photos) and CWS (last three photos) surveys included (clockwise from top left): Harry Carter, here searching for nesting Rhinoceros Auklets; Teresa Shepard, Keith Taylor, and Marilyn Paul (now Lambert) returning to the lighthouse after a wet day conducting surveys; an exhausted Marilyn Paul catnapping; Moira Lemon holding a Rhinoceros Auklet chick; Don Garnier preparing to run the "chain" to establish the transect line through the Rhinoceros Auklet colony; and Brian Carter and Patti Haist walking along the lighthouse-keepers' trail through the Rhinoceros Auklet colony. *Photos by R. Wayne Campbell, 15 June 1976 (first three), Glen Keddie, 26 July 2016, and Moira J.F. Lemon, July 1985, 1986 (last two).*

Figure 247. This downy Rhinoceros Auklet chick, pulled from a burrow on Pine Island, is less than a week old. Brooded by an adult for its first few days, it will soon be left alone in the burrow while both adults spend the day at sea, feeding themselves and capturing fish prey to carry back to it when they briefly return to the colony each night under the cover of darkness. *Photo by Moira J.F. Lemon, July 1986.*

Observations of staging Rhinoceros Auklets were made in 1975. We counted birds visible from land off the east side of the island on 12 and 13 July. Birds began gathering on the water at 19:30 hr and by 21:30 hr we estimated 5,000 present, after which it was difficult to count birds in the falling darkness. We made no staging area counts around other parts of the island but the lighthouse keepers informed us that birds regularly gathered off the southwest side of the island that is visible from the lighthouse area. We thus suspected that birds gathered around much of the island and estimated that staging concentrations of 20,000-40,000 birds were likely. Birds began circling around 22:00-22:30 hr in groups of up to 500 birds. On the east side we observed a steady flow of birds flying from west to east above tree-top level. Birds heading offshore thus emerged from over the forest above our vantage point on the east shore. Other birds were flying in low in the opposite direction heading directly into forest nesting areas on the east side. Better surveys are needed to accurately map staging areas around the island.

One pair of Black Oystercatchers with a large downy chick was found on the north side of the island in 1975 (Figure 248). Two oystercatchers were noted in 1982, six were seen on the west shore in 1985, and two were heard there in 1986. No evidence of nesting was reported in those years but surveying the Rhinoceros Auklet colony was the focus of those visits and time was not spent searching for oystercatcher nests. We thus consider the 1975 record to be the most reliable.

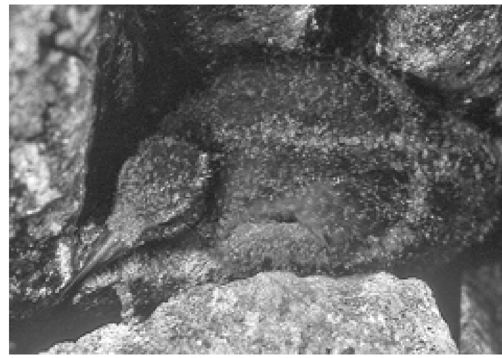


Figure 248. This motionless, large Black Oystercatcher chick discovered on Pine Island in 1975 was difficult to spot in the shadows between rocks. *Photo by Michael S. Rodway, 14 July 1975.*

Pigeon Guillemot nests have been found along the south side of the island. In 1975, guillemots were confirmed nesting in crevices on the southeast corner. In 1985, they were suspected nesting in crevices and burrows at the edge of the vegetation on the southeast corner and in the gorge by the lighthouse at the southwest corner.

Remarks: Three Bald Eagle nests were reported in 1975. Ten Bald Eagle nests were found but only two appeared active in 1985. Signs of predation on Rhinoceros Auklets by Bald Eagles were found in the colony in 1975 and 1985. In 1985, eagles were seen perching low in the forest in the evening when Rhinoceros Auklets were flying in to their burrows (Figure 249). Several birds are killed every year flying into the lightstation. Young stated that Leach's Storm Petrels were the most frequent species killed - sometimes half a bucket of them were picked up around the light.[251] We saw scats and trails of river otters on the east side of the island in 1975.

Figure 249. Bald Eagles prey on Rhinoceros Auklets at sea and also capture them on their breeding colonies at night. *Photo by R. Wayne Campbell.*

Pine Island is readily accessible from Port Hardy and has been an attractive site for research on Rhinoceros Auklets. As part of comparative, three-island studies, Vermeer [230, 233] analyzed characteristics of prey fishes delivered to Rhinoceros Auklet chicks between 1977 and 1980, Bertram [8, 9, 13] monitored provisioning and growth of nestlings between 1984 and 1986, and Harfenist [98, 99, 100] investigated the effects of growth rate and parental predation risk on fledging in 1989 and 1990 (Figure 250).

The Sea Provides – Again!

Each seabird colony is unique and our experiences on each island were always different. This was especially true if we were working on the colonies at night when nocturnal birds like Rhinoceros Auklets were active.

During CWS surveys, we often participated in other related studies, one of which was a comparative three-island study investigating the growth and provisioning of Rhinoceros Auklet chicks conducted by Doug Bertram for his M.Sc. Thesis. Doug's main study site was on Lucy Islands near Prince Rupert, and comparative data were gathered at Triangle and Pine islands. Each Rhinoceros Auklet adult brings in a bill-load of fish every night to feed its chick (Figure 251)*. To compare the species and quantity of fish being delivered to the growing chicks, the study required a number of complete bill-load samples to be obtained several times during the nestling period at each of the three islands. Over the years of that study, I (Moira) was fortunate to work several times on all three islands, each of which provided a unique and thrilling immersion into the intensity of nocturnal life on those colonies. It was always a spectacle to witness hundreds of auklets, with fish clutched firmly in their bills, flying into the colony, where they arrive like bullets out of the darkness. Rhinoceros Auklets, like other alcids, have short wings and fly fast and direct. Not being very maneuverable,*

Figure 250. Studies of provisioning rates, the characteristics of fish prey (left) brought to Rhinoceros Auklet chicks, and nestling growth rates have been conducted on Pine Island by CWS and SFU biologists. *Photos by R. Wayne Campbell.*

they frequently collide with obstructions such as trees that happen to be in their flightpath. Seabird researchers working in the colonies at night need to be concerned about impacts from incoming birds, but risks vary among colonies.

On Lucy Islands a boardwalk extended from the old lightstation down the length of the island, with a side branch connecting to the idyllic sandy beach on the southern shoreline where we camped. The boardwalk provided convenient access to various study sites and near its eastern end passed through a particularly dense section of the Rhinoceros Auklet colony. Trees are short there, with branches just at or below head height, which enabled us to sit on the boardwalk surrounded by darkness, and have birds literally rain down into our laps from the latticework of branches above, making the collection of food samples particularly easy. Those branches broke the birds' speedy approach, so generally there was no danger of the auklets colliding with us.

Collecting food samples on Pine Island was a little more challenging, with greater risks of being hit by incoming birds, but living was easy. Our accommodation was in the spare house at the lightstation and working there was like conducting field work in your backyard from the comfort of home. A network of trails and bridges that the resident lightkeepers had created over the years provided easy nighttime access into the forest where Rhinoceros Auklets nest. Trees are larger here than where we food sampled on Lucy Islands, and adults flying in with fish on Pine Island invariably crash into the trunks of trees and drop like stones to the forest floor. Surprisingly, despite these high-speed collisions, very few birds seemed to sustain any injury, and many immediately scurry off to find their burrow. However, some birds sit still for a short time, momentarily stunned, and in the open areas under the trees we were able to capture them by hand, or with a long-handled fishing net.

On Triangle Island there is no forest cover to provide protection from the high-speed approach of the 600 g bird "missiles" and food sampling was more dangerous. On food sampling nights, we would walk carefully up the steep grassy slopes behind the cabin in the south bay, and settle ourselves in amongst the grass tussocks to await the arrival of the incoming birds. We sat with our headlamps dimmed, and when a bird came whistling in to land nearby, we would brighten our headlamps to momentarily daze the bird, then hastily pounce and grab the bird before it scuttled off to its burrow. But it was hard to relax – getting hit by an adult Rhinoceros Auklet at full speed can inflict serious injury. After one night of food sampling in July 1984, Rob Butler, Ian Jones, Michael, and I realized that we needed some kind of head protection for when we next had to collect food samples. With a note of confidence in his voice, Ian said "I'll go find something" and he headed off to go "shopping" along the driftwood tideline. About an hour later he came back, carrying four construction hardhats that had washed up along the shore – perfect for our needs (Figure 252)*! Since then, hard hats have become mandatory for nighttime work on the slopes of Triangle Island.*

Figure 251. Each Rhinoceros Auklet parent generally delivers one bill-load of fish to their chick every night (top). As part of a study on the growth and provisioning of Rhinoceros Auklet chicks conducted by Doug Bertram in the 1980s, fish samples were collected and measured. *Photos by Moira J.F. Lemon, 10 July 2016 and 15 July 1985.*

Figure 252. Michael Rodway (standing left), Rob Butler, Ian Jones (sitting right), and Moira Lemon posing with their beach-combed hardhats on Triangle Island in 1984. *Photo by Moira J.F. Lemon, July 1984.*

QS-120 BUCKLE GROUP

Location: *50°56'29"N 127°39'26"W* (Bright Island)*;* *50°56'23"N 127°37'57"W* (Herbert Island)*; 92 L/13.*

Northeast of Nigei Island, between Pine Island and the Walker Group. The Buckle Group includes Bright and Herbert islands and several smaller islets (Figure 253).

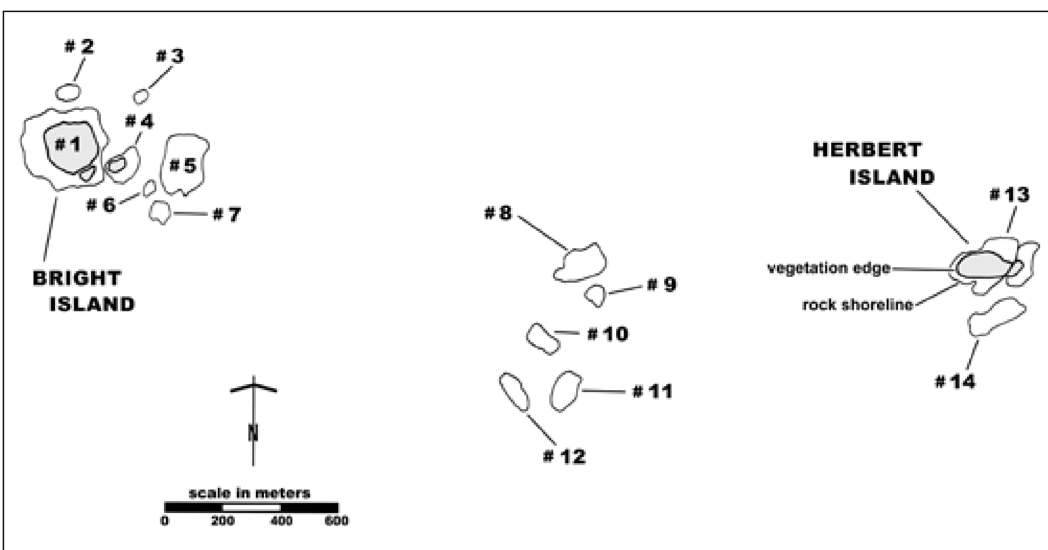


Figure 253. Numbered islands in the Buckle Group referred to in the text.

Description: *4.4 ha; 34 m high; Forested; Grassy rock; Bare rock.*
Bright and Herbert islands are covered with grass and salmonberry under an open spruce forest. Smaller islets in this group are mostly bare rock, except for the small islet (#4) just east of Bright Island that has a patch of grassy habitat (Figure 254). An automated weather station was established on Herbert Island in 1984.

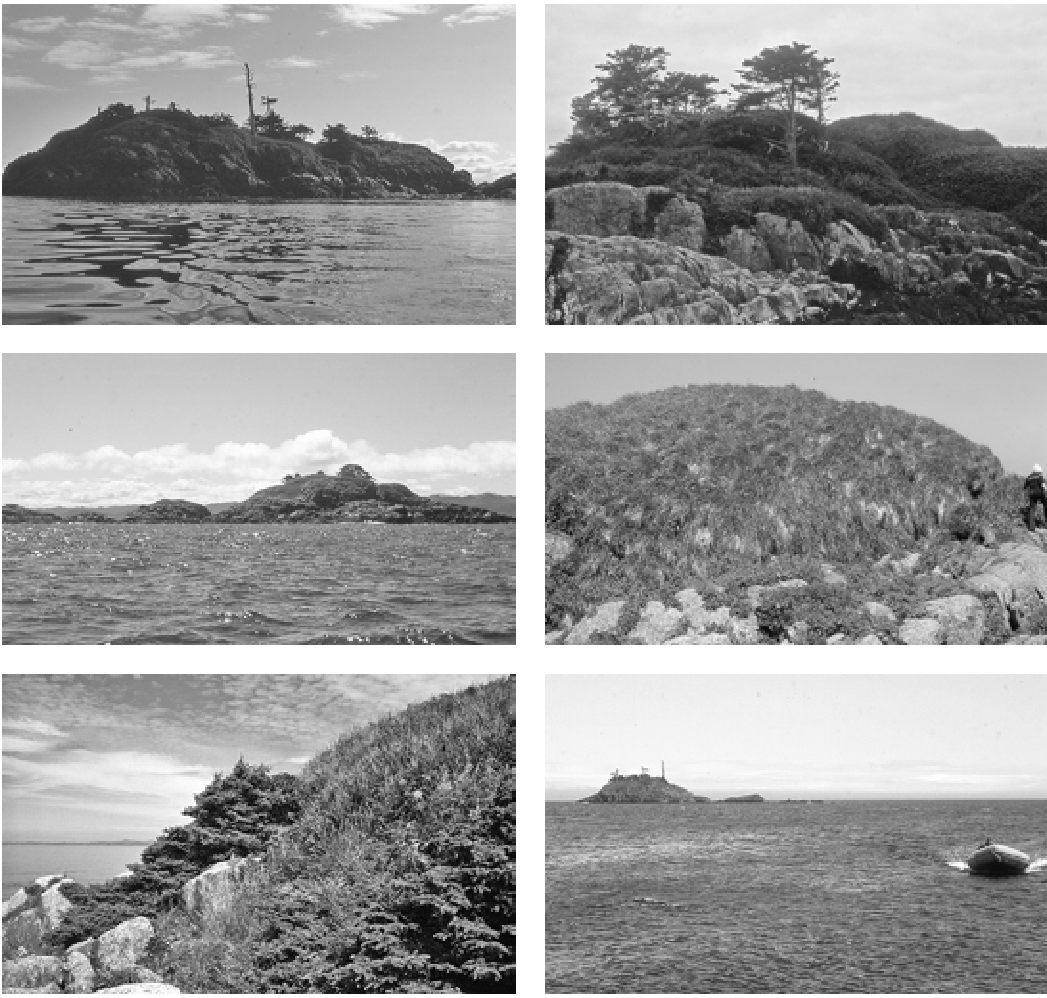


Figure 254. The Buckle Group is comprised of 14 islands and rocks. The two largest islands, Bright and Herbert islands, have open stands of Sitka spruce, with grassy areas and salmonberry shrubs above shoreline rocks. Smaller islets are mostly bare rock with some grassy patches. Shown here are (clockwise from top left): a profile of Herbert Island from the west side; burrowing habitat on Herbert Island; the cap of dune grass on islet #4; Herbert Island from sea; dense salmonberry, young spruce, and grasses above shoreline rock on the north end of Bright Island; and Bright Island and nearby islets from the north. *Photos by the authors.*

Buckle Islands are part of the Duke of Edinburgh Ecological Reserve.

Historical summary: Tex Lyon visited the area and confirmed nesting by Leach's Storm-Petrels in 1934 (Table QS-120), but it was not until 1975 that the islands were thoroughly explored. Leach's Storm-Petrels have been found nesting throughout vegetated areas, although burrow density is lower under salmonberry than in grassy areas. Fork-tailed Storm-Petrels have been found nesting on all surveys from 1975 to 1987 but have been far outnumbered by Leach's Storm-Petrels on all surveys (Figure 255). In each year, only one burrow occupied by a Fork-tailed Storm-Petrel was found compared to 33, 12, 54, and 28 occupied by Leach's Storm-Petrels in 1975, 1976, 1982, and 1987, respectively. The one Fork-tailed Storm-Petrel burrow was found on Herbert Island in 1975, on the small grassy islet (#4) just east of Bright Islet in 1982 (we also heard Fork-tailed Storm-petrels calling in two burrows on Herbert Island in 1982), and on Bright Island in 1985. Thus, Fork-tailed Storm-Petrels nest sparsely on all vegetated islets in the group.

Figure 255. Both Fork-tailed and Leach's storm-petrels nest on the Buckle Group but Leach's Storm-Petrel is far more abundant. Leach's Storm-Petrel burrows have been found throughout vegetated areas, with lower burrow density in shrubby areas of wind-blown and short salmonberry bushes than in grassy areas. *Photo by Michael S. Rodway, Herbert Island, BC, 11 July 1975.*

Cassin's Auklets were also found nesting on all three vegetated islets (#1, 4, and 13) during all surveys from 1975 to 1987 and were most abundant

Table QS-120. Seabird nesting records for the Buckle Group. See Appendix 2 for codes.

DATE	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	RHAU	SOURCE
10 Aug 1934		x							77
11-12 Jul 1975	200e	5,000e	52[12]	5[3]	60[27]	25e(37)	300e	35e	32, 265
16 Jun 1976	50e	1,200e	21[0]	4[4]	88[46]	x4(6)	2,000e	E	265
14 Jul 1978				3[3]					265
3-4 Jul 1982	350t	20,000t	16[1]	5[4]	127[103]	x6(74)	2,400t	E	265
3 Aug 1987	900t	27,000t	6[4]	2e	65[1]	S(68)	5,900t	E	183

in perimeter grassy habitat (Figure 256). Lower density burrowing occurred under salmonberry and no burrows were found in the central part of Bright Island in 1982 and 1987. Estimates for storm-petrels and Cassin's Auklets from 1982 and 1987 were both derived from line transect sampling techniques, but plots were not systematically spaced in 1982, giving a potential bias to the burrow density estimate, and colony area was not measured accurately. The 1987 estimates are considered more reliable.

Figure 256. Grassy perimeter areas, here on Herbert Island, were the preferred burrowing habitat for Cassin's Auklets in the Buckle Group. *Photo by R. Wayne Campbell, 16 June 1976.*

Rhinoceros Auklets were confirmed nesting on Herbert Island in 1975 but no evidence of breeding has been found since (Figure 257). In 1975, we found a Rhinoceros Auklet chick in a burrow at the edge of grassy habitat where Cassin's Auklet burrows were common. On the evening of 11 July, we saw a maximum of five Rhinoceros Auklets gathered offshore at 21:00 hr. We did not hear any on the colony that night. We concluded that few Rhinoceros Auklets were nesting and made a rough estimate of 35 pairs. Habitat on the Buckle Group is different than the forested areas typically used for burrowing on nearby Pine and Storm Islands and perhaps only an occasional pair nest on the Buckle Group.

The number of Pelagic Cormorant nests in the Buckle Group decreased between 1975 and 1987. Four different locations around Bright Island have been used for nesting and apparent nesting success has been poor in most years. In 1975, cormorant nests were found on two opposing rock faces, located on the southeast side of islet #4 and the northwest side of islet #6 (38 nests), just east of Bright Island, and on the cliffs at the northwest corner of Bright Island (14 nests). Ten of the 14 nests on Bright Island were disheveled and appeared abandoned, and only one adult bird was scared off the nesting cliff when we surveyed it. Birds were present at the other nesting

Figure 257. Teresa Shepard (left photo) and Keith Taylor and Marilyn Paul (now Lambert) searching vegetated areas for evidence of burrow-nesting seabirds, including Rhinoceros Auklets, on the Buckle Group in 1976. *Photos by R. Wayne Campbell, 16 June 1976.*

locations, but most nests were empty. All nests were empty in 1976 (Figure 258) and only one nest contained eggs in 1982. In 1982, all nests were on the northwest corner of Bright Island. Some nests were still being built and there were an additional five nest starts on the cliff. It is possible that eggs, perhaps replacement clutches, were still being laid. The six nests found in 1987 were located on the northwest face of the grassy islet (#4) off the east side of Bright Island. Adults were incubating eggs in four of those nests.

Black Oystercatchers have been found nesting at six locations (Figure 259): the west side (1 pair in 1987) and south side (1 nest in 1982) of Bright Island (one nest was also found on Bright Island in 1976); the south side of the grassy islet (#4) on the east side of Bright Island (1 nest in 1976, 2 nests in 1982); the north side of islet #5 (1 nest in 1982); the southwest

Figure 258. In the Buckle Group, numbers of Pelagic Cormorants nesting and timing of nest construction and egg-laying have varied among years. All nests found in 1976 were empty, including the nine nests shown in this photo. *Photo by R. Wayne Campbell, 16 June 1976.*

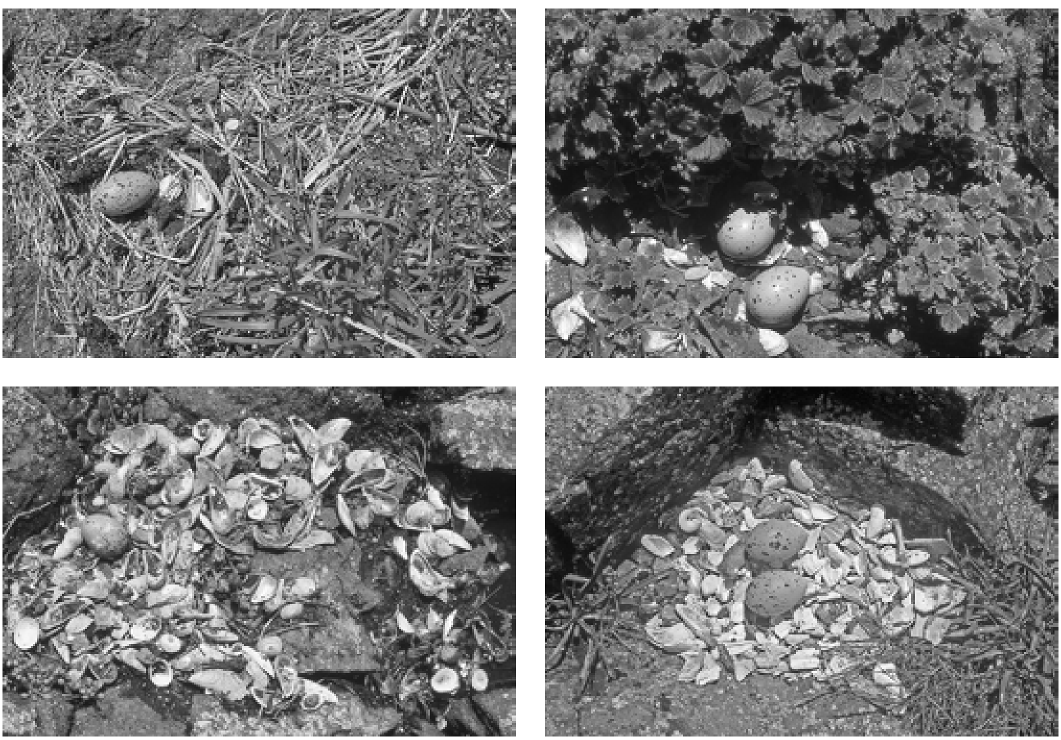


Figure 259. Four Black Oystercatcher nests were found on the Buckle Group in 1976: two on Herbert Island, one on Bright Island, and one on islet #4. Nests scrapes were lined with numerous mussel, barnacle, and limpet shells. *Photos by R. Wayne Campbell, 16 June 1976.*

rock (islet #12) of the middle group of rocks (1 nest in 1975); and Herbert Island (4 nests in 1975, 2 nests in 1976, 3 nests in 1978, 2 empty nests but only one nesting pair in 1982, 1 nest in 1987). In 1982, we also saw adults but found no nests on islets #8 (4 birds), #12 (6 birds), and #14 (2 birds).

Glaucous-winged Gulls have nested at eight locations, most predominantly on the rocks around Bright Island (Figure 260). Nests have been found on the east (6 nests in 1982) and south (2 nests in 1987) sides of Bright Island and on most adjacent rocks, including: islet #2 (2 nests in 1987); islet #4 (13, 22, and 4 nests in 1975, 1982, and 1987, respectively), islet #5 (34, 86, and 59 nests in 1975, 1982, and 1987, respectively); islet #6 (5 nests in 1982); and islet # 7 (7 nests in 1975, 2 nests in 1982). Gulls have also nested on the large, northern rock (islet #8) of the middle group of rocks (3 nests in 1975, 6 nests in 1982). Herbert Island has been the site most frequently used for nesting by oystercatchers but no gulls have ever been reported nesting around Herbert Island.

Figure 260. Looking towards Herbert Island from Bright Island in the Buckle Group. Glaucous-winged Gulls nest on the rocky islets around Bright Island seen in the foreground. *Photo by Moira J.F. Lemon, 3 August 1987.*

Pigeon Guillemots have been seen and nests found mostly on Bright Island and the islets near Bright Island (Figure 261). A total of 11 nests with

Figure 261. In the Buckle Group, Pigeon Guillemots apparently prefer Bright Island and its associated islets for nesting. This photo shows the south side bluffs and the vegetated top of Bright Island. Rock crevices provide nesting habitat for Pigeon Guillemots. *Photo by Moira J.F. Lemon, 3 August 1987.*

eggs or small chicks were found in 1975. Nests have been found in crevices and under rocks on: Bright Island (6 nests in 1975, 2 nests in 1976, 1 nest in 1982); the grassy rock (#4) just east of Bright Island (2 nests in 1975, 2 nests in 1976, 1 nest in 1982); the large, and most eastern (#5) of the Bright Island group of rocks (2 nests in 1975, 1 nest in 1982); the large, northern rock (#8) of the middle group of rocks (1 nest in 1975); and on the south side of Herbert Island (2 adults seen flying out of crevices and 1 nest with 2 young in 1982). In 1987, we saw 67 guillemots around Bright Island and one around Herbert Island.

Remarks: Observations made during the different surveys suggest that the colony suffers disturbance from an unknown source (Figure 262). Of the 52 cormorant nests counted in 1975, 40 were empty and a number of these were disheveled. In the same year over half the Glaucous-winged Gull nests were empty, appearing unused, and two broken eggs, seemingly from predation, were found in the oystercatcher nest on islet #12. In 1976, 51 gull nests were empty with over 50 broken eggs scattered about, and all cormorant nests were empty, though egg-laying may have been delayed. Gulls appeared to be nesting successfully in 1982, but only one cormorant nest contained eggs. Four of six cormorant nests contained eggs in 1987, but only one gull nest held eggs, the rest

Figure 262. Marilyn Paul (now Lambert) counting empty Pelagic Cormorant nests in the Buckle Group in 1976. Empty cormorant and gull nests and many broken gull eggs found during BCPM surveys in 1975 and 1976 indicated that the colony had suffered from some sort of disturbance, possibly from humans. *Photo by R. Wayne Campbell, 16 June 1976.*

appeared unused or as if all eggs had been removed. Egg harvesting by First Nations people likely still occurs on these islands but that seems unlikely to explain the many broken gull eggs found in 1976.

A Bald Eagle nest with two young was seen on Herbert Island in 1975. Nests were also recorded on Herbert Island in 1982 and on Herbert and Bright islands in 1987, but little activity was seen around those nests. Eagles were present on the islands in all years (1975-1987) but very little evidence of predation on adult seabirds was observed in any year. A few scats and paths of river otter were seen on Herbert Island in 1975.

Many slugs were noted in 1975 and many burrows had slugs in them, sometimes several, and in some cases so many that they were virtually blocking the burrow tunnel. It made checking burrows less pleasant (Figure 263). Surprisingly, slugs were not mentioned during subsequent surveys.

Figure 263. Many slugs were found in burrows on the Buckle Group in 1975. Checking burrows meant getting covered in slug slime, which is not easy to remove from clothing and hands. *Photo by R. Wayne Campbell.*

QS-130 JOAN ISLAND

Location: *50°55'32"N 127°33'02"W; 92 L/13.*
North of Tommy Point on Kent Island in the Walker Group.

Description: *0.3 ha; 5 m high; Bare rock.*
Joan Island lies at the north end of the Mahpahkum-Ahkwuna/Deserters-Walker Conservancy established by BC Parks in 2006.

Historical summary: Four Black Oystercatchers and four adult Glaucous-winged Gulls were present in 1975 (Table QS-130). Two oystercatcher nests with eggs were found and one gull nest was found that held three downy chicks. One adult gull and five oystercatchers were present in 1982 but there was no sign that they were nesting.

Twenty-eight Pelagic Cormorants, including three in breeding plumage were roosting in 1975 but there has been no evidence of cormorants nesting on the island.

Table QS-130. Seabird nesting records for Joan Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
11 Jul 1975	2[2]	1	32, 265
2 Jul 1982	0	0	183

QS-140 DESERTERS ISLAND

Location: *50°52'30"N 127°28'08"W; 92L/14.*
At the east end of the Deserters Group on the south side of Ripple Passage.

Description: *162 ha; 102 m high; Forested.*
The area was designated as part of the Mahpahkum-Ahkwuna/Deserters-Walker Conservancy established in 2006.

Historical summary: Two Glaucous-winged Gull eggs that originated from Deserters Island were brought to Young in 1929 (Table QS-140). No further details are available on the specific location for where these eggs came from. The main Deserters Island was visually inspected from the water in 1975 and 1982. In 1982, there was one pair of Black Oystercatchers associated with four empty scrapes on the rock off the large bay on the north side. Nesting was suspected but no eggs or young were found.

Table QS-140. Seabird nesting records for Deserters Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
Jun 1929		1	251
11 Jul 1975	0	0	265
1 Jul 1982	1S	0	183

QS-150 BARRY ISLET

Location: *50°53'11"N 127°25'40"W; 92 L/14.*
East of the Deserters Group, at the southeast end of Ripple Passage.

Description: *0.4 ha; 9 m high; Grassy rock.*
Barry Islet is included in the Mahpahkum-Ahkwuna/Deserters-Walker Conservancy designated in 2006.

Historical summary: Drent documented nesting by Glaucous-winged Gulls and Black Oystercatchers in 1968 (Table QS-150). Nesting by gulls was largely unsuccessful in 1975 and gulls were not seen on the rock in 1982.

Table QS-150. Seabird nesting records for Barry Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
5 Jul 1968	1	10[10]	265
11 Jul 1975	0	9[1]	32
1 Jul 1982	0	0	183

Remarks: Eagles may have been responsible for the elimination of nesting birds. In 1975, there were three Bald Eagles on the island, and it appeared that they had been preying on adult gulls. Only three adult gulls were on the islet, and eight of the nests were empty. Five broken eggshells were found. Signs of river otter were also observed. In 1982, six adult and 13 immature eagles were perched on top of the rock. Prey remains were abundant, and we found a number of eagle "dusting bowls" worn in the grass.

QS-160 BLEACH ROCK

Location: *50º52'07"N 127º30'24"W; 92 L/13.*
South of Race Island at the south end of Shelter Passage that separates the Walker and Deserters groups.

Description: *0.2 ha; 5 m high; Bare rock.*
This rock is part of the Mahpahkum-Ahkwuna/ Deserters-Walker Conservancy designated in 2006.

Historical summary: One pair of Black Oystercatchers and one pair of Glaucous-winged Gulls were attending nests with eggs in 1975 (Table QS-160). We only boated around the rock in 1982 and saw no birds. However, we considered the 1975 record from land the better and current estimate for oystercatchers.

Forty-six Pelagic Cormorants, including one in breeding plumage were roosting on the rock in 1975.

Table QS-160. Seabird nesting records (nests) for Bleach Rock.

DATE	BLOY	GWGU	SOURCE
11 Jul 1975	1	1	32, 265
2 Jul 1982	0	0	183

QS-170 CRANE ISLANDS

Location: *50º50'33"N 127º31'17"W; 92 L/13.*
On the south side of Gordon Channel, north of Bell Island.

Description: *0.5 ha; 11 m high; Grassy rock.*
This is a group of three rocks with grassy areas on the top of the higher west rock. There is a navigational beacon on the west rock. Crane Islands are part of God's Pocket Marine Provincial Park established in 1995.

Historical summary: In 1975, Glaucous-winged Gulls were nesting only on the middle rock; only two nests contained eggs (Table QS-170). Twelve adults were present. Four Black Oystercatchers were present, and three old scrapes were found, but the birds were not defensive, and did not appear to be nesting (Figure 264). No seabirds were present in 1982.

Figure 264. Non-breeding Black Oystercatchers, including immature birds, are often seen foraging or resting on small islets. *Photo by R. Wayne Campbell.*

Table QS-170. Seabird nesting records for Crane Islands. See Appendix 2 for codes.

DATE	GWGU	SOURCE
10 Jul 1975	6[2]	32, 265
2 Jul 1982	0	183

Remarks: We found prey remains left by Bald Eagles on the larger rock with the navigational beacon in 1975. Old batteries were strewn about and we wondered if disturbance from workers servicing the light as well as from eagles may discourage nesting on this rock.

QS-180 "DOYLE" ROCKS

Location: *50°48'28"N 127°28'30"W* (southwest side rocks)*; 92 L/14.*
Off the south side of Doyle Island in the Gordon Islands. Colony includes three rocks off the mid-southwest side and four rocks off the southeast end of Doyle Island.

Description: *0.6 ha; 8 m high; Bare rock; Grassy rock.*
These rocks are mostly bare, with some patches of grass on the higher rocks. There is a navigational beacon on the highest rock off the southeast end of Doyle Island.

Historical summary: McCabe photographed Glaucous-winged Gull nests with eggs on rocks south of Doyle Island in 1939 (Table QS-180). He did not specify which rocks he was referring to.[77] Drent found no sign of nesting when he was in the area in 1968 and we saw no seabirds on these rocks in 1975 or 1982.

Table QS-180. Seabird nesting records for "Doyle" Rocks. See Appendix 2 for codes.

DATE	GWGU	SOURCE
Jun 1939	2[2]	77
5 Jul 1968	0	265
10 Jul 1975	0	265
2 Jul 1982	0	183

Remarks: There were signs of mink on Doyle Island and other large islands in the Gordon Group in 1975.

QS-185 PORT HARDY

Location: *50°43'20"N 127°29'18"W; 92 L/14.*
At present, the only identified nesting site has been on the wharf in the outer harbour on the west side of Hardy Bay on Vancouver Island. However, for future consideration, we include the entire harbour area of Port Hardy in this colony (Figure 265).

Figure 265. Port Hardy, with a population of about 4,200 people, and Port McNeil, with about 2,100 people, are the main communities on northern Vancouver Island within the Queen Charlotte-Johnstone Strait region. It is a wet area: Port Hardy averages 1,908 mm (75.1 inches) of rain a year with November (312 mm) being the wettest month and July (58 mm) the driest.[317] As at many ports along the BC coast, Pigeon Guillemots are now nesting under wharves and piers.[33] *Photo by R. Wayne Campbell, 20 October 1971.*

Description: *Wharf.*

Historical summary: Egg specimens collected by Reverend Young, with a location given as Hardy Bay, exist for Black Oystercatcher from 26 May 1932 [278b] and Glaucous-winged Gull from May 1933.[278c] There is also a set of Black Oystercatcher eggs [270a] collected by J.B. Semple at Port Hardy on 25 May 1934. We are uncertain of the precise location of these records. We found a Pigeon Guillemot nest under the wharf in 1975 (Table QS-185).

Table QS-185. Seabird nesting records (nests) for Port Hardy.

DATE	PIGU	SOURCE
10 Jul 1975	1	33, 265

QS-190 NUMAS ISLANDS

Location: *50°46'10"N 127°06'00"W; 92 L/14.*
In the centre of Queen Charlotte Strait, between the mainland and Malcolm Point on Malcolm Island.

Description: *163 ha; 131 m high; Forested; Bare rock.*
Most of these islands are wooded. Dense salal forms the understory over most areas, except for narrow, perimeter fringes of grass, moss, and bare rock. Much of the cluster of three small islands (#5-7) off the south side of the largest island (#1) is bare rock, except the west half of island #5 is forested and there is a small patch of trees with a more open understory on island #6 (Figure 266). Island #4, near the west end of the largest island, is also bare rock (Figure 267).

Historical summary: Rhinoceros Auklet burrows were sparsely distributed around the fringes of forested islands in 1975 and 1982 (Table QS-190; Figure 268). Burrows appeared active, with well-worn entrances and droppings nearby. Numbers nesting were probably similar in the two years. In 1975, we found three burrows on island #5, counted 94 burrows along about 150 m of shoreline on the east side of island #1, and estimated at most 1,000 burrows around island #1, about 100 burrows around island #9, and 20 burrows around island #10. Burrows were located under tree roots and salal and were difficult to excavate; we found one addled egg outside a burrow that confirmed breeding. We estimated 750 pairs nesting. We made a more thorough count of burrows in 1982 and tallied a total of 716 burrows: 607 around island #1; 67 around island #9; 24 around island # 8; and 18 around island #10. Based on the median burrow occupancy rate for colonies in BC,[190] we estimated 550 pairs nesting. One downy chick was found in one burrow, and many hatched eggshells were found outside burrows.

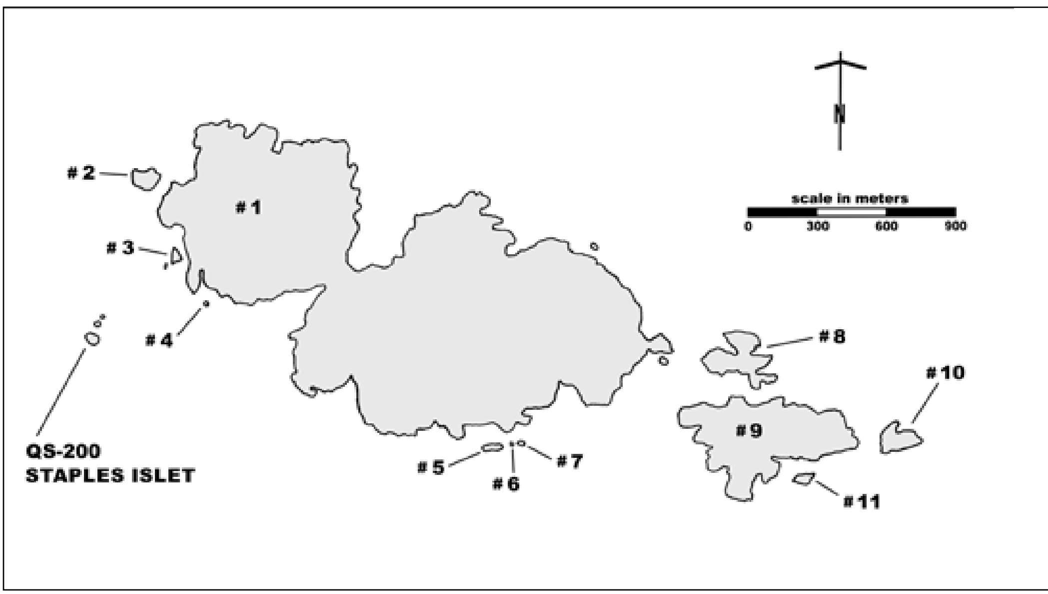


Figure 266. Numbered islands in the Numas Islands referred to in the text.

Figure 267. Most of the Numas Islands are forested, with an understory of dense salal. Salal often overhangs the shore rock, but narrow fringes of grass and moss occur along the forest edges above the rocky shorelines in some areas. There are rocky bluffs on the shores of the large islands and several small islands are mostly bare rock. *Photos by Michael S. Rodway, 19 July 1975.*

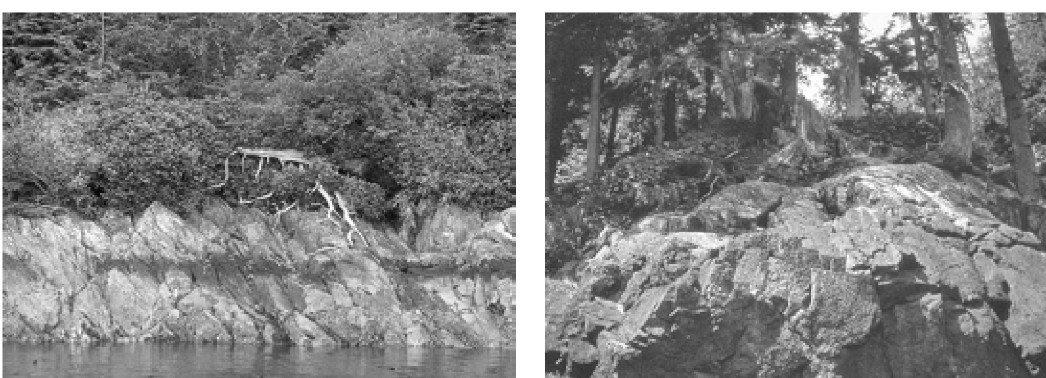


Figure 268. Habitat along the east side of the largest of the Numas Islands where Rhinoceros Auklet burrows were found in 1975 and 1982. *Photos by Michael S. Rodway, 19 July 1975 (left) and 30 June 1982.*

Glaucous-winged Gulls have been found nesting (Figure 269) at eight locations around the islands. Numbers nesting almost doubled between 1975 and 1982, and gulls were using three locations in 1982 that were not used in 1975. In both years, nests were found on: the cluster of three small islands (#5-7) off the south side of the largest island (19 nests in 1975, of which 16 were on the bare eastern half of island #5, 1 was on island #6, and 2 were on island #7, and 16 nests on the three islands combined in 1982); on the point on island #1 adjacent to those small islands (7 nests in 1975 and 16 nests in 1982); and on island #11 off the southeast side of the second-largest island (#9) in the group (10 nests in 1975 and 15 nests in 1982). In 1982, nests were also found on the south side of island #9 on the point opposite island #11 (6 nests), on the two eastern points of island #8 (10 nests), and on the south side of island #10 at the east end of the group (2 nests). Most nests were empty in both 1975 and 1982.

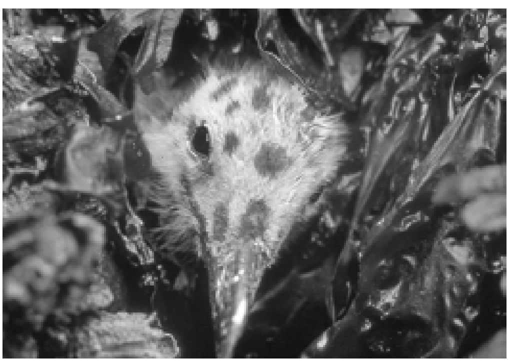


Figure 269. A young, downy Glaucous-winged Gull chick "hiding" among seaweeds near its nest. *Photo by R. Wayne Campbell.*

Black Oystercatcher nests have been found at five locations around the islands. In 1975, one nest with a small chick was found on the small islet (#11) off the south side of the larger east island. Two inactive empty scrapes were also found on the western (island #5) of the cluster of three small islands off the south side of the largest island; three birds were present but did not appear to be nesting. In 1982, oystercatchers were nesting at those two locations (1 nest with 1 egg at each location), as well as on the extreme west point of the largest island (6 empty scrapes associated with one pair), a small rock (island #4) near the west end of that island (1 empty nest), and on the northern of the east points of island #8 (1 nest with 1 egg).

In 1975 and 1982, Pigeon Guillemots were nesting in burrows at the edge of the vegetation above rock faces, under rocks, and in crevices. In 1975, there were 21 adults on the south side and 14 adults on the north side of island #1: guillemots were seen flying out of burrows and two eggshells were found in a crevice on the south side; and birds were suspected nesting in burrows along the north side. On island #11, one adult was seen sitting on a nest under a rock and a broken eggshell was found nearby. In 1982, Pigeon Guillemots were found nesting at four locations: on the south side of island #1 on the point opposite islands #5-7 (13 adults on the rocks; 3 nests with eggs and small chicks in crevices); on the extreme east tip of island #1 (14 adults on the water; 3 adults flying out of burrows; one burrow with adult on egg); on the northern of the east points of island #8 (1 adult flew out of a burrow); and on island #11 (2 adults; 1 nest with 2 eggs under rock).

Habitat in the small, forested patch on island #6 was similar to where storm-petrels were found nesting on other islands in Queen Charlotte Strait, but no evidence of nesting by storm-petrels has been found on the Numas Islands.

Table QS-190. Seabird nesting records for Numas Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	RHAU	SOURCE
18, 19 Jul 1975	1	36[13]	x(36)	750e	32, 265
30 Jun 1982	5[3]	65[27]	x9(41)	550	183

Remarks: There was little evidence of predation; we found a broken Pigeon Guillemot egg (Figure 270) and one Rhinoceros Auklet feather pile in 1975. Trails of river otter were noted on the west side of the largest island in 1975.

Figure 270. Broken eggshells found on a colony are likely a result of predation. This photo shows a broken Pigeon Guillemot eggshell. *Photo by R. Wayne Campbell.*

QS-200 STAPLES ISLET

Location: *50°46'08"N 127°07'13"W; 92 L/14.*
Off the southwest side of the largest Numas Island (see Figure 266).

Description: *0.1 ha; 7 m high; Bare rock* (Figure 271).

Figure 271. Staples Islet is a small, bare rock with some vegetation in hollows where water accumulates. *Photo by Michael S. Rodway, 18 July 1975.*

Historical summary: Black Oystercatchers and Glaucous-winged Gulls were nesting in 1975, although half the gull nests were empty (Table QS-200). A pair of oystercatchers was present and suspected nesting in 1982 but no nest was found (Figure 272). Fewer gulls were nesting and only two nests held eggs in 1982.

Figure 272. One Black Oystercatcher nest with two eggs was found on Staples Islet in 1975 (bottom). The scrape had a few barnacle and limpet shells with some dead grasses around it. In 1982, a pair was present and we suspected they were nesting based on their behaviour. Shown in the top photo is an adult feigning a broken wing to distract us, an almost sure sign of nesting. *Photos by Michael S. Rodway, 18 July 1975 (nest) and Moira J.F. Lemon.*

Table QS-200. Seabird nesting records for Staples Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
18 Jul 1975	1	10[5]	32, 265
30 Jun 1982	1eS	5[2]	183

QS-210 DEEP SEA BLUFF

Location: *50°48'52"N 126°29'12"W; 92 L/16.*
West end of Tribune Channel on the north side of the channel, north of the Burdwood Group.

Description: *60 m high; Cliffs.*

Historical summary: Archibald Menzies' note of the "shag" colony at Deep Sea Bluff in 1792, during his voyage with Captain Vancouver aboard HMS *Discovery*, is the first recorded visit to a seabird colony in BC (Table QS-210). The site was still being used by Pelagic Cormorants 170 years later when Thomas Widdowson visited the colony but was found abandoned in 1982. Perhaps it is used intermittently.

Widdowson counted nests from the water in 1962. He noted that cormorant nests were situated mainly in large overhangs within 50 ft (15 m) of the water, whereas Glaucous-winged Gulls and Pigeon Guillemots were nesting higher on the cliffs above the cormorants. Gull nests were placed in patches of scrub and grass on steep rock faces above overhangs. Cormorants were incubating and the colony seemed free of disturbance. The captain, Captain Johnson, of the vessel transporting Widdowson reported seeing young in one cormorant nest.

Table QS-210. Seabird nesting records for Deep Sea Bluff. See Appendix 2 for codes.

DATE	PECO	GWGU	PIGU	SOURCE
31 Jul 1792	x			155
6 Jul 1962	53	70	15e	265
27 Jun 1982	0	0	(0)	183

Remarks: Nesting cormorants were harvested for food by the crew of the HMS *Discovery* in 1792.[155]

QS-220 FOSTER ISLAND

Location: *50°42'20"N 126°50'40"W; 92 L/10.*
North of the east end of Malcolm Island, between George Passage and Salmon Channel. Colony includes small islets around the perimeter of the main island.

Description: *38 ha; 75 m high; Forested; Bare rock.* Thick salal forms the understory of this forested island, except for small, peripheral areas of grass and bare rock (Figure 273).

Historical summary: In 1975 (Table QS-220), Glaucous-winged Gulls were nesting at three locations: on a rocky point at the west end of the main island (2 nests); on the small islet off the northwest tip (1 nest); and on the rock off the southwest side of the island (1 nest). A pair of Black Oystercatchers and one empty scrape was found on the southwest rock.

Figure 273. Foster Island is covered with salal under a coniferous forest except for some small patches of grass and bare rock around the perimeter. *Photos by Michael S. Rodway, 19 July 1975.*

Five oystercatchers were present but did not seem to be nesting on the islet off the northwest tip (Figure 274). In 1982, one pair of oystercatchers and two pairs of gulls were nesting on the southwest rock. No nesting birds were seen on the west point or on the islet off the northwest tip where they were found in 1975. However, one oystercatcher and one gull nest were found on rocky areas at the southeast tip of the main island where they had not been seen in 1975.

Figure 274. Black Oystercatchers in groups are unlikely to be breeding birds. Groups may contain moulting birds, like the one in this photo. *Photo by R. Wayne Campbell.*

Pigeon Guillemots were nesting in burrows at the edge of the vegetation above rock faces along the south side of the island in 1982.

Table QS-220. Seabird nesting records for Foster Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
19 Jul 1975	1S	4[3]	S(1)	32, 265
28, 29 Jun 1982	2[2]	3[3]	x(28)	183

Remarks: We found a depredated egg beside the one gull nest on the northwest islet in 1975. River otter scats and trails were noted in 1975. In 1982, there was an adult Bald Eagle at the northwest tip of the island (Figure 275). One oystercatcher chick had a deformed bill; the upper mandible was curved to the left so that it did not meet the lower mandible.

Figure 275. An adult or immature Bald Eagle landing on a seabird colony can create chaos for surface-nesting birds. *Photo by R. Wayne Campbell.*

QS-230 TWIN ISLETS

Location: *50°41'56"N 126°50'44"W; 92 L/10.*
Just south of Foster Island.

Description: *0.7 ha; 29 m high; Forested; Bare rock.* These two islets have extensive, bare rocky shores. Higher areas are covered with dense salal under sparse trees (Figure 276). Separate bare rocks lie off the east islet.

Figure 276. Twin Islets have sparse stands of trees and extensive, bare rocky shores. *Photo by Michael S. Rodway, 19 July 1975.*

Historical summary: In 1975, three empty Black Oystercatcher scrapes were found, two on the west islet and one on the rock adjacent to the east islet, but no birds were nearby (Table QS-230). A flock of nine oystercatchers were observed but did not seem to be nesting on the east islet. In 1982, one oystercatcher nest containing one egg was found on the western islet. Four vocal adults were present on the eastern rocks and we suspected hidden young, although no nests or young were found. Glaucous-winged Gulls were nesting on the most eastern rocks in 1975 and 1982. Only one nest contained eggs in both years. A gull nest start was seen on the west islet in 1975 but it was not substantial enough to be counted. Pigeon Guillemots were suspected nesting in burrows at the vegetation edge above bluffs on the south side of the eastern treed islet in 1982.

Table QS-230. Seabird nesting records for Twin Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
19 Jul 1975	0	2[1]	(0)	32, 265
29 Jun 1982	3e	5[1]	S(5)	183

Remarks: River otter scats and trails were noted in 1975. One broken gull egg was found in 1982.

QS-240 PENFOLD ISLET

Location: *50°41'21"N 126°48'33"W; 92 L/10.* Southeast of Foster Island, north of the east end of Malcolm Island.

Figure 277. Penfold Islet is forested, with bare rock and grassy areas on its perimeter. *Photo by Michael S. Rodway, 19 July 1975.*

Description: *0.9 ha; 34 m high; Forested; Bare rock.* Grass and bare rock habitat occur on the perimeter of this wooded islet (Figure 277). There is a rock, connected to the main islet at low tide, on the west side.

Historical summary: Black Oystercatchers have not been confirmed nesting (Table QS-240). One pair of oystercatchers was present and likely responsible for three empty scrapes found in 1975. One pair was attending one empty scrape found on the main islet in 1982.

Numbers of Glaucous-winged Gulls nesting more than doubled between 1975 and 1982. Gull nests were located on the west rock in 1975 and on both that rock (25 nests) and the main islet (28 nests) in 1982 (Figure 278).

Figure 278. Typical Glaucous-winged Gull nest found on bare rocky islets. This nest is formed of a sparse collection of grasses and contains a full clutch of three eggs. *Photo by R. Wayne Campbell.*

Table QS-240. Seabird nesting records for Penfold Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
19 Jul 1975	1S	22[15]	32, 265
28 Jun 1982	1S	53[33]	183

Remarks: In 1975, two dead gull chicks were found and one gull nest had two eggs rolled out of the nest. River otter scats and trails were seen. In 1982, signs of predation, including eggshells and bits of down, were found around one empty gull nest. Two adult Bald Eagles were present.

QS-250 COACH ISLETS

Location: *50°42'54"N 126°42'40"W* (north rock)*; 92 L/10.*
West side of the Broughton Archipelago, west of Hudson Island on the north side of Arrow Passage. Colony includes the cluster of small islets north and east of Coach Islets and southwest of Angular Island.

Description: *3.4 ha; 2 m high (north rock); Forested; Bare rock.*
This is a group of about seven islets. There are patches of forest with extensive rocky areas on the larger islets. Three of the islets are bare rock (Figure 279). The islets are part of Broughton Archipelago Marine Provincial Park established in 1992.

Figure 279. Larger islets in the Coach Islets have some forested areas above extensive rocky shores. Smaller islets are bare rock, with scant vegetation in fissures. *Photos by Michael S. Rodway, 20 July 1975.*

Historical summary: Two Black Oystercatchers (Figure 280) and two Pigeon Guillemots were present but no nests were found in 1975 (Table QS-250). In 1982, one oystercatcher nest with two eggs was found on the bare, northern rock. A flock of eight vocal oystercatchers and a pair of Glaucous-winged Gulls were present on the rock east of the outer treed islet, but no nests were found.

Figure 280. Two Black Oystercatchers were seen on Coach Islets in 1975, but no nests were found. *Photo by R. Wayne Campbell.*

Table QS-250. Seabird nesting records for Coach Islets. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
20 Jul 1975	0	S(2)	32, 265
27 Jun 1982	1	(0)	183

Remarks: A Bald Eagle nest with a least one young was seen on the outer treed islet in 1982. Two adults were present.

QS-260 GREEN ROCK

Location: *50°40'12"N 126°40'28"W; 92 L/10.*
Southwest of Bonwick Island, north of Midsummer Island.

Description: *0.5 ha; 4 m high; Grassy rock.*
Green Rock (Figure 281) is part of Broughton Archipelago Marine Provincial Park established in 1992.

Historical summary: The rock was surveyed from the water in 1975 and no birds were seen (Table QS-260). In 1982, few Glaucous-winged Gull eggs had

Figure 281. Steep rocky shoreline of Green Rock with patches of grass on top. Visible in this photo are Glaucous-winged Gulls standing on nesting territories and Pelagic Cormorants roosting on lower rocks. *Photo by Paula Courteau, 20 May 2015.*

been laid at the time of our visit; 25 of the 32 nests were empty. An additional three nests had been started that were not included in the nest count. Seventy adults were present. Four Black Oystercatchers were seen (Figure 282), but only one nest with three eggs was found. We found one Pigeon Guillemot nest under a large rock in a crevice on the south side of the island.

Four Pelagic Cormorants, two in breeding plumage, were recorded in 1982 but there was no evidence of nesting.

Table QS-260. Seabird nesting records for Green Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
20 Jul 1975	0	0	(0)	265
26 Jun 1982	1	32[7]	1(1)	183

Figure 282. Black Oystercatchers are vocal, and their piercing calls, bright red bill, and pink legs often make them easy to spot on rocky shores. However, they can be secretive and quiet when near their nest or chicks, and can be easily missed when islands are viewed from the water. *Photo by R. Wayne Campbell.*

QS-270 “SEABREEZE” ROCK

Location: *50°40'17"N 126°37'33"W; 92 L/10.*
Off the south end of Seabreeze Island at the southern end of Retreat Passage.

Description: *0.1 ha; Grassy rock.*

Historical summary: This rock was surveyed only in 1982 (Table QS-270). A pair of Black Oystercatchers was attending an empty scrape (Figure 283). Three adult Glaucous-winged Gulls were present; one nest with three eggs was found.

Figure 283. It is important to record empty Black Oystercatcher nest scrapes because they generally represent a breeding effort. Often, black, downy chicks are hiding nearby. *Photo by R. Wayne Campbell.*

Table QS-270. Seabird nesting records for “Seabreeze” Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
26 Jun 1982	1S	1	183

QS-280 “RIDGE” ROCKS

Location: *50°39'14"N 126°36'29"W* (rock 1 km northwest)*; 50°39'03"N 126°36'02"W* (rock 0.5 km north)*; 50°38'47"N 126°34'37"W* (east rocks)*; 92 L/10.*
North and east of Ridge Islets, east of Midsummer Island.

Description: *0.4 ha; 2 m high; Grassy rocks.*
The northern rocks are at the eastern boundary of Broughton Archipelago Marine Provincial Park; the east rocks are outside the park.

Historical summary: We boated by Ridge Islets on 20 July 1975 and saw no evidence of nesting birds there, but we did not explore the small rocks to the east and north. In 1980, nests were found on the pair of rocks east of Ridge Islets: seven Glaucous-winged Gull nests were on the western and two gull nests and one Black Oystercatcher nest were on the eastern of those two rocks (Table QS-280). The oystercatcher nest held three eggs; egg laying was just beginning in the gull nests. Only one of the gull nests held an egg, others were empty and still being constructed. In 1982, one oystercatcher nest with two eggs and one young was located on the western of those two rocks. Unattended, old scrapes were found on the east of those rocks and on one of the rocks north of Ridge Islets. Gull nests were again on the western (5 nests) and eastern (4 nests) of the two rocks east of Ridge Islets, and also on the two northern rocks (1 nest each).

Table QS-280. Seabird nesting records for “Ridge” Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
8 Jun 1980	1	9[1]	259
26 Jun 1982	1	11[8]	183

QS-290 WHITE CLIFF ISLETS

Location: *50°39'09"N 126°43'41"W; 92 L/10.*
West of Fire Island, north of Swanson Island.

Description: *2.2 ha; 15 m high; Forested.*
Extensive rocky perimeters, with some grassy patches, surround small wooded areas on these islets (Figure 284). The islets are part of Broughton Archipelago Marine Provincial Park established in 1992.

Figure 284. White Cliff Islets have extensive rocky shorelines that appear to provide ample nesting habitat for Glaucous-winged Gulls and Black Oystercatchers. Surprisingly, only one pair of oystercatchers has ever been found nesting on these islets during seabird surveys. *Photo by Paula Courteau, 20 May 2015.*

Historical summary: One old, unattended Black Oystercatcher scrape was recorded in 1975 (Table QS-290). In 1982, an oystercatcher nest with two small chicks hiding nearby was found on the east end of the east islet. Four adult Glaucous-winged Gulls were on the west islet but no nests were found.

Table QS-290. Seabird nesting records (nests) for White Cliff Islets.

DATE	BLOY	SOURCE
20 Jul 1975	0	265
27 Jun 1982	1	183

QS-300 SURGE ISLANDS

Location: *50°38'24"N 126°42'52"W; 92 L/10.*
Northeast of Wedge Island, north of Swanson Island.

Description: *1.5 ha; 21 m high; Forested; Grassy rock* (Figure 285).
Surge Islands are part of Broughton Archipelago Marine Provincial Park established in 1992.

Figure 285. Surge Islands have forested areas, rock bluffs, and bare rocks with scant vegetation. *Photo by Michael S. Rodway, 20 July 1975.*

Historical summary: In 1975, when the islands were surveyed only from the water, one adult Glaucous-winged Gull was present, but nesting was not suspected (Table QS-300). In 1982, one gull nest with two eggs and an old, unattended Black Oystercatcher scrape were found on the most southern, grassy rock.

Table QS-300. Seabird nesting records (nests) for Surge Islands.

DATE	GWGU	SOURCE
20 Jul 1975	0	265
27 Jun 1982	1	183

QS-310 PLUMPER ISLANDS

Location: *50°35'38"N 126°47'28"W* (northeast islets)*; 92 L/10.*
West of Hanson Island on the south side of Blackfish Sound.

Description: *92 ha; 108 m high; Forested; Cliffs.*
Plumper Islands are part of Cormorant Channel Marine Provincial Park established in 1992.

Historical summary: Islands were surveyed from the water in 1975, and no seabirds were seen in the vicinity (Table QS-310). In 1982, Pigeon Guillemots were nesting in crevices on the bluffs on the south side of the pair of small islets on the northeast side of the group; one nest with two eggs was found.

Table QS-310. Seabird nesting records for Plumper Islands. See Appendix 2 for codes.

DATE	PIGU	SOURCE
9 Jul 1975	(0)	265
28 Jun 1982	x(7)	183

Remarks: One immature and eight adult Bald Eagles were sighted around the islands in 1982. A Short-tailed Weasel (*Mustela erminea*) was also recorded on the islands.

The Psychic Connection

In 1931, Edmund Selous [205] suggested that the coordinated flight of thousands of individual birds must be due to collective thought through telepathic communication amongst all the individuals in the flock. How else can one explain the unison of behavior in perhaps 20,000 Dunlin (Calidris alpina) *as they take flight and sweep left and right together across the sky like a single organism (Figure 286)? Such cluster flocking is a spectacle to behold. More recent theory proposes that each bird in a flock quickly reacts to the movements of its neighbours, accurately copying those movements so that the entire flock turns in concert within a fraction of a second.[3] Simulation models support this recent theory but in fact, the theory is no more proven than Selous's telepathic explanation. And what is being proposed is no less fantastical – what are the chances that 20,000 individuals read the signals of their neighbours perfectly accurately within microseconds? Imagine what would happen if only one bird made a mistake, "Oops, I thought you meant left", when the flock is sweeping right. Talk about a pile-up on the freeway! As far as we know, such a "mistake" has never been witnessed. Incredible!*

Scientists are skeptical but ultimately undecided about the possibility of thought-transference.[89] However, many of us have had experiences that seem most easily explained by some form of mental communication. My most memorable experience happened when I (Michael) was blissfully planing along in the zodiac among the cluster of islands at the southern end of Queen Charlotte Strait. I had just rounded the point of one island when for some reason I slowed down and turned to look offshore behind me. I have no idea why I did that. Looking offshore I could vaguely see what appeared to be some large piece of driftwood floating by. I felt compelled to go and check it out, still with no idea why. As I approached what turned out to be a large driftlog, I could see an overturned aluminum skiff beside the log. Not until I was almost upon the log did I make out the arm of a person holding on to the log – I couldn't see a head. I quickly pulled up and found a large man barely keeping his head above water. He was very large – at least 300 lbs – and it was all I could do to wrestle him into the zodiac. Thank goodness for the stability of an inflatable boat! He was conscious and said that he had been in the water for a long time after hitting the log and capsizing his skiff, his strength was gone, and he was just about to let go of the log when he heard me coming. I saved his life.

And he reeked of alcohol – I was sorry he was in front of me in the zodiac as I took him back to where he said he lived – I breathed the fumes all the way back! Turned out he lived with his similarly-sized brother on a floathouse in one of the nearby bays. Though he was nearly hypothermic, when we got to his home, he and his brother invited me in and offered me a drink of some of the foulest, home-distilled, gut-rot liquor I have ever tasted! I politely declined a refill and left them both imbibing their way to a reclaimed future! Today, almost 40 years later, I still cannot explain this experience without invoking a psychic connection between myself and the drowning man.

Figure 286. A variety of explanations of how large flocks of birds can fly together and not bump into each other have been proposed. An early theory posited telepathic communication among individuals about changes in direction.[205] Recent theory proposes that each bird in the flock visually perceives and then copies the movements of its neighbours.[3] *Photo by R. Wayne Campbell, North Arm jetty, Vancouver, BC, 21 December 1969.*

QS-320 STEPHENSON ISLET

Location: *50°34'29"N 126°49'36"W; 92 L/10.* Between Hanson Island and Pearse Islands. Colony includes the rocks surrounding Stephenson Islet and the unnamed rock to the northwest, off the east end of Pearse Islands.

Description: *0.7 ha; 8 m high; Shrubby rock.* Weathered salal and small spruce trees grow over much of Stephenson Islet; the perimeter is bare rock and grass (Figure 287). Smaller, surrounding islets are mostly bare rock with some grassy areas. The main islet and surrounding rocks, except for the northwest rock between Stephenson Islet and Pearse Islands, are within Cormorant Channel Marine Provincial Park.

Historical summary: Drent boated around the islets in 1968 and observed Glaucous-winged Gulls on territories on two low rocky islets (Table QS-320). In 1975, gulls were nesting on the main islet (24 nests), the rock south of the main islet (13 nests), and the southeastern rock (11 nests). Nests were again found on those same three islets in 1976 (26, 12, and 9 nests, respectively) and 1982 (10, 11, and 4 nests, respectively). In 1976, we noted that the nesting season seemed late and few eggs had been laid. The nesting population of gulls in 1982 was half that of former years.

Black Oystercatcher nests have been found at four locations: on the rock south of the main islet

Figure 287. Large patches of brown, weathered salal, a few small Sitka spruce trees, and some very old drift logs were seen on Stephenson Islet in 1976. *Photos by R. Wayne Campbell, 11 June 1976.*


Figure 288. Michael Rodway (far right) searching the edge of salal for nesting birds, including Black Oystercatchers, on the main Stephenson Islet in 1976 (left photo). An oystercatcher nest with two eggs was found on the rock south of the main islet. *Photos by R. Wayne Campbell, 11 June 1976.*

(one nest with two eggs in 1975 and 1976; Figure 288); the southeastern rock (one nest with one egg in 1975; a pair was present but we saw no evidence of nesting in 1982); the unnamed rock to the northwest (two adults with one large young in 1982); and on the main islet (an empty scrape in 1975 and 1982; no adults were present in 1975 but a pair was attending the nest in 1982).

Most Pigeon Guillemots were seen around the main island and nests were found there under rocks and logs in 1975. Two birds were seen around the rock to the northwest. We estimated 30-50 pairs nesting. In 1976, nests were found under drift logs on the main islet and the rock to the south.

Table QS-320. Seabird nesting records for Stephenson Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
6 Jul 1968		35-50eS		265
9 Jul 1975	2[2]	48[38]	x7(54)	32, 265
11 Jun 1976	1	47[2]	x2(6)	265
28 Jun 1982	3	25[15]	S(26)	183

Remarks: Signs of mink and river otter were seen in 1975. We suspected that a mink was responsible for three Pigeon Guillemot carcasses and one pile of feathers found on the southern rocks. Six broken eggshells were found around the guillemot nests on the main islet. River otter runways and scats were noted in 1976 and 1982. Two adult Bald Eagles were present on the southern rock in 1975.

QS-330 FULMORE LAKE

Location: *50°35'06"N 125°58'14"W; 92 K/12.*
Between the head of Port Neville and Call Inlet.

Description: *0.1 ha; 5 m high; Forested.*
Nesting occurs on the small, wooded islet towards the west end of Fulmore Lake. A salal understory covers most of the islet, with moss and some grass on the periphery.

Historical summary: This is the only known fresh-water nesting site for Glaucous-winged Gulls along the BC mainland coast north of Vancouver. In 1975, one Glaucous-winged Gull nest contained three eggs and one contained two eggs (Table QS-330; Figure 289). An empty eggshell with a small hole in it was found near the latter nest. Three adult Glaucous-winged Gulls were present but not aggressive. In 1982, we found one nest with three eggs attended by two adults. We also found two old Glaucous-winged Gull nests with two whole, addled eggs in each of them, probably from the previous year. In both years, nests were located on moss under salal shrubs on the south side of the islet.

Table QS-330. Seabird nesting records for Fulmore Lake. See Appendix 2 for codes.

DATE	GWGU	SOURCE
5 Jul 1975	2[2]	32, 265
24 Jun 1982	1	183

Remarks: Mew Gulls (*Larus canus*)[a] were also nesting on this islet each year it was checked (7 nests in 1975; 4 nests in 1982).

Figure 289. Glaucous-winged Gulls were found nesting on a small islet in Fulmore Lake in 1975 and 1982. Nests were located on moss under salal shrubs. This is the only record of Glaucous-winged Gulls nesting in fresh water along the BC outer coast; there are other records of nesting on lakes in the Salish Sea area near Vancouver and on the east side Vancouver Island. *Photo by Michael S. Rodway, 24 June 1982.*

QS-340 "GOAT" ISLAND

Location: *50°24'04"N 125°51'44"W; 92 K/5.*
Off the mouth of Billygoat Bay on the northeast side of Helmcken Island.

Description: *2.8 ha; 49 m high; Forested.*
This is the eastern and highest islet off the mouth of Billygoat Bay. The interior vegetation is salal under a hemlock forest; there are small grassy patches on the perimeter.

Historical summary: We found Glaucous-winged Gulls and Pigeon Guillemots nesting in rocky areas at the east end of the islet in 1975 and 1982 (Table QS-340). Fewer gulls were nesting in 1982 than in 1975. We estimated 10-15 pairs of Pigeon Guillemots nesting in 1975. Guillemot nests were found under large rocks in 1975 (Figure 290) and two guillemots were seen flying out of crevices in 1982.

[a] Now Short-billed Gull (*Larus brachyrhynchus*).[288]

Figure 290. This Pigeon Guillemot nest with two eggs is in a typical location in a rock cavity. *Photo by R. Wayne Campbell.*

Table QS-340. Seabird nesting records for "Goat" Island. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
7 Jul 1975	16[6]	x5(29)	32, 259, 265
23 Jun 1982	6[2]	x2(8)	183

Remarks: In 1975, two of the empty gull nests had broken eggshells nearby and one of the eggs was broken in one nest containing three eggs. One adult Bald Eagle was recorded in 1975.

SCOTT ISLANDS

Located off the northwest tip of Vancouver Island are five islands – Triangle, Sartine, Beresford, Lanz, and Cox – collectively known as the Scott Islands (Figure 291). This small group of islands warrants consideration as a special region for nesting seabirds in BC because of its importance to provincial and global breeding populations, especially for Cassin's Auklets. Currently, breeding populations are confined to the outer three islands, Triangle, Sartine, and Beresford islands, but large populations likely also nested on Lanz and Cox islands in the past, prior to the introductions of American Mink and Northern Raccoons to those islands in the 1930s (Figure 292).

Figure 291. The Scott Islands are a remote chain of five islands and associated rocks located off the northwest tip of Vancouver Island, BC. They have a combined land mass of about 1,928 ha (7.4 mi^2) and the largest island, Cox Island at the east end of the chain, rises to just over 300 m elevation. Shorelines are steep, rocky, and wave battered. Storms and fog are frequent and tidal currents are strong around the islands. The two eastern islands are forested; the western islands are covered with wind-pruned mantles of grasses and impenetrable shrubs. This photo looks back at the Scott Islands chain from the east side of Triangle Island. Castle Rock off Triangle Island is in the foreground with Sartine, Beresford, Lanz, and Cox islands visible in the receding distance. Many Steller Sea Lions are hauled out along the shore of Triangle Island. *Photo by Moira J.F. Lemon, 15 July 2004.*

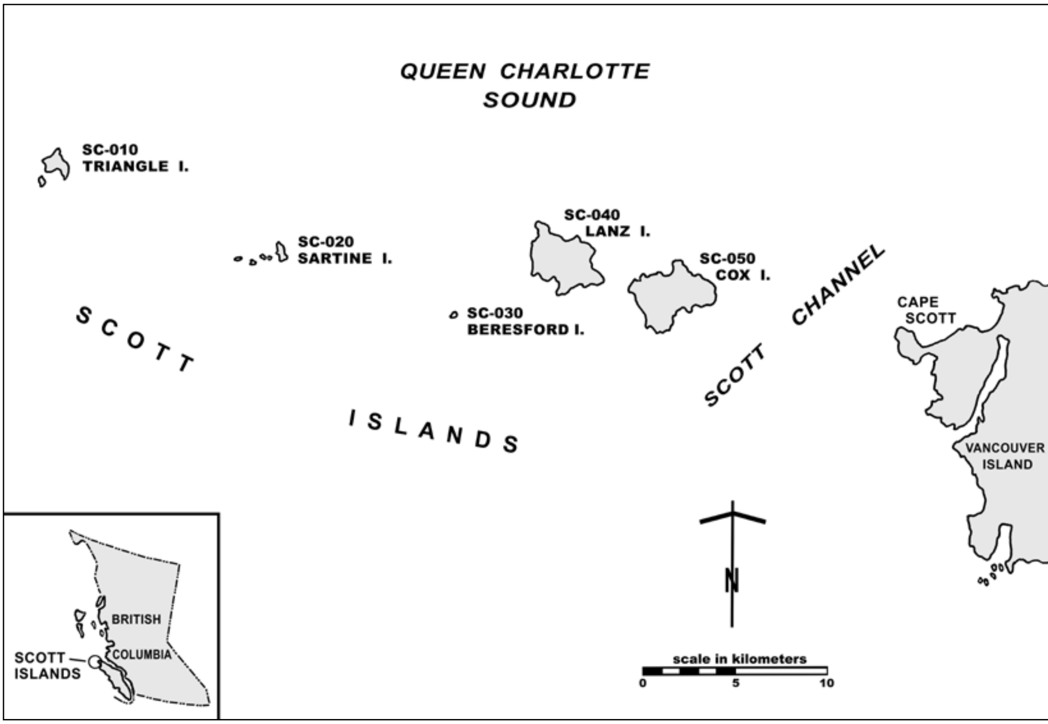


Figure 292. Locations of seabird colonies in the Scott Islands (modified from Rodway et al.[194]).

At the turn of the 19th Century, a few egg collectors visited Triangle Island after hearing from fisherman about "thousands of seabirds" nesting there. Almost half a century later, the first effort to document the flora and fauna of the Scott Islands was undertaken by the BCPM (Figure 293).[47] The importance of the islands for nesting seabirds was noted,[92] however the main purpose of the museum trip was to further investigate insular variation in small mammals along the BC coast (Figure 294).

After another quarter century, in 1974, a major research and survey program focused on nesting seabirds was launched by CWS with a base on Triangle Island (see introductory section *History of Seabird Colony Surveys on the BC Outer Coast*). In the same year, the Display Division of the BCPM mounted two expeditions to Triangle Island to collect specimens and information for a natural history exhibit at the museum in Victoria. In 1979, the museum opened the permanent natural history


PROVINCIAL MUSEUM, 1951

Biology of the Scott Island Group, British Columbia

By

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[Reprinted without change of paging from the Report of the Provincial Museum of Natural History and Anthropology, 1950.]

Figure 293. The first biological reconnaissance of the Scott Islands was conducted by BC Provincial Museum biologists in 1949 and 1950.

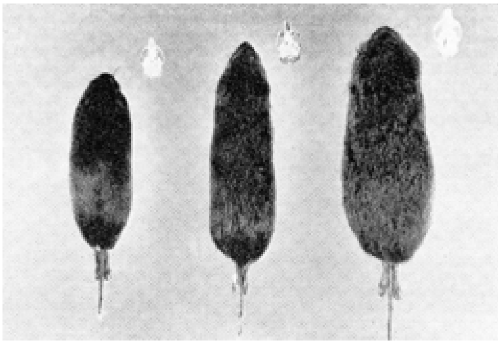


Figure 294. Following Guiguet's thesis research on the Goose Group in 1948,[93] the issue of small mammal variation on coastal islands was in vogue. Body size, colour, and dental formula were main criteria used to distinguish populations. Of the four subspecies of Townsend's Vole (*Microtus townsedii)* identified in BC, the unique race (*cowanii*) found on Triangle Island was the largest.[319] *Photo courtesy of G. Clifford Carl and BC Division of Visual Education.*

gallery *Living Land, Living Sea* with a wonderful diorama of coastal ecosystems along the west coast of Vancouver Island that included depictions of seabirds nesting on Triangle Island. Recently, the museum has attracted nearly 900,000 visitors each year and the natural history gallery has been one of the most popular attractions. Disconcertingly, it was announced in November 2021 that some of the museum exhibits were closing, and in May 2022, BC Premier John Horgan announced that the entire museum was closing on 6 September 2022. Horgan reversed the latter decision in June 2022, but many of the historic dioramas have been closed and will be seen no more.

Living Land, Living Sea – A Museum Exhibit of Vancouver Island's West Coast

The Royal BC Museum, a world-class museum of natural and human history, is consistently one of the top tourist attractions in Victoria. In this treatise on seabird colonies in BC, we have detailed the major contributions made by provincial museum staff to our historical knowledge of nesting seabird populations in BC, but we have so far not mentioned the contributions made by many staff in producing the exceptional museum exhibits that have made the museum such a tourist attraction. Although attitudes towards collecting animals for scientific specimens and for display purposes have changed, there is no question that the exhibits produced at the museum required great dedication from museum staff and provided important educational and conservation value to the millions of visitors that have come to see them over the last 50 years. The museum is currently in a transition period, with a vague future, and some of the exhibits that have been popular for so many years (Figure 295) *are now closed and being dismantled.*[331] *In this anecdote, we pay tribute to the many museum staff that produced the historic exhibits related to nesting seabirds and the natural history of the BC coast.*

In the early 1970s, the Modern History Gallery of the then British Columbia Provincial Museum (BCPM) had opened with great success. The next project, the First People's Gallery, was being constructed and underway. Jean Jacques André, Chief of Exhibits at the time, along with some of his team and with input from the Birds and Mammals Division, had begun setting their sights on the next goal – the Natural History Gallery: Living Land, Living Sea. *This effort would require constant planning and communication between researchers and designers for many years.*

The BCPM's seashore diorama in the Living Land, Living Sea *exhibit was designed to highlight various habitats of Vancouver Island's west coast. Accuracy was of paramount importance to the museum's creative team and all believed they had to personally experience the environments they were trying to depict before they could successfully achieve their vision for the exhibit. The group chose several locations along the coast to visit, from the spectacular seabird colony and sea lion rookery on Triangle Island, off the northwest tip of Vancouver Island, to the sea caves and surge channels near Sheringham Point, at the south end of Vancouver Island. In 1974, the museum mounted two expeditions to Triangle Island, one in June and another from 20-25 August. Both missions were focused on gathering information for the seashore diorama but their specific objectives were different.*

Triangle Island was a unique, challenging, and hazardous site to visit. The seabird colony there was known to have some of the largest nesting populations in the province, the salmonberry-covered *top of the island was nearly impenetrable, the steep perimeter slopes and cliffs were dangerous to climb, and the surrounding waters were some of the most treacherous in BC. Sitting 46 km off the northwest tip of Vancouver Island, it is an exposed, windswept island that had earned a reputation as being inhospitable to humans. A lighthouse was established on the island summit in 1909. Constantly battered by ferocious winter storms, which destroyed lighthouse structures, tormented resident lightkeepers, and ultimately resulted in a tragic loss of life, it was abandoned and dismantled 10 years later. The museum team knew that the expeditions to Triangle Island were not without risk. The June trip proved to be one of the most challenging and dangerous field trips the Bird and Mammal Division ever embarked upon.*

Logistics for the trips to Triangle Island were discussed in spring 1974. The main objective of the June trip was to collect animals for the seashore diorama. A harem of Steller Sea Lions, including a bull, cows, and pups, were needed as well as a selection of cliff-nesting Tufted Puffins and Common Murres (Figure 296)*. Sea lion births occur from mid-May to mid-July and peak in June. Fortuitously, Bob Wright, a close friend of the Curator of Birds and Mammals at the museum, Charles Guiguet, had just received a permit to obtain Steller Sea Lion pups for his public aquarium, Sealand of the Pacific, a popular tourist attraction in Oak Bay, Victoria that operated from 1969 to 1992. The timing and location couldn't have been better. The museum needed display specimens and Bob's destination was Triangle Island!*

The museum crew included Charles Guiguet, Phil Nott (technician), and Richard Gibbs (taxidermist). The Sealand group included Bob Wright, "Thor" the skipper, and a medical doctor, Dr. Daniel Buie. The group departed Oak Bay on the MV Western Spray *for the long trip to Triangle Island. The vessel was an old, buy-back seiner of about 70 feet, and needed repairs. Taking the Inside Passage route, the* Western Spray *made it to the village of Alert Bay before a fuel pump had to be ordered and replaced. Several days later, the boat's anchor was dropped in a bay on Triangle Island. Almost immediately, gun shots were heard. Charlie and Bob jumped into a Zodiac to investigate and found commercial fishermen shooting sea lions. The crew knew that it was illegal, because control programs and commercial hunting had ended in 1970,* [332] *and Bob Wright threatened to report the fishermen. The fishermen ceased their shooting and, as an appeasement gesture, gave the Sealand group a fresh 25-pound halibut.*

The females and pups shot by the fishermen were salvaged for the seashore diorama. A bull, however, had to be collected. A mature male Steller Sea Lion can weigh over 2,400 pounds, more than four times the combined weight of the three-person museum crew that had to obtain the mammal! Processing the collected sea lion specimens entailed making detailed measurements, creating plaster casts, especially of the flippers, careful skinning, and transporting of the hides back to the Western Spray*. Live pups for Bob's Sealand aquarium were captured and transferred to cages on deck. The process took a full day to complete. The demanding and long days also included trapping mice for systematic studies, collecting seaside plants, especially grasses, for reference, and keeping field notes.*

A summer storm, with strong winds, was imminent and the group decided to leave and seek shelter. The 100+ km trip was not without incident. Many times, the whir of the ship's propeller was heard out of water as the ship navigated large waves. There was genuine concern that it might detach! Closer to Port Hardy, the Western Spray *hit a large drift log and repairs were necessary. With the boat tossing in stormy seas, Richard was lowered with a small piece of plywood that he had to nail over the hole in the damaged hull.*

The pups were kept alive during the return trip by Dr. Buie, who had to administer medication and feed them frequently by inserting tubes of pulverised fish and liquids into their stomachs. Richard and Phil continued to flense sea lion hides and clean seabirds on deck.

Back at the museum, all aspects of preparing the collected specimens for the seashore diorama, including preparing layers of papier-mâchè bodies for sea lions and carving styrofoam forms for birds, were completed primarily by Richard Gibbs, with minor input from other staff. Specimens were mounted over a five-year period, between 1974 and opening day in 1979, in positions depicting the exhibit storyline.

The display team for the second trip to Triangle Island was assembled by Jean Jacques André and included diorama painter Jan Vriesen and photographer Brent Cooke. Three curators were *also invited. Wayne Campbell, who had become the assistant curator of the Birds and Mammals Division at the museum the previous year, Phil Lambert, from the Marine Biology Division, and Dr. Chris Brayshaw, from the Botany Division, provided biological expertise for the expedition. Although the focus of the trip was to document the Triangle Island environment that would be depicted in the diorama, Wayne gathered some quantitative data on nesting seabirds and banded 33 Rhinoceros Auklet chicks during that visit* (Figure 297).

The team flew out of Port Hardy on a large Coast Guard helicopter (Figure 298) *with rain lashing down sideways. Jan Vriesen recalls that the weather was too inclement in Port Hardy for a successful flight all the way to Triangle Island, but he urged them to go, certain the weather would clear for them. They did, and it did. As the island came into view Jan remembers that it was bathed in sunlight and grey clouds were circled all around it.*

A research camp with a small house trailer had been set up in the south bay of Triangle Island earlier that summer by CWS scientist Kees Vermeer. That was the destination for the BCPM exhibits team. Landing proved challenging as the tide was high and there were no open beach areas where they could safely set down. After what seemed like a considerable amount of time spent searching, the pilot finally managed to find a spot to land. With fog surrounding the island (a common occurrence in August), the pilot was anxious to depart, and the team had to offload their gear quickly.

The next days were spent exploring the island. Brent was a young biology technician at the time. His job was to photograph everything – seabird burrows, tufts of grasses, the shape of the landscape, bird droppings, vistas of both the land and sea. His images, combined with others taken by the curators, would later be used by the exhibits team, not only as reference material to ensure accuracy of the terrain and bird habitats, but to help capture the mood and very essence of the place.

Jean Jacques and Jan were both avid mountain climbers and, though it took them a long time, they made their way up the steep slopes to where the lighthouse had once stood. They had to climb fragile grassy slopes riddled with seabird burrows and then force their way through almost impenetrable thickets of up to 2 m-high salmonberry that covers much of the upper slopes of the island. Brent remembers Jan becoming very scratched up.

The adventure on Triangle Island ended up taking much longer than expected. Bad weather moved in, the helicopter was delayed, and it was additional days before the museum team could get back to Port Hardy. Sleeping in the trailer, they discovered it was overrun with Deer Mice and in the night a mouse was seen sitting on the chest of one of the crew as he slept.

Returning to Victoria, Jan painted the diorama background depicting Triangle Island and the west coast of Vancouver Island. The foreground was created by Display Division staff including Carol Christianson, Ewald Lemke, Donna Warren, Chris Denbigh, and Linda Cannon.

Jean Jacques was always sketching and drawing habitats. Even while in the field, he would be translating what he was seeing in front of him into ideas for the museum building's exhibit space. Essentially, he was conceptualizing the exhibits and determining how to make the different habitats flow together in a realistic manner (Figure 299). *His field sketches were filled with notes highlighting unique aspects of the site or specimens he'd want to show in the exhibits and that he would want verified by the curators and scientists. He enjoyed the challenge of fitting storylines into limited spaces, using every little nook and cranny. He felt it was essential for the visitor to experience the story as much as possible. He designed viscerally, stimulating virtually all the senses.*

Jean Jacques also was open to ideas from museum visitors. On the suggestion of a museum volunteer, for example, he included an interactive tide pool in the seashore diorama foreground to allow people to get up close to sea life. The tide pool was a saltwater aquarium complete with live sculpins, sea anemones, and other hardy marine life (Figure 300).

Jean Jacques' team also created a sea cave as part of the exhibit, as he was an avid caver in both his homeland of France and locally on Vancouver Island. The sea cave in the diorama, with water swooshing in, was a challenge for the skilled technicians who built it and a delight for the visitor who savoured the surprise of rushing water and the glimpse of a river otter poised at the opening of the rock.

As the opening day for Living Land, Living Sea *approached, all hands were on deck to ensure the exhibit was complete. Marine biologist Philip Lambert* *recalls gluing sand on the beach portion of the exhibit that Carol Christianson had sculpted. He said, "that's when we were all pitching in to get it done. We all worked together to make it happen."*

Up until this year, visitors could see the legacy that that close knit, talented team, willing to do whatever it took to create a world class exhibition, created for us during those days at the BCPM. Jean Jacques André, the designer of the displays, said they were some of his best years, not just because of what they achieved, but because of the friendships that were formed during that time. The friendships have lasted a lifetime. The exhibits lasted 50 years.

Jean Jacques André designed the BCPM's permanent galleries from 1968 to 1982. After leaving the BC museum, he went on to design museum exhibits all over the world. In 2001, he was awarded the Order of British Columbia for his creative work at the museum. Jean Jacques André died on 22 December 2021.

[contributed by Bianca Message, daughter of the late Jean Jacques André, and Richard E. Gibbs, retired Provincial Museum taxidermist].

Figure 295. The most popular attraction at the Royal BC Museum in Victoria for the last several decades has been this Woolly Mammoth created by taxidermist Richard Gibbs. Richard was an integral part of creating the *Living Land, Living Sea* exhibit and contributed to the *Human History* diorama. His taxidermy skills were apparent in many museum display specimens, including full mounts of Grizzly Bear, Roosevelt Elk, Cougar, California Bighorn Sheep, Columbian Black-tailed Deer, Horse, waterfowl and waterbirds, seabirds, songbirds, and his masterpiece, this Woolly Mammoth. The latter was created from the hides of nine Muskoxen and took Richard a year to complete! He published a 4-page article A Mammoth is Born in the BC Museum's Association newsletter Roundup explaining how "Woolly" was prepared. *Photo by Heidi M. Regehr, 13 September 2012.*

Figure 296. Specimens of Steller Sea Lions, Tufted Puffins, Common Murres, Glaucous-winged Gulls, and other animals were collected on Triangle Island to create the *Living Land, Living Sea* exhibit at the BC Provincial Museum in the 1970s. Shown here are photos of sea lion (top) and seabird specimens in the museum diorama. In early May, adult male Steller Sea Lions establish breeding territories on rookeries and maintain them for 40+ days without eating. They accumulate a harem and mate with females on territories. Contrary to the popular belief that sea lions eat commercially valuable fish stocks, they are not a serious factor in either salmon or herring mortality.[331] Almost 90% of the Tufted Puffins and most of the Common Murres nesting in BC are found on Triangle Island. *Photos by Bianca Message, André Family Archives (sea lions in diorama) and Heidi M. Regehr, 13 September 2012.*

Figure 297. It was important to the staff of the BC Provincial Museum Display Department involved in creating the seashore diorama to gain first-hand experience related to the concept and content of the display. In this photo, from left to right, Phil Lambert (a museum Marine Biology Department curator), Jan Vriesen (a Display Division diorama artist), and Brent Cooke, (a marine biology technician) get hands-on experience banding Rhinoceros Auklets on Triangle Island. *Photo by R. Wayne Campbell, 23 August 1974.*

Figure 298. A large Air Transport Command Rescue helicopter was used to transport the BC Provincial Museum display team to Triangle Island in August 1974. *Photo by R. Wayne Campbell.*

Figure 299. In designing the *Living Land, Living Sea* exhibit at the BC Provincial Museum, Jean Jacques Andrè and his creative team managed to depict different habitats of Vancouver Island's west coast in a seamless diorama that utilized all the display space available. One portion of the diorama showed sandy beach habitat used by foraging shorebirds, intertidal rocks where sea lions haul out, and steep, grassy slopes and cliffs that provide nesting habitat for Tufted Puffins, Common Murres, and Glaucous-winged Gulls (top photos). Also recreated were two other habitats used by seabirds in BC: sea caves used by Pigeon Guillemots (bottom right) and intertidal rocks with patches of mussels where Black Oystercatchers forage. *Photos of the diorama by Heidi M. Regehr, 13 September 2012 (top two photos) and Bianca Message, André Family Archives.*

Figure 300. On any walk to the seashore at low tide, you can find people who are fascinated and intrigued by marine creatures (left). In 1973, Win Speechly, a museum volunteer who travelled to remote areas to see wildlife and visit museums, returned from a trip during which she had been impressed by a tidepool exhibit with live animals. She described her experience to Dr. Alex Peden, curator of the Marine Biology Division, who suggested the concept to Jean Jacques Andrè in exhibits. Win was convinced the display would have great educational value for children as well as adults. Her timing was perfect, and the concept went into planning the seashore diorama. Intertidal animals, like limpets (photo), anemones, small sea stars, mussels, and snails, were collected locally as needed for the tide pool display in the seashore diorama. *Photos by R. Wayne Campbell, Green Point, Long Beach, BC, August 1967.*

Estimates of seabird nesting populations were generated during the initial CWS studies in the 1970s. [237, 242, 243] More comprehensive surveys were conducted in the 1980s that provided the current population estimates for seabirds nesting in the Scott Islands (Figure 301).[176, 194]

Almost 40% of the total seabird breeding population in BC nests on the three outer Scott Islands (see summary Table 4 on page 64 in Part 1[188]). Thirteen of the 15 colonial-nesting seabird species in BC have been found breeding there during recent surveys (Table 6). Questionable breeding records exist for two additional species, Ancient Murrelet [51] and Northern Fulmar.[41] The islands are the most important breeding grounds for Cassin's Auklets in the world, supporting almost two million breeding birds of this species nesting at the three adjacent sites (Table 6). These same three sites house most of the Common Murres (98%) and Tufted Puffins (89%) nesting in BC, as well as the only known colony of Thick-billed Murres in the province. Staging behaviour of the latter three species and Rhinoceros Auklets puts large concentrations of these birds at risk to disturbance and contaminants on the waters around the colonies throughout the breeding season. The Scott Islands are also an important centre for two species of cormorants. As of 1990, they support 41% of the Brandt's and 22% of the Pelagic cormorant breeding populations in BC.

Figure 301. CWS surveys of the Scott Islands in the 1980s were led by CWS employee Moira Lemon (left) and wildlife consultant Michael Rodway, shown here during some of their stints on Triangle Island. Their enthusiasm and commitment to apply robust survey methods and monitoring techniques to nesting seabirds in BC laid the foundation for this updated seabird catalogue. *Photos by Michael S. Rodway, 6 August 2009 (left) and Moira J.F. Lemon, 15 July 1984.*

Table 6. Estimates of seabird breeding populations in the Scott Islands 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 534-535 for an explanation of the letter codes used to qualify population estimates.

SITE CODE	SITE NAME	FTSP	LSPE	BRCO	PECO	BLOY	GWGU	COMU	TBMU	PIGU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
SC-010	Triangle Island	100e	200e		433	25	577e	4,100	7e(41)	x(331)	548,000t	41,700t	26,400t	S(4)	1,243,419	1989
SC-020	Sartine Island			39	168	1eS	390e	0(113)		x(176)	376,000t		6,400t	S(6)	766,178	1987, 89
SC-030	Beresford Island	2,900t	12,500t		6	3eS	110e			x(267)	66,000t		2,100t	S(7)	167,512	1987, 89
SC-040	Lanz Island				56[c]					S(28)	0	0			140	1987
SC-050	Cox Island				78[c]						0				156	1987
TOTAL NESTING PAIRS		**3,000**	**12,700**	**39**	**741**	**29**	**1,077**	**4,100**	**7**		**990,000**	**41,700**	**34,900**			
TOTAL BREEDING BIRDS		**6,000**	**25,400**	**78**	**1,482**	**58**	**2,154**	**8,200**	**14**	**802**	**1,980,000**	**83,400**	**69,800**	**17**	**2,177,405**	
TOTAL CURRENT SITES		2	2	1	5	3	3	1	1	4	3	1	3	3	5	
Confirmed on last survey		2	2	1	5	2	3	1	1	3	3	1	3	0	5	
Confirmed on any survey		2	2	1	5	3	3	1	1	3	3	1	3	0	5	
Unconfirmed		0	0	0	0	0	0	0	0	1	0	0	0	3	0	
TOTAL HISTORICAL SITES		2	2	1	5	3	3	2	1	4	5	2	3	3	5	
Confirmed		2	2	1	5	3	3	2	1	3	3	1	3	0	5	
Unconfirmed		0	0	0	0	0	0	0	0	1	2	1	0	3	0	
CURRENTLY ABANDONED SITES		0	0	0	0[c]	0	0	1	0	0	2	1	0	0	0[c]	
Previously confirmed					0			1			0	0				
Previously unconfirmed					0			0			2	1				

[a] Numbers of individuals.
[b] For sources see individual colony accounts.
[c] Breeding by Pelagic Cormorants was confirmed on Lanz and Cox islands but all nests were abandoned later in the season.

Historically, the Scott Islands were likely an even more important centre for breeding seabirds in BC. The two largest Scott Islands, Cox and Lanz Islands, may have supported large nesting populations in the past, but were deserted after the intentional introductions of mink (Figure 302) to Lanz Island and raccoon to Cox Island in 1938 or 1939.[47] Removal of those introduced predators is warranted to restore seabird nesting populations on the two islands.[120]

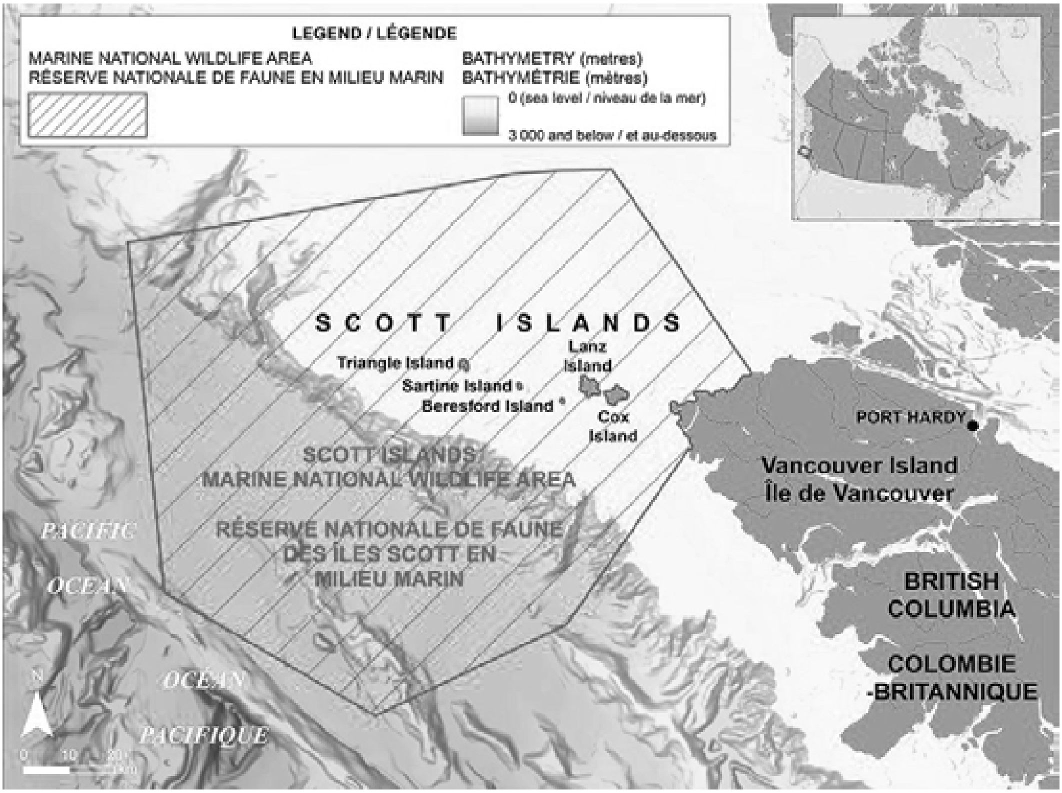


Figure 303. The marine waters surrounding Scott Islands were first identified as a potential area for protection by conservation organizations and Environment and Climate Change Canada (ECCC) in 1995. After years of lobbying and negotiations among interested parties, the Scott Islands Protected Marine Area (also called the Scott Islands marine National Wildlife Area) was finally established in 2018 under the *Canada Wildlife Act*. The protected area encompasses 11,546 km^2 (4,458 mi^2) of marine waters surrounding the Scott Islands and was designed to "conserve migratory seabirds and species at risk as well as the habitats, ecosystems, and marine resources that support them."[81] *Map reproduced from ECCC.* [320]

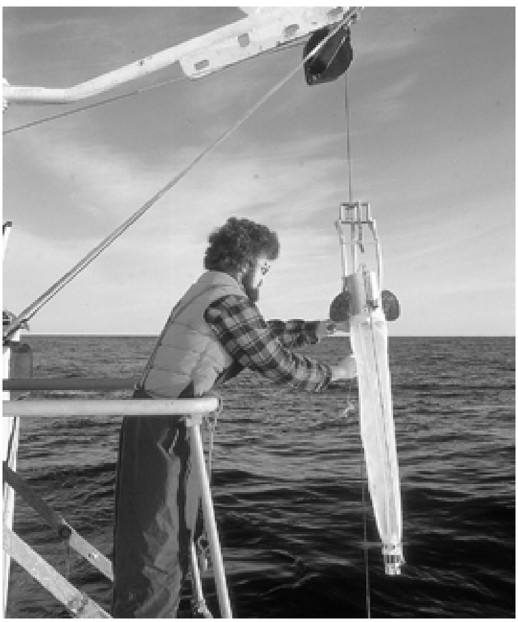
Figure 302. American Mink (shown here) and Northern Raccoon are widespread along the BC coast, but are absent from outer islands where seabirds nest. Both species are voracious predators of nesting seabirds.[108, 188, 189] Intentional introductions of those predators to Lanz and Cox islands likely eliminated large populations of seabirds that historically nested there. Those mammal species should be removed to allow seabird populations to recover. *Photo by Paula Courteau.*

The outer three Scott Islands were designated Ecological Reserves in 1971. Lanz and Cox Islands plus a 1 km foreshore area around the islands have been given Provincial Park status. Such status does not protect the highly vulnerable concentrations of breeding seabirds in the event of a local oil spill or other contamination of the marine environment. Restrictions on vessel traffic, commercial fisheries, and human disturbance within a 50-100 km radius of the islands are needed to protect staging and foraging birds around these colonies.[19] Partial protection has recently been provided by the 11,546 km^2 (4,458 mi^2) Scott Islands Protected Marine Area, established on 27 June 2018 (Figure 303). This is a positive move to protect breeding and migratory birds but falls short in its regulations (see section above, *Protective Status for Seabird Colonies on the Outer Coast*).

Just after the Scott Islands Protected Marine Area was established, Shell Canada Limited announced on 13 September 2018 that they were voluntarily releasing about 50,000 km^2 of offshore exploration permits along the BC outer coast to support marine conservation (Figure 304).[321] The relinquished area was more than one and a half times the size of Vancouver Island and overlapped with about one third of the Scott Islands Protected Marine Area. Although an informal moratorium against offshore oil exploration and development along the BC outer coast has been in effect since 1972, the relinquishing of their exploration permits by Shell Canada was a valuable contribution to the future security of the BC marine environment (Figure 305).

Figure 304. Acknowledging the biological significance of BC coastal waters to marine birds and mammals, and to support the establishment of the Scott Islands Protected Marine Area, on 13 September 2018, Shell Canada Limited relinquished their permits for offshore oil exploration along the BC outer coast.

Figure 305. The establishment of the Scott Islands Protected Marine Area by ECCC and the relinquishing of permits for offshore oil exploration by Shell Canada were important steps towards insuring the future wellbeing of nesting seabirds in the Scott Islands. However, weak regulations associated with the Scott Islands Protected Marine Area largely allow commercial fishing and shipping activities to continue as before.[322] The globally important breeding seabird populations in the Scott Islands are thus still subject to major risks of mortality from chronic and catastrophic oil spills and fisheries bycatch. They are also vulnerable to other anthropogenic and natural impacts. Photos here (clockwise from upper left) and associated text (numbered 1 to 6) illustrate and describe some of the threats and issues related to the conservation of nesting seabirds in the Scott Islands. **1)** Some of the most treacherous waters on the BC coast are found in the vicinity of the Scott Islands. Powerful storms occur during winter, but stormy weather is also common during the seabird breeding season from March to September and can impede foraging by seabirds and contribute to reproductive failures.[234] **2)** Climate change is causing ocean temperatures to rise, and sea surface temperatures off the BC coast have been warmer than normal in recent decades. Elevated temperatures change the distribution and availability of plankton and forage fish prey and impact seabird breeding success and survival.[14, 117] In this photo, sea surface temperatures are being taken by oceanographers. **3)** Commercial fishing activities impact seabirds through prey depletion and by entrapping them in fishing gear. Factory ships, such as this offshore bottom trawler accompanied by an at-sea processing ship, are extremely damaging to marine ecosystems, waste a large proportion of the fish and other marine animals that are caught, and cause substantial seabird mortality through collisions with warp cables during trawling operations and entanglement in nets as they are hauled in.[323] **4)** Oil pollution is a major threat to seabirds around the Scott Islands and elsewhere. Release of oil at sea is inevitable wherever ship traffic is abundant. It can be intentional, but is often accidental, due to human error, mechanical failure, or rough weather. To date, the Scott Islands have avoided a major catastrophe from an oil spill, but many blobs of oil reached the Scott Islands from the *Nestucca* oil spill that occurred off the Washington coast in December 1988.[193] Mortality from that spill was estimated at 56,000 seabirds, mostly Common Murres and Cassin's Auklets.[324] One oiled adult Glaucous-winged Gull was seen on Triangle Island on 31 January 1989; many more oiled birds would have been found there if the oil spill had occurred during the seabird breeding season. This photo shows a weathered blob of oil encountered on the shore of Triangle Island during the summer following the *Nestucca* spill. **5)** The intentional or unintentional introduction of mammalian predators to colony islands can decimate seabird nesting populations. Historical seabird nesting populations on Lanz and Cox islands were likely eliminated by American Mink and Northern Raccoons (shown here) that were intentionally released on the islands for fur trapping purposes in the late 1930s by two brothers from Cape Scott. Introduced European Rabbits (*Oryctolagus cuniculus*) escaped from lightkeepers on Triangle Island in the early 1900s but do not appear to have impacted nesting seabirds.[120] **6)** An inter-disciplinary approach of cooperative research and monitoring is essential for understanding ongoing changes in marine ecosystems and to assess emerging threats to seabirds and other ecosystem components. This photo shows university researchers conducting plankton hauls that will provide data on ocean productivity. The four volumes of this seabird catalogue contribute information on the province's nesting seabirds, and will be made available online by the Biodiversity Centre for Wildlife Studies (www.wildlifebc.org). *Photos by R. Wayne Campbell and Michael S. Rodway.*



SC-010 TRIANGLE ISLAND

Location: *50°51'50"N 129°05'00"W; 102 I/14.* Outermost of the Scott Islands, 46 km northwest of Cape Scott. Colony includes all rocks around the perimeter of the main island (Figure 306).

Description: *149 ha; 194 m high; Grassy and shrubby island; Bare rock.*
Triangle Island is the most dramatic and exciting seabird colony on the BC coast. It has been described in detail by Carl et al. (Figures 307 and 308).[47] Perimeter slopes are steep but accessible at several locations, as beaches or tidal rock shelves make it possible to walk around most of the circumference of the main island. The southwest peninsula ("Puffin Rock"; see Figure 306) and the offshore rocks and pinnacles drop more abruptly into the sea. From the air, the top of the island "...appears to be covered with a verdant cloak of smooth, grass-like texture, but on close examination it proves to be an almost continuous mantle of salmon-berry, closely and evenly wind-pruned to a height of from 2 to 6 feet."[47] On the highest part of the island, along the west ridge, the salmonberry gives way to an extensive area of fragile, heavily burrowed soil, covered with Alaska saxifrage (*Saxifraga ferruginea*), other forbs, and moss. Steep perimeter slopes are covered primarily with tufted hairgrass (*Deschampsia caespitosa*), but expanses of lady fern (*Athyrium felix-femina*) grow

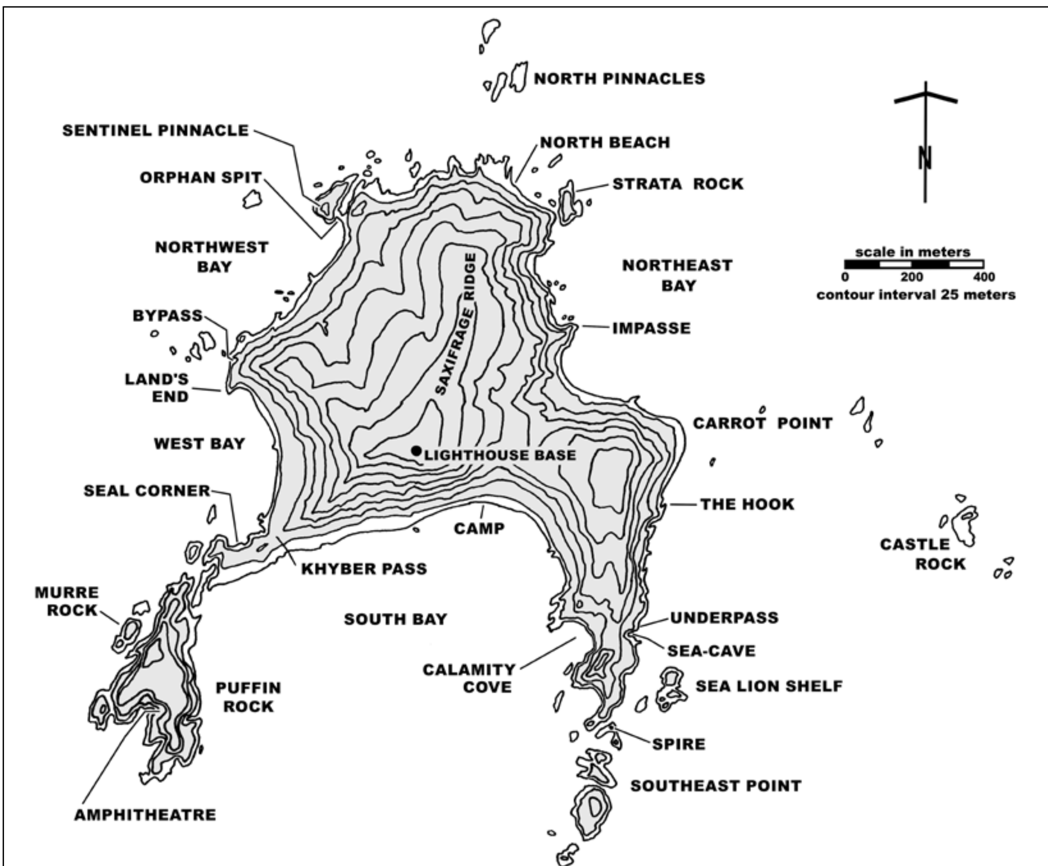


Figure 306. Locations mentioned in the text around Triangle Island, BC (modified from Rodway et al.[194]).

on north and south slopes and on Puffin Rock, and stunted salal grows on steep, exposed rocky ridges. Salmonberry also grows on steep slopes and has become more prevalent there in recent years, now covering many areas where tufted hairgrass used to be the dominant vegetation (Figure 309).[120]

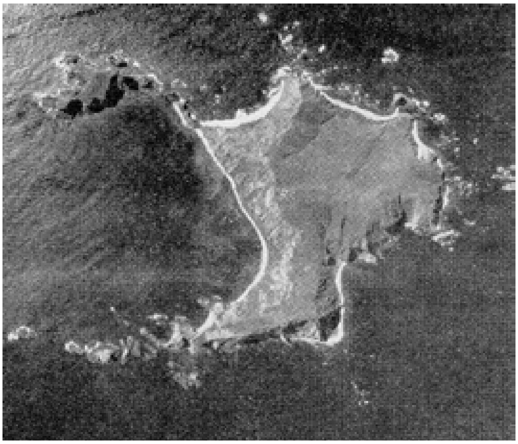


Figure 307. Aerial view taken by the Royal Canadian Air Force sometime before 1950 (left) and a view of the precipitous perimeter slopes of Triangle Island in 1949, with wind-blown, stunted black twinberry (also called twinberry honeysuckle) in the foreground. Provincial Museum botanist George A. Hardy obtained about 65 species of vascular plants in 1949, which, added to those previously identified by W.A. Newcombe in 1913, brought the total number of plant species identified on Triangle Island to about 80.[47] *Photos by Royal Canadian Air Force (left) and George A. Hardy, courtesy of G. Clifford Carl.*

Figure 308. For eight days in 1949, biologists from the BC Provincial Museum camped on the beach in the northeast bay of Triangle Island. Their camp at the base of the steep slopes is visible in the lower right corner of the left photo. The other photo shows their canvas sleeping tent and the additional shelter for cooking and specimen preparation. *Photos by G. Clifford Carl, June 1949.*

Figure 309. Images of Triangle Island (clockwise from upper left): **1)** a view in 2009 of Puffin Rock from the steep slopes above south bay where Michael Rodway is measuring out a permanent monitoring plot for Cassin's and Rhinoceros auklets; **2)** Moira Lemon and Michael Rodway walk gingerly, careful not to collapse Tufted Puffin burrows or to step on hidden Glaucous-winged Gull chicks, down a tufted hairgrass slope on the top of Puffin Rock in 2009, with the west side of the main island behind showing Khyber Pass between South Bay and West Bay, Land's End at the north end of West Bay, and the old lighthouse base on the top of the island; **3)** a view in 2014 looking northwest downslope from Saxifrage Ridge to Sentinel Pinnacle where Pelagic Cormorants nest in some years; **4)** Laurie Wilson at a Cassin's Auklet permanent monitoring plot on Saxifrage Ridge in 2014 with the lighthouse base in the distance; **5)** looking east in 2014 over the summit plateau with its cloak of wind-pruned salmonberry and Sartine Island visible in the distance; and **6)** Southeast Point seen from Saxifrage Ridge in 2014. *Photos by Heidi M. Regehr (1, 2) and Michael S. Rodway (3, 4, 5, 6).*

Figure 310. The concrete base of the historic lighthouse stands as a lonely and abandoned sentinel on the top of Triangle Island. *Photo by Michael S. Rodway, 23 July 2014.*

A lighthouse was built on the top of the island in 1909-1910. A tram was built up the steep slope from the northeast bay to transport construction materials to the site. After nine years of operation, with despairing lightkeepers tormented by wind, rain, and fog, it was dismantled. The concrete base remains a silent testimony to their efforts (Figure 310). A research cabin was set up in the south bay in 1974 (Figure 311).

Figure 311. The Triangle Island research cabin sits nestled at the base of steep slopes in the south bay, here on a typical foggy day in July. *Photo by Michael S. Rodway, 22 July 2009.*

A Monument to Ambition

A lighthouse on Triangle Island was the brainchild of Colonel William Patrick Anderson, who at the turn of the 19th century was chief engineer in the Marine and Fisheries Department and chairman of the Canadian Lighthouse Board. It was a time of great industrial achievements that promoted an arrogant confidence in man's ability to subjugate nature to his will – to build unsinkable ships and cut canals across continents to join oceans. In 1909, Anderson's crowning achievement, the lighthouse at Estevan Point, further south on the west coast of Vancouver Island, was just being completed. One of the tallest, free-standing concrete structures in western North America at that time, the Estevan light sits atop an elegant, 102-foot tower braced by eight flying buttresses to stabilize it against wind and earth tremors. Though widely recognized for his accomplishments, Anderson was not content to rest on his laurels. He set his sights on Triangle Island. A beacon high atop this rugged outpost would be an immortal monument to his skill and ambition and would propel his status into the company of the greatest engineers in the world. It would be visible for 50 miles, safely guiding ships from danger. Instead, it became a monument to man's foolishness and a testimony to tragedy that often follows in the wake of exaggerated ambition, not dissimilar to the sinking of the Titanic.

Other members of the Lighthouse Board tried to dissuade Anderson, but he was obsessed. He broke his own cardinal rule to never position lights more than 150 feet above sea level. The top of Triangle is 640 feet above the sea and is battered by hurricane-force winds from all points of the compass and more often than not is swallowed in fog. Undaunted, Anderson sent supplies and workers and construction began in the fall of 1909. Just anchoring in the northeast bay and offloading materials was a challenge. Building was an exercise in dogged perseverance. Living there proved intolerable.

A platform was cleared on the top, a tramway was built up the steep slope, and a steam-driven donkey engine was installed to winch supplies up from the northeast shore. Workers needed to be harnessed for safety, and fierce winds ripped shingles and siding off buildings almost as fast as they were nailed on. The heavy glass panes surrounding the lantern had to have special steel bracing to keep them from blowing out of their frames and cables and turnbuckles were installed to anchor buildings to the rock. Construction was completed in 1910 and the light and accompanying wireless station went into operation. What followed was nine years of misery for lighthouse keepers and wireless operators, inevitably ending in tragedy.

Life at the Triangle Island lighthouse was the antithesis of the idyllic romantic existence that we associate with this remote and exotic lifestyle. Keepers and their families were constantly tormented by shrieking winds that threatened to cleave them from their precarious perch. Windows were blown in, doors were torn off their hinges, roofs were ripped off, buildings were toppled from their foundations, and the wireless towers and rigging were broken off and hurled over the cliff. It sometimes took two men to open a door against the wind and people often had to crawl to get between buildings without being blown away. Clothes, blankets and other belongings were sucked out like in a tornado and tossed off the cliffs. Chimneys were sheared off and for days or sometimes weeks at a time the swirling winds filled the houses with smoke and made it impossible to keep a fire going, not even to cook a hot meal. Rain, driven horizontally by the constant wind, leaked through walls and further turned everything damp and dismal. Life on the island took a psychological toll and after enduring such torment for a few winters, keepers and their families begged to be relieved.

Provisioning the crews stationed on the island was also a nightmare. It was often months before a ship could approach and even after it arrived it was sometimes weeks before crews could safely land ashore to deliver supplies. The final disaster and event that likely clinched the end of Anderson's escapade occurred on 29 October 1918. The naval patrol vessel Galiano *came in to deliver supplies and exchange crews. By early afternoon a storm began to brew. They hurriedly dumped the remaining incoming provisions on the beach, loaded up personnel heading out, including the housekeeper that had been teaching the children, and set off as fast as they could get underway. Already set upon by the storm, the captain of the Galiano decided to head for open sea to weather the raging seas. Two hours later they radioed a distress call – their hold was full of water – and that was the last they were heard from. All were lost. A couple of bodies were picked up two days later drifting 200 miles away.*

The Lighthouse Board admitted defeat in 1919. The light was dismantled. It had been a dismal failure and must have been an embarrassment to Colonel Anderson. The Naval Service maintained a wireless and weather station on the island until 1921 (Figure 312)*, after which it too was abandoned. Although the island proved inhospitable to humans, it is a sanctuary for seabirds, and we can be grateful today that the legacy of Triangle Island belongs to them.*

Figure 312. View of the lighthouse wireless buildings on Triangle Island in about 1915. Note the support timbers needed to brace the building against ferocious winds. *Photo by T.E. Morrison, Agent, Department of Transport, Victoria, BC, courtesy G. Clifford Carl.*

Triangle Island became an Ecological Reserve in 1971. It was renamed the Anne Vallée Ecological Reserve in tribute to Anne who died there in 1982 while studying the puffins she so loved (Figure 313).

Historical summary: Burton, Pike, and possibly Green [53] visited Triangle Island during the first decade of the 20th century and collected eggs of Fork-tailed and Leach's storm-petrels, Common Murres, Cassin's Auklets, and Tufted Puffins (Table SC-010; Figure 314). Common Murre was the first species confirmed nesting when Burton collected four eggs in 1900,[92] although Carter and Sealy [53] debate the validity of the 1900 records (see introductory section on *History of Seabird Colony Surveys*). An egg collected earlier by Newcombe in 1898 on the "west coast of Vancouver Island" may have come from Triangle Island.[92] Pike also described nesting by Pelagic Cormorants, Black Oystercatchers, and Glaucous-winged Gulls in 1909, although no specimens were collected.[53] C.F. Newcombe and his son W.A. Newcombe collected Glaucous-winged Gull eggs in 1913. The Provincial Museum party of Carl, Guiguet, and Hardy, as well as F. Beebe, explored the island from 24 June to 1 July 1949 and documented nesting by most species presently known to breed on the island, except Thick-billed Murres and Rhinoceros Auklets.[47]

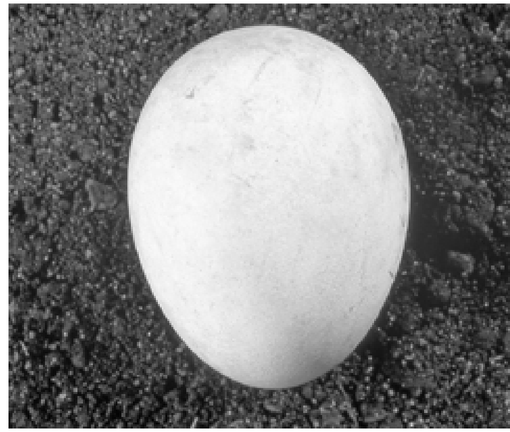
Figure 313. The worst tragedy in the history of seabird surveys in BC occurred on 31 July 1982 when Anne Vallée fell to her death off the steep slopes of Triangle Island. Anne had been studying nesting density and productivity of Tufted Puffins on Triangle Island from 1980-1982 as part of her graduate program at UBC. She fell while taking time out of her own studies to assist us with our surveys of Tufted Puffins. In 1983, the ecological reserve at Triangle Island was renamed the Anne Vallée Ecological Reserve in her honour. *Photos by Moira J.F. Lemon, July 1982.*

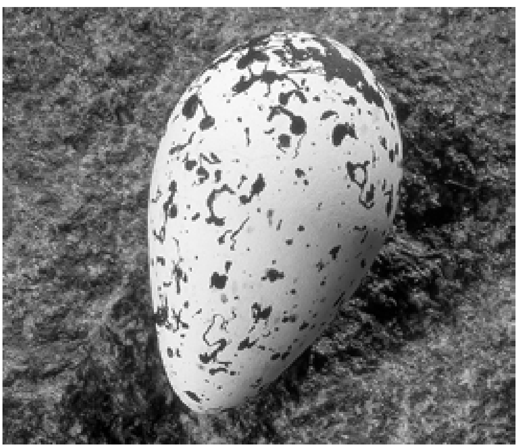
Table SC-010. Seabird nesting records for Triangle Island. See Appendix 2 for codes.

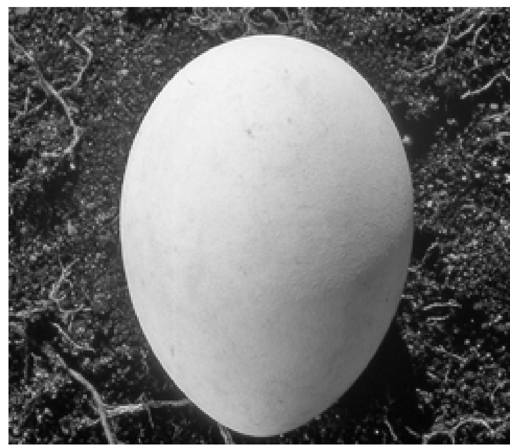
DATE	FTSP	LSPE	PECO	BLOY	GWGU	COMU	TBMU	PIGU	CAAU	RHAU	TUPU	HOPU	SOURCE
20 Jun 1900						x							92
Jun-Jul 1909	x	x	x	x	x	x			x		x		47, 53, 77, 92, 277j
Jun 1910						x			x				52, 77
Jul 1913					x	x							52, 77, 92
Jul 1915						x							277k
1920						x							77
24-30 Jun 1949	S	S	(2,400+)[a]	3+	x	x(3,000)		x	x	S	x		47
9 Jul 1958											x		77
24 May 1959				x									265
21 Sep 1961			100e		100e								265
3 Aug 1966										3,000e			96
28 Jun 1968			100-150e										265
20 Jul 1968						x(500)							97
1 Jul 1972												S(2)	38
May-Jul 1974		100e	75e	2+	200e	2,000e		150e	100,000's	1,000+e	20,000e	S(1)	242, 265
20-24 Aug 1974		S	164[b]	S	100's	x				x	x	S(2)	38, 242, 265
Jun-Sep 1975		S	75e		200e	x(5,934)		100e	100,000+e	15,000e	25,000e	S(4)	242
May-Sep 1976		S	100-150e	8[8]	200e	x		x	100,000+e	15,000t	25,000t	S(1)	243, 265
May-Sep 1977	S	S	194	13e	340e	x(2,500+)		100+S(238)	359,000t	16-18,000e	30,000+e	S(8)	38, 243, 265
Jun-Jul 1978				12[12]									265
Jun-Sep 1980						x						S	261
Jun-Sep 1981						x	19					S	221
8-31 Jul 1982	S	x	x	x	x	x(4,910)	x(70)	S(86)	x	x	21,400t	S(6)	140
5-29 Jul 1984	S	S	33	4	337e	0(12,000)	0(50)	x(241)	x	25,100t	x	S(1)	194
9-25 Jul 1985	S	S	144	6e	65+	x(3,956)	S(34)	x(173+)	x	x	x	S(2)	194
6-22 Jul 1986	S	S	x	2	x	x	S(3)	S		x	x	S(6)	9, 265, 266
21 Jul 1987			x36	S	S	S		S(81+)			S(200+)		259
Jun-Aug 1989	100e	200e	433	25e	577e	4,077(9,943)	7e(41)	x(331)	548,000t	41,700t	26,400t	S(4)	194

[a] Carl et al. [47] estimated in excess of 2,400 breeding birds; no nests were counted.

[b] The estimate of 50 pairs for Triangle Island given in Campbell [32] comes from a 1974 visit made with the BCPM Display Division when almost 50 nests were observed with young. A total of 164 nests were actually counted that year but the contents of most could not be ascertained.[265]







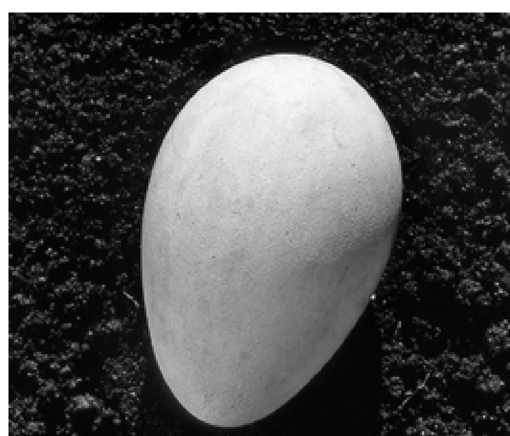


Figure 314. Egg collectors visiting Triangle Island during the first decade of the 20th century collected eggs of five species: Fork-tailed and Leach's storm-petrels, Common Murres, Cassin's Auklets, and Tufted Puffins. Eggs of the four burrow-nesting birds are all-white while those of surface-nesting murres are strongly patterned. All five species lay a single egg and have long incubation periods. In order of egg size (clockwise from top left), are eggs of: Leach's Storm-Petrel (1.20 x 0.95 in [30.5 x 24.1 mm]); Fork-tailed Storm-Petrel (1.25 x 0.95 in [31.8 x 24.1 mm]); Cassin's Auklet (1.80 x 1.30 in [45.7 x 33.0 mm]); Tufted Puffin (2.80 x 1.90 in [71.1 x 48.3 mm]); and Common Murre (3.40 x 2.00 in [86.4 x 51.0 mm]). Measurements from Reed.[325] *Photos by R. Wayne Campbell.*

Carter and Sealy [51] argued that Ancient Murrelets were also confirmed breeding on Triangle Island by Carl and colleagues in 1949, based on three egg specimens (1 set of 2 eggs and 1 single egg) in the RBCM,[277i] but we consider the evidence unconvincing. The egg specimens that Carter and Sealy [51] based their argument on were labelled "Queen Charlotte Islands" and were dated 1 July 1949 by collector A. L. Meugens. Carter and Sealy [51] postulated that they were really collected from Triangle Island by Carl and Guiguet in 1949, but that a series of coincidences and mistakes caused them to have been missed. However, we disagree for several reasons. Most importantly, nesting was not reported by Carl et al.[47] in their summary of that expedition nor later by Guiguet.[77] Carl et al.[47] specifically stated that "no burrows or eggs of this species had been discovered on the island previously, and no record was obtained by us." Drent and Guiguet [77] describe the Queen Charlotte Islands (now Haida Gwaii) as the southern limit of breeding for the species except for a single female incubating two eggs found in 1924 by Hoffman [124] on Carroll Island in Washington. To explain how these egg specimens could have come from Triangle Island in spite of these explicit statements that Ancient Murrelets were not found nesting there, Carter and Sealy [51] supposed that Carl collected these eggs just before the museum team were leaving the island and Guiguet never saw them (Guiguet was familiar with Ancient Murrelet eggs and he would have mentioned nesting on Triangle Island in the 1961 seabird colony catalogue [77] if he had seen them). Carter and Sealy [51] further suggested that Carl was inexperienced with Ancient Murrelet eggs and would have missed their significance. However, this scenario seems unlikely because Ancient Murrelet eggs are pale buff to olive brown with brown speckles, unlike the creamy- to dirty-white eggs of any other burrow-nesting alcid on Triangle Island, and would have been immediately recognized as different by Carl (Figure 315). Two other aspects of the egg specimens introduce doubt that they were collected by Carl and colleagues on Triangle Island. First, both specimens are labelled "Queen Charlotte Islands." Carter and Sealy [51] contend

Figure 315. Ancient Murrelet eggs are readily distinguished from those of all other burrow-nesting alcids in BC. Eggs of other burrow-nesting alcids (excluding Pigeon Guillemots, which sometimes nest in burrows) are all white, whereas the eggs of Ancient Murrelets are entirely buffy to olive brown and faintly marked with a variety of darker dots and lengthened spots. Ancient Murrelets also lay a clutch of two eggs, while other burrow-nesting species lay a single egg. *Photo by R. Wayne Campbell.*

that the location was an error and should have been "Queen Charlotte Sound" which was the location given for some Common Murre egg specimens collected on Triangle Island by Carl et al.[47] Second, the condition of the eggs was noted as "fresh" but the date given of 1 July for both these specimens is a very late date for fresh Ancient Murrelet eggs in BC. Carter and Sealy [51] suggested that they had been abandoned earlier and were little incubated.

Overall, the scenario to confirm breeding by Ancient Murrelets proposed by Carter and Sealy [51] is improbable. They suggested that Carl was grubbing burrows on the day the museum crew departed the island and found two of a possible handful of Ancient Murrelet burrows amongst 100s of thousands of Cassin's Auklet burrows, that those two burrows contained abandoned Ancient Murrelet eggs that Carl did not recognize as unique and did not show or mention to Guiguet, that the eggs languished in a private collection unknown to Guiguet for the next decade, and that the location of "Queen Charlotte Islands" and the collector (A. L. Meugens) were mistakes on the specimen card. Given the number of speculative contingencies required to support the argument that these eggs were collected by the museum party on Triangle Island in 1949, we think the most parsimonious explanation is that there were some errors made in the date and/or location during the succession of these records or on the specimen cards when these eggs were obtained by the museum. As a possible example of the latter, the specific locations given for these records in the online database from the RBCM are "Triangle Island" for one and "Triangle Mountain" for the other.

The three Ancient Murrelet egg specimens purported to come from Triangle Island by Carter and Sealy [51] may have come from Haida Gwaii (formerly Queen Charlotte Islands). The collector listed on the specimen cards was Arthur L. Meugens, an accountant and avid egg collector who lived the latter part of his life in Burnaby, BC.[39] The eggs were in Meugens' private collection until they were acquired by Wayne Campbell in the late 1960s, while Campbell was curator of ornithology at the Vertebrate Museum at UBC. Campbell later donated them to the BCPM. Campbell noted on the tag for these specimens, "Langara [in the Queen Charlotte Islands] sometimes called Triangle in error." [51] Meugens informed Campbell that he had obtained the eggs from his friend and fellow oologist, Walter S. Maguire, who lived nearby in New Westminster. As was their habit, when these egg collectors obtained specimens, they transferred the information to their own personal collection cards. Thus, Meugens was listed as the collector on the specimen cards but was not the original collector. Maguire had assisted Charles Guiguet on Langara Island in Haida Gwaii in 1947 [189] and may have collected the eggs then, or he may have obtained them from someone else.

There are no other records of Ancient Murrelets nesting on Triangle Island, and, given the uncertainty surrounding the 1949 record considered by Carter and Sealy,[51] we have not included Ancient Murrelet as a confirmed nesting species on the island.

Northern Fulmars are potential breeders on the island, as four to eight dark-phased birds have been observed courting and sitting in cormorant nests on the west side of Puffin Rock each year the island has been visited since 1974. Campbell et al.[41] changed the status of Northern Fulmar in BC to "breeding" based on an observation on Puffin Rock in 1979, but we are hesitant to accept that record as confirmation of breeding. The observation that caused the change in status for this species was from 14 June 1979, when a fisherman from Port Hardy scaled the cliffs of Puffin Rock to photograph birds. He flushed three fulmars from nests, one of which contained a single white egg which he assumed was a fulmar egg. However, we believe that this egg could have been a Pelagic Cormorant egg because they are also white (although smaller than fulmar eggs) and because fulmars have been seen sitting in cormorant nests, sometimes even on cormorant eggs, in this location. For example, on 10 July 1982, we observed a fulmar flush a Pelagic Cormorant from its nest containing two eggs and then proceed to sit on the eggs for a few minutes. If we had arrived after the cormorant had been flushed from its nest rather than before, and were not able to judge egg size accurately, then this event could also have been misconstrued as a fulmar breeding record. There has been no further evidence to confirm breeding (see Appendix 1) and we still consider Northern Fulmar a potential breeding species in BC (Figure 316).

Figure 316. Northern Fulmars have been observed on Triangle Island engaged in behaviours that suggest breeding, including courtship displays and birds sitting in nests in apparent incubation posture, like the one shown here. However, in all cases that have been investigated, nests where fulmars have been seen sitting have belonged to Pelagic Cormorants and have sometimes contained cormorant eggs. We have observed Northern Fulmars on Triangle Island usurp cormorant nests for brief periods and careful observations are required to identify which species the nests belong to, especially because the whitish eggs of Northern Fulmar and Pelagic Cormorant are similar. To date, there has been no confirmation of breeding by Northern Fulmars on Triangle Island. *Photo by R. Wayne Campbell.*

Although Triangle Island has been frequently visited and we have records going back to 1900, there are relatively few comparative quantitative data that provide reliable information on population trends. The best quantitative data are from the years 1975-1978, when Kees Vermeer, Ken Summers, Dan Bingham, and Ray Billings were conducting studies and surveys of breeding seabirds, and from 1982-1989 when we (Moira Lemon, Michael Rodway, and colleagues) surveyed the island as part of the CWS inventory program (Figure 317). The 1989 surveys were the most thorough and were conducted as part of the follow-up impact studies to the *Nestucca* oil spill that winter.[193] Colony-wide reproductive failure of several seabird species occurred in 1976 and 1984 and numbers of birds nesting in those years were depressed (see Remarks). On 21 July 1987, we made a brief circumnavigation of the island from 05:30 to 07:45 hrs. No breeding population estimates were made, but Pelagic Cormorants, Common Murres, and Glaucous-winged Gulls were attending nests or nesting ledges and appeared to be nesting successfully. Some partial counts were conducted in one area south of the "Hook" on the east side of the main island during that brief visit.

Fork-tailed and Leach's storm-petrels have been confirmed nesting since 1909 but only small numbers of have ever been estimated nesting and there is no evidence to suspect changes in population sizes.

Available records suggest that Pelagic

Figure 317. Getting to and from Triangle Island depends on the weather and is always an adventure. Crews and gear have been transported to the island by boat but more commonly by helicopter from Port McNeill on northern Vancouver Island. It is not unusual to have to wait several days for a break in the weather or to have to turn back part way because the weather has deteriorated. These photos from 2009 show: the CWS crew (from left to right, Michael Rodway, Heidi Regehr, Jasmine Freed, and Moira Lemon) fully outfitted and ready to leave Port McNeill in promising sunny weather; the helicopter at the landing pad near the research cabin in the south bay of Triangle Island; and the helicopter quickly departing as the fog begins to envelope the island. *Photos by Michael S. Rodway, 21 July 2009.*

Cormorants (Figure 318) declined on Triangle Island after 1949, but, contrary to trends elsewhere in BC, increased from the 1970s to 1989. In 1949, Carl et al. estimated in excess of 2,400 breeding cormorants, and said they were nesting in all available niches.[47] However, nests were not counted and it is possible that a large proportion of birds present that year may not have been nesting.[196] Other observations by Carl et al.[47] indicated that there was an abundant food supply around the island in 1949 which may have attracted large numbers of non-breeding cormorants to the area. Large numbers of non-breeding cormorants have been recorded in other years.[242] However, an abundant food supply may also have facilitated breeding by all mature individuals in the population. Nest counts since then have ranged between 33 and 433, and nesting locations have been used intermittently. Although we are not confident that the indicated decline after 1949 was real, we can speculate about how many nests there may have

Figure 318. This large Pelagic Cormorant chick is well-feathered but still has traces of down. *Photo by R. Wayne Campbell.*

been in 1949. Since 1949, 23 locations have been identified around Triangle Island where Pelagic Cormorants nest (Figure 319); only five to 17 of those locations have been used in any one season.[196] A tally of the maximum count of nests from all years at each of the 23 locations would total about 900 nests. Thus, a total of around 1,200 nests may not be unreasonable if all available niches were occupied in 1949 as stated by Carl et al.[47] If that many birds were nesting in 1949, then populations suffered a precipitous decline to only about 100 pairs in 1961, a decline from which they have never recovered. Records since 1961 indicate some reversal in that trend, with the maximum number of nests counted in 1989, although numbers have fluctuated from year to year. Comparable, full-island counts from which trends could be assessed were conducted in 1977, 1984, 1985, and 1989. Nesting was largely unsuccessful and most locations were abandoned in 1976 and 1984. The apparent increasing trend from 1977 to 1989 was contrary to declines reported in Haida Gwaii,[175] the northern mainland coast,[182] Queen Charlotte Strait,[183] and the west coast of Vancouver Island [238] during the same period. Contrary trends on Triangle Island and on the west coast Vancouver Island detected in 1989 may have been related to differences in oceanographic conditions and food supply in those areas.[196, 238] Human and Bald Eagle disturbance that may have affected populations in other areas seemed unlikely to account for the major population decline on the west coast of Vancouver Island between 1988 [181] and 1989 [238] (see West Coast Vancouver Island region below).

Figure 319. The white-washed “Amphitheatre” on the west side of Puffin Rock is one of 23 identified locations used for nesting by Pelagic Cormorants around Triangle Island. It is one of the most regularly used locations. *Photo by Michael S. Rodway, 25 July 2014.*

The only thorough count of Black Oystercatcher nests is from 1989, when we counted 24 nests (23 of which contained eggs or young) plus one nesting pair where we could not find the nest. Nests were found on upper beach areas and rocks around much of the perimeter of the island (Figure 320). Ken Summers, Dan Bingham, and Ray Billings documented eight nests with eggs in 1976 and found seven nests with eggs and six territories where nesting was suspected in 1977 but made no island-wide census in those years. In 1978, Ray Billings monitored the progress of 12 nests around the island; some chicks hatched in most nests except one nest with three eggs on the east side of Puffin Rock was destroyed during a high tide and heavy seas on 21 June.

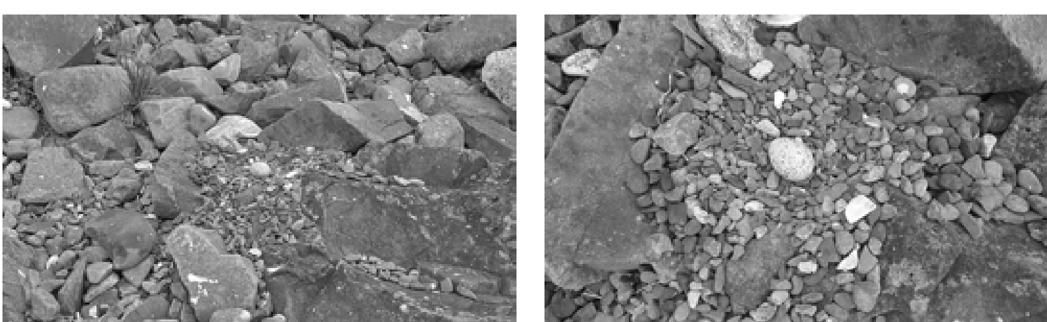


Figure 320. Beach habitat (left) in the south bay of Triangle Island where a Black Oystercatcher nest with one egg was found in 2014. *Photos by Michael S. Rodway, 17 July 2014.*

Figure 321. Glaucous-winged Gulls nest in many habitats on Triangle Island, including cliffs, steep rocky slopes, and among grass tussocks where puffins burrow. Nests are often dispersed and difficult to access, making complete nest counts impractical. Here, adult gulls and large young are visible on steep, grassy slopes on the west side of Puffin Rock adjacent to nesting murres and on precipitous rock faces on Murre Rock. *Photos by Michael S. Rodway, 4 August 2009 and 27 July 2014.*

Glaucous-winged Gulls nest in many inaccessible areas around Triangle Island and complete nest counts are impractical (Figure 321). The most complete surveys were conducted in 1977 and 1989. Results suggest an increasing population, similar to that observed in other parts of the BC coast during this time period. The best comparative data are for Puffin Rock. In 1977, accessible nests were counted only on Puffin Rock; the rest were estimated from birds standing on territories. On Puffin Rock in 1977, 169 nests were counted (148 contained eggs or young) plus 25 pairs were estimated nesting in inaccessible locations, resulting in a total estimate of 194 pairs. In 1989 on Puffin Rock, we inspected 234 nests (213 with eggs or young) and estimated an additional 60 pairs, resulting in a total estimate of 294 pairs. Over the entire island in 1989, the contents of 288 accessible gull nests were determined: 263 contained eggs or young. Differences in nest counts on Puffin Rock and in total breeding population estimates for the entire island suggest an increase of over 50% between 1977 and 1989.

The majority of Common Murres breeding in BC nest on Triangle Island (Figure 322). They nest in many inaccessible locations and are difficult to count. Numbers counted or estimated in all years except 1984 are of breeding birds standing on visible nesting or roosting areas. They do not include birds on the water, which can be as numerous as birds on land. In 1984, no murres were nesting, and counts were made of all birds on the water around the island.

Carl et al. made the first estimate of Common Murre numbers in 1949.[47] They noted that, "several rocky peninsulas, islets, and headlands of the main island were covered at their crowns and down the slopes with hundreds of murres," and estimated total numbers to be about 3,000 birds. Hancock estimated about 500 birds and saw over 125 eggs on cliffs of two southernmost pinnacles of the southeast point in 1968.[97] The first good count of the numbers of Common Murres attending nesting areas was made on 29 July 1975 when Vermeer et al.[242] counted 5,384 birds on the main island (Puffin Rock and Southeast Point) and about 550 on Castle Rock (Figure 323). From the almost 6,000 birds counted, they estimated 3,000 nesting pairs (note that Vermeer et al. stated that their estimate was similar to that of Carl et al. in 1949, but in fact Carl et al. estimated 3,000 breeding birds, not pairs). Counts since 1975 have varied but, except for years of breeding failure, they overall suggest little population change. We counted fewer birds in 1985 than in other years, but our maximum count from photographs on the same date (29 July) in 1989 (6,144 birds [176]) was very similar to the count of 5,934 birds from 1975. The larger total estimate of numbers of birds (9,943) in 1989 was calculated based on detailed observations and derived correction factors that have not been replicated in other years. The derived breeding population of 4,077 pairs in 1989 [176] is the only reliable estimate of the actual nesting population on the island. When murres failed in 1984, they spent much of their time clustered in dense rafts on the water below the main breeding areas; we counted a maximum of about 12,000 birds on the water that year. In 1989, murres successfully hatched young at most locations on Puffin Rock but failed or abandoned nests during incubation at almost all locations on the east side of the island, including

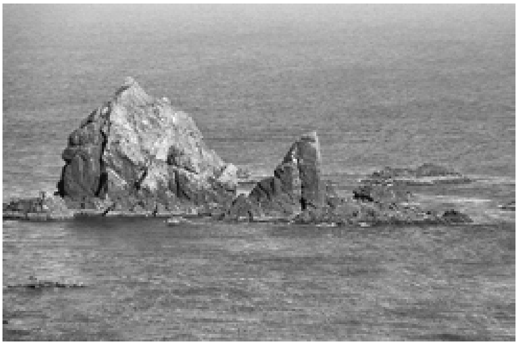
Figure 322. An estimated 98% of the Common Murre breeding population in BC nests on Triangle Island. Photos here (clockwise from upper left) and associated text (numbered 1 to 6) illustrate and describe Common Murres and their nesting habitats on Triangle Island. 1) Adults on Puffin Rock on 4 August 2009. Often described as "flying penguins", Common Murres have shorter wings than most seabirds their size. This adaptation allows them to use their wings to propel themselves underwater to catch fish as well as fly long distances in search of food. 2) Nesting habitat on the cliffs in June 1949. The colony in this photo is identified by white-wash on the cliffs. 3) A compact sub-colony seen in July 1982. 4) Relatively level nesting habitat photographed on 4 August 2009 where nesting murres have denuded former grassy areas. The eroded grass tussocks in the foreground mark the edge of a Tufted Puffin nesting slope. 5) Adult shielding a newly hatched chick in August 1974. 6) Chicks ready to fledge in August 1974. The age at which chicks leave the nest ledge is about 24 days, but may be greater when there are food shortages that delay chick development.[326] *Photos by Michael S. Rodway (1, 3), G. Clifford Carl (2), Moira J.F. Lemon (4), and R. Wayne Campbell (5, 6).*

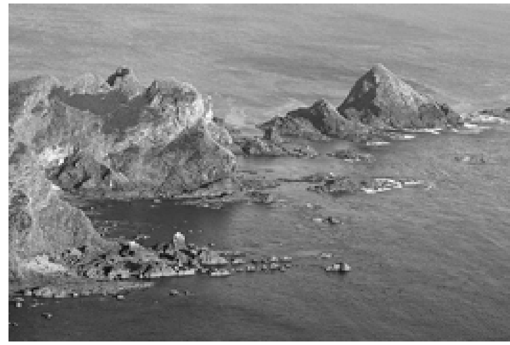





Castle Rock. Over 100 depredated eggshells were found on Castle Rock on 6 August 1989. After they failed, murres gathered on nesting areas *en masse* during the late afternoon but were absent from the areas at other times of day.

Figure 323. Common Murres have historically been recorded nesting in small and large groups at 37 identified locations around Triangle Island: 25 on Puffin and Murre rocks, six on the two southernmost pinnacles of Southeast Point, and six on Castle Rock. Murres have expanded nesting areas on Puffin Rock (this page), often eroding and encroaching into Tufted Puffin burrowing habitat. Nesting has not been observed on Castle Rock (next page, top left) or the Southeast Point pinnacles in recent years. *Photos by Moira J.F. Lemon (next page, right) and Michael S. Rodway, 2009 and 2014.*





Triangle Island is the only known nesting site for Thick-billed Murres in BC (Figure 324). They were first observed on the island in 1980, and were confirmed breeding in 1981.[221] Nineteen pairs were sighted and seven adults with chicks were photographed in the Common Murre colony on the west side of Puffin Rock on 27 August 1981. Maximum numbers were counted in 1982 when we counted 68 on the west side and two on the east side of Puffin Rock on 10 July. Like several other species, Thick-billed Murres were unsuccessful in 1984. In 1985, birds appeared to be incubating successfully, although no eggs were seen. Only seven of 41 birds counted on 31 July 1989 looked like they were incubating; one egg was seen.

Pigeon Guillemots have been confirmed nesting under boulders and in rock crevices around much of the island and adjacent rocks, including Castle Rock.[194] The highest count in 1989 is likely a result of the longer period we were present and conducting counts that year and probably more accurately reflects total numbers nesting on the island.

Along with Sartine and Beresford Islands, Triangle Island is the centre of the world distribution of Cassin's Auklets (Figure 325). After the census in 1977,[243] Triangle Island was thought to support the largest Cassin's Auklet colony in the world. Neighbouring Sartine Island was surveyed in 1987,[194] and though a much smaller island, was found to have a higher density of burrows and a higher burrow occupancy rate, resulting in a comparable, or even slightly larger estimate of the breeding population of Cassin's Auklets than that reported on Triangle Island in 1977 (see Sartine Island account). Triangle Island regained its unequivocal supremacy as the most important Cassin's Auklet colony in the world after it was surveyed in 1989 (730,000 burrows on Triangle Island vs 413,000 burrows on Sartine Island), even though the burrow occupancy rate on Triangle Island in 1989 (75%) was still lower than that found on Sartine Island in 1987 (91%). Occupancy rates are influenced by environmental conditions, and surveys in the same season would provide a more reliable comparison of breeding populations on these two colonies.

Figure 324. Thick-billed Murres are slightly larger than Common Murres and have a distinctive white gape stripe on the bill. *Photo by Alan D. Wilson.*

Figure 325. The outer three Scott Islands are the most important breeding site for Cassin's Auklets in the world, supporting almost two million birds. Photos here and associated text (numbered 1 to 6) illustrate and describe Cassin’s Auklets and various aspects of their breeding biology on Triangle Island. **1)** This small auk nests on islands along the North Pacific Ocean. Unlike ornamented alcids like Rhinoceros Auklets or Tufted Puffins, Cassin’s Auklets are nondescript, dark above and light below, with white crescents around the eyes. In flight, they look like “flying tennis balls.” **2)** Food fed to chicks on Triangle Island (bottom of this page) is mostly pelagic zooplankton, primarily large copepods, *Neocalanus cristatus* (7-10 mm long; left) and Euphausiids or krill, chiefly *Thysanoessa spinifera* (middle) and *T. longipes* (16-30 mm long); [227] small forage fish are occasionally important. [225, 227] Radio-tracking of adults delivering food to nestlings on Triangle Island revealed that they forage up to 113 km from the colony (average distance was about 52 km).[19] As a specialized adaptation for distant foraging, Cassin’s Auklets have gular pouches within which adults can carry food back to their chicks.[327] **3)** The most extensive area of high burrow density for Cassin’s Auklets on Triangle Island found during the intensive survey in 1989 was in tufted hairgrass habitat on the slopes of West Bay (next page, top). Tufted hairgrass areas are visible as lighter patches surrounded by encroaching salmonberry in this photo taken from the top of Puffin Rock on 27 July 2009. **4)** The West Bay area is where most data have been collected in studies of Cassin’s Auklets conducted by CWS in the 1970s and by the CWE since 1994. Permanent plots established to monitor changes in burrow numbers and vegetation cover are also surveyed here every five years. Surveyors in this photo (next page, bottom left) taken on 16 July 2014 included, from left to right, Rhonda Millikin, Joshua Green, and Laurie Wilson. **5)** This small chick, with its soft, black, downy covering, is recently hatched and will be fed by its parents for about another 45 days, after which it will become independent and venture into the open Pacific Ocean on its own. **6)** This older chick will soon have to fend for itself. Predation by Bald Eagles and Peregrine Falcons and at-sea food shortages have major impacts on the reproductive success and survival of Cassin’s Auklets. *Photos by R. Wayne Campbell (1, 5, 6) and Michael S. Rodway (3, 4). Images of zooplankton species courtesy of Seward Line Census of Marine Life.*[329, 330]

The Cassin's Auklet colony on Triangle Island was surveyed with line transects in 1977 and in 1989 and some comparisons were possible between the two years. The breeding population estimate in 1989 exceeded that from 1977 by 53%.[194] Burrow occupancy rate was significantly higher in 1989 (75%) than in 1977 (62%), however colony area estimates were similar and there was no statistical difference in burrow density estimates from the two years. Difference in occupancy rate accounted for 21% of the increase in the population estimate. The rest of the increase was attributed to more intensive sampling and exploration across many parts of the island in 1989 that allowed more accurate delineation of burrow density classes in different parts of the island. For example, unexplored areas assigned to lower density classes in 1977 were found to have higher densities when surveyed in 1989. The higher occupancy rate in 1989 than 1977 indicated that more birds were breeding in 1989, but this likely reflected a difference in environmental conditions rather than a change in breeding population size per se. Comparison of Cassin's Auklet burrow density within Rhinoceros Auklet colony areas that were surveyed in 1984 and 1989 also showed no significant difference between years.[194]

There has been a debate about the historical status of Rhinoceros Auklets (Figure 326) on Triangle Island, although it is evident that populations have increased in recent years. Brooks and Swarth reported a colony near Cape Scott.[21] This report may have been based on an adult collected at Triangle Island on 15 July 1909 [53] but could have referred to any of the Scott Islands, including Lanz and Cox islands at a time before populations were decimated by introduced mink and raccoon. Young stated that "...they are not found breeding on Triangle Island." [251] Carl et al. did not find them nesting in 1949, but said that "...adult birds in full breeding plumage were most numerous on the coast littoral to the south" and they suspected nesting on inaccessible headlands.[47] Most of the Rhinoceros Auklet population currently nests on steep slopes in the south bay and large numbers regularly gather on staging areas where Carl et al. observed them. We suspect that Rhinoceros Auklets may have been nesting in the south bay in 1949 but were undetected by Carl et al. because they did not thoroughly explore that area in that year. There is some evidence to support this idea. First, Carl et al. camped in the northeast bay and made their excursions from there, whereas major surveys since have been based in the south bay. Second, Northwestern Crows have been primarily seen in the south bay, where a population of 20-30 birds has been present on all surveys since 1974,[31, 140, 194, 242] and Carl et al. recorded no evidence of crows on the island. Third, stinging nettle (*Urtica dioica*) is abundant at the base of the Rhinoceros Auklet nesting slope in the south bay but was not included in the extensive plant list given by Carl et al.[47] To get from where they camped in the northeast bay to the south bay is an onerous hike up and down steep slopes and through extensive tracts of salmonberry thicket across the top of the island (Figure 327). Thus it seems likely that Carl et al. spent little time in the south bay area.

Figure 326. This close-up photo of an adult Rhinoceros Auklet extracted from a burrow on Triangle Island shows the "horn" that develops on the beak of both sexes prior to the breeding season and gives the bird its common name**.** *Photo by Moira J.F. Lemon, July 1984.*

Figure 327. Getting around on Triangle Island is onerous but the CWS crew (from left to right, Jasmine Freed, Jason van Rooyen, Moira Lemon, and Heidi Regehr) in 2009 was up for the challenge. They were in high spirits before setting out from the research cabin (left) for a days' work on the top of the island. This required climbing the steep slopes of South Bay (centre), much of which are covered by extensive tracts of up to 2 m-high salmonberry. In spite of the arduous climb, the crew was exhilarated to have reached the old lighthouse at the top (right). *Photos by Michael S. Rodway, 29 July 2009.*

Although we suspect that Rhinoceros Auklets were nesting on Triangle Island in 1949, they were first confirmed breeding by Hancock in 1966.[96] Hancock described a large colony in the south bay,[96] similar in extent to that reported in 1976 when Vermeer estimated 15,000 pairs nesting.[223] Thus it seems likely that the colony in the south bay had been established for a number of years before 1966. Surveys after 1966 have indicated continued population growth. Population estimates in 1976, 1984, and 1989 were derived from comparable line transect survey methods and indicated that nesting populations more than doubled between 1976 and 1989. Original data from the 1976 survey were not available and statistical comparisons between 1976 results and those from 1984 or 1989 were not possible, but comparing available population parameters suggests continued colony expansion over the years 1976, 1984, and 1989. Burrow density estimates increased from 4,166 burrows/ha in 1976 to 4,477 burrows/ha in 1984, and to 5,494 burrows/ha in 1989 (estimates from 1984 and 1989 were not significantly different). Estimated colony area increased from 7.4 ha in 1976 [260, 262] to 8.7 ha in 1984, and to 11.2 ha in 1989.[194] In 1984 and 1989, we found burrows in Calamity Cove and on the southeast ridge (Figure 328) where none had been recorded in 1976.[223, 262]

Figure 328. Cassin's and Rhinoceros auklet burrowing habitat on the gentle slopes along the southeast ridge in the valley above Calamity Cove, Triangle Island. Rhinoceros Auklets apparently expanded into this area between the 1970s and 1980s. Visible at the bottom of the photo are Heidi Regehr (left) and Michael Rodway near the corner of a permanent monitoring plot being surveyed in 2009. *Photo by Moira J.F. Lemon, 6 August 2009.*

Between 1984 and 1989, the extent of Rhinoceros Auklet burrows increased along the ridge line east of the lighthouse and on the east side of the island. Those extended areas in 1989 added 1.1 ha (13%) to the colony area mapped in the south bay in 1984. Occupancy rate was also lower in 1976 (43%) than in 1984 (65%) and 1989 (68%); reproductive success was reduced in 1976 [222] and poor conditions may account for the low occupancy rate that year. Thus the increase in the estimated population nesting on the south side of Triangle Island between 1976 and 1989 was partially due to increases in burrow density estimates and an expansion of colony areas and partially due to seasonal differences in occupancy rates.

Observations in 1982, 1984, and 1989 suggested that the Rhinoceros Auklet colony also expanded in the northeast bay during that period. However, some of the differences among those years may have been due to more intensive exploration and survey coverage in 1989. We found considerable area of colony in the northeast bay in 1989 that we had not recorded during our previous surveys in 1982 and 1984. However, other data suggest that Rhinoceros Auklets colonized slopes in the northeast bay sometime in the mid-1970s. In 1949, the museum party camped in the northeast bay and saw no evidence of nesting.[47] In 1977, Summers, Billings, and Cullin reported a newly established colony (mapped by Vermeer in his 1979 paper [223]) in that area, which they had not observed in 1975.[265] Summers counted 3,300 birds flying from slopes in the northeast bay on the morning of 28 July 1977. Birds were flying from the same areas as those mapped as colony in 1989. Given that populations were generally increasing, it seems most likely that we missed Rhinoceros Auklets nesting in the northeast bay during our previous surveys in 1982 and 1984. We explored the area in 1982, but the focus of that survey was Tufted Puffins, and Rhinoceros Auklets could have been overlooked. In 1984, exploration of that area was hindered by fog and lack of time. In 1985, surveillance of the northeast bay was kept on the evenings of 14 and 22 July, to determine if Rhinoceros Auklets were staging or flying into nesting slopes. An estimated 900 birds gathered in the bay at 21:30 hr on 14 July, and over 500 were staging there at the same time on 22 July. Some flocks flew around the east side of the island, probably to the south bay, after 21:30 hr, but none were seen circling or landing on slopes above the northeast bay. Birds may have begun circling after 22:00 hr when it was too dark to continue observations, though large flocks began circling the south bay that night at 21:30 hr. It is possible that Rhinoceros Auklets were not nesting in the northeast bay between 1982 and 1985, but our observations during those years are inconclusive. We think that the best interpretation of available data is that birds were absent from the northeast bay until about 1977 and have increased since then. Estimates in 1977 (1,500 pairs [223]) and 1989 (3,600 pairs [194]) suggest that the colony in that area has expanded.

The Wheel Goes Round

The arrival and departure routine of Rhinoceros Auklets was an anticipated spectacle every night on Triangle Island. Clouds of Rhinoceros Auklets circled in a huge wheel and flew into nesting slopes in the middle of the south bay most evenings that we were present in 1982, 1984, and 1985. Timing varied under different weather conditions – occurring earlier on dark, cloudy, or foggy nights – but generally followed the schedule outlined below.

Staging birds gathered on the water between 20:00 and 22:00 hr (PDT). For example, on 10 July 1985, we recorded 250 staging birds at 20:15 hr and 2,200 birds by 21:30 hr. On 12 July, numbers increased from 200 at 20:00 hr to 3,800 at 22:10 hr. An estimated 5,400 were staging at 21:50 hr on 14 July.

Small circling flocks flying in and out of staging groups on the water were frequently observed during the same period numbers of staging birds were increasing, but major wheels occurred later. After dusk, more and more birds began to lift off the water, until flocks of over 1,000 birds were wheeling hypnotically around the bay, gradually gaining elevation and approaching closer to nesting slopes. Major flights were clockwise around the bay, but there were always apparently suicidal individuals flying counter-current. Head-on collisions were rare, but did occur. Birds usually recovered from such collisions before they hit the ground, though some fell stunned to the beach.

To estimate the size of circling flocks, we timed the circling period of individual birds between 22:10 and 22:20 hr on 14 July 1985. The rotation period of *seven birds averaged 61 seconds (range: 40 to 113 seconds). Counting the number of birds passing within that interval indicated a flock size of 1,900 birds.*

Birds began landing on nesting slopes by 22:00 hr, but most landed under cover of darkness between 22:30 and 24:30 hr. Single birds were still arriving until after 03:00 hr when the majority began to depart. Departures were most frequent between 03:00 and 04:30 hr, but some birds were observed leaving until 05:45 hr, well after daylight.

Sporadic calls were heard after midnight on many nights, but the main period of vocalization on the slopes occurred after 03:00 hr, during the time birds were departing in large numbers. Calls were not heard from birds in flight or on the water.

Prior to 1989, we were present only in July, during the nestling period for Rhinoceros Auklets (Figure 329). *In 1989, we had the opportunity to make observations over a more extended period. Evening staging and circling behavior changed through the breeding season. The first large circling flock was observed on 21 June, about the time chicks began to hatch. Earlier in June, flocks were generally less than 100 birds, often no more than 10. Flight paths were erratic at that time, compared to the consistent clockwise pattern observed later. Large flocks became more frequent towards the end of June, were regular during the second week of July, and were rare through the end of July and middle of August. In other years, large circling flocks were more frequent later in July than observed in 1989. This may relate to hatching chronology, which appeared to be earlier in 1989 than previous years.*

Numbers of incoming birds increased from early June, during incubation, to July, when adults were feeding young. Many birds were flying straight into nesting slopes after the end of June, and steady streams of arriving birds flying straight in without circling were recorded from 16 July to 20 August. We suspect that during the nestling period at least, most circling birds were nonbreeders. We observed few birds carrying fish in circling flocks; most birds with fish appeared to fly directly to nest sites.

(from Rodway et al.[194])

Figure 329. The breeding season for Rhinoceros Auklets in BC extends from March to early September. Eggs are laid as early as the last week of April and can take 39-52 days to hatch. Chicks like this one can take 38-58 days to fledge. *Photo by R. Wayne Campbell.*

Most of the Tufted Puffins breeding in BC nest on Triangle Island (Figure 330). Main colony areas are on Puffin Rock, on steep slopes along the east side of the island, and on the northeast corner of the island. In addition, puffins nest sporadically on steep rocky ridges and above rock bluffs around many inaccessible perimeter areas. Comparable results of line transect surveys conducted in 1975,[223] 1982, and 1989 provided no evidence of change in abundance or distribution of nesting populations in main colony areas over that period.[194] Numbers nesting in inaccessible areas have not been determined and they were not included in population estimates from 1982 and 1989. Vermeer made a rough estimate of 2,000 pairs in scattered pockets in 1975,[223] but that included birds nesting on the northeast corner of the island that was not sampled by quadrats that year (that area was included in population estimates for 1982 and 1989).

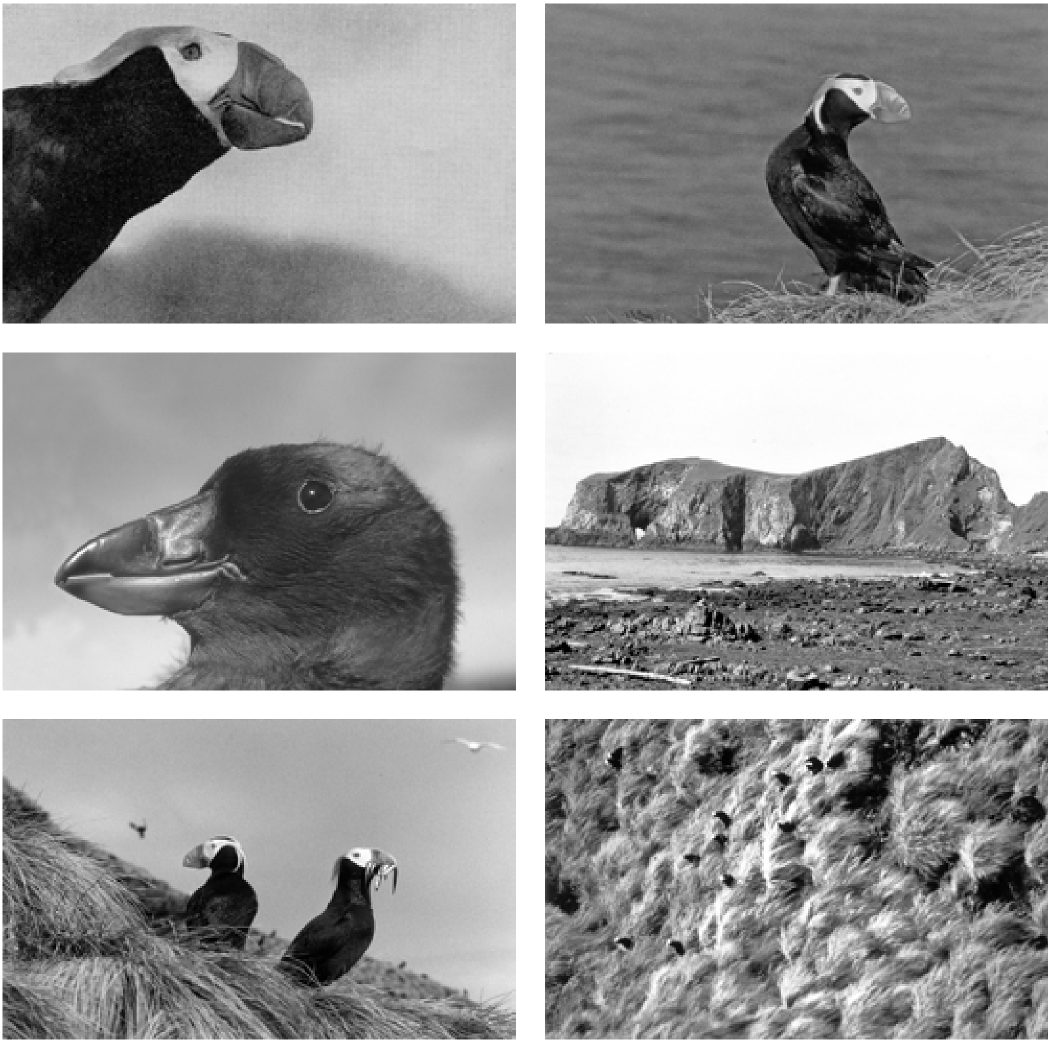


Figure 330. About 89% of British Columbia's (and Canada's) population of Tufted Puffins breed on Triangle Island. They are the most pelagic of the alcids and in winter lose their distinctive plumage. These Tufted Puffin photos (clockwise from upper left, and here numbered 1 to 6) show: **1)** the first published account (and photo) of Tufted Puffins in the province from a BC Provincial Museum field trip to Triangle Island in 1949;[47] **2)** the feather tufts on the head that are part of their distinctive breeding plumage; **3)** Puffin Rock where most puffins in BC nest; **4)** adults attending burrows in tufted hairgrass habitat; **5)** a parent puffin with a bill full of Pacific Sand Lance (*Ammodytes hexapterus*) brought for nestlings but often pirated by Glaucous-winged Gulls; and **6)** a juvenile Tufted Puffin at about 45 days old that must now get to the sea where it will spend the next 4-5 years maturing, although some immature puffins may return to the colony before then.[328] *Photos by G. Clifford Carl (1, taken in June 1949); Michael S. Rodway (2, 3, 4, 5, taken on 14 August 1989, June 1982, July 1985, 19 August 1989, respectively), and R. Wayne Campbell (6, taken on 14 August 1981).*

Horned Puffin has not been confirmed breeding according to our criteria (see Appendix 2) but undoubtedly nests on Triangle Island. Up to eight birds have been seen around Puffin Rock on almost all visits since Guiguet first recorded them in 1972.[38] In 1976, Summers and Bingham saw one bird carrying a fish fly into a crevice and emerge 5-10 minutes later without the fish.[265]

Remarks: Two Bald Eagle nests have been observed on most visits, and two to four Peregrine Falcon eyries have been recorded. Eagles and falcons have been recorded preying on most nesting seabird species. Eagles were also seen preying on gull chicks, rabbits, and dead sea lion pups (Figure 331). We have observed Common Ravens taking cormorant eggs, Northwestern Crows capturing Rhinoceros Auklet chicks from burrows, and Glaucous-winged Gulls pirating murre eggs, eating Pelagic Cormorant and Cassin's Auklet chicks, and kleptoparasitizing puffins flying in with fish. In 1989, we found a number of Cassin's and Rhinoceros auklets that had likely died from impacts with driftwood or shore rocks when departing nesting slopes at high speed (Figure 332).

Figure 331. Numbers of Steller Sea Lions at Triangle Island have increased tremendously since the 1980s and the island has become the largest Steller Sea Lion rookery in the world.[289] The main pupping areas are around Southeast Point and along the east side of the island where thousands of individuals can be seen hauled out on shoreline rocks and beaches. The top right photo shows a small harem with several pups. *Photos by Michael S. Rodway, 28 July - 6 August 2009.*

Figure 332. Adult Bald Eagle searching along the high tide line in the south bay of Triangle Island, perhaps hoping to scavenge dead Cassin's or Rhinoceros auklets that sometimes smash into rocks or logs on the beach when flying off the nesting slopes at high speed. *Photo by Michael S. Rodway, 13 July 2014.*

European Rabbits (*Oryctolagus cuniculus*) were introduced by the lightkeepers and have established themselves in small numbers (Figure 333). There is no indication they have displaced breeding birds or altered the vegetation on the island.[120]

Figure 333. Introduced feral rabbits are frequently seen around the field camp on Triangle Island. *Photo by Moira J.F. Lemon, July 2004.*

Considerable research has been conducted on Triangle Island in the years up to 1990: Carl et al. catalogued flora and fauna in 1949;[47] Vermeer investigated distribution, population, nesting habitat, and feeding ecology of Cassin's Auklets, Rhinoceros Auklets, and Tufted Puffins between 1974 and 1979,[222-225, 227-230, 232-234, 242, 243] and analysed the diet of Glaucous-winged Gulls in 1980;[226] Vallée studied the relationship between nesting density and productivity in the Tufted Puffin from 1980 to 1982;[87, 261] Rhinoceros Auklet chick growth and food was measured in 1984, 1985, and 1986 as part of a three-island comparison study by Bertram and Kaiser;[9, 13] Butler et al. examined the foraging behavior of Northwestern Crows in the Rhinoceros Auklet colony in 1984 and 1985;[31] and Burger studied diving behavior of Rhinoceros Auklets and Tufted Puffins in 1986.[23, 30]

Requiem for a Dying Crow

During the 1984 field season on Triangle Island, while conducting studies on the growth and reproductive success of nesting Rhinoceros Auklets, Michael and I (Moira) were also gathering information on the resident Northwestern Crow population.[31] We observed crows foraging in the intertidal zone and along the high tide line, and frequently saw them scouring the steep slopes of the island for fish that Rhinoceros Auklets would occasionally lose when coming into their nesting burrows at night to feed their chicks.

One day, after a night of capturing adult Rhinoceros Auklets to collect food samples, we rose to a lovely sunny day, glad of the opportunity to have a slower day of field activities. During the day, we had to weigh and measure the variety of fish we had collected in food samples the previous night. This was a welcome, relaxing task, for which we could sit out on the wooden deck of the cabin. While measuring fish and recording data, we could take time to gaze out over the bay and watch the daily activities of the non-human Triangle Island residents. On this day in the early afternoon, we became aware of quite a cacophony of caws coming from nearby.

We then witnessed an amazing event. We watched as 35 crows (perhaps the entire island population) gathered on the beach along the drift line, *just to the west of the camp. Perching on beach rocks and drift logs in a dense circle, each crow was loudly vocalizing* (Figure 334), *all peering down at something on the ground in the center of this circle. It seemed to be something of utmost importance to the social fabric of the crow community. We set up the spotting scope and could just see a crow lying on the ground – the group was clustered around this individual and it appeared as if some were trying to help it stand up by pushing with their bills. After about five minutes most of the crows flew off to the slopes and perched in surrounding bushes while seven crows remained on the beach.*

We were quite curious to see what this was all about, so we slowly walked down and approached the location of the gathering. Down on the rocks in the focal center of this gathering was what we thought looked like an old crow, very skinny and unable to stand, but with no obvious sign of injury. The old crow was not happy with our proximity, and feebly called out in alarm. Other crows were also upset – the entire flock gathered over our heads, scolding and dive bombing us in an attempt to drive us away. We backed off and returned to the cabin and watched as about twenty of the crows once again gathered in a now looser circle around the dying crow to resume their vigilance. There was much more cawing for several more minutes, until one by one the crows began to disperse down the beach and up onto the slopes, until only one or two remained perched on a tilted log above their dying comrade. For the next couple of hours, crows came and went from the scene, generally with two or three remaining perched like sentinels near their incapacitated comrade, except most of the flock gathered again to scold us if we tried to approach. After we finished measuring the fish from the Rhinoceros Auklet food samples, we offered some to the ailing crow. The crow swallowed four small sand lance at about 15:00 hr and another six around 17:30 hr. The food seemed to help the crow a little but it was still obviously too weak to get up – it died in the night. We could only presume that what we had observed was a requiem by the crow population for one of their own, and they had gathered to give comfort to their flock mate and witness the end of its life.

Figure 334. Northwestern Crows are social and highly intelligent and it is always intriguing to investigate their behaviour. *Photo by R. Wayne Campbell.*

Reproductive failures were documented in 1976, 1977, and 1984. Tufted Puffins experienced a near complete breeding failure in 1976, fledged few young in 1977,[234] and had a very low burrow occupancy rate (25%) and a delayed chronology in 1984.[194] Rhinoceros Auklet chicks had retarded growth rates in 1976 and 1984.[9, 224] Pelagic Cormorants, Common and Thick-billed Murres, and Glaucous-winged Gulls were all unsuccessful in 1984.[194] Those nesting failures were attributed to severe weather and food shortages. Storms and rainfall were excessive during incubation periods in 1976 and 1984, and the percentage of Pacific Sand Lance (Figure 335), a high quality prey species, was reduced in food loads delivered to Rhinoceros Auklet and Tufted Puffin chicks in 1976, 1977, and 1984.

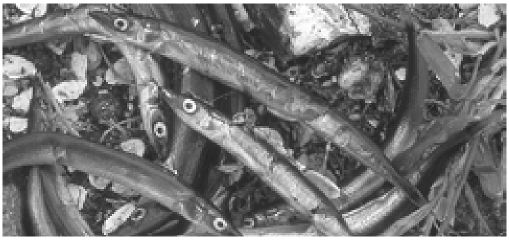


Figure 335. Pacific Sand Lance is a principal food for breeding Tufted Puffins and Rhinoceros Auklets in British Columbia.[223] The common, long, thin-bodied fish has a pointed snout, a forked tail fin, a silvery blue sheen, and may reach 28 cm (11 in) in length. *Photo by R. Wayne Campbell.*

Investigator disturbance has some impact on nesting seabirds. Researchers and surveyors traversing nesting slopes inevitably damage a few burrows. Capturing and banding of birds to obtain food samples and to determine survival rates, and checking samples of burrows to monitor chick growth and reproductive success, inevitably have some impacts to the small numbers of birds involved. Overall, impacts of investigator disturbance are likely minor, as researchers are careful to repair damaged burrows and limit their activities only to areas essential for their studies. Impacts that may pertain are outweighed by the benefits that accrue from ongoing studies, which include an increased understanding of how nesting seabirds are responding to climate change and other human perturbations of the marine environment on which they depend.

Other forms of human disturbance also have not been considered a major concern at Triangle Island, although the cause of the Common Murre failure on Castle Rock and Southeast Point in 1989 was unknown and could have been related to some form of disturbance. The area sees few recreational boats due to its isolation and surrounding treacherous waters. Fishermen often anchor in South Bay and will come ashore in that area to beachcomb but likely have little impact on nesting birds (Figure 336).

Triangle Island has continued as a centre for seabird research in BC and numerous studies as well as ongoing monitoring of breeding populations (Figure 337) have been conducted there since the Triangle Island Seabird Research Station was established in 1994 as part of the Centre for Wildlife Ecology at Simon Fraser University (see introductory section on *History of Seabird Colony Surveys*).

Figure 336. Fishing boats often anchor overnight in the south bay of Triangle Island (left), and fishermen sometimes come ashore to beachcomb for Japanese fishing floats and other flotsam and jetsam. Northwestern Crows also scavenge the beaches for washed-up treasures. The crow in the right photo had a great feast on all the pelagic gooseneck barnacles (*Lepas spp.*) attached to the Japanese glass ball. *Photos by Michael S. Rodway (left) and Moira J.F. Lemon.*

Figure 337. Intrepid seabird biologists Moira Lemon and Heidi Regehr (top) along with Michael Rodway (shown here with Heidi Regehr) resurveyed the CWS permanent monitoring plots on Triangle Island in 2009. *Photos by Michael S. Rodway and Moira J.F. Lemon, 2009.*

SC-020 SARTINE ISLAND

Location: *50°49'10"N 128°54'24"W; 102 I/14.* Southeast of Triangle Island. Named West Haycock Island prior to 1947. Colony includes offshore rocks to the west.

Description: *33 ha; 113 m high; Grassy and shrubby island; Bare rock.*
Sartine Island is composed of a series of rounded or flat-topped knobs with precipitous, rocky sides, joined by knife-edged ridges that have grassy slopes on either side (Figure 338). Like Triangle Island, it is a remote, treeless island, covered with grass and salmonberry (Figure 339). Tufted hairgrass grows on perimeter slopes above rock faces around most of the knobs, but Nootka reedgrass (*Calamagrostis nutkaensis*) is more abundant over most of the island, with dune grass frequent on lower slopes. Hemlock-parsley and montia are common forbs mixed with the grass. Salmonberry covers the entire northern slope of the largest section of the island but is sporadic in other areas. Outer west rocks are bare pinnacles, the most westerly of which were named "Little Sartine" by Vermeer et al.[237]

Sartine Island was designated an Ecological Reserve in 1971. An automatic weather station was established on the top of the main section of the island in 1984.

Historical summary: Carl et al.[47] documented nesting by five species in 1950 (Table SC-020). Hancock reported nesting by Common Murres in 1968,[97] and Vermeer et al. made observations in 1975.[237] A census of burrow-nesting species was first conducted in 1987.

Brandt's Cormorants were first reported nesting in 1975 when Vermeer et al. found 20 nests with attending adults on the west side of the main island.[237] No nest contents were determined. We saw no sign of this species in 1987, but 39 nests, each attended by one or two adults, were counted in 1989 (Figure 340). Eight nests were located on the north end and 31 were on low rocks near the southwest corner of the main island. Chicks were visible in 23 of the nests.

Figure 338. Views of the east (left) and west sides of Sartine Island, clothed in a mantle of grasses, forbs, and shrubs. *Photos by Moira J.F. Lemon, 9 July 1987 (left) and Michael S. Rodway, July 1987.*

Table SC-020. Seabird nesting records for Sartine Island. See Appendix 2 for codes.

DATE	BRCO	PECO	BLOY	GWGU	COMU	PIGU	CAAU	TUPU	HOPU	SOURCE
21-22 Jun 1950		S	x	x		x	x	x		47, 77
9 Jun 1959				14+e						265
18-19 Jul 1968					x(236+)					97
2 Aug 1975	20	x		x	x(600)	(290)	S	x	S(8)	237
9-13 Jul 1987	0	137	1eS	240e	0(440)	x(176)	376,000t	6,400t	S(1)	194
11 Jun, 29 Jul 1989	39	168[a]	1eS	390e	0(113)	x(116)	x	x	S(6)	194

[a] Only 49 nests were attended on 29 July.

Figure 339. Steep grassy slopes on the east side of Sartine Island seen from the top of the island. *Photos by Moira J.F. Lemon, 13 July 1987 (left) and Michael S. Rodway, July 1987.*

Figure 340. In 1989, Brandt's Cormorants were found nesting on Sartine Island. *Photo by Michael S. Rodway, 29 July 1989.* BC Photo 4312.[302]

Carl et al. saw large numbers of Pelagic Cormorants around the island and suspected breeding in 1950.[47] Breeding was confirmed and 136 birds counted in 1975.[237] In 1987, Pelagic Cormorant nests were located on pinnacles and bluffs on the east and west sides of the north end of the island. In 1989, more nests were built than in 1987, but most birds were unsuccessful. Nests were built at multiple different locations in 1989 and birds shifted nesting locations through the season. On 11 June, there were 168 attended nests at the southwest corner of the island; none elsewhere. On 29 July, we counted 164 nests at five locations, but only 49 nests were attended. Only 131 nests could be seen at the southwest corner: 100 were empty, young were visible in 13 nests, and other nests were attended but contents were not determined. Nests had also been built on the northwest rocks (22 nests; 12 attended) and southeast corner (5 abandoned nests) of the main island, and on the south end (1 nest with sitting adult) and east side (5 nests with sitting adults) of "Little Sartine".

Black Oystercatchers have not been confirmed breeding since Carl et al. reported nesting in 1950.[47] Single pairs were suspected nesting on the east side in 1987 and on the west side of the island in 1989. Adults were excited in 1989 and were likely defending young.

Glaucous-winged Gulls nest on rocky areas around the main island and on the outer west rocks. Nests have never been counted and all population estimates are derived from counts of adults on territories. Counts of 740 adults in 1975 [237] and a maximum of 777 in 1989 [194] suggest little population change, although counts in 1975 included birds on land and adjacent waters,[237] so likely included roosting birds as well as birds on territories. Numbers of adults visible on territories also varies through the season making comparisons difficult: we counted 485 adults on 9 July 1987, 777 on 11 June 1989, and 551 on 29 July 1989. David Spalding inspected 14 nests in 1959; four contained eggs and 10 were empty. Large chicks visible on territories have been recorded in other years.

Hancock found Common Murres nesting at two locations on the main island, on the northwest point and the mid-west side, and at three locations on the nearest and farthest of the outer west rocks.[97] He noted a total of 91 visible eggs at the different locations. More murres were observed and confirmed nesting in the same areas in 1975.[237] We saw Common Murres sitting on the water and flying around the island in 1987 and 1989, but none were observed nesting. On the adjacent Triangle Island, murres were attending nesting ledges in 1987 and 1989, although in early August 1989 they failed and abandoned nesting ledges on the east side of Triangle Island, closest to Sartine Island. Reasons for the lack of nesting on Sartine Island in 1987 and 1989 and for the failure on the east side of Triangle Island in 1989 are unknown.

Greatest numbers of Pigeon Guillemots were counted in 1975 but nesting was not reported.[237] They were confirmed nesting in 1950, 1987, and 1989 and presumably they were nesting in 1975 as well.

The population estimate for Cassin's Auklets from the 1987 survey on Sartine Island exceeded the available estimate for Triangle Island at that time,[243] making Sartine Island the largest reported Cassin's Auklet colony in the world (Figure 341). That preeminent status lasted only two years until the more thorough survey of Triangle Island in 1989 found almost twice (1.77 times) as many Cassin's Auklet burrows on Triangle than on Sartine island (see Triangle Island account above).

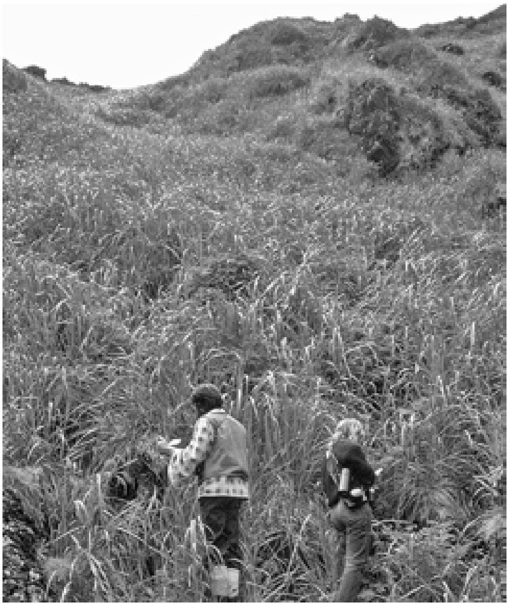


Figure 341. CWS crew members, Michael Rodway and Rosalind Chaundy, about to run a transect up a slope on the east side of Sartine Island in 1987. *Photo by Moira J.F. Lemon, 9 July 1987.*

Tufted Puffins have only been surveyed in 1987 and were found nesting in perimeter tufted hairgrass habitat above rock bluffs and outcroppings (Figure 342). Horned Puffins have been sighted each year since 1975 and likely nest. Six were seen around the southwest rocks in 1989.

Remarks: Hancock found 30 broken Common Murre eggs and three murre heads without bodies on the most westerly rock in 1968.[97] He suspected that river otters may have been responsible. One pair of Bald Eagles was likely nesting in 1987 and was confirmed nesting on a pinnacle at the north end in 1989. An eagle was seen taking a large gull chick in 1987. A family of Peregrine Falcons was observed in 1950 and one or two individuals have been recorded on most other visits, including two young in 1989.

Figure 342. Unlike other burrow-nesting alcids in BC that are nocturnal on their nesting grounds, Tufted Puffins are active on their colonies during the day and can often be seen standing around or interacting near their burrows. This adult standing on a grassy slope is likely nesting nearby. *Photo by R. Wayne Campbell.*

SC-030 BERESFORD ISLAND

Figure 344. There is an open Sitka spruce forest with an understory of elderberry, salmonberry, and sedge on the top of Beresford Island. The main trunks of many of the spruce trees are formed by the continued vertical growth of limbs from trees that have fallen. *Photo by Moira J.F. Lemon, 8 July 1987.*

Location: *50°47'25"N 128°46'23"W; 102 I/14.*
In the middle of the Scott Islands chain, southwest of Lanz Island. Named East Haycock Island prior to 1947.

Description: *14.5 ha; 98 m high; Grassy, shrubby, and forested island.*
Beresford Island is the smallest of the Scott Islands, and is in the middle of the group of five islands. The summit of the island is rounded, but most of the perimeter drops precipitously into the sea. There are attached knobs and pinnacles, and offshore rocks to the north and south. The vegetation exhibits transitional features between the large forested islands to the east and the treeless islands to the west (Figure 343). It is grassy with expanses of dense shrubs, similar to the vegetation cover on Triangle and Sartine islands, but it has an old stand of Sitka spruce growing over the crest of the island (Figure 344). Tufted hairgrass grows on exposed rocky edges, especially to the east and west, but dune grass and reedgrass dominate most grassy slopes. Hemlock-parsley is frequent throughout grassy areas, and montia and false lily-of-the-valley are profuse in small patches, especially on the western edge of the forest. Salmonberry is the most abundant shrub, occurring under the sparse stand of spruce and extending down part of the southern slope and much of the northern slope. Elderberry and twinberry are common under the trees.

Beresford Island was designated an Ecological Reserve in 1971.

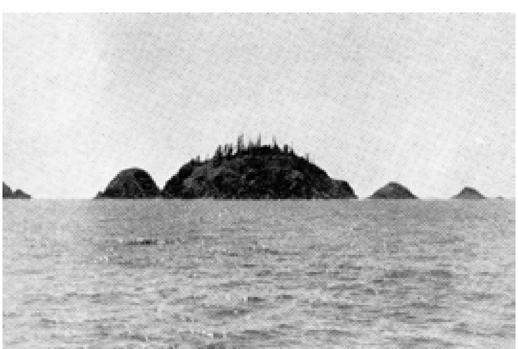


Figure 343. These views of the south end of Beresford Island, with its cap of spruce trees, shows the transitional features between the outer treeless islands and the forested inner islands in the Scott Islands group. *Photos by G. Clifford Carl, June 1950 (left) and Moira J.F. Lemon, 20 July 1987.*

Historical summary: The BCPM party of Carl, Guiguet, and Hardy, as well as Maguire made brief visits to the island and confirmed nesting by five species in 1950 (Table SC-030). David Spalding made observations from the water in 1961. He saw about 250 Pelagic Cormorants on the cliffs and suspected 125 pairs nesting, although no nests were recorded. He also noted a few Glaucous-winged Gulls and no puffins. Storm-petrels, Black Oystercatcher, and Horned Puffin were first recorded during the detailed survey for all species in 1987. Surface-nesting species were surveyed again in 1989. A few Common Murres were observed on the water around the island in 1961 (15) and 1987 (5), but no sign of nesting has ever been recorded. One dark-phase Northern Fulmar was on the water near the north rocks on 8 July 1987 but again no nesting activity has ever been recorded.

In 1987, storm-petrels were nesting in the centre of the main island, primarily under the sparse spruce forest. Cassin's Auklets (Figure 345) nested throughout most vegetated areas, although burrows were sparse under high salmonberry. Tufted Puffins were burrowing primarily in perimeter tufted hairgrass habitat on the northeast ridge and southwest side of the main island and on the southwest end of the southern vegetated rock. A few Tufted Puffin burrows were also found on the northwest rocks and a few may have been nesting where we saw birds sitting amongst large rocks at the base of salmonberry slopes on the north side of the northeast ridge. Horned Puffins also likely were nesting in this latter area; we saw what appeared to be an incubation shift there on 20 July 1987. Seven Horned Puffins were flying from the northwest rocks on 8 July 1987.

Figure 345. This Cassin's Auklet chick, found in a burrow on Beresford Island in early July, is near fledging age. *Photo by Moira J.F. Lemon, 8 July 1987.*

Pelagic Cormorants have been found nesting at four locations around the island (Figure 346). In 1987, cormorants were nesting in three locations: on the northeast point of the main island (109 nests on 8 July and 142 nests on 20 July); on the east side of the middle northwest rock (16 nests on 8 July); and in a crevice on the north end of the rocky islet immediately off the southeast side of the main island (3 nests on 20 July). All nests were attended in 1987. In 1989, only six attended nests and three partially constructed nests were discovered at a fourth location on the mid-northwest side of the rock off the southeast side of the main island. Those nests were seen from the south side of the main island and were difficult to see from the water. There were no cormorants nesting at the three locations used in 1987.

Table SC-030. Seabird nesting records for Beresford Island. See Appendix 2 for codes.

DATE	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	TUPU	HOPU	SOURCE
20-22 Jun 1950			x		x	x	x	x		47, 77
20 Sep 1961			125eS		S			(0)		265
8, 20 Jul 1987	2,900t	12,500t	161	3e	145e	x(267)	66,000t	2,100t	S(7)	194
11 Jun 1989	x	x	6	3eS	110e	x(146)	x	x	S(1)	194

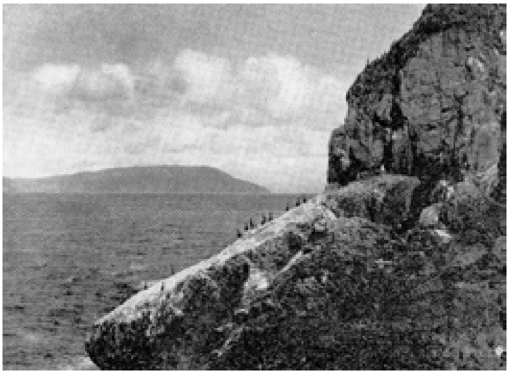


Figure 346. The Provincial Museum party found Pelagic Cormorants incubating eggs on Beresford Island during their visit in June 1950. In this photo, Lanz and Cox islands are visible in the background. *Photo by G. Clifford Carl, 20-22 June 1950.*

Black Oystercatchers were suspected nesting on the northwest rocks in 1987 and 1989. One nest with eggs was found on the middle northwest rock in 1987. Glaucous-winged Gulls have been observed nesting on all the offshore rocks and on the west side and southwest corner of the main island. Nests were counted on the two outer, northwest rocks in 1987; 66 of 82 nests contained eggs or young. The rest of the nesting population estimate in 1987 was based on counts of adults on territories, as was the entire 1989 estimate. Pigeon Guillemots have been sighted and confirmed or suspected nesting around much of the main island and offshore rocks.

Remarks: There was one active Bald Eagle nest in 1987. Two adult and four immature eagles were present in 1989 but the nest did not appear active. One pair of Peregrine Falcons was likely nesting in 1987 and 1989.

SC-040 LANZ ISLAND

Location: *50°49'N 128°41'W; 102 I/14.*
The second of the Scott Islands west of Cape Scott.

Description: *764 ha; 212 m high; Forested.*
Lanz Island has a rugged rocky shoreline with many pinnacles, cliffs, crevices, and precipitous slopes, plus numerous small bays and high-tide cobblestone beaches (Figure 347). There is a larger bay with a sandy beach on the east side. Most slopes near shore are shrub covered under a spruce, hemlock, and redcedar forest. Salal is predominant on slopes with southern exposures, especially in areas of old windfall, with salmonberry more abundant on eastern and northern slopes, and above steep rock near the southwest corner. Twinberry and elderberry are common mixed with the salal and salmonberry. Bare litter areas with lady fern were found under densely canopied spruce towards the southwest corner. Grass, primarily Nootka reedgrass, and forbs occur along much of the forest fringe (Figure 348). There is one extensive grassy area on the southwest point. Young spruce are expanding over this grassy area and many dead tussocks are visible under small saplings. Much of the forest on higher south slopes appeared diseased in 1987.

The island is part of Lanz and Cox Islands Provincial Park established in 1995.

Historical summary: Carl et al.[47] reported unoccupied seabird burrows on all grassy headlands visited in 1950 (Table SC-040). Most were suspected to be old Cassin’s Auklet burrows, but one headland on the southeast corner was perforated with larger burrows they suspected might have belonged to Rhinoceros Auklets. In 1987, we found signs of burrowing only on the southwest corner, where evidence of recent exploration by Cassin’s Auklets was observed (Figure 349). Two burrows that felt worn inside and several that were choked with roots were found, along with the depredated remains of six Cassin’s Auklets.

Figure 347. These views of the southern shore of Lanz Island show the complex of pocket beaches, rocky points, and pinnacles along the rugged coastline. *Photos by Moira J.F. Lemon, July 1984 (left) and G. Clifford Carl, 18 June 1950.*

Figure 348. The interior forest community on Lanz Island includes Sitka spruce and western hemlock and an understory of salal (left). A thick band of Nootka reedgrass and forbs extends along the shoreline at the edge of the forest above beach habitat on the south side. *Photos by G. Clifford Carl, 18 June 1950 (left) and Moira J.F. Lemon, 7 July 1987.*

Figure 349. Extensive steep grassy slopes on the southwest corner of Lanz Island where evidence of recent exploration by Cassin's Auklets was observed in 1987 and where burrow-nesting seabirds likely nested in the past. *Photo by Moira J.F. Lemon, 7 July 1987.*

Pelagic Cormorants had built 56 nests on the south side towards the east end of Lanz Island in 1987. Eggs had been laid in some nests, but no birds were attending nests at the time of our visit. Pigeon Guillemots were observed along shore rocks and were suspected nesting on the northeast and southwest corners of the island.

Table SC-040. Seabird nesting records for Lanz Island. See Appendix 2 for codes.

DATE	PECO	PIGU	CAAU	RHAU	SOURCE
16-20 Jun 1950			0	0	47
6-10 Jul 1987	56[a]	S(28)	0	0	194

[a] Nests were built but had been abandoned.

Remarks: In 1950, no nesting Glaucous-winged Gulls or Black Oystercatchers were seen, and Carl et al. attributed the absence of breeding seabirds to the presence of mink, introduced to the island in 1938 or 1939 by the Fredrickson brothers, of Cape Scott.[47] The mink population on the island appeared to be large in 1950. In 1987, Cassin's Auklet remains, including feather piles, feet, wings, and vertebral column, were found within grass tunnels in the vicinity of abundant mink scats, some of which were fresh and composed almost entirely of feathers. Scats, trails, and burrows of mink were frequent in all shoreline areas, and animals were sighted daily. Signs of river otter were also seen on the southeast knobs.

Pelagic Cormorant eggs or eggshells were visible in two nests, and depredated eggs, one of which had been well incubated, were found on the point opposite the nesting cliff in 1987.

Eighteen species of birds were recorded by the BC Provincial Museum expedition in 1949 (Figure 350).[47] Two active Bald Eagle nests and one suspected Peregrine Falcon eyrie were located in 1987.

Figure 350. The ubiquitous and opportunistic Common Raven occurs on all of the Scott Islands and feeds on almost anything, including sand hoppers, sea lion afterbirth, and seabirds. *Photo by R. Wayne Campbell.*

Wild Waters of the Scott Islands

During the second half of the 1987 CWS field season we surveyed the eastern four islands of the Scott Island group. The five islands that form the group stretch out in a line from Cape Scott at the northwestern tip of Vancouver Island, ultimately ending with Triangle Island, the largest seabird colony in BC. On more than a few occasions, that two week field session in July tested our abilities and skills in some of the most exposed areas of the coast.

We established our base camp at a northeast facing sandy bay on the east side of Lanz Island. There was very little area that we could explore on foot from this site, so we were dependant on boat travel to get to locations from which we could survey the extensive coastline of both Lanz and Cox islands, and the imposing slopes of Beresford and Sartine islands. Lanz and Cox are heavily forested islands with dense salal making travel along the shoreline areas extremely difficult, while the steep shores of Beresford and Sartine islands have no place to land the boat, requiring drop-offs to get ashore. Travel on the waters around all of these islands depended on good weather and reasonable sea conditions. Two particular eventful incidents remain etched in my (Moira) memory.

On one occasion we (Michael, Brian Carter, Rosalind Chaundy and I) had boated across the channel from our camp on Lanz Island and beached the boat on the western shore of Cox Island for a day of exploration along its shores. As we were returning early in the evening to our boat landing site, we could hear a dull roar in the distance. The roaring became louder and more menacing as we rounded the western point of the island and could look across the channel to our campsite on Lanz Island. The tide was in full flood and this channel, marked with all sorts of hazard warnings on the nautical chart, was living up to its reputation. The sea was a confused blur of standing waves and white-cresting combers. At the best, this was not going to be an easy venture. We considered waiting until the tide change had slackened, but that could be several hours away. Michael's boating skills are superlative and his judgement of sea conditions exceptional. An intense look came into his eyes as he gauged the condition of the passage and determined that it was feasible to transit. With a certain amount *of trepidation, we loaded up and launched the boat. With three of us sitting down on the floorboards, hanging on tightly to the side handles, and Michael kneeling low in the stern of the boat, manning the motor, we set off into the maelstrom. It required continuous unwavering concentration on Michael's part to navigate the confused seas, keeping on top of the wave crests and avoiding the steep narrow troughs. Although the channel was only a few nautical miles wide, and the time to cross it reasonably short, it was one of those moments that seem to stretch and expand into a much longer time. We arrived unscathed at our campsite, with a renewed respect for the ocean and hazards marked on marine charts, and eternal gratitude and appreciation of Michael's boating skills.*

At another time, a northeast outflow wind of near gale force raged for several days and forced us to sit tight at our Lanz Island camp, and witness the changes that even summer storms can cause (Figure 351)*. Unable to travel by boat, let alone launch into the waves that swept up the sandy shore, we watched the storm erode the sand from the beach, and lower the level by perhaps several feet. There are always unexpected surprises that materialize during and in the aftermath of storms along the coast, and this particular time was no exception. On the second day of the storm, the eroded sand revealed the tip of a buried object, and we spent the day digging out a large stainless steel tank* (Figure 352)*, a treasure to be sure that Michael ended up lugging home with him. The storm trapped us on shore for another two days. When it finally subsided we eagerly set about to launch the boat, keen for our final day of surveys on Beresford Island. The waves were still too large for all four of us to get into the boat and launch from shore, so with Michael at the helm, the rest of us pushed him off through the waves. A rocky point provided a safer spot for a pickup, and one by one we leapt into the boat as Michael repeatedly brought it in to the point on the crest of a wave. However, when it came to my turn, I hesitated. I could see what the others in the boat could not – one of the front pontoon chambers was completely deflated, having inadvertently struck some sharp barnacle or rock projection in the still tumultuous seas. I jumped in anyway, and once we all realized what had happened, we headed back to shore and boat repairs were the order of the morning – yet another half day of being shorebound!*

Figure 351. Northeast gales during our CWS surveys in 1987 forced us to stay at our campsite at a beach on the east side of Lanz Island for several days. *Photo by Moira J.F. Lemon, 17 July 1987.*

Figure 352. Storm-bound on Lanz Island, Michael Rodway (left) and Brian Carter spent much of one day digging out a large, stainless-steel tank that had been buried in the sand. *Photo by Moira J.F. Lemon, 17 July 1987.*

SC-050 COX ISLAND

Location: *50°48'N 128°36'30"W; 102 I/14.*
First of the Scott Islands west of Cape Scott.

Description: *978 ha; 312 m high; Forested.*
Similar to Lanz Island, Cox Island has a rugged shoreline with many bays and high-tide beaches between and around numerous pinnacles, cliffs, gorges, and steep rocky ridges (Figure 353). Salal and salmonberry dominate the understory of the spruce, hemlock, and redcedar forest. Grass and forbs fringe the forest slopes, especially above steep rock faces. Behind the large northern bay, the forest appeared diseased in 1987; many trees looked spindly and were probably dying.

The island is part of Lanz and Cox Islands Provincial Park.

Historical summary: Carl et al.[47] visited the island briefly in 1950 (Table SC-050). Little exploration was undertaken. They mention a report of a dog digging up several nesting birds on a point at the southwest corner of the island. From the description given, they suspected the birds were either Cassin's Auklets or Ancient Murrelets. We assume they were Cassin's Auklets as Ancient Murrelets have not been confirmed nesting in the Scott Islands (see Triangle Island account).

We found no sign of burrow-nesting seabirds in 1987. Pelagic Cormorants had built nests on the southeast and northeast sides of the island. On 12 July, one adult was flying around two nests in a cave on the northeast side. Three adults were sitting on nests and 12 were roosting below 76 nests on the mid-southeast side (Figure 354). No adults were present on 20 July.

Figure 353. A musical interlude by CWS crew members in 1987: Michael Rodway (left) and Brian Carter have a drumming session on an old rusty boiler washed up on the rugged south shore of Cox Island. *Photo by Moira J.F. Lemon, 12 July 1987.*

Figure 354. In 1987, Pelagic Cormorants built but later abandoned nests on these cliffs along the mid southeast side of Cox Island. *Photo by Moira J.F. Lemon, 12 July 1987.*

Table SC-050. Seabird nesting records for Cox Island. See Appendix 2 for codes.

DATE	PECO	BLOY	CAAU	SOURCE
16, 17, 21 Jun 1950			S	47
12, 20 Jul 1987	78[a]		0	194

[a] Nests were built but were all abandoned by 20 July.

Remarks: Raccoon (Figure 355) were introduced in 1938 or 1939 by the Fredrickson brothers, of Cape Scott, and were well established on the island by 1950.[47] Observers in 1950 saw raccoon and also suspected the presence of mink after finding obscure tracks of two animals on a gravel beach. Mink likely reached the island from nearby Lanz Island. In 1987, raccoon scats were profuse in all shoreline areas explored. Mink scats and trails were also encountered.

We saw five Bald Eagle nests and one Peregrine Falcon family group in 1987.

Figure 355. Raccoons have thrived on Cox Island for over 80 years since they were introduced by the Fredrickson brothers, of Cape Scott, in 1938 or 1939. Removal of raccoons and mink from Cox Island is warranted to restore seabird nesting populations. *Photo by R. Wayne Campbell.*

WEST COAST VANCOUVER ISLAND

Almost half a million seabirds are estimated to breed at 91 sites along the west coast of Vancouver Island as of 1990 (Figures 356 to 359; Table 7). There are 113 historic nesting sites in this region, but many small colonies of Pelagic Cormorants, Black Oystercatchers, and Glaucous-winged Gulls were not occupied on recent surveys. It is the main area in BC where Brandt's Cormorants are known to nest, though sites are used irregularly and only two of five historical nesting sites in the region were used in 1989. Storm-petrels, predominantly Leach's Storm-Petrels, comprise 81% of the total nesting seabird population, 92% of which nests on only two colonies, Gillam Islands and Solander Island. Solander Island supports most of the Cassin's Auklet and Tufted Puffin populations breeding in the region (Figure 360).

Species distribution and colony size in this region may be limited by available habitat. Offshore islands that are free of mink are all small and many are unvegetated. Colonies are clustered in the north and the south-central sections of the coast, outside of which there are only a few small islets and rocks (Figures 356-359). All but two colonies of burrow-nesting species occur in the northern section where the majority of mink-free, forested islands are located.

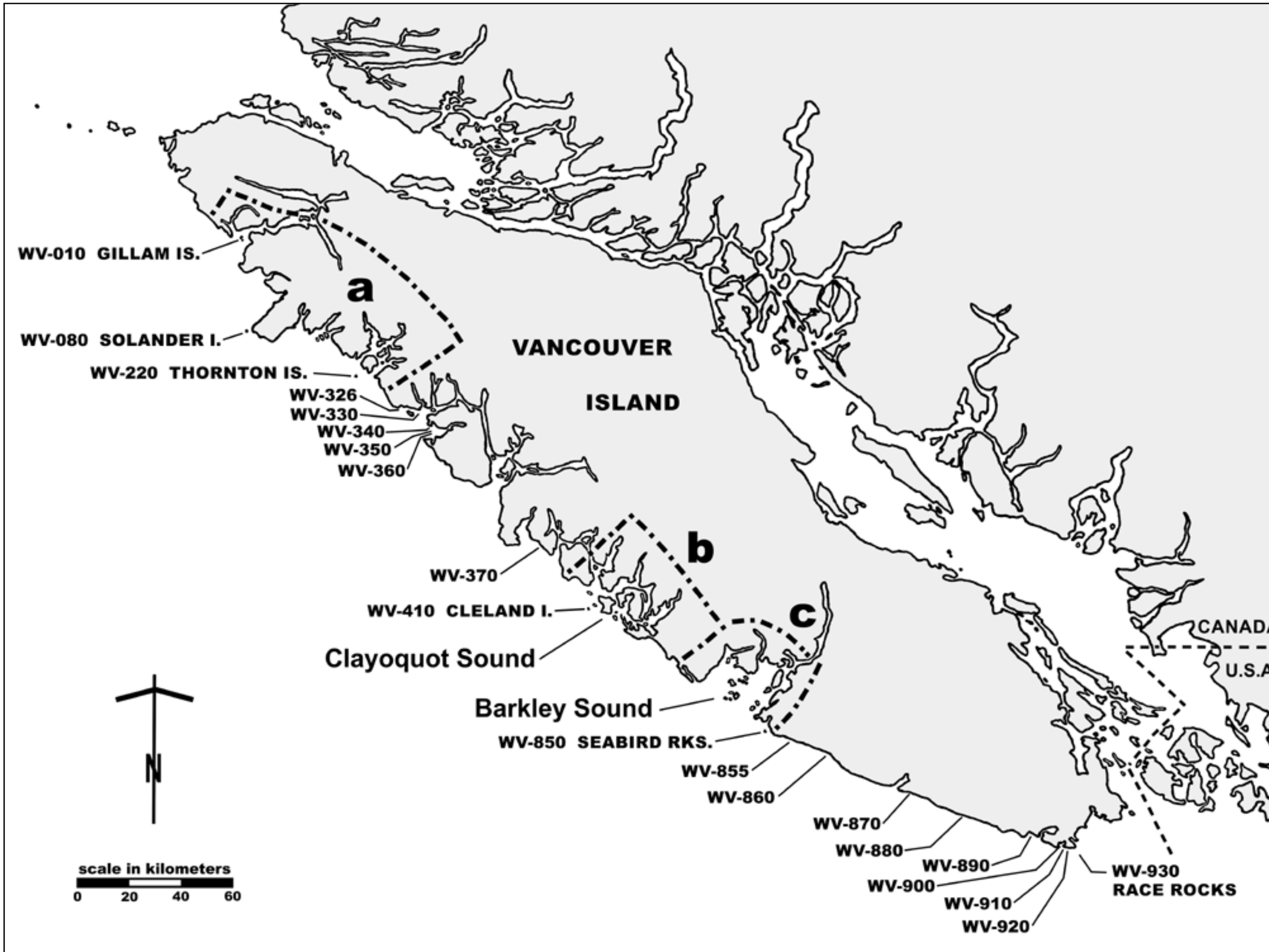


Figure 356. Overview of the West Coast Vancouver Island region, showing locations of colonies WV-326 to WV-370 and WV-855 to WV-930, and indicating areas (a, b, and c) that are covered by accompanying detailed maps. Accompanying maps (Figures 357 to 359**,** respectively) show locations of seabird colonies in the areas around: a) the north end of Vancouver Island; b) Clayoquot Sound; and c) Barkley Sound.

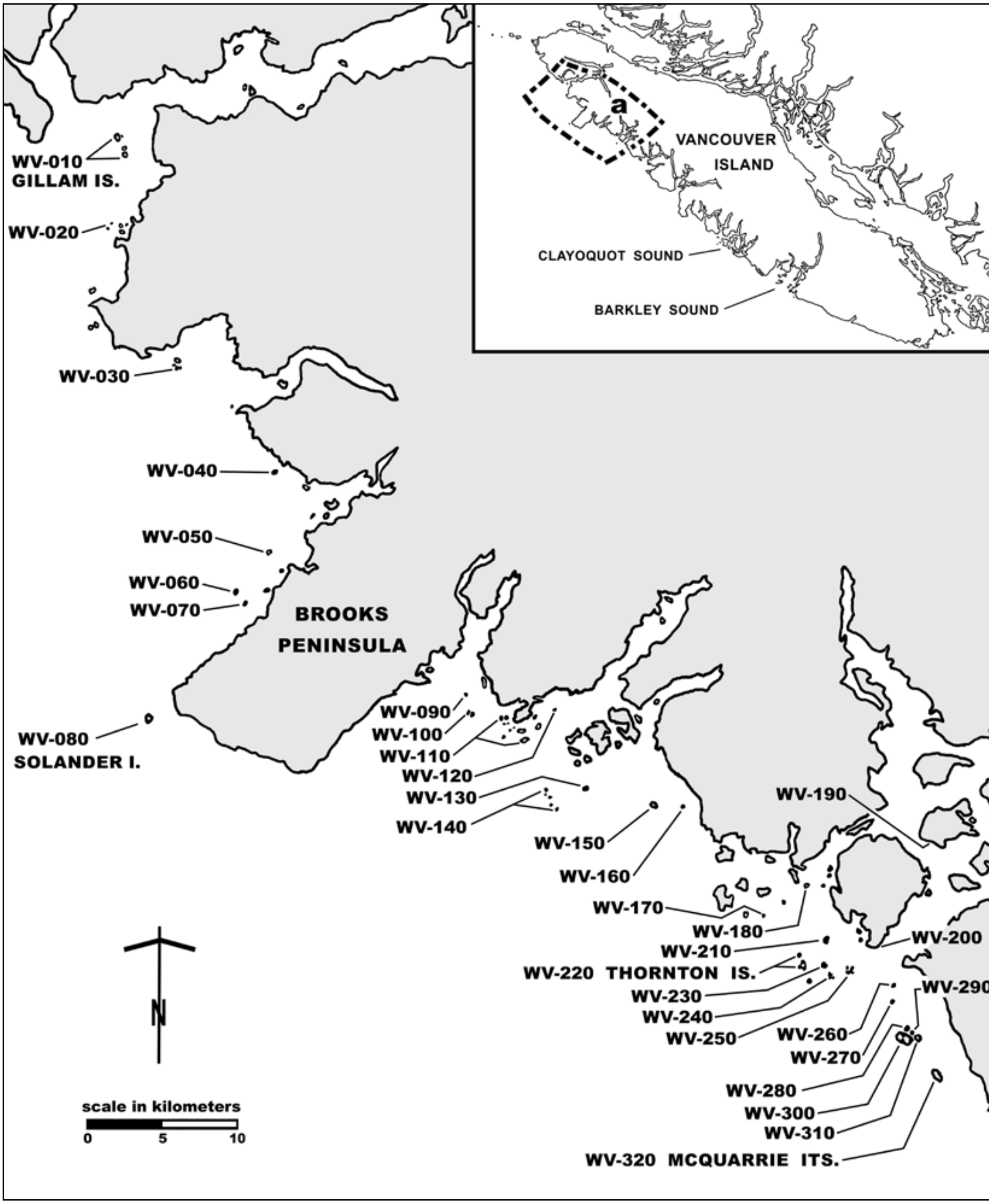


Figure 357. Locations of seabird colonies at the north end of the west coast of Vancouver Island (colonies WV-010 to WV-320).

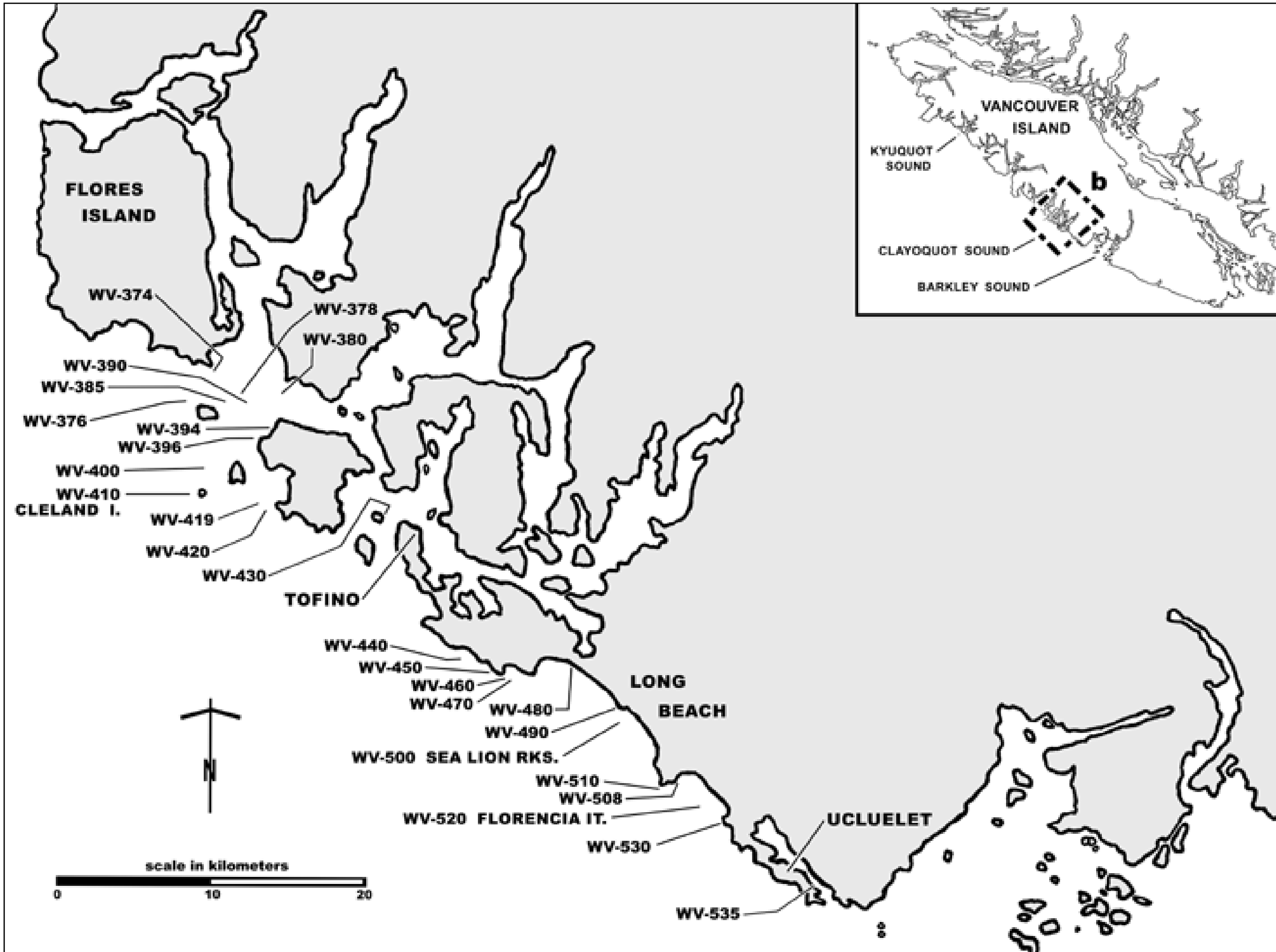


Figure 358. Locations of seabird colonies in the Clayoquot Sound area on the west coast of Vancouver Island (colonies WV-374 to WV-530).

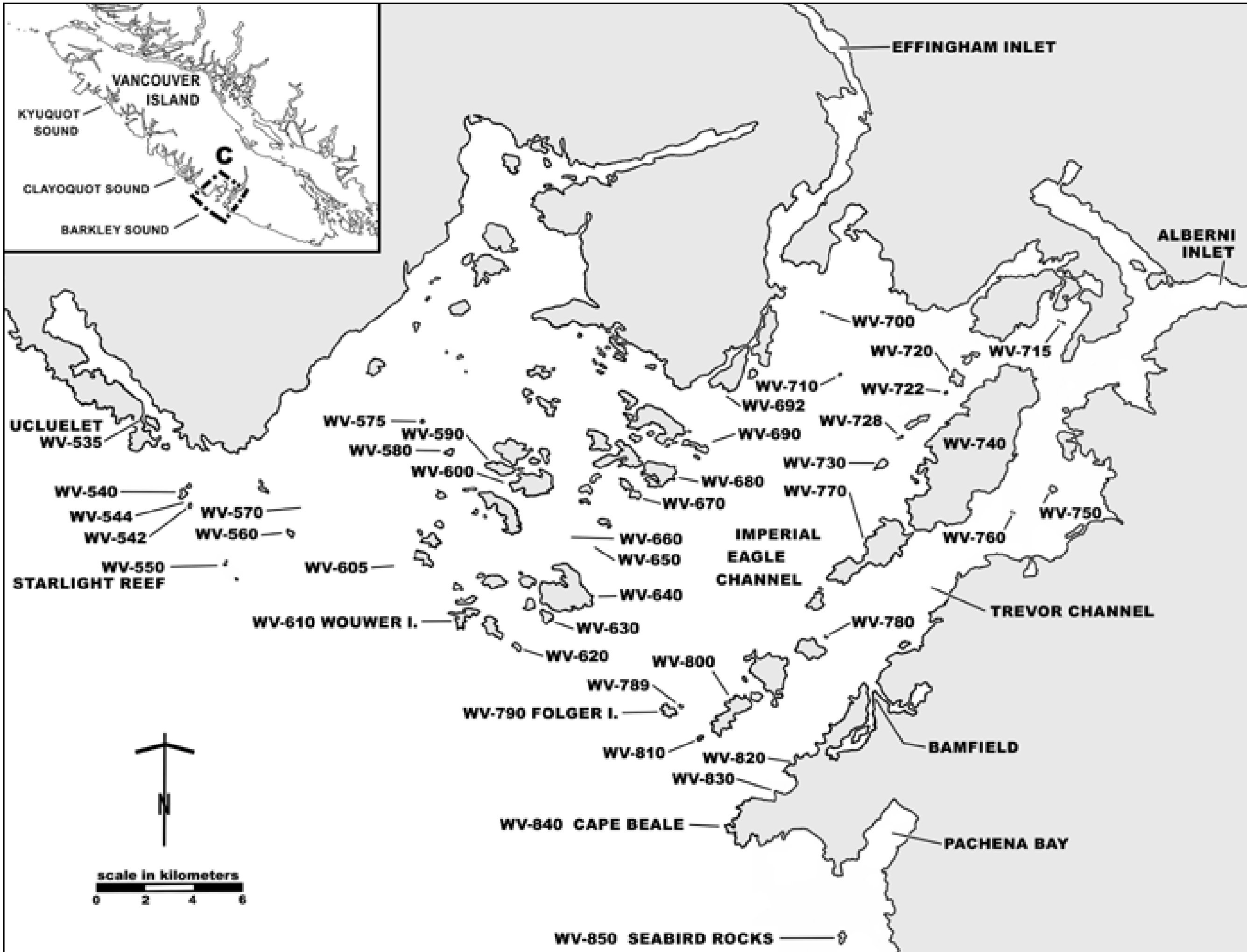


Figure 359. Locations of seabird colonies in the Barkley Sound area on the west coast of Vancouver Island (colonies WV-535 to WV-850).

Table 7. Estimates of seabird breeding populations on the west coast of Vancouver 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 534-535 for an explanation of the letter codes used to qualify population estimates.

SITE CODE	SITE NAME	FTSP	LSPE	BRCO	PECO	BLOY	GWGU	COMU	PIGU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
WV-010	Gillam Islands	42,000t	72,000t		0	13	477		S(45)			S(3)		229,028	1988, 89
WV-020	Rowley Reefs				0	2								4	1988, 89
WV-030	Rugged Islands					1	2		S(6)					12	1988, 89
WV-040	Gould Rock					4	0							8	1988, 89
WV-050	Clerke Islet					3	12eS		x2(13)					43	1988, 89
WV-060	Hackett Island						0		S(2)					2	1989
WV-070	Guilliams Island					2								4	1975
WV-080	Solander Island	0t	70,000t		67eS	1	530eS		x(107)	34,000t		3,100t	S(6)	215,509	1989
WV-090	Yule Rock						0		(0)					0	1988, 89
WV-100	O'Leary Islets				10eS	1	92eS		x4(5)					214	1988, 89
WV-110	Cuttle Islets					1	0		S(2)					4	1975, 88, 89
WV-120	Skirmish Islets					1								2	1988
WV-130	Bunsby Islands					7	105eS							224	1988, 89
WV-140	Clara Islet					4	53		x3(29)					143	1988, 89
WV-150	Thomas Island	0t	7,300t			10	1eS		S(16)					14,638	1988, 89
WV-160	"St. Pauls" Islets					3	0		(0)					6	1975, 88, 89
WV-170	"Favourite" Islets					1	0							2	1975, 88,89
WV-180	"Amos" Reefs				0				(0)					0	1989
WV-190	Hohoae Island				0									0	1989
WV-200	White Cliff Head				0				(0)					0	1989
WV-210	Moos Islet		E		0	17	79[c]		S(5)			(0)		197[c]	1988, 89
WV-220	Thornton Islands	S	700t		39	13	523		x(19)			S(4)		2,573	1988, 89
WV-230	"Mimulus" Islets					5	[c]							10[c]	1988, 89
WV-240	"Crag" Rocks				0	3	[c]							6[c]	1988, 89
WV-250	Munsie Rocks				0	9	119[c]		S(3)					259[c]	1988, 89
WV-260	Nipple Rocks				0	3	72		S(2)					152	1988, 89
WV-270	Volcanic Islets		50e		72	6	155		x(38)			2(2)		608	1988, 89
WV-280	Diver Islet					5	11		(0)					32	1988, 89
WV-290	"Calm" Rocks					6	1eS		S(4)					18	1988, 89
WV-300	Grassy Island		E			16	73		S(23)					201	1988, 89
WV-310	Clark Island				0	5	7		x3(29)			S(5)		58	1988, 89
WV-320	McQuarrie Islets				0	37	62eS		x3(18)			(0)		216	1988, 89
WV-326	High Rocks					1								2	1975
WV-330	White Rock					1								2	1975
WV-340	Ensanada Islet					1	0		S(10)					12	1975, 89
WV-350	Cameron Rocks					1								2	1975

Table 7. cont'd

SITE CODE	SITE NAME	FTSP	LSPE	BRCO	PECO	BLOY	GWGU	COMU	PIGU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
WV-360	Justice Rock					2								4	1975
WV-370	“Kanim” Coast				24+				S(49)					97	1982
WV-374	Kutcous Islets					2S	0		S(1)					5	1989
WV-376	Tibbs Islet					1eS	10eS							22	1989
WV-378	Shot Islets					2S			S(6)					10	1989
WV-380	Monks Islet					1	35eS		S(1)					73	1982, 89
WV-385	Whaler Islets					1S			S(1)					3	1989
WV-390	Leeke Islets					1			S(1)					3	1975, 89
WV-394	Burgess Islet					1S								2	1989
WV-396	Hobbs Islet					1S								2	1989
WV-400	Plover Reefs					2eS	0		S(4)					8	1989
WV-410	Cleland Island	700t	5,700t			44	1,848	0	x2(352)	800t	1,000t	6eS(10)		20,548	1988, 89
WV-419	Foam Reefs					1S								2	1989
WV-420	La Croix Group					5	1S							12	1975, 89
WV-430	“Clayoquot” Spit					1								2	1980
WV-440	Gowlland Rocks					1eS	0		(0)					2	1989
WV-450	“Portland” Rocks					1								2	1975
WV-460	“White” Island			0	0	2S	77		(0)					158	1989
WV-470	“Schooner” Island					1	0		(0)					2	1975, 89
WV-480	Lovekin Rock						0							0	1989
WV-490	Green Point					1								2	1972
WV-500	Sea Lion Rocks			5	4eS	1	120eS							260	1982, 89
WV-508	“Quisitis” Rocks					1								2	1989
WV-510	“Cormorant” Rock				0	1								2	1972, 89
WV-520	Florencia Islet				0	9e	186	0	S(10)			S(1)		401	1982, 89
WV-530	“Fletcher’s” Beach				6eS				S(3)					15	1989
WV-535	Ucluelet								1					2	1970
WV-540	George Fraser Islands						0							0	1989
WV-542	Janson Island					2e	1		S(1)					7	1989
WV-544	Humphries Reef					1	1							4	1989
WV-550	Starlight Reef			51		4e	320	1	S(11)					763	1988, 89
WV-560	Great Bear Rock			0	0	4e	175		S(2)					360	1989
WV-570	Alley Rock				0	0	5eS		S(2)					12	1989
WV-575	Pinder Rock					4e	9		S(1)					27	1989
WV-580	Hankin Island				0				(0)					0	1989
WV-590	Willis Island					0								0	1989
WV-600	Turtle Island					0	0		S(1)					1	1989
WV-605	Sail Rock						0							0	1989
WV-610	Wouwer Island						0		(0)					0	1989

Table 7. cont'd

SITE CODE	SITE NAME	FTSP	LSPE	BRCO	PECO	BLOY	GWGU	COMU	PIGU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES[a]	SURVEY YEAR(S)[b]
WV-620	Cree Island								(0)					0	1989
WV-630	Austin Island				0				S(3)					3	1989
WV-640	Effingham Island				0									0	1989
WV-650	Village Reef					2								4	1989
WV-660	Faber Islets					1	0							2	1975, 89
WV-670	Dempster Island				0									0	1989
WV-680	Gibraltar Island				0									0	1989
WV-690	Swale Rock					1								2	1989
WV-692	Mahk Rock					1								2	1989
WV-700	Rutley Islands				0	1S	1							4	1989
WV-710	Baeria Rocks				0	11e	130		(0)					282	1989
WV-715	Boyson Islands					1S	1							4	1989
WV-720	Weld Island				0									0	1989
WV-722	Stud Islets					1								2	1989
WV-728	Meade Islets					2e								4	1989
WV-730	Swiss Boy Island				5eS				S(2)					12	1989
WV-740	Tzartus Island					1			S(6)					8	1989
WV-750	Hosie Islands				0				S(2)					2	1989
WV-760	San Jose Islets					1eS	3eS							8	1975, 89
WV-770	Fleming Island				0				S(1)					1	1989
WV-780	Wizard Islet					5e	0							10	1989
WV-789	Leach Islet								S(10)					10	1989
WV-790	Folger Island				0	2eS	0		S(16)					20	1975, 89
WV-800	Edward King Island				0									0	1989
WV-810	Bordelais Islets				0	12S	0		S(2)					26	1970, 89
WV-820	"Execution" Rock				0									0	1989
WV-830	Lawton Point				0									0	1989
WV-840	Cape Beale				0									0	1989
WV-850	Seabird Rocks	320e	720e		12	12e	225		S(90)	270e	140e	4e(4)		3,496	1988, 89
WV-855	"Klanawa" Cliffs				12eS									24	1989
WV-860	Whyac				3eS									6	1989
WV-870	"Parkinson" Cliff				15e									30	1973
WV-880	San Simon Point				0									0	1989
WV-890	"Sooke Bay" Islets						0							0	1989
WV-900	Argyle Islet						0							0	1989
WV-910	Bedford Islands					1	28							58	1978, 89
WV-920	Church Island					1	0		S(2)					4	1978, 89
WV-930	Race Rocks			0	152	3	424		S(160)					1,318	1987, 89

Table 7. cont'd

	FTSP	LSPE	BRCO	PECO	BLOY	GWGU	COMU	PIGU	CAAU	RHAU	TUPU	HOPU	ALL SPECIES[a]
TOTAL NESTING PAIRS	**43,020**	**156,470**	**56**	**421**	**340**[d]	**5,974**	**1**		**35,070**	**1,140**	**3,112+**		
TOTAL BREEDING BIRDS	**86,040**	**312,940**	**112**	**842**	**680**[d]	**11,948**	**2**	**1,121**	**70,140**	**2,280**	**6,237**	**6**	**492,348**
TOTAL CURRENT SITES	4	7	2	13	77[d]	40	1	47[e]	3	2	8	1	91
Confirmed on last survey	3	7	2	6	62	27	1	10	3	2	3	0	63
Confirmed on any survey	4	7	2	12	65	39	1	27	3	2	6	0	82
Unconfirmed	0	0	0	1	12	1	0	20	0	0	2	1	9
TOTAL HISTORICAL SITES	6	9	5	46	80[d]	63	3	59[e]	3	2	10	1	113
Confirmed	5	9	5	45	71	57	3	31	3	2	8	0	103
Unconfirmed	1	0	0	1	9	8	0	28	0	0	2	1	10
CURRENTLY ABANDONED SITES	2	2	3	33	3	23	2	12[e]	0	0	2	0	22
Previously confirmed	1	2	3	33	3	18	2	4			2		21
Previously unconfirmed	1	0	0	0	0	7	0	8			0		1

[a] Numbers of individuals.

[b] For sources see individual colony accounts.

[c] Tallies for WV-210 Moos Islet and WV-250 Munsie Rocks in 1989 [238] likely included WV-230 "Mimulus" Islets and WV-240 "Crag" Rocks.[258]

[d] Numbers differ from those presented in Tables 3, 5 and 6 in Part 1, pages 63-65 [188] because we had previously considered Wilf Rock a separate colony. Wilf Rock is actually part of the La Croix Group and we have included it as part of that colony (WV-420) in this volume.

[e] Numbers differ from those presented in Table 6 in Part 1, page 65 [188] because we found a record of suspected nesting by Pigeon Guillemots on "Schooner" Island in 1970 and a record of Pigeon Guillemots nesting at Ucluelet in 1970.

Figure 360. Most Tufted Puffins breeding in the West Coast of Vancouver Island region nest on Solander Island. Images here illustrate puffin life on that important colony (clockwise from upper left): **1)** in a great swarm, hundreds of adults leave and return to nesting sites throughout the day; **2)** adults on nesting cliff; **3)** adult extracted from burrow; **4)** near fledging young; **5)** dead, well-developed chick; and **6)** dead, large young entangled in fishing line. Entanglement in fishing gear at sea is a major source of mortality for many seabird species. The young puffin found dead on Solander Island likely became entangled in fishing line carried to the colony by adult birds or that arrived on the island by some other means. Food shortage is another major mortality factor and may have been the direct or indirect cause of the dead chick seen in photo #5. When food resources are low, chicks may starve to death or they may come to the burrow entrance where they become vulnerable to predation by gulls and other avian predators. *Photos by R. Wayne Campbell, 23 June 1975 and 14 August 1981.*

A Second Chance at Life

Of 15 subspecies of American Mink recognized in North America, two occur in British Columbia: Neovison vison energumenos *that is found throughout the entire mainland and adjacent islands and* N. v. evagor *that is restricted to Vancouver Island and its offshore islands. The occurrence of mink is likely one of the main factors limiting the distribution of nesting seabirds in those areas. In the Scott Islands, the unauthorized introduction of mink eliminated nesting birds on Lanz Island within about 12 years!* [47] *Fortunately, the voracious mammal was not introduced to Haida Gwaii where nesting seabirds already have to deal with invasive rats and raccoons.*[108, 189]

While completing a Ph.D. on coastal mink on Vancouver Island, Dave Hatler received first-hand observations of mink from friends. One story involved a fisherman, Douglas Arnet, who witnessed an interaction between two top-level predators, one that lives in the ocean and the other a terrestrial mammal that depends on the seashore for a living.

On 24 November 1970, at about 13:00, Mr. Arnet spotted six Killer Whales between Wickaninnish and Felice islands, near Tofino. The day was sunny, the sea was flat calm, and thinking he might get a good look at the whales, he turned off the engine in his troller and drifted. Watching the whales through 7X binoculars, he saw that they were circling. They circled three or four times and then he noticed that there was something else swimming in the centre of the circle. Showing up only as a "v" on the water surface, this object moved steadily toward Felice Island. The whales seemed to lose the swimming animal, but then rediscovered it and circled again. This went on time and again, with the whales apparently over-swimming the object of their attention, then having to find it again. On the last circle made by the whales, one of the larger ones went clear into the kelp growth at the edge of Felice Island. The other animal, which had not deviated from its course during the entire episode, proved to be a mink. It scampered over the top of the kelp and up on the shore "making the barnacles fly." At no time did the whales show any sign of attacking the mink. Mostly, they just seemed curious.

(contributed by David F. Hatler)

The most widespread surveys along the west coast of Vancouver Island were conducted in 1975,[32, 265] 1988,[181] and 1989; [84, 236, 238] they provide the most comprehensive data for this region. Surveys of local colonies were conducted in the late 1960s and early 1970s in the areas now covered by Pacific Rim National Park Reserve (PRNPR).[95, 107, 304, 305, 311] CWS crews, led by Gary Kaiser, also surveyed some colonies along northern Vancouver Island in 1982 and 1983.[265]

Trends for Brandt's Cormorants have been well documented at the four historical colonies in the vicinity of PRNPR. Breeding was first confirmed on Sea Lion Rocks in 1965 when 110 nests were found (Figure 361).[211] Birds were next confirmed nesting on "White" Island in 1969, Great Bear Rock in 1970, and Starlight Reef in 1972.[107] Earlier breeding may have occurred: nesting was reported but never confirmed on Solander Island in 1904; [21] and nesting on Sartine Island in the Scott Islands (see above) was confirmed in 1975 but could have occurred earlier as there were no thorough surveys of the island before that. Nesting was ephemeral at some sites and was not seen on "White" Island after 1969 or Great Bear Rock after 1976. Brief nesting was also documented on the sixth known breeding site on Race Rocks in 1987. Breeding also may have occurred undetected at other sites such as Thornton Islands, Plover Reefs, and Florencia Islet, where birds carrying nesting material or partially-built nests have been observed, or at other sites where large numbers of roosting birds have been recorded. The total number of nests at the five known historical colonies on the west coast of Vancouver Island (i.e., excluding Sartine Island in the Scott Islands) was: 110 at one site in 1965; 68 at two sites in 1969; 150 at two sites in 1970; 130 at two sites in 1972; 72 at two sites in 1975, and 56 at two sites in 1989. Breeding numbers decreased further after 1990 and those five colonies were unused during the most recent surveys (see Appendix 1).

Figure 361. Brandt's Cormorants were first confirmed breeding in British Columbia (and Canada) in 1965 on Sea Lion Rocks. *Photo by R. Wayne Campbell, August 1968.*

Some trends can be detected for other surface-nesting species using comparative data from 1975,[32, 265] 1988,[181] and 1989.[236, 238] Large numbers of colonies were surveyed in those three years, however comparisons are compromised because not all colonies were surveyed in each year, areas surveyed differed among years, and methods used in 1989 often differed from those used in 1975 and 1988. In 1975, the BCPM surveyed all colonies from the north end of Vancouver Island south to Sea Lion Rocks, but many colonies in the southern portion were not surveyed that year (data presented on Campbell [32] were from BCPM surveys in 1975 for northern colonies, but much of the data presented for southern colonies, south of Sea Lion Rocks, were from earlier surveys conducted between 1968 and 1974 by BCPM crews and by Guiguet [95] and Hatler et al.[107]). In 1988, CWS surveys included colonies from the north end of Vancouver Island south to McQuarrie Islets, plus Cleland Island, Baeria Rocks, and Seabird Rocks.[181] In 1989, almost all colonies were surveyed for surface-nesting species, but for Black Oystercatchers only data for colonies from Kutcous Islets south to Seabird Rocks were reported; [84, 236, 238, 258] no records survive on what was observed for Black Oystercatchers at colonies outside that area.[258] Nest counts for all species were conducted from land whenever possible in 1975 and 1988 but in 1989 many colonies were surveyed from the water.[258] For counts conducted from the water in 1989, data were not available to determine whether nests were seen or not; pairs seen on suitable nesting habitat were also counted as nests. Those counts thus had to be considered as estimates without confirmation of breeding.[258] See specific colony accounts for greater detail. We have tabulated comparative data for Pelagic Cormorants and Glaucous-winged Gulls from 1975, 1988, and 1989 (Tables 8 and 9) to clarify previous presentations and simplify future comparisons.

Pelagic Cormorants have nested at 46 sites along the west coast of Vancouver Island but were only using 13 of those sites on the most recent surveys as of 1990 (Table 7). Overall, populations showed some decline between 1975 and 1988, followed by a precipitous decrease in 1989. Numbers of nests increased between 1975 and 1988 at several colonies such as Solander Island, Thornton Islands, and Volcanic Islets, but other colonies in the same area, such as O'Leary Islets, Munsie Rocks, and Nipple Rocks, declined or were not used in 1988. Overall population estimates at 19 colonies surveyed in the two years declined 11% from 837 nests at 15 sites in 1975 to 747 nests at nine sites in 1988 (Table 8). At those 19 colonies in 1989, only 200 pairs were found nesting and only five sites were used. Even though fewer colonies were surveyed in 1975 than 1988 (including the major colony on Race Rocks that was not surveyed in 1975), total numbers of nests counted decreased over 60% from 987 nests at 36 surveyed sites in 1975 to 382 nests at 44 surveyed sites in 1989. Declines were likely greater than that if all colonies were included.

Vermeer et al. [238] (their Table 1) reported a decrease for Pelagic Cormorants from 1,260 pairs in 1974/75 to 382 pairs in 1989, but they included many of the data from Campbell [32] that were from other years (e.g., the 27 nests on Effingham Island was from a 1972 survey; no nests were seen in 1975). We prefer to limit comparisons to the set of colonies that were surveyed in a single year because including data from multiple years biases inter-annual comparisons. This is because Pelagic Cormorants often use nest sites intermittently and population sizes at particular colonies vary considerably from year to year.[58, 196] The Race Rocks colony provides a good additional example of this problem: Vermeer et al.[238] included the count of 160 nests from 1974 but declines would have been more severe if the count of 437 nests from 1978 had been used instead in the comparison. Subsequent comparisons since 1990 for colonies in Barkley Sound [57] suffered from similar problems: in that comparison, high counts over a three-decade period (1947-1975) for each colony were used to obtain an inevitably inflated estimate of historical breeding populations (see Appendix 1). Concurrent, region-wide surveys of all colonies need to be conducted to obtain reliable comparative data.

Table 8. Pelagic Cormorant nesting sites on the west coast of Vancouver Island and trends in breeding populations (pairs; see Appendix 2 for codes) between 1975 and 1989.[32, 181, 238, 265] See colony accounts for specific data sources. A dash indicates colonies were not surveyed in that year.

				Maximum population estimate	
Colony	**1975**	**1988**	**1989**	**Year**	**Pairs**
WV-010 Gillam Islands	6	8	0	1988	8
WV-020 Rowley Reefs	1	1	0	1975	1
WV-080 Solander Island	416	464	67eS	1988	464
WV-100 O'Leary Islets	83	41	10eS	1975	83
WV-180 "Amos" Reefs	0	0	0	1957	50e
WV-190 Hohoae Island	0	0	0	1958	12e
WV-200 White Cliff Head	30e	1	0	1975	30e
WV-210 Moos Islet	1	0	0	1975	1
WV-220 Thornton Islands	62	125	39	1988	125
WV-240 "Crag" Rocks	27	0	0	1975	27
WV-250 Munsie Rocks	91	0	0	1975	91
WV-260 Nipple Rocks	50	0	0	1975	50
WV-270 Volcanic Islets	4	89	72	1988	89
WV-310 Clark Island	0	0	0	1958	x
WV-320 McQuarrie Islets	0	2	0	1988	2
WV-370 "Kanim" Coast	-	-	-	1982	24+
WV-460 "White" Island	19	-	0	1970	45
WV-500 Sea Lion Rocks	10	-	4eS	1968	48
WV-510 "Cormorant" Rock	-	-	0	1972	25

Table 8. cont'd

Colony	1975	1988	1989	Maximum population estimate Year	Pairs
WV-520 Florencia Islet	79	-	0	1973	86
WV-530 "Fletcher's" Beach	-	-	6eS	1968	46
WV-560 Great Bear Rock	2	0	0	1975	2
WV-570 Alley Rock	1	0	0	1975	1
WV-580 Hankin Island	0	-	0	1972	x
WV-630 Austin Island	0	-	0	1980	6
WV-640 Effingham Island	0	-	0	1972	27
WV-670 Dempster Island	0	-	0	1971	19+
WV-680 Gibraltar Island	0	-	0	1972	1+
WV-700 Rutley Islands	0	-	0	1982	6+
WV-710 Baeria Rocks	40	0	0	1975	40
WV-720 Weld Island	0	-	0	1979	18+
WV-730 Swiss Boy Island	25e[a]	-	5eS	1969	50e
WV-750 Hosie Islands	3[a]	-	0	1975	3
WV-770 Fleming Island	0	-	0	1980	8+
WV-790 Folger Island	7	-	0	1975	7
WV-800 Edward King Island	0	-	0	1970	41-42e
WV-810 Bordelais Islets	0	-	0	1970	4eS
WV-820 "Execution" Rock	-	8	0	1988	8
WV-830 Lawton Point	-	-	0	1979	9
WV-840 Cape Beale	-	-	0	1947	20e
WV-850 Seabird Rocks	23[a]	16	12	1975	23
WV-855 "Klanawa" Cliffs	-	-	12eS	1989	12eS
WV-860 Whyac	7+	-	3eS	1973	50e
WV-870 "Parkinson" Cliff	-	-	-	1973	15e
WV-880 San Simon Point	-	-	0	1973	12e
WV-930 Race Rocks	-	-	152	1978	437
Colonies surveyed in 1975, 1988, and 1989 (19 colonies)					
Number of colonies with nests	15	9	5		
Total number of nests[b]	837	747	200		
Colonies surveyed in 1975 and 1989 (36 colonies)					
Number of colonies with nests	22	n/a	8		
Total number of nests[b]	987	n/a	212		
All surveyed colonies					
Number of colonies surveyed	36	20	44		
Number of colonies with nests	22	10	11		
Total number of nests[b]	987	755	382		

[a] Pelagic Cormorant counts from 1975 BCPM surveys for Swiss Boy Island, Hosie Islands, and Seabird Rocks were not included on Campbell.[32]
[b] Includes number of nests and estimated number of nesting pairs at colonies where nests were not counted.

Glaucous-winged Gull numbers were also depressed in 1989. Of the 63 colonies where Glaucous-winged Gulls have been historically recorded nesting, 40 were occupied on the most recent surveys as of 1990 (Table 7). At 28 colonies surveyed in 1975, 1988, and 1989, nesting populations showed some increase (5%) between 1975 (5,362 nests) and 1988 (5,614 nests), even though six small colonies were not used in 1988, but then decreased almost 20% to 4,575 nests in 1989 (Table 9). A similar decrease (18%) was seen at 54 historical colonies surveyed in 1975 and 1989, from 6,718 pairs at 46 colonies to 5,518 at 36 colonies.

Although human and Bald Eagle disturbance may have contributed to declines in some areas, the sudden declines seen in Pelagic Cormorant and Glaucous-winged Gull populations along the west coast Vancouver Island area between 1988 and 1989 were likely related to changes in food supply.[196, 238]

Table 9. Glaucous-winged Gull nesting sites on the west coast of Vancouver Island and trends in breeding populations (pairs; see Appendix 2 for codes) between 1975 and 1989.[32, 181, 238, 265] See colony accounts for specific data sources. A dash indicates colonies were not surveyed in that year.

Colony	1975	1988	1989	Maximum population estimate Year	Pairs
WV-010 Gillam Islands	482	646	477	1988	646
WV-030 Rugged Islands	0	2	-	1988	2
WV-040 Gould Rock	3	0	0	1975	3
WV-050 Clerke Islet	20	29	12eS	1988	29
WV-060 Hackett Island	1	0	0	1975	1
WV-080 Solander Island	318	347e	530eS	1989	530eS
WV-090 Yule Rock	1	0	0	1975	1
WV-100 O'Leary Islets	115	117	92eS	1988	117
WV-110 Cuttle Islets	3	0	0	1975	3
WV-130 Bunsby Islands	190	124	105eS	1975	190
WV-140 Clara Islet	39	93	53	1988	93
WV-150 Thomas Island	7	7	1eS	1975	7
WV-160 "St. Pauls" Islets	23	0	0	1975	23
WV-170 "Favourite" Islets	2	0	0	1975	2
WV-210 Moos Islet	321	148	79[a]	1975	321
WV-220 Thornton Islands	687	1053	523	1988	1,053
WV-230 "Mimulus" Islets	210	222	[a]	1988	222
WV-240 "Crag" Rocks	21	75	[a]	1988	75
WV-250 Munsie Rocks	72	28	119[a]	1975[a]	72[a]
WV-260 Nipple Rocks	122	149	72	1988	149
WV-270 Volcanic Islets	134	153	155	1989	155
WV-280 Diver Islet	27	33	11	1988	33
WV-290 "Calm" Rocks	4	5	1eS	1988	5
WV-300 Grassy Island	141	188	73	1988	188
WV-310 Clark Island	13	16	7	1988	16
WV-320 McQuarrie Islets	256	203	62eS	1975	256
WV-340 Ensanada Islet	1S	-	0	1975	1S
WV-374 Kutcous Islets	1S	-	0	1975	1S
WV-376 Tibbs Islet	0	-	10eS	1989	10eS
WV-380 Monks Islet	42	-	35eS	1982	54
WV-400 Plover Reefs	10	-	0	1975	10
WV-410 Cleland Island	1,501	1,622	1,848	1982	2,236
WV-420 La Croix Group	1	-	1S	1975	1
WV-440 Gowlland Rocks	2S	-	0	1975	2S
WV-460 "White" Island	61	-	77	1989	77
WV-470 "Schooner" Island	1S	-	0	1975	1S
WV-480 Lovekin Rock	-	-	0	1961	15+e
WV-500 Sea Lion Rocks	167	-	120eS	1973	175
WV-520 Florencia Islet	479	-	186	1975	479
WV-540 George Fraser Islands	0	-	0	1970	10e
WV-542 Janson Island	0	-	1	1989	1
WV-544 Humphries Reef	-	-	1	1989	1
WV-550 Starlight Reef	306	-	320	1989	320
WV-560 Great Bear Rock	275	-	175	1975	275
WV-570 Alley Rock	3	x	5eS	1982	20e
WV-575 Pinder Rock	0	-	9	1989	9
WV-600 Turtle Island	0	-	0	1972	1
WV-605 Sail Rock	1S	-	0	1975	1S

Table 9. cont'd

Colony	1975	1988	1989	Maximum population estimate Year	Pairs
WV-610 Wouwer Island	0	-	0	1962	4S
WV-660 Faber Islets	2	-	0	1975	2
WV-700 Rutley Islands	0	-	1	1989	1
WV-710 Baeria Rocks	380	175	130	1975	380
WV-715 Boyson Islands	-	-	1	1989	1
WV-760 San Jose Islets	0	-	3eS	1989	3eS
WV-780 Wizard Islet	2	-	0	1975	2
WV-790 Folger Island	1S	-	0	1975	1S
WV-810 Bordelais Islets	1S	-	0	1970	25e
WV-850 Seabird Rocks	269	181	225	1970	400-500e
WV-890 "Sooke Bay" Islets	-	-	0	1960	2
WV-900 Argyle Islet	-	-	0	1978	1
WV-910 Bedford Islands	-	-	28	1989	28
WV-920 Church Island	-	-	0	1974	3S
WV-930 Race Rocks	-	-	424	1981	471
Colonies surveyed in 1975, 1988, and 1989 (28 colonies)					
Number of colonies with nests	28	22	22[a]		
Total number of nests[b]	5,362	5,614	4,575		
Colonies surveyed in 1975 and 1989 (54 colonies)					
Number of colonies with nests	46		36[a]		
Total number of nests[b]	6,718		5,518		
All surveyed colonies					
Number of colonies surveyed	55	29	61[a]		
Number of colonies with nests	46	23	39[a]		
Total number of nests[b]	6,718	5,614	5,972		

[a] Tallies for WV-210 Moos Islet and WV-250 Munsie Rocks in 1989 [238] likely included WV-230 "Mimulus" Islets and WV-240 "Crag" Rocks [258] and we have included those latter two sites in the tally of colonies surveyed in 1989. We assumed that the 1975 count on Munsie Rocks was the historical maximum.

[b] Includes number of nests and estimated number of nesting pairs at colonies where nests were not counted.

Trends for Black Oystercatchers are difficult to interpret, especially because survey data are available for only portions of the west coast Vancouver Island region in 1988 and 1989. Counts from 1975 and 1988 suggest some decline, whereas counts from 1975 and 1989 suggest some increase. At 29 colonies that were surveyed in both 1975 and 1988, numbers of oystercatcher nests found decreased from 260 nests at 29 colonies in 1975 to 179 nests at 25 colonies in 1988. However, much of the difference was due to larger numbers of empty nests recorded in 1975, particularly on McQuarrie Islets where 45 empty nests were counted in 1975. The same number of nests with eggs or young was found on McQuarrie Islets in both years (see colony account). At the 29 colonies surveyed in both years, 123 nests (47%) held eggs or young in 1975 compared to 103 nests (58%) with eggs or young in 1988. In the areas surveyed in both 1975 and 1989, there were 115 nests at 20 sites in 1975 compared to 123 nests at 31 sites in 1989. A number of new nesting sites were found in 1989.

We can compare Black Oystercatcher numbers between the mid-1970s and the late-1980s for most of the west coast Vancouver Island region if we combine data from 1988 and 1989. Combining data for two sequential years is less likely to bias comparisons for Black Oystercatchers than for Pelagic Cormorants because oystercatchers tend to use the same nesting sites from year to year.[109] There was almost no overlap in survey data for Black Oystercatchers from 1988 and 1989. Data from 1988 and 1989 combined covered all known colonies except five (WV-326 to WV-360 on the mid-coast) that contained six nests in 1975. A total of 295 nests were found at 54 sites in 1988 and 1989 combined. In 1975, BCPM crews found 368 nests at 52 sites (including the five sites missed in 1988/1989). These data suggest an overall decline but we are not confident that populations were actually smaller in 1988/1989 than in 1975 because some nesting oystercatchers were likely missed at historical colonies surveyed only from the water in 1989, and, as noted above, more empty nests were recorded in 1975 than in 1988 and perhaps 1989. In 1975, 165 of the 368 nests were empty, although hidden chicks were likely associated with some nests. Unfortunately, no comparative data survive regarding nest contents in 1989. The current (as of 1990) regional total of 340 pairs nesting at 77 sites given on Table 7 includes the 295 nests found at 54 sites in 1988/1989, plus previous nest counts from land for the five colonies that were not surveyed in 1988/1989 and for colonies that were surveyed only from the water in 1988/1989 and where no birds were seen (if birds were not detected on surveys from the water in 1989 but had been found nesting on previous land surveys, we considered the previous counts from the land survey to be the better and most current estimate for that colony). The resulting estimate of 340 pairs is similar to the 368 pairs estimated in 1975 and suggests that Black Oystercatcher breeding populations along the west coast of Vancouver Island were relatively stable between 1975 and 1988/1989. Also, the increase in number of known nesting sites between 1975 and 1988/1989 was likely only partially due to further exploration and would not be expected if populations had declined.

Few changes can be detected at colonies of burrow-nesting species. Leach's Storm-Petrels and a few pairs of Tufted Puffins have disappeared from Moos Islet. Intensive river otter predation was reported at that colony in 1975 and 1982. Mink have been sighted on Thomas and Cleland Islands and were likely responsible for some of the predation at those sites. The presence and impact of mink on those colonies should be monitored.

Data were inadequate to determine trends for Pigeon Guillemots. As discussed previously in Part 1,[188] estimates for Pigeon Guillemots based on brief surveys are poor because guillemot numbers fluctuate dramatically throughout the day and seasonally, and repeat counts are required to obtain reliable estimates of total birds associated with a colony.[76, 241] To obtain a current estimate of Pigeon Guillemot numbers at colonies on the west coast of Vancouver Island, we used data from the most recent survey (as of 1990), except for colonies that were surveyed in both 1988 and 1989. For those colonies we considered the maximum count from those two years to be the best estimate (see page 60 in Part 1 for a fuller discussion of the advantages and potential biases in this approach).

Other threats to nesting seabirds in this region include gill-net fisheries and human disturbance. Carter and Sealy documented gill-net mortality of Marbled Murrelets, Common Murres, and Rhinoceros Auklets in Barkley Sound.[50] Checleset Bay and Barkley Sound attract many recreational boaters, and some colonies of cormorants may have declined or been abandoned as a result.[107] The establishment of Pacific Rim National Park Reserve has attracted many tourists to the area, which has increased the problem of human disturbance to seabirds and other wildlife.

The Problem with Parks

The level of human disturbance along the west coast of Vancouver Island has increased tremendously since the 1960s, especially since Pacific Rim National Park Reserve (PRNPR) was established in 1970 and a new access road to the park area from Port Alberni was constructed and paved shortly after, in 1971. The first logging road opened to the coast in 1959, but it was a rough, hazardous, steep gravel road that few tourists traveled. For people visiting Long Beach today, it may be hard to imagine that in the 1960s, one could often camp on Long Beach and not see another soul or another campfire on the entire beach, something the authors of this publication remember with great nostalgia. However, even then, increasing tourist traffic was impacting natural habitats in the area.

Prior to the establishment of the 511 km^2 PRNPR in 1970, Wickaninnish Provincial Park (Long Beach) was managed by BC Parks Branch. At that time, the onslaught of tourists was already becoming unmanageable. During the 1960s, the sheer numbers of humans and the amount of garbage they generated, the practice of driving on the hard-packed sands of Long Beach, and the associated growing disturbance *to wildlife, were becoming major concerns. To accommodate the increasing tourist traffic, BC Parks cleared more land for additional campsites, erected new buildings, and established a system of walking trails to disperse visitors. Additional changes were made when PRNPR was established. Of the three areas that make up PRNPR, Long Beach is the most popular and most developed; it has 94 drive-in camp sites with full services. The Broken Group has self-contained camping at seven sites, is only accessible by boat, and is used mainly by ocean kayakers. The West Coast Trail segment is a multi-day hike with designated campsites along the way. Some of these developments, and the consequent human disturbance associated with their use, may impact nesting seabirds, including tree-nesting Marbled Murrelets and surface and burrow-nesting species at local colonies.*

The development of park facilities by Parks Canada and the expansion of the tourist-based economy in the nearby communities have fueled an ever-increasing inflow of human visitors to the PRNPR area. The consequences of the rapid growth and economic value of wildlife-based tourism and recreation along the west coast of Vancouver Island cannot be ignored. PRNPR is a prime example of the conflict between protecting wilderness areas as parks while at the same time advertising their wilderness attractions and developing facilities to support and entertain visitors (Figure 362)*.*

Ecotourism is also a well-established and growing industry in the northern portion of the west coast of Vancouver Island. Areas there like Checleset Bay are popular destinations for recreational boaters and kayakers. Although the area is more difficult to access, potential disturbance to major seabird colonies along northern Vancouver Island from increasing recreational traffic is also an ongoing concern. Impacts of increasing human disturbance to breeding seabird populations from the lucrative, multi-billion dollar ecotourism industry are a growing concern worldwide.[334, 335]

Figure 362. Impacts of ever-increasing human disturbance to wilderness areas on the west coast of Vancouver Island have been a major concern since the 1960s. Impacts have been especially severe in what was originally Wickaninnish Provincial Park (which included Long Beach) and later Pacific Rim National Park Reserve (PRNPR), including the Long Beach, Broken Group Islands, and West Coast Trail units. Photos (previous page to next page) and associated text (numbered 1 to 6) illustrate and describe examples of the impacts of human activities in the 1960s and since. **1)** On holiday weekends, such as this July 1st weekend in 1967, Long Beach was inundated with campers and their vehicles. Garbage left by visitors attracted scavengers, like crows, ravens, gulls, rats, and raccoons. The latter species was seen on Lovekin Rock where Black Oystercatchers and Glaucous-winged Gulls used to nest. **2)** Many cars, like this one seen in August 1968, that raced on the firm sands of Long Beach were later swallowed by incoming tides. **3)** A rich intertidal zone at Green Point supported a pair of nesting Black Oystercatchers in the early 1970s. With increased visitor disturbance and the indiscriminate collecting by tourists of intertidal life, including sea stars, snails, chitons, mussels, and seaweeds, the birds abandoned the site. Nesting has been reported there again in recent decades (see Appendix 1), which, optimistically, may indicate a more informed and less invasive tourist population. **4)** In July and August 1968, garbage collectors were asked to keep track of the number of dead sea stars that were discarded by park visitors. The total was a staggering 267 animals. **5)** Sea kayaking and canoeing have become popular recreational activities in Barkley Sound. Campsites have been cleared to accommodate overnight visitors. Although paddlers and campers receive instructions to reduce the effects of their visit, their activities often unintentionally impact nesting seabirds and other wildlife. The popularity of wildlife photography, especially since digital photography has revolutionized picture-taking, and the desire of people to get detailed photos and to post trip blogs on social media platforms, motivates people to approach wildlife closely. Pelagic Cormorants that have historically nested in sea caves and cliffs on many islands in Barkley Sound are the seabird species that has likely suffered the most from the close approaches of many recreational boaters and kayakers in that area. There is also the constant risk of boaters accidentally introducing alien animals, like rats, to island habitats. **6)** In the 1960s, hiking the West Coast Trail was dangerous and challenging. Here, the expressions on the faces of hikers in March 1968 (from left to right), Gary Russell, Robert G. Foottit, and Dion Wheeler, attest to the demands confronting hikers at that time. The difficulty of the hike was part of its appeal and helped to limit the number of visitors. Today, Parks Canada has developed and maintains well positioned campsites, composting toilets, ladders, platforms, cable cars, and boardwalks to make the hike easier and therefore attractive to many more people. Parks Canada also partners with First Nations, who act as guardians of the trail and assist hikers with transportation. Although promoted as a wilderness experience, the trail is now flooded with hikers and regulations and permits have had to be introduced to control human impacts. *Photos by R. Wayne Campbell.*

Many of the colonies along the west coast of Vancouver Island are included in Pacific Rim National Park Reserve: all colonies from Gowlland Rocks (WV-440) to Florencia Islet (WV-520) are within the Long Beach Unit of the park; Hankin Island (WV-580) to Swale Rock (WV-690) are in the Broken Island Unit; and Lawton Point (WV-830) to Whyac (WV-860) are in the West Coast Trail Unit. Solander Island, Cleland Island, the islands in Checleset Bay, and Race Rocks have protected status as Provincial Ecological Reserves. Main colonies within Pacific Rim National Park Reserve, including "White" Island, Sea Lion Rocks, Florencia Islet, Starlight Reef, and Great Bear Rock, have been frequently surveyed. Many of those surveys were conducted by park naturalists from what was initially Wickaninnish Provincial Park and later, Pacific Rim National Park Reserve.[107]

WV-010 GILLAM ISLANDS

Location: *50°26'50"N 127°58'12"W; 92 L/5.* Entrance to Quatsino Sound, east of Kains Island.

Description: *6.0 ha; 46 m high; Forested; Grassy rock; Bare rock.*

This small chain of islands has rocky shores, steep in some areas, with small crevices and gorges segmenting perimeter sections (Figure 363). The larger, northern island (#2) is forested with spruce (Figure 364); isolated, dwarfed spruce trees occur on some other islets (#1, 8-10). Thick salmonberry and currant form most of the understory on the northern

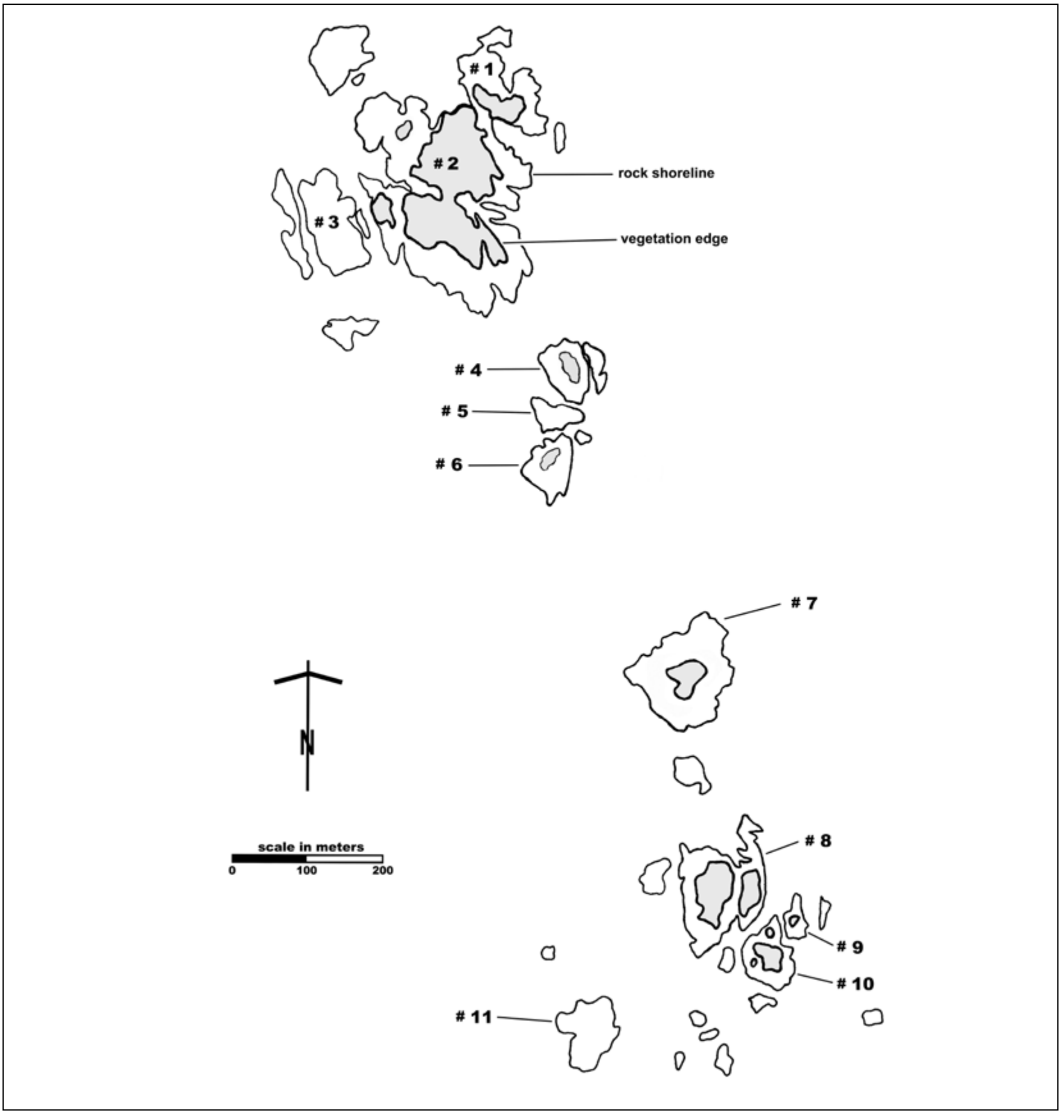


Figure 363. Numbered islands in the Gillam Islands referred to in the text.

treed island (#2) and cover much of the southern islets. Salal, elderberry, and crabapple also form dense pockets on the northern island. Luxuriant grasses and forbs crown the middle island (#7) and surround shrubby interiors on north and south islands. Lower rocks are bare.

Figure 364. Images of Gillam Islands (clockwise from top): **1)** from sea, Gillam Islands appear as a long string of islands, the larger of which are forested with Sitka spruce; **2)** Michael Rodway looking for a Bald Eagle nest in 1975; **3)** the largest islet (#2), seen here from the west, supports a dense spruce forest with a fringe of grasses along the shore. A clear-cut on the slopes of Quatsino Sound can be seen in the background; **4)** nearly impenetrable shrubs blanket some islands; and **5)** some islands are bare rock**.** *Photos by R. Wayne Campbell, 28 June 1975 (1, 2, 4, 5) and Moira J.F. Lemon, 7 July 1988 (3).*

In 1988, tent caterpillars (*Malacosoma californicum*) had infested shrubbery over extensive areas (Figure 365), especially on the south end of the north island (#2). Much of the salal in that area had dead tops.

Figure 365. Tent caterpillars can defoliate shrubbery on seabird colonies. *Photo by R. Wayne Campbell.*

Historical summary: The earliest record of seabirds nesting on Gillam Islands was from 1958 (Table WV-010), when nesting by Glaucous-winged Gulls was reported to G.F. van Tets by Bamfield residents.[77] In 1975, Widdowson counted gull nests only on the west side of the north island (#2) on 26 June, just before BCPM crews surveyed the islands on 28 June. Partial counts were made by CWS crews in 1982 and 1983, and a detailed census was conducted in 1988.

Other than depressed Pelagic Cormorant and Glaucous-winged Gull numbers in 1989 relative to 1988, there is little evidence of population change, although the proportion of the two storm-petrel species appears to have been different in 1975 and 1988.

Gillam Islands support the second largest storm-petrel colony in BC. Storm-petrels were nesting throughout all vegetation types where there was enough soil to support burrows (on islands #1, 2, 7, 8, 9, and 10) in both 1975 and 1988 and differences in population estimates are due to better survey methodology in 1988 (Figure 366). Burrows were counted only in some areas on the smaller islands in 1982. Data suggest that Fork-tailed Storm-Petrels were proportionally more abundant and Leach's Storm-Petrels less abundant in 1988 than in 1975. In 1975, we determined the contents of 46 burrows, 21 contained an incubating Leach's Storm-Petrel (Figure 367), six had only Leach's Storm-Petrel adults in the burrow, and 19 were empty. No Fork-tailed Storm-Petrels were found in burrows, but based on depredated remains found on the colony, we estimated a ratio of 10:1 Leach's to Fork-tailed storm-petrels. A similar number of burrows were examined in 1988 and indicated a ratio of about 2:1 Leach's to Fork-tailed storm-petrels: of 44 burrows inspected, 13 contained Fork-tailed Storm-Petrels (all with chicks), 22 contained Leach's Storm-Petrels (11 with incubating adults and 11 with just adults), one was empty, and eight could not be assigned to species (7 with only eggs and 1 with an unidentified adult). Burrows were sampled throughout nesting areas in both years and we do not suspect any bias in the types of burrows explored. Thus, we believe that the difference found in the proportion of the two species between years was representative of the entire colony. Why the relative proportion of Leach's Storm-Petrels may have declined while Fork-tailed Storm-Petrels increased is unknown, although predation seemed to be much higher on Leach's than Fork-tailed storm-petrels in both years (see below). Differences between years were possibly related to differences in breeding success rather than reflecting changes in relative population sizes of the two storm-petrel species. Burrow occupancy was much higher in 1988 (98%) than 1975 (59%), and the proportion of the two species would have been similar in the two years if most of the empty burrows in 1975 had belonged to Fork-tailed Storm-Petrels. It is possible that the earlier-nesting Fork-tailed Storm-Petrels failed in 1975, leaving only Leach's Storm-Petrels in burrows. Observers in 1975 noted that Leach's Storm-Petrels were just laying eggs and there was no sign of incubation. Perhaps conditions were poor earlier in the season when Fork-tailed Storm-Petrels would have been laying eggs.

Figure 366. Shown here on Gillam Islands, Harry Carter, part of the 1975 BCPM survey crew, is searching for storm-petrel burrows (left). In 1988, Brian Carter, part of the 1988 CWS crew, is pulling a survey chain through the fringe of grassy habitat on island #8 to mark a transect line along which survey plots will be examined for seabird burrows. It was a coincidence that two unrelated Carters were conducting surveys in this area in the 1970s and 1980s. *Photos by R. Wayne Campbell, 28 June 1975 and Moira J.F. Lemon, 7 July 1988.*

Figure 367. Michael Rodway with a Leach's Storm-Petrel egg extracted from a burrow on Gillam Islands in 1975. *Photo by R. Wayne Campbell, 28 June 1975.*

Pelagic Cormorants built nests at the same location on island #5 in 1975 (Figure 368) and 1988. They were just starting to lay eggs on 28 June 1975. Cormorants were still building nests in 1988, although the eight empty nests seen were mostly complete. Our survey was over a week later in 1988 than in 1975 and either egg-laying was delayed in 1988 or birds failed to lay that year. Seventeen adults in breeding plumage were roosting nearby but the nests were unattended at the time of our visit. No cormorants were nesting in 1989.

Figure 368. Patches of guano can be seen on the rocky cliffs where Pelagic Cormorants were nesting on island #5 in the Gillam Islands in 1975. *Photo by R. Wayne Campbell, 28 June 1975.*

Similar numbers of Black Oystercatcher nests were found in 1975 and 1988; only partial counts were conducted in 1982 and 1983. Hidden young were suspected around two of the empty nests found in 1988. Nests were found on seven islets (islands 2-7, and 11) in 1975 and on nine islets (#1-4, 6-8, 10, and 11) in 1988.

Numbers of Glaucous-winged Gulls nesting increased from 1975 to 1988 but were depressed in 1989 such that numbers in 1975 and 1989 were similar. Proportion of empty nests was similar in 1975 and 1988. At nests inspected during the partial count in 1982, most chicks had hatched and some young were near fledging; 242 young were counted outside nests and only 29 nests still had eggs. Eggs were still being laid at the time of the survey in 1983; most nests counted were empty and only 11 of 80 nests with eggs held full clutches of three eggs. However, many eggs had been lost to predation that year (see below). The distribution of gull nests was similar in 1975 and 1988; nests were located on 10 islands in 1975 (Figure 369) and 11 islands in 1988 (no nests were found on the main island #2 in 1975; 6 nests were found there in 1988). Nest contents and specific locations were not reported in 1989.

Pigeon Guillemots have been seen around most islands. We located 19 Pigeon Guillemot nests with eggs on islands #6, 7, 8, and 10 in 1975, and 11 nests with eggs, young, or adults on islands #4, 7, 8, and 10 in 1988. Nests were located under rocks and in rock crevices. Only one bird was seen in 1989. Tufted Puffins were suspected nesting on island #10 in 1988; no nests were found. Puffins have not been recorded in other years.

Observers in 1975 reported considerable evidence of predation and found numerous storm-petrel wings, mostly of Leach's Storm-Petrel. Similarly in 1988, we found one Fork-tailed and 52 Leach's storm-petrel wings. From predation evidence in surveyed quadrats, we estimated over 4,000 Leach's Storm-Petrels had been killed on the colony at the time of our survey. Egg predation has also been reported: surveyors found 79 depredated gull eggs and one depredated oystercatcher egg in 1983; we found 25 broken gull eggs in 1988.

Figure 369. Glaucous-winged Gulls were found nesting on 10 islands in the Gillam Islands archipelago in 1975. *Photo by R. Wayne Campbell, 28 June 1975.*

Table WV-010. Seabird nesting records for Gillam Islands. See Appendix 2 for codes.

DATE	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	TUPU	SOURCE
1958					x			77
26 Jun 1975					24[21]+			265
28 Jun 1975	300eS	3,000e	6[3]	11[6]	482[399]	40e(86)		32, 265
14 Jul 1982		1,128+e		3[3]+	187[29]+	(32)		265
22 Jun 1983				3[1]+	297[80]+			265
6,7 Jul 1988	42,000t	72,000t	8[0]	13[9]	646[525]	11x(45)	S(3)	181
Jun-Jul 1989			0		477	S(1)		84, 238, 258

Remarks: The dense storm-petrel colony on Gillam Islands is difficult to walk through in many areas for fear of trampling burrows.

Two Bald Eagles were noted in 1983 and there was one active Bald Eagle nest on island #1 in 1988. Bald Eagle pellets inspected in 1975 contained Leach's Storm-Petrel remains. River otter runs and scats were common in 1975 and 1988. River otters may have been responsible for much of the predation in 1975 (Figure 370), although few burrows had been dug up; we found river otter scats composed entirely of storm-petrel feathers. In 1988, river otter scats were composed of fish. We found a mink skull in 1975 but no recent evidence of mink has been reported on any surveys.

Figure 370. Excavated burrow (top of photo) and Leach's Storm-Petrel wings, likely a result of Northern River Otter predation on Gillam Islands in 1975. *Photo by R. Wayne Campbell, 28 June 1975.*

Getting Back to Where We Started

During most CWS seabird surveys, our field seasons would begin and end at the same boat launching site, either with arranged transport or with our own inflatable boats. The first part of the 1988 field season along the BC outer coast followed that familiar pattern. The Fisheries Research vessel Tanu *transported us and our boats and gear from Port Hardy northwards to the Moore Islands in mid May. From there we surveyed all the seabird colonies along the mainland shore of Hecate Strait south to Cape Caution, eventually returning to Port Hardy under our own power. During the second part of the season, however, we planned to survey much of the west coast of Vancouver Island from Gillam Islands southwards to the islets in Kyuquot Sound, eventually ending up in Tofino. So unlike the first part of the field season, we would end up at a location many 100s of kilometres by road from where we had started out.*

After re-provisioning in Port Hardy, Michael and I (Moira) with students Mike Force and Brian Carter, drove to Winter Harbour, leaving the truck and trailer there, planning to retrieve it later on with the use of my Volkswagen Bug which we had left in Nanaimo at the beginning of the field season. We launched our two inflatable boats out into Quatsino Sound and Brooks Bay for surveys of large colonies such as the delightful Gillam Islands and majestic Solander Island, before rounding brooding Brooks Peninsula with a cap of fog flowing down its flanks (Figure 371). *We explored all the myriad of islands in Checleset Bay and Kyuquot Sound, and were fortunate that the weather (for the most part) was kind to us. Only a few small storms blew through, and the usually constant outer coast summer fog did not materialize during the nearly two weeks we were out among the islands. The lovely weather was a welcome relief from the seemingly constant cold and wet conditions that we experienced during the first part of the season. We surveyed islands in shirt-sleeves and sunhat, shedding our floater jackets as soon as we stepped ashore from the boats. On one of the last days of the field season we were treated to the wonderful sight and sounds of two humpback whales* (Megaptera novaeangliae) *slowly surfacing beside our drifting boats in the pleasingly calm waters off Estevan Point.*

Arriving at the busy dock in Tofino was something of a culture shock after two months of living on the remote and picturesque coastal islands, and we then had to deal with the ordeal of retrieving our truck and trailer from Winter Harbour. Immediately after the four of us pulled up to the dock in Tofino, Mike Force and I embarked on what seemed like an epic whirlwind journey: we traveled to Nanaimo by bus and taxi to retrieve my Volkswagen Beetle; stayed a short night in a motel; drove up the island and through Port Hardy to Winter Harbour; rescued the trailer that had somehow become stuck in a ditch; and then returned to Tofino, finally arriving by about 2 am after a very long day of around 18 hours. Michael and Brian meanwhile were keeping watch on the boats and equipment at the small but bustling harbour. At daylight, after perhaps two hours of trying to doze on the noisy dock and still groggy with fatigue, with ears buzzing and head *ringing from the recent marathon drive, we loaded the boats and gear into the truck, and drove back across Vancouver Island from Tofino to catch the ferry to Vancouver. It was a marathon finish to an intense and rewarding field season. Unfortunately, my trusty, but decidedly long-in-the-tooth VW bug that had been sitting idle for nearly two months, barely survived the long drive and rough road to Winter Harbour, and succumbed to some now forgotten mechanical failure a few days after returning home.*

In that 1988 field season, we had travelled by zodiac about 300 nautical miles (as the crow flies) of the nearly 500 nautical mile straight line extent of the BC coast line, from tiny Joseph Island off the south end of Banks Island on the northern mainland coast all the way to Tofino on the west coast of Vancouver Island.

Figure 371. A fog bank flowing over the south side of the Brooks Peninsula remains high enough so that Solander Island is just visible on the horizon in the distance. *Photo by Moira J.F. Lemon, 9 July 1988.*

WV-020 ROWLEY REEFS

Location: *50°23'56"N 127°58'33"W* (outer west rocks)*; 92 L/5.*
North of Restless Bight, south of the entrance to Quatsino Sound.

Description: *0.6 ha; 11 m high; Bare rock.*

Historical summary: Nesting has been recorded only on the outer west rocks where we found Pelagic Cormorant and Black Oystercatcher nests in 1975 and 1988 (Table WV-020). Observations were made from the water in 1989.[258]

It is unknown whether Pelagic Cormorants have ever nested successfully here. In 1975, cormorants were attending one empty nest and a total of 44 adults and immatures were roosting on the cliff. In 1988, one freshly built but dilapidated nest was unattended on the outer southern section of the rock and five adults in breeding plumage plus 30 nonbreeding birds were roosting some distance away. No cormorants were recorded in 1989.

One adult Glaucous-winged Gull was present in 1988 but no sign of nesting by gulls has ever been recorded.

Table WV-020. Seabird nesting records for Rowley Reefs. See Appendix 2 for codes.

DATE	PECO	BLOY	SOURCE
28 Jun 1975	1[0]	2[1]	32, 265
7 Jul 1988	1S	2[2]	181
Jun-Jul 1989	0		238

WV-030 RUGGED ISLANDS

Location: *50°18'50"N 127°55'03"W* (southern rocks)*; 92 L/5.*
East of Lawn Point off entrance to Klaskino Inlet.

Description: *1.2 ha; 15 m high; Forested; Grassy rock.*
There are several islands in this cluster. The larger north islands have patches of forest on higher sections, surrounded by extensive rocky shoreline and separate rocky knobs. Southern islets are steep, jagged rocks, with patches of grass and salal on higher sections. The understory on forested islands is dense salal and sword fern (*Polystichum munitum*; Figure 372).

Historical summary: Nesting has been recorded only on the southern rocks. In 1975, we found a Black Oystercatcher nest with two small young and a Pigeon Guillemot nest with one egg in a crevice (Table WV-030). Eight adult Glaucous-winged Gulls were present but there were no nests. In 1988, we found one oystercatcher nest and two gull nests with eggs. In 1989, observations were made from the water, but no records survive on the presence or absence of oystercatchers and gulls.[258]

Figure 372. The Rugged Islands include (clockwise from upper left): larger islands crowned with Sitka spruce forests, with rocky bluffs around the perimeter; bare, rocky islets; areas of grasses and salal around forest edges; and a dense forest understory of salal and sword fern in interior areas. *Photos by R. Wayne Campbell, 28 June 1975.*

Table WV-030. Seabird nesting records for Rugged Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
28 Jun 1975	1	0	x(4)	32, 265
7 Jul 1988	1	2[2]	S(2)	181
Jun-Jul 1989			S(6)	84

Remarks: One adult Bald Eagle (Figure 373) and abundant river otter sign were noted in 1975.

Figure 373. One adult Bald Eagle was seen on Rugged Islands in 1975. It may have been nesting on one of the forested islands, although no nest was detected. *Photo by Alan D. Wilson.*

WV-040 GOULD ROCK

Location: *50°15'07"N 127°49'44"W; 92 L/4.*
Between the mouths of Klaskino and Klaskish inlets, northwest of Sapir Point.

Description: *10 m high; Bare rock.*

Historical summary: Similar numbers of Black Oystercatchers were nesting in 1975 and 1988 but Glaucous-winged Gulls had abandoned this rock in 1988 (Table WV-040). In 1975, there were 47 adult gulls on the rock but very few were nesting. No gulls were present in 1988 or 1989. Observations were made from the water in 1989.[258]

Table WV-040. Seabird nesting records for Gould Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
27 Jun 1975	5[3]	3[2][a]	32, 265
7 Jul 1988	4[2]	0	181
Jun-Jul 1989		0	238

[a] Corrected from Campbell 1976

WV-050 CLERKE ISLET

Location: *50°12'25"N 127°49'59"W; 92 L/4.*
Southwest of Klaskish Inlet, southwest of Orchard Point.

Description: *0.8 ha; 12 m high; Bare rock.*
This granitic rock is generally rounded but is dissected by many cracks and crevices. Tufts of herbaceous vegetation grow in higher fissures (Figure 374).

Historical summary: Almost all Black Oystercatcher (Figure 375) and Glaucous-winged Gull nests held eggs in 1975 (Table WV-050). Fewer oystercatchers and more gulls were nesting in 1988 than 1975, although more gull nests were empty in 1988. Two Pigeon Guillemot nests with eggs were found under rocks in 1975 (Figure 376). Observations were made from the water in 1989.[258]

Figure 374. Clerke Islet is mostly bare rock with some plant growth in higher crevices (top). Swirling tidal channels cover many low rocky areas at high tide. *Photos by R. Wayne Campbell, 27 June 1975.*

Figure 375. Black Oystercatchers were nesting safely above high tide levels in rock fissures on Clerke Islet in 1975. *Photo by R. Wayne Campbell, 27 June 1975.*

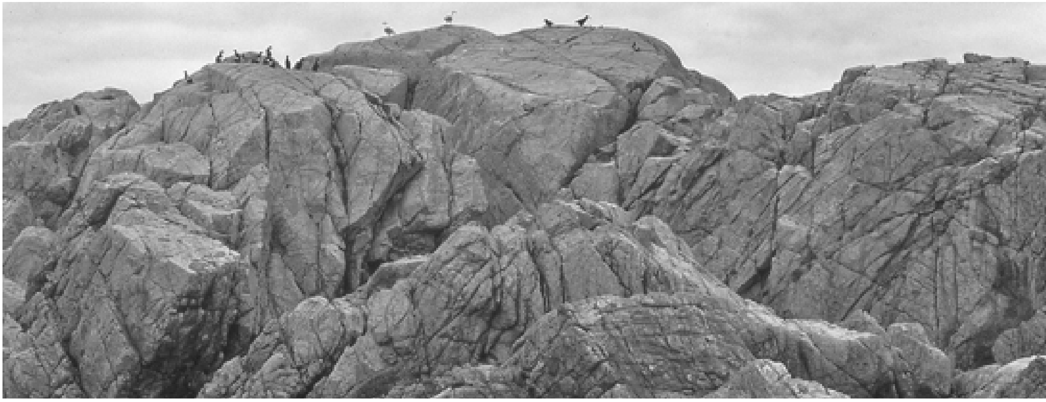


Figure 376. From left to right, seven Pigeon Guillemots, three Pelagic Cormorants, two Glaucous-winged Gulls, and two Black Oystercatchers atop Clerke Islet in 1975. Three of these four species were nesting on the islet. *Photo by R. Wayne Campbell, 27 June 1975.*

Table WV-050. Seabird nesting records for Clerke Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
27 Jun 1975	5[5]	20[19]	10e(18)	32, 265
9 Jul 1988	3[1]	29[17]	x2(8)	181
Jun-Jul 1989		12eS	S(13)	84, 238, 258

WV-060 HACKETT ISLAND

Location: *50°11'03"N 127°51'42"W; 92 L/4.*
North side of the Brooks Peninsula, west of Ambrosia Bay (Figure 377).

Description: *4.4 ha; 56 m high; Forested.*
Hackett Island is a forested island with a dense shrub understory and steep rocky shores (Figure 378).

Figure 377. A beach on the north side of the Brooks Peninsula provided a wonderful campsite while the CWS crew was surveying Hackett Island and other islands in the area in 1988. *Photo by Moira J.F. Lemon, 8 July 1988.*

Figure 378. Hackett Island has (clockwise from top): a forest of Sitka spruce on top; steep rocky shores; and patches of small regenerating spruce, salal, and herbaceous vegetation around forest edges. *Photos by R. Wayne Campbell, 27 June 1975.*

Historical summary: We recorded eight adult Glaucous-winged Gulls and found one nest with two eggs in 1975 (Table WV-060). In 1988, we only boated around the island and saw no birds. Observations were also made from the water in 1989.[258]

Table WV-060. Seabird nesting records for Hackett Island. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
27 Jun 1975	1	0	32
9 Jul 1988	0	0	181
Jun-Jul 1989	0	S(2)	84, 238

Remarks: One Bald Eagle nest with young and abundant river otter sign were seen in 1975.

WV-070 GUILLIAMS ISLAND

Location: *50º10'39"N 127º51'11"W; 92 L/4.*
North side of the Brooks Peninsula, southeast of Hackett Island.

Description: *4.0 ha; 26 m high; Forested.*
Dense salal under spruce covers most of the island above the rocky shoreline.

Historical summary: Black Oystercatcher nests held eggs in 1975 (Table WV-070). We only boated around the island in 1988 and considered the nest count conducted on land in 1975 the better and current estimate. Four oystercatchers were seen foraging on tidal rocks in 1988 (Figure 379).

Figure 379. Along the west coast of Vancouver Island, Black Oystercatchers forage intertidally for limpets, small barnacles, chitons, and a variety of small snails. *Photo by R. Wayne Campbell.*

Table WV-070. Seabird nesting records for Guilliams Island. See Appendix 2 for codes.

DATE	BLOY	SOURCE
27 Jun 1975	2[2]	265
9 Jul 1988	0	181

Remarks: We saw many river otter trails and scats in 1975.

Personality in Puffins

Anybody who has had a pet knows that animals have personalities, and anybody who has had more than one pet knows that each individual animal has a unique personality. Most people have had a pet of some kind at some time in their life, and so it is odd that scientists only relatively recently have started to consider how personality differences may affect how individual animals behave and make decisions that affect their survival and reproductive success.[171] My (Michael's) most intimate experience with how personality differences in seabirds affect their breeding success involved puffins – Atlantic Puffins (Fratercula arctica) *in this case* (Figure 380).

On Great Island in Newfoundland, I had a study plot of about 80 marked burrows on a level piece of grassy habitat just outside the research cabin.[179] The cabin served as a blind and I could sit in an open window and watch parents come in to feed their chicks. I recorded the arrival times of parents delivering food, identified the type and quantity of prey items in their bills, recorded their behaviour in approaching their burrow, and timed how long it took them to actually deliver the food into the burrow after they had landed. I also regularly measured chicks to monitor their growth rate.

Burrows were located 5-10 m from the edge of a steep grassy slope that dropped to the sea. Puffins have trouble taking off from level ground and prefer the safety of a steep slope from which they can easily launch themselves. They then plummet downwards until they gain enough momentum to become fully airborne. Birds emerging from their burrows in level areas generally walk or run to the edge of the slope to take off. Similarly, arriving birds often land at the edge, from where they can take off easily, and then walk or run to their burrows in the level area once they decide it is safe to proceed. Gulls kleptoparasitize puffins in *the air and on the ground, and puffins nesting on level ground are particularly vulnerable to gulls standing amongst their burrows, waiting to ambush them and steal the food they have worked so hard to gather and bring to their chicks. The way in which puffins address the risk of this kleptoparasitism is where personality differences really came into play.*

After a few days of watching, I could recognize individual puffins by their behaviour, which ranged from brazen, to cautious, to timid, to downright paranoid. The type of prey brought in also varied and was often predictable for particular individuals. One brazen fellow always had a bill full of capelin (Mallotus villosus), *a high-quality prey species* (Figure 381), *and hardly paused at all at the edge of the slope after he landed. Like a linebacker, he (or she) would put his head down and charge towards and into his burrow, knocking other puffins and whatever else was in his road out of the way. Once, an adult Herring Gull* (Larus argentatus) *was standing directly in front of his burrow. Though the gull was two or three times its size, the puffin, undeterred, charged full tilt and just bowled the Herring Gull over and slipped into his burrow with his bill full of capelin. Occasionally, this brave and aggressive fellow flew directly into his burrow, forgoing the caution of first landing safely at the edge. The partner of that bird also successfully delivered high-quality prey to the chick, which fledged fat and healthy.*

At the other extreme was a puffin who rarely mustered the courage to enter its burrow at all. He or she would stand nervously at the edge of the steep slope, sometimes starting towards his burrow and then turning back as soon as he got away from the safety of the edge. I watched that timid fellow fidget for sometimes an hour or more while the poor-quality larval fish or amphipods that he was carrying gradually dried out in his bill. As often as not, he would end up flying away with the prey still in his bill, sometimes returning later with the same food load to stand around undecided a while longer, and finally often giving up and never delivering the food to his hungry chick. The partner of this bird was not so timid and regularly fed the chick. Unfortunately this was not enough, and the chick lost mass as it got older and eventually succumbed, a victim of a paranoid parent.

Although I had the impression that timid birds tended to bring in poorer quality food, prey type and personality were not always related. One parent carrying a 15 cm capelin, which was a fine food load for its chick, fussed at the edge of the slope for a long time and seven times flew away and back with his capelin before finally, after a total of about 40 min, crossing the few meters of level ground and delivering the fish to the burrow.

Today biologists are aware that such personality differences can affect vital aspects of animal's lives, but there are still few studies that incorporate personality differences into their explanations of apparent patterns in foraging and breeding behaviour and reproductive success.

Figure 380. The Atlantic Puffin, known just as "Puffin" in Europe, occurs across the North Atlantic. It is the provincial bird of Newfoundland and Labrador. In Europe, the species occurs from Norway south to Spain. *Photo by R. Wayne Campbell.*

Figure 381. Atlantic Puffins on Great Island in Newfoundland nest mostly on steep grassy slopes but some individuals place their burrows on level ground above the steep slopes. Incoming parents with food, especially those nesting on level ground, are always at risk of being attacked by kleptoparasitic Herring Gulls that constantly patrol the area. Puffins delivering food to burrows located on level ground typically land at the edge of the steep slope from where they can take off easily before they venture towards their burrow. How quickly parents deliver their food load, in this case a large capelin, varies tremendously among individuals. Some birds hardly hesitate, and some are too timid to make the dash from the safety of the edge to their burrow. Chicks of timid parents may starve to death. *Photo by Michael S. Rodway, Great Island, NL, July 1993.*

WV-080 SOLANDER ISLAND

Location: *50°06'40"N 127°56'24"W; 92 L/4.*
Off the western tip of the Brooks Peninsula.

Description: *7.7 ha; 94 m high; Grassy and shrubby island; Bare rock.*
Solander Island is the southernmost of the genre of exposed treeless islands that includes the Kerouard Islands at the south tip of Haida Gwaii and the outer Scott Islands of the northwest tip of Vancouver Island. It is a monumental island, with precipitous rocky faces and steep grassy slopes culminating in a conical rocky peak (Figure 382). Deeply creviced pinnacles of rock are attached to the south and west sides, and an isolated rock lies off the northwest corner. Grass covers most of the more moderate northern, eastern, and southern slopes, extending over the rounded ridge-line north of the rocky crest and down small portions of the western face where soil has accumulated. Grass is primarily Nootka reedgrass, with tufted hairgrass on edges above cliffs or rock outcroppings. Montia grows over worn areas amongst the grass, and scattered pockets of angelica occur on upper slopes. There is a large patch of salmonberry on the south slope, but few, sporadic, short salmonberry mix with the grass in other areas.

There is a navigational beacon on the peak of the island (Figure 383), and an automated weather station, established in 1984, on the ridge just north of it. Solander Island was established as a Provincial Ecological Reserve in 1971.

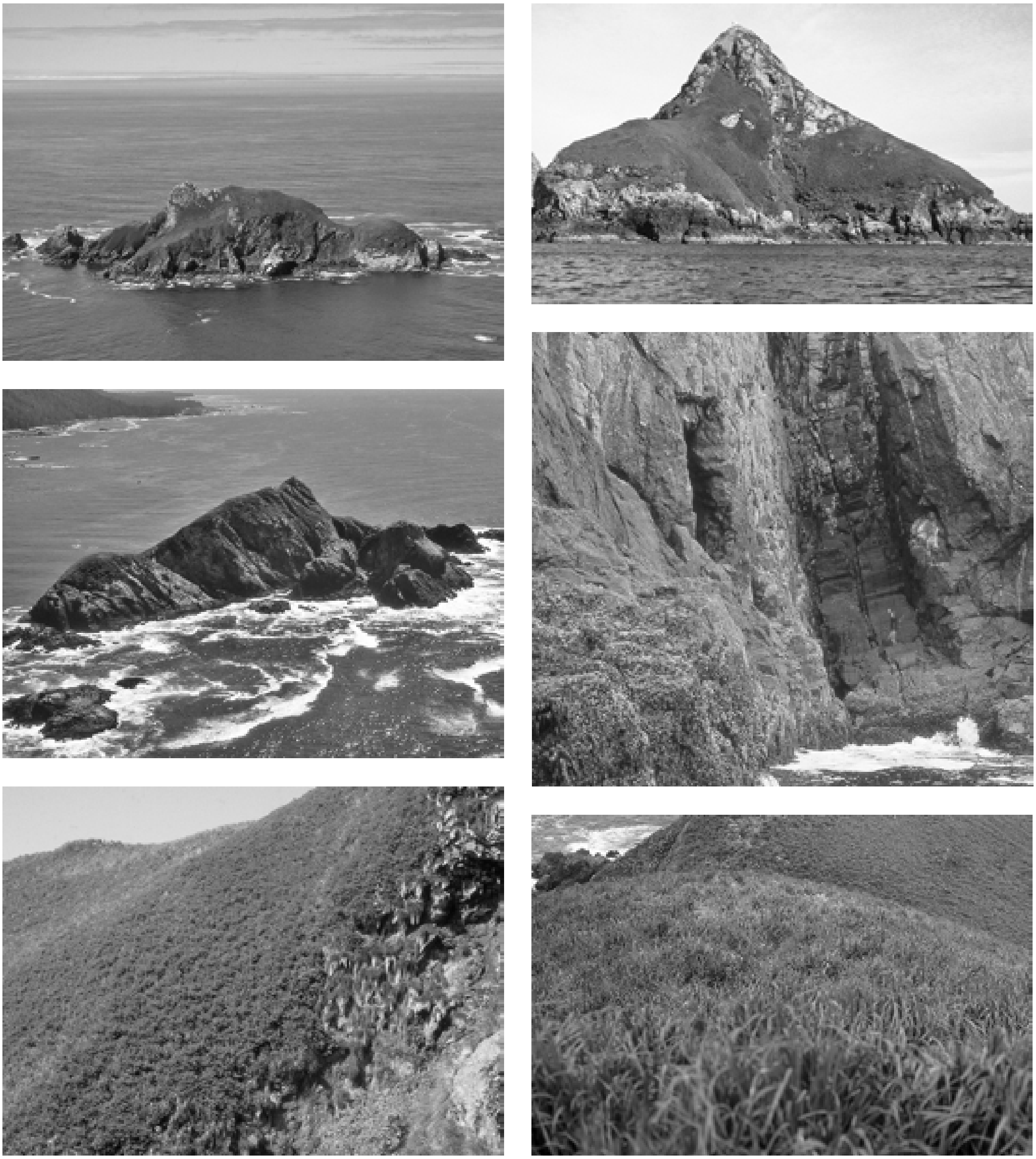
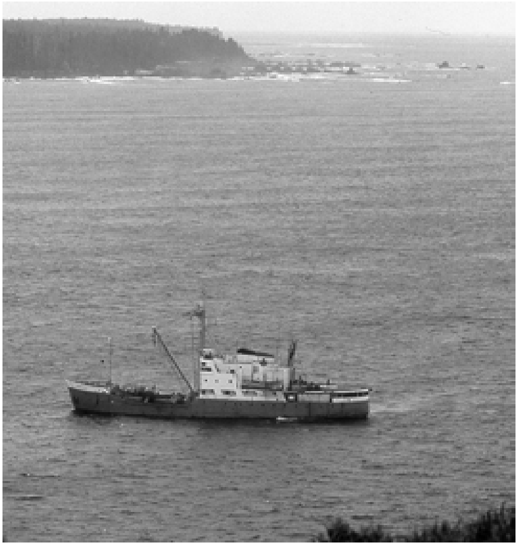


Figure 382. Images of Solander Island (clockwise from top left): **1)** windswept, treeless, and precipitous, the island rises steeply to 94 m; **2)** the imposing south face presents a formidable challenge for seabird surveyors attempting to gain access to its slopes; **3)** deep fissures of bare rock are common; **4)** grasses cover much of the vegetated areas; **5)** habitat on the south face; and **6)** bare rocky islet off the north end. *Photos by R. Wayne Campbell, 27 June 1976 and 5 August 1981 (1, 3, 4, 6), Moira J.F. Lemon, 8 July 1988 (2), and Michael S. Rodway, 28 May 1989 (5).*



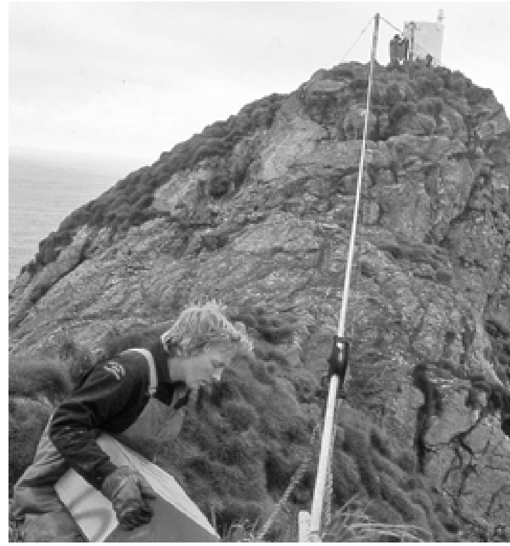


Figure 383. Servicing the navigational beacon on Solander Island was challenging for federal government personnel. The beacon/light tender MV *Camsell* (left) needed high tides and good weather to offload many boxes of batteries which then had to be transported across deep chasms to reach the island's summit. *Photos by R. Wayne Campbell, 6 May 1976.*

Historical summary: Brooks and Swarth [21] reported that Brandt's Cormorants were "nesting in numbers" on Solander Island off the west coast of Vancouver Island on 22 July 1904, and Taverner [216] incorporated Brooks' observation into his description of the breeding range of Brandt's Cormorants in BC. However, this record was based on a single observation made by Brooks of birds present in summer and was not accepted as a breeding record by Drent and Guiguet [77] or Campbell et al.[39] Brandt's Cormorants have been confirmed nesting on nearby Sartine Island and nesting on Solander Island is not unlikely but has never been confirmed. Eleven birds were roosting on Solander Island in 1975 (Figure 384), but none have been seen in other years since.

Figure 384. Observations of roosting Brandt's Cormorants, even if in breeding plumage, do not confirm nesting. *Photo by R. Wayne Campbell.*

Guiguet documented nesting by most species known to breed on the island, reporting large numbers of Leach's Storm-Petrels, Pelagic Cormorants, Cassin's Auklets, and Tufted Puffins in 1954 (Table WV-080). Fork-tailed Storm-Petrels were suspected nesting from a single wing found in 1975. Foster and Campbell found Leach's Storm-Petrels in three burrows but reported no sign of Fork-tailed Storm-Petrels in 1976. We identified only Leach's Storm-Petrels in 76 burrows investigated along transects in 1988, and concluded that nesting by Fork-tailed Storm-Petrels was unlikely. Up to 20 Common Murres have been counted flying around Solander Island (in 1975), but no evidence of breeding has been observed. Horned Puffins have been sighted

Table WV-080. Seabird nesting records for Solander Island. See Appendix 2 for codes.

DATE	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	TUPU	HOPU	SOURCE
1 Jul 1954		x	x		x	x	x	x		94
Jun, Jul 1954						x	x	x		6
27 Jun 1975	S	2,000e	416	1	318[302]	40e(33)	200e	3,000e	S(3)	32, 38, 265
5-6 May 1976	0	1,000's	S	3eS	S	S(16)	1,000's	S(100)		265
14 Aug 1981		x	49+	S	x	S		S(7)	S(3)	265
8 Jul 1988	0t	75,000t	464	1eS	347e	x(60)	44,000t	4,000t	S(6)	181
28-30 May 1989	0t	70,000t	x	1	x	S(107)	34,000t	3,100t	S(3)	181
Jun-Jul 1989			67eS		530eS	S(48)				84, 238, 258

flying and sitting on slopes with Tufted Puffins. We saw one pair of Horned Puffins on a ledge on the west point of the south bay in 1988. Nesting by Horned Puffins is likely but has not been confirmed.

Leach's Storm-Petrel (Figure 385), Cassin's Auklet (Figure 386), and Tufted Puffin populations were surveyed using line transects in 1988 and 1989. Leach's Storm-Petrels and Cassin's Auklets were nesting throughout grassy habitat and as far as 10 m into thick salmonberry cover (Figure 387). Tufted Puffins occurred on steeper slopes and along rims above rock faces and outcroppings. Sampling intensity was higher and transects were spaced to provide better sampling of the entire colony in 1989 and we consider 1989 estimates more accurate than 1988 estimates. The population estimate for Tufted Puffins in 1975 was based on counts of burrows in six, arbitrarily-placed, 10x10 ft. (9.3 m^2) quadrats and a rough estimate of colony area; other species were not sampled with quadrats in 1975. There was no evidence of changes in colony area or burrow density among years for these burrow-nesting species and differences between 1975 and 1989 estimates were not meaningful.

Figure 385. Michael Rodway holding an adult Leach's Storm-Petrel while searching its burrow for an egg or chick on Solander Island in 1975. *Photo by R. Wayne Campbell, 27 June 1975.*

Figure 386. A downy Cassin's Auklet chick found in a burrow on Solander Island in 1989. *Photo by Michael S. Rodway, 28 May 1989.*

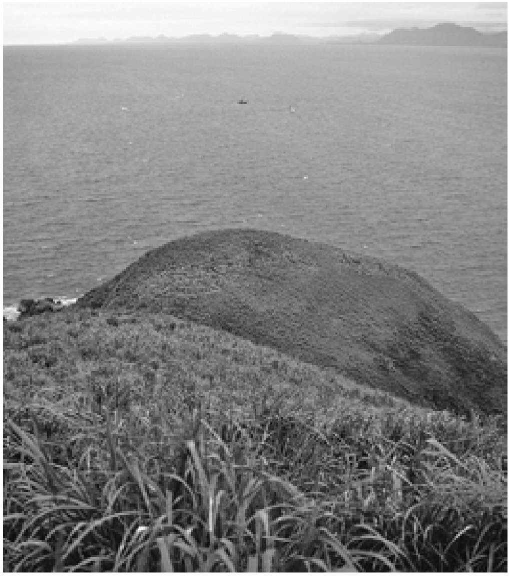
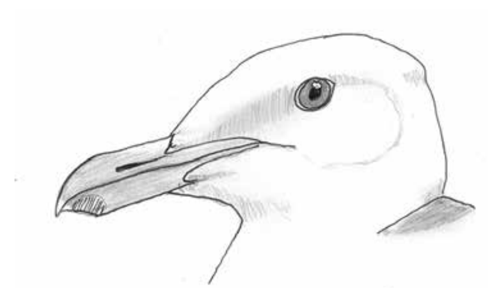


Figure 387. Looking north down the grassy ridge on Solander Island. Leach's Storm-Petrels and Cassin's Auklets nest throughout grassy areas, while Tufted Puffin burrows are confined to steep slopes and above rock edges. *Photo by Moira J.F. Lemon, 8 July 1988.*

Pelagic Cormorants have been recorded nesting around much of the perimeter of the island except the northeast side. Of 332 nests that could be inspected in 1975, 303 contained eggs; 84 nests were inaccessible. A total of 295 cormorants were present in early May 1976 but nests had not yet been built. A partial count of nests on the west side was made in 1981 (22 of 25 nests inspected contained eggs or young). In 1988, cormorants were nesting on rocks and cliffs along the west, south, and north sides of the island (Figure 388). Adults were sitting on all nests counted and eggs were visible in some nests. Numbers nesting increased slightly between 1975 and 1988. In May 1989, birds were building nests on the southeast corner of the island as well as at the locations used in 1988. Numbers of individuals present seemed similar to those in 1988, but fewer birds were nesting later in 1989. The cormorant colony was surveyed from the water later in 1989 [238, 258] and estimates may be low for that year because some nesting areas are not visible from the water (of 464 nests counted in 1988, 126 (27%) were on the east faces of west rocks and were visible only from land [181]). Numbers counted from the water still suggest many fewer pairs nesting in 1989 than 1988.

Glaucous-winged Gulls nest in many rocky areas around and on top of the island (Figure 389). Many nesting locations are difficult to access. The only complete nest count was made in 1975. In 1976, nest building had not yet begun; observers counted 331 adults on territories but made no population estimate. In 1988, of the 53 accessible nests inspected, 37 contained eggs or young. The estimated nesting population from the count of adults on territories (693 individuals) in 1988 was slightly greater than the nest count from 1975, but numbers are not directly comparable because of the difference in methods. Numbers estimated from the water in 1989 were larger than the estimate in 1988, contrary to the differences between 1988 and 1989 at other colonies along the northern part of the west coast Vancouver Island region.[238]



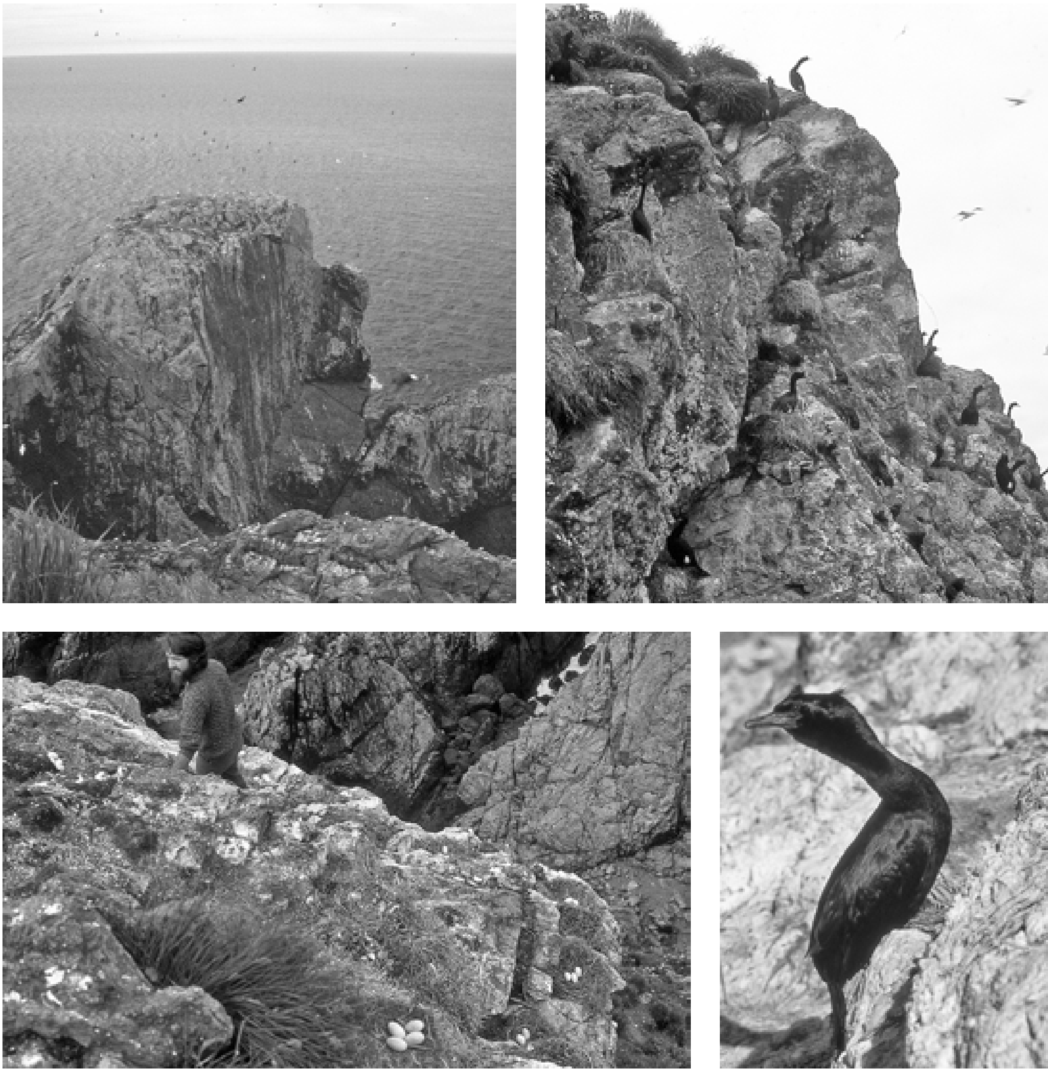


Figure 388. Precipitous cliffs with nest ledges on Solander Island provide ideal nesting habitat for Pelagic Cormorants. The island is one of the major breeding colonies in BC, but surveys in 1989 indicated major declines in the nesting population. Images here show (clockwise from upper left): **1)** the east side of the west rock, which is one of the locations where cormorants have been found nesting; **2)** adults, still showing white breeding flanks, roosting on nests; **3)** a nesting adult, not showing flank patches, near nest; and **4)** Michael Rodway recording nest contents, nest materials, and nesting locations on the island in 1975. *Photos by Moira J.F. Lemon, 8 July 1988 (1) and R. Wayne Campbell, 27 June 1975 and 14 August 1981 (2, 3, 4).*

Figure 389. Glaucous-winged Gulls were nesting in 1975 near the top of Solander Island on bare rocks and often adjacent to patches of vegetation. *Photo by R. Wayne Campbell, 27 June 1975.*

Single pairs of Black Oystercatchers have been confirmed nesting only in 1975, when a nest with two young was found on top of a rock pinnacle (Figure 390), and in 1989, when a nest with three eggs was located on the southwest rock. Three pairs were sighted and suspected nesting on the west side of the island in 1976.

Eight Pigeon Guillemot nests with eggs were found under rocks and in rock crevices in 1975 (Figure 391) and one bird was seen in a crevice in 1988. Most nests found in 1975 were on the most southerly rocky islet.

Figure 390. Harry Carter inspecting a Black Oystercatcher nest on Solander Island in 1975 (left). The nest contained two, well-camouflaged, downy chicks. *Photos by R. Wayne Campbell, 27 June 1975.*

Figure 391. A lot of effort is needed to find Pigeon Guillemot nest sites on Solander Island. In this photo, Harry Carter is searching rock crevices for a nest. *Photo by R. Wayne Campbell, 27 June 1975.*

Figure 392. This desiccated Cassin's Auklet was found in grassy habitat on Solander Island in 1975. Cause of death was unknown. *Photo by R. Wayne Campbell, 27 June 1975.*

Remarks: Beebe observed an adult female Peregrine Falcon and numerous depredated remains of Cassin's Auklets in 1954.[6] He was certain there had been an active eyrie that year. No falcons were present in 1975, but we saw one falcon in 1988, and a pair flushed off the cliffs in 1989. No Bald Eagles were seen in 1988 but five were perched on the island in May 1989. We found little evidence of predation in either year. Two dead Cassin's Auklets were found in 1975 (Figure 392), one at the entrance to a burrow. Cause of death was unknown.

Disturbance from two Canadian air force jets and one Coast Guard helicopter flying past Cape Cook put all cormorants on the east side of the island into the air during our visit in early 1989. Perhaps disturbance from passing boats and aircraft discourages nesting by cormorants on the east side in most years.

Getting to Know a Puffin

I (Michael) learned a lot about puffin personalities when we rescued an Atlantic Puffin chick with a damaged wing from the Great Island colony in Newfoundland and took him home in the hopes of rehabilitating him. Unfortunately, his wing never healed properly and we were unable to release him – he would never have survived in the wild. We named him Bunzo and he was as much a pet with a personality as any dog or cat we have ever had. He would wait at the bedroom door for me to get up in the morning and after a greeting would follow me into the kitchen or wherever else I was going. During the day he would sit at my feet while I worked on the computer. Carrying pencils around or playing tug-of-war with my slippers were his favorite games. When we went out I used to carry him inside my jacket. He would position himself so that his head was poking out of my collar and he could see where we were going (Figure 393). *If he had some business to take care, he would let me know by squirming about. I would put him on the ground, he'd complete his business, and then he'd wait for me to pick him up and tuck him away again so we could continue our walk. We gave him daily baths and he loved to splash around in the tub, but only if we were with him – he couldn't climb out by himself and so got nervous if he was left alone. Outdoors, we found small ponds that he could swim and dive in. He always came back to us after he had his fill. We loved him like any* *other pet but after a year we decided that it would be a better life for him if he could live in a semi-natural environment with other puffins. We contacted people at the Biodome Aquarium in Montreal, where puffins and other rescued seabirds live and even breed, who were pleased to take him (under a Scientific Salvage and Rehabilitation Permit). It was a painful parting but we were happy to know that the rest of his days would be spent safely in as close to a natural habitat as possible.*

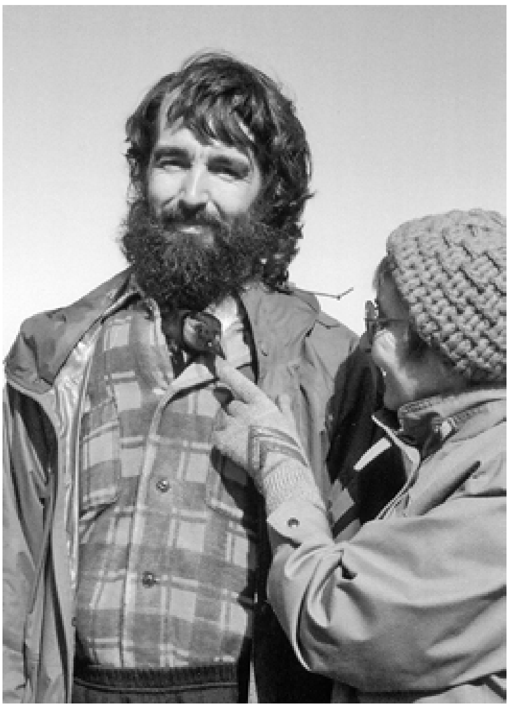


Figure 393. Out for a stroll with an Atlantic Puffin named "Bunzo." This rescued and disabled puffin became a dear pet for Michael and Heidi Rodway in Newfoundland and liked to "ride" with a view from Michael's collar when they went for walks. When Michael's mother Arleigh came to visit, she was delighted to meet "Bunzo." *Photo by Heidi M. Regehr, Mistaken Point, NL, September 1992.*

WV-090 YULE ROCK

Location: *50°06'44"N 127°38'55"W; 92 L/4.*
West of Acous Peninsula, north of O'Leary Islets.

Description: *6 m high; Bare rock.*
Yule Rock is within the Checleset Bay Ecological Reserve, established in 1981.

Historical summary: Two Black Oystercatchers were present in 1975 and 1988 but were not territorial (Figure 394). We found one Glaucous-winged Gull nest with one egg in 1975 (Table WV-090). No gulls have been recorded since. Four Pigeon Guillemots were present in 1975 but no evidence of nesting was obtained. Observations were made from the water in 1989.[258]

Figure 394. Black Oystercatchers that appear unconcerned and are not territorial may be subadults. *Photo by R. Wayne Campbell.*

Table WV-090. Seabird nesting records for Yule Rock. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
26 Jun 1975	1	S(4)	32, 265
9 Jul 1988	0	(0)	181
Jun-Jul 1989	0	(0)	84, 238

WV-100 O'LEARY ISLETS

Location: *50°06'06"N 127°38'32"W; 92 L/4.*
West of Acous Peninsula, south of Nasparti Inlet.

Description: *0.4 ha; 23 m high; Bare rock.*
These two islets are steep, dissected rocks with scant pockets of herbaceous vegetation in higher crevices (Figure 395). They are part of Checleset Bay Ecological Reserve.

Figure 395. The steep, dissected rocks of O'Leary Islets. *Photo by Moira J.F. Lemon, 9 July 1988.*

Historical summary: Four species were confirmed nesting by the BCPM crew in 1975 (Table WV-100). Trudy Carson (now Chatwin) and Bristol Foster surveyed the islets in 1978 and found fewer Pelagic Cormorants and Glaucous-winged Gulls nesting than we counted in 1975. In 1988, cormorant numbers were still depressed whereas gull numbers had regained 1975 levels. Cormorant numbers decreased further in 1989. Observations were made from the water in 1989.[258]

In 1975 and 1978, all cormorant nests were located on the eastern islet. In 1988, all but seven nests were found on the west rock; eleven of 14 nests inspected held eggs. There were two Black Oystercatcher nests on the west island and one on the east island in 1975 (Figure 396). Two adult oystercatchers were seen in 1978 but no evidence of nesting was reported. The nest with eggs found in 1988 was on the east islet. Gulls were nesting on both the east and west rocks in 1975, 1978, and 1988. Numbers were tallied separately in 1975 (87 and 28 nests on east and west rocks, respectively) and 1988 (95 and 22 nests on east and west rocks, respectively). Eight Pigeon Guillemot nests with eggs were found under rocks and in crevices on the east and west rocks in 1975.

Figure 396. Black Oystercatcher eggs on a nest of Hooked Slippersnail (*Crepidula adunca*) shells and a few limpets on O'Leary Islets in 1975. *Photo by R. Wayne Campbell, 26 June 1975.*

Table WV-100. Seabird nesting records for O'Leary Islets. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
26 Jun 1975	83[61]	3[3]	115[96]	20e	32, 265
16 Jun 1978	41[29]		54[54]	(15)	265
9 Jul 1988	41	1	117[107]	x4(5)	181
Jun-Jul 1989	10eS		92eS	S(4)	84, 238, 258

Remarks: There were two broken eggs in one of the oystercatcher nests on the west island in 1975.

WV-110 CUTTLE ISLETS

Location: *50°05'50"N 127°36'06"W* (southern islet)*; 50°06'26"N 127°36'59"W* (northwest islets)*; 92 L/4.*
South and southwest of Acous Peninsula. Colony includes unnamed islets to the northwest.

Description: *7.0 ha; 21 m high; Forested; Grassy rock.*
The main Cuttle Islets are wooded and have a dense understory of salal and other shrubs above rocky shores (Figure 397). The unnamed islet to the northwest is mostly bare rock with grass and forbs on top. Cuttle Islets are included in Checleset Bay Ecological Reserve.

Figure 397. The main Cuttle Islets are forested, with rocky shores and adjacent rocky knolls. *Photo by R. Wayne Campbell, 26 June 1975.*

Historical summary: In 1975, two Glaucous-winged Gull nests, one with three eggs (Figure 398) and one empty, were located on the rocky shore of the southern Cuttle Islet, and one nest with two eggs was found on the northwest, unnamed islet (Table WV-110). A Black Oystercatcher nest with three eggs (Figure 399) and a Pigeon Guillemot nest with two eggs in a rock crevice (Figure 400) were found on the southern islet. We boated around all islets in this area in 1988 and saw no seabirds. We considered the nest count conducted on land in 1975 the better and current estimate for Black Oystercatchers. Observations were also made from the water in 1989.[258]

Figure 398. Glaucous-winged Gull nest made of grasses in a patch of *Potentilla* on the southern of the Cuttle Islets in 1975. *Photo by R. Wayne Campbell, 26 June 1975.*

Figure 399. A full clutch of Black Oystercatcher eggs in a nest scrape of mussels and several limpet shells on the southern of the Cuttle Islets in 1975. *Photo by R. Wayne Campbell, 26 June 1975.*

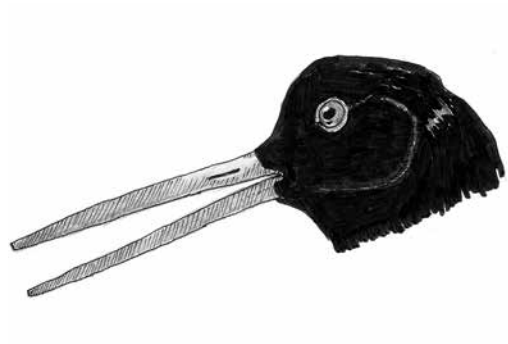
Figure 400. Two Pigeon Guillemot eggs (left side of photo) at the entrance of a rock crevice found on the southern of the Cuttle Islets in 1975. *Photo by R. Wayne Campbell, 26 June 1975.*

Table WV-110. Seabird nesting records for Cuttle Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
26 Jun 1975	1	3[2][a]	1(2)	32, 265
9 Jul 1988	0	0	(0)	181
Jun-Jul 1989		0	S(2)	84, 238

[a] Differs from the two nests listed on Campbell [32] because we included records for the northwest, unnamed islet.

Remarks: There were river otter runways throughout vegetated areas in 1975. One adult Bald Eagle was present in 1988.



WV-120 SKIRMISH ISLETS

Location: *50°06'46"N 127°34'20"W; 92 L/4.*
South of Battle Bay at the entrance to Ououkinsh Inlet.

Figure 401. The two largest Skirmish Islets are forested, with a dense understory of salal in interior areas. There are some areas of young, regenerating Sitka spruce and several snags. *Photos by R. Wayne Campbell, 26 June 1975.*

Description: *2.0 ha; 26 m high; Forested; Bare rock.* Skirmish Islets consist of four islets, each composed of a few rocky knolls. The two larger, central islets have patches of forest on higher knolls, surrounded by extensive rocky shorelines. Interior areas have patches of dense salal, regenerating young spruce, and a few snags (Figure 401). The smaller south islet and the north rock are bare. Skirmish Islets are part of Checleset Bay Ecological Reserve.

Historical summary: Nesting has been recorded only on the small, bare, southern rock. A pair of Black Oystercatchers with small young was seen in 1975 (Figure 402; Table WV-120). The oystercatcher nest in 1988 was empty but had a depredated egg just below the nest.

Figure 402. A Black Oystercatcher nest was found on the small, bare, southern rock of the Skirmish Islets in 1975. *Photo by R. Wayne Campbell, 26 June 1975.*

Table WV-120. Seabird nesting records (nests) for Skirmish Islets.

DATE	BLOY	SOURCE
26 Jun 1975	1	265
9 Jul 1988	1	181

Remarks: We noted river otter runways through the dense understory in forested areas in 1975.

WV-130 BUNSBY ISLANDS

Location: *50°04'14"N 127°33'19"W; 92 L/4.*
West of Malksope Inlet. The rock at the southwest corner of the Bunsby Islands group, south of Cautious Point, is where seabirds have been recorded nesting.

Description: *5 m high (southwest rock); Forested; Bare rock.*
Bunsby Islands is a cluster of numerous islands, most of which are wooded. The southwest rock is composed of a series of extensive, low, flat reefs connected by a broad, central shell beach. Pockets of dune grass and angelica grow in interior areas. Driftwood is scattered about the shoreline (Figure 403).

The Bunsby Islands were designated as part of Checleset Bay Ecological Reserve in 1981. The largest, eastern island was designated Big Bunsby Marine Provincial Park in 1996.

Historical summary: Nesting occurs only on the southwest rock where Carl and Guiguet confirmed nesting by Glaucous-winged Gulls in 1955 (Figure 404) and the BCPM crew confirmed Black Oystercatchers nesting in 1975 (Table WV-130). In 1975, many gull nests were built among driftwood and most of those were empty. Records suggest a slight decline in gull populations since 1975, although numbers of nests with eggs or young has been similar on all visits when nests were counted. In 1988, we found three oystercatcher nests with eggs (Figure 405) plus 11 empty nests that appeared to represent four territories, based on the number of territorial pairs present. Observations were made from the water in 1989.[258]

Figure 403. Numerous islands and islets make up the Bunsby Islands archipelago within Checleset Bay, an isolated and untamed area where Sea Otters are now plentiful. Checleset Bay is protected as an Ecological Reserve and in 1996 a large marine park was established on the largest of the Bunsby Islands to focus wilderness camping, sea kayaking, and salmon fishing away from more sensitive areas of the reserve. Images of the Bunsby Islands (clockwise from top left): **1)** some islands are forested; **2)** treed islands have rocky perimeters; **3)** dense shrub growth is present on forested islands; **4)** the southwest rock of the island group is composed of extensive flat reefs connected by a broad shell beach; **5)** driftwood accumulated on shores; and **6)** some islets are bare rock. *Photos by by R. Wayne Campbell, 26 June 1975 (1, 2, 3, 5, 6) and Moira J.F. Lemon, 10 July 1988 (4).*

Figure 404. Glaucous-winged Gulls have been documented nesting on this low, southwest rock of the Bunsby Islands since 1955 (left). In 1975, we counted 190 nests on this rock. Many, like this grass and stick nest with three eggs, were built amongst driftwood on the shell beach. *Photos by R. Wayne Campbell, 26 June 1975.*

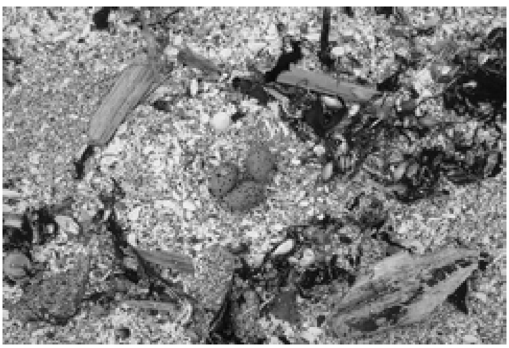


Figure 405. Black Oystercatcher nest with three eggs on a shelly substrate surrounded with seaweeds and bits of driftwood on the southwest rock of the Bunsby Islands in 1988. *Photo by Moira J.F. Lemon, 10 July 1988.*

Table WV-130. Seabird nesting records for Bunsby Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
4-10 Aug 1955		x	46
26 Jun 1975	3[1]	190[105]	32, 265
15 Jun 1978	2[2]	125[119]	265
20 Jun 1983		156[116]	265
10 Jul 1988	7[3]	124[103]	181
Jun-Jul 1989		105eS	238, 258

Remarks: Mink are present on the main Bunsby Islands. River otter trails and scats of fish were seen on the gull rock in 1988. Little evidence of predation has been reported in the gull colony; three depredated eggs were found in 1983. The Bunsby Islands are a popular recreational area, with safe anchorages, and are visited by many boaters during the summer. The decrease in the number of gull nests between 1975 and 1988 was offset by a comparable increase on the nearby Clara Islet group (see Clara Islet account below).

WV-140 CLARA ISLET

Location: *50°04'21"N 127°35'15"W; 92 L/4.*
Southwest of Bunsby Islands at the northwest end of the Barrier Islands. Colony includes the rocks surrounding and south of Clara Islet.

Description: *14 m high; Bare rock.*
Clara Islet and the surrounding cluster of exposed, bare rocks have scant vegetation (Figure 406). They are included in Checleset Bay Ecological Reserve.

Historical summary: All areas were surveyed in 1975 (Figure 407), 1988, and 1989, but only a partial survey of Clara Islet was conducted in 1982. Fewer Black Oystercatcher nests were found in 1988 than in 1975 but many nests were empty in 1975 (Table WV-140). In 1975, nests with eggs (Figure 408) were found on Clara Islet (1 nest) and the two middle of the southwestern rocks (1 and 2 nests); seven empty nests were found on the two middle rocks. In 1988, oystercatcher nests were found on Clara Islet (2 nests with eggs; 1 empty nest) and on the most southeastern rock (1 empty nest).

Figure 406. The Clara Islet seabird colony is comprised of many bare rocks. *Photos by R. Wayne Campbell, 26 June 1975.*

Figure 407. Conducting seabird surveys is always weather-dependent. Calm seas and slack tides facilitated thorough surveys of the rocks around Clara Islet in 1975. *Photo by R. Wayne Campbell, 26 June 1975.*

Figure 408. Three of the four Black Oystercatcher nests with eggs found on the Clara Islet colony in 1975. Nests were composed of (left to right): rock chips; rock chips and shell fragments; and Hooked Slippersnail shells. Seven empty nests were also found on the rocks. *Photos by R. Wayne Campbell, 26 June 1975.*

Glaucous-winged Gull numbers increased substantially between 1975 and 1988 and then decreased in 1989. The distribution of gull nests was also different in 1975 and 1988. Gull nests were found on four rocks in 1975 and five rocks in 1988. In 1975, gulls were not nesting on the southwestern, 30' (9 m) high rock where we found 10 nests in 1988. One nest was also found in 1988 on the most southeastern, 46' (14 m) high rock where none were seen in 1975. In contrast, on the middle, 26' (8 m) high rock there were 11 nests in 1975 and none in 1988. The other middle, 37' (11 m) high, and southwest, 36' (11 m) high, rocks had five and nine nests in 1975 and seven and 37 nests in 1988, respectively. The greatest number of nests were found on Clara Islet in both 1975 (14 nests) and 1988 (38 nests). No data survive on the distribution or contents of gull nests counted in 1989.[258]

Pigeon Guillemots have been seen around most rocks; three nests with eggs were found in rock crevices on the middle of the southern rocks in 1975, and nests with eggs or young were found on Clara Islet and the southwest rock in 1988.

Table WV-140. Seabird nesting records for Clara Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
26 Jun 1975	11[4]	39[38]	10e(14)	32, 265
15 Jun 1978	x			265
21 Jun 1982	2[2]+	6[6]+	(7)	265
10 Jul 1988	4[2]	93[90]	x3(29)	181
Jun-Jul 1989		53	S(4)	84, 238, 258

Remarks: The increase of nesting gulls on the Clara Islet group between 1975 and 1988 parallels a comparable decrease on the nearby Bunsby Islands, suggesting a possible change in distribution between the two colonies.

WV-150 THOMAS ISLAND

Location: *50°03'34"N 127°29'01"W; 92 L/3.* South of the entrance to Malksope Inlet.

Description: *2.0 ha; 44 m high; Forested; Bare rock.* The main Thomas Island is forested, with steep, rocky shores and a sea-cave cutting through the island from east to west. There are small knolls connected by a boulder beach on the northeast corner, and an extensive tidal area stretches to a small islet further north. There is also a rocky islet to the northwest. The understory of the spruce forest varies. Thick

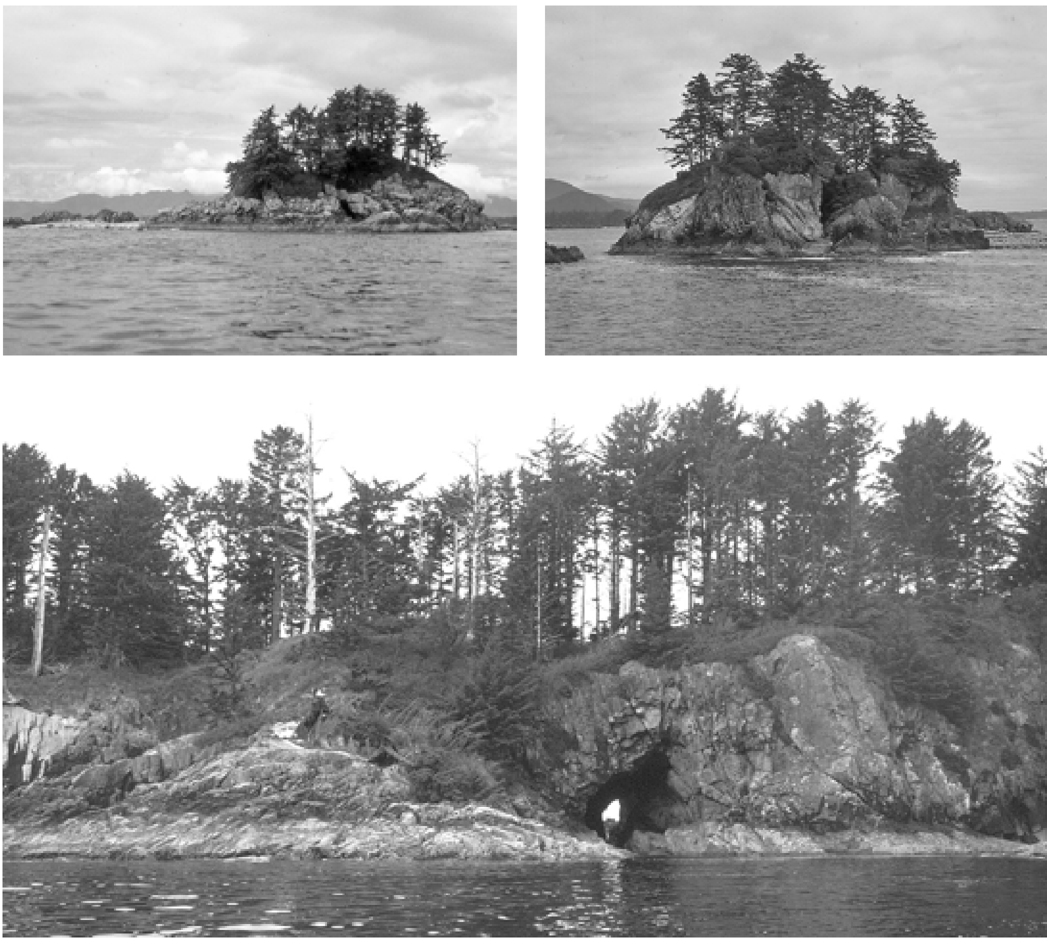


Figure 409. The main Thomas Island and the associated islets have diverse habitats. Shown here are (this page and next page): **1)** forested areas with rocky outcrops around the perimeter; **2)** cliffs; **3)** rocky shoreline and the sea-cave that cuts through the main island, with Sitka spruce forest on top; **4)** shrubs and herbaceous plants that include thimbleberry, salmonberry, salal, black twinberry, tiger lily (*Lilium columbianum*) , and miner's lettuce (*Montia perfoliata*); **5)** patches of lily-of-the-valley, miner's lettuce, and sprouting salmonberry; and **6)** bare rock islets. *Photos by R. Wayne Campbell, 25 June 1975 (1, 2, 4, 5, 6) and Moira J.F. Lemon, 11 July 1988 (3).*

salal, mixed with willow (*Salix* spp.), twinberry, and thimbleberry (*Rubus parviflorus*) covers south, west, and north slopes, and the northern end of the east side. The southern half of the east side has more open habitat with grass above the steep shore rock, changing to false lily-of-the-valley and montia further inland, and then to sparse salmonberry, which extends over the middle of the island. Much of the salmonberry had wilted leaves and little green growth in 1988. Thick shrubs under spruce cover the northern knolls, except for a large rocky area on the tidally-connected north islet. The northwest rock has scant vegetation (Figure 409).

Thomas Island is part of Checleset Bay Ecological Reserve established in 1981.

Historical summary: There is little evidence of population change since the island was first documented as a seabird colony in 1975, although a small population of Fork-tailed Storm-Petrels may have disappeared and predation on Leach's Storm-Petrels has increased (Table WV-150).

Storm-petrel burrows were found in most vegetated habitat (Figure 410) except some perimeter areas where salal and other shrubs were particularly dense. In 1975, we determined the contents of 39 burrows: 26 contained Leach's Storm-Petrels on eggs (Figure 411), one contained an incubating Fork-tailed Storm-Petrel, and 12 were empty. The Fork-tailed Storm-Petrel burrow was located under spruce roots deep in the wooded area of the main island. Fork-tailed Storm-Petrels were heard at night in 1978 and 12 adults were mist-netted in 1985 (70 Leach's Storm-Petrels were caught on the same night). Small numbers Fork-tailed Storm-Petrels may still nest here, but we found no evidence of nesting or any prey remains of this species in 1988 (see below).

Figure 410. Bruce Ford ready to search a grassy area for nesting storm-petrels on Thomas Island in 1975. *Photo by R. Wayne Campbell, 25 June 1975.*

Figure 411. Michael Rodway holding an adult Leach's Storm-Petrel (left) and the single egg from a burrow on Thomas Island in 1975. Burrows visible in the right photo were excavated in soft soil blanketed by lily-of-the-valley and miner's lettuce. *Photos by R. Wayne Campbell, 25 June 1975.*

The population estimate for Leach's Storm-Petrels in 1982 was based on one transect run through the denser part of the colony, which likely biased the estimate upward. Three transects were surveyed in 1988 and likely provided a more representative estimate of burrow density.

Black Oystercatcher nests (Figure 412) have been found on the west side of the main island (1 nest with 2 eggs in 1975) and on the northwest rock (10 nests, 3 with eggs or young and two with depredated eggs in 1975; and 10 nests, 4 with intact clutches and one with a depredated egg in 1988; note that Rodway and Lemon [181] mapped oystercatcher and gull nests on the northeast islet but we now think that was a note-keeping error). Glaucous-winged Gull nests were located on the northwest side of the main island (5 nests; 4 of them empty) and on the northwest rock (2 nests; 1 with eggs) in 1975. Gull nests were found only on the northwest rock in 1988 (again corrected from Rodway and Lemon [181]): two depredated eggs were found, otherwise all nests were empty (3 were only partially constructed).

Table WV-150. Seabird nesting records for Thomas Island. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	GWGU	PIGU	SOURCE
25 Jun 1975	50e	1,200e	11[6]	7[2]	10e(9)	32, 265
14, 16, 22 Jul 1978		x		x	S(9)	265
24 Jul 1982		11,600t			x(15)	265
24 Jun 1985	S	S				181, 265
11 Jul 1988	0t	7,300t	10[5]	7[1]	S(16)	181
Jun-Jul 1989				1eS	S(2)	84, 238, 258

Pigeon Guillemots were found nesting in crevices and under boulders in 1975 and one was seen carrying food into a sea-cave in 1982. Observations were made from the water in 1989.[258]

Remarks: Observers in 1975 and 1978 found little sign of predation. One storm-petrel burrow had been dug open, likely by a river otter, in 1975, and remains of one Leach's Storm-Petrel were encountered in 1978. In 1982, 65 pairs and 23 single wings of Leach's Storm-Petrels and remains of two Fork-tailed Storm-Petrels were counted. Mink were reported on the island. Leach's Storm-Petrel wings, dug-up burrows, and numerous scats composed of storm-petrel feathers were found in 1988 (Figure 413). Scats were attributed to both river otter and mink. Records suggest that mink spread to the island and river otters began preying more heavily on storm-petrels sometime between 1978 and 1982. There was one active Bald Eagle nest (Figure 414) recorded on most visits and some storm-petrel wings were found below the nest in 1988.

Figure 412. Black Oystercatcher nest with eggs on rock chips found on Thomas Island in 1975. *Photo by R. Wayne Campbell, 25 June 1975.*

Figure 413. Evidence of predation within the storm-petrel colony on Thomas Island was abundant in 1988, with many storm-petrel burrows dug up, most likely by river otters. Storm-petrel burrows dug into soft soil are particularly vulnerable to such predation. *Photo by Moira J.F. Lemon, 11 July 1988.*

Figure 414. Active Bald Eagle nest on Thomas Island in 1975. *Photo by R. Wayne Campbell, 25 June 1975.*

WV-160 "ST. PAULS" ISLETS

Location: *50°03'27"N 127°27'29"W; 92 L/3.*
West of St. Pauls Dome on Vancouver Island, east of Thomas Island.

Description: *14 m high; Shrubby rock.*
This is a cluster of small rocky islets with pockets of salal, salmonberry, and grass on the higher rocks (Figure 415). These islets are within the Checleset Bay Ecological Reserve.

Historical summary: Black Oystercatcher nests found in 1975 were empty, but there were broken eggshell fragments outside one nest (Table WV-160). Three Glaucous-winged Gull nests contained single eggs; the rest were empty. Two Pigeon Guillemot nests with eggs were found under boulders in 1975, although eggs in one clutch were broken. No birds were seen from the boat in 1988. We considered the count conducted on land in 1975 the best and current estimate for oystercatchers. Observations were also made from the water in 1989.[258]

Table WV-160. Seabird nesting records for "St. Pauls" Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
25 Jun 1975	3[1]	23[3][a]	10e(10)	32, 265
11 Jul 1988	0	0	(0)	181
Jun-Jul 1989		0	(0)	84, 238

[a] Corrected from Campbell.[32]

Remarks: River otter runs and scats were abundant in 1975. River otters may have been responsible for the large proportion of empty gull and oystercatcher nests and for the broken oystercatcher and guillemot eggs.

Figure 415. Views of "St. Paul's" Islets (clockwise from top) show: a panoramic view of the group; dense salal above steep shore rock; and rocky areas with patches of grass. *Photos by R. Wayne Campbell, 25 June 1975.*

WV-170 "FAVOURITE" ISLETS

Location: *49°59'42"N 127°23'56"W* (west island)*; 92 L/3.*
On both sides of Favourite Entrance, south of Kamils Anchorage.

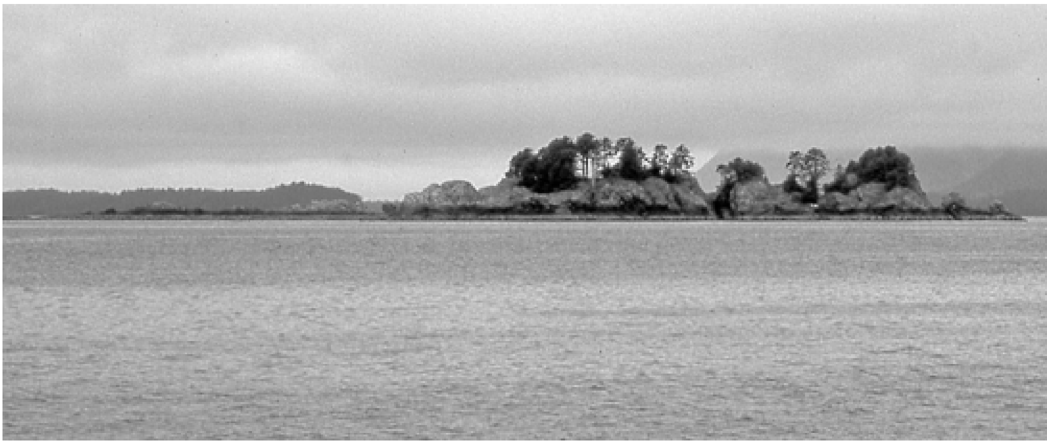


Figure 416. The western of the "Favourite" Islets is wooded, with rocky shores. *Photo by R. Wayne Campbell, 26 June 1975.*

Description: *0.5 ha; 9 m high; Forested; Bare rock.* The wooded island on the west side of Favourite Entrance has a rocky shoreline with rocky promontories and small beaches (Figure 416). Lower islets to the east are rocky with scant vegetation.

Historical summary: In 1975, isolated pairs of Glaucous-winged Gulls and Black Oystercatchers were nesting on the south point of the large island on the west side of Favorite Entrance and one gull nest was found on a northern rocky islet on the east side of Favorite Entrance about 600 m south of Kamils Island (Table WV-170). The two eggs were cold in the oystercatcher nest found in 1975; the two adults present were not aggressive.

We boated around the islets in 1988 and saw 14 adult Glaucous-winged Gulls on tidal rocks but no sign of nesting. The oystercatcher record from 1975 was considered a better and current estimate. We assumed that these islets were surveyed by boat for gulls and Pigeon Guillemots in 1989 and no nesting birds were seen,[84, 238] although no records survive.[258]

Table WV-170. Seabird nesting records for "Favourite" Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
26 Jun 1975	1	2[2]	32, 265
11 Jul 1988	0	0	181
Jun-Jul 1989		0	238

Remarks: Signs of river otter and one immature and one adult Bald Eagle were seen in 1975.

WV-180 "AMOS" REEFS

Location: *50°00'33"N 127°20'30"W; 92 L/3.*
Southeast of Amos Island in Nicolaye Channel.

Description: *15 m high; Rock bluffs.*

Historical summary: Guiguet observed Pelagic Cormorant and Pigeon Guillemot nests in 1957, but the site has been abandoned since (Table WV-180). No birds were present in 1975. Four Pelagic Cormorants in breeding plumage and 39 nonbreeding birds were roosting on the island in 1988. We assumed that these islets were surveyed by boat for cormorants and guillemots in 1989 and no nesting birds were seen,[84, 238] although no records survive.[258]

Table WV-180. Seabird nesting records for "Amos" Reefs. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
20 Jul 1957	50e	x	77
25 Jun 1975	0	(0)	265
15 Jul 1988	0	(0)	181
Jun-Jul 1989	0	(0)	84, 238

WV-190 HOHOAE ISLAND

Location: *50°02'10"N 127°13'50"W; 92 L/3.*
Northeast of Union Island in Kyuquot Sound. Cliffs are on the southwest side of the island.

Description: *30 m high; Cliffs.*

Historical summary: Pelagic Cormorants have been recorded nesting on these cliffs only in 1958 (Table WV-190). No seabirds were present in 1975 or 1988 but there were two recently constructed Pelagic Cormorant nests in 1988. We assumed that this island was surveyed by boat in 1989 and no nesting birds were seen,[84, 238] although no records survive.[258]

Table WV-190. Seabird nesting records for Hohoae Island. See Appendix 2 for codes.

DATE	PECO	SOURCE
1 Jul 1958	12e	77
25 Jun 1975	0	265
15 Jul 1988	0	181
Jun-Jul 1989	0	238

Remarks: One adult Bald Eagle was present in 1975.

WV-200 WHITE CLIFF HEAD

Location: *49°58'24"N 127°16'54"W; 92 E/14.*
South tip of Union Island.

Description: *30 m high; Cliffs.*

Historical summary: In 1975, Pelagic Cormorant nests were located in four different crevices in the cliffs (Table WV-200). A total of 66 cormorants flew out from those crevices and 26 nests were counted. Four Pigeon Guillemots flew out of one deep crevice but were not seen flying from specific nest locations. Observers estimated a maximum of five pairs nesting. In 1988, only one cormorant sitting on a nest was present.

Table WV-200. Seabird nesting records for White Cliff Head. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
24 Jun 1975	30e	5eS(4)	32, 265
15 Jul 1988	1	(0)	181
Jun-Jul 1989	0	(0)	84, 238

One For the Sierra Club

Nineteen seventy-five was the first year we had the Tedmac to serve as a mothership for the BCPM surveys and was the year that I (Michael) first became involved in seabird surveys on the BC coast. It was also my first experience living on a boat travelling along the outer coast. It was a summer that changed my life.

"Doc" Carter, who had purchased the converted fish boat for the purpose of conducting seabird surveys and was our trusted skipper, also frequently prepared our meals and generally looked out for our

well-being (Figure 417). *With a crew of six or more, we used a lot of groceries and generated considerable waste. As was routine on virtually all boats at that time, we just unthinkingly tossed our waste overboard – tins, bottles, plastics, everything went into the ocean* (Figure 418). *This bothered me and I suggested that it would be better to collect any waste that could be recycled, or at least disposed of in an environmentally friendly manner, and take it to port wherever we could. Recycling was a relatively novel concept at that time (the first Earth Day was celebrated and BC first established a bottle deposit return program in 1970, and the first recycling council in Canada was formed in 1974) but everybody readily agreed and so we began to save all the tins and bottles and plastics. It wasn't long before we had bags full of garbage filling up the deck space.*

Feeling responsible for the rapidly mounting pile of black garbage bags I was pleased when we finally headed into the next coastal port on northern Vancouver Island. After we were tied up securely at the government dock, I proudly marched up the dock with as many full garbage bags as I could carry looking for a repository where I could send them off to an "environmentally-sound" future. The wharf attendant saw me coming and quickly accosted me, "Where are you going with all that garbage?" When I told him, he laughed. "My boy", he said, "we load all the town's garbage on a scow and tow it offshore and dump it! You can march right back with all your bags and take them offshore yourself!" Sheepishly, I reloaded the bags back on the Tedmac, *and we proceeded to do as the attendant instructed.*

Though the Sierra Club began in 1892 with John Muir and other mountain climbers in the Sierra Mountains of California, its presence was first felt in Canada in 1969 when a handful of British Columbians formed a Canadian chapter of the Club in their attempts to protect the Nitinat Triangle and the West Coast trail on Vancouver Island. By 1975 it was a well-known voice for conservation in that area. I got mercilessly teased after the incident with the garbage and every time a bottle or tin can was tossed in the ocean after that, it was "Hey Mike - one for the Sierra Club!"

Figure 417. Purchasing the *Tedmac* to serve as a mothership for the BCPM seabird surveys in the 1970s was only the first of many responsibilities that "Doc" Carter accepted when he volunteered to help. "Doc" had to complete power squadron and navigational courses, learn boat maintenance issues, order extra boat parts, and pay annual moorage fees while docked in Victoria. At times, in safe anchorages, "Doc" delighted in helping with the surveys. *Photo by R. Wayne Campbell, 24 June 1976.*

Figure 418. Throughout history, the ocean has been a common dumping ground for human waste. It is still common practice for ships to dump their garbage, like these cartons of old eggs, and flush their bilges, at sea. Slowly, grass roots conservation groups, like the Sierra Club, became aware of the environmental risks posed by the accumulation in the ocean of human waste products, especially plastics and toxic chemicals. During the 1980s, it became apparent that the disposal of human waste products at sea was having an impact on marine birds and mammals and other sea life. Government regulations were imposed but they have proven difficult to enforce. *Photo by R. Wayne Campbell, off Vancouver Island, BC, November 1971.*

WV-210 MOOS ISLET

Location: *49°58'28"N 127°19'12"W; 92 E/14.*
West of Kyuquot Bay at the south end of Union Island. Colony includes unnamed rocks off the north and west sides.

Description: *2.8 ha; 32 m high; Forested; Grassy rock.*
A sparse spruce forest extends over the undulating top of Moos Islet above a steep, convoluted, rocky shoreline. Salmonberry and salal are dense in valleys and along perimeters. Open areas of grass, bracken

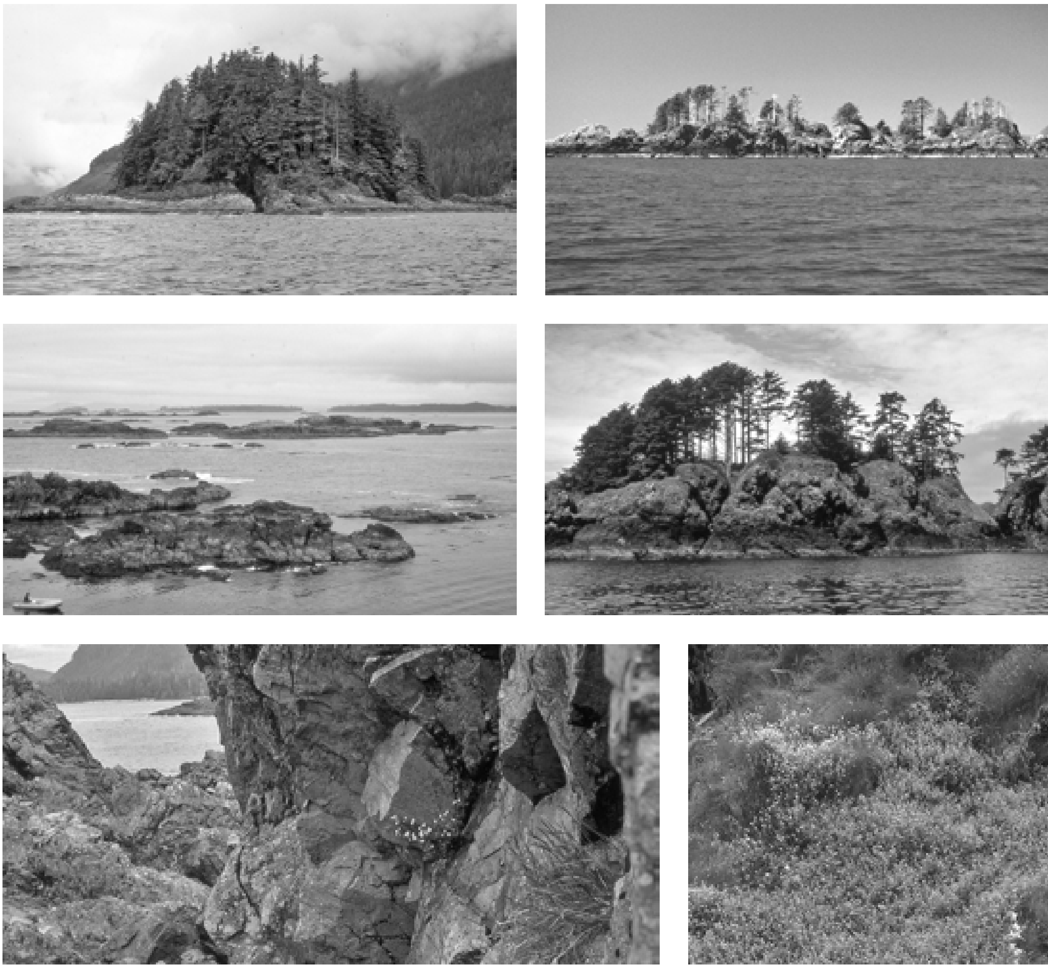


Figure 419. Moos Islet is a complex of rocky knolls capped with sparse Sitka spruce forest and patches of herbaceous and shrubby vegetation. Images here include (clockwise from top left): **1)** a profile showing sparsely and well forested knolls and lower bare rocks; **2)** a view from the south showing the complex topography and the vegetated areas above the rocky shores; **3)**; steep rock bluffs; **4)** miner's lettuce, monkey flower, and grasses in fissures on one of the larger knolls; **5)** vertical rock crevices on the main island; and **6)** tidal channels and surges that inundate some of the rocky areas. *Photos by R. Wayne Campbell, 24 June 1975 (1, 3, 4, 5, 6) and Moira J.F. Lemon, 17 July 1988 (2).*

fern (*Pteridium aquilinum*), and false lily-of-the-valley occur in the southern interior and along the east side. Offshore rocks are mainly bare, with pockets of grass and forbs on higher sections (Figure 419).

Historical summary: Records from 1975 to 1988 can be clearly assigned to this colony site but estimates from 1989 likely included unnamed rocks to the south. Those rocks were listed as two unnamed sites in Campbell; [32] we have designated them as WV-230 "Mimulus" Islets and WV-240 "Crag" Rocks (see below).[181] The estimate given on Table 2 in Vermeer et al.[238] for the number of gull nests (552) on Moos Islet in 1975 was the total for these three sites (Moos Islet, "Mimulus" Islets, and "Crag" Rocks). Records from 1989 were no longer available to separate counts for these different sites.[258]

Population declines have occurred since 1975 (Table WV-210). Leach's Storm-Petrels, Pelagic Cormorants, and Tufted Puffins abandoned the colony by 1988, and Glaucous-winged Gull numbers have decreased.

We found Leach's Storm-Petrels nesting on almost all grassy slopes and in the middle of the main islet in 1975 (Figure 420). About 5-10 burrows were found in grassy areas on the west rock. Incubating birds were found in 13 burrows explored, including one on the west rock. In 1982, Gary Kaiser and Doug Bertram found burrows on the main islet. We saw no sign of current nesting in 1988; two possible old burrows and four old Leach's Storm-Petrel wings were found.

Figure 420. Charlie Guiguet (left) with a Leach's Storm-Petrel egg pulled from a burrow in grassy habitat on Moos Islet in 1975. Bruce Ford is watching. *Photo by R. Wayne Campbell, 24 June 1975.*

Tufted Puffins were nesting in rock crevices on the south end of the main islet in 1975. Two nests with eggs were located. No puffins have been observed since.

One Pelagic Cormorant nest was found in 1975 on the west side of the main islet (Figure 421). One adult was present. The nest was empty, and none have been seen since.

Black Oystercatchers were nesting in similar numbers in 1988 as in 1975 (Figure 422) and they do not seem to have suffered declines like other species. Nests have been found only on the west (11 in 1975; 8 in 1988) and north (8 in 1975; 9 in 1988) rocks. Contents of seven oystercatcher nests were reported in 1982; all contained eggs.

Figure 421. A single Pelagic Cormorant nest was located on this vertical cliff (left side of photo) on Moos Islet in 1975. *Photo by R. Wayne Campbell, 24 June 1975.*

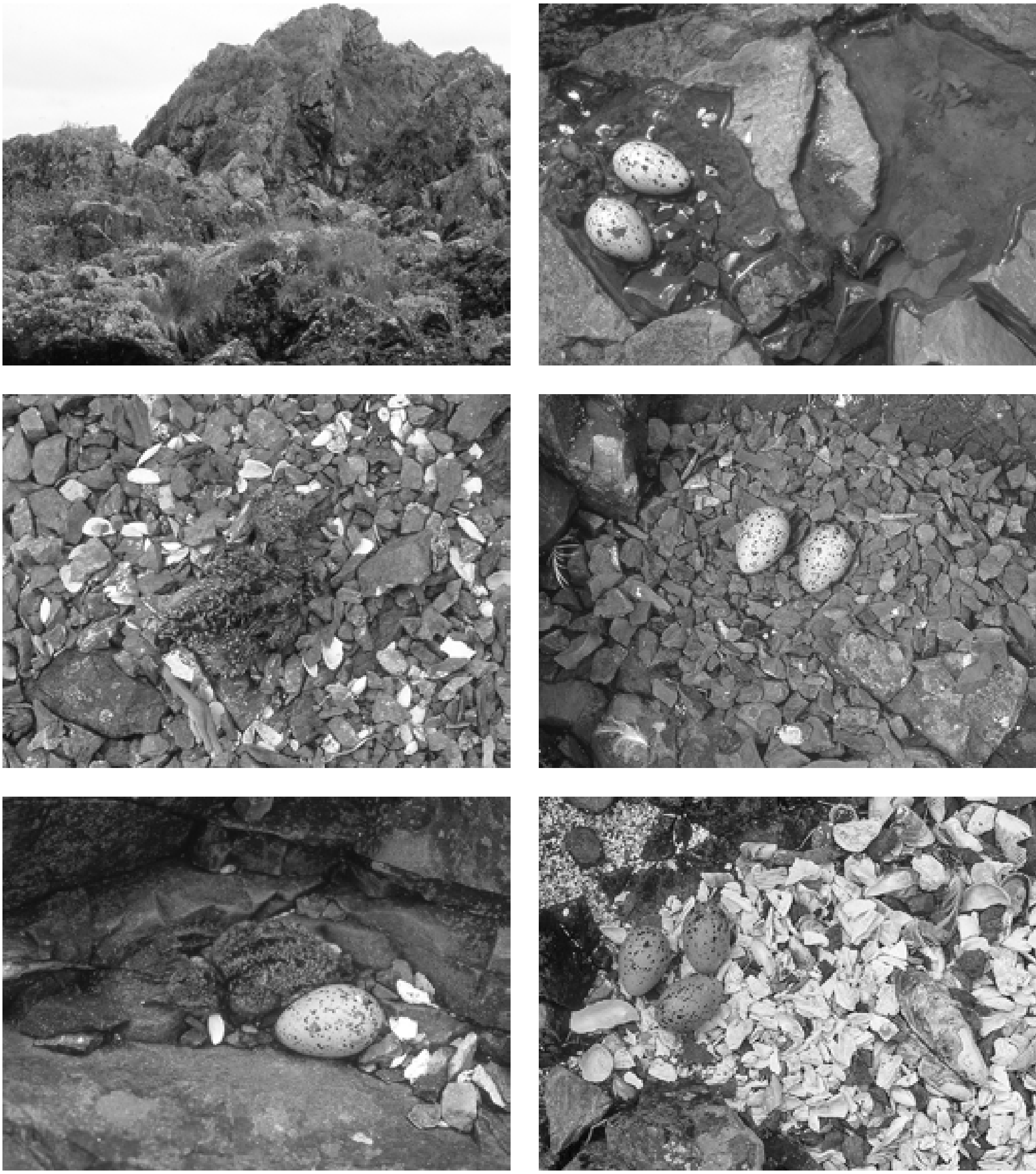


Figure 422. Nineteen Black Oystercatcher nests were found on Moos Islet in 1975. Ten nests contained eggs or newly hatched chicks. Some nest scrapes were bare rock, some were a bed of rock pebbles, and a few were adorned with mussel and barnacle shells. Shown here (clockwise from top left): typical habitat in rocky terrain with scant herbs and grasses; eggs on bare rock; eggs on rock chips; eggs on a scrape of barnacles and mussels; a newly hatched chick and egg; and a chick that died of unknown causes. *Photos by R. Wayne Campbell, 24 June 1975.*

Figure 423. Glaucous-winged Gull nesting location on Moos Islet in 1975. *Photo by R. Wayne Campbell, 24 June 1975.*

Numbers have decreased and the distribution of Glaucous-winged Gull nests has changed since 1975. In 1975, nests were located on the main islet (87 nests) and on the west (116 nests) and north (118 nests) rocks (Figure 423). In 1982, nests were only reported on the west (102 nests) and north (119 nests) rocks. In 1988, except for three nests at the southwest end of the main islet, we again found most nests on the west (45 nests) and north (100 nests) rocks. Most of the decline has thus occurred on the main islet.

It is possible that there has been some re-distribution of gull populations among the cluster of colonies from Moos Islet to Munsie Rocks. Between 1975 and 1988 there were declines on Moos Islet and Munsie Rocks, increases on Thornton Islands and "Crag" Rocks, and little change on "Mimulus" Islets. Total numbers of gull nests at these five colonies were 1,311 in 1975 and 1,526 in 1988, representing an overall increase of 16%. Numbers at these five sites dropped dramatically to 721 nests in 1989.

Six Pigeon Guillemot nests with eggs were found under boulders in 1975 (Figure 424). Nests were found on the main islet and on the west and north rocks.

Figure 424. This unusually large clutch of Pigeon Guillemot eggs was exposed at the entrance of a cavity under large boulders on Moos Islet in 1975. *Photo by R. Wayne Campbell, 24 June 1975.*

Table WV-210. Seabird nesting records for Moos Islet. See Appendix 2 for codes.

DATE	LSPE	PECO	BLOY	GWGU	PIGU	TUPU	SOURCE
24 Jun 1975	1,000e	1[0]	19[10]	321[306]	25e(16)	10e(4)	32, 265
22 Jun 1982			16	221[210]	(24)		265
24 Jul 1982	220						265
15 Jul 1988	E	0	17[11]	148[144]	S(5)	(0)	181
Jun-Jul 1989		0[a]		79[a]	S(3)		84, 238, 258

[a] May include counts from "Mimulus" Islets and "Crag" Rocks; see text.

Remarks: We suspected that river otters were preying on storm-petrels and may have been responsible for population declines since 1975. Hundreds of pairs of Leach's Storm-Petrel wings were encountered in 1975, and 39 pairs plus 19 single wings were counted in 1982. Heavy river otter predation may also explain why puffins were nesting in rock crevices and not burrows in 1975.

Most Glaucous-winged Gull nests contained eggs or young in all years between 1975 and 1988 and there were relatively few signs of predation on gulls. No evidence of predation was reported in 1975, three depredated gull eggs were found in 1982, and three dead chicks and two broken eggs were seen in 1988. We also found two dead oystercatcher chicks in 1988. If river otters were responsible, it appears that they mainly discouraged gulls from nesting on the main islet and their impacts were less on the offshore rocks. That may explain why oystercatcher numbers did not decrease the way that gull numbers did, since oystercatchers were found nesting only on the west and north rocks in 1975 and have never been recorded on the main islet.

There was one Bald Eagle nest in 1975 and 1988.

WV-220 THORNTON ISLANDS

Location: *49°58'05"N 127°20'36"W; 92 E/14.* Southwest of Union Island, southwest of Moos Islet. Colony includes the rock to the south.

Figure 425. Thornton Islands was named after the sailing vessel MV *Thornton*. The sloop was built in 1861 and was one of the earliest sailing boats on the west coast of Vancouver Island. It was owned by Captain James Warren who became involved in British Columbia's sealing and steamship industry. The Thornton Islands archipelago contains about 17 interconnected islands and rocks. The larger islands are forested with grasses and herbaceous plants and smaller islets are bare, with scant vegetation. Photos show (this page and clockwise from top left on next page) **1)** distant view of Thornton Islands; **2)** main island with forest, rocky shores, steep cliffs, and patches of shrubs and grasses; **3)** Sitka spruce that can grow to a very large size even on relatively small islands; **4)** rocky crevices on one of the smaller islets; **5)** looking northwards from the main Thornton Island across the connecting beach to the small northern islets; and **6)** bare rocks on one of the west islets. *Photos by R. Wayne Campbell, 24 June 1975 (1, 2, 4, 6) and Moira J.F. Lemon, 13 July 1988 (3, 5).*

Description: *8.9 ha; 38 m high; Forested; Bare rock.* Thornton Islands are composed of round-topped, steep-sided, granitic rock cut by many crevices and cliffs. The southern peninsula of the main island, and most areas on the north and west islets are bare rock, with few pockets of herbaceous vegetation. Beach and tidal rock join the closer, northern islets to the main island. The higher portion of the main island has intersecting, forested valleys running between rocky domes, forming a cross-like pattern. Tops and outer faces of these domes are primarily bare, or have scant vegetation over shallow soil, while interior facing slopes are covered with thick salal. Most of the east-west running valley is wet and supports an extensive bed of sedge (*Carex* spp.) and salmonberry. There is an open, drier area of grass, false lily-of-the-valley, and montia in the southern facing valley (Figure 425).

In 1988, a small cabin was found perched on the north corner of the main island (Figure 426).

Figure 426. A small cabin was found nestled at the edge of the forest on Thornton Island in 1988. *Photo by Moira J.F. Lemon, 13 July 1988.*

Historical summary: The islands were completely explored by BCPM crews in 1975 and by CWS crews 1988. Partial surveys led by Gary Kaiser were conducted by CWS in 1982 and 1983. Only the rocks north of the main island were visited in June 1982 and the storm-petrel colony on the main island was surveyed in July 1982. The rock offshore to the southeast probably gets splashed by waves and only roosting birds have been observed there.

Storm-Petrels have been found nesting only in the vegetated areas on the main island (Table WV-220). Surveyors in 1975 suspected nesting by Fork-tailed Storm-Petrel from a pair of wings found (Figure 427). Breeding was confirmed in 1982 by two downy young found in burrows. We heard this species calling at night in 1988, but no further evidence of nesting was obtained. There are likely a few Fork-tailed Storm-Petrels still nesting. Nine Leach's Storm-Petrels on eggs were found in 14 burrows explored in 1975; incubating adults were also found in 1982 and 1988. The colony was sampled with one transect in 1982 and 1988. The burrow density estimate in 1988 was less than half of that in 1982 and the nesting population of Leach's Storm-Petrels may have declined over that period.

Figure 427. Bruce Ford checking for storm-petrel burrows in grassy habitat on the Thornton Islands in 1975. *Photo by R. Wayne Campbell, 24 June 1975.*

Pelagic Cormorant and Glaucous-winged Gull numbers increased between 1975 and 1988 but decreased between 1988 and 1989. Cormorants were nesting in two areas in 1975 and 1988: the crevice that cuts the south rocks from the main island (22 nests in 1975 [Figure 428]; 45 in 1988); and on cliffs around the west rocks (40 in 1975; 80 in 1988). Of nests that could be inspected, 14 of 36 contained eggs in 1975 and 29 of 36 contained eggs or young in 1988. Cormorants were found nesting on the north rocks in 1982 (other areas were not visited that year). Contents were determined for all nests there and almost all contained eggs. Cormorants were not reported nesting on the north rocks in other years.

Figure 428. Twenty-two Pelagic Cormorant nests were counted in the rock crevice between the south rocks and the main island of the Thornton Islands in 1975. Note nests with eggs in lower right corner. *Photo by R. Wayne Campbell, 24 June 1975.*

Glaucous-winged Gulls have been found nesting in most rocky areas (Figure 429). Numbers nesting were over 50% higher in 1988 than in 1975, but were lower in 1989 than 1975, as was the case for Pelagic Cormorants. Nests were tallied separately in 1975 and 1988 for five areas: 1) south end of the main island to the gorge; 2) rock south of the gorge; 3) rocks west of the main island; 4) rocks north of the main island; and 5) offshore rocks to the north. The distribution of nests changed somewhat between 1975 and 1988. We counted 43, 353, 112, 139, and 40 nests in 1975, and 478, 89, 260, 154, and 72 nests in 1988 in those five areas, respectively. Proportionately more nests were found on the main island in 1988 than 1975.

Figure 429. Glaucous-winged Gull nesting habitat on the Thornton Islands. *Photos by R. Wayne Campbell, 24 June 1975.*

Black Oystercatchers have also been found nesting in most rocky areas as well as in upper beach habitat. Fewer Black Oystercatcher nests were found in 1988 than 1975 but many nests seen in 1975 were empty and some may have represented multiple nests by individual pairs. Seventeen of the empty nests were found along the upper beach of the rocks just north of the main island. Six nests with eggs or young were also found on those rocks, but only 18 adults in total were seen in that area. Numbers of nests containing eggs or young were the same in 1975 (Figure 430) and 1988.

Pigeon Guillemots have been sighted around the main island and around the west and north rocks. They were found nesting in burrows, under logs, and in crevices on the north rocks in 1975; two nests with eggs were seen. We suspected most guillemots were nesting in crevices in 1975 and 1988.

Two pairs of Tufted Puffins were recorded around the main island in 1975 and four birds were seen along the west and south rocks in 1988. No nests were found on either survey.

During our visit in 1988, approximately 200 non-breeding Brandt's Cormorants regularly roosted on the outer west rock. One immature bird was gathering nesting material. Perhaps Brandt's Cormorants will colonize this area in the future.

Table WV-220. Seabird nesting records for Thornton Islands. See Appendix 2 for codes.

DATE	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	TUPU	SOURCE
24 Jun 1975	20S	200e	62	27[8]	687[569]	25e(26)	5S(4)	32, 265
22 Jun 1982			31[29]+	1+	39[39]+	(11)		265
24 Jul 1982	x	1,600t				(4)		265
18 Jun 1983				7[7]+	295[110]+			265
13-15 Jul 1988	S	700t	125	13[8]	1,053[1,026]	x(19)	S(4)	181
Jun-Jul 1989			39		523	S(9)		84, 238, 258

Remarks: Many Leach's Storm-Petrel wings were found in 1975, and in 1982, the density of wings observed on the colony was estimated to be almost half the density of burrows. There were river otter runs throughout colony areas in both years and river otters may have been responsible for much of the predation seen, although no dug-up burrows, which are often associated with heavy river otter predation, were reported. We saw little evidence of predation on storm-petrels in 1988. There was one Bald Eagle nest with two young in 1982. Two apparently inactive eagle nests were seen in 1988, although a pair Common Ravens was frequently sighted in the vicinity and we speculated that they may have been using one of the nests.

Northwestern Crows (Figure 431) were preying on cormorant eggs in 1988. We found 39 cormorant eggshells under salmonberry bushes where crows were nesting.

Figure 430. Twenty-seven Black Oystercatcher nests were found on Thornton Island in 1975, but only eight held eggs or young. Shown here (clockwise from top left): typical nesting habitat in rock crevices, fissures, and on bare rock; eggs on rock chips; eggs on mussel shells; and two newly hatched chicks. *Photos by R. Wayne Campbell, 24 June 1975.*

Figure 431. Northwestern Crows are common birds along the BC coast. They do not occur on all seabird islands and may be absent especially from small islands and rocks and from areas where Common Ravens are nesting. They regularly occur around Pelagic Cormorant colonies and are quick to exploit any opportunity to prey on cormorant eggs. *Photo by R. Wayne Campbell.*

Torrential rains and gale-force winds on 12 and 13 July 1988 likely damaged gull nests and caused some mortality of chicks. We found 13 dead gull chicks and one dead oystercatcher chick when we counted nests on 13 and 14 July. Gulls were busy refurbishing nests after the storm and many nests already containing chicks looked freshly built.

WV-230 "MIMULUS" ISLETS

Location: *49°57'47"N 127°19'23"W; 92 E/14.*
East of Thornton Island, south of Moos Islet.

Description: *9 m high; Bare rock.*
These islets are bare, dissected rocks, with few forbs growing in cracks (Figure 432). Observers in 1975 noted patches of yellow monkey-flower (*Mimulus gullatus*), but no trace of this forb was found in 1988.

Historical summary: As noted in the Moos Islet (WV-210) account above, we suspect that "Mimulus" Islets were surveyed by Vermeer et al.[238] in 1989 and the results included with Moos Islet. Records from 1989 were no longer available to separate counts for "Mimulus" Islets.[258]

No Pelagic Cormorants have been recorded around these rocks but we thought that one nest on a cliff ledge that was being used by Glaucous-winged Gulls in 1988 had likely been built by Pelagic Cormorants (see Remarks).

Black Oystercatcher nests were found on the outer three west rocks but not on the southeast rock in 1975 and 1988 (Table WV-230). More nests were found in 1975 than 1988. We suspected hidden young around one empty nest in 1988. Glaucous-winged Gulls were nesting on all higher rocks in both years.

Figure 432. "Mimulus" Islets are bare rocks with scant forbs growing in cracks. In this photo, surveyors are looking for Black Oystercatcher and Glaucous-winged Gull nests on the rocky shelves during the CWS surveys in 1988. *Photo by Moira J.F. Lemon, 17 July 1988.*

Abundance and distribution of nests was similar in the two years. We tallied 84, 37, 70, and 19 gull nests on four rocks from northwest to southeast in 1975; and 83, 118, and 21 on the northwest rock, the middle rocks, and the southeast rock, respectively in 1988 (Figure 433).

Figure 433. Three downy Glaucous-winged Gull chicks on the edge of a grassy nest on "Mimulus" Islets in 1988. *Photo by Moira J.F. Lemon, 17 July 1988.*

No Pigeon Guillemots were seen around these rocks in 1975 or 1988.

Table WV-230. Seabird nesting records for "Mimulus" Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
24 Jun 1975	12[7]	210[203]	32, 265
17 Jul 1988	5[1]	222[214]	181
Jun-Jul 1989		[a]	238

[a] Counts were likely included with Moos Islet; see text.

Remarks: In 1988, we found a dead gull chick dangling from the side of nest on a ledge that we thought may have been built by Pelagic Cormorants. The chick had got its foot tangled in a piece of surf grass (*Phyllospadix* spp.) in the nest. We also saw two other dead chicks and four depredated gull eggs in the colony.

WV-240 "CRAG" ROCKS

Location: *49°57'36"N 127°19'05"W; 92 E/14.*
West of Munsie Rocks at the entrance to Kyuquot Channel, southeast of "Mimulus" Islets.

Description: *8 m high; Bare rock.*
These are rugged, volcanic rocks with jagged pinnacles and crevices.

Historical summary: As noted in the Moos Islet (WV-210) account above, we suspect that "Crag" Rocks were surveyed by Vermeer et al.[238] in 1989 and the results included with Moos Islet. Alternatively, 1989 data from "Crag" Rocks may have been included with Munsie Rocks (see below) by Vermeer et al.[238] Records from 1989 were no longer available to separate counts for "Crag" Rocks.[258] Nests were tallied for north and south rocks in 1975 but we did not separate areas in 1988.

Pelagic Cormorants nested on the northern rock in 1975 (Table WV-240). Contents were determined in 24 nests; 12 contained eggs. In 1988, there was one Pelagic Cormorant in breeding plumage roosting, but no sign of nesting. We assume none were seen in 1989 (see above). Black Oystercatcher and Glaucous-winged Gull nests were found on north and south areas in 1975 and 1988. Adults were aggressive and we suspected hidden young around the one empty oystercatcher nest in 1988. The number of gull nests was greater in 1988 than 1975 (but see Munsie Rocks and Moos Islet). We tallied nine nests on the north rock and 12 nests on the south rock in 1975.

A group of 29 immature Brandt's Cormorants were roosting in 1988.

Table WV-240. Seabird nesting records for "Crag" Rocks. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	SOURCE
24 Jun 1975	27	3[2]	21[19]	32, 265
17 Jul 1988	0	3[2]	75[75]	181
Jun-Jul 1989	[a]		[a]	238

[a] Counts were likely included with Moos Islet or Munsie Rocks; see text.

WV-250 MUNSIE ROCKS

Location: *49°57'49"N 127°18'08"W; 92 E/14.* Southwest of White Cliff Head at the south end of Union Island.

Description: *14 m high; Bare rock.* This is a group of about six, bare, dissected rocks, with steep bluffs on the southwest rock (Figure 434).

Figure 434. Munsie Rocks are a chain of 6-7 bare rocky islets (top left). Many small rocks are exposed at low tide (top right). Most areas are bare rock with some vegetation in fissures. *Photos by R. Wayne Campbell, 24 June 1975.*

Figure 435. The steep bluffs of Munsie Rocks provide nesting habitat for Glaucous-winged Gulls, Black Oystercatchers, and Pelagic Cormorants, although cormorants have been recorded nesting only in 1975. In the foreground, the zodiac is approaching to pick up one of the surveyors on the rocks in 1988. *Photo by Moira J.F. Lemon, 17 July 1988.*

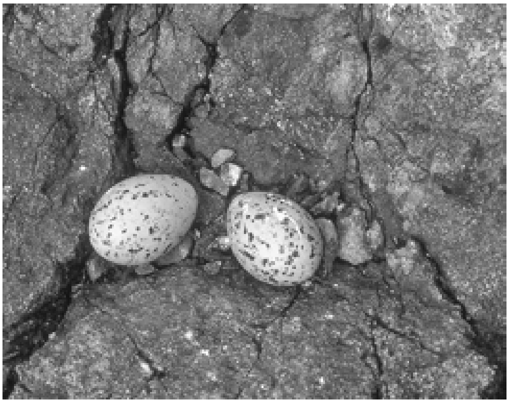
Historical summary: Records from 1975 to 1988 can be clearly assigned to this colony but estimates from 1989 may include unnamed rocks to the west that we have designated WV-230 "Mimulus" Islets and WV-240 "Crag" Rocks. Records from 1989 were no longer available to separate counts for these different sites.[258] We tallied nests separately for six rocks in 1975 but not in 1988 (Figure 435).

Pelagic Cormorants were nesting on three southeastern rocks in 1975 (Table WV-250). Most nests (62) were on the largest, southeast rock, with 11 and 18 nests on the northeast and mid-south rocks nearby (Figure 436). No sign of nesting by cormorants was observed in 1988 or 1989. Eight non-breeding birds were roosting on the southwest rock in 1988.

Black Oystercatcher nests were recorded on six different rocks in 1975 (Figure 437). Most were on the larger, middle-west rock (8 nests) and southwest rock (4 nests). Fewer oystercatcher nests were found in 1988.

Figure 436. Pelagic Cormorants were nesting on small rock ledges on the southeastern rocks of Munsie Rocks in 1975. *Photos by R. Wayne Campbell, 24 June 1975.*

Figure 437. Eighteen Black Oystercatcher nests were found on Munsie Rocks in 1975; 11 of them contained eggs or young. Nests were located in bare rocky habitat (this page) and were made of a variety of nesting materials (next page, left, top to bottom). Some nests had no accumulated nesting materials (top). One nest had rock chips with a few mussel and barnacle shells (middle), and another nest was composed of hundreds of shell fragments. *Photos by R. Wayne Campbell, 24 June 1975.*



Glaucous-winged Gull nests were tallied on five rocks in 1975 (Figure 438). Their distribution was like that of oystercatchers with most nests on the larger, middle-west rock (30 nests) and southwest rock (18 nests). The small mid-south rock had no nests and the southeast, northeast, and northwest rocks had 8, 7, and 9 nests, respectively. The change in gull numbers from 1975 to 1988 is almost exactly opposite that on nearby "Crag" Rocks. See the Moos Islet account above for an interpretation of the overall trend in gull numbers in the cluster of islands from Moos Islet to Munsie Rocks from 1975 to 1989.

Figure 438. Glaucous-winged Gulls were nesting on five of the Munsie Rocks in 1975. *Photo by R. Wayne Campbell, 24 June 1975.*

One Pigeon Guillemot nest with two eggs was found under rocks on the southeast rock in 1975.

Table WV-250. Seabird nesting records for Munsie Rocks. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
24 Jun 1975	91[23]	18[11]	72[67]	5e(6)	32, 265
17 Jul 1988	0	9[7]	28[25]	S(3)	181
Jun-Jul 1989	0[a]		119[a]	S(1)	84, 238, 258

[a] May include counts from "Mimulus" Islets and "Crag" Rocks; see text.

Remarks: We found 22 broken cormorant eggs below nesting cliffs in 1975, and one depredated oystercatcher egg and six broken gull eggs in 1988.

WV-260 NIPPLE ROCKS

Location: *49°57'08"N 127°15'44"W; 92 E/14.*
Southwest of Rugged Point at the south side of the entrance to Kyuquot Channel.

Description: *13 m high; Bare rock.*
The northern of these three jagged, volcanic rocks is the highest and has the most cliff habitat. Patches of herbaceous plants occur on higher sections (Figure 439).

Figure 439. Nipple Rocks have a serrated appearance and are mostly bare rock with scant vegetation in higher crevices. Four seabird species breed on higher parts, including large numbers of gulls. *Photo by R. Wayne Campbell, 23 June 1975.*

Historical summary: Surveyors counted nests from land in all years, except the north rock was surveyed from the water in 1982 (the two southern rocks were counted from land).

Like many other Pelagic Cormorant colonies in the area, Nipple Rocks were abandoned on the most recent surveys (Table WV-260). Cormorant nests were located on the northern (47 nests) and middle rock (3 nests) in 1975 (Figure 440). Only one nest on the northern rock contained an egg, the rest were empty. In 1982, cormorants were nesting on the southern rocks (which ones were not specified); none were seen on the main north Nipple Rock. Fewer cormorants were nesting but most nests contained eggs that year. No breeding cormorants were present in 1988 or 1989.

Figure 440. Areas of white guano on the cliffs identify locations of nesting Pelagic Cormorants on Nipple Rocks in 1975. *Photo by R. Wayne Campbell, 23 June 1975.*

Black Oystercatcher nests were found on all three rocks in 1975 (Figure 441) and 1988. Adults were defensive around the one empty nest found in 1988 and hidden young were likely present.

Figure 441. Two newly-hatched chicks and an egg in a Black Oystercatcher nest found on Nipple Rocks in 1975. *Photo by R. Wayne Campbell, 23 June 1975.*

Glaucous-winged Gulls were nesting on all three rocks (see Figure 439) but most nests were on the south (81 in 1975; 94 in 1988) and middle (35 in 1975; 39 in 1988) rocks with fewer on the north rock (6 in 1975; 16 in 1988). In 1982, 74 gull nests (69 with eggs) were counted on the two southern rocks. Eight pairs were estimated nesting on the north rock. Three Pigeon Guillemot nests with eggs were found on the north and middle rocks in 1975.

Table WV-260. Seabird nesting records for Nipple Rocks. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
23 Jun 1975	50[1]	7[3]	122[89]	5e(4)	32, 265
23 Jun 1982	28[22]		82e		265
16 Jul 1988	0	3[2]	149[147]	S(2)	181
Jun-Jul 1989	0		72	S(1)	84, 238, 258

Remarks: Almost all cormorant nests were empty and several broken eggs were found below nests in 1975. Thirty-three gull nests were also empty in 1975 and eggs may have been harvested by local First Nations people.[265] Two broken cormorant eggs and three depredated gull eggs were seen in 1982. We saw six addled gull eggs and two dead gull chicks in 1988. Observers in 1975 speculated that eagles may perch on the tallest peak, scaring cormorants from their nests, although no sign of eagles was seen.

WV-270 VOLCANIC ISLETS

Location: *49º56'36"N 127º15'44"W; 92 E/14.*
West of Kapoose Point, south of Rugged Point.

Description: *0.9 ha; 19 m high; Grassy rock; Bare rock.*

The main islet is composed of two major rocky knobs separated by a narrow gorge (Figure 442). The south knob is cliff-bound on the west, south, and east sides, while the north knob has an extensive low rocky area on the north and west sides. Higher portions are covered with grass and forbs, plus pockets of salmonberry, salal, and saskatoon berry (*Amelanchier*

Figure 442. The steep rock faces of Volcanic Islets. *Photo by R. Wayne Campbell, 23 June 1975.*

alnifolia). In 1988, patches of vegetation on the south knob had been denuded by gulls plucking nesting material, and soil along the cliff tops had been eroded by nesting cormorants. The small islet to the south is bare, jagged rock.

Historical summary: Gary Kaiser made observations from the water in 1982 and we counted cormorant nests from the water in 1988; otherwise counts were conducted from land.

Leach's Storm-Petrels were nesting on the tops of both knobs in 1975 (Figure 443) but were confined to the north knob in 1988 (Table WV-270). Many burrows were empty in 1975. Adults on eggs were found in three burrows in 1975 and one chick was pulled from a burrow in 1988. No sign of Fork-tailed Storm-Petrels was seen in either year.

Figure 443. Harry Carter searching for Leach's Storm-Petrel burrows in a patch of cow parsnip in soft soil on Volcanic Islets in 1975. *Photo by R. Wayne Campbell, 23 June 1975.*

Pelagic Cormorants were nesting on the south end of the main islet in 1975 and on the south end (64 nests) and west side (25 nests) in 1988 (Figure 444). We made a complete count from the water and also inspected 27 nests (all with eggs) from land in 1988. Adults were attending all nests. The marked increase of nesting Pelagic Cormorants between 1975 and 1988 is contrary to the trend at most other sites in the vicinity. However, all 72 nests were empty in 1989, most with unhatched or broken eggs in the vicinity.[238]

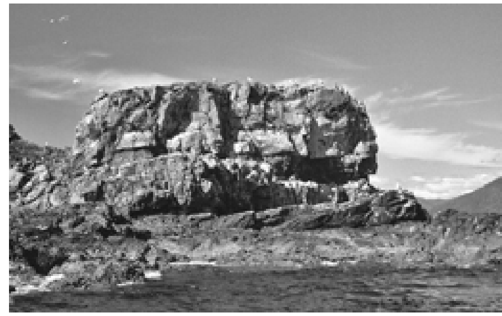


Figure 444. Pelagic Cormorants were nesting on the cliffs at the south end and west side of the main Volcanic Islet in 1988. *Photo by Moira J.F. Lemon, 16 July 1988.*

Black Oystercatchers (Figure 445) and Glaucous-winged Gulls (Figure 446) were nesting on

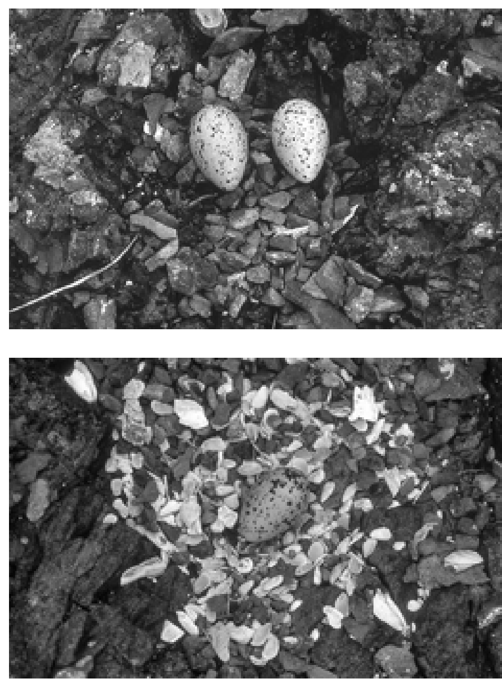


Figure 445. Two of the Black Oystercatcher nests found on Volcanic Islets in 1975: one nest scrape contained rock chips (top); eggs in the other were laid on shell fragments. *Photos by R. Wayne Campbell, 23 June 1975.*

Figure 446. West side of Volcanic Islets showing the steep shoreline rock with patches of grass and shrubs on higher sections. Glaucous-winged Gulls are circling above a nesting area. *Photo by Moira J.F. Lemon, 16 July 1988.*

both knobs of the main islet in 1975 and 1988 and on the south rock in 1988. There were two oystercatcher nests and two gull nests on the south rock in 1988; the rest were on the main islet (25 on the south knob and 109 on the north knob in 1975; we did not keep separate tallies in 1988). Many gull nests were empty in 1975. Six Pigeon Guillemot nests with eggs were found under rocks and in crevices on north and south knobs of the main islet in 1975.

Tufted Puffins were nesting in crevices on the south side of the south knob in 1975. We found one nest with an egg. In 1988, puffin nests were located on the east side of the north knob, one under a rock (with an egg) and one in a burrow (with a chick).

Remarks: In 1975, many Leach's Storm-Petrel remains were reported on the south knob, and numerous broken gull eggs and empty nests were found on the north knob. Trails and scats of river otter were observed, especially on the north knob. There was little evidence of predation in 1988; we found one dead gull chick.

Table WV-270. Seabird nesting records for Volcanic Islets. See Appendix 2 for codes.

DATE	LSPE	PECO	BLOY	GWGU	PIGU	TUPU	SOURCE
23 Jun 1975	50e	4[2]	6[4]	134[78]	20e(23)	5e(8)	32, 265
23 Jun 1982		32e			(20)	(3)	265
16 Jul 1988	50e	89	6[5]	153[146]	x(12)	2(2)	181
4 Jul 1989		72		155	S(38)		84, 238, 258

WV-280 DIVER ISLET

Location: *49°55'44"N 127°14'58"W; 92 E/14.*
North of Grassy and Clarke islands, west of Mushroom Point.

Description: *9 m high; Bare rock.*
Diver Islet is bare rock with a few tufts of grass and lichens (Figure 447).

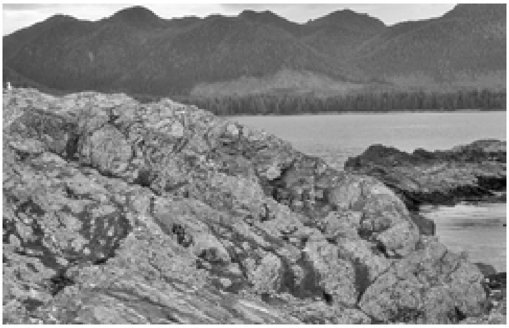


Figure 447. Diver Islet is mostly bare rock with scattered patches of grass in crevices and lichens on rocks. *Photos by R. Wayne Campbell, 23 June 1975.*

Historical summary: Black Oystercatchers (Figure 448) and Glaucous-winged Gulls nest on the islet (Table WV-280). Numbers of nesting gulls have oscillated; fewer nests were found in 1982 and 1989 than in 1975 and 1988. No evidence of Pigeon Guillemots nesting has been found. They were recorded present in 1982 but no additional information was provided. We assumed that these islets were surveyed by boat for guillemots in 1989 and no birds were seen,[84] although no records survive.[258]

Table WV-280. Seabird nesting records for Diver Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
23 Jun 1975	3[3]	27[26]	(0)	32, 265
23 Jun 1982	1	12[10]	(2)	265
16 Jul 1988	5[2]	33[33]	(0)	181
Jun-Jul 1989		11	(0)	84, 238, 258

Figure 448. Three Black Oystercatcher nests were found on Diver Islet in 1975 (left to right): an egg on rock chips with a few mussel shells; eggs on pieces of rock chips; and a chick that just hatched. *Photos by R. Wayne Campbell, 23 June 1975.*

WV-290 "CALM" ROCKS

Location: *49°55'33"N 127°14'47"W; 92 E/14.*
Between Diver Islet and Clark Island, west of Mushroom Point.

Description: *5 m high; Bare rock.*

Historical summary: Nesting success seems to have been marginal on these rocks (Table WV-290). Glaucous-winged Gull nests were empty except for a broken egg in one nest in 1975, and all Black Oystercatcher nests found in 1988 were empty, with a depredated egg beside one nest. One Pigeon Guillemot nest with two eggs was located under logs in 1975. Observations were made from the water in 1989.[258]

Table WV-290. Seabird nesting records for "Calm" Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
23 Jun 1975	4[2]	4[1]	2e(4)	32, 265
16 Jul 1988	6[1]	5[2]	S(4)	181
Jun-Jul 1989		1eS	(0)	84, 238, 258

Remarks: In addition to the broken gull and depredated oystercatcher eggs mentioned above, we also found a broken Pigeon Guillemot egg in 1975.

WV-300 GRASSY ISLAND

Location: *49°55'25"N 127°15'17"W; 92 E/14.*
West of Clark Island, west of Mushroom Point, south of Rugged Point. Colony includes all rocks that are tidally connected to the main island.

Description: *4.2 ha; 16 m high; Shrubby rock; Bare rock.*
The main vegetated island has a steep west face above high tide beach and rock (Figure 449). Beaches also occur around the east and north sides. The flattish top is covered with thick salal, salmonberry, twinberry, and other shrubs, with a small stand of spruce on the south end. Grass and forbs occur on fringes above shore rock, and, mixed with shrubs, extend over the low slopes above the east beach (Figure 450). To the west of the higher, vegetated section is an extensive complex of flat tidal rock, with many low, above-tide ridges. The rock is sedimentary with numerous outcroppings of *Buchia* fossils.

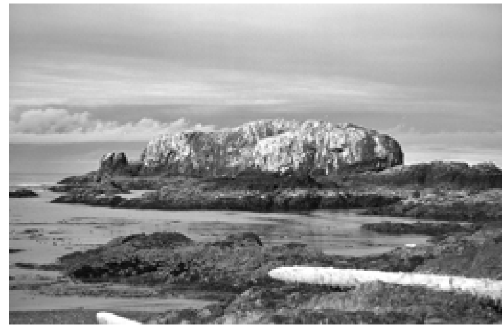


Figure 449. The steep west face of Grassy Island overlooks extensive tidal rock shelves. *Photo by Moira J.F. Lemon, 15 July 1988.*

Figure 450. Shoreline habitat of Grassy Island showing a small stand of Sitka spruce in the background. *Photo by Moira J.F. Lemon, 15 July 1988.*

Historical summary: Guiguet confirmed Glaucous-winged Gulls nesting in 1958 (Table WV-300). Numbers of nesting gulls increased from 1975 to 1988 then decreased in 1989.

Nesting attempts have been recorded but it is unknown whether storm-petrels have ever nested successfully on the island. One Leach's Storm-Petrel wing was found in 1975, but no burrows were discovered after a thorough search. One pair of adults occupied one of an estimated 25 burrows located in dirt cliffs on the north end of the island in 1982. Many of those burrows appeared unfinished in shallow soil. No evidence of nesting by storm-petrels was encountered in 1988.

Black Oystercatchers and Glaucous-winged Gulls have been found nesting mainly along the extensive rock shelves on the west side of the island. The only exceptions were in 1975, when we found four oystercatcher nests (2 with eggs) on upper beach areas at the south end of the vegetated area (Figure 451), and two empty gull nests on a headland at the south end of the island. In 1988, we found 11 oystercatcher nests with eggs or young and seven empty nests within what we judged were five territories. Hidden young were suspected around three of the empty nests. Only one Pigeon Guillemot nest has been found; one with two eggs under a rock on the west side in 1975.

Figure 451. On Grassy Island in 1975, two Black Oystercatcher nests with eggs were found on the shell beach at the edge of vegetation that included dune grass and cow parsnip. *Photo by R. Wayne Campbell, 23 June 1975.*

Doug Bertram recorded three Tufted Puffins off the island in June 1982 and we saw one off the west side in 1988. No evidence of nesting has been found, although in 1975 we noted the bases of eroded grass tussocks such as those that occur in an old, eroded puffin colony. Perhaps soil was deeper in the past and supported a few burrows. Puffins seen in 1982 and 1988 may have originated from nearby Clark Island.

Table WV-300. Seabird nesting records for Grassy Island. See Appendix 2 for codes.

DATE	LSPE	BLOY	GWGU	PIGU	SOURCE
28 Jun 1958			x		77
23 Jun 1975	0	16[6]	141[113]	10e(14)	32, 265
23 Jun 1982		5[5]	160[150]		265
22 Jul 1982	25e				181, 265
15 Jul 1988	E	16[11]	188[179]	S(23)	181
Jun-Jul 1989			73	S(1)	84, 238, 258

Remarks: One depredated oystercatcher egg was found in June 1982 and three depredated gull eggs, one dead gull chick, and one adult Glaucous-winged Gull feather pile were seen in 1988. River otter runways were evident under the shrubbery and one immature Bald Eagle was perched in a spruce tree in 1975. Nine Common Ravens were recorded in June 1982.

A Wandering Salamander (*Aneides vagrans*) was seen and photographed on Grassy Island on 23 June 1975 (BC Photo 4313),[302] the province's second offshore occurrence for the west coast of Vancouver Island (see anecdote on page 392).

WV-310 CLARK ISLAND

Location: *49°55'21"N 127°14'27"W; 92 E/14.* West of Mushroom Point across Clear Passage.

Description: *2.7 ha; 12 m high; Shrubby rock.* Clark Island has a rocky shoreline with small, high-tide beaches. Steep-sided knobs of sedimentary rock containing fossilized *Buchia* rise from the southwest

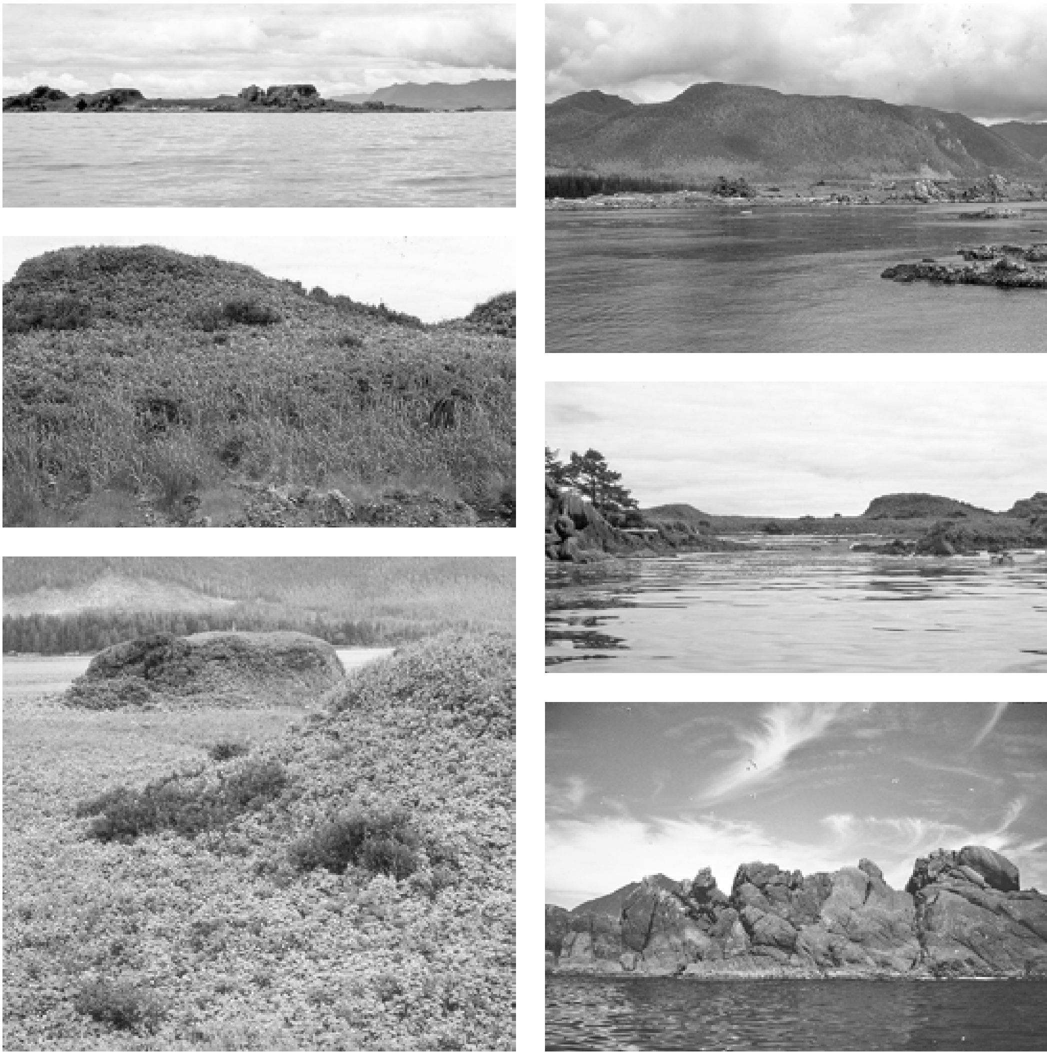


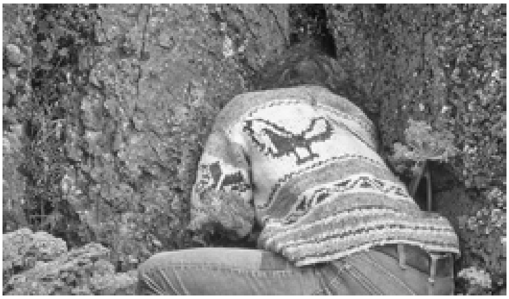
Figure 452. Clark Island, like many seabird colonies, has rocky shores, bluffs, and lush meadows with a variety of plants. Images here (clockwise from top left) show: **1)** view of the island from sea; **2)** rocky shores, drift logs, meadow vegetation, and a small grove of Sitka spruce, with Vancouver Island in the background; **3)** tidal rocks and log-littered beach; **4)** rocky bluffs that provide nesting habitat for Glaucous-winged Gulls and Pigeon Guillemots; **5)** stunted salmonberry shrubs; and **6)** upper shore grasses (foreground) and salmonberry shrubs in flower. *Photos by R. Wayne Campbell, 23 June 1975 (1, 2, 3, 5, 6) and Moira J.F. Lemon, 16 July 1988 (4).*

corner, and flat-topped, grassy knolls project from lower beaches on the south side. The lower northern end is covered with thimbleberry, twinberrry, salal, and other shrubs. Dune grass, reedgrass, and other grasses and forbs grow through a central meadow and around the perimeter. There are a couple of spruce trees near the north end (Figure 452).

Historical summary: Guiguet in 1958 confirmed nesting by most species known to nest on the island, although he provided no estimates of the numbers of nesting birds at that time (Table WV-310). Pelagic Cormorants have not been observed nesting since. Four non-breeding cormorants were roosting in 1975 and one was roosting in 1988.

In 1975, all Black Oystercatcher nests were located around the island along upper beach areas close to vegetation and drift logs (Figure 453) and all Glaucous-winged Gull nests were on rocky promontories at the southeast end of the island. In 1988, oystercatcher nests were again on high tide beaches around the island but gulls were nesting sporadically on perimeter rocky areas around more of the island than in 1975. Four empty oystercatcher nests were found in 1988 but two of them were close together and probably represented one territory. Four Pigeon Guillemot nests with eggs were found in rock crevices on the southwest corner in 1975. Guillemots were attending rocks at the southwest and southeast corners in 1988. Two nests were found in crevices and one was located under a rock.

A few pairs of Tufted Puffins were nesting in crevices and burrows on the southwest corner of the island in 1958, 1975, and 1988. Of the seven nests found in 1975, six were in crevices (Figure 454) and one was in a short (0.5 m) burrow. All nests found contained eggs: five were being incubated by an adult and two were broken with no adult present. In one unusual case, two adults were incubating side by side in the same crevice so that they were touching each other. We suspected all puffins were nesting in crevices in 1988; we saw one obvious nest entrance in one crevice but could not reach the end.



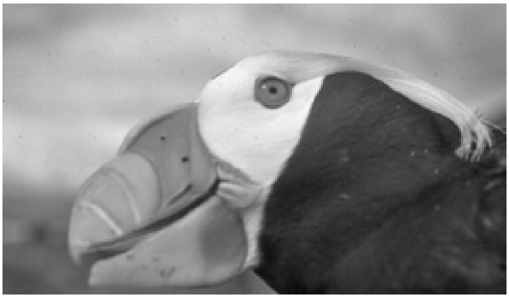


Figure 454. Seven Tufted Puffin nests were found on Clark Island in 1975; six in rock crevices and one in a burrow. Photos here show Harry Carter searching a narrow crevice for nests (top) and holding an adult puffin. *Photos by R. Wayne Campbell, 23 June 1975.*

Figure 453. All of the Black Oystercatcher nests found on Clark Island in 1975 were scattered in the upper beach areas. Three of the oystercatcher nests (left to right) had: eggs on pebbles with pieces of barnacles; eggs on barnacle chips; and eggs on a loose assortment of barnacle fragments. *Photos by R. Wayne Campbell, 23 June 1975.*

Table WV-310. Seabird nesting records for Clark Island. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	TUPU	SOURCE
28 Jun 1958	x		x	x	x	77
23 Jun 1975	0	9[6]	13[7]	10e	7(5)	32, 265
16 Jul 1988	0	5[2]	16[16]	x3(29)	S(5)	181
Jun-Jul 1989	0		7	S(8)		84, 238, 258

Remarks: There were river otter runs and scats throughout the island in 1975. One gull egg in a nest was broken in 1975 and three Pigeon Guillemot eggs were found broken in one crevice nest in 1988.

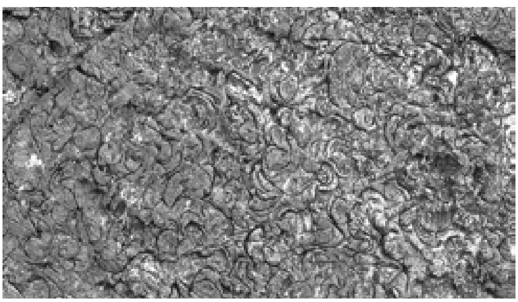
WV-320 McQUARRIE ISLETS

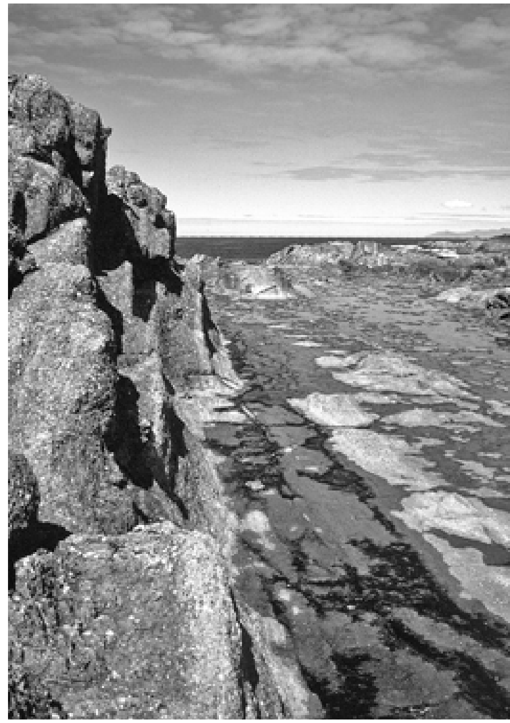
Location: *49°54'05"N 127°13'30"W; 92 E/14.* Southern end of the Barrier Islands and Clear Passage, west of Gregoire Point.

Description: *5.1 ha; 12 m high; Bare rock.* These islets are formed by an extensive, low, sedimentary rock shelf with many protrusions, knobs, and ridges. Ridges are highest, steepest, and most dissected at the south end. *Buchia* fossils are abundant on the southern ridges (Figure 455).

Historical summary: Thorough surveys were conducted in 1975 and 1988. Only a partial count of Glaucous-winged Gull nests at the south tip of the island was conducted in 1982. Observations were made from the water in 1989.[258]

Figure 455. McQuarrie Islets are a long chain of low islets (top). Other photos show (this page): extensive rocky shelves and tidal channels (left) and higher rocks with scant vegetation; and (next page) jagged rock terrain (top left); fossils of *Buchia*, a marine bivalve (bottom left); and steep rock rising from low, tidal shelves. *Photos by R. Wayne Campbell, 23 June 1975 and Moira J.F. Lemon, 16 July 1988 (next page, right).*





Not present in 1975, Pelagic Cormorants were recorded nesting for the first time in 1988 but were absent again in 1989 (Table WV-320). In 1988, two nests with eggs were located on steep rock faces at the south end of the islet. Four adults in breeding plumage were present.

More Black Oystercatcher nests were found in 1975 than 1988 but in both years most of the oystercatcher nests were empty. Numbers of nests with eggs or young were the same in the two years (Figure 456), although hidden chicks were suspected around two empty nests in 1988.

Numbers of Glaucous-winged Gulls nesting decreased somewhat between 1975 and 1988 (Figure 457) and then decreased dramatically in 1989. Nine of 10 gull nests inspected in 1982 contained eggs.

Figure 456. Most identified Black Oystercatcher nests on McQuarrie Islets were empty in 1975 and 1988. Nests found included (left to right): an empty nest scrape of gathered rock chips in 1975; two eggs laid on a few pieces of rock chips and shell fragments in 1975; and a chick and an egg in a nest of rock chips in 1988. *Photos by R. Wayne Campbell, 23 June 1975 and Moira J.F. Lemon, 16 July 1988 (right).*

Figure 457. In 1975 and 1988, most Glaucous-winged Gull nests on McQuarrie Islets were composed entirely of marine algae. Examples included (left to right): a nest made entirely of rockweeds (*Fucus gardneri*), a brown algae, in 1975; a nest built using rockweed, sea lettuce (*Ulva lactuca*), surf grass (*Phyllospadix torreyi*), and Turkish towel (*Chondracanthus exasperatus*) in 1975; and a large nest made of a copious pile of seaweeds in 1988. *Photos by R. Wayne Campbell, 23 June 1975 and Moira J.F. Lemon, 16 July 1988 (right).*

Table WV-320. Seabird nesting records for McQuarrie Islets. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	TUPU	SOURCE
23 Jun 1975	0	62[17]	256[231]	10e	1	32, 265
23 Jun 1982			25+			265
16 Jul 1988	2	37[17]	203[198]	x3(18)	0	181
Jun-Jul 1989	0		62eS	S(5)		84, 238, 258

Pigeon Guillemot nests were found under boulders in 1975 (6 nests with eggs or young were found) and 1988.

One pair of Tufted Puffins was found nesting in a crevice at the southeast end of the islet in 1975. The egg was being incubated (Figure 458). We saw no sign of puffins in 1988.

Remarks: Several broken and depredated gull eggs were found in 1975 (Figure 459). In 1988, two oystercatcher nests contained depredated eggs, and we found one broken oystercatcher egg and two dead oystercatcher chicks outside nests. We also saw eight addled gull eggs, six broken gull eggs, and 10 dead gull chicks in 1988. No predators were seen in 1988. One adult Bald Eagle was perched on the island and river otter scats containing fish were noted in 1975.

Figure 458. A Tufted Puffin incubating an egg was found in a shallow rock crevice on McQuarrie Islets in 1975. *Photos by R. Wayne Campbell, 23 June 1975.*

Figure 459. Based on the size and shape of the puncture, this Glaucous-winged Gull egg found on McQuarrie Islets in 1975 was preyed on by a Northwestern Crow. *Photo by R. Wayne Campbell, 23 June 1975.*

First Flight

For most birds there are two dramatic events that mark the path to independence. The first is when the chick is freed from the constraints of its eggshell and gains a small measure of mobility and control. The second is the first flight. For most seabird youngsters, and birds in general, attaining flight represents a giant leap forward in the control of their own destinies. As a seabird biologist, it was a great thrill to witness an individual's first flight. I watched on occasion, with my spine tingling, when a young gull that we had been observing daily from bumbling beginnings, stretched its wings into the wind, and for the first time sailed aloft, 20 to 30 feet above ground, like a kite on a short string, then settled again to beg for food from its parents.

*The first flight of a puffin chick is even more dramatic because it represents a permanent departure from its parents and from the burrow that has, up until then, been its home. It is also a more unique observation because it happens at night. Puffin fledglings, like adults, are limited by their short alcid wings and have difficulty taking off from level surfaces – they require a good deal of lift to become airborne. If they are not departing from burrows on steep slopes, they usually make their way to the edge of the colony from where they can obtain some lift in the drop to the ocean below. On Great Island, Newfoundland, where Michael and I studied seabirds, including Atlantic Puffins (*Figure 460*), for two summers,*[172, 179] *we witnessed several such events. During the fledging season at night, we would sometimes hear the rustlings and bumping of a puffin fledgling against our cabin, as it was trying to make its way to the sea. We would go outside and free the chick from the cabin or other obstacle, escort it safely to the edge of the cliffs, then watch as it made its first flight into the unknown. The young puffins would leap from the edge, and with wings frantically beating, arc downwards gradually, landing about 100 m or so offshore. This was the typical fledging event. However, the first fight of one very special puffin chick was spectacularly different!*

One day, Michael returned from his study plots on the other side of the island carrying an intriguing package. Inside was a beautiful, healthy puffin chick. It had rolled down the slope almost to Michael's feet as he walked home along the trail – the little guy's curiosity must have gotten the better of him, luring him to the opening of his burrow from where a gull had grabbed him. The little puffin, that we named Carlos, was a good size, but not yet ready to fledge. Michael knew from his work in his study plots what the wing size of a fledgling normally was (145 mm [180]*), and Carlos's wings were about 10 mm short. We decided to look after him until he was ready to fledge and then release him. However, we were concerned over the possible risk of imprinting, so were careful to avoid any direct interactions.*

We kept Carlos in a box, simulating burrow conditions, and fed him by just opening one flap enough to push in fish. We obtained fish in a variety of ways; for example, Michael sometimes found a fish left in a study burrow by a parent whose chick had fledged in the night, or sometimes fish were dropped on the slope by a puffin harassed in the air by a kleptoparasitic gull. Each day Carlos was weighed and measured, just like the puffin chicks in Michael's study plots, so we could track his growth. Here too we were careful to not let him see us, transferring him to a cloth bag inside the box, then after weighing him, pulling just one wing carefully out of the bag for measuring. Carlos sat quietly in his "box burrow" during the day, just waiting for fish to appear. But each evening, when puffin chicks sometimes venture out of their burrows to exercise their wings, we would turn the box gently onto its side and open the flaps. Shortly thereafter, Carlos would slowly emerge and step into the darkness of our research cabin. Then a whirring began as though a fan was turned on. Carlos began to beat his little wings, pumping with such ardor that his feet hovered just slightly above the cabin floor, and this way he slowly turned and shifted, moving gradually around in the small cabin like a little hovercraft. We sat quietly in the darkness nearby and watched with delight.*

Carlos grew slowly but steadily and one evening after he had been with us for seven days, he seemed restless in his box. Normally he sat quietly until we turned his box and opened the flaps, at which time he would cautiously emerge. But tonight was different; we could hear him shuffling about inside the box as though he was no longer content to sit and wait. It had worried us a little how we would know when the time was right to release him, but he made it clear: we knew his wings had attained sufficient size and he was ready. Once the darkness was complete, we carried him in his box to a spot along the edge of the cliffs where an onshore breeze was blowing. This would help him to begin his journey into the open ocean, where he would spend the next several years of his life. We put the box down and turned it on its side, opening the flaps, as we had on all the evenings before in our cabin. We expected that he would emerge, shuffle over to the edge of the cliff, then descend gradually to the ocean below, as we had seen other puffin chicks do before him. What happened next was astonishing: he stood for a moment in the moonlight, turning his head this way and that to take in his surroundings, then stretched out his wings, began the whirr that we had seen in the cabin at night, and lifted straight up into the air! Like a rocket ship heading for the moon he went ever upwards, on sound, strong wings, until he disappeared from view. For Michael and I the moment was pure magic - our spirits soared with him into the sky that moonlit night, borne aloft by our exhilaration.

Given that puffins do not begin to breed until about five years old and are long-lived, it is possible that after 25 years, Carlos still returns to the shores of Great Island each summer. We also believe that, based on his exceptional first flight, he has many descendants that also return each year to the slopes of that magical island.

(contributed by Heidi Regehr)

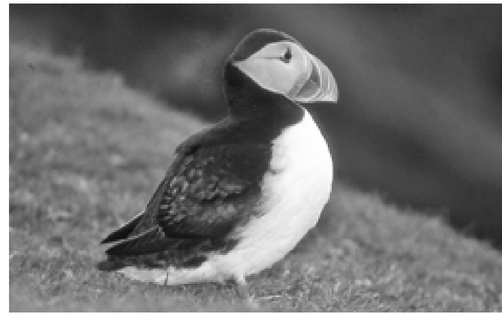


Figure 460. The estimated world population of Atlantic Puffins is about 5.8 million of which at least 350,000 pairs breed in North America, most in eastern Canada.[336] The similar-looking Horned Puffin is found only in the north Pacific Ocean. *Photo by R. Wayne Campbell.*

WV-326 HIGH ROCKS

Location: *49°50'47"N 127°07'02"W; 92 E/14.*
West of Catala Island at entrance to Esperanza Inlet, south of Yellow Bluff.

Description: *15 m high; Grassy rock; Bare rock.*
Most areas are bare rock. The highest knoll is covered with grass and forbs and has enough soil for burrows.

Historical summary: A Black Oystercatcher nest with two eggs was found on the highest knoll in 1975 (Figure 461; Table WV-326). There were also two burrows that we could not reach the ends of, with fresh feces around the entrances. We suspected that they were Pigeon Guillemot burrows, but no birds were seen.

Figure 461. A pair of Black Oystercatchers nested on the highest point of High Rocks in 1975. *Photo by R. Wayne Campbell, 22 June 1975.*

Table WV-326. Seabird nesting records (nests) for High Rocks.

DATE	BLOY	SOURCE
22 Jun 1975	1	259

WV-330 WHITE ROCK

Location: *49°51'01"N 127°04'37"W; 92 E/14.* Northwest of Catala Island at entrance to Esperanza Inlet.

Description: *9 m high; Bare rock.*
White Rock is within Catala Island Marine Provincial Park established in 1995.

Historical summary: One Black Oystercatcher nest with two eggs was found in 1975 (Figure 462; Table WV-330). We have no other records for this colony.

Figure 462. Black Oystercatcher eggs in a nest of barnacle and mussel shells found on White Rock in 1975. *Photo by R. Wayne Campbell, 22 June 1975.*

Table WV-330. Seabird nesting records (nests) for White Rock.

DATE	BLOY	SOURCE
22 Jun 1975	1	265

WV-340 ENSANADA ISLET

Location: *49°47'16"N 126°57'43"W* (main islet)*; 49°47'29"N 126°58'38"W* (northwest rock)*; 92 E/15.* West of Port Langford, north side of entrance to Nuchatlitz Inlet. Colony includes the rock to the northwest.

Description: *3.3 ha; 15 m high; Forested; Bare rock.* Ensanada Islet has a wooded top and rocky shores. The northwest rock is bare (Figure 463). The islet lies within Nuchatlitz Provincial Park established in 1996.

Figure 463. Habitats on Ensanada Islet include (this page): a few tall Sitka spruce trees and steep rocky shores (top) and rocky outcrops, grasses, and regenerating spruce in perimeter areas; and (next page, left) bare rock (top); and shrub cover of salal, an evergreen plant that keeps its leaves year-round, that was in blossom when the islet was surveyed in 1975. *Photos by R. Wayne Campbell, 22 June 1975.*

Figure 464. A Bald Eagle nest saddled on branches (centre) about 15 m up in a tall Sitka spruce tree was seen on Ensanada Islet in 1975. *Photo by R. Wayne Campbell, 22 June 1975.*

Historical summary: A Black Oystercatcher nest with two eggs and an empty Glaucous-winged Gull nest were located on the northwest rock, and one Pigeon Guillemot nest with two eggs was found in a crevice on the main islet in 1975 (Table WV-340). Observations were made from the water in 1989.[258]

Table WV-340. Seabird nesting records for Ensanada Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
22 Jun 1975	1	1S	5e(6)	32, 265
Jun-Jul 1989		0	S(10)	84, 238

Remarks: A Bald Eagle nest (Figure 464) and a Northwestern Crow nest were seen in 1975. Mink tracks were observed on the larger island northwest of Ensanada Islet in 1975.

WV-350 CAMERON ROCKS

Location: *49°46'41"N 126°55'20"W; 92 E/15.* Mouth of Nuchatlitz Inlet, northwest of Fitz Island. Known as Bare Island prior to 1946. The name was changed to Cameron Island in 1946 and then to Cameron Rocks in 1959.

Description: *0.2 ha; 8 m high; Bare rock* (Figure 465).

Historical summary: Four adult Black Oystercatchers were present but only one nest with three eggs was found in 1975 (Table WV-350). We have no other records for this colony.

Table WV-350. Seabird nesting records (nests) for Cameron Rocks.

DATE	BLOY	SOURCE
22 Jun 1975	1	265

Figure 465. Cameron Rocks is a series of low rocky islets without vegetation. *Photo by R. Wayne Campbell, 22 June 1975.*

WV-360 JUSTICE ROCK

Location: *49°46'08"N 126°55'46"W; 92 E/15.*
Mouth of Nuchatlitz Inlet, west of Fitz Island.

Description: *0.1 ha; 5 m high; Bare rock* (Figure 466).

Figure 466. Justice Rock is a low, bare rock. *Photos by R. Wayne Campbell, 22 June 1975.*

Historical summary: We found two Black Oystercatcher nests with eggs in 1975 (Figure 467; Table WV-360). We have no other records for this colony.

Figure 467. Black Oystercatcher nest with three eggs (lower left) on bare rock found on Justice Rock in 1975. *Photo by R. Wayne Campbell, 22 June 1975.*

Table WV-360. Seabird nesting records for Justice Rock. See Appendix 2 for codes.

DATE	BLOY	SOURCE
22 Jun 1975	2[2]	265

WV-370 "KANIM" COAST

Location: *49°23'30"N 126°20'34"W to 49°21'10"N 126°17'11"W; 92 E/8.*
Vancouver Island coastline between Kanim Lake and Barney Rocks, west of Hotsprings Cove.

Description: *Caves; Cliffs; Bare rock.*
This coastline is within Maquinna Marine Provincial Park established in 1955.

Historical summary: In 1982, Harry Carter located Pelagic Cormorant nests in two caves (18+ and 6+ nests each) along this stretch of coastline (Table WV-370). Nest contents could not be determined. He also counted Pigeon Guillemots flying out of two caves (10 and 15 birds each) and from two cliffs (5 and 3 birds each) and saw 16 guillemots on one rock along this shore. We have no other records for this colony.

Table WV-370. Seabird nesting records for "Kanim" Coast. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
16 Jun 1982	24+	S(49)	181, 265

WV-374 KUTCOUS ISLETS

Location: *49°14'46"N 126°04'31"W; 92 E/1.*
Off Kutcous Point at the south end of Flores Island.

Description: *1.4 ha; 5 m high; Bare rock.*
These islets are part of Flores Island Provincial Park established in 1995.

Historical summary: Two empty Black Oystercatcher scrapes and one empty Glaucous-winged Gull nest start were found in 1975 (Table WV-374). Six oystercatchers and one gull were present. In 1989, observers landed on the islets and recorded two pairs of oystercatchers nesting, but surviving notes were inadequate to determine whether nesting was confirmed.[258]

Table WV-374. Seabird nesting records for Kutcous Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
13 Aug 1975	2S	1S	(0)	32, 265
Jun-Jul 1989	2S	0	S(1)	84, 236, 238, 258

WV-376 TIBBS ISLET

Location: *49°13'46"N 126°06'31"W; 92 E/1.*
Northwest of Bartlett Island at the mouth of Russell Channel.

Description: *0.5 ha; 12 m high; Bare rock.*
There is a navigational beacon on the islet. The islet lies within Flores Island Provincial Park established in 1995.

Historical summary: No birds were recorded here in 1975, but Black Oystercatchers and Glaucous-winged Gulls appeared to be nesting in 1989 (Table WV-376). Observations were made from the water in 1989.[258]

Table WV-376. Seabird nesting records for Tibbs Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
13 Aug 1975	0	0	265
Jun-Jul 1989	1eS	10eS	236, 238, 258

Remarks: Eighty Pelagic Cormorants were roosting on the shore in 1975.

WV-378 SHOT ISLETS

Location: *49°14'00"N 126°03'06"W; 92 E/1.*
Russell Channel north of Leeke Islets.

Description: *2.9 ha; 52 m high; Forested.*
Extended rocky perimeters surround higher forested areas on these two islets.

Historical summary: There were remnants of old Pelagic Cormorant nests on the southwest headland of the north islet in 1975. One Black Oystercatcher and two Glaucous-winged Gulls were present but no nests were found (Table WV-378). In 1989, observers landed on the islets and recorded two pairs of oystercatchers nesting, but surviving notes were inadequate to determine whether nesting was confirmed.[258] A few Pigeon Guillemots were also seen.

Table WV-378. Seabird nesting records for Shot Islets. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
18 Jun 1975	0	(0)	265
Jun 1989	2S	S(6)	84, 236, 258

WV-380 MONKS ISLET

Location: *49°13'55"N 126°00'58"W; 92 E/1.*
North of Vargas Island, south of Chetarpe. Also locally known as White Rocks. Colony includes the rock to the north, southwest of Chetarpe.

Description: *0.9 ha; 12 m high; Grassy rock.*
Monks Islet and the north rock are mostly bare, with small patches of grass and forbs on top. Some salmonberry grows on Monks Islet. There is a navigational beacon on the islet (Figure 468).

Figure 468. Photo of Monks Islet showing bare rock, patches of vegetation, and navigational beacon. *Photo by R. Wayne Campbell, 18 June 1975.*

Historical summary: Cowan first observed nesting in 1931 (Table WV-380), although Drent and Guiguet [77] were uncertain whether it occurred on Monks Islet or on the rock north of it. Cowan noted that 25 Glaucous-winged Gull nests had been prepared but no eggs had yet been laid. Since 1931, only one record pertains to the north rock, that of a single pair of Black Oystercatchers nesting in 1975 (one nest with 3 eggs); all other records are for the main islet (Figure 469). Numbers of oystercatchers nesting appear to have declined from the 5-6 pairs nesting in the 1970s. Observers in 1982 found one oystercatcher nest with two eggs and an additional 11 empty scrapes, which they called "frustration" nests and did not include in their nest tally due to the few oystercatchers present. No oystercatchers were recorded in 1989 but observations were made from the water [258] and we considered the 1982 record from land the better and current estimate for oystercatchers.

Table WV-380. Seabird nesting records for Monks Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
31 May 1931[a]	4[4]	25S		77, 255
14 Jul 1970	6[6]	47[41]	(0)	265
18 Jun 1975	5[5]	42[36]	(0)	32, 265
17 Jun 1982	1	54[27]	(0)	181, 265
Jun-Jul 1989	0	35eS	S(1)	84, 236, 238

[a] Year corrected from Drent and Guiguet [77] who gave the year as 1930.

Remarks: Ward and Shepard found full clutches but no young in gull nests in 1970. They postulated that the season had been delayed by egg collecting. Doug Bertram also remarked on the large number of empty gull nests in 1982.

Figure 469. Two Black Oystercatcher nests with two eggs each found on Monks Islet in 1975. Nests were made of varying amounts of pebbles, twigs, mussel shells, and chiton fragments. *Photos by R. Wayne Campbell, 18 June 1975.*

WV-385 WHALER ISLETS

Location: *49°13'34"N 126°04'00"W; 92 E/1.* East of Bartlett Island, south of Flores Island.

Description: *3.3 ha; 27 m high; Forested; Bare rock.* The main, central islet has small, forested patches connected by a rocky rib. The rock is flanked by broad sandy beaches. The smaller north islet is partially vegetated and the south islet is bare rock.

Historical summary: No seabirds were seen on these islets in 1975 (Table WV-385). Observers landed on the islets and recorded one pair of Black Oystercatchers nesting in 1989, but surviving notes were inadequate to determine precisely where birds were nesting and whether nesting was confirmed.[258]

Table WV-385. Seabird nesting records for Whaler Islets. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
13 Aug 1975	0	(0)	265
Jun 1989	1S	S(1)	84, 236, 258

Remarks: Two dead Black Oystercatchers were found on the main islet in 1975.

WV-390 LEEKE ISLETS

Location: *49°13'32"N 126°03'00"W; 92 E/1.* Northwest of Vargas Island, east of Bartlett Island.

Description: *2.1 ha; 30 m high; Forested; Bare rock.* Leeke Islets consist of three connected knolls. The east and west knolls are heavily wooded (Figure 470), and the middle area is mostly bare rock with scattered cinquefoil.

Historical summary: One Black Oystercatcher nest with two eggs was located on the middle rock in 1975 (Figure 471; Table WV-390). No oystercatchers were seen in 1989 but the islets were surveyed by boat that year [258] and we thus considered the 1975 record the better and current estimate for oystercatchers.

Figure 470. The higher sections of Leeke Islets are densely forested. *Photo by R. Wayne Campbell, 18 June 1975.*

Figure 471. Michael Rodway (top) inspecting a Black Oystercatcher nest with two eggs laid on mussel and a few barnacle shells on Leeke Islets in 1975. *Photos by R. Wayne Campbell, 18 June 1975.*

Table WV-390. Seabird nesting records for Leeke Islets. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
18 Jun 1975	1	(0)	265
Jun-Jul 1989	0	S(1)	84, 236

WV-394 BURGESS ISLET

Location: *49°12'51"N 126°01'51"W; 92 E/1.*
Off the northwest end of Vargas Island.

Description: *3.9 ha; 44 m high; Forested.*
Burgess Islet is mainly forested and has a rocky shoreline. It is part of Vargas Island Provincial Park established in 1995.

Historical summary: Two adult Black Oystercatchers and two adult and four immature Glaucous-winged Gulls were present, but no evidence of nesting was found in 1975 (Figure 472; Table WV-394). Observers landed on the island and recorded a pair of oystercatchers nesting in 1989, but surviving notes were inadequate to determine whether nesting was confirmed.[258]

Figure 472. Burgess Islet was thoroughly searched for evidence of nesting seabirds in 1975. With a pair of adult Black Oystercatchers present, we expected to find some sign of nesting, even just an empty nest scrape, but none was found. *Photo by R. Wayne Campbell.*

Table WV-394. Seabird nesting records for Burgess Islet. See Appendix 2 for codes.

DATE	BLOY	SOURCE
18 Jun 1975	0	265
Jun 1989	1S	236, 258

Remarks: One river otter was recorded in 1975.

WV-396 HOBBS ISLET

Location: *49°12'26"N 126°02'33"W; 92 E/1.*
Off the northwest end of Vargas Island.

Description: *2.9 ha; 46 m high; Forested.*
Hobbs Islet is mostly forested, with an extensive rocky area on the west side (Figure 473). It is part of Vargas Island Provincial Park.

Figure 473. Hobbs Islet is mostly forested but also has large rocky areas, including bluffs, on the west side. *Photo by R. Wayne Campbell, 18 June 1975.*

Historical summary: One Glaucous-winged Gull was present but no evidence of nesting was found in 1975 (Table WV-396). Observers landed on the islet and recorded one pair of Black Oystercatchers nesting in 1989, but surviving notes were inadequate to determine whether nesting was confirmed.[258]

Table WV-396. Seabird nesting records for Hobbs Islet. See Appendix 2 for codes.

DATE	BLOY	SOURCE
18 Jun 1975	0	265
Jun 1989	1S	236, 258

WV-400 PLOVER REEFS

Location: *49°10'53"N 126°05'05"W; 92 E/1.*
Clayoquot Sound west of Vargas Island, northeast of Cleland Island.

Description: *0.7 ha; 5 m high; Bare rock.*
Plover Reefs are within Vargas Island Provincial Park.

Historical summary: We confirmed nesting by Black Oystercatchers and Glaucous-winged Gulls and suspected nesting by Pigeon Guillemots in 1975 (Table WV-400). There was no sign of gulls nesting in 1989, although observations were made only from the water that year.[258]

Brandt's Cormorants have been recorded roosting in large numbers: Michael Shepard reported more than 200 present on 29 June 1970; and Wayne Campbell and Terry Thormin from the BCPM counted 155 on 3 August 1974. Michael Shepard also saw two adults near a partially-built nest (about one-third complete) in 1970. No further evidence of attempted breeding has been reported.

Table WV-400. Seabird nesting records for Plover Reefs. See Appendix 2 for codes.

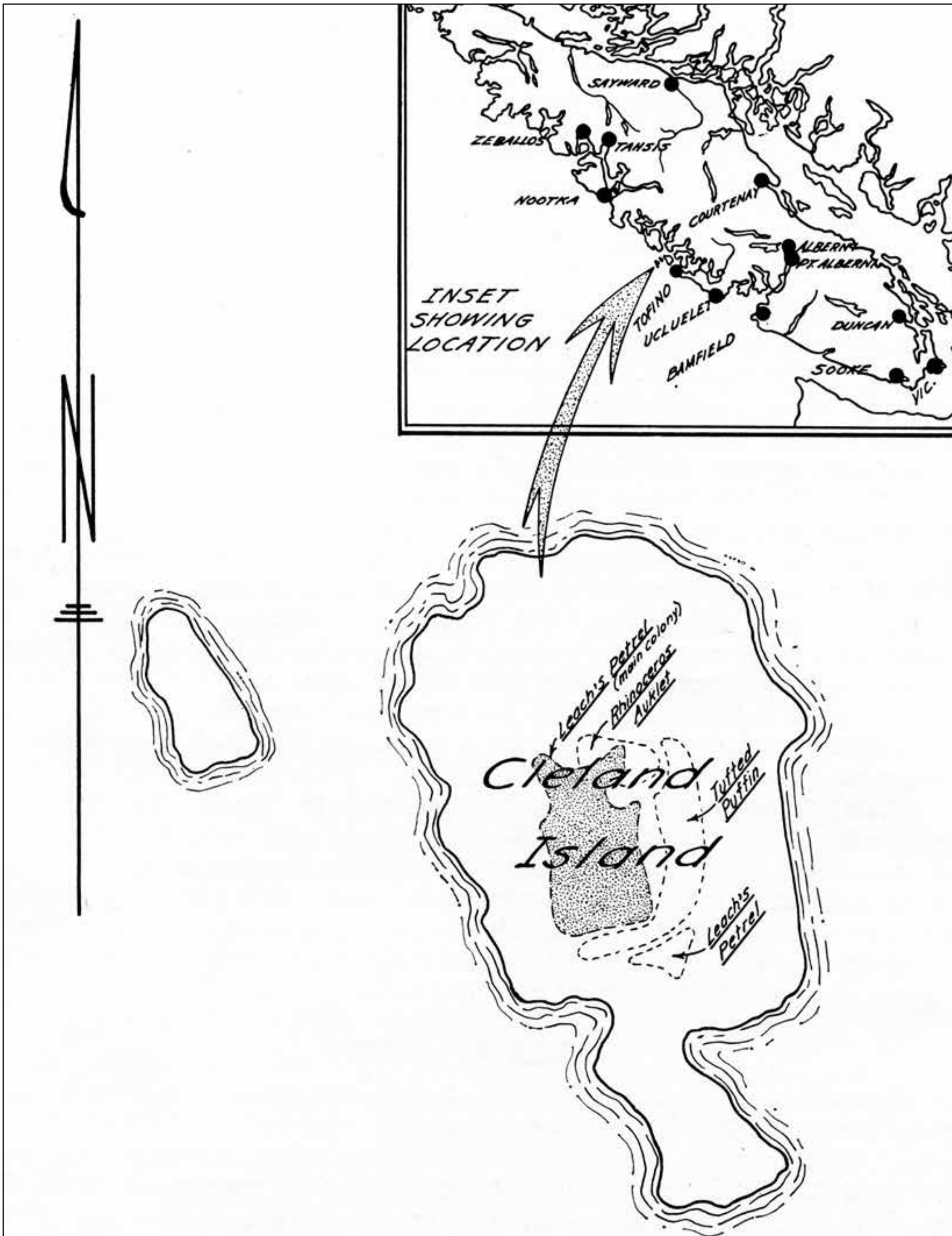
DATE	BLOY	GWGU	PIGU	SOURCE
18 Jun 1975	2[2]	10[8]	2S(2)	32, 265
Jun-Jul 1989	2eS	0	S(4)	84, 236, 238, 258

WV-410 CLELAND ISLAND

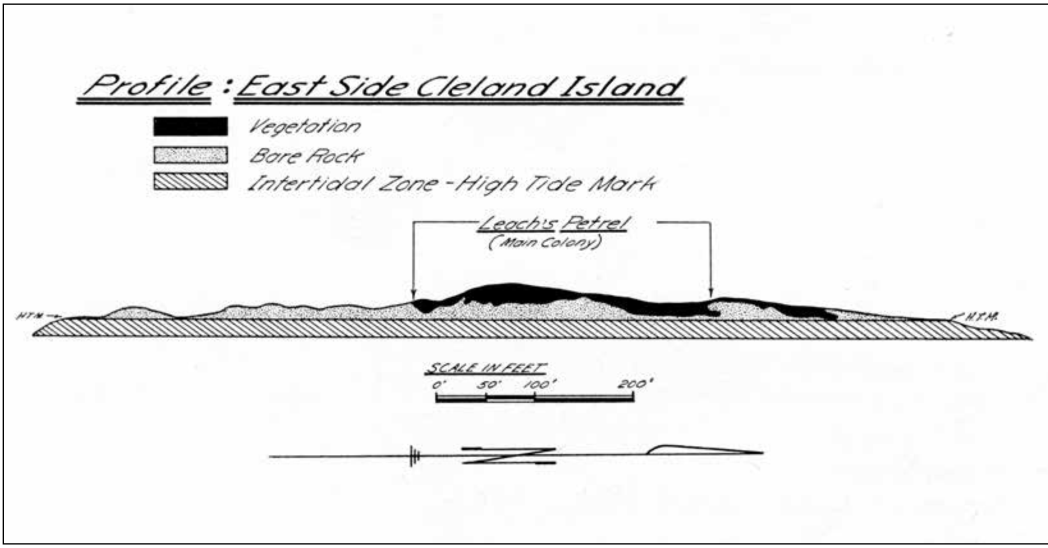
Location: *49°10'16"N 126°05'28"W; 92 E/1.*
Clayoquot Sound west of Vargas Island. Named Bare Island prior to 1934. Colony includes the rock off the northwest corner (locally known as "Murre Reef").

Description: *7.7 ha; 10 m high; Grassy and shrubby island; Bare rock.*
Cleland Island has been described and lists of flora and fauna given by Campbell and Stirling,[37] Ward,[245] and Hartwick.[102] The island, formerly known as Bare Island, is devoid of trees, but has a lush covering of grasses, forbs, and shrubs over the higher central area, surrounded by extensive perimeter rock. There are small, shell beaches around the island. Salmonberry and wild rose (*Rosa* spp.) form a thicket down the middle of the vegetated section, with dune grass, cow parsnip, false lily-of-the-valley, and other forbs covering areas to either side. Bracken fern mixes with shrubs and forbs in some areas (Figure 474).

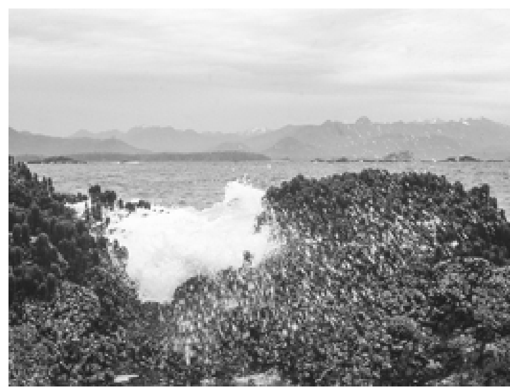
Figure 474. Cleland Island is a treeless island with a variety of habitats for nesting seabirds. Nine seabird species have nested on the island, including substantial numbers of Leach's Storm-Petrels, Black Oystercatchers, and Glaucous-winged Gulls. Maps and photos described here (numbered 1 to 6) are shown on the next page and then on the following page, ordered clockwise from top. **1)** Map from Campbell and Stirling [37] showing the extent of Leach's Storm-Petrel, Rhinoceros Auklet, and Tufted Puffin burrows in 1967 (see map in Rodway and Lemon [181] for a comparison of the extent of burrowing in 1988). The island is the shape of a hand mirror, the short handle lying to the south. It is about three-eighths of a mile (600 m) long by about one-quarter of a mile (400 m) wide. **2)** Map of the island in profile showing the extent (in black) of Leach's Storm-Petrel burrows in 1967. **3)** Landing on the island, even at slack tide, is always challenging because of the constant wave surge. **4)** There is one large shell beach on the island. **5)** Tall patches of salmonberry cover some interior areas. In the foreground, from left to right, Bruce Ford, Michael Shepard, and Michael Rodway are searching for Rhinoceros Auklet burrows. **6)** Areas of cow parsnip and dune grass correspond with the extent of the Leach's Storm-Petrel colony. *Maps (1, 2) courtesy Ray Huckin, BC Parks Branch [37] and photos by R. Wayne Campbell, 29 June 1970 (3), 18 May 1970 (4), July 1975 (5), and June 1969 (6).*



SAYWARD
ZEBALLOS
TAHSIS
NOOTKA
COURTENAY
ALBERNI
PT. ALBERNI
INSET
SHOWING
LOCATION
TOFINO
UCLUELET
BAMFIELD
DUNCAN
SOOKE
VIC.
N
Leach's Petrel
(main colony)
Rhinoceros
Auklet
Cleland
Island
Tufted
Puffin
Leach's
Petrel



Profile : East Side Cleland Island
Vegetation
Bare Rock
Intertidal Zone - High Tide Mark
Leach's Petrel
(Main Colony)
H.T.M.
H.T.M.
SCALE IN FEET
0'
50'
100'
200'



The island was proposed as a federal Migratory Bird Sanctuary by Munro in 1925, following reports from Darcus about the nesting seabirds on the island,[150] but it did not receive protected status until 1971, when it became the first designated Ecological Reserve in BC.[138] As part of Munro's proposal in 1925, he recommended that $50 per annum be paid to Darcus to act as warden if the island was declared a Bird Sanctuary. There is a small research cabin that was erected by Drent in 1969 on the west side; it was in poor shape in 1988 (Figure 475).

Historical summary: Nine seabird species have been recorded breeding on the island (Table WV-410). The first records are from 1925, when Darcus and Young collected eggs of Fork-tailed Storm-Petrels, Leach's Storm-Petrels, Glaucous-winged Gulls, and Tufted Puffins. Darcus also reported Black Oystercatchers and Pigeon Guillemots breeding in 1925,[150] but apparently no specimens were collected, and he may not have confirmed breeding by those two species at that time. The location given for specimen records from 1925 varies and is confusing: "Bare Island, near Tofino, Haro St, Vancouver Island" for one Fork-tailed Storm-Petrel record from 14 June [278d] and three Glaucous-winged Gull records from 6 and 15 June; [278e] "Bare Island, W coast of Vancouver Island" and "Cleland Island" for two Leach's Storm-Petrel records from 19 [280d] and 25 June,[277l] respectively; and "Bare Island, Tofino" and "Cameron Rocks, Clayoquot Sound" for two Tufted Puffin records from 15 June.[277m] Young collected Glaucous-winged Gull eggs again at "Bare Island, near Tofino, Haro St, Vancouver Island" on 25 June 1932.[278f]

Figure 475. As a student, during his graduate studies of Pigeon Guillemots on Mandarte Island off southern Vancouver Island, Rudi Drent realized the benefits of having a small cabin to use as a research base. When he became a professor at UBC, he thus designed a prefabricated hut to be used as a base for research by graduate students on Cleland Island. Images here (clockwise from top left) illustrate the process of erecting the hut: from left to right, Ken Summers, Bob Foottit, and Rudi Drent moving a panel for the hut; Bob Foottit (left) and Ken Summers carrying another panel; Ken Summers (left) and Rudi Drent attaching panels; and the completed research hut. *Photos by R. Wayne Campbell, 15 May 1969.*

Table WV-410. Seabird nesting records for Cleland Island. See Appendix 2 for codes.

DATE	FTSP	LSPE	BLOY	GWGU	COMU	PIGU	CAAU	RHAU	TUPU	SOURCE
6-20 Jun 1925	x	x	S	x		S			x	77, 149, 276a, 277l,m, 278d,e, 280d
9, 22 May 1931[a]	S	S	15eS	150-200e		S(150)			x	77, 255
25 June 1932				x						278f
1959				x						77
4 Aug 1961	S	x	x	2,000+e		S(1,000+)	S	S	x	256
8 Jul 1966				100s						22
Jul-Aug 1967	x	5,000e	3-6e	300-500e	0	200e(700)	S	25e	50e(75-100)	37
Jul-Aug 1968		5,000e		300+e		x		x	x(50)	265
May-Aug 1969	200e	5,000e		1,800e	2(30)	150e	100e	350-450e	100e	43, 107, 213, 265
May-Aug 1970	x	5,200e	56[56]	1,550e	6(104)	80e(100)	x	x	x(77)	43, 103, 107; 265, 266
May-Aug 1971			57[57]	x			x	x		103, 113, 265
May-Aug 1972			42[42]						x	103, 107
Jul-Aug 1973		x	x	125+	3(10)	x		x		43, 104, 107, 265
2-3 Aug 1974		x	x	x	1(17)	x7		x	x(60)	43, 265
11-19 Jun 1975	25S	3,000e	35[28]	1,501[1,315]	5(86)	100e(150)	25e	500e	20-40S(30)	32, 265
26 Jun 1976			35-40e	1,137[1,061]+[b]						91, 265
31 Aug 1976					5(12)				S(8-10)	265
30 Aug 1977	S	1,000's	35-40e	x	1(2)	S	x	x	S(5+)	91, 265
25 Jun 1978			35-40e	580e		x5		S	S	91, 265
11-12 Jul 1979				955[700]	4e(106)					48, 85
29, 30 Jun 1980	S	S	x	x	S(30)	x	x	S	S(10)	144
15-16 Jun 1982			50	2,236[1,889]	8(18)	(326)			(50)	265
28-29 Jul 1982	x	11,900t			(150)			2,100t	(15)	265
May-Jul 1982			[39]							141
May-Jul 1983			[35]							141
4 Aug 1984	S	S	x	x	0(50)	25+e(300)		x	S(19)	265, 266
2 Sep 1984			x	x	(0)	x(2)				265
19-20 Jul 1985	S	S	x						5(20-30)	265
22 May 1986		x	x3	S	(2)	S(268)	x	500e	S(53)	253
10 Jul 1987									(25)	266
7-9 Jul 1988	700t	5,700t	x5	1,622[1,535]	0	x2(205)	800t	1,000t	6eS(10)	181
May-Jul 1989			44	1,848		S(352)			(3)	84, 236, 238, 258, 266

[a] Year corrected from Drent and Guiguet (1961) who gave the year as 1930.
[b] Nests were counted only on the main island in 1976.

Some of these early records are puzzling, especially the ones with a location of "Bare Island, near Tofino, Haro St. Vancouver Island". "Near Tofino" seems clearly to indicate Cleland Island but "Haro St." we assume refers to Haro Strait in the Salish Sea. Bare Island in Haro Strait would likely be Mandarte Island, which was also formerly called Bare Island. However, we think it is safe to assume that this location description refers to Cleland Island because it was given for a Fork-tailed Storm-Petrel record in 1925 and Fork-tailed Storm-Petrels have never been recorded nesting on Mandarte Island or anywhere in the Salish Sea. Young used this exact same location description in 1925 and again on 25 June 1932. Drent and Guiguet [77] assigned 1925 storm-petrel records to Cleland Island and were not aware of or did not list the others. For 1932, there are three other Glaucous-winged Gull egg specimens [280e] also dated 25 June that are labelled "Mandarte Island" in the Strait of Georgia (see forthcoming volume on Salish Sea colonies). Drent and Guiguet [77] listed two of these gull records (that were originally in the W. S. Maguire collection) for Mandarte Island and did not list any from that date for Cleland Island. The collector for the Mandarte Island specimens is unknown, but we believe it was someone other than

Young, who we infer was on Cleland Island on that date. To be consistent, we have listed all records saying "near Tofino" for Cleland Island, but there is clearly potential confusion about the origins of some of these records.

As for the "Cameron Rocks, Clayoquot Sound" location given for one 1925 Tufted Puffin record, we suspect confusion arose because both Cleland Island and Cameron Rocks were named Bare Island at that time. The actual Cameron Rocks is further north at the mouth of Nuchatlitz Inlet, not in Clayoquot Sound. The puffin egg specimen was most likely collected on the Bare Island near Tofino (i.e., Cleland Island), which is in Clayoquot Sound, and is where the other puffin egg specimen was collected on the same day. Darcus, in his letter to Munro in 1925,[150] made it clear that the Bare Island he was referring to was Cleland Island: "…the island is situated in the open Pacific, twelve miles north-west of Tofino."

Cowan in 1931 reported the same six species nesting as had Darcus and Young in 1925, but again did not confirm breeding by Black Oystercatchers and Pigeon Guillemots. Nesting was not definitely confirmed for those two species until 1961 and 1967, respectively.[37, 256] Guiguet noted numerous Black Oystercatcher nests in 1961.[256] Guiguet also first reported burrows of Rhinoceros Auklets in 1961, and Campbell and Stirling [37] found four Rhinoceros Auklet young in burrows in 1967 (Figure 476). In addition, adults were seen on the water near the island, some carrying fish, during five trips to and from Cleland in 1967.

Ken Summers first confirmed breeding by Cassin's Auklets in 1969, though Guiguet [256] and Campbell and Stirling [37] had suspected nesting in 1961 and 1967. The ninth and final seabird species known to nest on Cleland Island was also first confirmed that year. Cleland Island became the third known breeding site in BC for Common Murres when Drent found fragments of four eggshells on Murre Reef on 29 June 1969.[43, 265] Further observations that year by Michael Easton and Ken Summers documented two nests where murres were incubating eggs on 4 August and brooding young on 19 August (Figure 477).

Figure 476. Large nestling Rhinoceros Auklet extracted from its burrow on Cleland Island in 1967. *Photo by R. Wayne Campbell, 24 July 1967.*

Figure 477. Cleland Island was the third confirmed breeding site for Common Murres in BC. Eggshells were found in June and an adult brooding a chick was seen in August 1969 (left). Two nests, each with a single egg (one pipping), were photographed on 12 August 1973. *Photos by R. Wayne Campbell.*

As discussed in the introduction to this volume, Western Gulls have not been considered a breeding species in BC, but they do hybridize with Glaucous-winged Gulls at several colonies, including Cleland Island. Campbell and Stirling noted one Western Gull adult on territory with Glaucous-winged Gulls in 1967,[37] and Mark observed one pure Western Gull sharing incubation duties with a Glaucous-winged Gull in 1980.[144] Fifty hybrids were estimated nesting with Glaucous-winged Gulls in 1980.

Brandt's Cormorants have been observed roosting (170 were recorded on Murre Reef on 16 May 1969 [265]) but no evidence of breeding on Cleland Island has ever been recorded.

Changes in the distribution and population of some species have been documented. The nesting population and colony area of Rhinoceros Auklets have increased from 47 burrows (25 pairs estimated nesting) in an area of about 520 m^2 in 1967,[37] to an estimated 1,000 pairs nesting over an area of 14,600 m^2 in 1988 (Figure 478).[181] In 1988, burrows were most concentrated in two pockets with a combined area of 1,620 m^2. A larger estimate of 2,100 pairs was made in 1982, however the difference in the population estimates for Rhinoceros Auklets from 1982 and 1988 were due to differences in survey methods. The higher estimate in 1982 was based on two partial transects run in selected locations with high burrow density, which gave a biased and inflated estimate of population size. In 1988, five, systematically spaced transects were run across the island to provide a more robust estimate of population size.[181]

Figure 478. The number of Rhinoceros Auklets nesting on Cleland Island expanded from an estimated population of 25 pairs in 1967 to 1,000 pairs 21 years later. *Photo by R. Wayne Campbell, 24 July 1967.*

Figure 479. Cleland Island is the second largest Leach's Storm-Petrel colony in the West Coast Vancouver Island region. In this region, only Solander Island has a larger estimated nesting population. *Photo by R. Wayne Campbell, 12 August 1970.*

Rhinoceros Auklets stage on the water around the island. Counts were made in 1970 of 1,350 birds gathered on the water on the evening of 25 June and 720 birds at 20:20 hr on 17 July.[266]

The 1982 estimate for Leach's Storm-Petrels is also higher than previous and subsequent estimates but is again considered inflated due to placement of transects in dense areas of the colony. Other estimates based on sampling schemes were obtained in 1967 [37] and 1970 (Figure 479).[265] In 1967, six, 10x10 ft. (9.3 m^2) quadrats were surveyed at various locations through the colony (Figure 480). The main area of the colony was estimated to be 300 by 150 feet (4,181 m^2), the average burrow density was 1.11 burrows/ m^2, and the occupancy rate of the 63 burrows in the quadrats was 71% (calculated from data in Campbell and Stirling [37]). Only Leach's Storm-Petrels were found in occupied burrows, but the survey was conducted on 28 August when the majority of Fork-tailed Storm-Petrels would already have fledged.[235] In 1970, Ward surveyed an unspecified number of 10x10 ft. plots in three subsections of the colony. His estimates of colony area and burrow density were similar to those obtained in 1967. In 1988, the storm-petrel colony area was calculated to be almost four times the 1967 and 1970 estimates (1.6 ha), but a lower average burrow density (0.48 burrows/ m^2), and a similar occupancy rate (or 83%; 10 of 12 burrows checked were occupied, with a ratio of 89% Leach's to 11% Fork-tailed storm-petrels), resulted in a population estimate for Leach's Storm-Petrels that was similar to those from 1967 and 1970. We suspect that measurements taken along the five systematically placed transects in 1988 provided a more accurate estimate of colony area. The average burrow density was likely higher in 1967 and 1970 because quadrats sampled only the main, higher-density part of the colony in those years.

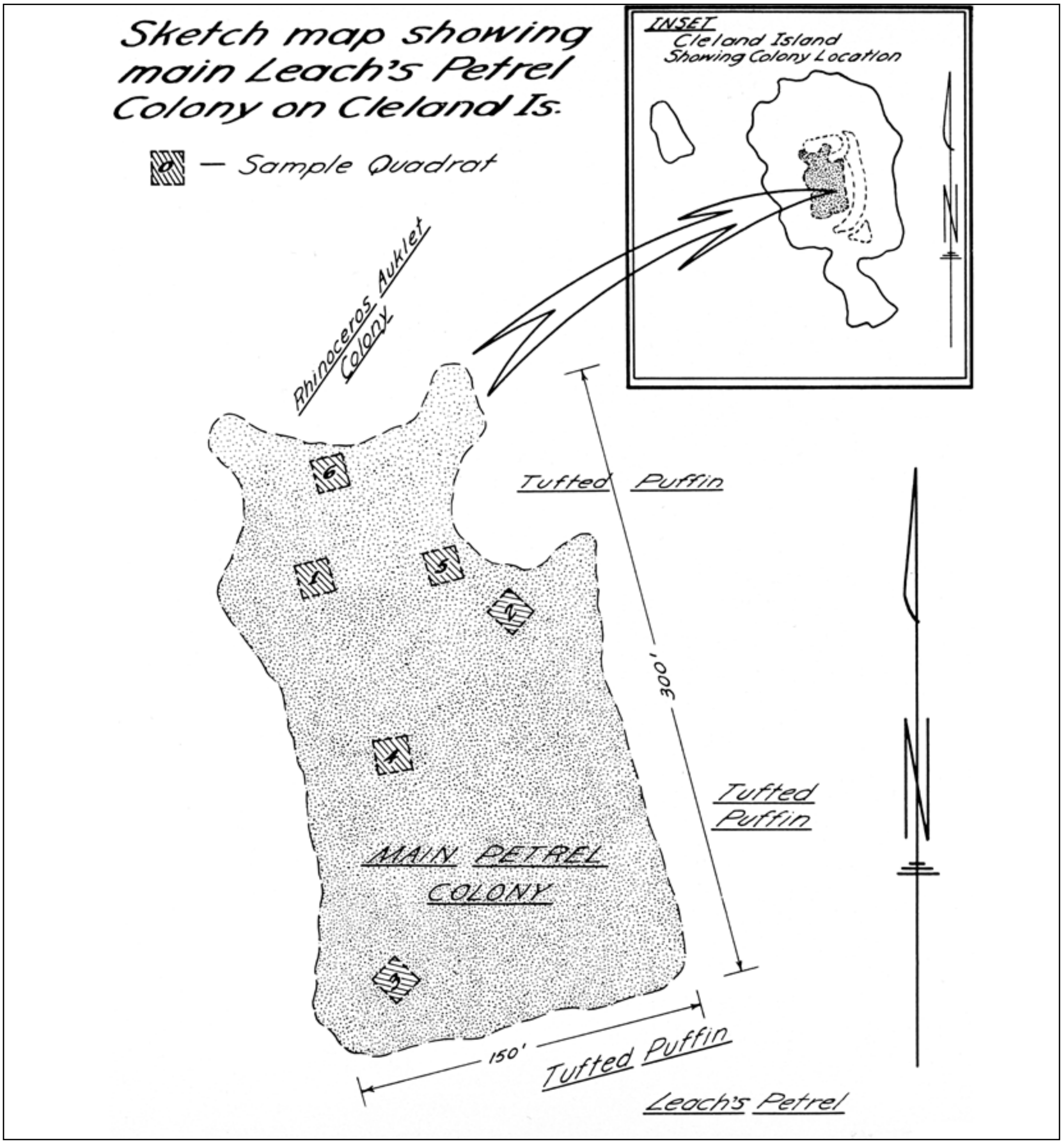


Figure 480. The Leach's Storm-Petrel colony on Cleland Island was surveyed with sample quadrats in 1967.[37] Images from that survey include (previous page, then clockwise from top right on this page): sketch map showing six sample 10 x 10 ft (9.3 m^2) plots, distributed over an estimated colony area of 300 x 150 ft (4,181 m^2); view of the main colony (centre) in 1967; nesting habitat with driftwood used to walk to individual plots to avoid trampling burrows; a typical burrow; nest found under a log with an adult and a downy chick (note the eggshell still in the nest chamber); and an adult being banded to determine annual nest site fidelity. *Map courtesy Ray Huckin, BC Parks Branch [37] and photos by R. Wayne Campbell, August 1967.*

Slug Slime: A Threat to Breeding Storm-Petrels

A unique situation occurs on Cleland Island. It involves two species of native slug, Pacific Banana Slug (Ariolimax columbianus) *and Yellow-bordered Taildropper* (Prophysaom foliolatrum), *and nesting Leach's Storm-Petrels. Both slug species are commonly found along the entire BC coast, can grow to 260 mm (10 in) and 100 mm (4 in) long respectively, and are commonly encountered in humid and wet forests. Their distribution on offshore islands is not well documented. These slugs somehow made it to Cleland Island where they thrive in a humid environment and pose a threat to nesting Leach's Storm-Petrels. Their abundance on Cleland Island was measured in quadrats surveyed for Leach's Storm-Petrels in 1967: the number of slugs per 10 x 10 ft (9.3 m^2) quadrat ranged between 10 and 82 animals.[37] Most were Pacific Banana Slugs.*

The slugs are omnivorous, eating fungi, organic detritus, living and dead plant tissue, animal droppings, insects, and even carrion.[337] Slugs have a structure in the mouth called a radula, which has thousands of tiny teeth that are used to scrape away at food items. Slugs move on a trail of slime that is visible as a silvery track. The slime has strong adhesive properties and will bond to many surfaces, including the hands of seabird biologists conducting surveys. Letting the slime dry, then rolling it up and peeling it off is the best remedy for cleaning the rather unpleasant stuff off your hands.

Slugs are most active at night, when their environment is damp, and spend a lot of time underground. On Cleland Island, they often use storm-petrel burrows as shelters, and sometimes many individuals aggregate in burrow entrances, which can pose a problem for the storm-petrels. When the storm-

Figure 481. Slugs on Cleland Island take shelter at night in storm-petrel burrows and may almost completely block the burrow entrances. Storm-petrels arriving at night to exchange incubation duties or feed chicks must work their way through a wall of slime, which can contaminate their feathers and compromise their ability to fly. Shown here (clockwise from top left): the Banana Slug can grow to 25 cm (9.8 in) long; two dead Leach's Storm-Petrels coated with slug slime; the wings of a Leach's Storm-Petrel gnawed by Pacific Banana Slugs; and pellets composed of Leach's Storm-Petrel remains regurgitated by Glaucous-winged Gulls. *Photos by R. Wayne Campbell, August 1967.*

petrels arrive at their burrow to change incubation duties or feed their chicks, they have to pass through a "wall" of slime that coats their feathers. The birds sometimes become so impaired from the slime that they cannot fly and will flop around outside the burrows where they are vulnerable to predation or may starve (Figure 481).

Major decline in the Tufted Puffin nesting population occurred after the 1960s (Figure 482). Cowan noted many burrows in 1931,[77] Campbell and Stirling estimated 75 to 100 birds nesting along much of the east and south sides of the island in 1967,[37] and Summers and Drent estimated 100 pairs nesting in 1969.[213] Two adults carrying fish were seen in 1977 and only five active burrows were found in 1985.[181]

Figure 482. The decrease in the numbers of Tufted Puffins nesting on Cleland Island, from an estimated 100 pairs in the mid-1960s to five pairs two decades later, may be due, in part, to an increase in activities of researchers and tourists, and to predation by American Mink. *Photo by R. Wayne Campbell, July 1967.*

Common Murres, which established a small colony in 1969,[43] were last observed breeding in 1982 when Margaret Purdy and CWS crews led by Gary Kaiser both reported eight birds incubating eggs. Murres nested on Murre Reef, except in 1974 one slightly addled egg was found on the northeast corner of the main island. Carter saw one chick and 3-4 birds that appeared to be incubating in 1979.[48] Carter also reviewed the historical records relating to murres breeding on the island.[48]

Cleland Island is the largest Black Oystercatcher "colony" in BC (Figure 483). A maximum of 57 pairs were breeding and laid eggs in 1971,[103] and 40-50 pairs have been found nesting in most years when complete surveys were conducted. Some pairs lose eggs and lay replacement clutches so that the number of clutches monitored during intensive studies (see below) exceeds the number of nesting pairs. Hartwick monitored the fate of 60, 59, and 48 clutches in 1970, 1971, and 1972, respectively.[103] Groves estimated 35-40 pairs nesting each year during the three years of her study and monitored the fate of 54, 60, and 29 clutches in 1976, 1977, and 1978, respectively.[91] In 1982, the CWS crew led by Gary Kaiser reported 38 nests with eggs or young on 15-16 June, and Marie-Aude Coleman (now L'Hyver), who was conducting a study of oystercatchers out of the University of Victoria, later documented 50 nests.[265] L'Hyver monitored the laying activity of 39 pairs in 1982 and 35 pairs in 1983. [141, 142] Alan Burger estimated 40-50 birds on the island and found three nests with eggs in 1986. Oystercatchers nest around most of the perimeter of the main island and on Murre Reef. Separate tallies of nests on those two areas have been kept in only two years: counts on Murre Reef and on the main island were 4 and 31 in 1975,[265] and 9 and 35 in 1989.[236]

Outside the Strait of Georgia, Cleland Island is the most important Glaucous-winged Gull colony in BC (Figure 484). Peak numbers were recorded in 1982 and nest counts have shown some decline since, although total counts ranging from 955 nests in 1979 (Figure 485) to 2,236 nests in 1982 suggest considerable year-to-year variation in breeding effort. The proportion of gull nests that have contained eggs or young has also varied from 73% in 1979 to 95% in 1988. In a subset of nests inspected, 94 of 102 (92%)

Figure 483. Up to 57 pairs of Black Oystercatchers have been recorded nesting on Cleland Island, which is the largest number ever recorded nesting at a colony in BC. *Photo by Ervio Sian, 2 July 1972.*

in 1967 [37] and 210 of 269 (78%) in 1968 [265] contained eggs or young. Separate tallies of nests on Murre Reef and on the main island, respectively, were 95 and 1,406 in 1975, 166 and 2,070 in 1982, and 154 and 1,694 in 1989.[238] Campbell et al. estimated about 20 pairs nesting on Murre Reef in 1967 and about 125 pairs in 1973.[37] Separate tallies were not kept in other years. Nests were counted only on the main island in 1976. Syd Roberts with some UBC students counted 116 nests with eggs over an estimated one fifth of the total nesting area in 1978. Extrapolating to the rest of the island gave a total estimate of about 580 pairs. Ward monitored laying chronology in 1,394 nests in 1970. He estimated 1,400 nesting pairs on the main island and 150 pairs on Murre Reef.

Pigeon Guillemot nests have been found in rock crevices (Figure 486), under drift logs and rocks, in abandoned puffin burrows, among thick grasses, and under clumps of fireweed.[37, 265] Six nests with eggs or young were found in 1967. Ken Summers documented 22 nests with eggs or young in 1969. John Ward, with the help of Bob Baker and Michael Shepard, monitored 43 nests and banded young in 1970. The BCPM crew found 21 nests with eggs in 1975 (20 on the main island and one on Murre Reef). CWS crews saw adults carrying food to nests and estimated about 25 pairs nesting at the north end of the island in 1984. Adrian Dorst counted Pigeon Guillemots in May 1989.[84]

Figure 484. Over 2,200 Glaucous-winged Gull nests have been tallied on Cleland Island, which is the largest Glaucous-winged Gull colony in BC outside the Strait of Georgia. These photos show a silhouette of a Glaucous-winged Gull on 29 June 1970 (left) and adults on territories on rocky habitat on a misty day in August 1974. *Photos by R. Wayne Campbell.*

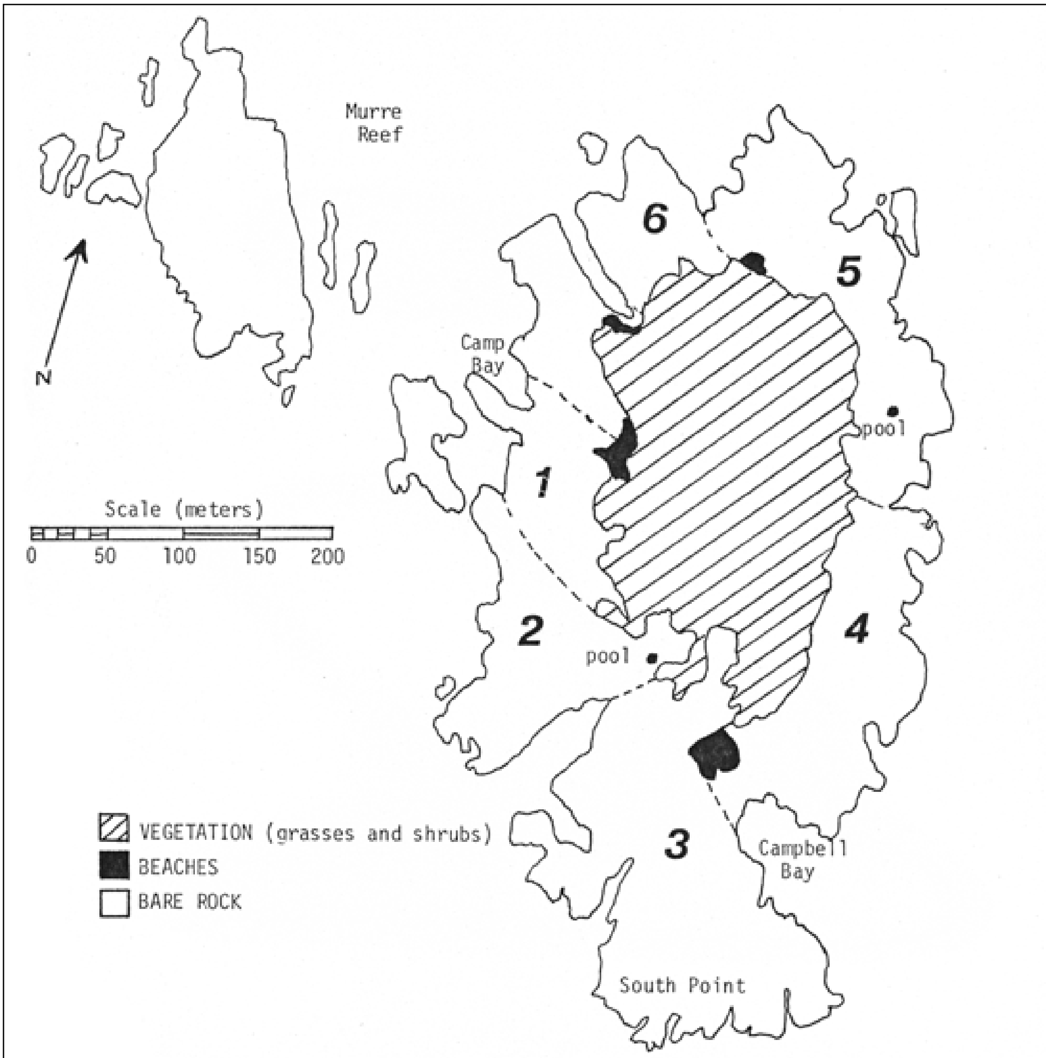


Figure 485. Schematic diagram of Cleland Island for a Glaucous-winged Gull census conducted by 18 students enrolled in the Marine Science 402 course at the Bamfield Marine Sciences Center in 1979.[85] The main island was divided into six sections, separated by major topographical features. General features identified included: vegetated areas of grasses and shrubs (hatched); beaches (solid black); bare rock where gulls nest (clear); and two rain pools (black circles). The students that surveyed the main island tried to answer different questions. Examples of research topics included: comparing subplot estimates to total nests counted; comparing a visual count to a calculated number; determining the feasibility of establishing permanent plots to monitor trends; and calculating nearest neighbour distances to determine if nest distribution was random. The census on 11 July 1979 tallied 955 nests of which 700 contained eggs or chicks and 255 were empty. *Map drafted by Dr. Rudi Drent.*

Figure 486. This fledging Pigeon Guillemot had just left its nest chamber in a rock crevice on Cleland Island and was heading towards the sea (left) when it was caught and banded. *Photos by R. Wayne Campbell, August 1974.*

Remarks: Sarah Groves and Laurel Dick in 1976 noted a "high-powered" storm over 29/30 May that washed out all gull nests, including eggs and nesting materials. After rebuilding nests, gulls again lost all their eggs, this time to First Nations harvesters in early and mid-June. In 1982, four of the eight Common Murre eggs were preyed upon while crews were conducting surveys on the island and disturbing birds.

A mink was observed on the island in 1982, and at least 12 dead Rhinoceros Auklets were found that observers suspected had been killed by mink. In 1985, four decapitated adult Tufted Puffins were encountered in burrows.[181] Alan Burger noted the remains of three Leach's Storm-Petrels and found one dead Cassin's Auklet and four dead Rhinoceros Auklets lying in dense shrubs at entrances to burrows in 1986.[253] Auklet carcasses were uneaten and bloodied at the back of the head. Piles of mustelid scats found in the cabin contained abundant fish remains but also many alcid and storm-petrel feathers. Most scats in 1986 were suspected to be from river otter.[253] The presence and impact of mink and/or river otter on nesting seabirds, especially Tufted Puffins, should be investigated. Little sign of either mustelid species was seen in 1988.[253]

Burger found the remains of a Glaucous-winged Gull that was likely taken by a Bald Eagle in 1986.[253] One adult and two immature eagles were seen. During repeated visits in 1967, Campbell and Stirling saw only one adult Bald Eagle circling high overhead.[37] One female Peregrine Falcon was seen once in 1967, perched on a rocky outcropping. In 1986, one falcon flew over and was twice seen perched on the island for 30 to 60 minutes. In 1988, one was seen several times swooping over the southwest end of the island.

Cleland Island has been an attractive site for research studies (Figure 487). Drent [213] performed twinning experiments with Rhinoceros Auklets in 1969 to test Lack's [139] hypothesis on the evolution of optimal clutch size. Ward investigated reproductive success and food supply in relation to the evolution of optimal clutch size in the Glaucous-winged Gull in 1969 and 1970.[245] Henderson studied the control and organization of feeding behavior of Glaucous-winged Gulls in 1971.[113, 114] Hartwick studied foraging strategy and breeding ecology of the Black Oystercatcher from 1971 to 1973 (Figure 488).[102-106] Further research on Black Oystercatchers was undertaken by Groves from 1975 to 1978,[90, 91] Purdy from 1981 to 1983,[166, 167] and L'Hyver in 1981 and 1982.[141, 142] Snyder made a cursory analysis of the energetic requirements of seabirds around Cleland Island in 1979 [206] and Burger studied the diving behavior of Rhinoceros Auklets in 1988.[23, 30]

Figure 487. Cleland Island had a small, easily accessible Rhinoceros Auklet colony in the late 1960s. This gave Rudi Drent and his associates an opportunity to collect unique natural history information on the species. Aspects of those studies included (clockwise from top left): Rudi Drent (left) and Bristol Foster assembling a small observation blind; determining the arrival and departure times for adults; measuring growth rates of chicks; recording departure times for juveniles; and banding adults and large young, which sometimes can be a painful process for researchers. *Photos by R. Wayne Campbell, June to August 1967-1970.*

Figure 488. A Ph.D. study of Black Oystercatchers on Cleland Island in the early 1970s showed that mussels formed most of the diet in terms of weight.[102] *Photo by R. Wayne Campbell.*

A total of 4,601 Glaucous-winged Gull chicks were banded on Cleland Island between 1967 and 1972.[265]

Value-added Information Collected During Seabird Surveys

Exploring pristine environments that have been little touched by human activities is always an adventure. The discovery of something unknown is an added thrill. The BCPM seabird inventory crews in the 1970s visited hundreds of remote islands recording plants and animals encountered. There were lots of surprises. Although completing the first comprehensive inventory for nesting seabirds in BC was the primary objective, the value-added incidental observations were also significant and rewarding. New breeding seabird species were found, unknown colonies were documented, life history information was gathered, and hundreds of new distributional records for plants and animals were reported. Finding an amphibian, a Wandering Salamander (Aneides vagrans)*, on offshore islands was one of the biggest surprises!*

The Wandering Salamander has a disjunct distribution. It only occurs in northern California and on the south coast of BC, mainly on Vancouver Island. Its body colour (dark brown or gray with some mottling of lighter gray), low numbers, and preferred forest habitats make it a challenge to find. It is patchily, but widely distributed in low numbers across Vancouver Island and has recently been found on the mainland near Trout Lake on the Sunshine Coast.[338] The salamander is restricted to moist microhabitats within parts of the Coastal Western Hemlock and Coastal Douglas-fir biogeoclimatic zones below 600 m. It is usually found under bark and within cavities and cracks of decaying wood.[339, 340]

Wandering Salamanders have been discovered on only two islands out of the many hundreds of islands that have been checked for nesting seabirds along the BC Outer Coast. Both of those islands are located off Vancouver Island's west coast. The first discovery in 1967 was on Cleland Island.[37] Cleland Island is a low, treeless island, with vegetated areas of predominately dense wild rose and salmonberry shrubs and patches of cow parsnip. Many of the salamanders here were found in driftwood, which is scattered among plants, pushed up by winter storms (see Figure 480). After the species was detected on Cleland Island, a piece of beached plywood was placed at the edge of the Leach's Storm-Petrel colony and the underside was monitored for salamander presence over the next several years. From 3-9 animals were noted, of which one had eggs (Figure 489)*. Unlike slugs, no Wandering Salamanders were found in seabird burrows during hundreds of searches. A preliminary study was conducted on Cleland Island in the 1970s on the distribution and movements of this lungless salamander.[341]*

The second discovery, in 1975, was on Grassy Island, about 120 km north of Cleland Island. This low island is vegetated with a mixture of thick salmonberry and twinberry shrubs, patches of cow parsnip, and a small cluster of Sitka spruce trees. The salamander was found under beach logs among dune grass and cow parsnip (see Figure 450 in WV-300 Grassy Island account).

In 2014, the Wandering Salamander was listed as a species of Special Concern by the Committee on the Status of Endangered Wildlife in Canada.[340] This designation is defined as, "a wildlife species that may become threatened or an endangered species because of a combination of biological characteristics and identified threats." Logging practices, resulting in fragmentation of habitat, residential development, and severe droughts, combined with the species' poor dispersal ability, low reproductive rate, and specific habitat requirements, contribute to the species' vulnerability. Nearshore and small island populations are vulnerable to changing weather patterns, especially extreme heat, and could be decimated by a tsunami.[340]

Figure 489. Seabird surveys have had many added-value benefits. One was the discovery of Wandering Salamanders on two offshore islands along western Vancouver Island, Cleland Island and Grassy Island. They were first discovered on Cleland Island in 1967. In August 1974, an adult protecting 26 eggs was found under a piece of plywood (left). The attending salamander, likely the female, stays with the clutch, and does not eat until the eggs hatch. On Grassy Island, a salamander was discovered under drift logs on 23 June 1975 (BC Photo 4313).[302] *Photos by R. Wayne Campbell.*

WV-419 FOAM REEFS

Location: *49°09'42"N 126°02'19"W; 92 E/1.*
West of Ahous Point on the west side of Vargas Island.

Description: *Bare rock.*
These low rocks are likely washed by high waves (Figure 490). They are within Vargas Island Provincial Park.

Historical summary: No birds were present in 1975 (Table WV-419). In 1989, observers landed on the rock and recorded one pair of Black Oystercatchers nesting, but surviving notes were inadequate to determine whether nesting was confirmed.[258]

Table WV-419. Seabird nesting records for Foam Reefs. See Appendix 2 for codes.

DATE	BLOY	SOURCE
19 Jun 1975	0	265
Jun 1989	1S	236, 258

Figure 490. Foam Reef is a low, bare rock and Black Oystercatchers nesting there likely risk having their nests washed out by high summer tides and large waves. Oystercatchers were not seen nesting on the reef in the 1970s, but naturalists did report one or two birds, like this juvenile, feeding on the reefs in summer. A pair was reported nesting in 1989. *Photo by R. Wayne Campbell.*

WV-420 LA CROIX GROUP

Location: *49°09'23"N 126°01'41"W; 92 E/1, F/4.*
Off the southwest side of Vargas Island, north of entrance to Father Charles Channel. Previously named Rugged Group; name changed to La Croix Group in 1947. The La Croix Group officially includes Wilf Rock (*49°08'13"N 125°58'37"W*), which lies southwest of Moser Point at the south end of Vargas Island, and all islets along the west side of Vargas Island from Wilf Rock north to, but not including, Foam Reefs, west of Ahous Point.[154]

Description: *7.4 ha; 29 m high; Forested; Grassy rock; Bare rock.*
Most of the islets are rocky with pockets of herbaceous vegetation (Figure 491). The highest islet has a patch of forested habitat. Wilf Rock is a bare, 0.5 ha, 9 m-high rock. The entire group lies within Vargas Island Provincial Park.

Figure 491. Most islets in the La Croix Group are bare rock with small patches of vegetation. *Photo by R. Wayne Campbell, 19 June 1975.*

Historical summary: Black Oystercatchers and Glaucous-winged Gulls (Figure 492) were nesting on the northwest rocks in 1975; no birds were present on Wilf Rock (Table WV-420). Two small oystercatcher young were seen at one of the five nests found and a second nest had broken eggshell fragments outside the nest. A total of 17 oystercatchers were present. The gull nest contained two eggs. We found a few old, small (possible storm-petrel) burrows in herbaceous habitat on the highest islet, but no sign of recent use.

Figure 492. One pair of Glaucous-winged Gulls was found nesting on the La Croix Group in 1975. A pair was also suspected nesting in 1989. *Photo by David Thomson.*

In 1989, observers landed on Wilf Rock but made observations of the rest of the La Croix Group from the water.[258] A pair of gulls was suspected nesting, but no oystercatchers were seen on the northwest rocks where nesting occurred in 1975. Observers recorded a pair of oystercatchers nesting on Wilf Rock but surviving notes were inadequate to determine whether nesting was confirmed.[258] We considered the 1975 count that was conducted entirely from land the best indicator of the oystercatcher nesting population in this group up to 1990.

Table WV-420. Seabird nesting records for La Croix Group. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
19 Jun 1975	5[2]	1	32, 265
Jun-Jul 1989	1S	1S	236, 238, 258

Remarks: Mink were sighted on the rocks in 1975 and may have been responsible for the empty oystercatcher nests and broken eggs.

Seabirds in the Rain Forest – Floodwaters in Clayoquot Sound

One of the most famous conservation battles in BC took place in Clayoquot Sound from 1984 to 1993. It was called the "War in the Woods" and was a fight to save some remaining intact stands of the magnificent old-growth rain forest that used to clothe the entire BC coast. The struggle garnered international attention and civil disobedience on an unprecedented scale. A total of 932 people were arrested in their determination to blockade further logging, and they suffered fines up to $3,000 and as much as 60 days jail time. It remains the largest act of civil disobedience in Canadian history (Figure 493).

Clayoquot Sound was known to be an important area for Marbled Murrelets since Harry Carter conducted at-sea surveys there in 1982.[204] *Repeated surveys in the 1990s indicated a decline in murrelet numbers that was attributed to loss of old-growth forest nesting habitat due to logging* (Figure 494).[135] *Following the success of the "War in the Woods" campaign, and addressing recommendations made by the government-appointed Clayoquot Sound Scientific Panel, an intensive study of Marbled Murrelets was initiated in 1995 supervised by Trudy Chatwin of the BC Ministry of Water, Land and Air Protection.*[28] *The objectives of the study were to determine abundance, habitat associations, and impacts of forest fragmentation by logging for Marbled Murrelets nesting in Clayoquot Sound. The ultimate goal was to identify suitable nesting habitat that could be set aside as Wildlife Habitat Areas to protect an adequate quality and quantity of habitat to sustain this old-growth dependent species.*[63]

Conducting those studies was a great adventure. I (Michael) had the good fortune to be part of the research team responsible for conducting inland surveys of Marbled Murrelet activity and measuring habitat associations during the summer of 1997.[185-187] *We conducted repeated surveys at 177 stations in 11 watersheds. These were remote areas. To access our survey stations, we would get dropped off by helicopter in one of the valleys and then spend 10 days hiking from station to station up and down river valleys and across ridges to adjacent watersheds. Midway through a 10-day session we would get a food drop and sometimes a helicopter lift into the next valley. We worked in teams of two spread across the different watersheds. Each evening we had a check-in by hand-held VHF radios among the four teams involved. Other than that, each team was on their own and had to cope with whatever obstacles the landscape and the weather offered. That summer we learned why the area is called a rain forest.*

Hiking through remote wilderness forests where there are no trails usually entails bushwhacking (Figure 495), *scrambling over rocks, clambering over and under deadfalls, and crossing creeks and rivers either by wading through the stream or balancing across a log if a tree has serendipitously fallen across the creek where you happen to need it. Each night you need to find a dry and level spot to pitch your tent and make your camp. All this is generally straightforward, although it can sometimes take considerable searching to find a comfortable campsite when slopes are steep, or the topography is uneven. But watch out when the rains come. On one of our 10-day excursions, the rains began and did not let up. They were torrential. Within hours small streams were swollen to raging torrents. And we were in a location where camping was not feasible; we had to keep moving. Traversing a small stream that we normally could boulder hop across became a death-defying balancing act over a small log precariously hung above swirling currents that threatened to sweep us away at one misstep. Water began to spring from the ground. All through the forest floor, water was spouting out of the moss. Finally, just before dark, we found a small patch of forest floor, just the size of our tent, that wasn't gushing water. But all around us was. I remember reaching out the door of our tent and filling a cup from a fountain of water that was incongruously spouting from a patch of moss around a tree base where one might typically lounge for a lunch break or a quick nap in the sun. We had never seen anything like it.*

Although there were remnant signs of the flood the next day – debris washed up into the forest where creeks normally didn't run – by and large the forest returned to its peaceful demeanor and showed little signs of erosion or other damage. Streams returned to their banks and again ran clear and cool. Not so where forests had been recently logged. There, soils eroded away, and creeks were laden with sediment. We had witnessed firsthand how forests protect the land that supports them. And we had to be grateful to the over 11,000 activists that came out to lobby for the protection of these magical forests.

Figure 493. For a decade, a bitter battle raged between loggers and conservationists regarding the fate of the remaining stands of old-growth rain forest in Clayoquot Sound, near Tofino, BC (left). Saving old-growth nesting habitat for Marbled Murrelets was a major issue. *Photos by Adrian Dorst.*

Figure 494. Surveys of Marbled Murrelets in Clayoquot Sound, BC in the 1990s indicated that numbers of this tree-nesting alcid were declining. Marbled Murrelets nest on branches of large-diameter trees and population declines were attributed to the loss of old-growth forest nesting habitat due to logging. *Photos by Adrian Dorst.*

Figure 495. Tangles of vegetation and other obstructions made walking through the wilderness forests in Clayoquot Sound difficult and slow. *Photo by Adrian Dorst.*

WV-430 "CLAYOQUOT" SPIT

Location: *49°09'40"N 125°55'39"W; 92 F/4.*
On the north end of Stubbs Island north of the former town and steamship landing of Clayoquot, northwest of Tofino.

Description: *2 m high; Sand spit.*

Historical summary: Single Black Oystercatcher nests with eggs were found in 1969, 1970, and 1980 (Figure 496; Table WV-430). The same nest was used in 1969 and 1970.[107] Stubbs Island may have been surveyed by boat in 1989 and no birds observed,[236] but we are uncertain because there are no surviving records [258] and surveys were focused on the outer coast in this area.[236] Thus we have no definite records since 1980.

Figure 496. On "Clayoquot Spit" on Stubbs Island, a single Black Oystercatcher nest was found in sandy areas among small bits of scattered driftwood on three separate occasions between 1969 and 1980. Dune grass, visible in the centre of photo, helps stabilize sand dunes on Vancouver Island's west coast. *Photo by Adrian Dorst.*

Table WV-430. Seabird nesting records (nests) for "Clayoquot" Spit.

DATE	BLOY	SOURCE
2 Jul 1969	1	107
18 May 1970	1	107
11 Jun 1980	1	266

WV-440 GOWLLAND ROCKS

Location: *49°04'16"N 125°51'25"W; 92 F/4.*
Northwest of Portland Point, south of Cox Bay, within PRNPR.

Description: *0.8 ha; 13 m high; Grassy rock* (Figure 497).

Historical summary: Nesting has been recorded only on the main rock. One Black Oystercatcher nest with three eggs and two empty Glaucous-winged Gull nests were found in 1975 (Table WV-440). Four adult gulls were present. Observations were made from the water in 1989.[258]

Figure 497. Gowlland Rocks are mostly bare rock with patches of grasses in crevices. Nesting has been recorded on the main rock (top photo) but not on the southeast rock. *Photos by R. Wayne Campbell, 20 June 1975.*

Table WV-440. Seabird nesting records for Gowlland Rocks. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
20 Jun 1975	1	2S	(1)	32, 265
Jun-Jul 1989	1eS	0	(0)	84, 236, 238, 258

Remarks: Several gull skeletons, and signs of river otters, eagles, and crows were observed in 1975. Extensive potential nesting habitat for surface nesting seabirds was unused.

WV-450 "PORTLAND" ROCKS

Location: *49°03'51"N 125°50'02"W; 92 F/4.*
West of Portland Point, southeast of Gowlland Rocks, within PRNPR. Colony includes the small rocks west of the point and south of the islets off Radar Beaches.

Description: *0.4 ha; 6 m high; Bare rock.*
The lowest rocks west of Portland Point are likely wave-washed. Nesting has been recorded only on the highest rock.

Historical summary: The Black Oystercatcher nest found in 1975 contained two eggs (Table WV-450). Four adult Glaucous-winged Gulls were also present on the same rock but there was no evidence of nesting. We assume that these rocks were surveyed by boat in 1989 and no birds were observed,[236] although no records survive.[258]

Table WV-450. Seabird nesting records (nests) for "Portland" Rocks.

DATE	BLOY	SOURCE
20 Jun 1975	1	265
Jun 1989	0[a]	236, 258

[a]see text.

WV-460 "WHITE" ISLAND

Location: *49°03'25"N 125°49'08"W; 92 F/4.*
South of Portland Point, northwest corner of Wickaninnish Bay, within PRNPR.

Description: *0.7 ha; 12 m high; Bare rock.*
Two surge channels on the west side cut this rock into three steep-sided ridges (Figure 498).

Historical summary: "White" Island was the second recorded nesting site for Brandt's Cormorants in BC. About 300 birds, mostly immatures, were roosting in 1968. Nesting was recorded in 1969 but has not been observed since (Table WV-460). In 1969, two clusters of six and 21 nests were located on the level top and gently sloping rock at the west tip of the middle ridge. The remains of five old nests were reported in 1974. Roosting birds, again mostly immatures, were recorded in 1972 (60 immatures), 1974 (115 birds), 1975 (3 adults, 151 immatures), and 1977 (55 birds).

Pelagic Cormorants have mainly used three nesting locations and the distribution of nests among those locations has varied. Main nesting locations have been on the cliffs on the north and south sides of the middle ridge and on the mid-east side. Numbers of nests in these three areas, respectively, were: 8, 23, and 5 in 1969; 38, 2, and 4 on 28 June 1970; 42, 0, and 2 on 25 August 1970; 21, 0, and 0 in 1972; 25, 0, and 0 in 1973; and 23, 0, and 4 on 4 August 1974. Additional locations have been used occasionally on the south side of the north finger (1 nest with 3 young on 25 August 1970, and 1 empty nest on 4 August 1974) and on the north side of the south finger (1 nest in 1975). Harry Carter and Bill McIntyre reported nests in a crevice on the west side in 1977 but did not specify which crevice. Nest counts for Pelagic Cormorants indicate a gradual decline since 1970. Thirteen of 14 nests inspected were empty in 1975. The colony was abandoned in 1989 (Figure 499).

Figure 498. This rock was named "White" Island during seabird surveys due to the extensive guano blanketing the cliffs from roosting and nesting Pelagic and Brandt's cormorants. The island is bare rock (left) and whitewash is most evident along the west side. *Photos by R. Wayne Campbell, 4 August 1969 (left) and 30 July 1968.*

Figure 499. The Pelagic Cormorant colony on "White" Island was first documented in 1968 but was abandoned in 1989 for unknown reasons. Images here show (clockwise from top left): the slippery guano that made accurate nest counts treacherous in 1968; typical nests of grasses, twigs, seaweeds, and marine debris on the east side of the island in 1974; adult Pelagic Cormorant in 1969 at nest with two new eggs (light) and two eggs that are stained from being incubated; and two downy nestlings showing emerging wing feathers in 1969. *Photos by R. Wayne Campbell, 30 July 1968, 4 August 1974, and 4 August 1969.*

Racey reported 15 partially constructed Glaucous-winged Gull nests in 1931. Gull nests were not counted in 1968 and 1969; young were large and many had already fledged. Many young were also away from their nests in 1973 and 1974. Nesting occurs over most of the island, and numbers of nests have varied among years.

Locations of Black Oystercatcher nests have not been specified except in 1975 when single nests were found on the top middle of the north and south ridges (Figure 500). Observers landed on the island in 1989 but surviving records are inadequate to determine whether nesting by oystercatchers was confirmed.[258]

Table WV-460. Seabird nesting records for "White" Island. See Appendix 2 for codes.

DATE	BRCO	PECO	BLOY	GWGU	PIGU	SOURCE
31 May 1931				15		170
30 Jul 1968	0	37[36]	1	50-75e		107, 265
4 Aug 1969	27[11]	36[32]		75-100e	(2)	107, 265
28 Jun 1970	0	44[40]	2[2]	72[72]		107, 265
25 Aug 1970	0	45[42]		x	x(2)	265
2 Jul 1972	0	21[18]	1	36[11]		107
2 Aug 1973	0	25[23]	2	62		107, 265
1 Aug 1974	0	23[22]		41		107, 265
4 Aug 1974	0	28[22]	1	15e		107, 265
20 Jun 1975	0	19	2[2]	61[41]		32, 107, 265
29 Aug 1977		9[8]				265
Jun-Jul 1989	0	0	2S	77	(0)	84, 236, 238, 258

Remarks: This colony may have suffered from repeated disturbances. An extraordinary number of dead gull chicks were reported in 1969. A First Nations family collected gull eggs on 24 June 1972. Between visits three days apart by Hatler et al. in 1974,[107] the total number of gull eggs in nests dropped from 44 to four, the number of chicks found were similar (24 and 22), and the number of nests reported declined from 41 to an estimated 15.

Ninety-four Glaucous-winged Gull chicks were banded in 1968 and 1969.

Figure 500. Black Oystercatcher nest of rock chips and a gooseneck barnacle on the top of "White" Island in 1975. The egg was pipping, and a chick may have been hiding nearby. *Photo by R. Wayne Campbell, 20 June 1975.*

WV-470 "SCHOONER" ISLAND

Location: *49°03'28"N 125°48'31"W; 92 F/4.*
South of Schooner Cove, southeast of Portland Point, within PRNPR.

Description: *4.3 ha; 62 m high; Forested.*
The forest on this island has a thick salal understory. Many dead snags were noted by Dave Hatler and Wayne Campbell in 1970. There is an extensive rocky area around the southern end.

Historical summary: Two Glaucous-winged Gulls were sitting on top of a snag in 1970 but there was no evidence that they were nesting (Table WV-470). A pair of agitated gulls was present and suspected nesting in 1975 but no nest was found. No Black Oystercatchers were seen in 1970 but an oystercatcher nest with two eggs was found on the southwest point in 1975. In 1970, one Pigeon Guillemot was present just offshore and observers suspected that it may have had a mate incubating eggs on the island. No guillemots were seen in 1975. We assume that this island was surveyed by boat in 1989 and no birds were observed,[236, 238] although no records survive.[258]

Table WV-470. Seabird nesting records for "Schooner" Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
28 Jun 1970	0	0	S(1)	265
20 Jun 1975	1	1eS	(0)	265
Jun-Jul 1989	0[a]	0	(0)	236, 238, 258

[a] see text.

Remarks: One adult Bald Eagle was present in 1970.

WV-480 LOVEKIN ROCK

Location: *49°04'00"N 125°45'28"W; 92 F/4.*
North end of Long Beach, just southeast of Incinerator Rock, within PRNPR.

Description: *0.5 ha; 13 m high; Grassy rock.*
Lovekin Rock is connected to Vancouver Island at low tide.

Historical summary: Ian Smith reported Glaucous-winged Gull nests with eggs in 1961 (Table WV-480). The site was abandoned in 1966 and there have been no nesting records since, except one nest record card submitted by Alex Mills on 18 June 1981 that may refer to Lovekin Rock. Alex gave the location as "a small island on the coast one mile from the restaurant at Long Beach," which approximately describes the location of Lovekin Rock. He observed one adult gull sitting on a nest for about one hour. A second adult visited the nest briefly during this period.

We assume that this rock was surveyed by boat in 1989 and no birds were observed,[238] although no records survive.[258]

Table WV-480. Seabird nesting records for Lovekin Rock. See Appendix 2 for codes.

DATE	GWGU	SOURCE
Jun 1961	15+e	107
1966	0	107
Jun-Jul 1989	0[a]	238, 258

[a] see text.

Remarks: Increasing tourist use and raccoons were suggested as possible causes for the abandonment of this colony (Figure 501).[107]

Figure 501. In the mid-1960s, garbage scattered by tourists on Long Beach attracted many night-time scavengers. Nearby Lovekin Rock was accessible at low tide to curious tourists and predators of nesting seabirds, including Northern Raccoons. *Photo by R. Wayne Campbell.*

WV-490 GREEN POINT

Location: *49°03'06"N 125°43'20"W; 92 F/4.*
Middle of Long Beach on the shore of Wickaninnish Bay, within PRNPR.

Description: *11 m high; Rocky point* (Figure 502).

Figure 502. Green Point, which is mostly bare rock, was a popular place in Wickaninnish Park (later part of Pacific Rim National Park Reserve) for visitors to explore tide pools. *Photo by R. Wayne Campbell, August 1968.*

Historical summary: Adrian Dorst found a Black Oystercatcher nest with two eggs in 1972 (Table WV-490). As of 1990, there were no reported visits since 1972 (but see Appendix 1). We have no record of Green Point being surveyed for Black Oystercatchers in 1989,[236, 258] but Ewins et al.[84] stated that the Vancouver Island shoreline in this area was surveyed for Pigeon Guillemots during that survey. They may have boated by the point and saw no nesting birds.

Table WV-490. Seabird nesting records (nests) for Green Point.

DATE	BLOY	SOURCE
12 Jun 1972	1	107

Remarks: The main campsite at Long Beach is located at Green Point (Figure 503) and it is unlikely that nesting seabirds would persist here in the face of constant disturbance (but see Appendix 1).

Figure 503. The main campsite in Wickaninnish Provincial Park (later part of Pacific Rim National Park Reserve) is located at Green Point. From 1967 to 1969, Wayne Campbell was the seasonal naturalist at Wickaninnish Provincial Park. The employment offered by BC Parks Branch was a unique opportunity to survey local seabird colonies and band marine birds. *Photo by William M. Verbruggue, June 1967.*

WV-500 SEA LION ROCKS

Location: *49°02'18"N 125°43'11"W; 92 F/4.*
South of Green Point in Wickaninnish Bay, within PRNPR.

Description: *1.3 ha; 8 m high; Bare rock.*
This is a group of five rocks, only two of which have supported nesting seabirds. The largest, main rock has precipitous sides and a rounded, irregular top (Figure 504).

Historical summary: These rocks have been frequently surveyed by provincial and federal Park personnel (Figure 505). Surveys from land were conducted in most years between 1965 and 1977. The rocks were surveyed only from the water in 1989.[258]

Figure 504. View of Sea Lion Rocks (background) from Green Point. Seabirds breed on two of the largest of the five rocks in this group. *Photo by R. Wayne Campbell, 11 August 1969.*

Figure 505. Ocean waters around Sea Lion Rocks are typically rough due to ocean swells and almost constant wind, and landing on the rocks can be hazardous. During surveys by Parks personnel, an extra person was required to drop surveyors off and then attend the inflatable boat. *Photo by R. Wayne Campbell.*

All cormorant, oystercatcher, and gull nests have been located on the main rock except in 1975 when one oystercatcher and seven gull nests were found on the northwest rock (Figure 506; Table WV-500). All cormorant nests have been on the northeast corner of the main rock. Brandt's and Pelagic cormorant populations have declined, whereas Glaucous-winged Gull numbers have remained relatively stable, oscillating between 130 and 175 nests, except only 120 pairs were estimated nesting in 1989 from the water.

Figure 506. At least 300 non-breeding Steller Sea Lions haul out on the largest of the Sea Lion Rocks each summer. Their presence restricts available nesting habitat for Brandt's Cormorants, Black Oystercatchers, and Glaucous-winged Gulls. *Photo by R. Wayne Campbell, July 1967.*

Yorke Edwards and David Stirling observed many Brandt's Cormorants, some of which were carrying nesting materials, in 1964 (Figure 507). Stirling and Buffam returned in 1965 and confirmed the first breeding record for this species in Canada.[211] Nests were clustered in three groups of 58, 29, and 23 nests spaced 50-100 feet apart on the gradually sloping rock at the top edge of the cliffs on the northeast corner of the largest rock. Contents of individual nests were not specified, but observers noted that most, or perhaps all, nests contained eggs or young. Their numbers have decreased since, offset by slight increases in 1972 and 1977. Only six pairs successfully raised young in 1970,[7] and the eight pairs that built nests in 1971 appeared to be unsuccessful. Repeat visits were made in 1972: nests were counted from the water on 29 June; land surveys were conducted on 2 and 29 July; and on 7 September, 29 large young were counted from the water. No nests were recorded in 1982, but the visit occurred early in the season and nests may have been built afterwards; 65 birds were present.[107] Only five nests were reported in 1989.[258]

Figure 507. In June 1964, Brandt's Cormorant had not yet been confirmed nesting in BC, but nesting was suspected on Sea Lion Rocks. Nesting was confirmed there the following summer. During the ensuing 57 years, this peripheral species has nested irregularly along the west coast of Vancouver Island and in the Scott Islands. It has recently also been found nesting on Mandarte Island in the Salish Sea.[59] Aspects of Brandt's Cormorants nesting on Sea Lion Rocks are shown here (clockwise from top left). **1)** Using a telescope to view the colony from Green Point, Brandt's Cormorants were observed flying over Sea Lion Rocks in 1964. Several birds appeared to be carrying clumps of nesting material. **2)** The colony, in all years, was located on the northeast corner of the largest island about 0.35 km from Long Beach. Numbers decreased steadily since the colony was first established in 1965. **3)** Nest consisting entirely of Torrey's surf-grass (*Phyllospadix torreyi*), a maritime vascular plant growing in intertidal to subtidal habitats. **4)** Naked chick and egg seen on 27 July 1969. **5)** Three large young still covered with down on 4 August 1970. **6)** Michael Shepard banding nestlings on 4 August 1970. *Photos by R. Wayne Campbell.*

Figure 508. The Glaucous-winged Gull colony on Sea Lion Rocks was surveyed eight times between 1967 and 1982. Number of nests ranged from 131 to 175 (see Table WV-500). Images of the gull colony include (clockwise from top left): part of the Glaucous-winged Gull colony in rocky habitat; young chicks too small to band; young gull with a tarsus large enough to receive a band; and Bill Anderson (left) and two park visitors dressed in "hoodies" during banding operations. *Photos by R. Wayne Campbell, 30 June 1968 (top left) and 3 July 1967.*

Stirling and Buffam found no Pelagic Cormorant nests in 1965.[211] Pelagic Cormorants were first recorded nesting in 1967.[37] Nests were mainly on ledges on the cliffs below the Brandt's Cormorant colony, but several nests were located on the level rocks above the cliffs. The nesting population has oscillated between 10 and 48 pairs, with highest numbers in 1968 and lowest in 1975. None bred successfully in 1970. In 1974, observers reported a total of 24 nests of both cormorant species on 1 August, which likely included the same 11 Brandt's and 13 Pelagic cormorant nests counted on 4 August. Only four Pelagic Cormorant nests were seen from the water in 1989.

Black Oystercatchers were recorded present but not breeding in 1965.[211] They were confirmed breeding in 1967 when one nest containing two eggs was found in the centre of the gull colony.[37] Three pairs were present in 1968, but only a single empty nest scrape was found among basking sea lions on higher rocks on the main island. The nest found with eggs in 1970 was also located in the centre of the main rock. In 1975, one nest with three eggs was found on the northwest rock and at least one pair was suspected nesting on the main rock. No oystercatchers were seen from the water in 1989.

Complete nest counts have been made for Glaucous-winged Gulls in most years (Figure

Table WV-500. Seabird nesting records for Sea Lion Rocks. See Appendix 2 for codes.

DATE	BRCO	PECO	BLOY	GWGU	SOURCE
26 Jul 1965	110	0	0	x	211
3 Jul 1967	81[61]	23[23]	1	131[122]	37
30 Jun 1968	68[60]	48[38]	2+eS	170[167]	107, 265
27 Jul 1969	41[37]	42[39]	2S	x	107, 265
27 Jun 1970	43[0]	30[0]	1	141[135]	107, 265
4 Aug 1970	43[3]				107, 265
10 Aug 1971	8[0]	15[15]		x	107, 265
29 Jun 1972	47				107, 265
2 Jul 1972	50[40]	20[17]		171	107, 265
29 Jul 1972	30[25]	23[18]		x	107, 265
2 Aug 1973	5[3]	22[17]		175	107, 265
1 Aug 1974				137	107, 265
4 Aug 1974	11[7]	13[12]			107, 265
20 Jun 1975	6[1]	10[3]	2e	167[158]	32, 265
29 Aug 1977	29[27]	25[21]	S	x	265
19 Jun 1982			1	133[106]	181, 265
Jun-Jul 1989	5	4eS	0	120eS	238, 258

508), but contents of all nests have not always been specified. Most gull nests contained eggs or young on 2 July 1972 and on 2 August 1973. In 1974, there were 87 empty gull nests but there were many young outside nests.

Campbell observed a Western Gull on territory with a Glaucous-winged Gull at a nest with three young on 27 July 1969.[265]

There has been no evidence of Pigeon Guillemots nesting on Sea Lion Rocks. One was reported nearby in 1975 and two immatures were noted in 1977.

Remarks: Minor predation on Brandt's Cormorant eggs by Northwestern Crows was observed when the colony was disturbed by surveyors in 1967.[37] Belton attributed the low breeding success of cormorants in 1970 to disturbance from low-flying aircraft.[7] Hatler et al. listed disturbance from park visitors, "buzzing" by aircraft, and shooting at sea lions by fishermen as possible causes of the general decline of Brandt's Cormorants.[107] They felt that the weekly boat excursions around the island that were conducted for tourists by Parks personnel were unlikely to disturb nesting birds (Figure 509).

Figure 509. The province's first wildlife viewing excursions were organized at Wickannish Provincial Park to view sea lions and marine birds. Park visitors were picked up at the north end of Long Beach and viewing distances were maintained so basking and nesting animals were not disturbed. *Photo by R. Wayne Campbell, Long Beach, BC, 15 July 1967.*

The colony has been frequently surveyed and intensive banding operations have been conducted. A total of 950 Glaucous-winged Gull chicks were banded between 1967 and 1972.[107] Band returns from that study were from Port Hardy, Kamloops, and the Lower Mainland in BC but most were from Washington State. Juveniles travelled as far south as San Francisco and one made it to Midway Island.

On a Rising Tide

Timing is crucial and many incredible experiences in life are fortuitous. The more hours spent in the field, the better the chances of seeing something unique and unexpected. While banding young Glaucous-winged Gulls on Sea Lion Rocks, off Long Beach on 27 July 1968, we had the opportunity to witness such an unexpected and riveting event that, in this case, involved Killer Whales and sea lions. While conducting the banding, we noticed that a group of loafing Steller Sea Lions suddenly became attentive and nervous. We then spotted the erect dorsal fin of a male Killer Whale (Orca), which was just visible behind the sea lions, about a metre from the main rocks (Figure 510). *We assumed that the Orca was attempting to panic some of the sea lions into the ocean, but the tactic did not appear to be effective. Soon, more whales appeared and patrolled the east side of the main rocks, swimming for 10 minutes or so about 50 m offshore. The pod included an adult male with a large, vertical dorsal fin, two females (presumed), and two smaller whales (presumed young).*[305] *At that time, there were still about 100 sea lions hauled out on the northeastern tip of Sea Lion Rocks* (Figure 511).

Watching the Orcas hunt was a perplexing experience as it was difficult to understand their strategy. It seemed as though they could have easily captured a sea lion off the rocks, given that the sea lions were located so low and close to the water's edge (Figure 512). *The most vulnerable sea lions were in two groups: one group of about 30 gathered on a small rock off the southeastern tip of Sea Lion Rocks, and a second group of seven that were barely able to stay on another tiny rock. However, for the next 45 minutes the Orcas simply swam around and at times seemed to be playing, tail-flapping and slapping their flippers. On several occasions, the pod disappeared, and we assumed it had moved on.*

When they did attack, the whales focused their attack on the smaller group of seven sea lions, including an immature bull, on the now wave-splashed rock. The tide was rising! Three sea lions had to leave the sanctuary of the rock and at least one was captured and devoured. Nearby Glaucous-winged Gulls, 11 roosting Heermann's Gulls (Larus heermanni; Figure 513), *several Western Gulls, one Black-legged Kittiwake that had arrived early from its northern breeding grounds, and a few Brandt's Cormorants, flew to the site to feed on the sea lion scraps that had floated to the surface. Also, hundreds of California Gulls* (L. californicus), *which were resting on Long Beach, about 0.35 km away, flew in to join the feeding frenzy* (Figure 514).

We suspected that another sea lion was taken about 45 minutes later when we observed a mixed-species flock of gulls feeding just offshore. Unfortunately, it was too far away to see clearly. Only two sea lions, one a young bull, remained on the small rock when the Orcas left, travelling southward.

The Orca is the apex predator in the BC marine ecosystem and has a diverse diet, preying on a variety of marine animals, including whales and sea turtles. It is one of the most widespread mammals in the world. Three reproductively isolated lineages (ecotypes) have been identified in BC: "Residents" that feed mostly on salmon, "Transients" that mainly prey on marine mammals, and "Offshores" that mainly eat sharks.[342] *The ranges of these three lineages overlap. The Orcas seen off Sea Lion Rocks 27 July 1968 were identified as "Transients."*

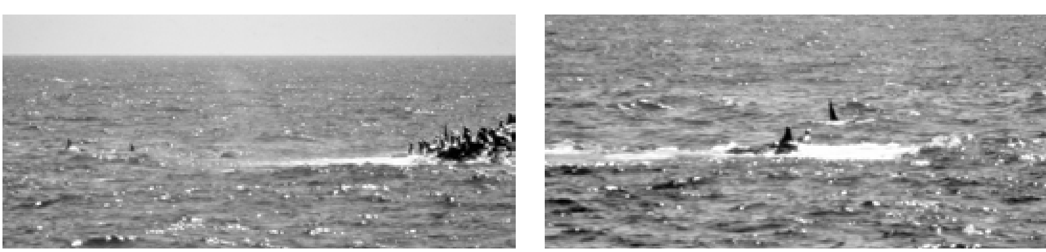


Figure 510. The tall dorsal fin of an adult Orca is just visible behind a group of sea lions (left) that were at the edge of water on Sea Lion Rocks. Note two presumed female Orcas nearby. When the Orcas departed, only two sea lions remained, one an immature bull. *Photos by R. Wayne Campbell, 27 July 1968.*

Figure 511. Nonbreeding adult and immature Steller Sea Lions use Sea Lion Rocks to bask, rest, and haul-out during the summer months. Numbers decrease from about 300 in early June to 100 or so by the end of August each year.[304, 305, 311] *Photo by R. Wayne Campbell, 27 July 1968.*

Figure 512. It appeared that Orcas seen hunting around two islets off Sea Lion Rocks in 1968 had a good opportunity to capture a sea lion off the low rocks where they were hauled out, such as the sea lions in this photo that are closest to the water. Instead the whales left to hunt around a nearby smaller rock. *Photo by R. Wayne Campbell, 27 July 1968.*

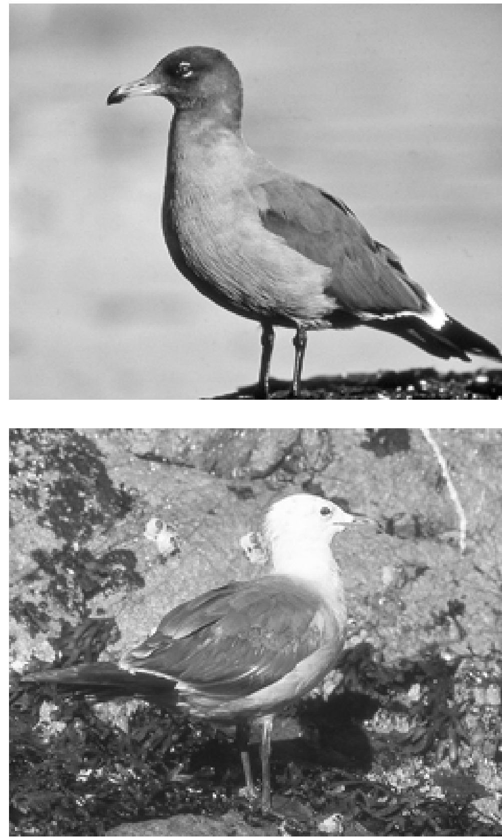


Figure 513. Heermann's Gulls are frequently seen along the southern west coast of Vancouver Island.[298, 343] They are a distinctive-looking gull. Juveniles (top) have a very dark sooty brown body and bi-coloured bill; adults have a gray body, white head, and a red bill. In BC in recent years, this species has been arriving earlier, departing later, and occasionally overwintering. As sea temperatures increase due to climate change, and with shifting food patterns, some researchers suggest this Mexican gull may breed in BC in the near future. *Photos by R. Wayne Campbell, 4 August 2003.*

Figure 514. California Gulls loafing and preening on Long Beach in 1968 were alerted to a sudden new source of food and quickly flew about 350 m to where Orcas were eating a sea lion. *Photo by R. Wayne Campbell, July 1968.*

WV-508 "QUISITIS" ROCKS

Location: *48°59'44"N 125°39'26"W; 92 C/13.* East of Quisitis Point at the north end of Florencia Bay, within PRNPR.

Description: *0.3 ha; 3 m high; Bare rock.*

Historical summary: In 1975, two Glaucous-winged Gulls were present but no nests were found; no Black Oystercatchers were present (Table WV-508). Observers landed on the rock and found one oystercatcher nest in 1989.[258]

Table WV-508. Seabird nesting records (nests) for "Quisitis" Rocks.

DATE	BLOY	SOURCE
20 Jun 1975	0	265
Jun-Jul 1989	1	236

WV-510 "CORMORANT" ROCK

Location: *48°59'31"N 125°40'01"W; 92 C/13.* South of Quisitis Point at the north end of Florencia Bay, within PRNPR.

Description: *1.7 ha; 8 m high; Bare rock.* This rock has a precipitous north face and a rounded southern aspect.

Historical summary: Nesting by Pelagic Cormorants and Black Oystercatchers has been recorded only in 1972 (Table WV-510). Adrian Dorst counted cormorant nests on the north-side cliffs by telescope from the Vancouver Island shore and reported 19 nests on 20 June and 25 nests on 30 June. Most nests were located under rock overhangs and were not visible from above. Three of four nests that were accessible from land contained eggs on 2 July. Observers boated around the island in 1989 and saw no birds.[258]

Table WV-510. Seabird nesting records for "Cormorant" Rock. See Appendix 2 for codes.

DATE	PECO	BLOY	SOURCE
1971	0		107
30 Jun 1972	25		107
2 Jul 1972	x	1	107
1 Aug 1973	0		107
Jun-Jul 1989	0	0	238, 258

WV-520 FLORENCIA ISLET

Location: *48°58'44"N 125°38'36"W; 92 C/13.*
In Florencia Bay, west of Wya Point, within PRNPR.

Description: *10.6 ha; 15 m high; Forested.*
Florencia Islet is a forested islet with rocky shores, outcrops, and cliffs. Dense shrub cover of black twinberry occurs under the Sitka spruce forest (Figure 515). The predominantly rocky area at the southeast end is separated from the main islet by a tidal channel. There is a steep slope on the north end covered with dune grass.

Historical summary: The islet has been thoroughly surveyed several times since 1968. Only cormorant nests on the northwest end of the islet were counted on 4 August 1974, and only the south end was surveyed for gulls in 1979.

Figure 515. Florencia Islet is heavily forested (top right), with a thick black twinberry (top left) understory and rocky outcrops and steep cliffs around the perimeter. Six species of seabirds have been recorded nesting on the islet. A nearby, unnamed rocky reef in Florencia Bay is used at low tides by loafing Glaucous-winged Gulls (bottom foreground). *Photos by R. Wayne Campbell, 11 July 1975.*

In 1968, Pelagic Cormorants were nesting at the north end of the islet (Figure 516; Table WV-520). After not using the islet for at least three years (none seen in 1969, 1970, and 1972; no data for 1971), an expanded population occupied three locations on the main islet on 2 August 1974: the northwest corner (45 nests), the mid-west tip (16 nests), and the southwest tip (21 nests). Only the northwest (37 nests) and southwest (42 nests) corners were used in 1975. Observers in 1982 noted many nests under overhangs that could not be counted and it is not known whether numbers nesting were less in 1982 than 1975. Cormorants had again abandoned the islet in 1989.

Figure 516. Some of the nesting Pelagic Cormorants were flushed from their nests on the north end of Florencia Islet due to disturbance from personnel surveying the colony in 1968 (top). The bottom photo shows a selection of fishes, including sculpins, regurgitated by a cormorant. *Photos by R. Wayne Campbell, 22 July 1968.*

Black Oystercatchers were suspected nesting when the islet was first surveyed on 22 July 1968 and were confirmed nesting when one large chick was found hiding in the rocks on 2 August 1968. Large numbers of oystercatchers were counted around the island in 1968 (22), 1969 (46), 1970 (37), 1975 (20), and 1982 (19). Four Black Oystercatcher nests were located and nine pairs were estimated nesting in 1989 (Figure 517).

Figure 517. Five Black Oystercatcher nests were found on Florencia Islet in 1975, and a maximum of nine pairs were estimated nesting in 1989. *Photo by R. Wayne Campbell, 11 July 1975.*

The nesting population of Glaucous-winged Gulls appears to have peaked around 1975 and has declined since. Gulls have nested along the west side of the main islet and on the southeast rock, except one nest with two eggs was found on the east side of the main islet in 1975. Many large gull chicks were already out of their nests when the islet was surveyed in 1968, 1969, and 1974 (Figure 518). Complete nest counts were not attempted in 1968 and 1969. In partial counts conducted on 22 July 1968 and 15 July 1969, 37 of 68 and 85 of 124 nests, respectively, still contained eggs or young. All nests were counted on 2 August 1974; most (308) nests were empty but many young (452 were counted) were present out of nests. In 1970, nests were tallied for three separate areas: 19, 170, and 70 nests on the northwest and southwest parts of the main islet and on the southeast rocks, respectively. Totals of 22, 208, and 248 nests were counted in those areas in 1975. During the survey of the south end in 1979, 126 nests were tallied, of which 116 (92%) were empty, and only 10 held eggs.

Figure 518. Glaucous-winged Gull chicks that wander from their parents' territories are often attacked by neighbouring adults and may be injured or killed. The large chick on the right in this photo has a small, bloody wound on its face, likely from such an attack. During the nestling period, especially later in the season when chicks are larger, is thus not a good time to conduct nest counts because of the risks to mobile chicks that are inevitably flushed into strange territories by human intruders. Also, many nests are empty at this time and many have been at least partially obliterated by the activities of the birds and weather. This makes it difficult to obtain accurate nest counts. *Photo by Paula Courteau.*

There is only one record of Common Murres breeding on the islet. One pair was standing on a cliff ledge on the east side of the isolated south end in 1969. One freshly broken egg was found.[107] One to six Tufted Puffins have been present on most surveys. One puffin was flushed from a burrow on the north end of the islet in 1970.[265] Pigeon Guillemot nests have been found under rocks and drift logs (1969), in a burrow (1970), and under salal (1975).

Inconclusive evidence of breeding by three species has been reported. Campbell flushed one adult Brandt's Cormorant from a loose assemblage of nesting materials on the northwest side of the islet in 1969.[265] He also encountered several burrows on the east side of the islet that he suspected were used by Rhinoceros Auklets. Remains of a Leach's Storm-Petrel were found in 1972 and 1975, and observers in 1975 reported about 60 individuals of this species calling in the early morning. Hatler et al. located no burrows on intensive searches in July 1972 and 1975 and concluded that nesting was unlikely.[107]

Figure 519. A family camping in Florencia Bay helped tally nests and band young gulls on Florencia Islet in 1968. *Photo by R. Wayne Campbell, 22 July 1968.*

Table WV-520. Seabird nesting records for Florencia Islet. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	COMU	PIGU	TUPU	SOURCE
22 Jul 1968	14[2]	2-4S	75-100e	(30)	S(53)	S(1)	265
2 Aug 1968	16[11]	x	x		S(75)	S(2)	107, 265
15 Jul 1969	0		124+	1	x2(44)	S(4)	107, 265
28 Jun 1970	0	6[2]	259[229]	0	x(35)	1(2)	107, 265
3 Jul 1972		2[2]	307		x(33)	S(6)	107, 265
29 Jul 1972	0	1					107
29 Jul 1973	86						107
2 Aug 1974	82[80]	1	325				107, 265
4 Aug 1974	42[41]+			(4)	(23)	(6)	265
11 Jul 1975	79[67]	5[4]	479[353]		x(14)	S(5)	32, 107, 265
13 Jul 1979		2[2]	126[10]+		(2)		85
19 Jun 1982	27[22]+	7[5]	346[322]	0	S(12)	S(1)	265, 181
Jun-Jul 1989	0	9e	186		S(10)		84, 236, 238, 258

Remarks: Twenty-four dead gull chicks and one dead adult Pelagic Cormorant were found in 1975. No evidence of predation other than the remains of single Leach's Storm-Petrels mentioned above was recorded in other years. Signs of river otter were noted in 1970 and 1975. One adult Bald Eagle was present in 1975 and a Bald Eagle nest and two adult eagles were seen in 1982.

A total of 608 Glaucous-winged Gull chicks were banded between 1968 and 1972 (Figure 519).[107] Vermeer investigated the diet of Glaucous-winged Gulls in 1980.[226]

Who's Who in the Animal World
- It's All What You're Used To

As the cliché goes, from the perspective of a person of one race, all people of another race look the same. Even more so for seabirds or other animal species – they all look the same to us humans! But individual animals are as unique as individual humans and amongst their own kind have no difficulty identifying each other. And the cues they use are probably like ours, including sight, smell, sound, and body language (Figure 520).

Common Murres identify their uniquely-marked eggs by sight and will find and move a displaced egg several meters to return it to its original nest site. To do this, the parent murre will tuck the egg into incubation position, where it is held above and between the tarsi, and then shuffle slowly back to their nest site.[128] In contrast, storm-petrels use smell to identify their mates and to find their burrows, which, under the cover of night, they must distinguish from thousands of similar burrows.[18] Ancient Murrelet chicks that precociously depart nesting colonies find their parents on the water among a milieu of birds using individually-recognizable calls. When they are only two days old, chicks learn the call of their parents through several minutes of intense vocalization by the parents just before departure from the burrow.[129] Birds also likely recognize their mates and other birds by their personal "jizz" or unique body posture and movements, similar to the way we can recognize familiar people by the way they carry themselves. This, in combination with their visual acuity allows birds to recognize each other from considerable distance. Tim Birkhead [16] recounts how he saw one incubating Common Murre suddenly get up and start to give the greeting call that is used when a partner returns from sea. The observation was puzzling because no bird had yet arrived. Scanning out to sea, Tim could just make out the black dot of a bird approaching the colony. Amazingly, with the mate on the colony continuing to call, the distant bird flew in and alighted at the nest and enthusiastically greeted its partner in turn. The incubating bird had recognized its mate from 100s of meters away!

Birds do not just recognize their mates – they clearly know other individuals that they are in contact with. This is obvious when birds are courting and choosing partners, but it is apparent during many other interactions as well. I (Michael) once watched a *male Harlequin Duck that was out foraging suddenly get distracted by something he spotted on shore about 100 m away. There was a dense line of roosting Harlequin Ducks on the shore rock and the distracted male made an intent beeline for one of the males standing in the middle of this line. When he reached the rock, he climbed out of the water, ran up to the other male and bashed him off his feet. He then turned around, swam back out to sea, and continued feeding* (Figure 521). *He had obviously recognized a bird that he did not like and purposely ran over to "punch him in the nose." Who knows what might have previously transpired between them to establish such animosity!*

Figure 520. Research has uncovered some fascinating facts about the lives of seabirds. Some of these include (clockwise from top left): the pattern on a Common Murre egg is unique and if the egg is moved, the adult will return it to the original location; smell is used by Fork-tailed (photo) and Leach's storm-petrels at night to find mates and locate burrows among thousands in a colony; for two days after hatching, Ancient Murrelet chicks learn the unique calls of their parents and are able to locate them among large flocks when they scramble to the sea; and Common Murres at colonies can visually recognize mates from hundreds of metres away. *Photos by R. Wayne Campbell.*

Figure 521. Animals have no trouble recognizing each other. We observed one clear and amusing demonstration of this once when we were watching Harlequin Ducks. A foraging male Harlequin Duck appeared to suddenly recognize a rival male loafing on shore amongst a large group of roosting birds located about 100 m away. The foraging male suddenly and rapidly began to swim towards the roosting group of birds, swam directly to one of the males hauled out on the shore, climbed out of the water, bashed the other male off his feet, and then swam back offshore to resume foraging. *Photo by R. Wayne Campbell.*

WV-530 "FLETCHER'S" BEACH

Location: *48°58'18"N 125°36'47"W; 92 C/13.*
South of Wya Point, north end of "Fletcher's" Beach.

Figure 522. This Pelagic Cormorant colony at "Fletcher's" Beach was first discovered in summer 1968. The site is easily accessed by tourists and photographers and cormorant numbers have decreased since 1968, likely due to disturbance and associated crow predation on cormorant eggs. *Photo by R. Wayne Campbell, 5 July 1968.*

Description: *12 m high; Cliffs.*

Historical summary: Pelagic Cormorant nests have been found in south-facing rock crevices (Table WV-530). Contents were determined in 26 nests (16 with eggs) in 1968 (Figure 522) and 13 nests (7 with eggs) in 1970. Adults were seen at the colony in 1972 but no nest count was made. Fewer were nesting in 1989 than in previous years. Pigeon Guillemots have been seen on the cliff faces and likely breed.

Table WV-530. Seabird nesting records for "Fletcher's" Beach. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
5 Jul 1968	46	S(2)	265
14 Aug 1968	12[1]	S(2)	107, 265
9 Jul 1970	24		107
18 Jul 1971	14+		107
3 Jul 1972	x		107
Jun-Jul 1989	6eS	S(3)	84, 238, 258

Remarks: Northwestern Crows were preying heavily on cormorant eggs on 5 July 1968. Later that season, observers attributed the decline in breeding cormorant numbers to local squatters that had been harvesting eggs as well as attempting to photograph the birds (Figure 523). All but one nest were empty at that time. Some crow predation was again noted in 1970.

Figure 523. Access to the "Fletcher's" Beach Pelagic Cormorant colony is a short walk from Highway 4 (Ucluelet-Tofino Highway). It is a popular spot for accessing the open ocean and photographing cormorants. Garbage left behind attracts Northwestern Crows who prey on cormorant eggs. *Photo by R. Wayne Campbell.*

WV-535 UCLUELET

Location: *48°56'17"N 125°32'11"W; 92 C/13.* Ucluelet waterfront on west side of Ucluelet Inlet.

Description: *Wharf* (Figure 524).

Historical summary: A Pigeon Guillemot was seen carrying fish to a nest under the wharf in 1970 (Table WV-535).

Table WV-535. Seabird nesting records (nests) for Ucluelet.

DATE	PIGU	SOURCE
24 Jul 1970	1	33

Figure 524. Historically, Ucluelet was a fishing and logging community. There are still many pilings and wharves where Pigeon Guillemots can nest. *Photo by R. Wayne Campbell, 26 August 1970.*

WV-540 GEORGE FRASER ISLANDS

Location: *48°54'22"N 125°30'49"W; 92 C/13.*
South of the mouth of Ucluelet Inlet, in the entrance to Barkley Sound. Previously named Shelter Islands; name changed to George Fraser Islands in 1934.

Description: *23 ha; 62 m high; Forested; Bare rock.* George Fraser Islands consist of a central large island surrounded by several smaller islets. Larger islands are forested and have rocky promontories. Some small islets are bare rock (Figure 525).

Figure 525. The central island of the George Fraser Islands is forested with rocky outcroppings (top). There are three campsites for ocean kayakers on a pebble beach. Surrounding islets are bare rock. Amphitrite Point on Ucluth Peninsula is visible in the background in the bottom photo. *Photos by R. Wayne Campbell, 12 July 1975.*

Historical summary: Glaucous-winged Gulls have not been seen nesting at this colony since 1970 (Table WV-540). Guiguet saw 12 adults in pairs on territories in June 1970. Campbell found one nest with three young and estimated 10 pairs nesting on the west end of the main island on 23-24 July 1970. Ten gulls were recorded in 1975 but no evidence of nesting was seen. Observers boated around the island in 1989 and saw no birds.[258]

Table WV-540. Seabird nesting records for George Fraser Islands. See Appendix 2 for codes.

DATE	GWGU	SOURCE
4 Jun 1970	6eS	95
23-24 Jul 1970	10e	95, 265
12 Jul 1975	0	265
Jun-Jul 1989	0	238

Remarks: George Hillier reported a Northwestern Crow nesting on the ground under a salal bush on the largest George Fraser Island in June 1967. It contained three pin-feathered nestlings (Figure 526). Ground-nesting by crows is common on seabird colonies in BC.

Figure 526. Ground-nesting by Northwestern Crows has been frequently observed on seabird colonies in BC. This nest was found on the largest of the George Fraser Islands in June 1967. *Photo by R. Wayne Campbell.*

WV-542 JANSON ISLAND

Location: *48°54'04"N 125°30'38"W; 92 C/13.*
Just south of George Fraser Islands. Colony includes low rocks to the east.

Description: *1.4 ha; Forested* (Figure 527).

Figure 527. Janson Island is heavily forested, with rocky shores and outcrops. *Photo by R. Wayne Campbell, 12 July 1975.*

Historical summary: Guiguet saw Glaucous-winged Gulls carrying nesting material here in 1970 but observers in 1975 saw no evidence of nesting (Table WV-542). A thorough search for Black Oystercatcher nests was not conducted in 1975. In 1989, one pair of gulls was confirmed nesting and one Black Oystercatcher nest was found. A second pair of oystercatchers was suspected nesting. Nests may have been on the east rocks.

Table WV-542. Seabird nesting records for Janson Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
4 Jun 1970		S		95
12 Jul 1975		0		265
Jun-Jul 1989	2e	1	S(1)	84, 236, 238, 258

WV-544 HUMPHRIES REEF

Location: *48°53'55"N 125°30'43"W; 92 C/13.*
Just south of George Fraser Islands and Janson Island.

Description: *0.4 ha; 4 m high; Bare rock.*

Historical summary: Nesting was first recorded in 1989 (Table WV-544).

Table WV-544. Seabird nesting records (nests) for Humphries Reef.

DATE	BLOY	GWGU	SOURCE
Jun-Jul 1989	1	1	236, 238, 258

WV-550 STARLIGHT REEF

Location: *48°52'53"N 125°29'07"W; 92 C/14.*
Southeast of George Fraser Islands, south of Felice Channel.

Description: *6 m high; Bare rock.*
Starlight Reef is composed of three higher areas connected by tidal rock. The southern rocky area is the largest (Figure 528).

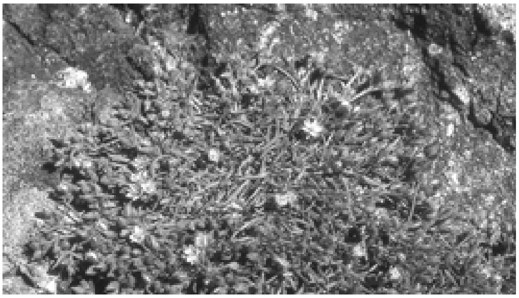


Figure 528. Starlight Reef in silhouette (left). The reef consists of a series of low, undulating rocks with pockets of vegetation in higher crevices. *Photos by Michael G. Shepard, 12 July 1975.*

Historical summary: Starlight Reef, along with Sea Lion Rocks, has been the most consistently used nesting site by Brandt's Cormorants in BC (Figure 529). Campbell reported 80 non-breeding and two adult Brandt's Cormorants roosting on the east side of the largest rock in 1970 (Table WV-550). Breeding was first documented there in 1972, and the site has been occupied on most visits since, except in 1976 and 1988 when only roosting birds were observed. The reef was not landed on in 1988 and some nests may have been present. David Hatler made three visits to the reef in 1972: Brandt's Cormorants were seen carrying nesting materials on 13 June; egg-laying was just beginning on 4 July; and 106 mobile young and 80 nests were counted on 7 September.

The most thorough explorations for Black Oystercatcher nests were conducted by Mike Shepard and others from the BCPM in 1975 and by Doug Bertram and Jeff Reeve from CWS in 1982. In 1975, of 13 nests found, 11 contained eggs or young; hidden young were suspected around the two empty nests. Two additional nests were suspected. Observers also noted five scrapes that were not considered separate nests. All 10 nests found in 1982 held eggs. In other years, one pair was confirmed breeding and 22 birds were counted in 1970, and two oystercatcher nests were found and four pairs were estimated nesting in 1989.

Figure 529. Starlight Reef has been the most dependable site for finding Brandt's Cormorants nesting in BC. Large young, at least two-thirds grown, were seen in late August 1977 (top). *Photos by Michael G. Shepard, 12 July 1975 and R. Wayne Campbell, 30 August 1977 (top).*

Most Glaucous-winged Gulls have nested on the largest rocky area (Figure 530). A total of 159 nests were counted there in 1970; 116 contained eggs or young but there were likely large hidden young associated with many of the empty nests. In 1972, eggs or young were recorded in 142 nests, but the contents of all nests were not specified. Similarly in 1973, many eggs (93) and young (138) were seen but many young were outside nests and the contents of all nests were not specified.

Figure 530. Glaucous-winged Gulls disturbed during the survey of the Brandt's Cormorant colony on Starlight Reef in 1974. *Photo by R. Wayne Campbell, 4 August 1974.*

Five Common Murres were seen offshore in 1970, but breeding was first confirmed in 1975 when one Common Murre with an egg was discovered in a crevice in the cormorant colony (Figure 531). Two young murres were seen in 1980, one on the edge and one in the middle of the Brandt's Cormorant colony. Ken Morgan found one egg in a fissure near the top of the reef in 1989.[60] Pigeon Guillemots have been sighted around the reef but have not been confirmed nesting.

Figure 531. A Common Murre with a single egg was discovered on Starlight Reef in 1975. *Photo by Michael G. Shepard, 12 July 1975.* BC Photo 4312.[302]

Remarks: One dead gull chick was found in 1975, and depredated eggs of Brandt's Cormorant (1) oystercatcher (1) and gulls (19) were seen in 1982. One adult and one immature Bald Eagle were recorded in 1982. Most Brandt's Cormorant chicks were banded in 1980. Vermeer collected regurgitated pellets from gulls as part of a comparative study of adult and chick diets on the east and west coasts of Vancouver Island in 1980.[226]

Table WV-550. Seabird nesting records for Starlight Reef. See Appendix 2 for codes.

DATE	BRCO	BLOY	GWGU	COMU	PIGU	SOURCE
13 Aug 1962		x	x			95
24 Jul 1970	0	10-15e	175e		S(1)	95, 107, 265
4 Jul 1972	41[3]	3[2]	182			107
7 Sep 1972	80					107
29 Jul 1973	61[46]					107
2 Aug 1973			181			107
4 Aug 1974	82[73]	x				107, 265
12 Jul 1975	66[59]	15e	306[288]	1		32, 265
18 Aug 1976	0	x				265
30 Aug 1977	26[21]			(27)		265
16 Aug 1980	43[42]			2		265
18 Jun 1982	31[0]	10[10]	279[231]	0		181, 265
22 Aug 1988					S(11)	181
Jun-Jul 1989	51	4e	320	1	S(2)	60, 84, 236, 238, 258

WV-560 GREAT BEAR ROCK

Location: *48°53'32"N 125°27'18"W; 92 C/14.*
West of the Broken Group, between Loudoun and Felice Channel.

Description: *12 m high; Bare rock.*
The north and south sections of this rock are joined at low tide (Figure 532).

Historical summary: Great Bear Rock was the third Brandt's Cormorant colony identified in BC (Figure 533). Nesting by both Brandt's and Pelagic cormorants has been intermittent and infrequent (Table WV-560). Brandt's Cormorants were recorded nesting in 1970 and 1971, and then again only in 1976, though large roosting flocks were present in other years. Nests were located on the northeast side of the south rock. Pelagic Cormorants have been observed nesting only in 1975, when two nests with young were found. No landing was made in 1988, but only roosting cormorants were sighted from the water.

Glaucous-winged Gulls and Black Oystercatchers have nested on the north and south rocks, but counts for these species have not been kept separate for those two areas in most years. Highest numbers of nests for both species were recorded in 1975. For Black Oystercatchers, six to ten pairs have likely nested in most years, although only four pairs were estimated nesting in 1989. Guiguet counted 24 adult oystercatchers and inspected two nests on this reef on 3 June 1970. One large chick was seen on 24 July 1970. David Hatler and Jim Biggar saw over 35 adults but located no nests in July 1971. In

Figure 532. Great Bear Rock is a low, rocky islet that lacks vegetation. *Photos by R. Wayne Campbell, 12 July 1975 (left) and August 1967.*

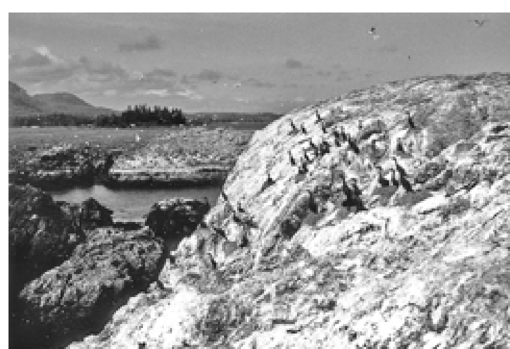


Figure 533. Brandt's Cormorants at nests dot the terrain, with Glaucous-winged Gulls flying above the colony on Great Bear Rock in 1970 (left). The right photo shows a portion of the Brandt's Cormorant colony on sloping bare rocks. *Photos by R. Wayne Campbell, 25 August 1970 (left) and 24 July 1970.*

1972, Hatler observed five pairs acting defensively and found one nest with eggs on 19 May and two different nests (one with eggs) on 13 June. In 1975, nine nests (8 with eggs or young) were located (Figure 534), four on the north rock and five on the south rock, and one other nest was suspected. Hidden young were suspected around the one empty nest. In addition, four scrapes were seen that were not considered separate nests. In 1982, Gary Kaiser and Jeff Reeve located four nests (3 with eggs or young) and suspected two other nests, and in 1989, two oystercatcher nests were found and four pairs were estimated nesting.

Glaucous-winged Gulls were just beginning to lay eggs on 3 June 1970; most nests contained young by 24 July. Only the south rock was surveyed for gull nests on 20 July 1971 and 2 August 1973. Separate tallies were kept for numbers of nests on the north and south rocks on 13 June 1972 (70 on the north and 62 on the south rock) and 13 July 1975 (129 on the north and 145 on the south rock).

Pigeon Guillemots have not been confirmed nesting but one was seen carrying a fish in 1975.

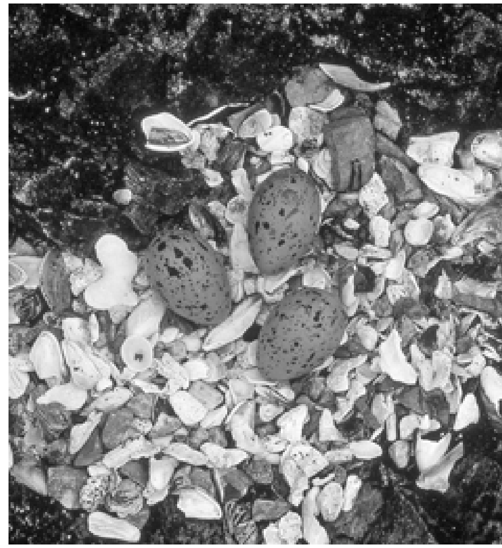


Figure 534. Black Oystercatcher nest on Great Bear Rock with three eggs on a bed of mussel, chiton, and Hooked Slippersnail shells and a few rock pebbles. *Photo by R. Wayne Campbell, 12 July 1975.*

Table WV-560. Seabird nesting records for Great Bear Rock. See Appendix 2 for codes.

DATE	BRCO	PECO	BLOY	GWGU	PIGU	SOURCE
13 Aug 1962	0		x	x		95, 107
20 Jul 1969	0	0		x		95, 107
3 Jun 1970	0	0	2[2]	18[3]		95, 107
24 Jul 1970	61[54]	0	6-8e	47[37]	(4)	95, 265
25 Aug 1970	107[58]	0				95
20 Jul 1971	98[35]	0	S	39+	S	107
9 Aug 1971	107[70]	0		x		107
9 Sep 1971	87[58]+	0		x		107
13 Jun 1972			7e	132[100]	S	107
6 Jul 1972	0	0				107
26 Jul 1972	0	0				107
29 Jul 1973	0	0				107
2 Aug 1973	0	0		53+		107, 265
12-13 Jul 1975	0	2	10e	275[253][a]	S(3)	32, 107, 265
18 Aug 1976	34[23]	0				265
10 Jun 1979		0				58
18 Jun 1982	0	0	6e	247[207]	S(8)	181, 265
22 Aug 1988	0	0		x	S(1)	265
Jun-Jul 1989	0	0	4e	175	S(2)	84, 236, 238, 258

[a] Number of gull nests corrected from Campbell.[32]

Figure 535. Hundreds of Glaucous-winged Gulls were flushed by two Bald Eagles that landed on Great Bear Rock in 1970. *Photo by R. Wayne Campbell, 25 August 1970.*

Remarks: No evidence of predation was seen on 18 August 1976. During a subsequent visit four days later, some dead cormorant chicks were found that had died from excessive rainfall and some cormorant eggs were taken by crows. Depredated gull (6) and oystercatcher (1) eggs and one gull that had probably been killed by an eagle were seen in 1982. Two Bald Eagles were recorded on 25 August 1970 (Figure 535).

Many Brandt's Cormorant chicks were banded in 1970 (108) and 1971 (61), and 200 gull chicks were banded in 1971. Observers in 1970 noted that cormorants were quite tolerant of disturbance and that adults with young could be approached to within 10 feet (Figure 536). However, Hatler noted that the adult cormorants were very nervous and left their nests before the survey party even landed in 1971.[265]

Figure 536. On some visits to Great Bear Rock, nesting Brandt's Cormorants could be approached to within a few feet. *Photo by R. Wayne Campbell, 28 July 1970.*

WV-570 ALLEY ROCK

Location: *48°53'51"N 125°26'01"W; 92 C/14.*
West of Loudoun Channel, northeast of Great Bear Rock.

Description: *6 m high; Bare rock* (Figure 537).

Figure 537. Alley Rock is a series of four bare, rocky islets. *Photo by R. Wayne Campbell, 15 July 1975.*

Historical summary: Pelagic Cormorants have been recorded nesting only in 1975 when one nest with two eggs was discovered (Table WV-570). The rock was not landed on in 1988 or 1989, but no cormorant nests were visible from the water.[258] Large numbers of Brandt's Cormorants were roosting on 24 July 1970 (150 – mostly immatures), in 1975 (80), and in 1988 (100), but no evidence of breeding has ever been reported.

Variable numbers of Black Oystercatchers and Glaucous-winged Gulls have nested on this colony. Guiguet reported Black Oystercatchers and Glaucous-winged Gulls nesting in 1962. He noted three nesting pairs of oystercatchers and found one nest with two eggs on 3 June 1970 (Figure 538). Eight pairs of Glaucous-winged Gulls were present on that date, but no nests had been built. Campbell surveyed the rock later in the same year (on 24 July 1970) and saw three oystercatchers but no sign of nests, eggs, or young. He did find two gull nests with young. In 1972, no gulls were found nesting, and only one pair of oystercatchers was suspected nesting and thought to have young, although two pairs of oystercatchers were present. Oystercatchers have not been recorded nesting since 1972. The greatest number of Glaucous-winged Gulls nesting was recorded in 1982, when Doug Bertram made a partial count of 12 gull nests (11 with eggs), and estimated a total of 20 breeding pairs. Five oystercatchers were seen but no evidence of nesting was found. No oystercatchers were seen from the water in 1989.

Figure 538. Charles Guiguet recorded a Black Oystercatcher nest with two eggs on Alley Rock on 3 June 1970. *Photo by R. Wayne Campbell.*

Pigeon Guillemots have been recorded around the rock but have not been confirmed nesting.

Table WV-570. Seabird nesting records for Alley Rock. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
13 Aug 1962		x	x		95
3 Jun 1970		3e	S		95
24 Jul 1970			2[2]		95
18 Jul 1972		1S	0		265
13 Jul 1975	1	0	3[2]		32, 265
Aug 1976	0				58
10 Jun 1979	0				58
18 Jun 1982	0	0	20e	S(4)	181, 265
22 Aug 1988	0		x	(1)	265
Jun-Jul 1989	0	0	5eS	S(2)	84, 236, 238, 258

Remarks: River otter scats containing fish were noted on the rock on 24 July 1970.

WV-575 PINDER ROCK

Location: *48°55'33"N 125°22'48"W; 92 C/14.*
Loudoun Channel, northwest of Hankin Island.

Description: *0.3 ha; 6 m high; Bare rock.*

Historical summary: Numbers of Black Oystercatchers nesting have increased since 1970 and Glaucous-winged Gulls appear to have colonized the rock sometime between 1975 and 1989 (Table WV-575). One empty oystercatcher scrape (Figure 539) with two adults present was found in 1970, two pairs but no nests were seen in 1972, and two empty scrapes with four adults present were reported in 1975. Three Black Oystercatcher nests were found and four pairs were estimated nesting in 1989. Two Glaucous-winged Gulls were present in 1975 but nesting was not observed until 1989. Pigeon Guillemots may nest although no evidence of nesting has been found.

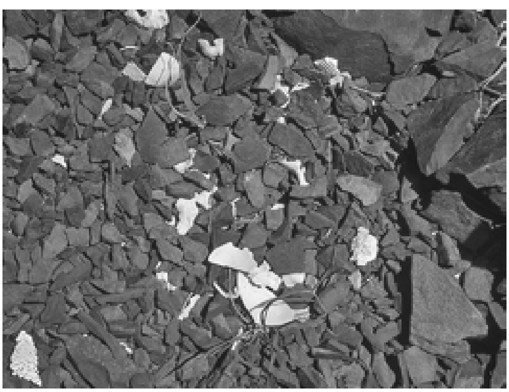


Figure 539. A Black Oystercatcher nest may be just a few marine shell fragments on bare rock. *Photo by Michael S. Rodway.*

Table WV-575. Seabird nesting records for Pinder Rock. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
17 Jun 1970	1S			95
1971			S(2)	107
4 Jun 1972	0		S(2)	107
14 Jul 1975	2S	0		265
Jun-Jul 1989	4e	9	S(1)	84, 236, 238, 258

WV-580 HANKIN ISLAND

Location: *48°55'15"N 125°22'06"W; 92 C/14.*
West of Dodd Island, north end of Loudoun Channel, within PRNPR.

Description: *10 ha; 61 m high; Forested; Cliffs.*

Historical summary: Hatler et al.[107] reported a Pelagic Cormorant colony of unknown size in a surge channel on the south side of the island in 1972 (Table WV-580). There are no records for this site from the surveys by Carter et al.[58] in 1979-1982 or Vermeer et al.[238] in 1989. We assumed that surveyors in 1989 boated around the island and saw no birds. Pigeon Guillemots were present in 1971 and 1972 but no evidence of nesting was obtained.

Table WV-580. Seabird nesting records for Hankin Island. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
1971		S(2)	107
1972	x	S(2)	107
14 Jul 1975	0		265
Jun-Jul 1989	0	(0)	84, 238, 258

WV-590 WILLIS ISLAND

Location: *48°54'54"N 125°20'30"W; 92 C/14.*
North side of the Broken Group, south of Dodd Island, within PRNPR. Colony includes the tidally-connected islet off the north side.

Description: *46 ha; 78 m high; Forested; Bare rock.*

Historical summary: Hatler found one Black Oystercatcher nest with two eggs on a reef on the north side of the island in 1973 (Table WV-590). No birds were recorded in 1975 or 1989. We assume that the island was surveyed from the water in 1989, although no records survive.[258]

Table WV-590. Seabird nesting records (nests) for Willis Island.

DATE	BLOY	SOURCE
10 Jul 1973	1	107
15 Jul 1975	0	265
Jun-Jul 1989	0[a]	236

[a] see text.

WV-600 TURTLE ISLAND

Location: *48°54'35"N 125°19'15"W; 92 C/14.* Broken Group, northeast of Turret Island, within PRNPR. Colony includes the rocks off the east and northwest sides.

Description: *115 ha; 73 m high; Forested; Bare rock.*

Historical summary: A maximum of one pair of Black Oystercatchers and one pair of Glaucous-winged Gulls have been recorded nesting (Table WV-600). The location of the Glaucous-winged Gull nest in 1972 and 1973 was unusual; it was located on a mossy pad 25 m high in a dying redcedar tree.[107] Eggs were visible in the nest in 1972. The nest was not inspected in 1973. The location of the nest tree was not specified. Oystercatchers were found nesting on the northwest rock between 1969 and 1973, but none were reported nesting on the last two surveys in 1975 and 1989. In 1975, one adult gull was present, but no nests were found. The island was circled by boat in 1989 and we assumed that no gulls or oystercatchers were suspected nesting.

Table WV-600. Seabird nesting records for Turtle Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
18 May 1969	1S			107
31 May 1971	1			107
30 Apr 1972	1S			107
20 Jun 1972		1		107
28 May 1973	1			107
9 Jul 1973		1S		107
15 Jul 1975	0	0	(1)	265
Jun-Jul 1989	0	0	S(1)	84, 236, 238, 258

Remarks: The gull nest in the cedar tree was viewed from an adjacent tree in 1972. An incubating adult flushed off the nest and did not return for about four days. The adults incubated the eggs until about 8 August, but the eggs must have died as they were unsuccessful. Birds were incubating again in 1973 and were not disturbed.

WV-605 SAIL ROCK

Location: *48°52'50"N 125°23'42"W; 92 C/14.* Outer west corner of the Broken Group, south of Loudoun Channel, within PRNPR.

Description: *0.3 ha; 22 m high; Bare rock* (Figure 540).

Figure 540. Sail Rock is an exposed, jagged, bare rock that can be difficult to land on. Harry Carter (bottom) was able to land on the rock on a relatively calm day in August 1977. *Photos by R. Wayne Campbell, 14 July 1975 (top) and William E. McIntyre, 30 August 1977.*

Historical summary: This exposed rock was considered inaccessible and was surveyed from the water in 1975 and 1989. One pair of Glaucous-winged Gulls was present and suspected nesting, and two Pelagic Cormorants were roosting in 1975 (Table WV-605). The rock was not surveyed for nesting birds in 1977, but about six Brandt's Cormorants, 10 Pelagic Cormorants, and 30 Glaucous-winged Gulls were recorded roosting on the rock on 30 August.

Table WV-605. Seabird nesting records for Sail Rock. See Appendix 2 for codes.

DATE	GWGU	SOURCE
14 Jul 1975	1eS	32, 265
Jun-Jul 1989	0	238, 258

WV-610 WOUWER ISLAND

Location: *48°51'45"N 125°21'36"W; 92 C/14.* West end of the Broken Group, north of the entrance to Imperial Eagle Channel, within PRNPR. Colony includes the rocks to south and west.

Description: *44 ha; 69 m high; Forested; Rocky point.*

Historical summary: Guiguet recorded four breeding pairs of Glaucous-winged Gulls in 1962 (Table WV-610). In 1970, a gull nest with three eggs was found on the northwest tip of the island. One Pigeon Guillemot was seen near shore and an empty burrow was found that may have been a nest. A single guillemot was also seen in 1975 but no information on possible nesting was given. The island was surveyed from the water in 1989.[258]

Table WV-610. Seabird nesting records for Wouwer Island. See Appendix 2 for codes.

DATE	GWGU	PIGU	SOURCE
13 Aug 1962	4S		95
24 Jul 1970	1	S(1)	95, 265
14 Jul 1975	0	(1)	265
Jun-Jul 1989	0	(0)	84, 238

Remarks: Two immature Bald Eagles (Figure 541) and one river otter were sighted in 1970.

Figure 541. Young Bald Eagles often patrol among islands in Barkley Sound, patiently waiting for signs of an at-sea feeding frenzy by other eagles. *Photo by R. Wayne Campbell.*

WV-620 CREE ISLAND

Location: *48°51'06"N 125°19'50"W; 92 C/14.* Southwest corner of the Broken Group, entrance to Imperial Eagle Channel, within PRNPR.

Description: *6.3 ha; 90 m high; Forested.*

Historical summary: Guiguet observed Pigeon Guillemots flying in and out of nests on the steep sides of the island from 1965 to 1969 and reported at least four pairs nesting in burrows on the south side in 1970 (Table WV-620). Hatler searched the island in 1971 and 1972 and found no evidence of nesting. Surveyors boated around the island in 1989.

Table WV-620. Seabird nesting records for Cree Island. See Appendix 2 for codes.

DATE	PIGU	SOURCE
Aug 1965-1969	x	95
11 Jun 1970	4e	95
22 Jul 1971	(0)	107
23 Jul 1972	(0)	107
15 Jul 1975	(0)	265
Jun-Jul 1989	(0)	84

WV-630 AUSTIN ISLAND

Location: *48°51'45"N 125°18'53"W; 92 C/14.* Broken Group, southwest of Effingham Island, within PRNPR. Colony includes the islets and rocks around the south and east sides.

Description: *15 ha; 82 m high; Forested; Caves.*

Historical summary: Pelagic Cormorant nests have been located in a cave on the south side of Austin Island, just off the bow of the shipwrecked *Vanlene.* Twelve fledglings were seen near the mouth of the cave in 1971 and three nests were visible there in 1972, with more nests suspected further inside the cave (Table WV-630). Two nests visible on 27 August 1979 appeared empty. Fifteen adults flushed from the cave in 1980. Carter et al.[58] observed one adult fly out and 11 adults on the water at a second (most northerly) cave in 1979, but nesting was not confirmed and no birds were seen there in 1980 or 1982. Pigeon Guillemots were recorded around the island only in 1989.

Table WV-630. Seabird nesting records for Austin Island. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
17 Sep 1971	x		107
6 Jul 1972	3+		107
23 Jul 1973	0		107
15 Jul 1975	0		58
16 Jun 1979	1		58
27 Aug 1979	2		58
1 Jul 1980	6		58
22 Aug 1982	0		58
Jun-Jul 1989	0	S(3)	84, 238

Remarks: The *Vanlene* shipwreck (Figure 542) is an advertised dive site. The ship was loaded with Dodge Colt cars when it went down in 1972 and has still some car parts in it. Tourists visiting the site may disturb cormorants nesting in the adjacent cave.

Figure 542. Navigating by compass and encountering a thick spring fog, the MV *Vanlene*, a freighter from Japan, ran aground off Austin Island in Barkley Sound in 1972.[344] *Photo courtesy of the Port Alberni Maritime Museum, Port Alberni, BC.*

WV-640 EFFINGHAM ISLAND

Location: *48°52'15"N 125°18'15"W; 92 C/14.* Broken Group, north side of Imperial Eagle Channel, within PRNPR.

Description: *240 ha; 102 m high; Forested* (Figure 543)*; Caves.*

Figure 543. On many of the forested islands in Barkley Sound, a dense understory of salal (left) discourages searching for burrow-nesting seabirds in inland habitats. Consequently, although we assume that burrowing seabirds are unlikely to nest in such habitats, interior areas of forested islands in Barkley Sound have not been well explored for nesting seabirds. Those areas also have not been searched for nesting Bald Eagles or corvids. The large, leathery, evergreen leaves of salal were harvested in the 1960s for flower shops on Vancouver Island and in the Lower Mainland. *Photos by R. Wayne Campbell.*

Historical summary: Pelagic Cormorants have nested at two locations. Cormorants were nesting on ledges and crevices under a rock overhang in a shallow cave on the southwest side in 1972 (Table WV-640). Of 20 accessible nests inspected, 13 contained eggs or young. That cave was not located in subsequent years, and Carter et al.[58] postulated that the cave may have collapsed. In 1979, nesting occurred at a rock arch on the southeast corner of the island; only one of the five nests had an incubating adult on 16 June and no birds were present on 27 August. Nesting was not observed in later years.

Table WV-640. Seabird nesting records (nests) for Effingham Island.

DATE	PECO	SOURCE
6 Jul 1972	27	107
23 Jul 1973	0	107
15 July 1975	0	265
16 Jun 1979	5	58
27 Aug 1979	0	58
1 Jul 1980	0	58
22 Aug 1982	0	58
Jun-Jul 1989	0	238

Remarks: Two adult Bald Eagles were recorded in 1975 (Figure 544).

Figure 544. Bald Eagles are known to nest on Effingham Island.[265] Observations of both adults at a nest in late July suggests that there are large young in the nest ready to fledge but still dependent on the adults for food. *Photo by R. Wayne Campbell.*

WV-650 VILLAGE REEF

Location: *48°53'14"N 125°17'20"W; 92 C/14.*
Broken Group, northeast of Effingham Island, within PRNPR.

Description: *0.3 ha; 2 m high; Bare rock.*

Historical summary: From two to five pairs of Black Oystercatchers have nested each year that the reef was surveyed (Table WV-650).

Table WV-650. Seabird nesting records for Village Reef. See Appendix 2 for codes.

DATE	BLOY	SOURCE
2 Jun 1972	5[3]	107
10 Jul 1973	3[3]	107
15 Jul 1975	4[3]	265
Jun-Jul 1989	2	236

WV-660 FABER ISLETS

Location: *48°53'29"N 125°18'03"W; 92 C/14.*
Broken Group, north of Effingham Island, within PRNPR.

Description: *1.3 ha; 5 m high; Bare rock.*
Faber Islets are a cluster of about four bare rocks with some beach on the north side of the main and north islets.

Historical summary: Four pairs of Black Oystercatchers were confirmed nesting in 1972 (Table WV-660). Two pairs were present in 1975 but only one active nest was found. Two unused scrapes were also seen, and observers stated that two pairs were possibly nesting. Glaucous-winged Gulls have been documented nesting only in 1975; one of the two nests found contained three young. The islets were surveyed from the water in 1989.[258] No birds were seen but we considered the 1975 record for Black Oystercatchers the better and current estimate.

Table WV-660. Seabird nesting records for Faber Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
2 Jun 1972	4[4]		107
15 Jul 1975	1	2[1]	32, 265
Jun-Jul 1989	0	0	236, 238

WV-670 DEMPSTER ISLAND

Location: *48°54'30"N 125°16'05"W; 92 C/14.* Broken Group, southwest of Gibraltar Island, within PRNPR.

Description: *28 ha; 75 m high; Forested; Caves.*

Historical summary: Guiguet reported Pelagic Cormorants nesting in three caves on the east side of the island in 1970 (Table WV-670; note that Hatler et al.[107] described the 1970 nesting locations as on the southwest corner of the island, but that differs from the original Guiguet description). Since 1970, nesting has been observed in only two caves, located on the southwest end according to Hatler et al.[107] and on the south tip according to the map in Carter et al.[58] Most accessible nests inspected in 1971, 1972, and 1980 contained eggs or young. Nests were not observed in 1973 but 23 adults were present at the southern of those two caves and 15 were present at the northern cave. Only the south cave was used for nesting in 1980, and only the north one was used in 1982. Cormorants had abandoned the caves in 1975 and 1989.

Table WV-670. Seabird nesting records for Dempster Island. See Appendix 2 for codes.

DATE	PECO	SOURCE
12 Jun 1970	18	95
8 Aug 1971	19+	107
17 Jun 1972	14+	107
23 Jul 1973	S	107
15 Jul 1975	0	58
1 Jul 1980	8	58
22 Aug 1982	5[1]	58, 265
Jun-Jul 1989	0	238

Remarks: Two adult Bald Eagles were sighted in 1975. In 1980, kayakers were observed entering both nesting caves, flushing cormorants from their nests (Figure 545).[58]

Figure 545. Sea kayaking is a popular sport and exploring caves and deep crevices is enticing. Unfortunately, these activities can have major consequences for nesting seabirds. In Barkley Sound, Pelagic Cormorants nest in many of the sea caves and are flushed by approaching kayaks. Such disturbance can impact nesting success and often cause birds to abandon breeding sites. *Photo by R. Wayne Campbell.*

WV-680 GIBRALTAR ISLAND

Location: *48°54'50"N 125°15'10"W; 92 C/14.* Broken Group, south of Nettle Island, within PRNPR. Colony includes the rocks off the north side.

Description: *96 ha; 91 m high; Forested* (Figure 546)*; Cave.*

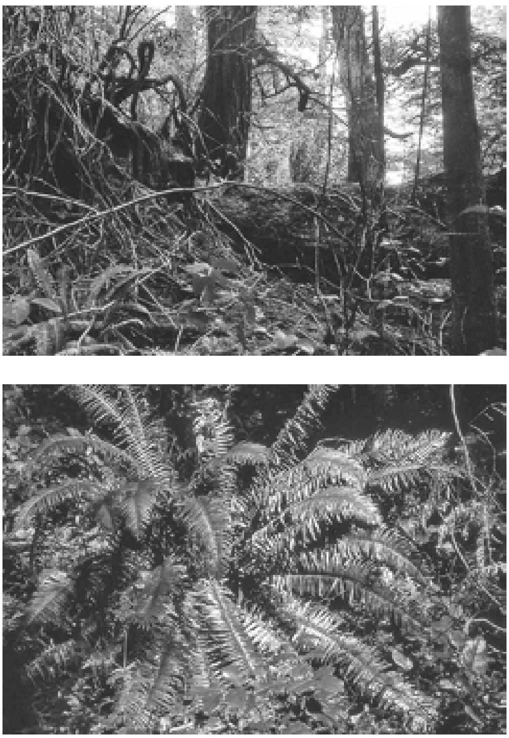


Figure 546. Sitka spruce, western redcedar, and western hemlock are the most common trees along the moist outer coast of BC (top). In Barkley Sound, sword fern is often associated with stands of western redcedar. *Photos by R. Wayne Campbell.*

Historical summary: The single Pelagic Cormorant nest recorded in 1972 was located at the mouth of a low cave near the southwest tip of Gibraltar Island (Table WV-680). Nesting has not been observed since.

Table WV-680. Seabird nesting records (nests) for Gibraltar Island.

DATE	PECO	SOURCE
17 Jun 1972	1+	107
15 Jul 1975	0	265
1979	0	58
1 Jul 1980	0	58
23 Jun 1982	0	58
Jun-Jul 1989	0	238

WV-690 SWALE ROCK

Location: *48°55'32"N 125°13'20"W; 92 C/14.* Northeast corner of the Broken Group, east entrance to Sechart Channel, within PRNPR.

Description: *0.3 ha; Bare rock.*

Historical summary: Black Oystercatchers have nested intermittently on this rock (Table WV-690).

Table WV-690. Seabird nesting records for Swale Rock. See Appendix 2 for codes.

DATE	BLOY	SOURCE
22 Jun 1972	2[2]	107
15 Jul 1975	0	265
Jun-Jul 1989	1	236

WV-692 MAHK ROCK

Location: *48°56'30"N 125°12'52"W; 92 C/14.* Off the south side of Alma Russell Islands, at the east entrance to Sechart Channel.

Description: *0.2 ha; Bare rock.*

Historical summary: Black Oystercatchers were first found nesting in 1989 (Table WV-692). We have no previous records.

Table WV-692. Seabird nesting records (nests) for Mahk Rock.

DATE	BLOY	SOURCE
Jun-Jul 1989	1	236

WV-700 RUTLEY ISLANDS

Location: *48°58'29"N 125°09'34"W; 92 C/14.*
Off the mouth of Effingham Inlet, south of Vernon Bay.

Description: *2.2 ha; 49 m high; Forested; Cliffs; Bare rocks.*

Historical summary: Pelagic Cormorants were nesting on cliffs on the west side of the most northerly forested island in 1982 (Table WV-700). Six nests were visible, one adult was carrying nesting material, and 15 adults were on the cliff on 24 June. Only one nest with three large young was seen on 22 August. The nest was located on a cliff ledge under overhanging foliage. No details are available on the specific locations of the Black Oystercatcher (Figure 547) and Glaucous-winged Gull nests in 1989.

Figure 547. Black Oystercatchers were suspected nesting on Rutley Islands in 1989 but no definite evidence of nesting was reported. Observations of eggs or flightless young are required to confirm breeding. *Photo by R. Wayne Campbell.*

Table WV-700. Seabird nesting records for Rutley Islands. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	SOURCE
17 Jul 1975	0	0	0	265
24 Jun 1982	6+			58
22 Aug 1982	1			265
Jun-Jul 1989	0	1S	1	236, 238, 258

Remarks: An adult Bald Eagle was present in 1975.

WV-710 BAERIA ROCKS

Location: *48°57'16"N 125°09'10"W* (north rock)*; 92 C/14.*
Northeast end of Imperial Eagle Channel, south of Vernon Bay.

Description: *0.8 ha; 5 m high; Bare rock.*
Baeria Rocks are comprised of two main rocks separated by about 500 m. Each rock is composed of about three tidally-connected knobs. The northern rock is larger. There is a navigational beacon on the eastern knob of the south rock. The rocks were established as an Ecological Reserve in 1971.

Historical summary: Nesting was reported to G.F. van Tets by Bamfield residents in 1958, and A.R. Wootton photographed the colony from the water in 1960 (Table WV-710). The first census was conducted in 1970. Both Pelagic Cormorants and Glaucous-winged Gulls have declined since their numbers peaked in 1975.

Egg laying by Pelagic Cormorants was in progress on 15 June 1970 and nests held 0-3 eggs, but on 25 July, all nests were empty or had broken eggshells. Nests were located on the northwest tip of the south rocky knob with the beacon. In 1975, cormorants were nesting on this knob (17 nests) and on the knob just west of it (23 nests). In 1977, nests were recorded on the south side of the knob with the beacon. Since 1977, cormorants have only been observed nesting in 1982 when eight nests with incubating birds were seen.

Glaucous-winged Gulls nest on the north and south rocks. From the water on 4 June 1970, Guiguet estimated 150-200 and 200 pairs on the north and south rocks, respectively. On 15 June 1970, he again estimated 150-200 and 100-150 pairs from the water and, after landing, found most nests containing 2-3 eggs. On 25 July 1970, Wayne Campbell, David Hawes, and Myrnal Hawes (Figure 548) counted 111 and 99 nests on the north and south rocks, respectively (90 of 177 nests inspected contained eggs or young). On the south rock, they made separate tallies of 25, 41, and 33 nests for the three knobs from east to west, respectively. In 1975, there were 247 nests on the north rock and 42, 55, and 36 nests on the same three

Figure 548. Mammalogists Dave (left) and Myrnal Hawes helped with seabird colony surveys on Baeria Rocks on 25 July 1970. *Photo by R. Wayne Campbell, off Haines Island, Barkley Sound, BC, 29 July 1970.*

knobs of the south rock. Totals of 133, 45, 23, and 21 nests were tallied at these four locations in 1980. Gary Kaiser, Doug Bertram, and Jeff Reeve found 112 and 90 nests on the north and south rocks in 1982. The least number of gulls was found nesting in 1986 when Alan Burger saw less than 20 nests and found only three nests containing eggs (1 egg each). More nests were counted in 1988 than 1986, but numbers in 1988 were still less than half the number tallied in 1975. Between 1988 and 1989, numbers decreased again, in keeping with the general decline seen across the region.[238]

Black Oystercatcher nests have also been found on the north and south rocks. Guiguet reported nine and seven pairs obviously nesting on the north and south rocks, respectively, based on observations of their behaviour from the water on 4 June 1970. On 15 June 1970, he found three and four nests on those same rocks (nests on the north rock contained 3 eggs each but all 4 nests on the south rock contained broken eggshells). In 1975, two and three nests were found on north and south rocks, respectively; one nest contained two eggs and young were suspected around the other four nests. Observers also found an additional five scrapes on the north rock that they did not consider active nests. Bristol Foster photographed a nest with one egg in May 1977 (Figure 549). A maximum of 11 adult oystercatchers were seen but no nests were found in 1980. Alan Burger suspected at least seven pairs nesting and found three nests with eggs in 1987. Ten oystercatcher nests were found and 11 pairs were estimated nesting in 1989.

Small numbers of Pigeon Guillemots have been seen and suspected nesting around these rocks in most survey years, but nesting has never been confirmed.

Table WV-710. Seabird nesting records for Baeria Rocks. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
1958			S		77
18 Jul 1960	6-8S		50+S		77
4 June 1970		16eS	350-400eS	S(16)	95
15 Jun 1970	28	7[7]	250-350e	S(20+)	95
25 Jul 1970	32	S	210	S(7)	95
17 Jul 1975	40[36]	5[1]	380[309]	S(8)	265
17 Aug 1976	25[20]				58
May 1977		x			265
16 Aug 1977	3+		10+		4
30 Aug 1977	6[5]	(8)	x		58, 265
5 Jun 1979	0				58
1 Jul 1980	0				58
6 Jul 1980	0	0	222[212]	S(14)	265
12 Jun 1982		9[9]	202[143]	(8)	265
22 Aug 1982	8				58
10 Jul 1986	0	3[3]	<20	S(2)	253
9-10 Jul 1987	0	7e	31[10]	S(2)	253
23 Jul 1988	0	2[1]	175[153]		181, 253
Jun-Jul 1989	0	11e	130	(0)	84, 236, 238, 258

Remarks: Human disturbance and predation (Figure 550) may be responsible for population declines seen on these rocks. On 25 July 1970, all cormorant nests were empty and many broken eggs were strewn about, some of which appeared to have been neatly punctured and their contents sucked out, obviously by people. Human litter was also scattered about. Low-flying aircraft were often observed over Baeria Rocks in 1979 and 1980. Two gull nests with broken eggs were found in 1987.

Figure 549. Black Oystercatcher nest and egg on Baeria Rocks in 1977. The nest is composed entirely of dried rockweed (*Fucus gardneri*), a common, intertidal algae. *Photo by J. Bristol Foster, May 1977.*

Figure 550. Local Northwestern Crows have learned to prey on Pelagic Cormorant eggs, which are usually available in June and early July on Baeria Rocks. *Photo by R. Wayne Campbell.*

Ninety-nine Glaucous-winged Gull chicks were banded in 1971. The site is occasionally used for research and educational purposes by the Bamfield Marine Sciences Centre (see student group photo in Figure 40). Ballard and Ring collected six young cormorants from three nests and 21 young gulls from 10 nests for their study of ectoparasites in 1977.[4]

WV-715 BOYSON ISLANDS

Location: *48°58'12"N 125°02'05"W; 92 C/14.*
East of Seddall Island in the centre of Rainy Bay.

Description: *5.0 ha; 55 m high; Forested; Bare rock.* Larger islands in this group are forested. There is a small bare rock at the west end of the group and rocky islets that are mostly bare rock on the mid-north side.

Historical summary: Black Oystercatcher and Glaucous-winged Gull nests were found on the west rock in 1989 (Table WV-715). We have no previous records.

Table WV-715. Seabird nesting records for Boyson Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
Jun-Jul 1989	1S	1	236, 238, 258

WV-720 WELD ISLAND

Location: *48°56'57"N 125°05'25"W; 92 C/14.*
Chain Group, northwest side of Tzartus Island.

Description: *23 ha; 84 m high; Forested; Cliffs; Cave.*

Historical summary: Pelagic Cormorants have been recorded nesting only in 1979 and 1980 in a cave on the west side of the island (Table WV-720). Contents of 13 nests were determined in 1979; 10 contained eggs or young. Thirteen adults flew out of the cave but only two nests were visible in 1980.

Table WV-720. Seabird nesting records (nests) for Weld Island.

DATE	PECO	SOURCE
17 Jul 1975	0	58, 265
30 Jun 1979	18+	58
1 Jul 1980	2+	58
4 Sep 1982	0	58
Jun-Jul 1989	0	238

Remarks: There were no Pelagic Cormorant nests on nearby Baeria Rocks during the two years that there were nests on Weld Island, suggesting possible movement between these sites.[58] One adult Bald Eagle was recorded in 1975 (Figure 551).

Figure 551. Sea kayakers in Barkley Sound reported finding a Bald Eagle nest in the interior of Weld Island in the mid-1970s.[265] *Photo by R. Wayne Campbell.*

WV-722 STUD ISLETS

Location: *48°56'35"N 125°05'34"W; 92 C/14.* Chain Group, southeast of Weld Island.

Description: *3.1 ha; 38 m high; Forested; Bare rock.* The larger, southern islets in this group are forested and the northern islets are mostly bare rock.

Historical summary: Four immature Glaucous-winged Gulls (Figure 552) were recorded in 1975 but no Black Oystercatchers were present (Table WV-722). Observers found one oystercatcher nest on the northern rocks in 1989.[258]

Figure 552. Immature Glaucous-winged Gulls, two and three years old (top), are relatively easy to identify in their transitional plumages, but as they approach maturity at 4-7 years old (average 5.4 years), they are more difficult to distinguish from adult birds. *Photos by R. Wayne Campbell.*

Table WV-722. Seabird nesting records (nests) for Stud Islets.

DATE	BLOY	SOURCE
17 Jul 1975	0	265
Jun-Jul 1989	1	236

WV-728 MEADE ISLETS

Location: *48°55'33"N 125°07'14"W; 92 C/14.*
Chain Group, northeast of Swiss Boy Island. Colony includes the rock to the east.

Description: *3.4 ha; 38 m high; Forested; Bare rock.*
Meade Islets are a cluster of connected and separate rocky knobs. They are mostly bare rock except for a pocket of vegetation on the southwest knob and a patch of forest on the largest central area. There are beaches at the south end of the forested area.

Historical summary: Three Black Oystercatchers were present and possibly nesting on Meade Islets and one was seen on the east rock in 1975 (Table WV-728). Observers found one oystercatcher nest and suspected two pairs nesting on Meade Islets in 1989.

Table WV-728. Seabird nesting records for Meade Islets. See Appendix 2 for codes.

DATE	BLOY	SOURCE
17 Jul 1975	1eS	265
Jun-Jul 1989	2e	236, 258

Remarks: Three adult Bald Eagles were seen in 1975.

WV-730 SWISS BOY ISLAND

Location: *48°55'02"N 125°07'53"W; 92 C/14.*
South end of the Chain Group, west of Tzartus Island.

Description: *10.5 ha; 81 m high; Forested; Caves.*

Historical summary: Pelagic Cormorants have nested intermittently in a cave located on the mid-northwest side of the island (Table WV-730). Large downy young were observed in nests in 1969 (Figure 553). Cormorants were seen flying in and out of the cave in 1979. Guiguet reported a large number of adult Pigeon Guillemots with young of the year along the shores of the island in 1969. Few have been seen since.

Figure 553. Near fledging Pelagic Cormorant young were seen in nests on Swiss Boy Island in early August 1969. *Photo by R. Wayne Campbell.*

Table WV-730. Seabird nesting records for Swiss Boy Island. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
11 Aug 1969	50e		95
21, 24 Aug 1969		S(200)	95
11 Jun 1970	0		95
17 Jul 1975	25e		58, 265
30 Jun 1979	S		58
22 Aug 1982	0		58
Jun-Jul 1989	5eS	S(2)	84, 238

Remarks: Three adult Bald Eagles were recorded in 1975.

WV-740 TZARTUS ISLAND

Location: *48°55'23"N 125°04'49"W; 92 C/14.*
Deer Group, west of entrance to Alberni Inlet.

Description: *1,730 ha; 314 m high; Forested; Cliffs; Bare rock.*
This is a large, forested island that has been partially logged. There are some small rocks off the west side opposite Meade Islets.

Historical summary: Pigeon Guillemots were flying in and out of nests on cliffs in 1982; one was carrying fish (Table WV-740). The location of the cliffs was not specified (nesting was reported on the west side of the island, east of Swiss Boy Island in 2011; see Appendix 1). The Black Oystercatcher nest found in

1989 was located on the rocks off the west side of the island opposite Meade Islets.

Table WV-740. Seabird nesting records for Tzartus Island. See Appendix 2 for codes.

DATE	BLOY	PIGU	SOURCE
17 Jul 1975	0	(7)	265
24 Jun 1982		x(15)	265
Jun-Jul 1989	1	S(6)	84, 236

Remarks: Two adult Bald Eagles were sighted in 1975 (Figure 554).

Figure 554. In the late 1960s, George McIntyre, a logger from Ucluelet, reported that at least two pairs of Bald Eagles nested on Tzartus Island, one pair at each end.[265] *Photo by R. Wayne Campbell.*

WV-750 HOSIE ISLANDS

Location: *48°54'30"N 125°02'15"W; 92 C/14.* Northeast end of Trevor Channel, east of Tzartus Island.

Description: *5.0 ha; 67 m high; Forested; Cave.*

Historical summary: BCPM crews found Pelagic Cormorants nesting in a cave on the west side of the main islet in 1975 (Table WV-750). Three nests and five birds were recorded. Pigeon Guillemots were sighted in 1989.

Table WV-750. Seabird nesting records for Hosie Islands. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
25 Jul 1970	0		265
16 Jul 1975	3		58, 265
Jun-Jul 1989	0	S(2)	84, 238

WV-760 SAN JOSE ISLETS

Location: *48°54'04"N 125°03'26"W; 92 C/14.* Northeast end of Trevor Channel, east of Tzartus Island, southwest of Hosie Islands.

Description: *0.8 ha; 7 m high; Forested; Grassy rock.* The western islet is wooded, and the eastern islet is rocky with a grassy crown. There is a navigation marker on the west islet.

Historical summary: Black Oystercatchers were nesting on the west islet and Glaucous-winged Gulls were nesting on the east islet in 1970 (Table WV-760). Two agitated oystercatchers were present in 1975 but no nest was found; observers recorded two inactive scrapes (Figure 555). No gulls were seen in 1975 but have nested in subsequent years. An oystercatcher nest with three eggs was located in 1981. The island was surveyed from the water in 1989.[258] No oystercatchers were observed.

Figure 555. Crouching, feigning injury, or other agitated behaviours by a Black Oystercatcher generally indicates nesting. Although a pair of agitated oystercatchers was present on San Jose Islets in 1975, only two empty nest scrapes were found. Small chicks may have been hiding in the vegetation. *Photo by R. Wayne Campbell.*

Table WV-760. Seabird nesting records for San Jose Islets. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
25 Jul 1970[a]	1	2[2]	95, 265
16 Jul 1975	1eS	0	265
25 Jun 1981	1	1	265
1986		2	253
Jun-Jul 1989	0	3eS	238

[a] Guiguet [95] mistakenly reported the date as 25 August 1970.

WV-770 FLEMING ISLAND

Location: *48°53'14"N 125°08'00"W; 92 C/14.*
Deer Group, southwest of Tzartus Island.

Description: *320 ha; 116 m high; Forested; Caves.*

Historical summary: Pelagic Cormorants have been recorded nesting in two caves on the mid-northwest side of the island. Guiguet suspected nesting in 1967-1969 and found three nests in one cave and five nests in the other in 1970 (Table WV-770). Nests were not seen but adults were flying in and out of one cave in 1974. No nesting was reported in 1975, though seven cormorants (age not recorded) were present. Eight nests were visible, but more were suspected further in the cave in 1979 and 1980. Fifteen adults flew out of the cave in 1980. No sign of nesting cormorants was seen in 1989. Pigeon Guillemots have been recorded at this site only in 1989.

Table WV-770. Seabird nesting records for Fleming Island. See Appendix 2 for codes.

DATE	PECO	PIGU	SOURCE
Aug 1967-1969	S		95
11 Jun 1970	8		95
1974	S		58
17 Jul 1975	0		265
14 Jun 1979	8+		58, 265
1 Jul 1980	8+		58, 265
22 Aug 1982	1		58
Jun-Jul 1989	0	S(1)	84, 238

WV-780 WIZARD ISLET

Location: *48°51'29"N 125°09'34"W; 92 C/14.*
Deer Group, east end of Satellite Channel, northeast of Helby Island.

Description: *0.8 ha; 3 m high; Bare rock.*
There is a navigational beacon on the rock.

Historical summary: Guiguet observed a pair of Black Oystercatchers nesting each year from 1964 to 1970 (Table WV-780). In 1975, surveyors found young in three nests (Figure 556) and suspected young around the three empty nests; many mussel shells were scattered around the empty nests. They also found two scrapes that they considered inactive. Alan Burger visited the island in 1987 and 1988 and Ken Morgan found four oystercatcher nests and estimated five pairs nesting in 1989.

Figure 556. Black Oystercatcher chick and pipping egg. *Photo by R. Wayne Campbell.*

Although local residents reported nesting by Glaucous-winged Gulls on Wizard Islet, Guiguet found only roosting gulls on his visits. Gulls have been confirmed nesting only in 1975 when one nest containing two young was found.

Table WV-780. Seabird nesting records for Wizard Islet. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
Aug 1964-1969	1	0	95
5 Jun 1970	1	0	95
16 Jul 1975	6[3]	2[1]	265
1987	2[2]	0	253
1988	2[2]	0	253
Jun-Jul 1989	5e	0	236, 238, 258

WV-789 LEACH ISLET

Location: *48°49'50"N 125°14'27"W; 92 C/14.*
Deer Group, south side of the entrance to Imperial Eagle Channel, east of Folger Island.

Description: *3.0 ha; 46 m high; Forested.*
Most of this islet is forested above an extensive and steep rocky shoreline.

Historical summary: In 1970, Campbell found no evidence of nesting seabirds but remarked that there was excellent nesting habitat for Pigeon Guillemots (Table WV-789). The islet was surveyed from the water in 1989. Pigeon Guillemots were again suspected nesting (Figure 557).

Table WV-789. Seabird nesting records for Leach Islet. See Appendix 2 for codes.

DATE	PIGU	SOURCE
26 Jul 1970	2eS(4)	32, 265
16 Jul 1975	(0)	265
Jun-Jul 1989	S(10)	84

Remarks: One adult Bald Eagle was recorded in 1970 and 1975.

WV-790 FOLGER ISLAND

Location: *48°49'42"N 125°14'53"W; 92 C/14.*
Deer Group, south side of the entrance to Imperial Eagle Channel.

Description: *15 ha; 70 m high; Forested; Cave.*
This densely wooded island has steep, rocky shores. There is a navigational beacon on the northwest point.

Historical summary: Pelagic Cormorants have been found nesting in a cave on the northwest tip of the island. Between 1965 and 1970, 2-3 pairs of cormorants were annually seen entering and leaving the cave and were assumed nesting (Table WV-790). Seven nests were seen but no contents could be determined in 1975. The site was abandoned in 1982 and 1989.

Eleven Black Oystercatchers were recorded in 1970 but no evidence of nesting was reported (Figure 558). Oystercatchers and Glaucous-winged Gulls were suspected nesting on rocky headlands on the south side of the island in 1975. Pigeon Guillemots were confirmed nesting in 1965 and one adult holding a sculpin was seen perched on the shore rocks in 1970. The island was surveyed from the water in 1989;[258] only Pigeon Guillemots were recorded.

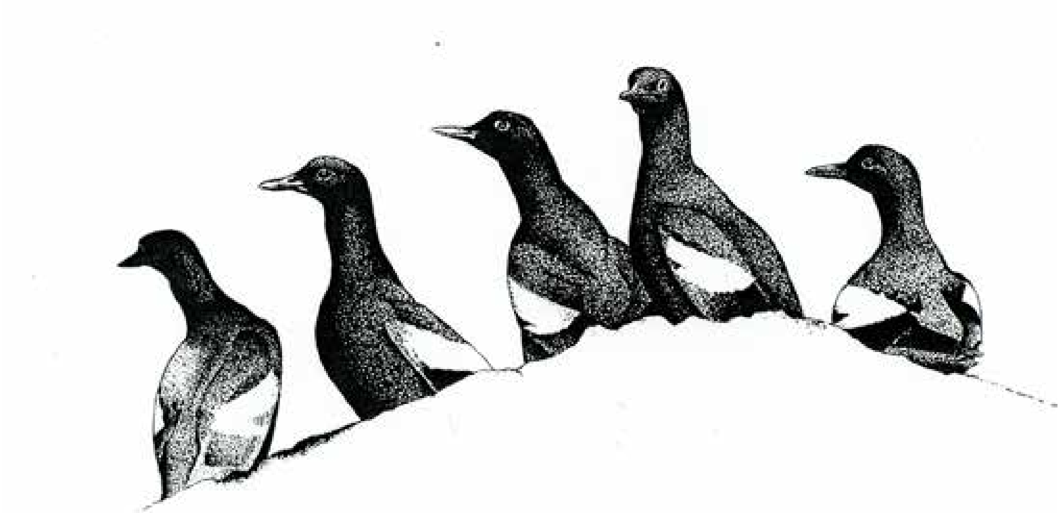


Figure 557. Pigeon Guillemots seen roosting on rocks often may be nesting nearby. *Drawing by Keith Taylor.*

Figure 558. No Black Oystercatcher nests or behaviour indicative of nesting were observed on Folger Island in 1970, suggesting that the group of 11 Black Oystercatchers present was a nonbreeding flock. *Photo by Al Whitney*.

Table WV-790. Seabird nesting records for Folger Island. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
Aug 1965	2-3eS			x	95, 256
Aug 1966-1969	2-3eS				95
24 Jul 1970	2eS			S(4)	95, 265
16 Jul 1975	7	2eS	1eS	(1)	58, 265
Aug 1982	0				265
Jun-Jul 1989	0	0	0	S(16)	84, 238, 258

WV-800 EDWARD KING ISLAND

Location: *48°49'43"N 125°12'53"W; 92 C/14.* Southwest end of the Deer Group, north of Cape Beale.

Description: *102 ha; 87 m high; Forested; Caves; Cliffs.*

Historical summary: Pelagic Cormorants (Figure 559) have been confirmed or suspected nesting at a least five and perhaps six locations around the island. They were nesting in three caves along the east side of the island from 1964-1970 (Table WV-800). In 1970, Guiguet estimated 18, 3-4, and 20 pairs in those caves at the southeast, central, and north-central sections of the east shore, respectively. Ballard and Ring [4] did not specify nest locations on 17 August 1977, but Spencer Sealy and Ken Summers saw one or two cormorants flying in and out of a cave near the east end of the south side of the island on 21 August 1977. We are uncertain whether this is the same as the southeast cave location referred to by Guiguet.[95] Carter et al.[58] observed breeding birds at four caves on the east side, and located three nests on a cliff on the south tip of the island, on 10 July 1979. Those three nests were abandoned five weeks later, and no birds were present at any nesting locations on subsequent visits.

Figure 559. Adult Pelagic Cormorants in breeding plumage show the white flanks when flying. *Photo by R. Wayne Campbell.*

Table WV-800. Seabird nesting records for Edward King Island. See Appendix 2 for codes.

DATE	PECO	SOURCE
Aug 1964-1969	x	95
Jun 1970	41-42e	95
16 Jul 1975	0	265
17 Aug 1977	4	4
21 Aug 1977	1eS	265
19 May 1979	1	58
10 Jun 1979	3+	58
17 Jul 1979	0	58
1 Jul 1980	0	58
22 Aug 1982	0	58
Jun-Jul 1989	0	238

Remarks: Ballard and Ring collected eight young cormorants from four nests for their study of ectoparasites in 1977.[4]

WV-810 BORDELAIS ISLETS

Location: *48°49'03"N 125°13'53"W; 92 C/14.* Southwest end of the Deer Group, southwest of Edward King Island. Known as Ship Islet prior to 1934.

Description: *2.7 ha; 12 m high; Grassy rock; Cliffs.* These three steep-sided islets are connected at low tides. They are mostly bare rock but have some grass and shrubs on higher sections. There are cliffs on the west end of the islets.

Historical summary: Theed Pearse confirmed Glaucous-winged Gulls nesting in 1943 (Table WV-810). He noted the presence of Pelagic Cormorants and Black Oystercatchers but did not mention nesting by those species. Guiguet found cormorants nesting on the cliffs on the west end in 1965 and saw four pairs in breeding plumage high on those cliffs in 1970. One bird was carrying nesting material in 1970. Guiguet observed oystercatchers and gulls with large young each year (Figure 560), except in 1970 when he was on the islets earlier in the season. On 5 June 1970, he found 12 freshly prepared, empty oystercatcher nests and just a few eggs laid in gull nests. He counted

Figure 560. By mid-August, many Black Oystercatcher families have left Barkley Sound. Juveniles (foreground) have a dark-tipped bill and scaled body feathers. *Photo by R. Wayne Campbell.*

20 adult oystercatchers present. Guiguet also saw Pigeon Guillemots carrying food to nest sites each year from 1964-1970 but was unable to inspect nests. He estimated at least eight pairs nesting on the west islet in 1970.

Census crews in 1975 were unable to land. They saw two adult gulls on the islets that they suspected were nesting. The islets were also surveyed from the water in 1989; [258] Only Pigeon Guillemots were recorded. We considered the last land survey in 1970 to be the better and current estimate for Black Oystercatchers.

Table WV-810. Seabird nesting records for Bordelais Islets. See Appendix 2 for codes.

DATE	PECO	BLOY	GWGU	PIGU	SOURCE
17 Aug 1943			x		265
Aug 1964		x	x	x	95
13 Aug 1965	3	x	x	x	95
Aug 1966-1969		x	x	x	95
5 Jun 1970	4eS	12S	25e	8e	95
16 Jul 1975	0	0	1S	(0)	265
Aug 1977	0				58
1979	0				58
1980	0				58
23 Aug 1982	0				58
Jun-Jul 1989	0	0	0	S(2)	84, 238

Remarks: Crow predation on gull eggs was noted in 1970. Theed Pearse banded 10 young gulls on his visit in 1943.

WV-820 "EXECUTION" ROCK

Location: *48°48'51"N 125°10'41"W; 92 C/14.*
On the shore of Vancouver Island between Mills Peninsula and Whittlestone Point.

Description: *Cliffs.*
Execution Rock is a Cultural Heritage Site within the village site of Kiix̣in of the Huu-ay-aht First Nations. The area was officially designated as a National Historic Site by the Historic Sites and Monuments Board of Canada in 1999.

Historical summary: Pelagic Cormorants intermittently nest on the seaward-facing cliffs (Table WV-820). Nests were observed but not counted in 1974.

Table WV-820. Seabird nesting records for "Execution" Rock. See Appendix 2 for codes.

DATE	PECO	SOURCE
1974	S	58
1979	0	58
Aug 1982	4	58
22 Aug 1988	8	181
Jun-Jul 1989	0	238

Remarks: Sports fishermen (Figure 561) and SCUBA divers frequently disturbed nesting cormorants in August 1982.[58] Centuries ago, Huu-ay-aht warriors dropped logs on to invading canoes from these cliffs.

Figure 561. Some sports fishermen are attracted to the vicinity of seabird colonies because they are good sites to jig for Northern Red Snappers (*Lutjanus campechanus*; photo) and Lingcod *(Ophiodon elongatus)*. Close approach by fishermen can cause major disturbances and impacts to nesting seabirds, especially cliff-nesting Pelagic Cormorants. *Photo by R. Wayne Campbell.*

WV-830 LAWTON POINT

Location: *48°48'03"N 125°11'28"W; 92 C/14.*
Vancouver Island southwest of Whittlestone Point, within PRNPR.

Description: *Cave.*

Historical summary: Lawton Point was one of the few sites where Carter et al.[58] found Pelagic Cormorants consistently nesting each year of their surveys (Table WV-830). Three and six nests were visible on the left and right sides of the cave, respectively, in 1979. Nests were seen but not counted in 1980. No nests were visible but at least two pairs were suspected nesting farther in the cave in 1982. The site was abandoned in 1989.

Table WV-830. Seabird nesting records for Lawton Point. See Appendix 2 for codes.

DATE	PECO	SOURCE
19 May 1979	S	58, 265
4 Jun 1979	7	58, 265
28 Jun 1979	9[5]	58, 265
14 Jun 1980	x	58, 265
4 Sep 1982	2eS	58, 265
Jun-Jul 1989	0	238

Remarks: Northwestern Crows were seen taking eggs from cormorant nests at the cave entrance when observers approached during several visits in 1979.[58]

WV-840 CAPE BEALE

Location: *48°47'10"N 125°12'59"W; 92 C/14.*
Vancouver Island at southwest entrance to Barkley Sound, within PRNPR.

Description: *Cave; Cliffs.*
There is a manned lighthouse atop the cape. It was the first to be constructed along Vancouver Island's western shore and went into operation in 1874.

Historical summary: J.A. Brooks reported Pelagic Cormorants nesting in a cave about 30 m south of the lighthouse in 1947, and Thomas Widdowson counted 14 nests on cliffs below the lighthouse in 1959 (Table WV-840). Nests contained well-grown young in 1947 but most nests were empty in 1959. Cormorants in breeding plumage have been present on all subsequent visits. Bristol Foster observed cormorants carrying nesting material in 1970.

Ballard and Ring observed Common Murre adults with young on the water off Cape Beale on 5, 19, and 24 August 1977 (Figure 562).[4] No evidence of nesting has been reported.

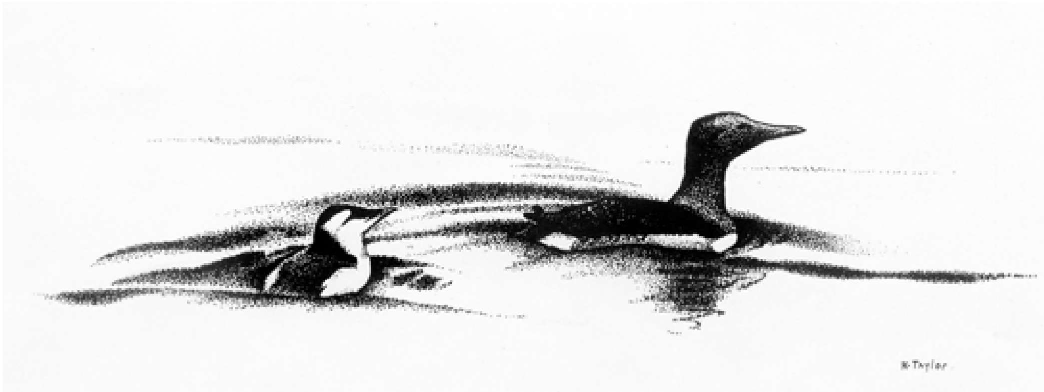


Figure 562. The families of Common Murres seen off Cape Beale in 1977 likely originated from a colony in Washington State. *Drawing by Keith Taylor.*

Table WV-840. Seabird nesting records for Cape Beale. See Appendix 2 for codes.

DATE	PECO	SOURCE
Jul 1947	20e	77
6 Jul 1959	14[3]	77
22 Aug 1970	S	95
19 May 1979	S	58
14 Jun 1980	S	58
4 Sep 1982	S	58
Jun-Jul 1989	0	238

Remarks: Widdowson in 1959 reported that the colony had recently been "shot up with rifle fire". He found cormorant eggshells lying about above the cliffs. Eggs had likely been pilfered by crows after nesting birds were disturbed. Only two of three remaining nests with eggs were attended.

WV-850 SEABIRD ROCKS

Location: *48°44'57"N 125°09'16"W; 92 C/14.*
Mouth of Pachena Bay, southeast of Cape Beale, within PRNPR.

Description: *0.3 ha; 15 m high; Grassy rock.*
The higher portion of this rocky islet has a central gully of salmonberry surrounded by a lush growth of grasses and forbs (mostly dune grass and cow parsnip). There is a navigational beacon on the highest grassy knoll (Figure 563).

Historical summary: Carter et al. have described in detail the history of ornithological work on Seabird Rocks.[55] C.F. Newcombe collected eggs of Black Oystercatcher, Glaucous-winged Gull, and Pigeon Guillemot in 1894 and 1896 at what was most likely Seabird Rocks (Table WV-850). Glaucous-winged Gull and Pigeon Guillemot egg specimens labelled "west coast Vancouver Island" that Newcombe collected in 1892 may also have originated on Seabird Rocks (see introductory section on *History of Seabird Colony Surveys*). Pearse banded Glaucous-winged Gull chicks in 1943 and 1945 (Figure 564), and also confirmed nesting by Leach's Storm-Petrels, Black Oystercatchers, and Tufted Puffins. Puffin burrows were not explored but one or two puffins were observed flying in with fish. Breeding Fork-tailed Storm-Petrels and Rhinoceros Auklets were first recorded in 1970 by Foster and Guiguet,[95] who also suspected nesting by Cassin's Auklets. Guiguet described the ground as "honeycombed" with burrows of both storm-petrel species. Hatler first confirmed breeding by Cassin's Auklets in 1972 and Pelagic Cormorants were first observed breeding in 1975. Pearse [161] observed a pair of Western Gulls and suspected nesting in 1943, but this has not been accepted as a breeding record for this species in BC.[40, 77]

Figure 563. Historically, nine species of seabirds have been recorded nesting on Seabird Rocks, which represents the highest diversity at any colony within Pacific Rim National Park Reserve. Images of Seabird Rocks (clockwise from top left): **1)** the rock is small, low, and lightly vegetated; **2)** a band of dense vegetation in the central portion is used by burrow-nesting species (June 2010); **3)** about two-thirds of the area consists of rocky and beach habitats (27 May 2011); **4)** dune grass (wild-rye) is a common, coastal, shoreline plant; **5)** cow parsnip grows in rich, moist soils and flowers from late May to late June; and **6)** salmonberry, a shrub endemic to the Pacific Northwest, forms a thicket used by burrow-nesting seabirds. *Photos by Peter V. Clarkson (1,2), Percy N. Hebert (3), Adrian Dorst (4); R. Wayne Campbell (5,6).*

Figure 564. Theed Pearse, a magistrate in Comox whose hobby was bird study, was among the earliest to band seabirds in BC. He banded Glaucous-winged Gulls at Mitlenatch Island in the BC Salish Sea beginning in the 1920s and at Seabird Rocks on the west coast of Vancouver Island in the mid-1940s. *Photo by R. Wayne Campbell.*

Table WV-850. Seabird nesting records for Seabird Rocks. See Appendix 2 for codes.

DATE	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	RHAU	TUPU	SOURCE
14 Jun 1894					x	x				55
1 Jun 1896				x		x				52, 55
19 Aug 1943		x		1	200e	S			x(7)	160, 161
11 Aug 1945		x			x				x(7)	160, 161, 265
12 Jun 1970	x	x		6[6]+	400-500e	70e(70-80)	S	x	x(24)	95
24 Jul 1972	x	500+e		25e	108+	50e(84)	<100e	150e	20e(13)	107, 265
16 Jul 1975		50-100e	23[16]	7[4]	269[189]	x(50)		100e	x(10)	265
17 Jul 1979	x	x			191[112]	x		x	S(12)	85
12 Jun 1982				5e	195[164]	(33)			S(8)	265
16 Aug 1985									(6)	266
5 Jun 1986	x	S	0	15e	x	S(121)	x	x	x(9)	55
Jul-Aug 1987	S	S	0	2+	200e	x(200)		x	S(14)	55, 253
26, 30 Jul 1988	318e	715e	16[13]	5[5]	181[149]	S(65)	269e	140	4e(4)	55, 181
Jun-Jul 1989			12	12e	225	S(90)				84, 236, 238

Actual nest counts for gulls and other species were first made in 1972 and we have several total counts of gull nests since. Surveys for oystercatchers were less complete in most years and the best estimates are likely from 1989 and perhaps 1975 (see below). The only reliable estimates for burrow-nesting species are from 1988. In 1979, a rough estimate of 2,500 total storm-petrel and auklet burrows, based on the density of burrows determined in one 3 x 3 m sample plot and rough measurements of burrowing area, was made by a student group from the Bamfield Marine Sciences Centre (Figure 565).[85] Total or partial counts conducted by Alan Burger and Don Garnier provided estimates for burrowing species in 1988. Carter et al.[55] revised 1988 estimates for burrow-nesting species presented in Rodway and Lemon,[181] following the discovery of additional field notes not available to Rodway and Lemon (Figure 566).[181]

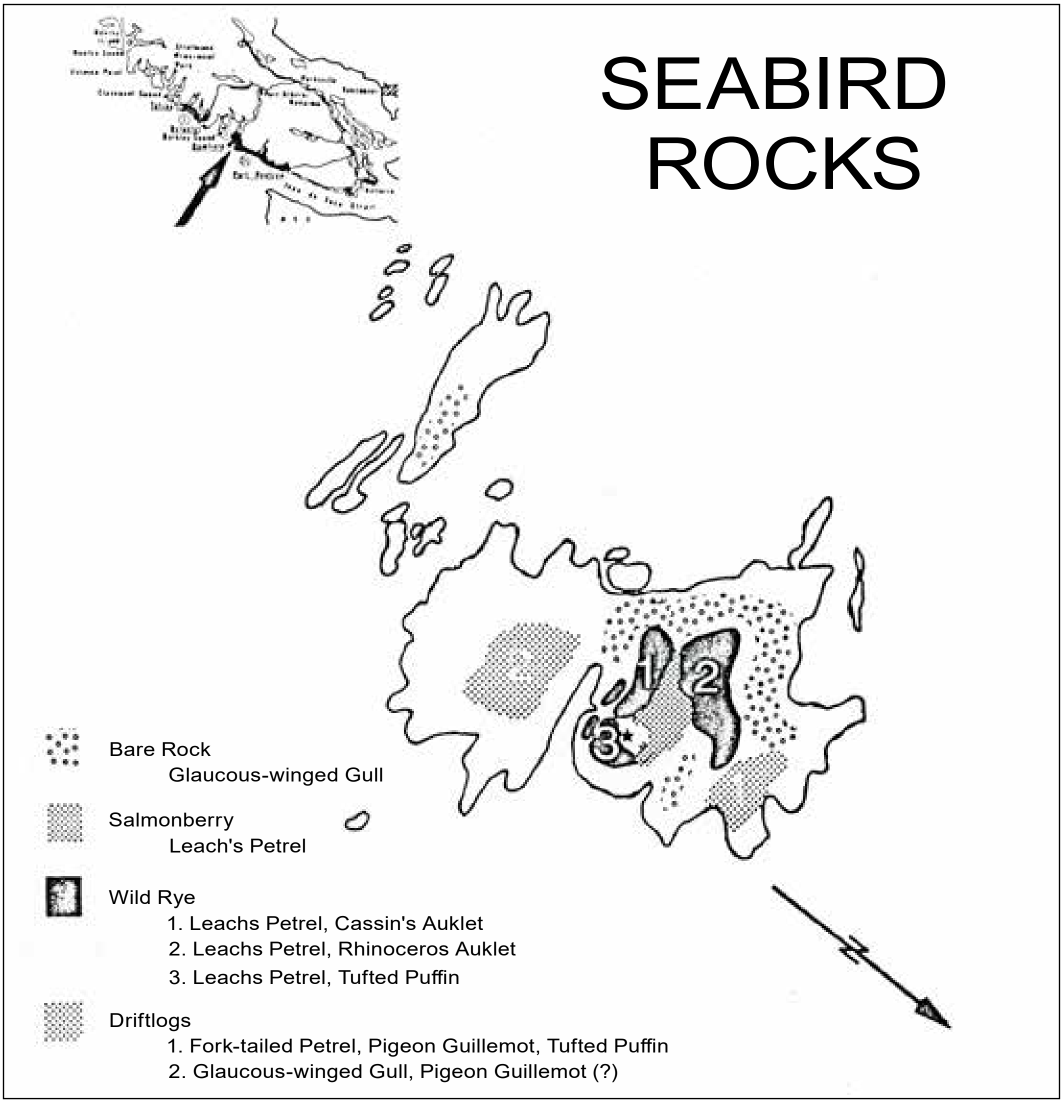


Figure 565. Summer students from the Bamfield Marine Sciences Centre visited Seabird Rocks on 17 July 1979. They mapped different habitats, including: bare rock (open dots); salmonberry/driftwood (stippled); and dune grass (wild rye). The occurrence of nesting seabirds within each habitat type and area (numbered polygon) was also indicated. Black Oystercatchers and Glaucous-winged Gulls nested in bare rock habitat. Leach's Storm-Petrels nested throughout vegetated areas of dune grass and salmonberry. In addition, in salmonberry/ driftwood habitat, Fork-tailed Storm-Petrels, Pigeon Guillemots, and Tufted Puffins nested in polygon #1, and in polygon #2, Glaucous-winged Gulls nested and Pigeon Guillemots were suspected nesting. In dune grass habitat, Cassin's Auklets, Rhinoceros Auklets, and Tufted Puffins nested in polygons #1, #2, and #3, respectively. *Map drawn by Dr. Rudi Drent and reproduced from Ferguson.*[85]

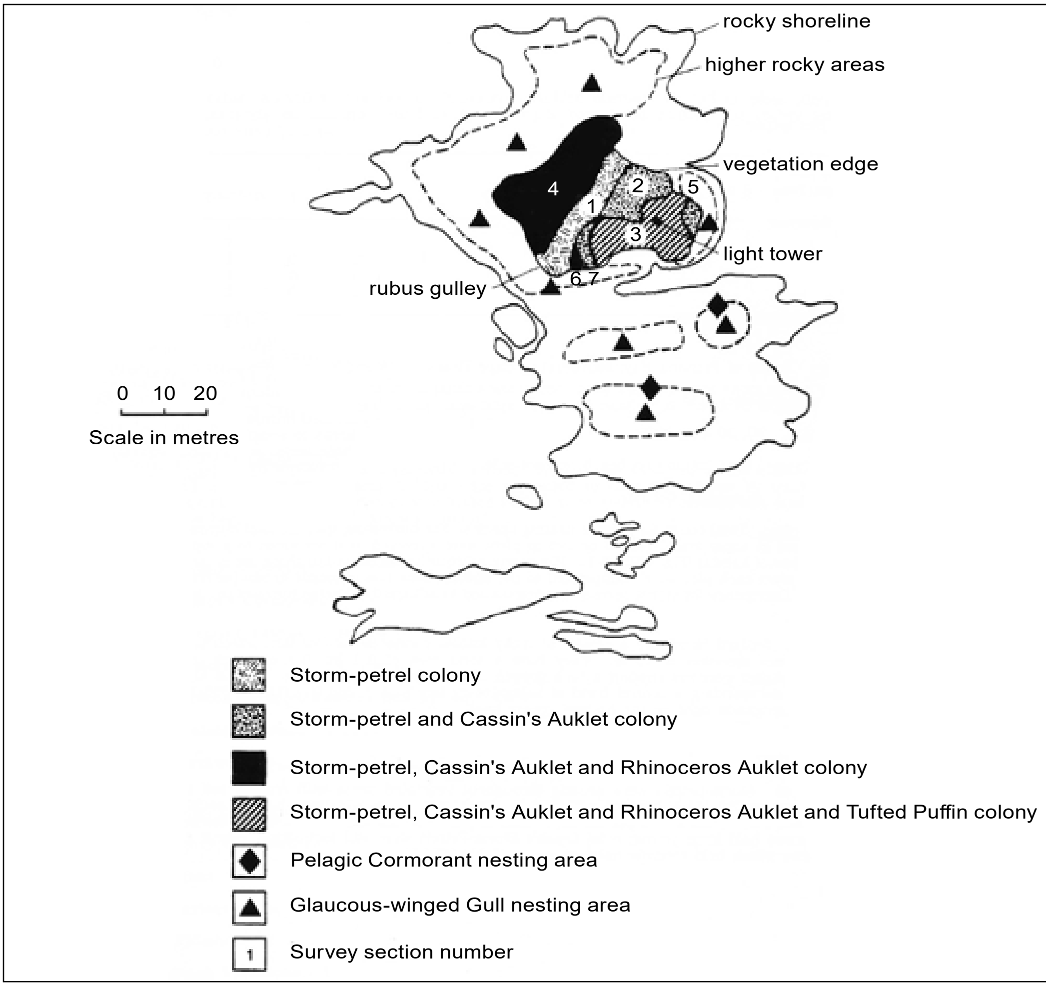


Figure 566. Detailed map showing nesting and survey areas for six of the seabird species documented nesting on Seabird Rocks in 1988. *Modified from Rodway and Lemon* [181] *and reproduced from Carter et al.*[55]

In 1988, Leach's and Fork-tailed storm-petrels, at a ratio of just over two-to-one, were nesting in all vegetated habitat with enough soil to support burrows, Cassin's Auklets were found in most vegetated areas except in the salmonberry gully, and Rhinoceros Auklet burrows were found mainly in the grassy area at the northwest corner of the vegetated habitat. Hatler reported Tufted Puffins nesting in dune grass habitat on the knoll with the navigational beacon and a few nesting among drift logs on the shore in 1972. Puffin burrows were found only on the knoll near the beacon in subsequent years. Pigeon Guillemot nests were found under heavy beach debris in 1970, under a drift stump in 1972, and again under driftwood in 1975.

Pelagic Cormorants have been recorded nesting on only three surveys, suggesting infrequent use of this site. Cormorant nests were located on north-facing bluffs at the south end of the rocks.

Pearse saw about 20 Black Oystercatchers and found one nest in 1943. Six nests were found and 80 adults counted in 1970, and 62 adults were seen and two nests with eggs or young were found in 1972. In 1975, the BCPM crew found four nests with eggs or young and suspected young around three empty nests (Figure 567). They also recorded 11 additional scrapes that they did not consider active nests. In 1982, three nests with eggs were found and at least five nests were estimated. Alan Burger estimated 15 pairs breeding and found three nests with eggs in 1986. Ten oystercatcher nests were found and 12 pairs estimated nesting in 1989.

Figure 567. On Seabird Rocks, Black Oystercatchers nest on bare rock around the periphery of the island. *Photo by R. Wayne Campbell.*

Glaucous-winged Gull nest counts indicate some decline in the gull breeding population since the mid-1970s. However, numbers were also low in 1972 when Hatler counted only 108 nests on all accessible areas and estimated only a few more nests on inaccessible reefs. Burger estimated 300-400 gulls on the island on 5 June 1986; nests were being built but no eggs were seen. Numbers were somewhat higher in 1989 than 1988, contrary to the general trend in the region.[238]

Remarks: Pearse found depredated remains of Leach's Storm-Petrels (Figure 568) and Glaucous-winged Gulls in 1945.[160] Pearse suggested Great Horned Owl (*Bubo virginianus*) as possibly responsible for the plucked gull remains, but we suspect Bald Eagle was the more likely culprit. Remains of several Leach's Storm-Petrels and five Rhinoceros Auklets were found in a river otter resting area in 1972.[108] BCPM crews in 1975 counted 10 dead Rhinoceros Auklets they suspected had been killed by mink. Carter et al.[55] suggested that they could also have been killed by river otters. Four Bald Eagles were present in 1979 and 1982 and two immatures were seen sitting on the island on 5 June 1986. In 1987, Alan Burger recorded one Bald Eagle, one immature Peregrine Falcon, and signs of river otter, including a well-worn runway through the vegetation and numerous scats (a few contained bird remains; most contained fish). No evidence of predation on seabirds was recorded in 1988. A river otter was seen on the island and there was a well-worn trail among the burrows, but all scats contained only fish remains.

Figure 568. Theed Pearse confirmed nesting and found depredated remains of Leach's Storm-Petrels on Seabird Rocks in 1945. Seabird Rocks is the southern-most storm-petrel colony in BC. *Photo by R. Wayne Campbell.*

Glaucous-winged Gulls fared poorly in 1972 and few nests contained chicks when surveyed on 24 July. Hatler et al. suspected that First Nations people had harvested eggs.[107] Some young gulls were also taken by eagles that year. There was also a breeding failure of Glaucous-winged Gulls in 1986; observers found only one chick and many depredated eggs in August.[55] Similar evidence of failure was seen again in 1987; only six of an estimated 200 nests contained eggs on 23 July 1987 and only two pairs seemed to raise chicks successfully.[253] No evidence of mammalian predators was discovered, and Northwestern Crows, one pair of which nest on the islet, were suspected to be responsible for egg predation, likely exploiting human or eagle disturbance to the gulls.

Hatler et al.[107] suspected that the nesting population of Tufted Puffins may have been reduced due to disturbance and trampling of burrowing habitat by Department of Transport personnel servicing the light. As well, dead batteries had been discarded into the vegetation north of the light resulting in the loss of some storm-petrel habitat.

Seabird Rocks is visited by researchers and students from the Bamfield Marine Sciences Centre and there has been considerable researcher disturbance on the island (Figure 569). Burger studied the foraging behavior of Rhinoceros Auklets from 1986-1989.[23, 30] Depth gauges were attached to adults captured as they were returning to feed chicks. Birds were also banded and had to be recaptured to retrieve the depth gauges. The greatest number of gauges was deployed in 1987 when they were placed on 85 adults, which would constitute about 30% of the breeding population on the island. Gauges were placed on 13 and 17 adults in 1986 and 1988, respectively. Since 1990, further intensive studies on Rhinoceros Auklet nestling growth and diet were conducted in 1995-1997 [70-72] and 1998-2002 [10] that also required capturing adults as they were returning to feed young.

The Moral Dilemma – Revisited

Most of our wildlife conservation efforts are attempts to mitigate or compensate for damages caused by the relentless tide of human population growth and consumption, either directly through the usurpation of wildlife habitats and resources, or indirectly through the accidental or intentional introduction of alien species, pollutants, and other impacts that perturb natural ecosystems. In the Haida Gwaii volume of this seabird colony catalogue, we briefly discussed the moral dilemma presented by control efforts aimed at eliminating introduced species like rats and raccoons from seabird islands. What about the less-common situations where one native species impacts another native species that we are concerned about? Is there justification for human interference into the normal functioning of native ecosystems in such cases? This was the moral dilemma recently faced by Parks Canada in managing seabird populations on Seabird Rocks.

Human interference into the functioning of native ecosystems often occurs when we wish to protect rare or endangered species in an area from the impacts of more common species. However, such situations are generally the result of human

Figure 569. These marked eggs (left) were part of a research project on the breeding biology of Glaucous-winged Gulls. Such projects can provide important information about nesting species that is essential for threats assessment and for effective conservation planning. However, disturbance from research activities can, in itself, become a threat to nesting species and biologists have a responsibility to minimize their impacts. Biologists also need to reduce impacts that may persist after their project ends. This may involve dismantling structures, like old climatic stations (right photo), and removing unused building materials, garbage, and other debris. *Photos by R. Wayne Campbell.*

impacts at larger scales, such as broad-scale habitat destruction that has resulted in one species becoming endangered in the first place. Examples include culling wolves (Canis lupus) *to protect caribou* (Rangifer tarandus) *or removing Barred Owls* (Strix variato) *to protect Spotted Owls* (Strix occidentalis) *within the limited habitat remaining for these species. There is often controversy surrounding these programs.*

On Seabird Rocks, recent surveys found that Cassin's and Rhinoceros auklets and Tufted Puffins were no longer nesting and populations of storm-petrels were much reduced compared to 1988.[55] *Human disturbance and damage to nesting habitats was suspected to have caused the earlier decline and disappearance after 1998 of Tufted Puffins and may also have affected other species. In addition to impacts associated with servicing the light beacon, egg-harvesting by First Nations people, and increasing recreational traffic, there has been frequent disturbance for research and teaching purposes. Student groups occasionally visit from the Bamfield Marine Sciences Centre and several studies on the foraging behaviour and nestling growth of Rhinoceros Auklets have been conducted since those begun by Alan Burger in the 1980s.*[10, 23, 30, 70-72] *However, the presence of a family of river otters* (Figure 570) *and some signs of predation on seabirds by river otters led Carter et al.*[55] *to conclude that river otters were likely primarily responsible for the more recent declines (since 2005) of most burrow-nesting species.*

This conclusion led Parks Canada to consider several restoration actions aimed at controlling river otter predation, including lethal or non-lethal removal of family groups of otters, blocking bedding sites to discourage long-term visits by otters, and installing predator-proof artificial nest sites to help protect remaining small numbers of breeding birds.[55] *Making such management decisions requires wrestling with the ethical issues surrounding each option. It was not certain that river otters were the main cause of seabird declines and it was unknown what the long-term benefit might be* (Figure 571). *In 2012, Pacific Rim National Park Reserve decided that immediate action was needed to protect remaining seabirds and chose lethal removal of river otters as a restoration strategy. River otters were removed in 2012-14 (n=11) and 2016 (n=1) as a traditional harvest arrangement with the Ditidaht First Nation.*[264] *First Nations groups regularly trap river otters on adjacent areas of Vancouver Island, although there is increasing public resistance to this inhumane practice.*[163]

One issue that needed to be addressed was how important it was to protect and restore the small number of burrow-nesting seabirds on Seabird Rocks. This is the only colony of these species in Pacific Rim National Park Reserve and thus constitutes a rare and endangered wildlife component within their jurisdiction. At larger scales, breeding populations on Seabird Rocks comprise a small proportion of overall regional or provincial populations. However, this does not reduce the value of protecting even small colonies given the major threats to seabird populations globally. Thus, it is easy to agree that protecting nesting seabirds on Seabird Rocks is desirable, but at what cost?

River otters are important components of aquatic ecosystems throughout BC and frequently occur on seabird colonies along the coast (Figure 572). *Unlike other mustelids whose presence is generally incompatible with concentrations of burrow-nesting seabirds, river otters have likely coexisted with nesting seabirds in BC for thousands of years. Diet in coastal habitats is 98% fish* [108] *but river otters also prey on waterbirds and occasionally will take nesting seabirds, especially storm-petrels, in large numbers. However, we know of no instances other than that suggested on Seabird Rocks where river otters have contributed to the decimation or abandonment of auklet colonies. Speich and Pitman also found substantial predation by river otters on nesting storm-petrels but not on auklets or puffins in Washington.*[209] *Signs of dug-up burrows are often associated with intense river otter predation on a storm-petrel colony (e.g., Hippa Island in Haida Gwaii) but were not reported on Seabird Rocks. Decapitated and partially eaten carcasses of storm-petrels and Rhinoceros Auklets found on the colony in 2006 were also consistent with mink predation, although other signs of mink were not seen. Raptors like Peregrine Falcons will also often leave decapitated and partially eaten bird carcasses. Intense predation on nesting storm-petrels by river otters seems to be a learned behaviour by specific individuals or families and impacts to nesting populations are typically local and may be cyclical.*

We do not have long-term observations to verify a cyclical pattern but we do know that a few small storm-petrel colonies, such as Moos Islet at the mouth of Kyuquot Sound, may have been decimated by river otter predation over a short time period. The fact that these colonies and many others with river otters exist today suggests that colonies have recovered from similar bouts of excessive predation by particular river otters in the past. Removing the river otters that had recently established themselves on Seabird Rocks may accelerate that recovery process, although justification for the lethal methods used to manage river otters will remain an open issue (Figure 573)*.*

Did the removal of river otters facilitate the recovery of nesting seabirds? For the first time since the early 2000s, a pair of Rhinoceros Auklets was confirmed breeding in 2016,[264]*but typical of the dynamic nature of seabird nesting habitat, which is often transformed by devastating natural events like windfalls or landslides, unexpected impacts have occurred on Seabird Rocks that have reduced the potential for recovery. Over the winter of 2015-2016, storm surges eroded a small amount of the flat grassy habitat historically used by burrow-nesting seabirds. The next winter, California* (Zalophus californianus) *and Steller Sea Lions moved in and established a haul-out on the flat part of the rocks, essentially removing about 50% of the burrowing habitat. Greater erosion of the grassy benches was seen in spring 2017. Some areas were worn down to the bedrock and where soil remained it was compacted with essentially no vegetation cover. The only remaining area with normal vegetation growth was on the knoll with the light beacon where Tufted Puffins used to nest. Storm-petrels are still nesting on the island although the proportion of the two species appears to have changed since 2017 (see Appendix 1).*[264]

The future fate of nesting seabirds on Seabird Rocks is uncertain. It will depend on the interplay of natural ecosystem processes and human perturbations which are now inextricably entwined in even the most remote corners of this planet.

Figure 570. A group of Northern River Otters photographed with a motion-activated camera on Seabird Rocks on 2 June 2011. *Reproduced from Clarkson et al.* [345]

Figure 571. Seabird Rocks is less than 2 km from the shore of Vancouver Island, well within the range of swimming river otters.[108] Following the killing of river otters on Seabird Rocks, it likely will not be long before other river otters inhabiting nearby areas will travel to Seabird Rocks to forage and perhaps build a den. *Photo by R. Wayne Campbell.*

Figure 572. In intertidal zones (shown here) along the BC coast it is common to see a Northern River Otter hauled out eating a fish, its preferred food. In summer, river otters sometimes eat waterbirds, especially seabirds breeding on offshore islands. *Photo by R. Wayne Campbell.*

Figure 573. Human attitudes are rapidly changing towards the shooting and culling of wildlife, especially among photographers, wildlife viewers, and naturalists. Watching a river otter basking on a wharf is a unique and beautiful life experience for many people. *Photo by Mike McCammon.*

WV-855 "KLANAWA" CLIFFS

Location: *48°42'23"N 125°00'00"W; 92 C/10.* Vancouver Island shore extending from 4 km northwest to one km southeast of Klanawa River, within PRNPR. Colony includes Valencia Bluffs located just northwest of the Klanawa River.

Description: *Cliffs.*

Historical summary: Vermeer et al.[238] reported Pelagic Cormorants nesting at two locations (8 and 4 pairs) along this stretch of shoreline (Table WV-855). No data survive on what was specifically seen.[258] We have no previous records for this site.

Table WV-855. Seabird nesting records for "Klanawa" Cliffs. See Appendix 2 for codes.

DATE	PECO	SOURCE
Jun-Jul 1989	12eS	238, 258

WV-860 WHYAC

Location: *48°40'01"N 124°50'55"W; 92 C/10.* Vancouver Island just south of the Nitinat River mouth, within PRNPR.

Description: *Cliffs; Caves.*

Historical summary: Pelagic Cormorant nests were located in a surge channel just south of Whyac in 1973 and in two caves about 400 m apart in 1975 (Table WV-860). Jim Cuthbert and others observed eggs in nests in 1973. In 1975, Lorne McIntosh found three nests with eggs in one cave and four nests under construction in a second cave to the southeast. No details on the 1989 observations were available.[258]

Table WV-860. Seabird nesting records for Whyac. See Appendix 2 for codes.

DATE	PECO	SOURCE
Jun 1973	50e	107
21 Jul 1975	7+	265
Jun-Jul 1989	3eS	238, 258

WV-870 “PARKINSON” CLIFF

Location: *48°30'38"N 124°22'25"W; 92 C/9.*
Near Parkinson’s Creek, 2.5 km southeast of Providence Cove.

Description: *8 m high; Cliffs.*
These cliffs are within Juan de Fuca Provincial Park established in 1996.

Historical summary: Bristol Foster reported 10 large young in Pelagic Cormorant nests in 1973 (Figure 574; Table WV-870). There are no recorded visits since.

Figure 574. Near-fledged Pelagic Cormorant young were recorded on “Parkinson Cliff” on 21 September 1973, which is late in the season for young to still be in the nest. *Photo by R. Wayne Campbell.*

Table WV-870. Seabird nesting records for “Parkinson” Cliff. See Appendix 2 for codes.

DATE	PECO	SOURCE
21 Sep 1973	15e	32, 265

WV-880 SAN SIMON POINT

Location: *48°26'02"N 124°06'34"W; 92 C/8.*
West of the mouth of the Jordan River.

Description: *6 m high; Cliffs.*
San Simon Point is within Juan de Fuca Provincial Park established in 1996.

Historical summary: Bristol Foster observed eight large Pelagic Cormorant young in nests on the cliffs just west of San Simon Point in 1973 (Table WV-880). No evidence of nesting was seen in 1989.

Table WV-880. Seabird nesting records for San Simon Point. See Appendix 2 for codes.

DATE	PECO	SOURCE
21 Sep 1973	12e	32, 265
Jun-Jul 1989	0	238

WV-890 “SOOKE BAY” ISLETS

Location: *48°22'04"N 123°46'22"W; 92 B/5.*
Unnamed islets on the north side of Sooke Bay.

Description: *0.1 ha; 3 m high; Bare rock.*

Historical summary: J. A. Brooks found two Glaucous-winged Gull nests with young in 1960 and Bruce Butler monitored a single nest in 1961 and 1962 (Table WV-890). Butler made three visits in 1961, finding two eggs, three eggs, and three young in the nest on 20 June, 27 June, and 26 July, respectively. The one nest in 1962 held three eggs on 28 June and three young on 15 July. No gulls were nesting in 1989.

Table WV-890. Seabird nesting records for “Sooke Bay” Islets. See Appendix 2 for codes.

DATE	GWGU	SOURCE
1960	2[2]	77
27 Jun 1961	1	265
28 Jun 1962	1	265
Jun-Jul 1989	0	238

WV-900 ARGYLE ISLET

Location: *48°19'15"N 123°36'07"W; 92 B/5.*
East side of Becher Bay.

Description: *0.1 ha; 4 m high; Bare rock.*

Historical summary: There is only one record of Glaucous-winged Gulls nesting on these rocks; one nest with two eggs was found by Harry Carter and others in 1978 (Table WV-900). Previously, Phil Nott and Gary Seedhouse from the BCPM reported no use by seabirds in 1974. We assume that the islet was surveyed from the water and no birds were seen in 1989,[238] although no records survive from that visit.[258]

Table WV-900. Seabird nesting records (nests) for Argyle Islet.

DATE	GWGU	SOURCE
4 Jul 1974	0	265
15 Jun 1978	1	265
Jun-Jul 1989	0	238

Remarks: Signs of river otter were seen in 1978.

WV-910 BEDFORD ISLANDS

Location: *48°18'58"N 123°36'25"W* (West Bedford Island)*; 92 B/5.*
East side of entrance to Becher Bay. Bedford Islands includes Large Bedford, South Bedford, and West Bedford islands and some smaller rocks between these islands.

Description: *1.5 ha; 17 m high; Grassy rock.*
Large Bedford Island is partially forested and is connected by a sandbar to the main shore of Vancouver Island. It is not used by nesting seabirds. Nesting has occurred on the more isolated islands in this group, which are mostly bare rock, with some grassy patches and a few shrubs on higher sections.

Historical summary: All Glaucous-winged Gull nests have been found on the South Bedford Island (Figure 575), except one empty nest located on the 7 m rock just south of the Large Bedford Island in 1978. Twelve adult gulls were present but only two nests were found in 1974 (Table WV-910). Black Oystercatchers have been recorded nesting on West Bedford Island (1 nest with 3 young in 1977) and on the 7 m rock south of the Large Bedford Island (1 nest with 1 young and 1 empty nest with suspected young in 1977; and 1 nest with 1 egg in 1978). Three additional empty scrapes were found on the 7 m rock in 1977, but nests were associated with only two pairs of oystercatchers. Only South Bedford Island was surveyed in 1974 [265] and 1989.[258]

Figure 575. Glaucous-winged Gull nests on South Bedford Island have been built entirely of varying amounts of dry grasses, often gathered from the vicinity of the nest site. *Photo by R. Wayne Campbell.*

Table WV-910. Seabird nesting records for Bedford Islands. See Appendix 2 for codes.

DATE	BLOY	GWGU	SOURCE
4 Jul 1974		2[1]	32, 265
21 Jun 1977	3[2]	21[19]	265
15 Jun 1978	1	25[17]	265
Jun-Jul 1989		28	238

Remarks: River otter runways and scats were seen on West Bedford Island in 1977.

WV-920 CHURCH ISLAND

Location: *48°18'29"N 123°35'17"W; 92 B/5.*
Southwest of Church Point, east of Becher Bay.

Description: *0.4 ha; 16 m high; Grassy rock* (Figure 576).

Figure 576. Church Island is a small, bare rock with pockets of grass. *Photo by R. Wayne Campbell, 4 July 1974.*

Historical summary: Four Black Oystercatchers were present, but no nests were located in 1974 (Table WV-920). In 1977, three pairs of oystercatchers were seen but only two nests were found. There was only one pair of oystercatchers on the rock in 1978; one nest with three eggs plus two empty scrapes were associated with that one nesting pair.

Glaucous-winged Gulls have never been confirmed nesting on this rock. Three complete but empty gull nests were found in 1974. One pair of gulls was attending the rock in 1977 and six adults were present in 1978 but no nests were seen in either year. Observations were made from the water in 1989; no gulls were seen and no records survive on what was observed for oystercatchers.[258] Pigeon Guillemots were nesting in a rock crevice in 1974.

Table WV-920. Seabird nesting records for Church Island. See Appendix 2 for codes.

DATE	BLOY	GWGU	PIGU	SOURCE
4 Jul 1974	0	3S	1	32, 265
21 Jun 1977	2[1]	0		265
15 Jun 1978	1	0		265
Jun-Jul 1989		0	S(2)	84, 238, 258

Remarks: The Pigeon Guillemot nest contained a broken egg in 1974. River otter runs were seen in 1977.

WV-930 RACE ROCKS

Location: *48°17'53"N 123°31'54"W* (Great Race Rock)*; 92 B/5.*
South of Bentinck Island, off the extreme south tip of Vancouver Island between Christopher Point and Edye Point. Race Rocks includes Great Race Rock, North Race Rock, West Race Rocks, and four other rocks.

Description: *1.7 ha; 30 m high; Grassy rock; Bare rock.*
The seven low rocks in this group are mostly bare. There are rock bluffs on Great Race Rock, which is the largest of the group, and grasses, forbs, and some shrubs cover higher sections of that islet. Lighthouse facilities occupy the center of Great Race Rock. Built in 1869-1870, the lighthouse was one of the first to be established on the west coast of British Columbia (Figure 577). The light was automated in the 1990s but the facilities continue to be used by Pearson College (see introductory section on the *History of Seabird Colony Surveys on the BC Outer Coast*).

Figure 577. Race Rocks, named for surging tides that swirl through the channels at speeds up to 8 knots, is the most southerly part of BC and is the southernmost and final colony in this BC Outer Coast volume of this seabird colony catalogue. The archipelago consists of seven low, mostly bare rocks; some vegetation occurs on Great Race Rock. The lighthouse (next page, top left) on Great Race Rock was initially constructed in 1869-1870, was automated in the late 1990s, and has been operational for over 150 years. Also illustrated here, Pelagic Cormorants and Glaucous-winged Gulls have historically nested on all seven rocks in the group, and cormorants often roost on the rocks in large numbers. *Photos by R. Wayne Campbell, 4 July 1974.*






Race Rocks were established as an Ecological Reserve in 1980. The reserve was expanded in 2001 to include the terrestrial area of the rocks, except for a 0.14 ha area around the lighthouse, plus 225 ha of seabed surrounding the rocks.[152] In 1998, the waters around Race Rocks were designated a Pilot Marine Protected Area (Area of Interest) by the Department of Fisheries and Oceans.[250] The area has not been formally established as a Marine Protected Area, as of 2022 (Figure 578).

Figure 578. Ecological reserves in BC are established for the maintenance of biological diversity. They assist in developing and promoting an environmental consciousness and are benchmarks against which environmental changes can be measured. Race Rocks Ecological Reserve protects an area of high biological diversity. A Marine Protected Area around Race Rocks has been proposed but, as of 2022, has not been formally established. Canadian and American ecotour excursions regularly visit the waters around the ecological reserve, which is accessible year-round. The boats are filled with people who mostly want to see whales, like Killer (Orca) and Humpback whales, but are also thrilled to see other mammals like seals, sea lions, and elephant seals. Regulations have been instituted or recommended to minimize disturbance to these marine mammals. There are government-enforced 400 m buffer zones for whales but for other marine mammals there are only recommended and self-imposed buffers of 100 m. Four marine mammal species are easily viewed on Race Rocks (clockwise from top left). **1)** *Steller Sea Lion* – far less common than their barking relatives, the California Sea Lion, Steller Sea Lions haul out mainly during winter months. **2)** *California Sea Lion* – often seen in zoos and aquaria, this species barks and has a unique bony bump on top of the skull. The population of 30 animals on Race Rocks in 1966 grew to over 300 by 2007. The photo shows a sports fisherman viewing an adult male. **3)** *Northern Elephant Seal* – in the late 1980s, an occasional elephant seal was reported on Great Race Rock. Less than a decade later, the large mammal has become a regular visitor throughout the year. Up to 25 elephant seals are seen at a time.[332] On 30 January 2009, first breeding by elephant seals in BC was recorded when a pup was born next to the helicopter pad on Great Race Rock.[346] The pup was named *Ninene*, meaning child or offspring, and was seen in rough shape 10 weeks later near Port Angeles in Washington. The closest breeding in the Eastern Pacific Ocean is Shell Island in central Oregon.[347] **4)** *Harbor Seal* – this small pinniped is a common resident in the area and pups on Race Rocks. *Photos by R. Wayne Campbell (1, 2, 4) and Courtney Edwards (3), courtesy Race Rocks Ecological Reserve.*[348]

Historical summary: Munro confirmed Glaucous-winged Gulls nesting on North Race Rock in 1924 (Table WV-930). He suspected nesting by Pigeon Guillemots and noted no cormorants nesting on that rock. There is a Black Oystercatcher egg specimen [273a] collected by Burton on 17 June 1932 with a location of "Vancouver Island, on small island two miles offshore off south end." This description may refer to Race Rocks, as Munro [149] gave the location of Race Rocks as "two miles off Rocky Point," which is the northeast point of Bentinck Island. If so, the oystercatcher egg specimen would constitute the first confirmed breeding on Race Rocks by that species. McCabe observed remains of Pelagic Cormorant nests on an unspecified rock in October 1937, but it was not until Odlum's observations in 1953 that Pelagic Cormorants and Pigeon Guillemots were confirmed breeding. Black Oystercatchers were also confirmed at that time. Odlum kept records of breeding seabirds on Great Race Rock while he was lightkeeper from 1953 to 1960. He reported nesting by Pelagic Cormorants, Glaucous-winged Gulls, and Pigeon Guillemots in all years, and made detailed observations on the chronology of all cormorant nests from 1956 to 1958, Black Oystercatcher nests from 1956 and 1960, and of about two-thirds of the gull nests during the 1956 to 1960 seasons. In 1958, Odlum visited the surrounding rocks, presumably the entire Race Rocks group, providing the first overall estimates for Pelagic Cormorants and gulls. Brandt's Cormorant became the fifth seabird species known to breed on Race Rocks when Campbell [39] discovered three nests with eggs in 1987. None were nesting in 1989. Guiguet noted three or four pairs of Tufted Puffins hanging around the northwest cliffs on Great Race Rocks in 1953 but found no sign of nests.[256] Puffins have not been recorded on other surveys up to 1990 (1-2 birds have been seen in recent years; see Appendix 1).

Nest counts indicate dramatic increases in cormorant and gull populations between 1974 and 1977, but 1974 may have been a poor season (see Remarks), and apparent increases may be exaggerated, especially for gulls. Estimates of nesting gulls on Great Race Rock have been similar since 1956, except for a low count in 1974 (Figure 579). Cormorant numbers show greater fluctuations, rising to a peak in 1978, declining rapidly to a low in 1981, and then showing some increase up to 1989.

Table WV-930. Seabird nesting records for Race Rocks. See Appendix 2 for codes.

DATE	BRCO	PECO	BLOY	GWGU	PIGU	SOURCE
23 Jul 1924		0+		75+e	S	149, 265
14 Oct 1937		S				77
22 Jun 1953		x	1	72+	x	256, 265
28 Jun 1953		x		74+	20+e	77, 157
28 Jun 1954		x	2	91+	20+e	77, 157
1955		x		x	20+e	77
8 Jul 1956		23+	4	150+e	20+e	77, 265
22 Jun 1957		21+	4[4]	175+e	20+e	77, 265
May-Jul 1958		102e	4-6	325e	20+e	77, 265
1959		45+	4-6	140+e	20+e	77, 265
1960		x	4-6	140+e		77, 265
31 May 1969			1			265
4 Jul 1974		160[132]	2[2]	141[86]	80eS(200+)	32, 265
21 Jun 1977		349[270]	1	423[364]	80e(81)	265
15 Jun 1978		437[381]	1	417[346]	(4+)	265
24 Jun 1980		102	1	337[337]	(34)	265
22 Aug 1980		140				265
22 Jun 1981		75[11]	2[2]	471[426]	S(30)	265
May-Jun 1983		143				231
15 Jul 1987	3[3]	120	3		S(78)	39, 80, 239, 240
Jun-Jul 1989	0	152		424	S(160)	84, 238, 258

Figure 579. Complete counts of Glaucous-winged Gull nests on Race Rocks between 1974 and 1989 suggested a major increase in numbers between 1974 and 1977, but the low count in 1974 may have been related to a cold and wet spring when fewer gulls initiated breeding and may therefore underrepresent population size for that year. *Photo by R. Wayne Campbell, 4 July 1974.*

Five surveys between 1974 and 1981 allow comparisons for individual rocks (Tables WV-930.1 and WV-930.2). Tallies for individual rocks were not reported in years before 1974 and after 1981.The most marked changes in cormorant numbers have occurred on Rock 6.

The distribution of nests, especially of Pelagic Cormorants, has also changed. Odlum reported Pelagic Cormorants nesting on Great Race Rock from 1953-1960. Cormorants were nesting on the northwest bluffs of that rock in 1957 and were occupying that location and a second location about 100 m away on the other side of the rock in 1959. On the complete survey in 1974, cormorants were nesting on six of the seven rocks, and were absent only from Great Race Rock where they were being actively discouraged (see Remarks). Observers on 24 June 1980 noted

Table WV-930.1. Pelagic Cormorant nest counts on Race Rocks between 1974 and 1981. Rocks 2-7 are numbered west to east.

Rock No.	Year[a] 1974	1977	1978	1980	1981
1 (North)	37	22	0	0	4
2	15	10	5	0	0
3 (West)	13	0	13	0	0
4	23	30	45	0	0
5 (Great)	0	0	7	0	0
6	14	213	268	90	51
7	58	74	99	50	20
Totals	**160**	**349**	**437**	**140**	**75**

[a] For sources see Table WV-930.

Table WV-930.2. Glaucous-winged Gull nest counts on Race Rocks between 1974 and 1981. Rocks 2-7 are numbered west to east. A dash indicates that counts were not separated by rock.

Rock No.	Year[a] 1974	1977	1978	1980	1981
1 (North)	7	23	18	-	39
2	1	5	6	-	8
3 (West)	14	100	76	-	117
4	1	77	93	-	88
5 (Great)	108	143	146	-	151
6	0	55	56	-	46
7	10	20	22	-	22
Totals	**141**	**423**	**417**	**337**	**471**

[a] For sources see Table WV-930.

Pelagic Cormorants nesting at three unspecified locations; nest contents were not determined. On 22 August 1980, nesting was reported on only the two small rocks south of Great Race Rocks: 50 nests with eggs were counted from land on the smaller of the two rocks (#7); and about 90 with what appeared to be incubating birds were counted from the water on the larger rock (#6). In 1981, Mike McNall and Martin Lee found cormorants nesting at three locations: nests on North Race Rock were empty; and only five of 51 and six of 20 nests held eggs on the southern two rocks (Table WV-930.1).

Gulls have also used all rocks for nesting (Table WV-930.2), but oystercatcher and guillemot nests have been found only on Great Race Rock, except in 1987, when Vermeer et al.[239] reported oystercatcher nests on two unspecified rocks. A few oystercatchers and guillemots have been sighted around other rocks, and undiscovered nests may have been present.

Remarks: Gull eggs have been traditionally harvested by First Nations people.[250] Odlum remarked that the lightkeeper that preceded him disliked the odour of seabirds and broke eggs to discourage nesting.[77] Lightkeepers in 1974 had similar sentiments and followed the same practice. In 1959, Odlum attributed the increase in cormorant numbers to his policy of non-interference. The construction of the lighthouse undoubtedly usurped nesting habitat. A cement helicopter pad built in 1978 destroyed gull nesting habitat. Dogs have been frequent pets of lightkeepers, though there have been no reports of them disturbing nesting seabirds.

Observers in 1974 noted a very cold and stormy spring, which they felt had delayed egg-laying in gulls, and may have contributed, along with disturbance, to the absence of cormorants on Great Race Rock. Lighthouse keepers in 1980 reported that river otters were becoming a problem on the island, but no additional information was recorded (Figure 580).

Figure 580. In addition to human perturbations, natural events also may impact seabirds breeding on Race Rocks. For example, the changing residency patterns and increasing numbers of sea lions and elephant seals using Race Rocks may impact nesting oystercatchers and gulls. Increasing numbers of these marine mammals require more haul out space and may usurp nesting habitat formerly used by nesting seabirds. In addition, trampling of seabird nests and young by mammals, especially when disturbed, is a concern. *Photo by R. Wayne Campbell.*

Munro banded 36 Glaucous-winged Gull chicks on North Race Rock in 1924.[149] Ongoing research and educational programs have been conducted at Race Rocks mainly by staff and students from Pearson College UWC since 1974. Educational visits by elementary and high school students were common but have been discouraged to reduce disturbance and have been replaced by low-impact web-casting.[152]

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.[188] Here we have tried to acknowledge those who participated specifically in seabird surveys or have just contributed incidental breeding records for seabirds along the BC outer coast in the years subsequent to Drent (Figure 581) and Guiguet's 1961 seabird catalogue,[77] up to 1990. We thank all those who shared the experience with us and have listed them below by region.

Figure 581. The first BC seabird catalogue was completed and published by Rudi Drent in 1961.[77] Much of the data in that early catalogue were gathered by Drent through requests for information and correspondence with numerous people. Contributors were acknowledged by Drent and, although we summarize all historical data presented by Drent, we have not duplicated his list of acknowledgements here. As we described in our tribute to Drent at the beginning of the second volume of this present treatise,[189] soon after the first catalogue was published in 1961, Drent began collecting information for an updated book. However, although Drent's research was well established, his community outreach programs were popular, and he was elevated to Associate Professor at UBC, he decided to permanently return to the University of Groningen in 1972, as a Professor, mainly studying Arctic geese. This left Drent's vision of an updated BC seabird catalogue in limbo, but not for long. Wayne Campbell had been inspired by Drent and carried on collecting information and subsequently conducting the first comprehensive surveys of nesting seabirds in BC in the mid-1970s.[32, 34] Seabird data gathered by Campbell was incorporated into the mammoth *The Birds of BC* project,[39, 40] but Campbell always kept his sights on an updated seabird catalogue and maintained individual data files for every documented seabird colony in BC. During the 1970s surveys, Michael Rodway was in turn inspired by Campbell, and, by the early 1980s, had adopted the vision and motivation for an updated seabird catalogue. Forty years later, Rodway, Campbell, and Moira Lemon, who co-led the CWS seabird surveys with Rodway in the 1980s, are finally bringing Drent's vision to fruition. *Photo by R. Wayne Campbell, Lucy Island, BC, 7 July 1970.*

Northern Mainland Coast: Mauricio Alvarez, T.M. Anderson, Douglas F. Bertram (Figure 582), R. Wayne Campbell, Richard J. Cannings, Brian Carter, Harry Carter Sr., Harry R. Carter (Figure 583), Rosalind Chaundy, D.I. Comfort, Rudolph (Rudi) H. Drent, Bob Emory, Michael Force, Ed Good, Dick Grinnell (see Figure 582), Matthew Grinnell (see Figure 582), Susan Guiguet (see Figure 583), G.S. Hackman, F. Gordon Hart, Heather Hay, Bill Hays, Norman Holmes, Gary W. Kaiser (Figure 584), Martin C. Lee, Moira J.F. Lemon, Ian McGregor, Marilyn A. Paul (Figure 585), David Powell (see Figure 582), Donald Richards, Kathy Richards, Christine M. Rodway, Michael S. Rodway (see Figure 585), and Keith G. Taylor (see Figure 585).

Figure 582. Some of the CWS crew that helped conduct surveys along the northern mainland coast were veterans of previous CWS seabird colony surveys in Haida Gwaii. Seen here in Haida Gwaii are (clockwise from top left): Doug Bertram investigating an Ancient Murrelet burrow on Hippa Island; Dave Powell enjoying the comforts of a mossy log on Hippa Island; and Dick Grinnell perched on a rocky pinnacle on Kunghit Island. Dick's son Matthew Grinnell joined the team during CWS surveys along the northern mainland coast and is shown here holding a Cassin's Auklet chick on Byers Island. *Photos by Moira J.F. Lemon.*

Figure 583. Harry Carter (left) and Susan Guiguet aboard the MV *Tedmac*. Skippering the boat on the BCPM coastal seabird survey was a great challenge; it required constant awareness of environmental conditions, studying marine charts to find safe passage ways, keeping a watch for other boat traffic and floating debris, and searching for safe anchorage sites. *Photo by R. Wayne Campbell, 5 July 1977.*

Figure 584. Gary W. Kaiser was responsible for administering the CWS seabird colony inventory program on the BC outer coast in the 1980s and participated in some surveys, especially on the west coast of Vancouver Island. *Photo by R. Wayne Campbell, Victoria, BC, 21 August 2000.*

Figure 585. Remote offshore islands are a beachcomber's paradise where one can find treasures from as far away as Japan. In this photo, large buoys, plastic floats, and glass fishing balls that have been cast ashore by tides and wind are examined on McKenney Islands by, from left to right, Keith Taylor, Marilyn A. Paul, and Michael S. Rodway. *Photo by R. Wayne Campbell, 25 June 1976.*

Figure 586. CWS crew members that helped with surveys on Pine Island in Queen Charlotte Strait included (from left to right): Brian Carter, here holding a Rhinoceros Auklet chick on Pine Island; Don Garnier, shown here inspecting burrows in the abandoned Cassin's Auklet colony on Saunders Island in Haida Gwaii; and Damian Power, here in the Rhinoceros Auklet colony on Pine Island. *Photos by Moira J.F. Lemon.*

Queen Charlotte Strait and Johnstone Strait: Allister Bell, Douglas F. Bertram, Mike Biro, R. Wayne Campbell, Brian Carter (Figure 586), Harry R. Carter, Rosalind Chaundy, Gregory Dawe, Nel Drent, Rudolph (Rudi) H. Drent, Douglas P. Fraser, Gwen Fraser, Lisa Fraser, Donald Garnier (see Figure 586), Patty Haist, Moira J.F. Lemon, Marilyn A. Paul, David Powell, Damian Power (see Figure 586), Christine M. Rodway, Joy Ann Rodway, Michael S. Rodway (Figure 587), Wilf Schofield (Figure 588), Teresa Shepard (Figure 589), Douglas Swanston, Keith G. Taylor, and Thomas Widdowson.

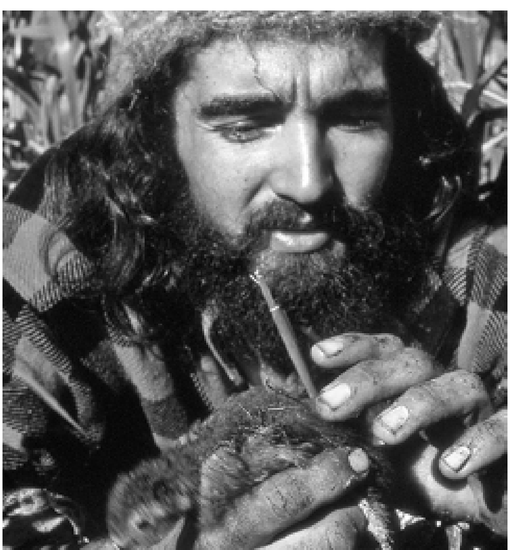


Figure 587. Michael Rodway with a Cassin's Auklet chick extracted from a burrow on Tree Islets. *Photo by R. Wayne Campbell, 12 June 1976.*

Figure 588. Wilf Schofield, a botanist from UBC, collecting plants from Wells Rocks in 1970. He kept incidental records of birds and mammals during a trip, organized by Rudi Drent, exploring offshore islands. *Photo by R. Wayne Campbell, 1 July 1970.*

Figure 589. Teresa Shepard holding an adult Cassin's Auklet extracted from a burrow in the Buckle Group. *Photo by R. Wayne Campbell, 16 July 1978.*

<u>Scott Islands:</u> Robin Best (Figure 590), Ray R. Billings, Daniel S. Bingham, Robert W. Butler (Figure 591), R. Wayne Campbell, Brian Carter (Figure 592), Rosalind Chaundy, Leo Cullen, Willy Egeland, Dick Grinnell (see Figure 592), David Hancock, Lyn Hancock, Ian Jones (Figure 593), Moira J.F. Lemon (Figure 594), David A. Manuwal, Joy Ann Rodway, Michael S. Rodway (Figure 595), David J. Spalding, Gail Summers, Kenneth R. Summers, Anne Vallée, Allison Watt, Kees Vermeer, Lotus Vermeer, and Robert Wright.

Figure 590. In the 1960s, a group of young enthusiasts from the Greater Vancouver area participated in conservation projects, which included gathering information on seabird colonies. These adventurous individuals visited seabird colonies along the entire coast and included, from left to right, Norm Clarkson (Langara Island), George P. Sirk (Thornton Island, Cleland Island, Mitlenatch and other islands in the Salish Sea), Robin Best (Triangle Island), and Ken Kennedy (Cleland Island, Christie Island, Mitlenatch Island, and Pam Rocks). *Photo by R. Wayne Campbell, Vancouver, BC, April 1956.*

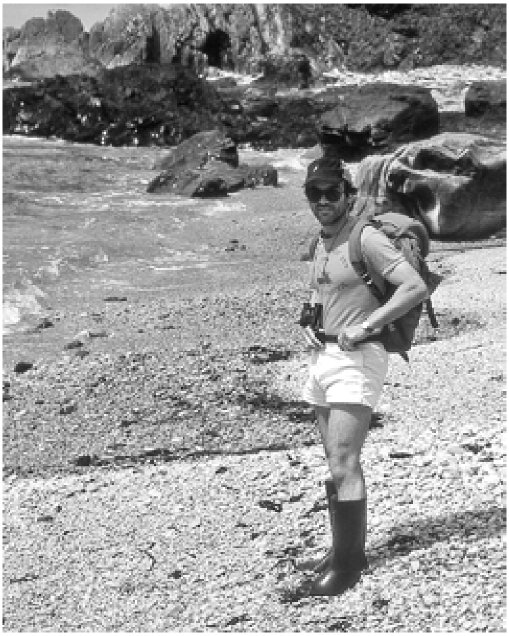


Figure 591. Former CWS scientist Robert W. Butler, seen here on Triangle Island in 1984, has had a life-long interest in breeding seabirds. *Photo by Michael S. Rodway, 18 July 1984.*

Figure 592. Dick Grinnell (left) and Brian Carter checking for seabird burrows on Triangle Island in 1989. *Photo by Michael S. Rodway, August 1989.*

Figure 593. Ian Jones conducted graduate studies on Ancient Murrelets in Haida Gwaii in 1984 and 1985 and also assisted with CWS surveys on Triangle Island in 1984. He subsequently became the first scientific director of the Triangle Island Research Station established in 1994 by the Centre for Wildlife Ecology. *Photo by Michael S. Rodway, 18 July 1984.*

Figure 594. Moira Lemon with (front to back) Heidi Regehr and Jasmine Freed at low tide in the south bay of Triangle Island in 2009. *Photo by Michael S. Rodway, 22 July 2009.*

Figure 595. Michael S. Rodway outfitted in full raingear on Puffin Rock on Triangle Island in 1982. *Photo by Moira J.F. Lemon, July 1982.*

West Coast of Vancouver Island: Bob Baker (see Figure 597), John T. Ballard, Desmond E.J. Belton (Figure 596), Dennis Belton, Douglas F. Bertram, James Biggar, John Blades, Stephanie Blades, Frank Buffam, Alan E. Burger, Bruce Butler, Barb Campbell, Barry Campbell, Eileen C. Campbell, R. Wayne Campbell, Trudy A. Chatwin, Brian Carter, Harry Carter Sr., Harry R. Carter, John R. Cassie, William (Bill) Chudyk, Marie-Aude Coleman, G.E. Corley-Smith, M. Elizabeth Courtnall, Scott Crawford, James T. Cuthbert, Laurel Dick, Adrian Dorst, David Duncan, Michael Easton, Barry Edwards, Peter Ewins, Michael Force, Bruce S. Ford, J. Bristol Foster, Eric Foster, Victor Foster, D. Lorne Frost, Donald Garnier, Chris George, Richard E. Gibbs, Janine Goodall, Wynne Gorman, Craig Greenwood, Lauri Greenwood, Sarah Groves, Charles J. Guiguet, Susan Guiguet, Earl Hartwick, David F. Hatler (Figure 597), Marietta Hatler, David M. Hawes, Myrnal A.L. Hawes, George Hillier, Keith Hobson, Norman Holmes, Jim Hudnal, Kerry R. and Lynn Joy (Figure 598), Gary W. Kaiser, Ken Kennedy (see Figure 590), Martin C. Lee, Ewald Lemke, Moira J.F. Lemon, Eric C. Lofroth, John MacDonald, N.T. MacDonald, Donald Maxwell, Lorne D. McIntosh, William E. McIntyre, Michael C.E. McNall, William J. Merilees, Alex Mills, Ken H. Morgan, Henry Nolan (Figure 599), Phil R. Nott, Emily Oguss, Marilyn A. Paul, Betty-Lou Peers, Eleanor Perkins, David Powell, Margaret Purdy, Jeff Reeve, Al Reimer, Laszlo I. Retfalvi, Richard A. Ring, Robert Risebrough, Syd Roberts, Ian Robertson (see Figure 597), Michael S. Rodway, W. Jack Schick, Spencer G. Sealy, Gary Seedhouse, Michael G. Shepard, Christopher D. Shepard, George P. Sirk (see Figure 590), Ian D. Smith, Andy Snyder, David Stirling, Kenneth R. Summers, Bob Switzer, Terry W. Thormin, William Verbrugge, Anita Vincente, John G. Ward (see Figure 597), Ken White, Andrew Whittaker, Thomas Widdowson, Rory Wilson, Pam and David Woolgar (see Figure 598), and Ian Yule.

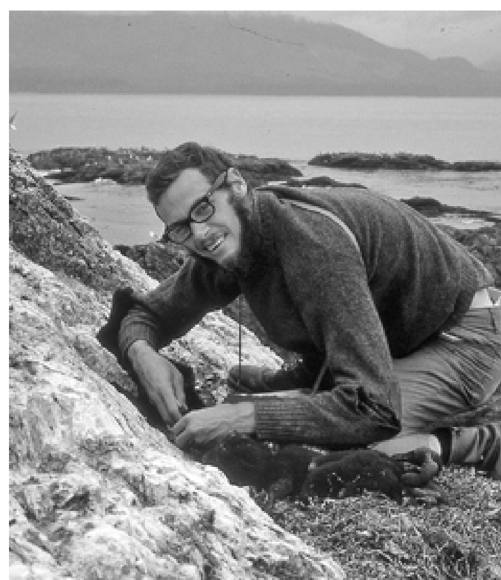


Figure 596. Des Belton banding nestling Brandt's Cormorants on Sea Lion Rocks in 1970. *Photo by R. Wayne Campbell, 25 August 1970.*

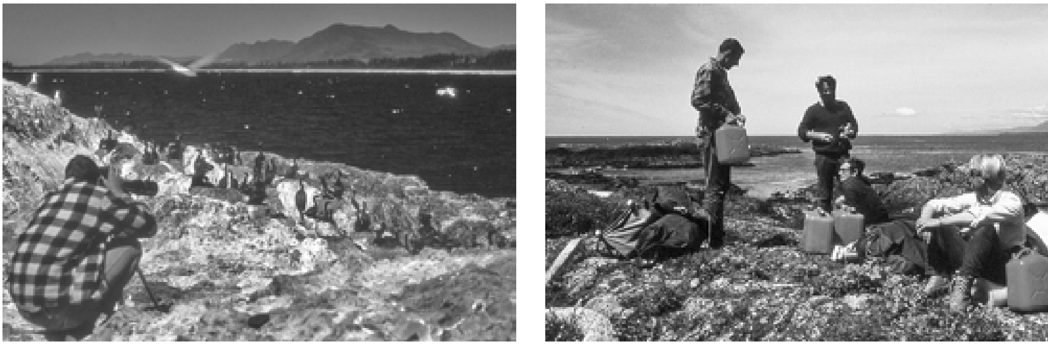


Figure 597. While completing his Ph.D. on American Mink in the marine environment, David F. Hatler surveyed seabird colonies on the central coast of Vancouver Island in the mid-1960s and early 1970s. He submitted an unpublished report to CWS that was later condensed into a BCPM publication.[107] In these photos, Dave is photographing nesting Brandt's Cormorants on Sea Lion Rocks on 27 July 1969 (left) and visiting Cleland Island with friends on 19 May 1970. Right photo shows (from left to right): Dave Hatler, Ian Robertson, John G. Ward, and Bob Baker. *Photos by R. Wayne Campbell.*

Figure 598. Incidental observations of nesting seabirds, mainly on Cleland Island, were made in the 1960s by (left to right): Pam Woolgar, David Woolgar, Kerry Joy, and Lynn Joy. *Photo by R. Wayne Campbell, Wickaninnish Park, BC, August 1967.*

Figure 599. We often underestimate the value of contributions made by volunteers to conservation projects. In this photo, volunteer Henry Nolan is banding Glaucous-winged Gull chicks on Sea Lion Rocks. *Photo by R. Wayne Campbell, August 1967.*

Since 1990, many people have contributed to our knowledge of seabird breeding populations. When known, those people are acknowledged in Appendix 1. We have added some historical and recent records submitted by contributors to eBird,[266] however, the names of contributors are no longer included in the eBird database and so these people in most cases remain anonymous. Breeding records were also extracted from Birds Canada NatureCounts dataset for colonial birds, [284] but again contributors were not named in the database. We thank them all and apologize for any other observers we may have omitted.

Production of this updated seabird catalogue would not have been possible without the long-term efforts of Wayne Campbell and his wife Eileen, who, for decades, have maintained individual seabird colony inventory files, which were developed by Wayne Campbell as a component of the BC Nest Record Scheme. The BC Nest Record Scheme (Figure 600) was established in 1955 [350] and has been maintained by Wayne and Eileen Campbell since 1972. All data collected by Drent and Guiguet [77] and all records collected by Wayne Campbell, including

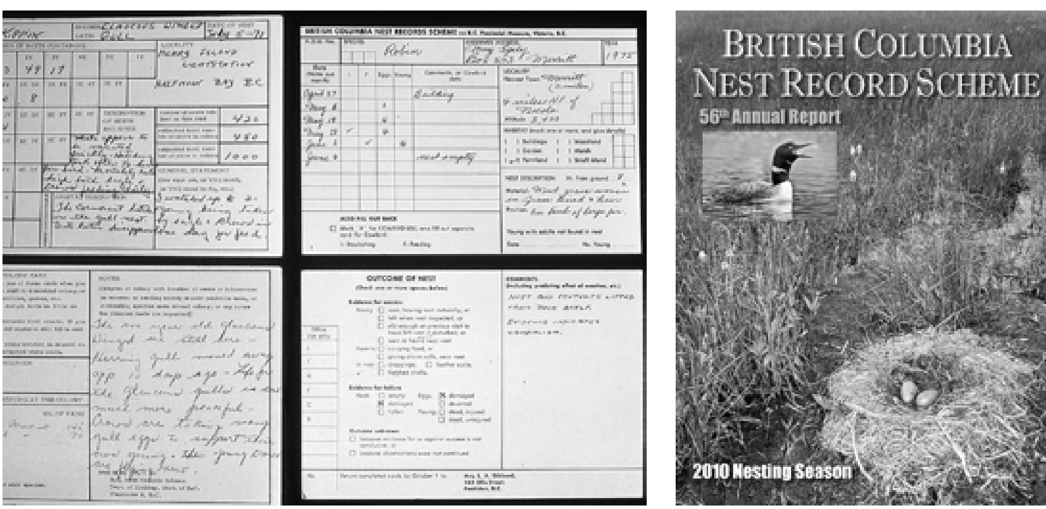


Figure 600. The British Columbia Nest Record Scheme is the oldest volunteer program collecting information on BC avifauna and has been operating successfully for the past 68 years. It houses close to one million breeding records (left) for 315 species. Annual reports (right) are sent to contributors. The seabird colony inventory files that were developed by Wayne Campbell as a component of the BC Nest Record Scheme were an invaluable resource in the production of this updated seabird catalogue. *Photos by R. Wayne Campbell.*

all data gathered during the BCPM seabird surveys along the BC outer coast, were transferred to the seabird colony inventory files. Data for outer coast colonies from other sources, including international literature, North American museum collections, and historical field notes were also compiled and entered into the inventory files. Much of that historical data would have been lost if not for the sustained efforts to compile and preserve those data by the Campbells and many others who assisted them over the years. We are grateful to all those who helped with that data compilation. Our main sources of data from the CWS surveys of the 1980s were the CWS seabird colony inventory reports authored by Michael Rodway and Moira Lemon (Figure 601).[176, 181, 182, 183, 194]

Figure 601. Moira Lemon taking notes during surveys of permanent monitoring plots on Triangle Island in 2009. Heidi Regehr is visible in the background. *Photo by Michael S. Rodway, 2 August 2009.*

Initial inventories of colonial nesting seabirds in BC were sponsored and financed by a small group of dedicated aficionados. When Rudi Drent returned to UBC in 1967 as an Assistant Professor, he used his research grant for student expenses and personally paid for other expenses involved in conducting seabird colony surveys along the BC outer coast. When Wayne Campbell arrived at the BCPM in early 1973, the position was not funded. Nevertheless, Campbell organized and directed a survey of the entire coast for nesting seabirds between 1974 and 1979 as part of *The Birds of BC* project.[39, 40] He also coordinated the compilation of seabird nesting records by many volunteers and paid employees of the BCPM (Figure 602). Initial financial support came from the BC Wildlife Branch (Victoria) and a two-year provincial summer student program. Some support money came with the student program. Over the years others supported the BCPM surveys, including: Dr. Harry Carter Sr., who personally purchased a modified fish boat, the MV *Ted Mac*, to serve as a mothership, helped with gasoline and grocery expenses, and bravely skippered the *Ted Mac* through remote waters along the west coast of Vancouver Island and the northern mainland coast during the surveys; BC Ecological Reserves (Victoria); BC Parks Branch (Victoria); Canadian Wildlife Service (Edmonton); Parks Canada (Ottawa); William Verbrugge, who helped with expenses for food, gas, and boat rental; and Ernie and Erica Bach (Figure 603), who supplied a 14 foot dinghy used by Campbell to visit Cleland Island many times.

Figure 602. Michael G. Shepard, a BCPM technician, sorting index cards, some of which were transferred to the master seabird colony files. *Photo by R. Wayne Campbell, Victoria, BC, circa mid-1970s.*

Figure 603. Erica (left) and Ernie Bach aboard the *Chica* towing the aluminum boat used by Wayne Campbell for Cleland Island explorations. *Photo by R. Wayne Campbell, off Long Beach, BC, 27 August 1970.*

Seabird surveys and research funded by CWS were begun by Kees Vermeer on the Scott Islands in 1975-1978. Michael S. Rodway (contractor) and Moira J.F. Lemon (CWS) led the comprehensive CWS inventory program and designed and established the permanent monitoring scheme during the 1980s under the supervision of first Kees Vermeer and then Gary Kaiser. Many students, volunteers, and other colleagues (listed above) assisted with those programs. Ken Morgan (CWS) was largely responsible for conducting surveys of surface-nesting species at colonies along the west coast of Vancouver Island in 1989 as part of Vermeer's continuing research projects. 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, Jean-Pierre Savard, and Steve Wetmore at CWS for making helpful comments at various early stages in the preparation of the document. We especially thank Heidi Regehr (Figure 604) for reviewing the entire manuscript and for her superb editorial skills throughout the production of the final document. Heidi also contributed two delightful anecdotes for this volume. Dennis A. Demarchi and Patricia Huet reviewed the final submission and we thank them for their knowledgeable comments and recommendations that improved the manuscript.

Figure 604. Heidi Regehr has been a constant source of help throughout the production of this work. The quality of the presentation was greatly improved by her careful review of the entire manuscript. She is shown here during her Master's thesis research on Black-legged Kittiwakes conducted on Great Island, Newfoundland in 1992-1993. *Photo by Michael S. Rodway, July 1993.*

We are very grateful to Laurie Wilson (Figure 605) for providing unpublished data from recent CWS permanent plot and colony surveys and for procuring CWS funding to support the publication of this volume. Thanks to Ken Morgan for helping to interpret data from his surveys along the west coast of Vancouver Island in 1989.[84, 236, 238] Yuri Zharikov kindly provided data on recent surveys of nesting seabirds at colonies in Pacific Rim National Park Reserve. Thanks to Mark Hipfner for providing details of his observations of Northern Fulmars on Triangle Island. Team eBird provided access to eBird data. We also thank the BC Breeding Bird Atlas for supplying data, and specifically thank the following partners: Birds Canada, Canadian Wildlife Service, British Columbia Ministry of Environment, BC Nature, BC Field Ornithologists, Biodiversity Centre for Wildlife Studies, Louisiana Pacific, and the Pacific Wildlife Foundation, as well as all of the volunteer participants who gathered data for the project. We are grateful to Catherine Jardine at Birds Canada for approving and helping with access to the NatureCounts colonial bird dataset.

Many thanks again to wildlife and landscape artist Mark Hobson (Coastline Art Inc.; art@markhobson.com), who enthusiastically donated images of his inspiring coastal artwork that appear in the coloured inserts at the front of this volume. The colour plate here (Figure 606) shows Mark at work, additional images of his paintings, and his gallery in Tofino. We also thank Rino del Zoppo, Gallery Manager and Assistant to Artist Mark Hobson, for his help in providing high-quality images of Mark's paintings and photos of Mark's gallery. We are also very grateful to Rob Butler (Figure 607) who contributed delightful drawings that he created specifically for this volume. Those drawings are displayed in Figure 51 on pages 54-55 and are also inserted to complement the layout at various places throughout the text. Rob also shared with us some of his lovely watercolour paintings that capture the magic of places like Triangle Island on the BC outer coast (Figure 608). Dave Hatler kindly contributed an intriguing anecdote about coastal mink.

Most photographs are by the authors. Eileen Campbell eased 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. Some wonderful photographs were contributed by Paula Courteau, Adrian Dorst, Heidi Regehr, Ervio Sian, and Alan D. Wilson. We thank them and all other

Figure 605. CWS seabird biologist Laurie Wilson, shown here surveying permanent plots on the northwest corner of Triangle Island in 2014, has been a constant supporter of this four-volume treatise on seabird colonies in BC. She has contributed unpublished data from recent CWS surveys, procured funding to help defray publication costs, and has spent long hours in consultation with authors Michael Rodway and Moira Lemon to ensure that data presented in these volumes and in CWS databases are consistent. *Photo by Michael S. Rodway, 23 July 2014.*

Figure 606. An essential stop when visiting Tofino is the gallery of local artist Mark Hobson, managed by Rino del Zoppo. The following colour plate illustrates: on the front plate, Mark painting (top left; *Photo by Chris Pouget*); two of Mark's wonderful paintings, "Tide-pool Turbulence" (top right) and "Swimming into the Current" *courtesy Mark Hobson, Coastline Art Inc.*; and on the rear plate, Mark's gallery in Tofino *(Photos by Rino del Zoppo, 2019).*




MARK HOBSON
GALLERY

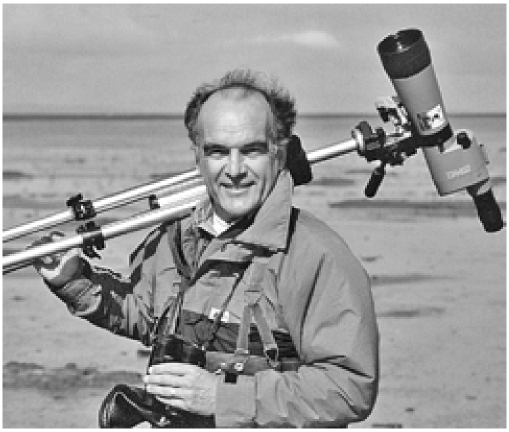


Figure 607. Rob Butler generously created delightful pen and ink drawings of each seabird species breeding along the outer coast of BC specifically for use in this volume. Rob has been a dedicated wildlife conservationist as well as a gifted artist throughout his life. He is shown here carrying his spotting scope during a survey of migrating shorebirds on Sidney Island in the Salish Sea. *Photo by Moira J.F. Lemon, May 1999.*

contributors. All photographers are acknowledged in photo captions. We are also grateful for the care taken by Kate Seymour and Carley Clifford in the photo department at London Drugs in Saanich while they were processing hundreds of Wayne's photographs from black-and-white negatives to use for this volume.

Many thanks to Bianca Message, of André & Associates Interpretation and Design Ltd. and André Family Archives, in Victoria, BC, for contributing information for the anecdote about her father's work at the BCPM and for providing photographs of parts of the *Living Land, Living Sea* diorama at the museum. Her father, the late Jean Jacques André, was head of the display division at the BCPM from 1968 to 1982. We also thank Brent Cooke, Phil Lambert, and Jan Vriesen for sharing their memories of Jean Jacques André with Bianca and to Richard Gibbs for providing memories of his harrowing collecting expedition to Triangle Island in 1974.

We are much indebted to Mark Nyhof for his skill and dedication in laying out the manuscript and preparing it for publication. The high quality appearance of the final product is a result of 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, through the patient efforts of Dan Horth and Diana Brizan. We again thank Christopher McNeill for his assistance with technical difficulties that we encountered on several occasions during the production of this work.

Publication of the seabird colony catalogue in *Wildlife Afield* was supported by the Ron Jakimchuk Wildlife Heritage Foundation, administered by the Victoria Foundation, funding from Canadian Wildlife Service, Environment and Climate Change Canada, procured by Laurie Wilson, and personal contributions from Peter Blokker, Eileen Campbell, Cyril Colonel, Dennis Demarchi, Brian Finnie, Bryan Gates, Phil Henderson, Ted Hillary, Doug Leighton, Fred McMechan, Wayne Nelson, Sylvia and Keith Pincott, Robert Puls, Andrew Reynolds, Chris Siddle, Jim Sims, Tom Stevens, Mary Taitt, Howard Telosky, and John and Mary Theberge.

Brightening Up Your Day

The dark days of winter are a time for compiling all the data that have been collected during seabird surveys the previous summer. Notebooks have to be gone through, data from transect and permanent plot record forms have to be tabulated and analyzed, and reports have to be written. It is a laborious job that can take as much or more time than was spent collecting the data during the seabird breeding season. The job is made easier by the many reminders of the previous summer's adventures that you encounter as you go through the summer's notes. A description of one of the islands surveyed or a note about something seen but forgotten can bring back the excitement of the field season. One of the nicest surprises that brighten up a dark winter day is encountering little sketches that the artists in your crew have doodled in their notebooks or on the data sheets. On Triangle Island in 1984, we had the pleasure of having two artists with us, Rob Butler and Ian Jones. Here is a sample of the little sketches they left behind on the data forms that were always a delight to find and, although likely unanticipated by them, brightened the darkest of our winter days (Figure 609).

Figure 608. Rob Butler has captured the magic of being on seabird colonies and other islands on the BC outer coast in his lovely watercolour paintings, which he has generously shared with us. These paintings are from his time with us on Triangle Island in 1984, except for the one painting (top left) of McInnes Island on the northern mainland coast done in 1994.

Figure 609. Delightful doodles by Ian Jones (slug, birds, and glass ball) and Rob Butler on Triangle Island data sheets, 1984.

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Figure 609. Immature and non-breeding Black-legged Kittiwakes are commonly seen around outer coastal islands in BC from late April through September. Size of foraging and roosting flocks vary greatly. *Photo by R. Wayne Campbell.*

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Figure 610. Frank Beebe, a falconer, published a well-referenced work on marine peregrines in BC which was a main source of information used for our publication on tree-nesting Peregrine Falcons found during seabird surveys in the Byers and Whitmore islands in 1976.[42] *Photograph courtesy Alice Kimoff, Victoria, BC.*

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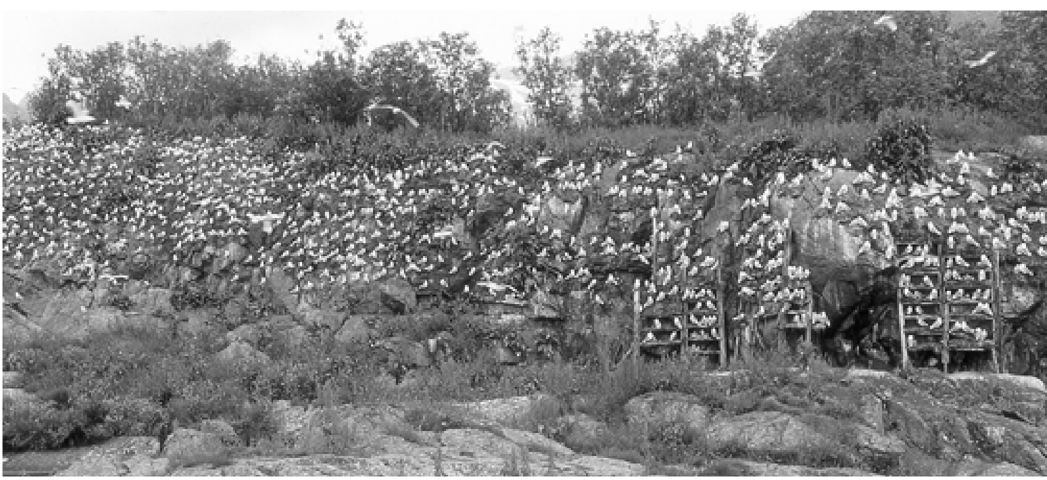

Figure 611. Black-legged Kittiwake is listed as Vulnerable on the IUCN Red List of Threatened Species due to major declines in world populations that have occurred since the 1980s, likely related to changes in the availability of prey species and increased adult mortality due to climate change, over-fishing, and oil pollution. In Scotland, ladders have been installed against the cliffs to provide additional nesting habitat. *Photo by R. Wayne Campbell.*

Figure 612. In 1920 and 1921, Allan Brooks and his friend Charles de Blois Green visited the area around the north end of Porcher Island, located 24 km (14.9 mi) southwest of Prince Rupert. They recorded over 50 species of birds, including five seabird species. Black Oystercatchers, Glaucous-winged Gulls (photo), and Pigeon Guillemots were found nesting around Porcher Island, and Rhinoceros Auklets were found nesting on outer islands nearby. Hoping to find Marbled Murrelet nests, they searched any burrows they encountered, one of which was 12 feet deep! *Photo by R. Wayne Campbell.*

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Figure 613. Northwestern Crows are widely distributed along the BC outer coast. They are common near human habitation and are frequently seen around lighthouses on seabird colony islands, where they have been observed scavenging Rhinoceros Auklets that have been killed by flying into lighthouse structures. *Photo by R. Wayne Campbell.*

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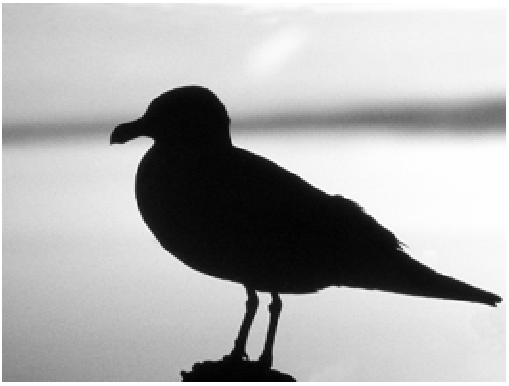

Figure 614. Cleland Island was proposed as a federal Migratory Bird Sanctuary by Munro in 1925,[150] but it did not receive protected status until 1971, when it became the first designated Ecological Reserve in BC. *Photo by R. Wayne Campbell, 29 June 1970.*

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Figure 615. Since the first two volumes of *The Birds of British Columbia* were published in 1990, there has been escalating concern for the health of marine environments and the status of breeding seabirds in BC and globally. Numerous non-profit conservation and environmental groups have been established and much research has been conducted on the consequences for seabird populations of ever-increasing human impacts from fisheries, oil and toxic chemical spills, plastic pollution, eco-tourism, and climate change.[351] *Photo by R. Wayne Campbell, Great Chain Island, BC, July 1978.*

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Figure 616. From 3 to 11 August 1955, G. Clifford Carl (Director of the BCPM) and Charles J. Guiguet (Curator, Birds and Mammals Division of the BCPM) explored three islands in the Bunsby group. Their main focus was collecting small mammals, although all observations of animals were recorded. This photo shows Gay Passage from their camp on East Bunsby Island. *Photo by G. Clifford Carl.*

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Figure 617. Obtaining accurate counts of Common Murres at breeding colonies can be problematic, especially at large colonies that can be dangerous to access or virtually impossible to explore completely. *Photo by R. Wayne Campbell.*

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Figure 618. Trudy Chatwin (née Carson) enthusiastically participated in the BCPM seabird surveys of the 1970s and passed her knowledge and experience on to Moira Lemon during the CWS research on Frederick Island in 1980. She is seen here, back at camp and looking rather muddy, but beaming, after a wet day surveying the Cassin's Auklet nesting colony on Frederick Island. *Photo by Moira J.F. Lemon, 16 July 1980.*

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Figure 619. Obtaining accurate counts of nesting seabirds can be difficult even for surface-nesting species like Glaucous-winged Gulls. The efficacy of a survey is affected by numerous factors, including weather, number and experience of surveyors, terrain, size of colony, nesting chronology, and locations of nests and young. In this photo, Robert Byers located a gull chick hiding in grasses. *Photo by R. Wayne Campbell.*

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Figure 620. Black Oystercatchers often feed on islands where they breed. However, on tiny Cleland Island, where approximately 50 pairs nest, it is likely difficult for all birds to find enough mussels, limpets, and barnacles to feed themselves and their chicks, and many forage elsewhere. Areas around Cleland Island that are used for foraging include: Plover Reef, Blunden Island, west coast of Vargas Island, and associated reefs and headlands. *Photo by R. Wayne Campbell.*

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Figure 621. CWS research scientist Mark Hipfner has made major contributions to our understanding of seabird breeding biology. He is seen here resurveying one of the CWS permanent monitoring plots in the Rhinoceros Auklet colony on SGaang Gwaii in Haida Gwaii. *Photo by Moira J.F. Lemon, 9 July 2006.*

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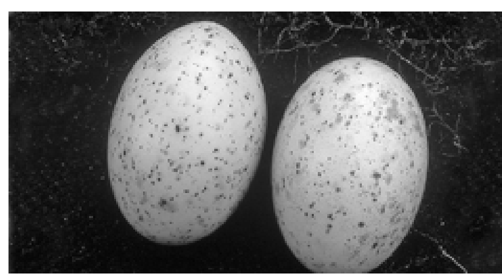

Figure 622. There are only two confirmed breeding records of Ancient Murrelets south of Haida Gwaii. In BC, Rudi Drent and Wayne Campbell found one pair nesting on the Moore Islands on the northern mainland coast in 1970. Further south, in Washington State, Ralph Hoffman collected a female and two nearly-hatched eggs from a burrow on Carroll Island in 1924. The eggs are pale buff to olive brown with faint brown speckling. *Photo by R. Wayne Campbell.*

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Figure 623. Vladimir J. Krajina was one of the "fathers of ecology" and labored for over 40 years to synthesize attributes of the climate, vegetation, and soils of British Columbia into what is generally referred to as the biogeoclimatic classification system. Plant associations are important components of such classification systems. In this photo, Marilyn Paul (now Lambert) is holding a bunch of common red paintbrush discovered on Conroy Island in 1976. This species is widespread in BC and has been recorded from 16 Biogeoclimatic Zones. During seabird surveys, red paintbrush was found mainly on islands with grassy slopes or moist meadows. *Photo by R. Wayne Campbell, 3 July 1976.*

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Figure 624. Black-legged Kittiwakes typically build their nests on cliff ledges but will also nest on buildings. In BC, they have been found breeding only on Holland Rock where they nest on the face of the concrete base of the old lighthouse as well as on natural rock faces. *Photo by Heidi M. Regehr, Great Island, NL, July 1992.*

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Figure 625. Michael Rodway completed his M.Sc thesis at Memorial University of Newfoundland studying the breeding success of Atlantic Puffins. *Photo by R. Wayne Campbell.*

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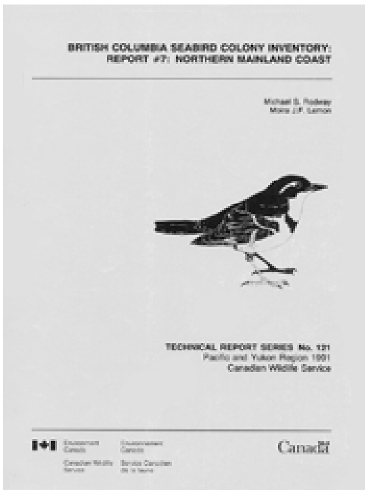

BRITISH COLUMBIA SEABIRD COLONY INVENTORY:
REPORT #7: NORTHERN MAINLAND COAST

Michael S. Rodway
Moira J.F. Lemon

TECHNICAL REPORT SERIES No. 121
Pacific and Yukon Region 1991
Canadian Wildlife Service

Canada

Figure 626. Results of CWS seabird surveys conducted in the 1980s in the four designated regions of the BC outer coast were compiled into four federal technical reports: Scott Islands (BC Seabird Colony Inventory Report #4), West Coast Vancouver Island (#5), Northern Mainland Coast (#7), and Queen Charlotte Strait and Johnstone Strait (#8). Those reports are available online.

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Figure 627. Who would have expected that pairing CWS government employee Moira Lemon with independent contractor Michael Rodway to conduct seabird surveys in 1982 would create an enduring team who have now worked together on seabirds in BC for 40 years. The duo is shown here in 2009 on Saxifrage Ridge on Triangle Island where they are resurveying permanent monitoring plots that they set up in the 1980s. *Photo by Heidi M. Regehr, 29 July 2009.*

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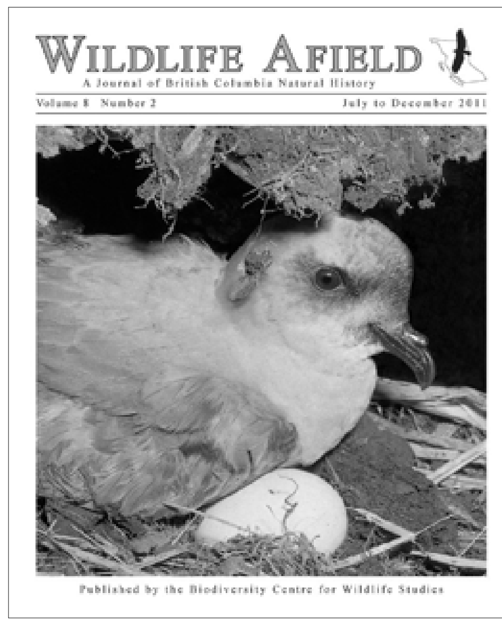

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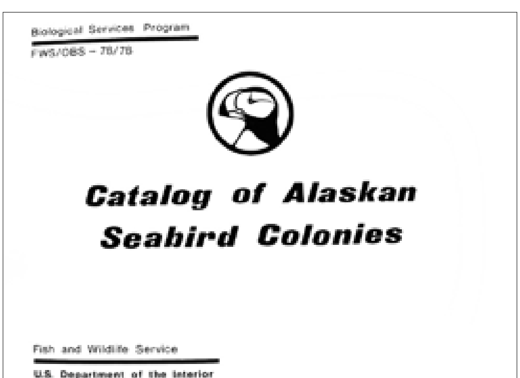

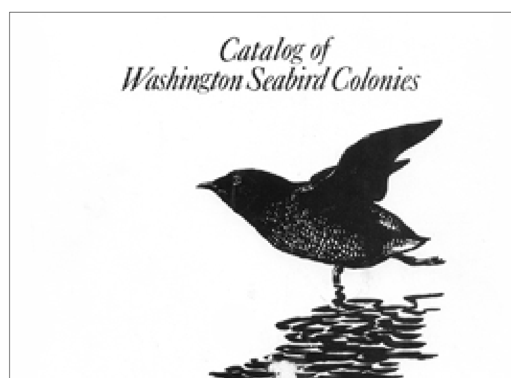

Figure 629. Seabird catalogues for Alaska (left) and Washington State that were compiled in the 1970s and 1980s were important reference documents during the preparation of this BC seabird catalogue. They provided information on two species from Alaska, Black-legged Kittiwake and Horned Puffin, which are now nesting in BC, and on Brandt's Cormorant that have expanded their range into BC from Washington colonies.

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Figure 630. Richard Thomson's 1981 book is an invaluable source of information on the physical oceanography of the BC coast. Thomson dedicated four chapters of his book to the dynamics of ocean waves. Wave-watching has become a frequent event off Tofino on the outer coast of Vancouver Island, especially during storms. *Photo by Adrian Dorst.*

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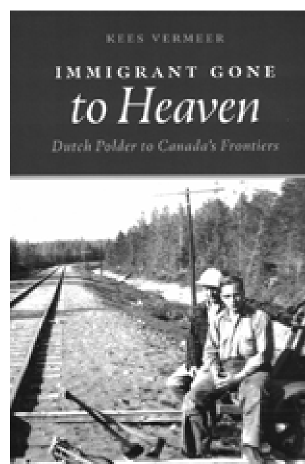

Figure 631. Kees Vermeer made tremendous contributions to our knowledge of nesting seabirds in BC during his tenure as a research scientist with CWS. He has recently (2021) published an autobiography, *Immigrant Gone to Heaven: Dutch Polder to Canada's Frontiers*, that includes a complete list of his published works.

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Figure 632. Between 1974 and 1983, Ulrich Wilson and David Manuwal compared the breeding biology of Rhinoceros Auklets (photo) at three colonies in Juan de Fuca Strait, northern Washington: two inner sites, Protection and Smith islands, and an outer site, Destruction Island. Chicks on the inner sites were fed heavier fish loads, reached heavier peak body weights, and were heavier when they fledged than chicks on the outer site. Breeding success at the inner sites was also higher. *Photo by R. Wayne Campbell, Cleland Island, BC, August 1974.*

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[257]J. Mark Hipfner, Science & Technology Branch, Environment and Climate Change Canada.
[258]Ken H. Morgan, Canadian Wildlife Service, Environment and Climate Change Canada.
[259]Michael S. Rodway, Wildwing Environmental Research.
[260]Ken R. Summers, KS Biological Services.
[261]Anne Vallée, University of British Columbia, deceased.
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Museum Specimens

[269]Canadian Museum of Nature (CMNAV):
- a – BLOY egg specimen No. E959.
- b – TUPU egg specimen No. E556. [Figure 633]

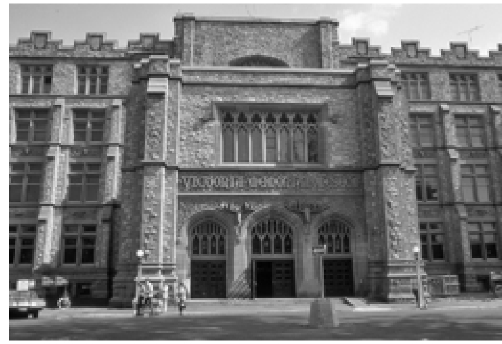


Figure 633. In the mid-1970s, Wayne Campbell visited every major natural history museum in North America to copy specimen records of birds for *The Birds of BC* project. All seabird egg specimen records were also copied to the master seabird colony inventory files and were used in compiling this seabird catalogue. Tufted Puffin egg specimen record No. E556 collected by Walter Raine in 1890 is from the natural history collections in the Canadian Museum of Nature (shown here) located in the Natural Heritage Campus in Gatineau, Quebec. Trips to museums were sponsored by "The Friends of the BCPM" (now RBCM) and a research grant from Dr. Ian McTaggart-Cowan at UBC. *Photo by R. Wayne Campbell, Victoria Memorial Museum Building, Ottawa, ON, June 1976.*

[270]Carnegie Museum of Natural History (CM):
- a – BLOY egg specimen No. E3119.
- b – PIGU egg specimen No. E1556.

[271]Cornell University Museum of Vertebrates (CUMV):
- a – BLOY bird specimen No. 1767.

[272]Humboldt State University (HSU):
- a – TBMU egg specimen No. 2871.

[273]James R. Slater Museum of Natural History (PSM):
- a – BLOY egg specimen No. 13798.

[274]Museum of Vertebrate Zoology at Berkley (MVZ):
- a – COMU egg specimen No. 4691.
- b – PIGU egg specimen No. 5809.

[275]National Museum of Natural History, Smithsonian Institution (USNM):
- a – COMU egg specimen No. B18721.
- b – BLOY egg specimen No. B34714.

[276]Penticton (R.N. Atkinson) Museum and Archives (P(RNA)MA):
a – GWGU egg specimen No. 12.
[277]Royal British Columbia Museum (RBCM; formerly British Columbia Provincial Museum):
a – GWGU egg specimens No. E1612, E1613, E1614, E1618, E1625.
b – PIGU egg specimens No. E1153, E1155, E1157.
c – BLOY egg specimens No. E1427, E1428.
d – GWGU egg specimen No. E0209.
e – PIGU egg specimen No. E1542.
f – PIGU egg specimen No. E2093.
g – RHAU egg specimen No. E1535.
h – RHAU egg specimen No. E0247.
i – ANMU egg specimens No. E242, E243.
j – TUPU egg specimen No. E1504.
k – COMU egg specimen No. E2079.
l – LSPE egg specimen No. E1470.
m – TUPU egg specimens No. E1502, E0250.
[278]Royal Ontario Museum (ROM):
a – GWGU egg specimen No. 503554.
b – BLOY egg specimen No. 502485.
c – GWGU egg specimen No. 503555.
d – FTSP egg specimen No. 500065.
e – GWGU egg specimens No. 503557-503559.
f – GWGU egg specimen No. 503561.
[279]Sam Noble Oklahoma Museum of Natural History (OMNH):
a – BLOY egg specimen No. E3531.
[280]University of British Columbia Beaty Biodiversity Museum (UBCBBM):
a – BLOY egg specimen No. B020535 and B020536.
b – BRCO egg specimen No. B020151.
c – TUPU egg specimen No. B020862.
d – LSPE egg specimen No. B020081.
e – GWGU egg specimens No. B020696, B020697, and B020704.
[281]University of Michigan Museum of Zoology (UMMZ):
a – TBMU egg specimen No. 191184.
b – PIGU egg specimen No. 191194.
[282]Western Foundation of Vertebrate Zoology (WFVZ):
a – GWGU egg specimen No. 39292.
b – BLOY egg specimens No. 76708, 100344.
c – WEGU egg specimens No. 157751.
[283]Yale Peabody Museum (YPM):
a – PIGU egg specimen No. 128986.

Last Minute Additions

Some information was obtained or inserted after the body of the manuscript, including all the superscript reference numbers, was already formatted for publication. We list those last-minute data sources here in the order they were inserted.

[284]British Columbia Breeding Bird Atlas. 2008. Data accessed from NatureCounts, a node of the Avian Knowledge Network, Birds Canada. Available: http://www.naturecounts.ca/. Accessed: 21 January 2021.
[285]British Columbia Ministry of Forests, Lands and Natural Resource Operations (BC MFLNRO). 2011. Bird Colonies - Coastal Resource Information Management System (CRIMS). Available at: http://catalogue.data.gov.bc.ca/dataset/bird-colonies-coastal-resource-information-management-system-crims. Accessed: April 2021. [Figure 634]
[286]Brooks, J. 2016. Proposed Aurora LNG project: marine bird technical data report. Prepared by Stantec Consulting for Aurora LNG, Calgary, AB.

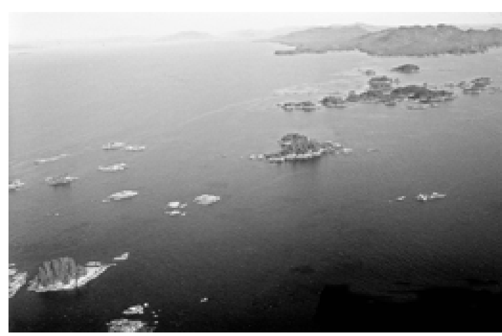


Figure 634. Aerial photo of the Tree Nob Group of islets, west of Prince Rupert, with forested Stephens Island at top of photo. Aerial photos showing large groups of islands are helpful for identifying, mapping, and assigning reference numbers to individual islets where seabirds nest. *Photo by Dennis A. Demarchi, 29 June 1982.*

[287]eBird. 2022. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: http://www.ebird.org. (Accessed: 20 September 2022).

[288]IOC. 2021. Taxonomic updates - IOC World Bird List (version 11.2, July 10, 2021). https://www.worldbirdnames.org/new/updates/taxonomy/.

[289]Olesiuk, P.F. 2018. Recent trends in Abundance of Steller Sea Lions (*Eumetopias jubatus*) in British Columbia. DFO Canadian Science Advisory Secretariat Research Document 2018/006. v + 67 pp.

[290]Willie, M and R. Tranmer. 2014. Pacific NorthWest LNG: technical data report – terrestrial wildlife and marine birds. Prepared by Stantec Consulting for Pacific NorthWest LNG Limited Partnership, Vancouver, BC. 121 pp.

[291]Hay, R.B. 1976. An environmental study of the Kitimat region with special reference to the Kitimat River estuary. Prepared for the Canadian Wildlife Service, Pacific and Yukon Region, Delta, B.C. 59 pp.

[292]Bell, L.M. and R.J. Kallman. 1976. The Kitimat River estuary status of environmental knowledge to 1976. Special Estuary Series No. 6. Report of the Estuary Working Group, Department of the Environment, Regional Board, Pacific Region, West Vancouver, BC. 296 pp. [Figure 635]

[293]d'Entremont, M. 2010. Enbridge Northern Gateway Project technical data report: marine birds. Jacques Whitford AXYS Ltd. Burnaby, BC. 132 pp.

[294]Barry, K.L. 2015. Glaucous-winged Gull. *In* Davidson, P.J.A., R.J. Cannings, A.R. Couturier, D. Lepage, and C.M. Di Corrado (eds.). The Atlas of the Breeding Birds of British Columbia, 2008-2012. Bird Studies Canada. Delta, B.C. http://www.birdatlas.bc.ca/accounts/speciesaccount.jsp?sp=GWGU&lang=en [15 Nov 2022]

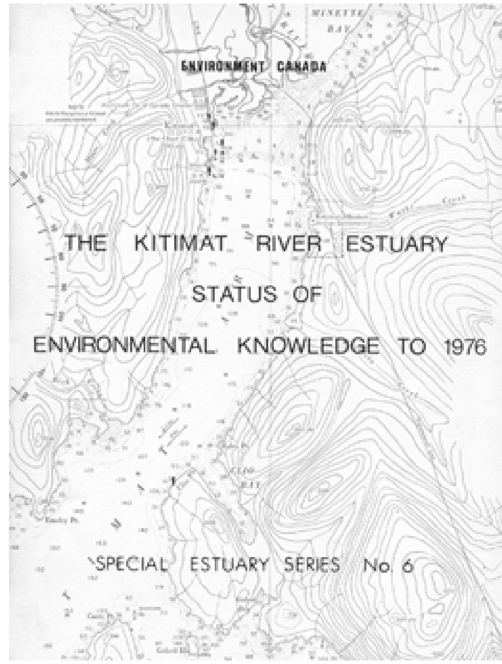


Figure 635. Small islands at the mouth of estuaries and along inside channels and fiords on the BC coast, such as Coste Rocks near Kitimat, may support small populations of nesting Pelagic Cormorants, Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots. Inside channels and fiords can also be important foraging areas for Marbled Murrelets.

[295]Hoffman, W., J.A. Wiens, and J.M. Scott. 1978. Hybridization between gulls (*Larus glaucescens* and *L. occidentalis*) in the Pacific Northwest. Auk 95:441-458.

[296]Martin, P.W. 1978. A winter inventory of the shoreline and marine oriented birds and mammals of Chatham Sound. Unpublished report, Canadian Wildlife Service, Delta, BC. 47 pp.

[297]Campbell, R.W. and K.R. Summers. 1997. Vertebrates of Brooks Peninsula. Pages 12.1-12.39 *in* R.J. Hebda and J.C.Haggarty (eds.). Brooks Peninsula: an ice age refugium on Vancouver Island. British Columbia Parks Branch Occasional Paper No. 5, Victoria, BC. [Figure 636]

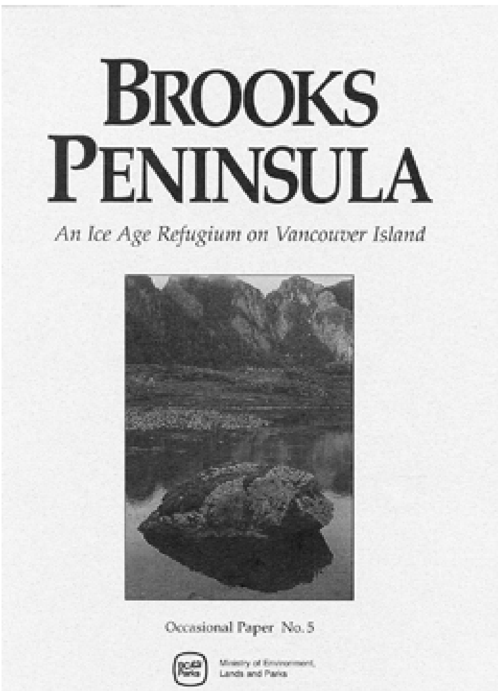


Figure 636. This article by Wayne Campbell and Ken Summers contains unpublished information on seabirds breeding and roosting on islands off the Brooks Peninsula, including Clerke Islet, other islands in Brooks Bay, Solander Island, and Quineex Reef.

[298]Dorst, A. 2018. The Birds of Vancouver Island's West Coast. On Point Press, an imprint of UBC Press, Vancouver, BC. 557 pp.

[299]Campbell, R.W., H.R. Carter, C.D. Shepard, and C.J. Guiget. 1979. A bibliography of British Columbia ornithology. British Columbia Provincial Museum Heritage Record No. 7, Victoria, BC. 185 pp.

[300]Campbell, R.W., T.D. Hooper, and N.K. Dawe. 1988. A bibliography of British Columbia Ornithology - Volume 2. Royal British Columbia Museum Heritage Record No. 19, Victoria, BC. 591 pp.

[301]Pearce T. 1968. Birds of the early explorers in the Northern Pacific. Published privately, Theed Pearse, Comox, B.C. 275 pp.

[302]Campbell, R.W. and D. Stirling. 1971. A photo duplicate file for British Columbia vertebrate records. Syesis 4:217-122. [Figure 637]

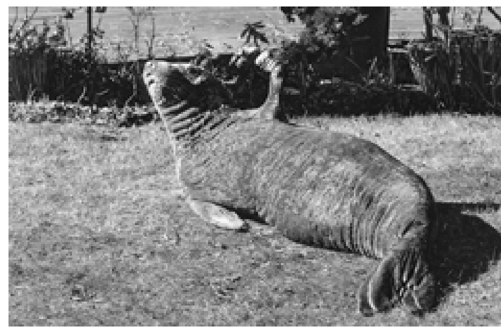


Figure 637. An important function of archiving identifiable photographs of rare vertebrates in BC is to help document historical changes in their distribution and abundance. In the past, Northern Elephant Seals were frequently seen in deep waters off the BC outer coast. In the late 1980s, the marine mammal was being reported regularly in nearshore areas of southern Vancouver Island, where it was seen hauling up on rocks, beaches, and urban lawns, and wallowing in ditches. It now breeds on Race Rocks. This photo documents a female hauled out on a residential back lawn in the upper reaches of Portage Inlet in Victoria in 2002. The seal stayed for 10 days, from 9 to 18 March. *Photo by Dennis A. Demarchi, March 2002.* BC Photo 2068.

[303]Buffam, F.V. 1965. Wickaninnish Beach - summer 1965. British Columbia Parks Branch Unpublished Report, Victoria, BC. 80 pp.

[304]Campbell, R.W. 1967. Summer naturalist report, Wickaninnish Provincial Park – 1967. British Columbia Ministry of Recreation and Conservation, Parks Branch, Unpublished Report, Victoria, BC. 163 pp.

[305]Campbell, R.W. 1968. Summer naturalist report, Wickaninnish Provincial Park – 1968. British Columbia Ministry of Recreation and Conservation, Parks Branch, Unpublished Report, Victoria, BC. 104 pp.

[306]Drent, R.H. and R.W. Campbell. 1979. Three weeks with marine birds; ecology and energetics. Bamfield Marine Station, Bamfield, BC. 99 pp.

[307]Eder, T. and D.L. Pattie. 2001. Mammals of British Columbia. Lone Pine Press, Vancouver, British Columbia. 296 pp.

[308]Elbroch, M. 2003. Mammal tracks & sign: a guide to North American species. Stackpole Books, Mechanicsburg, PA. 784 pp.

[309]Baicich, P.J. and C.J.O. Harrison. 1997. A guide to the nests, eggs and nestlings of North American birds. Academic Press, New York, NY. 345 pp.

[310] Andres, B.A. and G.A. Falxa. 1995. Black Oystercatcher (*Haematopus bachmani*). *In* The Birds of North America, No. 155 (A. Poole and F. Gill, eds.) The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, DC. 20 pp.

[311] Campbell, R.W. 1969. Summer naturalist report, Wickannish Provincial Park – 1969. British Columbia Ministry of Recreation and Conservation, Parks Branch, Unpublished Report, Victoria, BC. 85 pp. [Figure 638]

Figure 638. The hard sandy beaches and constant roaring waves along the central outer west coast of Vancouver Island attract thousands of walkers and beachcombers each year. *Photo by Adrian Dorst.*

[312]Arcese, P., M.K. Sogge, A.B. Marr, and M.A. Patten. 2002. Song Sparrow (*Melospiza melodia*) *In* The Birds of North America, No. 704 (A. Poole and F. Gill, eds.) The Birds of North America, Inc., Philadelphia, PA. 40 pp.

[313]Robertson, G. J. and R. I. Goudie. 1999. Harlequin Duck (*Histrionicus histrionicus*) *In* The Birds Of North America, No. 466 (A. Poole and F. Gill, eds.) The Birds of North America, Inc., Philadelphia, PA. 32 pp.

[314]Anonymous. 2012. Another lighthouse destroyed by the sea! http://lighthousememories.ca.

[315]U.S. Fish and Wildlife Service. 2018. 2016 National Survey of fishing, hunting and wildlife-associated recreation: FHW/16-NAT: U.S. Department of the Interior, U.S. Fish and Wildlife Service. Washington, DC. 122 pp. [Figure 639]

Figure 639. Revenues from non-consumptive activities related to wildlife viewing and photography have out-paced consumptive interests like hunting. Wildlife and wilderness experiences also have intrinsic value to human mental health that is difficult to measure. *Photo by Adrian Dorst.*

[316]Vermeer, K. and K. Devito. 1987. Habitat and nest-site selection of Mew and Glaucous-winged Gulls in coastal British Columbia. Studies in Avian Biology No. 10:105-118.

[317]Environment and Climate Change Canada. 2022. Canadian Climate Normals 1981-2010 Station Data. https://climate.weather.gc.ca/climate_normals/.

[318]Stirling, D. 2021. Nesting everywhere. Posted on Wednesday, May 26, 2021 at https://racerocks.ca/tag/black-oystercatcher/.

[319]Thomas, W.K. and A.T. Beckenbach. 1986. Mitochondrial DNA restriction site variation in the Townsend's vole, *Microtus townsendii*. Canadian Journal of Zoology 64:2750-2756.

[320]Environment and Climate Change Canada. 2022. Scott Islands marine National Wildlife Area. https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/locations/scott-islands-marine.html#toc2.

[321]CBC. 2018. Shell Canada gives up exploration permits to make way for protected area. https://www.cbc.ca/news/canada/british-columbia/shell-canada-gives-up-exploration-permits-to-make-way-for-protected-area-1.4823180.

[322]WWF Canada. 2020. Reducing impacts from shipping in Scott Islands marine National Wildlife Area: Pacific case study. https://wwf.ca/wp-content/uploads/2021/02/WWF-MPA-10-Scott-Islands-v5.pdf.

[323]Sullivan, B.J., T.A. Reid, and L. Bugoni. 2006. Seabird mortality on factory trawlers in the Falkland Islands and beyond. Biological Conservation 131:495-504.

[324]Burger, A.E. 1992. The effects of oil pollution on seabirds off the west coast of Vancouver Island. Pages 120-128 *in* K. Vermeer, R.W. Butler, and K.H. Morgan (eds.). The ecology, status, and conservation of marine and shoreline birds on the west coast of Vancouver Island. Canadian Wildlife Service Occasional Paper No. 75, Ottawa, ON.

[325]Reed, C.A. 1904. North American Birds Eggs. Doubleday, Page & Company, New York.

[326]Ainley, D.G., D.N. Nettleship, H.R. Carter, and A.E. Storey. 2002. Common Murre (*Uria aalge*). *In* The Birds of North America, No. 666 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA. 44 pp. [Figure 640]

[327]Speich, S.M. and D.A. Manuwal. 1974. Gular pouch development and population structure of Cassin's Auklet. Auk 91: 291-306.

Figure 640. Common Murres are widely distributed along the Pacific coast from Alaska to California. *Photo by R. Wayne Campbell.*

[328]Piatt, J.F. and A.S. Kitaysky. 2002. Tufted Puffin (*Fratercula cirrhata*). *In* The Birds of North America, No. 708 (A. Poole and F. Gill eds.). The Birds of North America, Inc., Philadelphia, PA. 32 pp.

[329]Seward Line Census of Marine Life. Accessed August 2022. http://research.cfos.uaf.edu/sewardline/ZoopSpecies/copepod/Neocalanus_cristatus.html.

[330]Seward Line Census of Marine Life. Accessed August 2022. http://research.cfos.uaf.edu/sewardline/ZoopSpecies/Euphausiids.html#.

[331]BC Government (Office of the Premier). 2022. Historic investment to build modern, new RBCM, safeguard collection. https://news.gov.bc.ca/releases/2022PREM0030-000747.

[332]Ford, J.K.B. 2014. Marine mammals of British Columbia: Volume 6. Royal BC Museum Handbook, Victoria, BC. 460 pp.

[333]Spalding, D.J. 1964. Comparative feeding habits of the Fur Seal, Sea Lion and Harbour Seal of the British Columbia Coast. Fisheries Research Board of Canada Bulletin No. 146, Ottawa, ON. 52 pp.

[334]Chardine, J.W. and V. Mendenhall. 1998. Human disturbance at seabird colonies in the Arctic. Conservation of Arctic Flora and Fauna (CAFF) Technical report. no. 2. CAFF International Secretariat, Akureyri, Iceland. 18 pp.

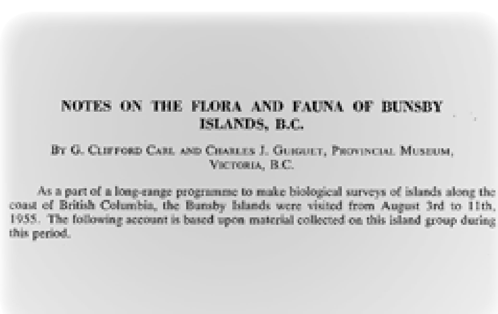
[335]Yorio, P., E. Frere, P. Gandini, and A. Schiavini. 2001. Tourism and recreation at seabird breeding sites in Patagonia, Argentina: current concerns and future prospects. Bird Conservation International 11:231-245.

[336]Chardine, J.W. 1999. Population status and trends of the Atlantic Puffin in North America. Canadian Wildlife Service Bird Trends No. 7.

[337]Forsyth, R. 2004. Land snails of British Columbia. Royal BC Museum Handbook. Royal BC Museum, Victoria, BC. 188 pp.

[338]Ryder, G.R. and R.W. Campbell. 2004. First occurrence of wandering salamander on the Sunshine Coast of British Columbia. Wildlife Afield 1:5-6.

[339]COSEWIC. 2014. COSEWIC assessment and status report on the Wandering Salamander *Aneides vagrans* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xi + 44 pp. (www.registrelep-sararegistry.gc.ca/default_e.cfm). [Figure 641]


NOTES ON THE FLORA AND FAUNA OF BUNSBY ISLANDS, B.C.

BY G. CLIFFORD CARL AND CHARLES J. GUIGUET, PROVINCIAL MUSEUM, VICTORIA, B.C.

As a part of a long-range programme to make biological surveys of islands along the coast of British Columbia, the Bunsby Islands were visited from August 3rd to 11th, 1955. The following account is based upon material collected on this island group during this period.

Figure 641. The earliest record of the Wandering Salamander on offshore islands along the BC outer coast was a specimen collected by C.J. Guiguet (BCPM) on 6 August 1955 on the Bunsby Islands.[46]

[340]Matsuda, B.M., D.M. Green, and P.T. Gregory. 2006. Royal BC Museum handbook of amphibians and reptiles of British Columbia. Royal British Columbia Museum, Victoria, BC. 266pp.

[341]Jaremovic, R.V. 1978. Distribution and movements of the salamander *Aneides ferreus* (Cope, 1869) on Cleland Island, B.C. B.Sc. Thesis. University of British Columbia, Vancouver, BC.

[342]Ford, J.K.B, E.H. Stredulinsky, G.M. Ellis, J.W. Durban, and J.F. Pilkington. 2014. Offshore Killer Whales in Canadian Pacific Waters: distribution, seasonality, foraging ecology, population status and potential for recovery. DFO Canadian Science Advisory Secretariat Research Document 2014/088. vii + 55 pp.

[343]Campbell, R.W., M.I. Preston, S.G Sealy, and M.G. Shepard. 2006. Wildlife Date Centre: Featured Species – Heermann's Gull. Wildlife Afield 3:152-204.

[344]Weber, D. 2019. The Vanlene: Bamfield's vehicular grave. Port Alberni Maritime Heritage. https://www.portalbernimaritimeheritage.ca/post/2017/08/23/the-vanlene-bamfield-s-vehicular-grave.

[345]Clarkson, P.V., Y. Zharikov, H.R. Carter, L.R. Halpin, and S. Helms. 2011. Seabird Rocks trip report (25 July 2011). Unpublished report, Pacific Rim National Park Reserve, Ucluelet, BC; and Carter Biological Consulting, Victoria, BC. 5 pp.

[346]Fletcher, G. 2009. First Elephant Seal born at Race Rocks: January 2009. Race Rocks Ecological Reserve Warden Report. https://racerocks.ca/first-elephant-seal-born-at-race-rocks/.

[347]Hodder, J., R. Brown, and C. Cziela. 1998. The northern elephant seal in Oregon: a pupping range extension and onshore occurrence. Marine Mammal Science 14:873-881.

[348]Edwards, C. 2022. Elephant Seal swapping. Race Rocks Ecological Reserve Ecoguardians log. https://racerocks.ca/seal-swapping/.

[349]Hart, K.A., K.G. Wright, V. Pattison, and J.M. Hipfner. 2022. Successful breeding by Black-legged Kittiwakes *Rissa tridactyla* at the only colony along Canada's Pacific coast. Marine Ornithology 50:115-117. [Figure 642]

Figure 642. In May 1969, the skipper of the fish packer *Challenger* noticed "many seagulls on cliffs under the building" on Holland Rock. Holland Rock is located south of Prince Rupert at the south end of Chatham Sound and the building that was referred to is the tall concrete base of the old lighthouse that now has a weather station on it. Afterwards, commercial fishermen from Prince Rupert intermittently reported that "gulls" were "probably nesting" at this site. This colony site was not included in *The Birds of BC* [40] because the identity of the nesting "gulls" was not confirmed. Nesting by Black-legged Kittiwakes on the rock was finally confirmed by Margo Hearne on 2 June 1997. [110] Kirk Hart and coauthors observed near-fledging young in August 2021. It is likely, given the description of "cliff-nesting" reported in 1969, that the original nesting "gulls" were also kittiwakes. *Photo by R. Wayne Campbell.*

[350]Myres, M.T., I.McT. Cowan, and M.D.F Udvardy. 1957. The British Columbia nest records scheme. Condor 59:308-310.

[351]Young, L. and E. Vanderwerf (eds.). 2022. Conservation of Marine Birds. Academic Press, London, UK. 624 pp.

[352]Pearson S.F., I. Keren, P.J. Hodum, B.A. Drummond, J.M. Hipfner, N.A. Rojek, H.M. Renner, and S.M. Thomas. 2022. Range-wide changes in the North American Tufted Puffin *Fratercula cirrhata* breeding population over 115 years. Bird Conservation International, 1–10. https://doi.org/10.1017/S0959270922000193.

[353]Horwood, D. 1992. Birds of the Kitimat Valley: including Kemano, Gardner Canal, Kitimat Arm and Lakelse Lake. Kitimat Centennial Museum, Kitimat, BC. 178 pp.

APPENDIX 1. POST-1990 DATA KNOWN TO US ABOUT SEABIRD NESTING POPULATIONS AT COLONIES ALONG THE BC OUTER COAST

Introduction to Post-1990 Data

Colony accounts in this document present all known records of visits to seabird colonies up to 1990. The reasons for limiting the colony accounts to that time period were given in Part 1 of this seabird colony catalogue [188] and are reiterated in the introductions to Part 2 [189] and this volume. Here we present all post-1990 data known to us for each colony and summarize them for each region on the outer coast. Previously, in each species account in Part 1, we summarized data collected since 1990 that we were aware of as it related to each species. 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. New data include those from: regular counts of burrows in permanent monitoring plots at colonies where they were established in the 1980s by CWS (Figure 643); recent surveys by Parks Canada at colonies in Pacific Rim National Park Reserve; and a number of records from eBird through summer 2022.[266] The summaries are inevitably incomplete because other surveys that we were unaware of, or for which data were not readily available, have likely been conducted by different individuals and agencies in various regions. Compiling all survey data to maintain an up-to-date account of breeding population estimates would require the participation of all parties that collect population data.

We know of only a few breeding population surveys that have been conducted since 1990 in the outer coast regions of BC. Resurveys of permanent plots by CWS have provided some trend information for monitored colonies and the Centre for Wildlife Ecology has conducted intensive studies and collected some population data on Triangle Island and the other Scott Islands. Surveys of cormorants, Black Oystercatchers, and Glaucous-winged Gulls have been conducted on a few colonies, mostly in Pacific Rim National Park Reserve. Those surveys

Figure 643. Many people have assisted with resurveying the CWS seabird monitoring plots since they were established in the 1980s. Shown here (left to right) are: Mark Drever, with a fish net at night ready to capture an incoming Rhinoceros Auklet for the food sampling project on Pine Island; Valerie Labreque, with a young Rhinoceros Auklet chick on Pine Island; and Glen Keddie, here taking a break on Frederick Island in Haida Gwaii. Glen has been an indispensable member of the CWS seabird survey crew for many years. *Photos by Moira J.F. Lemon.*

indicated extirpation of Brandt's Cormorants, continued reduced population levels for Pelagic Cormorants and Glaucous-winged Gulls, and stable or increasing trends for Black Oystercatchers at colonies in the park area. Monitoring of Black Oystercatcher populations at 15 colonies within the park reserve in 2008-2018 found much larger nesting populations [264] than had been reported in 1989,[236] but at least some of that increase was likely due to differences in survey methods. Several new colony sites were identified during those surveys. A few new colony sites for Pelagic Cormorants, Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots have also been identified in other areas, most notably a previously undocumented colony site for Black Oystercatchers, Pigeon Guillemots, and likely Glaucous-winged Gulls on Coste Rocks near Kitimat. That site is located well over 100 km from the nearest known seabird colony along the outer coast. In no areas can we update regional breeding population estimates, but dramatic decreases in numbers of Cassin's Auklet burrows in permanent plots on Triangle Island indicate that population estimates in that important area are outdated.

A new species was added to the list of breeding seabirds in BC when Black-legged Kittiwakes were confirmed nesting on Holland Rock, south of Prince Rupert on the northern mainland coast, in 1997 (Figure 644).[41, 110]

Figure 644. Black-legged Kittiwakes became the 17th seabird species known to breed in BC when they were confirmed nesting on Holland Rock on the northern mainland coast in 1997. *Photo by R. Wayne Campbell.*

Burrow-occupancy Rates Post-1990

Except for a resurvey of most transects on Sartine Island in 2006 to determine burrow density for Cassin's Auklets,[120] there have been no transect surveys for burrow-nesting species at colonies along the BC outer coast since 1990. However, burrow occupancy data have been gathered more frequently in conjunction with surveys of permanent plots and other research conducted on Lucy Islands, Pine Island, and Triangle Island (Figure 645). 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 along the BC outer coast in Table A1-1.

Figure 645. No transect surveys to update population estimates for burrow-nesting seabirds have been completed on the BC outer coast since 1990. However, permanent monitoring plots for Cassin's Auklets (photo), Rhinoceros Auklets, and Tufted Puffins have been repeatedly surveyed at three colonies. *Photo by R. Wayne Campbell.*

Table A1-1. Burrow occupancy rates determined at colonies along the BC Outer Coast since 1990. Occupancy rates have been reviewed by Laurie Wilson, Moira Lemon, and Michael Rodway to confirm 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	Source
Cassin's Auklet				
SC-010 Triangle Island	1995	57	156	12, 252
	1996	62	79	12, 252
	1997	62	110	12, 252
	1998	38	142	12, 252
	1999	52	123	12, 252
	2000	51	133	12, 252
	2003	82	~80	122
	2004	84	~80	122
	2005	77	~80	122
	2006	44	~80	122
	2014	78	36	257
	2019	~69	29	257
Rhinoceros Auklet				
MC-100 Lucy Islands	2006	~78	18	267
	2011	63	30	267
	2016	58	33	267
QS-110 Pine Island	2001	~67	9	267
	2006	~74	23	267
	2011	62	45	267
	2016	77	30	267
SC-010 Triangle Island	2002	67	76	121
	2003	72	76	121
	2004	64	72	121
	2005	65	79	121
	2014	69	36	257
	2019	50	32	263
Tufted Puffin				
SC-010 Triangle Island	2003	8	89	119
	2004	46	120	119
	2005	9	109	119
	2014	~32	22	263
	2019	78	32	263

Northern Mainland Coast Post-1990

Surveys of seven Pelagic Cormorant colonies in western Queen Charlotte Strait on 8-9 July 2014, including Dugout and Ruby rocks in the northern Mainland Coast region (Table A1-2), indicated further declines in Pelagic Cormorant nesting populations.[49] On the seven colonies surveyed, numbers of nests declined from 46 to 5 nests. That survey was conducted from the water and a small number of nests on inland-facing cliffs may have been undetected. Numbers of other birds, including Pigeon Guillemots, were also counted at those colonies. Otherwise, we know of no other dedicated colony surveys conducted since 1990 in this region.

Incidental records from eBird [266] have documented new nesting sites for four species. In 2015, Pelagic Cormorants were reported nesting on Green Island where they had not been recorded before. Between 2016 and 2022, observations by teacher and long-term Kitimat resident Walter Thorne identified a previously undocumented colony site for Black Oystercatchers, Pigeon Guillemots, and likely Glaucous-winged Gulls on Coste Rocks (now designated MC-205 Coste Rocks) within Coste Rocks Provincial Park.[287] Nesting by Pigeon Guillemots and Glaucous-winged Gulls had been suspected at this site in the 1970s [291, 292] but as far as we know had not been confirmed, although others have reported it as a known breeding site at that time.[293] Coste Rocks are located along the Douglas Channel fiord, south of Coste Island, about 22 km south of Kitimat and well over 100 km from the open ocean where other known seabird colonies are located. Fifty guillemots were recorded east of Coste Rocks on 28 May 2011.[284] Thorne first reported Black Oystercatchers (2) and Pigeon Guillemots (45) at the rocks on 9 April 2016. On 22 March 2018, he suspected a pair of oystercatchers was nesting, recorded four Glaucous-winged Gulls, and reported the site as a known Pigeon Guillemot colony (65 guillemots present). On 11 April 2019, he reported four oystercatchers, one Glaucous-winged Gull, and 150 guillemots. One, three, and 90 of those same species were seen on 15 May 2020. On 7 July 2020, a pair with a recently fledged juvenile confirmed breeding by oystercatchers (Figure 646), and four Glaucous-winged Gulls present were

Figure 646. Black Oystercatchers in BC are expanding their breeding range and nesting in a greater variety of habitats. Nests have been found on: remote islets in long, deep, saltwater fiords; bare headlands on islands inhabited by humans; rocky breakwaters; an artificial rock jetty with constant vehicle traffic; rooftops; and small rocks in busy urban waterways. In his book on birds of Kitimat (left) published in 1992,[353] Dennis Horwood summarized decades of observations made while motor sailing through marine waterways near Kitimat. At that time he had never recorded a Black Oystercatcher in the area. In 2016, a pair of oystercatchers was reported on Coste Rocks, south of Kitimat, by local resident Walter Thorne. Breeding was confirmed in 2020 when Thorne saw a recently fledged juvenile (right) on the rocks and in 2021 when smaller chicks were seen. *Photo by Paula Courteau.*

suspected nesting, which Thorne noted would be a first for this colony. On 29 May 2021, Thorne noted oystercatchers nesting successfully again (a pair with two young), suspected that a pair of gulls was again nesting, and recorded 60 guillemots. In 2022, he reported a pair of oystercatchers, five Glaucous-winged Gulls, and 135 guillemots present on 25 March.[287] In nearby Gilttoyees Inlet, which branches off Douglas Channel west of Coste Rocks, a team from Jacques Whitford reported a small, previously unrecorded colony of Pigeon Guillemots in 2006.[293] They did not find evidence of nesting in 2009 and, without further details on what was seen in 2006, we have considered it a suspected but not confirmed breeding site (see Appendix 3). Possible nesting by Pigeon Guillemots has also been reported on several rocky cliffs along Gardner Canal, east of Douglas Channel (Figure 647).[353]

Figure 647. Pigeon Guillemots occur in the Kitimat region year-round, but have been confirmed nesting in the area only on Coste Rocks. Horwood [353] also reported them on several rocky cliffs along Gardiner Canal but no details were given that confirmed nesting. Sightings of guillemots near suitable nesting habitat often indicates breeding but we have considered breeding confirmed only if birds are observed entering nesting cavities or nests are found. *Photo by R. Wayne Campbell, Sadler Island, BC, 20 July 1977.*

Closer to the open Pacific, Thorne also identified a new nesting site for Black Oystercatchers on Marble Rock (now designated MC-203 Marble Rock) off the north end of Campania Island. Thorne observed a pair with one chick on 19 June 2022. Thirty Glaucous-winged Gulls and 25 Pigeon Guillemots were also recorded but Thorne gave no information on possible nesting for those species. He photographed what looked like a territorial pair of Glaucous-winged Gulls on the rock and we suspect nesting by both gulls and guillemots.

Further south, near Bella Bella, SFU professor John Reynolds observed Pigeon Guillemots flying from likely nest locations on the cliffs in Troup Narrows (now designated MC-405 Troup Narrows) on 8 and 9 July 2013.[266] He recorded six birds flying from cliffs on Chatfield Island on the north side of the narrows on both days. Previous observers on 24 June 2011 had also counted six guillemots in the area and noted possible nesting habitat nearby.[284] Troup Narrows is located between Chatfield and Cunningham islands, northeast of Bella Bella.

Another likely nesting site was reported in 2022 on Fog Rocks, located south of Bella Bella in Fisher Channel between Hunter and King islands, north of Kipling Island. Although evidence of nesting was not reported, eBird contributor Jeff Sauer from Juneau, Alaska, counted 10 Glaucous-winged Gulls and 20 Pigeon Guillemots on the rocks on 2 May. Black Oystercatchers have also been reported in previous years (see Appendix 3). This group of five, mostly bare rocks isolated in the middle of Fisher Channel provide suitable nesting habitat and are likely free of terrestrial predators. We suspect nesting would be confirmed on these rocks if they were surveyed.

Records of nesting on Coste Rocks, Troup Narrows, and perhaps in Gilltoyees Inlet, Gardner Canal, and on Fog Rocks further suggest that there are likely more undocumented seabird nesting sites along the channels and fiords of the BC inner coast, which have not been well explored during seabird surveys (Figure 648). Another possible nesting site deep in the mainland fiords of the central coast was reported on 25 June 2011. Observers recorded six guillemots near the head of Kynock Inlet and noted that there were suitable nesting cliffs in the area.[284]

Figure 648. The many deep fiords and long inside passages, like Grenville Channel shown here, along the northern mainland coast of BC have not been well explored for nesting seabirds. There are numerous cliff sites and isolated rocks that provide suitable nesting habitat for species like Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots. Breeding has been confirmed on several of those sites and will likely be detected on others during future explorations. *Photo by Dennis A. Demarchi, 14 August 1997.*

A new nesting site for Black Oystercatchers was discovered on the north beach of Calvert Island west of Pruth Bay (now designated MC-526 Calvert Island - Northwest); a pair was seen with one adult on a nest on 21 June 2018. A new nesting site for Pigeon Guillemots was documented on the Breaker Group (now designated MC-522 Breaker Group) on the north side of Hakai Passage on 17 June 2017; eight adults were present and were seen carrying food to chicks. A possible new nesting site for Pigeon Guillemots and Glaucous-winged Gulls was identified on 7 June 2009 on a steep rock face on Hanmer Island, at the north end of Arthur Passage on the east side of Porcher Island.[284] No evidence of nesting was obtained but there were signs of burrows at the edge of the vegetation at the top of the cliff that may have been used by Pigeon Guillemots.

Black-legged Kittiwakes were first confirmed breeding in BC in 1997 when they were found nesting on Holland Rock.[41, 110]

The Enthusiasm of the Black-legged Kittiwake

Perhaps the most enthusiastic and excitable seabird of all is the Black-legged Kittiwake. From perches on cliffs where they build their nests (Figure 649)*, kittiwakes look out at the world from on-high, and they tend to be highly vocal and passionate about their perceptions. In addition, their excitement is contagious: one kittiwake, triggered by an obvious or unknown cause to loudly proclaim, sets off its neighbours, and soon the entire colony bursts into a raucous chorus. Most enchanting of all is the kittiwake's greeting ceremony. When one partner returns to the nest after having been gone even for a short while, it receives a greeting fit for a long-lost friend or lover. The welcoming kittiwake exclaims in what appears to be uncontainable excitement, and once landed, the returning partner also chimes in, apparently just as happy to be reunited. They call loudly together, crossing their necks in exuberant greeting. Owing to their excitable behaviour, watching* kittiwakes is a lot of fun. And although it initially appears that we cannot differentiate individuals, the black wing tips of kittiwakes are sufficiently variable to allow us to distinguish members of a pair.

Kittiwakes are a small and beautiful gull. They are only about 40 cm in length and their mass is just under 400 g (compared to ~65 cm length and ~1,000 g mass for Glaucous-winged Gulls). Kittiwakes are also particularly handsome, with white body and head, grey mantle, jet black wing tips, a yellow bill, and black legs and feet. However, the most striking of all is the juvenile. The appearance of the fledgling kittiwake is so dramatically different from its parents that some local fishermen believe that a different species of seabird arrives in the area in the later part of the summer. The juvenile has the grey mantle and clean white body and head of the adult, but it has an arresting black partial collar, a dark crescent behind the eye, and a black band running through the centre of each wing that matches a deep black tail band and contrasts handsomely with the grey mantel and white body (Figure 650).

Black-legged Kittiwakes typically nest on narrow cliff ledges; sometimes a nest is perched on a protrusion so small it can barely be seen under the vegetation and mud nesting material pasted on top of it. In some situations, such as when nest predators are common, some nests are better than others. For example, we found that, during years of heavy nest predation in Newfoundland, kittiwakes nesting under rock overhangs had greatest success, as did those nesting near the centre of the colony.[173] *Kittiwakes also use artificial nest sites such as the window ledges of buildings by the sea. Like other gull species, kittiwakes lay up to three eggs. Incubation lasts 25 to 27 days and chicks fledge after 34 to 50 days.*[2] *Typical for seabirds, kittiwakes are long-lived; they have been known to survive in the wild for more than 20 years.*

Black-legged Kittiwakes are circumpolar in distribution and have an estimated world population of about 15 million individuals, with about 2.6 million belonging to the North Pacific sub-species (Rissa tridactyla pollicaris). *They have only recently begun breeding in BC, extending their range southwards from Alaska, where approximately half a million birds breed. Holland Rock is the only known breeding site for the species in BC, colonized sometime between 1979 and 1997. Major declines in the world population have occurred since the 1980s, likely related to changes in the availability of prey species and increased adult mortality due to climate change, over-fishing, and oil pollution. The species is listed as Vulnerable on the IUCN Red List of Threatened Species.*[15] *Black-legged Kittiwakes are red-listed in BC because of their limited breeding distribution; numbers breeding on Holland Rock have increased since the colony was discovered in 1997.*[110]

(contributed by Heidi Regehr)

Figure 649. Black-legged Kittiwakes typically nest on cliff ledges, as seen here on Great Island in Newfoundland. *Photo by Heidi M. Regehr, July 1992.*

Figure 650. Black-legged Kittiwake juveniles are striking. They are mostly brilliant white like their parents but have a black partial collar, a dark crescent behind the eye, and a black band running through the centre of each wing. *Photos by Michael S. Rodway, Great Island, NL, July 1992.*

Nesting by Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots has been reported on East and West Kinahan islands located on the northern mainland coast, south of Digby Island, close to Prince Rupert.[285, 286, 290] We have been unable to confirm the validity or determine the source of those records and have thus not listed Kinahan Islands as a known seabird breeding site. Further investigation of those records and future surveys of those islands are warranted.

The BC Breeding Bird Atlas account for Glaucous-winged Gulls published in 2015 reported about 400 nests on Dundas Island in 2010 and listed that site as the third largest gull colony in BC.[294] This was an error and has since been revised in consultation with Michael Rodway. We have no records of gulls nesting on Dundas Island itself, but there are several colonies in the area, with the largest on Grey and Green islands. Total number of nests counted on colonies in the Dundas Island area during our CWC surveys in 1988 was around 400; we tallied 356 nests on Grey and Green islands.[182] We think that this is the source for the original record in the atlas account. Even at 400 nests, this would not rank as the third largest gull colony in BC; there are other colonies in addition to those that were mentioned in the original atlas account that are much larger (Figure 651).[188]

Figure 651. An important function of this seabird catalogue is to provide accurate details for seabird breeding populations in BC and to provide perspective on the importance of individual colonies and geographic regions to overall provincial and global populations. This is especially valuable for species like Ancient Murrelet, Cassin's Auklet, and Rhinoceros Auklet, for which BC has stewardship responsibility for much of their world populations, but is also important for common, widespread species, like Glaucous-winged Gull, that often come into conflict with humans. *Photo by R. Wayne Campbell.*

Table A1-2. Post-1990 data for seabird colonies on the Northern Mainland Coast.

Species	Post-1990 data
MC-040 Green Island	
PECO	Forty-five active nests were counted on 3 August 2015.[266] This is the first record of Pelagic Cormorants nesting on the island.
GWGU	Observers on 3 August 2015 noted about 200 fluffy chicks in a total of 3,000 gulls on the island [266] and stated that the breeding population was now much larger than in the 1980s (note that they erroneously reported a previous count of 356 breeding pairs in 1986; that count was actually from 1988 and was the count of nests on Grey and Green islands combined).
MC-100 Lucy Islands	
BLOY	In 2015, a nest with two eggs was recorded on the islands on 17 May, a nest with two eggs was found on the southeast islet among the gull colony on 3 June, and a total of three active nests were reported on the islands on 4 June.[266]
PIGU	High counts recorded on eBird include 243 birds on 14 May 2015 and 215 birds on 5 May 2018.[266]
RHAU	Numbers of burrows in five permanent plots increased (not significantly) 34% between 1984 and 1987, were similar in 1987 and 2011,[184] and decreased 7% from 231 burrows in 2011 to 215 burrows in 2016.[263] Overall, the number of burrows in the five permanent plots has remained stable over time, with an annual rate of increase of 0.4% per year from 1984 to 2016.[263] Five permanent monitoring plots were considered insufficient to detect changes on Lucy Islands and more plots were recommended to increase the sample size and make the monitoring scheme more sensitive.[184]
MC-150 Holland Rock	
BLKI	Three nests, one of which contained a single egg, found on 23 June 1997 confirmed this as the first breeding site for Black-legged Kittiwakes in BC.[41, 110] Numbers nesting have increased since. On 19 June 19 2002, 23 attended nests were counted; six nests held one egg each. In 2012, 135 adults and 65 nests were counted on 27 May, and 238 adults and 18 nests were counted on 14 June.[110] Bernard Schroeder reported numerous single birds and pairs attending nests along the concrete base of the weather station on 18 July 2017.[287] In 2021, Ken Wright and Vivian Pattison counted 101 adults and 54 nests on 21 July; young were seen in some nests.[287] Four large young, including three close to fledging, and about 118 adults were seen during a second visit on 13 August.[349] In 2022, Victoria birder Andrew Jacobs noted birds on nests and counted 70 birds present on 2 July.[287]
MC-290 Moore Islands	
PIGU	About 800 guillemots were seen feeding in the Moore/Whitmore Islands IBA on 2 May 2018.[266] Walter Thorne estimated 1,500 birds within the IBA on 6 Jul 2020 and tallied 250 present on 8 July 2021.[287]
MC-550 Dugout Rocks	
PECO	Only four nests were seen in 2014.[49] In 1988, two nests were located on an interior rock face that would not have been visible from the water during the 2014 survey.
PIGU	Seventeen birds present in 2014.[49]
MC-560 Ruby Rocks	
PECO	No nests were seen in 2014.[49]
PIGU	Fourteen birds present in 2014.[49]

Queen Charlotte and Johnstone Straits Post-1990

Only a few colonies of Pelagic Cormorant have been surveyed since 1990 in this region (Table A1-3). As noted in the above section, at seven colonies surveyed in the Northern Mainland Coast and Queen Charlotte and Johnstone straits regions, numbers of nests counted declined 89% between 1982-1988 and 2014.[49] However, some historical nesting locations on Storm Islands may not have been visible from the boat and the McEwan Rock colony (with 14 nests in 1982) in the same area was not surveyed in 2014. Carter and McClaren [49] assumed no nesting in 2014 at McEwan Rock but this assumption seems unfounded given the variable pattern of site use typically exhibited by Pelagic Cormorants (Figure 652).[58, 196] A nest with two young seen on Pine Island in 2014 [49] provided the first confirmation of nesting by Pelagic Cormorants at that site (Figure 653).

Figure 652. Obtaining accurate estimates of Pelagic Cormorant breeding populations in BC is difficult and requires concurrent comprehensive surveys at region-wide or even province-wide scales. Numbers and locations of nests fluctuate among years, both within and across colonies, and may be affected by many factors, including climate change and changing food supplies, summer storms, Bald Eagle predation, other natural disturbances, and human disturbance (photo). Types of survey methods used also affect the accuracy and comparability of counts. *Photo by R. Wayne Campbell, July 1978.*

Figure 653. A Pelagic Cormorant nest with two young found in 2014 was the first definite breeding record for Pine Island. *Photo by R. Wayne Campbell.*

Harry Carter found a potentially new Pelagic Cormorant nesting site on Nigei Island, 0.9 km west of Boxer Point in 2009.[49] He saw two empty nests there on 2 July (we have listed this potential colony site as "Boxer" Cliffs in Appendix 3). We boated by that area in 1975 and saw no birds.

Carter and McClaren counted Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots that were on territories, roosting, or on the water around the colonies they surveyed for Pelagic Cormorant nests in 2014.[49] No nests were counted for those species but some sightings of Pigeon Guillemots flying out of nests provided some nesting information for that species. A new Pigeon Guillemot nesting site was found on Tremble Island (officially named Turret Rock; now designated QS-015 Turret Rock) at the entrance to Seymour Inlet. A total of 17 guillemots were seen at that site including four birds flying out of apparent nest holes. We have no previous records of visits to that site. Nesting at this site, recent records of nesting at Coste Rocks and other sites along inland waterways on the northern mainland coast (see above), and previous records of nesting around Bella Bella reported by Drent and Guiguet [77](see the introduction to the Northern Mainland Coast Region in the main text), suggests that nesting by may be more widespread along inside waters of the BC coast. Those areas have not been exhaustively explored for nesting seabirds.

One new colony for Glaucous-winged Gulls has been identified in this region since 1990. On 27 August 2006, Nanaimo veterinarian and birder Ken Langelier photographed adults with downy young on Stubbs Island (now designated QS-309 Stubbs Island), located at the east end of Cormorant Channel, just northwest of Plumper Islands.[266] A few pairs may have been nesting; eight adults are visible in the photographs. No gulls were nesting on this island when we surveyed it in 1975 (see Appendix 3).

On 26 May 2006, Parksville birder Guy Monty reported that some Pigeon Guillemots appeared to be nesting on Haddington Island near Port McNeill.[266] No guillemots were seen when the island was explored in 1975. Further observations may confirm this as a colony site.

A declining trend between 1984 and 2001 in numbers of Rhinoceros Auklet burrows in permanent plots on Pine Island was contrary to the trend at all other monitored colonies in BC (Figure 654).[184] Reasons for the suggested population decline are unknown.

Figure 654. Contrary to a general increasing trend in numbers of Rhinoceros Auklet burrows at colonies in BC, permanent plots on Pine Island showed a declining trend between 1984 and 2001. *Photo by Michael S. Rodway, 13 July 1975.*

Table A1-3. Post-1990 data for seabird colonies in Queen Charlotte and Johnstone straits.

Species	Post-1990 data
QS-010 Bremner Islet	
PECO	No nests were seen in 2014.[49]
QS-030 Storm Islands	
PECO	No nests were seen in 2014, although Carter and McClaren [49] did not boat into narrow coves among the islands and likely did not inspect locations where cormorants were nesting in 1975.
PIGU	Ten birds present in 2014.[49]
QS-040 Naiad Islets	
PIGU	Three birds present in 2014.[49]
QS-050 Reid Islets	
PECO	No nests were seen in 2014.[49]
PIGU	Five birds present in 2014.[49]
QS-100 Tree Islets	
PECO	No nests were seen in 2014.[49]
PIGU	Twenty-four birds present in 2014.[49]

Table A1-3. cont'd

Species	Post-1990 data
QS-110 Pine Island	
PECO	One nest was found in 2014.[49] This is a new confirmed nesting site, although Pelagic Cormorants may have been nesting when Young [251] visited in 1929 (see colony account).
PIGU	There were 56 birds present in 2014.[49] High counts were reported of 160 birds on 10 May 2016 and 75 birds on 1 May 2017.[266] A minimum of 250 guillemots were seen between Pine Island and Tree Islets on 10 May 2017.[266]
RHAU	Numbers of Rhinoceros Auklet burrows in eight permanent plots decreased 21% between 1984 and 2001 and then were stable between 2001 and 2011 [184] and since.[263] In six of the plots surveyed in 2016, there were 317 burrows compared to the 311 burrows counted in those six plots in 2011, an increase of 2%. The number of burrows in the permanent plots has decreased from 1984 to 2016 at an annual rate of -1.4% per year.[263]
QS-120 Buckle Group	
PECO	No nests were seen in 2014.[49]
PIGU	Twenty-one birds present in 2014; 11 around Bright Island and 10 around Herbert Island.[49]
QS-260 Green Rock	
GWGU	Eight active nests and 49 birds were reported on 24 June 2017.[266] We could not tell if this was a complete count.
QS-280 “Ridge” Rocks	
GWGU	Adults on nests and a total of 50 gulls were seen on the east rocks on 28 May 2021, and adults on nests and a total of 20 gulls were recorded on the rocks 0.5 km north on 22 June 2022.[287]

Scott Islands Post-1990

The centre of the world’s population of Cassin’s Auklets in the Scott Islands may be serving as a bellwether of climate change (Table A1-4). There has been a steady decline (2.5% per year) in numbers of Cassin’s Auklet burrows counted in permanent plots between 1989 and 2009, resulting in a 40% decline in 20 years (Figure 655).[184] Declines were also evident on the other Scott Islands [120] and suggested that more than 20% of the world’s breeding population may have been lost.[184] A declining trend since 1990 is consistent with other indicators from productivity and survival studies and has likely been mediated by changing oceanographic conditions that have affected food supply. [12, 14, 111] A reversal of the declining trend on Triangle Island was seen between 2009 and 2014,[197] but a massive die-off the following winter [115] may have offset any potential population recovery. Numbers of burrows in permanent plots again decreased between 2014 and 2019.[263]

Although permanent plots have not shown a major decline in numbers of Tufted Puffin burrows on Triangle Island, studies on diet and reproductive success suggest that puffins will be impacted severely by climate change.[87, 352]

Figure 655. Cassin’s Auklet is the most numerous seabird breeding in BC, with over half of the world’s breeding population nesting at three colonies in the Scott Islands. Regular monitoring of permanent plots on Triangle Island indicated a 40% decline in the breeding population between 1989 and 2009, likely related to changing oceanographic conditions that have reduced the availability of zooplankton species that the auklets feed on. *Photo by R. Wayne Campbell.*

Potential seabird nesting areas on Lanz and Cox islands were visited on 9-12 August 2006 and no evidence of nesting was found.[120] Signs of mink and raccoon were abundant. A cooperative program to remove introduced mink and raccoon and restore seabird breeding population on these two islands has recently been approved; planning is underway. Laurie Wilson from CWS has established permanent plots on the islands to monitor anticipated recovery of seabird nesting populations.[263]

Table A1-4. Post-1990 data for seabird colonies in the Scott Islands.

Species	Post-1990 data
SC-010 Triangle Island	
NOFU	Evidence of apparently successful nesting was reported in 2008 and 2009 [118] but this was based only on observations of birds flying up to the cliffs on Puffin Rock,[257] similar to what was previously observed in the 1970s and 1980s (we have not accepted these observations as confirmation of breeding; see discussion in SC-010 Triangle Island account). The same behaviour was seen in 2019 and most prior years since 2009.[257]
STPE	In 2018, incubating adults found in burrows confirmed nesting by Leach's Storm-Petrels; Fork-tailed Storm-Petrels were heard calling around the cabin.[266]
PECO	Total counts of 326 and 335 nests in 2009 and 2010, respectively, indicated a 23% decline since the maximum count of 433 nests in 1989.[196]
BLOY	Hipfner et al. studied breeding biology and reproductive success on Triangle Island from 2003-2011.[123] Numbers of nests with eggs found ranged from nine to 15 in the study area on the south and west sides of the island where we found 10 nests in 1989.[194] Incidental observations of nests with eggs or young were reported on 27 June 1999, 13 May 2017, 27 May and 2, 9, 11, and 19 June 2018, and 27 and 29 May 2019.[266, 287]
COMU	A photographic count was conducted of murres on Puffin Rock and Murre Rock on 28 July 2003 and observations of other areas were made on several days in 2003 and 2004.[116] Total counts were 4,297 birds on Puffin Rock and 30 on Murre Rock, which were down 27% compared to similar counts made in 1989.[176] No murres were nesting on Castle Rock or Southeast Point in 2003-2004. Three thousand birds were recorded on 19 August 2010, a conservative estimate of 6,000 birds was reported on 11 June 2016, and 5,000 birds were estimated present, with several thousand on the cliffs on 16 May 2017.[266] Rough estimates of 5,000 to 10,000 birds on nesting cliffs and rafted on the water were made in June 2018.[266] The first egg was seen on 16 June that year – it was taken by a Glaucous-winged Gull. A minimum of 5,000 birds were estimated on 1 June 2019; most birds were on the colony.[287] There have been no estimates of the number of breeding birds since 1989.
TBMU	None were seen in 2003 at their usual breeding locations.[116] One bird was seen repeatedly on a cliff ledge amongst Common Murres on Puffin Rock on 20-26 June 2018.[266] Two birds were on the nesting ledge on 24 June 2019.[287]
CAAU	Data from permanent plots suggested a 40% decline in breeding population between 1989 and 2009.[184] Some recovery was seen in 2014 [197] but numbers of burrows in permanent plots again decreased between 2014 and 2019.[263] In 2014, a total of 2,336 burrows were counted in the 15 permanent plots, which was a 27% increase compared to the 1,833 burrows counted in 2009, but still 25% less than the 3,122 burrows counted in 1989. In 2019, the numbers of burrows in the 15 plots decreased to 1,953, which is 37% less than in 1989 when the monitoring plots were first established. If we also consider numbers of Cassin's Auklet burrows in plots established for Rhinoceros Auklets and Tufted Puffins that have been monitored continuously since 1989, then overall numbers in 2019 were 33% less than in 1989, a declining trend of -1.1% per year over 30 years.

Table A1-4. cont'd

Species	Post-1990 data
RHAU	Numbers of burrows in permanent plots increased and colony area expanded between 1984 and 2009.[184] A reversal in that trend was seen in 2014 and 2019. A total of 678 and 633 burrows were counted in eight permanent plots (6 established in 1984 and 2 established in 2009) in 2014 and 2019, respectively, indicating a 24% decrease by 2019 compared to the 834 burrows counted in 2009.[263] Numbers of burrows in five plots monitored continuously since 1984 indicated a 9% decrease between 1984 (421 burrows) and 2019 (382 burrows). One of the original six plots was lost to erosion sometime between 1989 and 1994 and was not included in this calculation (that plot was re-established in 2009).[184] We can use a larger sample size to calculate a trend if we also consider numbers of Rhinoceros Auklet burrows in the 15 plots established for Cassin's Auklets in 1989 (Rhinoceros Auklet burrows have not been found in Tufted Puffin plots). Numbers of Rhinoceros Auklet burrows in the 15 Cassin's Auklet plots increased from nine in 1989 to 110 in 2019. Including data from the 15 Cassin's Auklet plots and the five Rhinoceros Auklet plots monitored continuously since 1989 indicates that numbers of Rhinoceros Auklet burrows in 2019 were 17% greater than in 1989, an increasing trend of 0.6% per year over 30 years. The increase in the number of Rhinoceros Auklet burrows in Cassin's Auklet plots is consistent with the observed expansion of the Rhinoceros Auklet colony between 1984 and 2009.[184] Concurrent decreasing numbers of burrows in Rhinoceros Auklet plots suggests some re-distribution of nesting birds from older to newer colony areas, although in two plots established in 2009 in areas of colony expansion, burrow numbers were almost identical in 2009 (210 burrows) and 2019 (208 burrows). Burrow occupancy rate was similar to that determined in other years in 2014 but was lower in 2019 (Table A1-1).
TUPU	Numbers of burrows in four permanent plots varied but showed no long-term trend between 1984 and 2009.[184] One plot could not be surveyed in 2014 and a new plot was established. In the three plots surveyed continuously since 1984, there were 152 burrows in 2014 and 130 burrows in 2019 compared to 183 burrows in 1984. This suggested a decline of 29% since 1984. However, burrowing habitat in some of those plots may be deteriorating due to erosion. In the new plot established in 2014, the numbers of burrows increased from 59 to 83 (41%) between 2014 and 2019. Overall, in all plots surveyed, there was a 14% decrease in numbers of burrows from 1984 (247 burrows) to 2019 (213 burrows). A statistical analysis using all data points in a hierarchical Bayesian, generalized additive mixed model (GAMM) indicated a decline of about 18% at a rate of -0.6% per year.[263] However, occupancy rate was much higher in 2019 (78%) than all previous estimates since 1990 (Table A1-1). The 2019 rate was also higher than in 1982 (68%) but not as high as in 1989 (84%).[194] High occupancy suggested favourable breeding conditions for puffins in 2019.
HOPU	One to five birds have been regularly sighted around Puffin Rock in the post-1990 years through 2022.[287]
SC-020 Sartine Island	
COMU	None were nesting on 9 July 2004.[116]
CAAU	Six of the seven transects used to survey the colony in 1987 [194] were resurveyed on 3-5 August 2006.[120] Burrow density in sample quadrats declined by almost 50%. Burrow occupancy rate and colony area were not determined in 2006 and a revised population estimate was not calculated.

West Coast Vancouver Island Post-1990

The four Brandt's Cormorant nesting sites within Pacific Rim National Park Reserve were surveyed in 2004-2005.[254] Only Starlight Reef was still occupied in 2004, and numbers there had decreased to seven nests from the 51 nests recorded in 1989 (Table A1-5). According to Carter et al.,[59] there were no Brandt's Cormorants nesting on the west coast of Vancouver Island from 2008 to 2012. We have no records of nesting since then.[264]

Surveys of Pelagic Cormorants at 32 locations on 24 colonies in Barkley Sound by Carter et al.[57] in 2006 found 16-20 nesting pairs at four locations, including two caves on Edward King Island, a cave on the east side of Hankin Island, and the cave site in the cove east of Deadman Cove where Guiguet [95] saw birds in 1970 and Carter saw birds in 1980 and 1982 (this site was not previously designated as a seabird colony; see Appendix 3). The "Deadman" Cave site had about 5-7 nests in 2006 and is thus a new nesting site for Pelagic Cormorants and a new colony site for BC (now designated WV-844 "Deadman" Cave). Total number of nesting pairs found by Carter et al.[57] in 2006 was similar to the 17 pairs found nesting at two sites by Vermeer et al.[238] in 1989. Results suggest that the dramatic reduction in nesting populations seen in 1989 has persisted. In 2007, Carter et al.[57] visited 17 of the 32 locations that were surveyed in

2006 and found 12 nests at four sites. There were five nests again at "Deadman's" Cave in 2007. Hankin Island was not surveyed in 2007.

In addition to the "Deadman" Cave site, Carter et al.[57] reported nesting at two other locations, one of which is definitely a new recorded nesting site for Pelagic Cormorants and a new colony site for BC. In 2005, nesting was noted by Stephanie Avery-Gomm at a cliff site (7+ nests) on the southwest side of Sandford Island (now designated WV-775), located just southwest of Fleming Island, and a cave site (1+ nests) on the main shore of Vancouver Island on the south side of Tapaltos Bay, south of Whittlestone Point. Carter et al.[57] considered breeding confirmed at the Sandford Island site but some uncertainty surrounded the Tapaltos Bay record and breeding there was considered unconfirmed. Carter et al.[57] suspected that the Tapaltos Bay site was actually part of the Lawton Point colony.

In 2012, Harry Carter (Figure 656) found another new Pelagic Cormorant nesting site on cliffs on the east side of Cape Parkins (now designated WV-008 Cape Parkins) on northern Vancouver Island, 0.25 km northwest of Kains Island, at the entrance of Quatsino Sound.[49] He counted 14 nests attended by 33 adults on 26 May and 92 abandoned nests on 24 July. On 29 June 2021, Gordon Curry, from Sointula, observed nests with young and estimated over 100 cormorants nesting at this site.[287] A major colony of 140 nests was reported on Hohoae Island in 1991;[267] 12 pairs were estimated nesting here in 1958 but the site had been unused since. Nesting by large numbers of Pelagic Cormorants at these new or long-abandoned sites towards the north end of Vancouver Island may indicate some re-distribution of breeding birds along the west coast of Vancouver Island and further emphasizes the need for region-wide surveys to accurately determine population status and trends.

Black Oystercatcher surveys by Parks Canada since 2000 have indicated stable or increasing nesting populations and have identified several new nesting sites (see below).

Glaucous-winged Gulls were surveyed by Parks Canada on Cleland Island, Florencia Islet, Baeria Rocks, and Seabird Rocks in 2004-2007 [65, 268] and on "White" Island (Figure 657), Sea Lion Rocks, Florencia Islet, and Seabird Rocks in 2008-2014 [264] (Table A1-5). On Florencia Islet, gull numbers in 2005 were similar to those in 1989 but much reduced compared to counts from 1970-1982. Numbers of nests on Cleland Island and Baeria Rocks decreased further between 1989 and 2005, although greater numbers have been reported in recent years than in 2005 on Baeria Rocks. At the four colonies monitored in 2008-2014, total numbers of nests varied from 620 in 2010 to 569 in 2013. Totals were similar to the 608 nests reported on those four colonies in 1989, but much less than the 976 nests counted on the same colonies in 1975. Greatest decreases since 1975 were seen on Florencia Islet and Seabird Rocks. Results of recent surveys suggest that gull populations have not recovered from the abrupt decline seen in 1989 and may have declined further.

Figure 656. In the mid-1970s, Harry Carter became fascinated with nesting seabirds and made a life-long career studying and surveying them along the Pacific coast of North America. An excellent field biologist, he kept detailed records of what he observed, including this Sitka Black-tailed Deer fawn that he encountered near Sandspit during the BCPM surveys in Haida Gwaii. *Photo by R. Wayne Campbell, 19 June 1977.*

Figure 657. Many seabird colony sites in BC have no official, gazetteered name. We assigned names to all unnamed colonies to facilitate the identification of such sites. In some cases, like "White" Island shown here, we simply adopted local names for the site. *Photo by R. Wayne Campbell, August 1970.*

Impacts to nesting gulls have continued since 1990. Traditional egg harvesting apparently continues on Cleland Island and White et al.[247] suspected that increasing Bald Eagle disturbance may have reduced reproductive success of gulls nesting on Seabird Rocks. There is likely increasing human disturbance in the area as well. Intense avian predation on gull eggs was reported in some years on different colonies. In 2008, high levels of predation were noted only on "White" Island. In 2010, predation was intense on "White" Island, Sea Lion Rocks, and Seabird Rocks, but there was no evidence of predation on Florencia Islet. In 2012, there were some signs of predation on Florencia Islet and abundant signs of predation on Seabird Rocks. In 2013, predation was severe on "White" Island, Florencia Islet, and Seabird Rocks, but was less on Sea Lion Rocks.

Surveys in 2011 revealed that other species nesting on Seabird Rocks have also declined or been extirpated; storm-petrels were the only burrow-nesting seabirds still breeding.[55] In addition to eagle and human disturbance, nesting seabirds have also been impacted by river otter and perhaps mink predation. River otters were eliminated from Seabird Rocks in 2012-2016 by Pacific Rim National Park Reserve as a response to declining seabird populations. Potential recovery of nesting species was compromised by the recent elimination of burrowing habitat by winter storms and roosting sea lions (see anecdote on pages 451-453).

Three new nesting sites for Pigeon Guillemots have been reported (Figure 658). At what is locally known as Big Beach (now designated WV-536 "Big Beach" Cliffs) on the west coast at Ucluelet, 14 birds were present and one bird carrying food flew into a crevice on 12 August 2017.[266] Along the West Coast Trail near Walbran Creek (now designated WV-865 "Walbran" Cliffs), six guillemots were seen flying to and from the base of trees rooted on the side of the cliff on 2 August 2018.[266] On 17 August 2019, Ken Summers saw two guillemots near the top of a rocky bluff (now designated WV-875 "Sombrio" Bluffs) in the bay between Sombrio Beach and Sombrio Point; one entered a cavity in the rocks and tree roots.[287]

Figure 658. New nesting sites for Pigeon Guillemots are mostly detected through observations of birds flying to and from nest cavities, often carrying food. Although guillemots have been seen on the majority of seabird colonies in BC, relatively few nests have been located. *Photo by R. Wayne Campbell.*

Table A1-5. Post-1990 data for seabird colonies on the west coast of Vancouver Island except see Table A1-6 for results of Black Oystercatcher surveys conducted by Parks Canada in 2000-2018.

Species	Post-1990 data
WV-010 Gillam Islands	
PECO	Harry Carter found no cormorants nesting on 26 May and 24 July 2012.[49]
PIGU	Many more were seen around the islands in 2009 than had been seen on previous visits. About 150 were present on the rocks and water and some were seen flying in and out of crevices on 4 July 2009.[284]
WV-190 Hohoae Island	
PECO	A major colony of 140 nests was found here in 1991.[267] None had been reported nesting since 1958.
WV-385 Whaler Islets	
BLOY	Nesting was confirmed at this site by John Watson, from Newmarket, Ontario, who observed a nest with two eggs on 24 July 2019.[287]
WV-410 Cleland Island	
LSPE	Rennie et al. studied adult survival rates from 2007 to 2010.[174] They extracted and banded 400 adults from burrows in 2007 and recaptured as many as they could find in the same burrows in 2008, 2009, and 2010. Estimated apparent annual survival was 91.6% the first year after capture and 97.5% in subsequent years; disturbance and capture effects thus reduced apparent annual survival by 6.3% in the first year. Overall, estimated survival rate was the highest documented for the species.
BLOY	Forty-two birds on territories were reported on 12 May 2018.[266]
GWGU	Clarkson et al.[65] counted 1,142 nests on the main island and 214 nests on Murre Reef on 6 July 2004, a decrease of 27% since 1989.[238] Similar numbers (about 1,400 nests) were reported in 2010.[69] Estimates of 900 birds were made on 27 July and 10 August 2014; some large young were seen.[266]
COMU	No murres were nesting on 1 June and 6 July 2004.[65, 116] Carter et al. were confident that two pairs bred in 2006.[60] Up to 15 birds were seen repeatedly at the same location on the island on 12 May 2018.[266]
PIGU	High counts of birds from eBird include 150 on 27 May 2003, 150 on 25 May 2004, 40 on 2 July 2008, 75 on 17 May 2013, 120 on 27 July 2014, 200 on 2 July 2017, 385 on 12 May 2018, and 500 on 1 July 2022.[266, 287] The highest count in 2018 was called a "careful count" [266] and we have used that count as the current estimate. Nests were found in 2022.[287]
TUPU	Many counts submitted to eBird for Cleland Island included puffins seen on the way to the island from Tofino. The highest count of birds recorded for just Cleland Island from eBird was 17 on 13 May 2017.[266]
WV-460 "White" Island	
BRCO	No nests were seen in 2003 [254] or from 2008 to 2012.[59]
PECO	Pete Clarkson observed one nest in 2003.[254]
GWGU	Parks Canada counted nests on 30 June 2008 (22 nests; 9 with eggs or young), 28 June 2010 (62 nests; 40 with eggs or young), 6 July 2011 (71 nests; 70 with eggs or young), and 1 July 2013 (39 nests; 2 with eggs or young).[264] Variation in numbers was similar to that seen in the 1960s and 1970s and suggests that impacts to this colony have continued. Intense avian predation on gull eggs was apparent in 2008, 2010, and especially 2013, when almost all nests had been depredated.[264]
WV-480 Lovekin Rock	
BLOY	One nest with two eggs found on 6 June 2000 [268] confirmed this as a new nesting site.
WV-490 Green Point	
BLOY	A nest with one egg on 15 June 1994 provided the first confirmation of breeding here since 1972.[267] A fledgling accompanied by adults was reported on 17 July 2018, [266] a nest with eggs was found by Ian Cruickshank, from Victoria, on 17 June 2019,[287] and North Saanich birder Trevor Henry reported nesting adults with young on 20 July 2022.[287]

Table A1-5. cont'd

WV-500 Sea Lion Rocks	
BRCO	No nests were seen in 2003 [254] or from 2008 to 2012.[59]
GWGU	Parks Canada counted nests on 1 July 2008 (164 nests; 134 with eggs or young), 28 June 2010 (169 nests; 132 with eggs or young), 6 July 2011 (185 nests; 167 with eggs or young), and 2 July 2013 (110 nests; 88 with eggs or young).[264] Numbers were similar to high counts from the 1960s and 1970s, except for the one from 2013, which was more similar to the reduced numbers seen in 1989. Numerous signs of avian predation on gull eggs were seen in 2010; less abundant signs were seen in 2013.[264]
WV-520 Florencia Islet	
GWGU	A Parks Canada survey tallied 171 nests in 2005,[254] which is similar to the count from 1989 but much reduced compared to 1970-1982. Greater numbers were counted by Parks Canada on 3 July 2008 (256 nests; 199 with eggs or young), 10 July 2009 (329 nests; 285 with eggs or young), 30 June 2010 (256 nests; 230 with eggs or young), 3 July 2012 (299 nests; 259 with eggs or young), and 2 July 2013 (302 nests; 150 with eggs or young),[264] although still less than the maximum of 479 nests found in 1975. A Bald Eagle was seen hunting gull chicks in 2009. There was no evidence of predation on eggs in 2010. Some signs of nest predation were noted in 2012, and abundant signs of predation were seen in 2013 when half the nests were empty.[264]
COMU	None were nesting on 30 June 2004.[116]
WV-550 Starlight Reef	
BRCO	Seven nests were counted in 2003.[254] Carter et al.[59] reported none nesting from 2008 to 2012.
COMU	None were nesting on 30 June 2004.[116]
WV-560 Great Bear Rock	
BRCO	No nests were seen in 2003 [254] or from 2008 to 2012.[59]
PECO	Unused in 2006 and 2007.[57]
WV-570 Alley Rock	
PECO	Unused in 2006 and 2007.[57]
WV-580 Hankin Island	
PECO	Two nests in a cave on the east side in 2006.[57] The location of this cave differs from the surge channel on the south side of the island described by Hatler et al.[107] in 1972.
WV-630 Austin Island	
PECO	Unused in 2006 and 2007.[57]
WV-640 Effingham Island	
PECO	Unused in 2006 and 2007.[57]
WV-670 Dempster Island	
PECO	Unused in 2006 and 2007.[57]
WV-680 Gibraltar Island	
PECO	Unused in 2006 and 2007.[57]
WV-700 Rutley Islands	
PECO	Unused in 2006.[57]

Table A1-5. cont'd

WV-710 Baeria Rocks	
PECO	Unused in 2006 [57] and there was no evidence of nesting on 22 June 2011 or 7 June 2018.[266]
BLOY	Parks Canada counted nests in 2001 and 2005 (see Table A1-6). Other records were listed on eBird: eight birds were counted on each of the north and south islets and some were seen on nests on 22 June 2011; a total of 26 birds, including large young with adults, were feeding in the intertidal on the northern rock on 25 July 2014; and nests with young and totals of 11 and 33 birds were recorded on the north and south rocks on 9 and 26 July 2015, respectively.[266]
GWGU	Only four nests were recorded in 2005 [254] but larger numbers have nested in subsequent years. Many records have been submitted to eBird [266] since 2010. A number of these observations were made by students with the bird class from Bamfield Marine Sciences Centre, including Instructor Joel Heath and assistant Jenn Provencher, and several were submitted by divers and their students. All observations listed below were made from the water. On 22 June 2011, a minimum of 43 nests and a total of 475 adults and 25 juveniles were estimated on the north islet, and a minimum of 22 nests and 145 adults were visible on the south islet. On 1 June 2012, 161 and 72 adults were seen on the north and south islets, respectively; some adults were sitting on nests. On 25 July 2014, adults sitting on nests, various sizes of unfledged young, and totals of 241 and 100 adults were recorded on the north and south islets, respectively. On 9 July 2015, there were 110 adults, 41 nests with adults sitting, and three chicks visible on the north islet; and 35 adults, 17 nests with adults sitting, and six chicks on the south islet. On 26 July 2015, 15 larger chicks, 45 adults still sitting on nests, and a total of 341 adults were seen on the north islet, and 67 adults and 15 chicks were visible on the south islet. On 7 June 2018, adults on nests and a total of 220 adults were seen on the rocks. Whether this included the north or south rock was not specified. On this date, many birds were flying in with nesting material and a large proportion appeared to be Glaucous-winged/Western gull hybrids.
WV-720 Weld Island	
PECO	Unused in 2006.[57]
WV-730 Swiss Boy Island	
PECO	Unused in 2006.[57]
WV-740 Tzartus Island	
PIGU	Four and 12 birds were recorded at two locations on the west side of the island, east of Swiss Boy Island and north of Fry Island, on 26 June 2011.[284] Birds were displaying in pairs and were seen entering cavities at one of the locations. In 2022, eBird contributor Pete Boon reported a small colony of 22 birds occupying 11-12 ledges on 21 July.[287] Adults were seen carrying food.
WV-750 Hosie Islands	
PECO	Unused in 2006.[57]
WV-770 Fleming Island	
PECO	Unused in 2006.[57]
WV-780 Wizard Islet	
BLOY	Parks Canada conducted several surveys between 2004 and 2018 (see Table A1-6). Other records were listed on eBird: four adults and one large young were seen on 27 August 1996; 12 birds including fledglings were present on 13 and 14 July 2011; agitated pairs and a maximum of 10 birds were seen in April 2013; and 20 birds including fledglings were reported on 22 June 2016.[266]
WV-790 Folger Island	
PECO	Cormorants were seen flying into cave in some years between 1986 and 2005. Unused in 2006. Nesting suspected in 2007 – five adults in breeding plumage roosting at cave entrance and one flew into cave.[57]
PIGU	Recent surveys revealed much higher numbers than were ever seen before 1990. In 2013, a maximum of 230 birds were tallied around Folger Island and Leach Islet on 26 April 2013.[266] Many birds were flying to and from nest locations at the top of cliffs. Sixty birds were counted around Folger Island on 2 August 2013.

Table A1-5. cont'd

WV-800 Edward King Island	
PECO	Northern caves were unused in 2006 and 2007. One southern cave held 3-5 nests in 2006 and one nest in 2007. A second southern cave had 6 nests in 2006 and was unused in 2007. The nesting location on the cliffs at the south tip of the island was unused in 2006 and had two nests in 2007.[57]
WV-810 Bordelais Islets	
PECO	Unused in 2006.[57]
WV-820 "Execution" Rock	
PECO	Nesting in some years between 1986 and 2005; unused in 2006 and 2007.[57]
WV-830 Lawton Point	
PECO	One adult flew out of cave in 2006 and 4 nests were seen in 2007.[57]
WV-840 Cape Beale	
PECO	Unused in 2006.[57]
WV-850 Seabird Rocks	
STPE	Fork-tailed and Leach's storm-petrels were confirmed nesting still in 1998 and were heard at the colony during the years 1998-2002 that Doug Bertram and others were conducting studies of Rhinoceros Auklets.[55] Between 2002 and 2011, this small colony may have been nearly extirpated, possibly by river otters.[55] Some depredated remains, primarily of Leach's Storm-Petrels, were found each season from 2005 to 2011. In 2006, over 25 carcasses were found around burrow entrances near the base of the light beacon, most with head and breast tissue removed. In 2011, remains of 22 storm-petrels were seen.[264] Observers in 2011 thought that river otters were primarily responsible for predation on nesting seabirds, although only 3 river otter scats contained bird remains; most contained only fish. A family of 5 river otters were trapped off the island in 2012 and a total of 12 animals were killed between 2012 and 2016.[264] Remains were found of 10 storm-petrels in 2012 and of at least 7 in 2013. One river otter was seen offshore in 2012 but there was no sign of river otter activity in 2014; all runways were overgrown.[264] No bird remains were seen in 2014 or 2017; remains of one Leach's Storm-Petrel were found in 2018. Since 2015, much of the burrowing habitat was destroyed by winter storms and roosting sea lions (see anecdote on page 451). A remnant population of storm-petrels continued to nest through to 2021. From 2017 to 2019, the ratio of Fork-tailed to Leach's storm-petrels changed from about 1:1 to 6:1 in banding/mist-netting data gathered by Parks Canada.[264]
PECO	No nests were seen in 1992,[253] 2001, or 2002.[55] There were eight nests in 2003 but the site was again not used in 2005,[254] 2006, 2007, or 2011.[57]
GWGU	Surveys since 1990 found 194 nests in 1992 [253] and 126 nests (20 with eggs or young) in 2005,[55, 254] suggesting a continued decline. Numbers remained low in 2006 (140 nests) and 2007 (120 nests, 91 with eggs or young; [55, 158]) and have been relatively stable since, except for a low count in 2011. Parks Canada counted nests on 2 July 2008 (131 nests; 82 with eggs or young), 29 June 2010 (133 nests; 70 with eggs or young), 5 July 2011 (88 nests; 36 with eggs or young), 4 July 2012 (126 nests; 71 with eggs or young), 3 July 2013 (118 nests; 11 with eggs or young), and 3 July 2014 (132 nests; 120 with eggs or young).[264] Apparent avian predation on gull eggs was intense in 2010, 2012, and 2013. Eagle pellets full of gull feathers were found in 2013, when most nests were empty. Nests have not been counted since 2014, but several counts of adults on territories were made in 2016 (185-220 birds), 2017 (153-160 birds), 2018 (110-190 birds), 2019 (130-200 birds), 2020 (144 birds), and 2021 (210 birds).[264]
PIGU	Several counts of Pigeon Guillemots around the island have been made by Parks Canada since 2009.[264] Highest counts per year were 82, 154, 161, 164, 170, 143, 240, 215, 250, 150, 180, and 165 birds in 2009, 2010, 2011, 2012, 2013, 2014, 2016, 2017, 2018, 2019, 2020, and 2021, respectively. Two nests and a freshly-killed adult were found in 2011.[264]
CAAU	One chick found in a burrow confirmed breeding on 19 July 1998. No evidence of nesting was found in 2011. [55]

Table A1-5. cont'd

	WV-850 Seabird Rocks cont'd
RHAU	Rhinoceros Auklet studies were conducted by Gail Davoren and Doug Bertram from 1995 to 2002.[10, 55, 70-72] During those studies, up to 40 burrows containing chicks (representing about 30% of the nesting population) were used to collect food samples being delivered by parents. Food was collected from study burrows a maximum of four times per season. Samples of 11 to 17 chicks were handled at 10 days intervals to monitor chick growth. The colony was extirpated sometime before 2011.[55] A cold egg was found in one burrow in 2005. In 2006, burrows appeared unused, although about 100 birds were seen on the water around the island and 10 adult carcasses with the head and breast tissue removed were found near the base of the light, where eagles or other raptors commonly perch. Smaller numbers (1-36 birds) were reported around the island in other years between 2004 and 2017.[264, 266] Some active burrows were seen but not explored near the base of the light in 2007. Remains of three birds were seen in 2011.[264] In 2016, a pair was confirmed breeding for the first time since 2005; an egg was laid but it failed to hatch.[264] Two adults were present when Yuri Zharikov visited the colony in 2020 but none were seen in 2021.[264]
TUPU	The pre-1990 decline continued and no puffins nested on the island after 1998,[55] although one puffin was seen on 25 July 2011 [55] and three birds were seen on 29 June 2004.[266]
WV-930 Race Rocks	
PECO	The colony was unused in 2000,[64] 2008-2009,[168] and 2014.[56] Complete nest failure was reported in 2001 and 2002, thought due to the lack of Pacific Herring (*Clupea pallasii*) feed in the surrounding waters, and only two or three nests successfully hatched eggs in 2003, 2004, and 2005.[168] There were only one or two nests in 2007. Very few cormorants were noted on 1 June 2017.[266]
BLOY	Up to six pairs were reported nesting by personnel from Lester B. Pearson College as of 2004.[73] Two pairs were suspected nesting on 17 June 2017.[266] Fourteen birds, some on nests, were seen on 15 June 2018.[266] Observers noted that numbers were increasing. Nine nests were mapped by Derek Stirling on 26 May 2021.[318]
GWGU	In 2002, after several years of failed nesting, 100 gulls fledged successfully.[169] A. Harding from Lester B. Pearson College reported 115 nests in 2009.[17] Many fledglings were seen on 27 August 2015 but very few gulls were noted on 1 June 2017.[266] On 11 June 2020, a total of 290 gulls were counted, at least 80 were on nests, and many nests held three eggs.[287]
PIGU	High counts of birds from eBird include: 165 on 4 May 2014; 250 on 13 May 2016; 110 on 6 Aug 2017; 100 on 19 August 2018; 165 on 11 June 2020; 136 on 12 August 2021, and 215 on 14 May 2022.[266, 287]
TUPU	One to two puffins were recorded at Race Rocks on 21 June 1999, 9 July 2005, 5 May 2011, and 23 and 29 July 2016.[266]

Black Oystercatcher Surveys conducted on the west coast of Vancouver Island since 2000 by Parks Canada

Parks Canada conducted sporadic surveys of Black Oystercatchers at 42 locations on 37 colonies in 2000-2005,[158, 268] including Cleland Island [65] in 2004 (Table A1-6). They conducted annual monitoring of nesting populations at 21 locations on 15 colonies in 2008-2014,[264] and opportunistically collected survey data at those same locations in 2015-2018. Results to 2005 indicated stable populations of Black Oystercatchers on Cleland Island since 1983, although fewer nests were found in 2005 than 2004. Parks Canada reported increased populations of oystercatchers on Florencia Islet and Seabird Rocks.[158] However, the maximum numbers found nesting on Florencia Islet in the early 2000s were the same as that found in 1989 (nine pairs) while maximum numbers on Seabird Rocks were less than half of that found in 1989. On Starlight Reef, six pairs were found nesting on 6 June 2000; more than were estimated in 1989 but less than were found during the thorough surveys in 1975 and 1982. Fewer nesting pairs were found in 2001-2005 than in 1989 at a few other colonies such as Baeria Rocks, Pinder Rock, and Meade Islets, but generally greater numbers were seen elsewhere, resulting in a net increase since 1989 of about 24 pairs in the areas surveyed in 2001-2005. Most of that increase was at new nesting locations identified in 2001-2005. Numbers were likely underestimated and some nesting sites missed in 1989 because surveys were conducted only from the water unless birds were seen.[236] Thus, nesting populations were likely stable or perhaps increasing between 1989 and 2005.

Table A1-6. Black Oystercatcher surveys conducted by Parks Canada on the west coast of Vancouver Island in 2000-2005, results of annual monitoring of nesting populations at selected colonies within Pacific Rim National Park Reserve in 2008-2014, and data from opportunistic surveys conducted since 2014.[65, 264, 268] Surveys were conducted primarily during the end of May and beginning of June. An asterisk indicates new nesting locations discovered since 1990. New colony numbers assigned since 1990 are in bold. Sites not surveyed are indicated by a dash. Surveys by Parks Canada were conducted at some colonies outside Pacific Rim National Park Reserve as far north as Tibbs Islet in 2005 and as far south as Seabird Rocks. For completeness in this table, we have thus listed all known nesting sites for Black Oystercatchers from Tibbs Islet to Seabird Rocks and summarize the results of the complete survey of this area from 1989.[236] Numbers are nests counted except in 1989 many records indicate pairs that were suspected nesting. When the contents of all nests were determined, the number of nests that contained eggs or young is indicated in square brackets. An "S" indicates that breeding was not confirmed (see Appendix 2).

Colony	1989	2000	2001	2002	2003	2004	2005	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
WV-376 Tibbs Islet	1S	-	-	-	-	-	1S	-	-	-	-	-	-	-	-	-	-	-
WV-378 Shot Islets	2S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-380 Monks Islet	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-385 Whaler Islets	1S	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
WV-390 Leeke Islets	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-394 Burgess Islet	1S	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
WV-396 Hobbs Islet	1S	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
WV-400 Plover Reefs	2S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-410 Cleland Island - main island	35	-	-	-	-	35[17]	27	-	-	-	-	-	-	-	-	-	-	-
- "Murre" Reef	9	-	-	-	-	8[4]	5	-	-	-	-	-	-	-	-	-	-	-
WV-418* "Ahous" Rocks (N of Ahous Pt.)	0	-	-	-	-	5S	-	-	-	-	-	-	-	-	-	-	-	-
WV-419 Foam Reefs	1S	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
WV-420 La Croix Group - northern rocks	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
*- "Wilf Dome" (N of Wilf Rock; E rock)	0	-	-	-	-	1S	1	1[d1]	1	2[1]	2[1]	2[2][d1]	1	-	-	-	3[3]	2[2]
*- "Wilf Plateau" (N of Wilf Rock; large W rock)	0	-	-	-	-	4	5[1]	5[5]	7[7][d2]	7[5][d2]	7[5]	8[8]	8[6]	2[2]	-	1[d1]	2[2]	2[2]
*- "Wilf Seal Haulout (W side of large W rock)	0	-	-	-	-	-	1	1	1	1	1S	0	1S	1	-	-	-	-
*- Wilf Rock (N knob)	0	-	-	-	-	2	2[2]	2[2]	2[2]	2[2]	3[2]	2[1]	2[2]	3[3]	-	2[2]	-	2S
- Wilf Rock (S rock)	1S	-	-	-	-	4	4	6[6]	7[6]	7[6]	7[2]	6[4]	6[3]	-	1	6[4]	1	5[5]
WV-430 Clayoquot Spit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table A1-6. cont'd

Colony	1989	2000	2001	2002	2003	2004	2005	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
WV-435* “MacKenzie” Islet (off Mackenzie Beach)	0	-	-	-	-	-	2	2[2][d1]	3[1]	3[2]	4[4][d1]	5[4]	2[2]	2[2]	-	-	2[1]	2[2][d1]
WV-440 Gowlland Rocks	1S	-	-	-	1	-	-	5[5]	5[5]	5[4]	7[5]	9[9][d1]	9[8][d1]	4[4]	4[4]	-	4[4]	4[3]
WV-445* “Radar” Rocks (off Radar Beaches)	0	-	2S	0	3[3]	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-450 “Portland” Rocks	0	-	-	-	1S	-	-	1	1	1	1	1	1	-	-	-	-	1
WV-460 “White” Island	2S	-	-	-	2S	-	-	2[1]	3[3]	1	3[2]	4[4]	3[3]	3[3]	-	3[2]	2[2]	2[1]
WV-470 “Schooner” Island	0	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-
WV-480* Lovekin Rock	0	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-490 Green Point	-	-	-	-	-	-	1	1	1	1	1	1	1	1[d1]	2[2]	2[2][d2]	2[2]	-
WV-500 Sea Lion Rocks	0	1S	1	-	-	-	-	1S	1	1	3[3]	1S	2S	2[2]	2[1]	-	-	1S
WV-504* “Lismore” Rock[a]	0	-	-	-	1	-	-	2[2]	1	1	2[2]	1	1	1	3[3]	-	-	4[2]
WV-508 “Quisitis” Rocks[b]	1	-	-	-	-	-	-	1	1	1[d1]	1	2[1][d1]	1	1	1	-	1	1[d1]
WV-510 “Cormorant” Rock[c]	0	-	-	-	-	-	-	1	2[2]	1S	1S	2[2]	2[2]	2[2]	1[d1]	-	-	1
WV-520 Florencia Islet	9e	-	4[4]	-	-	5	9	11[9]	10[10]	14[9]	14[11][d2]	14[10]	20[13][d1]	6[5][d1]	14[7][d3]	8[6]	1	8[6]
WV-540* George Fraser Island	0	-	-	-	-	-	1S	-	-	-	-	-	-	-	-	-	-	-
WV-542 Janson Island	2e	-	-	-	-	-	2S	-	-	-	-	-	-	-	-	-	-	-
WV-544 Humphries Reef	1	-	-	-	-	-	1S	-	-	-	-	-	-	-	-	-	-	-
WV-550 Starlight Reef	4e	-	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-560 Great Bear Rock	4e	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-570 Alley Rock	0	-	2S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-575 Pinder Rock	4e	-	2[2]	-	-	-	-	5[5]	5[5]	2[2]	4[2]	5[2][d1]	5[4]	-	3[3]	4[4]	3[3]	1
WV-590 Willis Island	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-600 Turtle Island	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-602* Nantes Island	0	-	1	-	-	-	-	1	1	1	1	0	1	-	1	1	-	-
WV-650 Village Reef	2	-	5	-	-	-	-	4[3]	3[3]	2[2]	5[4]	2[2][d2]	5[4]	-	-	5[5]	2[2]	2[2]
WV-660 Faber Islets - main	0	1	3[3]	-	-	-	-	3[3]	4[4][d4]	1	3[3]	4[4]	2[2]	4[4]	1	-	4[4]	-
- north	0	-	-	-	-	-	-	1	1S	1S	1	1	1	-	1	-	-	-
- west	0	-	-	-	-	-	-	2[2]	2[2][d2]	1S	3[3]	3[3]	3[3][d1]	1	3[3]	-	-	2S
WV-665* Wiebe Island	0	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-690 Swale Rock	1	1	1	-	-	-	-	-	-	2[2]	2[2]	3[3]	4[3]	-	2[1][e]	1	2[2]	3[1]

Table A1-6. cont'd

Colony	1989	2000	2001	2002	2003	2004	2005	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
WV-692 Mahk Rock	1	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-
WV-700 Rutley Islands	1S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-710 Baeria Rocks	11e	-	6	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-
WV-715 Boyson Islands	1S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-722 Stud Islets	1	-	-	-	-	-	1S	-	-	-	-	-	-	-	-	-	-	-
WV-728 Meade Islets	2e	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-
WV-740 Tzartus Island	1	-	-	-	-	-	0	-	-	-	-	-	-	-	-	-	-	-
WV-760 San Jose Islets	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-780 Wizard Islet	5e	-	-	-	-	1S	5[1]	5[5]	-	6[4]	6[4]	3[3]	7[6]	-	3[2][e]	5[5]	3[3]	3[3]
WV-790 Folger Island	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-810 Bordelais Islets	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WV-850 Seabird Rocks	12e	-	-	-	3	-	5	12[12]	14[13][f]	10[8]	14[12]	13[13][d1]	24[14]	7[7]	8[8][d1]	9[9]	5[5]	4[4]
Total nesting population at 25 locations monitored by Parks Canada in 2008-2013 (n/a indicates that surveys were incomplete)																		
Number of nests counted[g]	38	n/a	n/a	n/a	n/a	n/a	n/a	75	n/a	74	96	92	112	n/a	n/a	n/a	n/a	n/a
Number of nests with known contents	0							74		71	94	91	109					
Number of nests containing eggs or young	n/a							70		56	72	79	82					
Number of depredated nests								2		3	3	7	3					

[a] "Lismore" Rock is at the south end of Long Beach.
[b] Called "Petroglyph" Islet in PRNP database.
[c] Called "Petroglyph" Reef in PRNP database.
[d1-4] Number of depredated nests recorded (e.g., d4 indicates that four nests were depredated).
[e] Mink seen in the vicinity.
[f] From Carter et al.[55]
[g] Except total in 1989 which includes nests counted and pairs suspected nesting.

Numbers of Black Oystercatcher nests found on monitored colonies in 2008-2013 were two to three times the number found on those colonies in 1989 (Table A1-6; Figure 659). Much of the difference may have been due to more thorough nest searches on land in 2008-2013. For example, in 1989 in the La Croix Group, observers landed only on Wilf Rock where they saw one pair of oystercatchers; other rocks were boated by and no birds were seen. In 2008-2013, six rocks were explored and the number of nests found ranged from 15 to 20. The number of nests counted on monitored colonies was greatest in 2013, although a larger proportion of empty nests were counted that year, especially on Seabird Rocks. Numbers of nests containing eggs or young were more similar across the years of monitoring, although still greatest in 2013. Fewer nests were found on islands surveyed in the La Croix Group, Gowlland Rocks, Florencia Islet, and Seabird Rocks in 2014 than in 2013. Except for a higher nest count on Florencia Islet in 2015, numbers remained low on these colonies through 2018. At 19 sites that were surveyed in 2018, there were 50 nests in 2018, 106 nests in 2013, 86 nests in 2012, and 69 nests in 2010. Even so, data through 2018 still suggest increased populations since 1989; on colonies surveyed in both 1989 and 2018, numbers of nests increased from 28 in 1989 to 50 in 2018 (Table A1-6).

Figure 659. Black Oystercatcher is a large, easy-to-identify shorebird with distinctive behaviours and piercing calls. Breeding populations in many areas of the BC coast appear to have increased over the last few decades. Surveys of monitored sites in Pacific Rim National Park Reserve in 2008-2013 found two to three times the number of nests that were reported in the same area in 1989. *Photo by R. Wayne Campbell.*

Nine new nesting sites for Black Oystercatchers were discovered since 1990. Two of those were at previously designated colonies on Lovekin Rock and George Fraser Islands (Table A1-6). Breeding was confirmed at Lovekin Rock but not at George Fraser Islands. The other seven new nesting sites were at previously undesignated colony sites. Six of those sites were within areas surveyed by Parks Canada in 2000-2018 and are listed on Table A1-6; they include: 1) rocks north of Ahous Point ("Ahous" Rocks); 2) a rock off MacKenzie Beach ("MacKenzie Islet); 3) rocks in the Radar Beaches area ("Radar" Rocks); 4) a rock at the south end of Long Beach ("Lismore" Rock); 5) Nantes Island in the Broken Group (where one empty scrape was found in 1972; see Appendix 3); and 6) Wiebe Island in the Broken Group. Breeding was confirmed at all these sites except "Ahous" Rocks where five pairs were suspected breeding in 2004. The seventh new colony site was to the north on rocks at the mouth of the Mahope River (now designated WV-118 "Mahope" Rocks) in Battle Bay northwest of the Skirmish Islands in Checleset Bay (one nest with two eggs on 27 June 1991).[267]

New discoveries since 1990 increase the total number of historical breeding sites for Black Oystercatchers in the West Coast Vancouver Island region to 89 from the 80 presented in Table 7 (pages 289-292). Nesting was recorded at all but two of those sites (Willis and Turtle islands) during the most recent survey (from land if applicable) of each colony. Since 1990, nesting has been confirmed on previously suspected breeding sites on Whaler Islets, Burgess Islet, Hobbs Islet, Foam Reefs, and Wilf Rock in the La Croix Group (Table A1-6). The only reported colonies along the west coast of Vancouver Island where breeding has not been confirmed are on Kutcous Islets, Tibbs Islet, Shot Islets, "Ahous" Rocks, George Fraser Islands, Rutley Islands, Boyson Islands, and Folger Island. Thus, breeding has been confirmed on 81 of the 89 known historical colony sites.

Signs of egg predation were seen in a few Black Oystercatcher nests at colonies surveyed in 2008-2013 (Table A1-6). Levels of egg predation were much lower in oystercatcher nests than in Glaucous-winged Gull nests at the same colonies (see above).

Double-crested Cormorants Roost in Sooke

Double-crested Cormorants (Phalacrocorax auritus [*now* Nannopterum auritum[288]]) *have not been recorded nesting on the BC outer coast, but in recent years they have established a major roost in trees on the waterfront in the town of Sooke* (Figure 660). *Ian Cruickshank from Victoria estimated a minimum of 300 birds roosting in trees along the harbour on 12 October 2012.*[287] *Establishment of such a roost site is sometimes a prelude to nesting and we were curious about this site.*

Lily Mah-Sen is an educator and climate justice activist who has lived in Sooke for the last five years. She can see the roost trees from her condo at 6591 Lincroft Road and has kept records of her observations.[287] *We wrote Lily to ask if she had ever seen any evidence of nesting. This was her informative reply.*

"We've lived here for 5 years now, and we have noticed a significant change in their behaviour.

"The first year, in the fall, we witnessed a big flock settling in the trees, stripping leaves furiously. Whenever another flock arrived, they would engage in "warfare" with much squawking, circling, and birds landing on already claimed branches and almost physically pushing each other off their perches. (While we found this highly amusing, we really wondered if we had chosen the wrong place to live!) Eventually everything settled down and the main colony seemed satisfied with their surroundings.

"The second fall, we noticed a little bit of stripping and fighting. But now, it's all rather peaceful, except they still make a lot of noise—at night as well. No new flocks trying to take over.

"Every spring, they leave...one day they're there, 300+; and the next day they are gone. A few juveniles are left behind and they remain throughout the summer. End of August, early September they start coming back. One day there's 8; the next day 20; and so on.

"As to actually nesting, we haven't seen any sign of this at all. No leaf-stripping these past 2-3 years.

"Mind you, there are a couple of resident Bald Eagles who like to swoop down from time to time, and the whole flock gets all agitated flying around. We also witness them working together to fish in the Sooke Harbour.

"There's public access right to their roost, including places to park your car (just be prepared to wipe off the poop from your windshield!) in case you or your colleagues want to study them more intensely."

(contributed by Lily Mah-Sen)

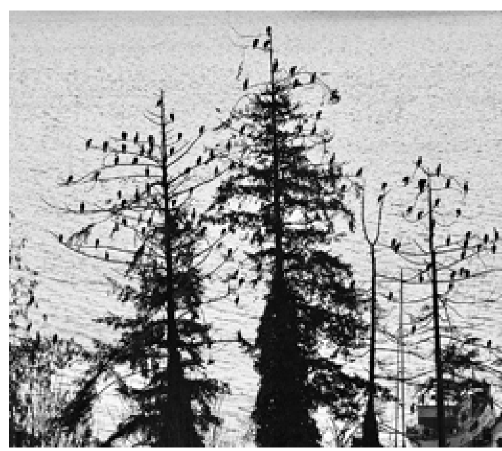


Figure 660. In recent years, Double-crested Cormorants have established a major winter roost in waterfront trees in the town of Sooke, BC. At times, more than 300 birds occupy the roost. *Photo by Lily Mah-Sen, 4 January 2022.*

APPENDIX 2. DATA CODES USED ON SUMMARY TABLES

See Key to Summary Tables on pages 53-56 in Part 1 [188] for a more detailed explanation of codes.

x: Breeding confirmed by at least one pair but no population estimated. When followed by a number (e.g., **x**3) it indicates the number of nests where breeding was confirmed and does not indicate a population estimate. For all species, breeding is confirmed by the presence of eggs (Figure 661) in a burrow, nest, or on a nesting ledge, or unfledged young in or near a nest (Figure 662), including recently hatched or broken eggshells or dead young (Figure 663). 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 (Figure 664).

Figure 661. A nest containing one or more eggs is accepted as a confirmed breeding record for all seabird species. *Photo by R. Wayne Campbell, Sea Lion Rocks, BC, 22 July 1967.*

Figure 662. Young in, or near a nest, unable to sustain flight, confirms breeding at a site. The photo shows two Glaucous-winged Gull chicks and a pipping egg. *Photo by R. Wayne Campbell, July 1980.*

Figure 663. Broken eggs, either depredated or accidentally damaged by surveyors, constitute a confirmed breeding record. *Photo by R. Wayne Campbell, Dawson Island, BC, 31 July 1977.*

Figure 664. For Pelagic Cormorants, observation of an adult sitting on a nest is accepted as a confirmed breeding record even if nest contents have not been determined. *Photo by R. Wayne Campbell.*

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. 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 and Thick-billed 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 on Tables

Codes for species names follow Campbell and Harcombe.[35]

NOFU: Northern Fulmar *Fulmaris glacialis*

FTSP: Fork-tailed Storm-Petrel *Oceanodroma furcata*

LSPE: Leach's Storm-Petrel *O. leucorhoa*

BRCO: Brandt's Cormorant *Phalacrocorax penicillatus* (*Urile penicillatus* [288])

PECO: Pelagic Cormorant *P. pelagicus* (*Urile pelagicus* [288])

BLOY: Black Oystercatcher *Haematopus bachmani*

WEGU: Western Gull *Larus occidentalis*

GWGU: Glaucous-winged Gull *Larus glaucescens*

COMU: Common Murre *Uria aalge*

TBMU: Thick-billed Murre *U. lomvia*

PIGU: Pigeon Guillemot *Cepphus columba*

ANMU: Ancient Murrelet *Synthliboramphus antiquus*

CAAU: Cassin's Auklet *Ptychoramphus aleuticus*

RHAU: Rhinoceros Auklet *Cerorhinca monocerata*

HOPU: Horned Puffin *Fratercula corniculata*

TUPU: Tufted Puffin *F. cirrhata*

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 665). 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. Sources of data are the same as those for confirmed colony sites. Many records are from the BCPM surveys conducted in the mid-1970s (Figures 666-668). 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.

Figure 665. This small rock in the Fox Group located in Retreat Passage off the northwest end of Gilford Island was explored for nesting seabirds in 1982. No seabirds were present then but a pair of Glaucous-winged Gulls is visible in this photo from 2015. Gulls may now nest on these islands. *Photo by Paula Courteau, 24 May 2015.*

Figure 666. Scarf Island has steep rocky bluffs and a dense crown of Sitka spruce with scattered snags (left). The interior is impenetrable salal. Signs of old burrows, two Black Oystercatchers, and an immature Pelagic Cormorant were seen in 1976. *Photos by R. Wayne Campbell, 26 June 1976.*

Figure 667. Centre Island is heavily forested to the tideline. Observations in 1977 were made only from the water. *Photo by R. Wayne Campbell, 8 July 1977.*

Figure 668. Shag Islet has a steep, rocky perimeter, dense salal under a sparse Sitka spruce forest, and a few snags. The islet has potential habitat for nesting seabirds, but no seabirds were seen when it was surveyed by the BCPM in 1975. *Photo by R. Wayne Campbell, 18 June 1975.*

Sightings of seabirds are listed for each site, and unless otherwise indicated, birds are assumed to be roosting, feeding, or sitting on the water. Any evidence suggesting breeding is noted (Figure 669). Sightings and signs of small mammals are also noted. Breeding has been suspected at some sites and future investigations may confirm breeding at those locations. Possible current nesting populations at all sites listed here 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 669. Whitesand Island in the Dundas Islands group has a firm shell beach encircling the island with some rock outcroppings and tidal rock shelves. In 1987, four Black Oystercatchers were present and four empty scrapes were found, but nesting was not confirmed. Future surveys may confirm this as a breeding site. *Photo by Moira J.F. Lemon, 13 May 1987.*

In 1989, many areas along the west coast of Vancouver Island were surveyed for Pelagic Cormorants, Black Oystercatchers, Glaucous-winged Gulls, and Pigeon Guillemots.[84, 236, 238] During those surveys, observers boated around almost all islands along that coastline, but only reported observations for islands where nesting by those seabird species was observed or suspected, or where previous records had indicated breeding in the past. No records survive on what was observed on islands with no history of breeding by seabirds,[258] and we have not attempted here to list all the islands that might have been visited. However, "negative" data for many islands can be inferred from those studies and the relevant publications [84, 236, 238] should be consulted to determine which islands were surveyed.

Table A3-1. Islands surveyed along the BC Outer Coast, from north to south, with no record of breeding by seabirds. Any adult seabirds, possible evidence of nesting, or mammalian predators observed at these sites are noted.

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Northern Mainland Coast					
Gnarled Islands	103 J/10	54°38’27”N	130°50’00”W	3 Jul 1976	(265)
				17 May 1987	5 BLOY - 3 empty scrapes on N islets, 4 GWGU, 5 PIGU; mink burrows (182)
				2 Jul 2021	7 PECO, 38 PIGU (287)
				30 Jun 2022	2 BLKI, 20 PIGU, 12 RHAU, 8 TUPU (287)
White Islets	103 J/10	54°38’07”N	130°55’20”W	17 May 1987	3 GWGU; fresh beaver sign; mink burrows (182)
Holliday Island	103 J/10	54°37’23”N	130°45’34”W	3 Jul 1976	(265)
				17 May 1987	mink burrows (182)
Whitesand Island (see Figure 669)	103 J/10	54°30’50”N	130°45’02”W	3 Jul 1976	(265)
				13 May 1987	4 BLOY; 4 empty scrapes on shell beach (182)
Ducie Island	103 J/10	54°30’49”N	130°46’22”W	13 May 1987	suspected mink burrows (182)
Nares Islets	103 J/10	54°31’06”N	130°49’18”W	13 May 1987	small NE islets; 14 BLOY on tidal rocks; 6 GWGU roosting; 1 PIGU offshore; suspected mink burrows (182)
Baron Island	103 J/7	54°28’00”N	130°49’00”W	12-19 May 1987	4 GWGU, 3 PIGU, 20 MAMU off NW side; 2 mink (182)
Moffat Islands	103 J/7	54°28’23”N	130°44’52”W	13 May 1987	small N islets; 1 mink (182)
“Jackal” Rocks	103 J/7	54°22’34”N	130°50’14”W	3 Jul 1976	off Jackal Point (265)
Archibald Islands	103 J/2	54°12’26”N	130°49’54”W	28 Jun 1976	(265)
				21 May 1987	2 BLOY, 2 GWGU, 8 PIGU; 3 mink and mink burrows (182)
China Islet	103 J/2	54°08’47”N	130°50’03”W	30 Jun 1976	(265)
“Philip” Rock	103 J/2	54°08’12”N	130°49’00”W	22 May 1987	52’ rock S of Philip I.; from water only (182)
Cruice Rock	103 J/1	54°06’57”N	130°20’46”W	27 May 1987	6 GWGU (182)
Alice Island + S islets	103 J/1	54°06’26”N	130°26’50”W	27 May 1987	2 GWGU; 1 mink (182)
Rod Island	103 J/2	54°05’40”N	130°41’09”W	22 May 1987	from water only (182)
Creak Islands	103 J/1	54°04’57”N	130°29’31”W	27 May 1987	outer NW islets only; mink burrows (182)
Warrior Rocks	103 J/2	54°03’52”N	130°51’08”W	30 Jun 1976	1 PECO, 1 PIGU (265)
“Henry” Islet	103 J/2	54°01’32”N	130°38’02”W	22 May 1987	108’ islet E of Henry I.; mink burrows (182)
Fog Islands	103 J/2	54°00’23”N	130°41’07”W	22 May 1987	mink in a burrow (182)
Seal Rocks	103 J/2	53°59’58”N	130°47’31”W	30 Jun 1976	(265)
Bass Rock	103 G/15	53°56’16”N	130°43’53”W	22 May 1987	75 PECO roosting (182)
Oval Point	103 G/15	53°56’00”N	130°43’36”W	22 May 1987	44 BLOY & 30 GWGU on tidal rock; 1 mink (182)
Fan Island	103 G/15	53°54’20”N	130°44’21”W	30 Jun 1976	(265)
Gilttoyees Inlet	103 H/15	53°49’53”N	128°58’19”W	2006	< 30 PIGU (293)
Coste Rocks (now designated **MC-205**)[b]	103 H/15	53°48’21”N	128°47’18”W	4 Jul 1975	2 rocks 2.1 km SW of Louis Pt. on Coste I.; 16 GWGU (265)
Grassy Island	103 G/16	53°48’23”N	130°24’00”W	25 May 1987	(182)
Shakes Islands	103 G/15	53°48’19”N	130°30’32”W	24 May 1987	NW 225’ island only (182)
Moore Island	103 G/15	53°47’20”N	130°31’16”W	25 May 1987	from water only (182)
Prager Islands	103 G/15	53°46’00”N	130°31’37”W	25 May 1987	W and S islands; 35 MAMU; mink burrows (182)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Barren Rocks	103 G/15	53°45'45"N	130°31'52"W	25 May 1987	8 imm. PECO, 2 BLOY, 12 imm. GWGU (182)
Sentinel Islet	103 G/9	53°44'54"N	130°28'59"W	25 May 1987	plus islets to NE; 1 GWGU; mink burrows (182)
Christie Islands	103 G/9	53°44'03"N	130°24'34"W	25 May 1987	mink burrows (182)
Friday Island	103 G/9	53°43'23"N	130°23'47"W	25 May 1987	from water only (182)
Ralph Islands	103 G/9	53°43'05"N	130°25'09"W	25 May 1987	mink burrows (182)
White Rocks	103 G/10	53°37'56"N	130°33'58"W	25 May 1987	2 mink and mink burrows (182)
Archie Rock	103 G/10	53°37'05"N	130°35'43"W	25 May 1987	from water only (182)
Wells Islet	103 G/10	53°34'49"N	130°34'58"W	25 May 1987	mink burrows (182)
Bonilla Island	103 G/10	53°29'20"N	130°36'40"W	29 Jun 1976	(265)
Porter Island	103 A/13	52°56'54"N	129°33'50"W	2 Jun 1970	(265)
Jacinto Islands	103 A/13	52°56'32"N	129°36'49"W	28 Jun 1976	(265)
Trenaman Island	103 A/11	52°39'56"N	129°14'54"W	28 Jun 1976	(265)
"Kettle" Islet	103 A/11	52°42'31"N	129°17'11"W	28 Jun 1976	at entrance to Kettle Inlet (265)
				11 Jun 1988	from water only (182)
South Arriaga Island	103 A/11	52°30'25"N	129°06'21"W	24 Jun 1988	(182)
Jaffrey Rock	103 A/7	52°27'28"N	128°49'19"W	24 Jun 1988	probably wave-washed (182)
Susan Rock	103 A/7	52°17'10"N	128°30'22"W	24 Jun 1988	probably wave-washed (182)
McMullin Group	103 A/1	52°02'14"N	129°24'38"W	21 Jun 1976	SE 26' islet only; mink (265)
				28 Jun 1988	W rocks only (182)
Fog Rocks	92 M/13	51°58'19"N	127°55'00"W	23 Aug 1986	3 BLOY, 20 GWGU (287)
				1 Jun 2008	5 PECO, 4 BLOY, 44 GWGU, 70 PIGU (287)
				17 Jun 2016	4 BLOY, 5 GWGU, 40 PIGU (287)
				23 Mar 2019	10 PECO, 12 BLOY, 300 GWGU, 11 PIGU (287)
				13 Jul 2019	3 PECO, 2 BLOY, 50 GWGU, 21 PIGU (287)
				14 Sep 2021	1 BLOY, GWGU (287)
				2 May 2022	10 GWGU on rocks, 20 PIGU on rocks (287)
Simonds Group	102 P/16	51°57'00"N	128°17'08"W	21 Jun 1976	(265)
Purple Bluff	102 P/16	51°56'23"N	128°18'12"W	29 Jun 1988	1 PIGU, 6 MAMU (182)
Granville Islands	102 P/16	51°55'12"N	128°16'48"W	29 Jun 1988	from water only (182)
"Spider" Rocks	102 P/16	51°51'46"N	128°15'31"W	29 Jun 1988	N and E sides of Spider I.; from water only (182)
"Edna" Rocks	102 P/16	51°49'06"N	128°15'42"W	29 Jun 1988	W of Edna I.; from water only (182)
"Nalau" Islets	102 P/16	51°48'30"N	128°01'07"W	20 Jun 1976	at E entrance to Nalau Passage (265)
"Manley" Islets	102 P/16	51°48'29"N	128°10'30"W	20 Jun 1976	islets E and S of Manley I. (265)
"Kidney" Islet	102 P/16	51°47'24"N	128°12'25"W	20 Jun 1976	56' islet S of Kidney I. (265)
Serpent Group	102 P/16	51°47'13"N	128°10'00"W	20 Jun 1976	islets at S end of group only (265)
"Stirling" Rocks	102 P/9	51°46'31"N	128°07'58"W	19 Jun 1976	rocks and small islets along E and W sides of Stirling I. (265)
Planet Group	102 P/9	51°44'51"N	128°03'53"W	19 Jun 1976	(265)
Odlum Island	102 P/9	51°41'26"N	128°07'18"W	19 Jun 1976	(265)
Surf Islands	102 P/9	51°39'56"N	128°09'10"W	19 Jun 1976	(265)
"Calvert" Rocks	102 P/9	51°38'55"N	128°09'48"W	19 Jun 1976	at NW corner of Calvert I. (265)
Blackney Island	102 P/8	51°29'40"N	128°06'25"W	19 Jun 1976	(265)
Edna Mathews Island	92 M/12	51°35'40"N	127°33'35"W	8 Aug 1977	plus surrounding islets (265)
Ida Island	92 M/12	51°34'01"N	127°31'33"W	8 Aug 1977	3 MAMU (265)
Ethel Island	92 M/12	51°33'12"N	127°31'45"W	8 Aug 1977	4 MAMU (265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Florence Island	92 M/12	51°31'45"N	127°32'02"W	8 Aug 1977	(265)
Clip Rock	92 M/12	51°32'27"N	127°47'58"W	8 Aug 1977	(265)
"Arthur" Rock	92 M/12	51°32'01"N	127°48'06"W	8 Aug 1977	NW of Arthur Point (265)
"Pierce" Islets	92 M/12	51°31'47"N	127°46'00"W	8 Aug 1977	in Pierce Bay (265)
Bald Islet	92 M/12	51°31'10"N	127°47'17"W	8 Aug 1977	plus 16' rock to SW (265)
Welch Island	92 M/12	51°31'20"N	127°42'30"W	8 Aug 1977	(265)
Stevens Rocks	92 M/12	51°30'47"N	127°40'07"W	8 Aug 1977	(265)
Lone Island	92 M/12	51°30'32"N	127°44'45"W	8 Aug 1977	(265)
"Klaquaek" Islets	92 M/12	51°29'50"N	127°41'45"W	8 Aug 1977	at N end of Klaquaek Channel (265)
Jennie Islet	102 P/8	51°28'03"N	128°03'18"W	19 Jun 1976	(265)
Harold Rock	102 P/8	51°27'53"N	128°03'46"W	19 Jun 1976	wave-washed (265)
Charley Islands	92 M/5	51°26'36"N	127°58'07"W	19 Jun 1976	(265)
O'Neil Islet	92 M/5	51°26'05"N	127°57'17"W	19 Jun 1976	(265)
Sorrow Islands	92 M/5	51°25'00"N	127°55'05"W	19 Jun 1976	(265)
Paddle Rock	92 M/5	51°22'33"N	127°48'17"W	2 Jul 1988	from water only; roosting rock (182)
False Egg Island	92 M/5	51°19'28"N	127°48'21"W	18 Jun 1976	(265)
Tie Island	92 M/5	51°19'17"N	127°47'14"W	18 Jun 1976	(265)
Brown Island	92 M/5	51°18'34"N	127°46'23"W	18 Jun 1976	(265)
Table Island	92 M/5	51°16'00"N	127°48'25"W	17 Jun 1976	from water only (265)
Queen Charlotte and Johnstone Straits					
Mayor Island	92 M/4	51°02'34"N	127°35'49"W	18 Jul 1975	trails and burrow of mink suspected (265)
Dickenson Rock	92 M/4	51°00'32"N	127°34'37"W	18 Jul 1975	(265)
Southgate Group	92 L/13	51°00'00"N	127°31'40"W	18 Jul 1975	from water only (265)
Wallace Islands	92 L/14	50°57'43"N	127°27'30"W	18 Jul 1975	from water only (265)
Wentworth Rock	92 L/13	50°57'19"N	127°30'13"W	18 Jul 1975	probably wave-swept; 1 PECO in breeding plumage, 2 ad. GWGU (265)
Jeannette Islands	92 L/14	50°55'22"N	127°24'40"W	11 Jul 1975	from water only (265)
				30 Jun 1982	(259, 265)
Ghost Island	92 L/14	50°54'47"N	127°25'26"W	11 Jul 1975	(265)
				30 Jun 1982	(259, 265)
Millar Group	92 L/14	50°55'20"N	127°27'32"W	11 Jul 1975	from water except two NW islands landed on (265)
				30 Jun 1982	1 PIGU (259, 265)
Torrance Islet	92 L/13	50°55'10"N	127°33'37"W	11 Jul 1975	(265)
				3 Jul 1982	(259, 265)
Hedley Islands	92 L/13	50°54'37"N	127°34'21"W	11 Jul 1975	7 PECO (2 in breeding plumage; 5 BLOY - 1 inactive scrape; 1 ad. GWGU; 2 PIGU (259, 265)
				3 Jul 1982	6 BLOY - no nests (259, 265)
Jane Rock	92 L/13	50°54'39"N	127°35'51"W	11 Jul 1975	(265)
				3 Jul 1982	(259, 265)
"Redfern" Islet	92 L/13	50°54'31"N	127°35'14"W	11 Jul 1975	N of Redfern I.; 9 BLOY (265)
Redfern Island	92 L/13	50°54'12"N	127°35'16"W	11 Jul 1975	3 PIGU; otter or mink trails (259, 265)
				3 Jul 1982	(259, 265)
"Redfern" Rock	92 L/13	50°53'51"N	127°34'59"W	11 Jul 1975	SE of Redfern Island (265)
Walker Group	92 L/13	50°53'55"N	127°30'45"W	11 Jul 1975	only island NE of Staples I. explored; rest from water only; 3 ad. GWGU (259, 265)
				3 Jul 1982	(259, 265)
Browning Islands	92 L/14	50°53'48"N	127°19'54"W	30 Jun 1982	(259, 265)
Richard Islets	92 L/14	50°54'00"N	127°26'36"W	5 Jul 1968	(265)
				11 Jul 1975	2 PECO (259, 265)
				30 Jun 1982	(259, 265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Willoughby Rocks	92 L/14	50°53’44”N	127°27’38”W	5 Jul 1968	(265)
				11 Jul 1975	2 PECO (259, 265)
				30 Jun 1982	(259, 265)
Raynor Group	92 L/14	50°53’00”N	127°14’30”W	30 Jun 1982	1 GWGU (259, 265)
Echo Islands	92 L/14	50°52’37”N	127°26’23”W	11 Jul 1975	from water except NW island landed on (265)
				30 Jun 1982	(259, 265)
Deserters Group	92 L/14	50°52’40”N	127°29’00”W	11 Jul 1975	not Deserters I.; from water except two small SW islands landed on (265)
				30 Jun 1982	(259, 265)
Race Island	92 L/13	50°52’27”N	127°30’33”W	11 Jul 1975	lots of river otter scats and trails (259, 265)
				2 Jul 1982	(259, 265)
Cardigan Rocks	92 L/13	50°52’33”N	127°38’57”W	11 Jul 1975	(265)
Balaklava Island	92 L/13	50°51’00”N	127°37’30”W	10 Jul 1975	S end and W side explored; rest from water (265)
“Boxer” Cliffs	92 L/13	50°50’04”N	127°39’56”W	10 Jul 1975	W of Boxer Pt. on Nigei I.; from water only (265)
				2 Jul 2009	2 empty PECO nests (49)
“Boxer” Islet	92 L/13	50°49’51”N	127°38’57”W	10 Jul 1975	off Boxer Pt. on Nigei I.; from water only (265)
Lucan Islands	92 L/13	50°50’00”N	127°37’53”W	10 Jul 1975	from water only (265)
Jerome Island	92 L/13	50°49’36”N	127°37’23”W	10 Jul 1975	(265)
“Jerome” Rock	92 L/13	50°49’27”N	127°37’18”W	10 Jul 1975	S of Jerome Island (265)
Boyle Island	92 L/13	50°51’06”N	127°33’26”W	10 Jul 1975	mink or river otter trails (259, 265)
				2 Jul 1982	(259, 265)
Hurst Island	92 L/13	50°50’15”N	127°34’45”W	10 Jul 1975	from water only (265)
				12 Jun 1976	(265)
“Harlequin” Island	92 L/13	50°50’25”N	127°33’28”W	10 Jul 1975	E of Harlequin Bay on Hurst Island (265)
Bell Island	92 L/13	50°50’12”N	127°32’30”W	10 Jul 1975	plus surrounding unnamed islands; from water only (265)
“Bell” Islet	92 L/13	50°49’56”N	127°33’13”W	10 Jul 1975	S between Bell I. and Hurst I.; mink trails (265)
Heard Island	92 L/13	50°49’45”N	127°30’45”W	10 Jul 1975	from water only (265)
“Heard” Islets	92 L/13	50°49’24”N	127°30’46”W	10 Jul 1975	S of Heard Island (265)
Noble Islets	92 L/13	50°49’13”N	127°35’26”W	10 Jul 1975	2 BLOY - 2 scrapes, no eggs or young; river otter sign (259, 265)
Blyth Islands	92 L/13	50°49’05”N	127°33’51”W	10 Jul 1975	(265)
Duncan Island	92 L/13	50°48’50”N	127°33’05”W	10 Jul 1975	from water only (265)
Gordon Islands	92 L/14	50°48’40”N	127°28’25”W	30 Jun 1982	except “Doyle” Rocks; good burrowing habitat; mink sign (259, 265)
Masterman Islands	92 L/14	50°45’29”N	127°25’34”W	10 Jul 1975	from water only (265)
Charlie Islands	92 L/11	50°44’08”N	127°23’26”W	10 Jul 1975	1 GWGU (265)
Peel Island	92 L/11	50°43’40”N	127°23’45”W	10 Jul 1975	from water only (265)
Twin Rocks	92 L/11	50°43’31”N	127°22’49”W	10 Jul 1975	(265)
Round Island	92 L/11	50°43’28”N	127°21’56”W	10 Jul 1975	(265)
Cattle Islands	92 L/11	50°42’45”N	127°24’12”W	10 Jul 1975	from water only (265)
Deer Island	92 L/11	50°42’52”N	127°22’45”W	10 Jul 1975	from water only (265)
Shell Island	92 L/11	50°42’29”N	127°24’24”W	10 Jul 1975	(265)
Lewis Rocks	92 L/14	50°48’53”N	127°02’54”W	19 Jul 1975	1 empty GWGU nest; 16 GWGU roosting, did not act as though nesting (265)
				30 Jun 1982	(259, 265)
“Boyle” Islets	92 L/14	50°48’56”N	127°01’09”W	19 Jul 1975	off Boyles Point (265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Ommaney Islet	92 L/15	50º50’04”N	126º58’07”W	29 Jun 1982	including surrounding islets (259, 265)
“Dickson” Islets	92 L/15	50º49’53”N	126º56’09”W	29 Jun 1982	islets around Dickson Island (259, 265)
Percy Island	92 L/15	50º49’24”N	126º57’00”W	19 Jul 1975	from water only (265)
				29 Jun 1982	(259, 265)
Drew Islet	92 L/15	50º49’18”N	126º55’14”W	29 Jun 1982	(259, 265)
Vincent Island	92 L/15	50º48’45”N	126º56’04’W	19 Jul 1975	from water only (265)
				29 Jun 1982	(259, 265)
Polkinghorne Islands	92 L/15	50º47’40”N	126º55’55”W	19 Jul 1975	from water except SE island and W side of largest island explored; river otter scats and trails (259, 265)
				29 Jun 1982	2 GWGU; 25 RHAU (259, 265)
Burdwood Group	92 L/16	50º47’55’N	126º29’15”W	26 Jun 1982	(259, 265)
“Twin” Islands	92 L/15	50º47’19”N	126º39’41”W	29 Jun 1982	at the mouth of Twin Lagoon (259, 265)
“Booker” Islands	92 L/15	50º45’53”N	126º45’15”W	29 Jun 1982	unnamed islands at the mouth of Booker Lagoon, S of Long I. (259, 265)
Olden Island	92 L/15	50º46’12”N	126º44’55”W	29 Jun 1982	(259, 265)
Nelly Islet	92 L/15	50º45’58”N	126º44’43”W	29 Jun 1982	(259, 265)
Duff Islet	92 L/15	50º45’22”N	126º43’22”W	19 Jul 1975	from water only (265)
Screen Island	92 L/10	50º44’57”N	126º43’25”W	19 Jul 1975	from water only (265)
				29 Jun 1982	(259, 265)
Holford Islets	92 L/10	50º44’00”N	126º48’27”W	19 Jul 1975	no seabirds seen; possible PIGU burrow start, 10” deep; 1 BLOY scrape; river otter scats and trails (259, 265)
				29 Jun 1982	1 BLOY flying (259, 265)
Fox Group (see Figure 665)	92 L/10	50º43’31”N	126º35’38”W	26 Jun 1982	(259, 265)
Crib Island	92 L/10	50º43’36”N	126º42’12”W	20 Jul 1975	(265)
Huston Islet	92 L/10	50º43’32”N	126º43’09”W	19 Jul 1975	from water only (265)
Liska Islet	92 L/10	50º43’18”N	126º43’26”W	19 Jul 1975	from water only (265)
Kate Islet	92 L/10	50º43’16”N	126º43’06”W	19 Jul 1975	from water only (265)
Narrows Islet	92 L/10	50º43’13”N	126º42’41”W	19 Jul 1975	from water only (265)
Angular Island	92 L/10	50º43’07”N	126º42’00”W	20 Jul 1975	from water only (265)
Coach Islets	92 L/10	50º42’40”N	126º42’43”W	20 Jul 1975	(265)
				27 Jun 1982	8 vocal BLOY; 2 ad. GWGU; no nests found (259, 265)
Fog Islets	92 L/10	50º42’06”N	126º41’18”W	20 Jul 1975	from water only (265)
				26 Jun 1982	10 ad.+ 6 imm. GWGU on reef (259, 265)
Cove Islet	92 L/10	50º41’47”N	126º40’42”W	20 Jul 1975	from water only (265)
Loon Rock	92 L/10	50º41’47”N	126º41’26”W	20 Jul 1975	1 GWGU (265)
Trap Rock	92 L/10	50º41’37”N	126º41’23”W	20 Jul 1975	(265)
Ledge Rock	92 L/10	50º41’33”N	126º41’50”W	20 Jul 1975	40 GWGU; 8 imm. PECO (265)
Start Island	92 L/10	50º41’13”N	126º41’50”W	20 Jul 1975	from water only (265)
				26 Jun 1982	(259, 265)
Sail Island	92 L/10	50º41’19”N	126º36’30”W	26 Jun 1982	(259, 265)
Yellow Rock	92 L/10	50º41’05”N	126º36’00”W	26 Jun 1982	8 GWGU (259, 265)
High Island	92 L/10	50º41’01”N	126º40’57”W	20 Jul 1975	from water only (265)
Sedge Islands	92 L/10	50º40’50”N	126º41’35”W	20 Jul 1975	from water only (265)
Gilford Rock	92 L/10	50º40’51”N	126º36’42”W	26 Jun 1982	(259, 265)
Seabreeze Island	92 L/10	50º40’32”N	126º37’30”W	26 Jun 1982	(259, 265)
House Islet	92 L/10	50º40’10”N	126º42’14”W	20 Jul 1975	(265)
Canoe Islets	92 L/10	50º39’59”N	126º41’32”W	20 Jul 1975	from water only (265)
				26 Jun 1982	8 BLOY, 3 GWGU (259, 265)
Morning Islets	92 L/10	50º39’42”N	126º39’24”W	26 Jun 1982	(259, 265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Fire Island	92 L/10	50°39'09"N	126°42'08"W	20 Jul 1975	from water only (265)
Round Islet	92 L/10	50°38'49"N	126°43'44"W	20 Jul 1975	plus islet SW; from water only (265)
Passage Islet	92 L/10	50°38'40"N	126°42'28"W	20 Jul 1975	from water only (265)
				26 Jun 1982	(259, 265)
Wedge Island	92 L/10	50°38'11"N	126°43'18"W	20 Jul 1975	plus NW islet; from water only (265)
				26 Jun 1982	2 BLOY on reef (259, 265)
Night Islet	92 L/10	50°38'04"N	126°40'21"W	20 Jul 1975	from water only (265)
Jumble Islands	92 L/10	50°38'08"N	126°39'35"W	20 Jul 1975	from water only (265)
Pering Islets	92 L/10	50°38'07"N	126°38'53"W	20 Jul 1975	from water only (265)
Lord Islet	92 L/9	50°38'28"N	126°26'28"W	20 Jul 1975	from water only (265)
Lady Islands	92 L/9	50°38'34"N	126°25'00"W	20 Jul 1975	from water only (265)
Puzzle Islands	92 L/10	50°37'49"N	126°43'02"W	26 Jun 1982	(259, 265)
Mist Island	92 L/10	50°37'42"N	126°42'37"W	26 Jun 1982	(259, 265)
Twist Island	92 L/10	50°37'42"N	126°41'44"W	20 Jul 1975	from water only (265)
Whirl Island	92 L/10	50°37'35"N	126°41'20"W	20 Jul 1975	from water only (265)
Western Islets	92 L/10	50°37'13"N	126°41'57"W	26 Jun 1982	(259, 265)
Haddington Island	92 L/11	50°36'05'N	127°01'18"W	9 Jul 1975	N side explored on foot; rest from water (265)
Cormorant Island	92 L/10	50°35'30"N	126°55'30"W	9 Jul 1975	from water only along NE side (265)
Stubbs Island (now designated **QS-309**)[c]	92 L/10	50°36'14"N	126°49'01"W	9 Jul 1975	3 PIGU (259, 265)
Pearse Islands	92 L/10	50°35'13"N	126°50'09"W	9 Jul 1975	only island E of Kuldekduma I. explored (265)
Ksuiladas Island	92 L/10	50°35'20"N	126°47'52"W	9 Jul 1975	2 imm. GWGU (259, 265)
Spout Islet	92 L/10	50°35'25"N	126°44'56"W	9 Jul 1975	1 PECO non-breeding, 1 imm. GWGU; river otter sign (259, 265)
"Double Bay" Islets	92 L/10	50°35'20"N	126°45'32"W	9 Jul 1975	at mouth of Double Bay; from water only (265)
"Blackfish" Islets	92 L/10	50°35'15"N	126°44'14"W	9 Jul 1975	N side of Hanson I.; from water only (265)
Weynton Island	92 L/10	50°34'22"N	126°47'27"W	9 Jul 1975	from water only (265)
Hanson Island	92 L/10	50°35'00"N	126°45'00"W	9 Jul 1975	only N&W sides explored; lots of mink sign (265)
"Blackney" Islets	92 L/10	50°33'43"N	126°41'34"W	8 Jul 1975	E side of Hanson I.; from water only (265)
Bowers Islands	92 L/9	50°34'54"N	126°13'46"W	20 Jul 1975	(265)
Tom Islet	92 L/9	50°33'34"N	126°12'25"W	20 Jul 1975	from water only (265)
Triangle Island	92 L/9	50°33'31"N	126°12'16"W	20 Jul 1975	from water only (265)
Bockett Islets	92 L/9	50°32'16"N	126°14'00"W	20 Jul 1975	from water only (265)
Havannah Islets	92 L/9	50°32'14"N	126°15'02"W	20 Jul 1975	from water only (265)
Lily Islet	92 L/9	50°31'53"N	126°15'24"W	20 Jul 1975	from water only (265)
Sophia Islands	92 L/10	50°32'03"N	126°38'09"W	8 Jul 1975	3 imm. PECO, 13 imm. GWGU (259, 265)
				25 Jun 1982	(259, 265)
"Boat Bay" Islet	92 L/10	50°31'17"N	126°33'28"W	8 Jul 1975	off Boat Bay; from water only (265)
				25 Jun 1982	(259, 265)
Bush Islets	92 L/9	50°31'01"N	126°24'34"W	8 Jul 1975	(265)
				25 Jun 1982	(259, 265)
"Forward Bay" Rock	92 L/9	50°31'27"N	126°22'58"W	8 Jul 1975	(265)
				25 Jun 1982	(259, 265)
Broken Islands	92 L/9	50°30'45"N	126°17'40"W	8 Jul 1975	12 PECO (non-breeding), 21 imm. GWGU, lots of river otter sign (259, 265)
				25 Jun 1982	(259, 265)
Milly Island	92 L/8	50°28'57"N	126°05'51"W	8 Jul 1975	(265)
				25 Jun 1982	(259, 265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Jesse Island	92 L/8	50°28’23”N	126°01’49”W	7 Jul 1975	from water only (265)
				25 Jun 1982	(259, 265)
Mary Island	92 K/5	50°28’16”N	125°59’32”W	7 Jul 1975	from water only (265)
				23 Jun 1982	(259, 265)
Murray Island	92 K/5	50°29’46”N	125°49’20”W	7 Jul 1975	from water only (265)
Midgham Islets	92 K/5	50°28’23”N	125°46’33”W	7 Jul 1975	(265)
				23 Jun 1982	(259, 265)
Poyntz Island	92 K/5	50°29’00”N	125°50’43”W	7 Jul 1975	(265)
				23 Jun 1982	(259, 265)
Seymour Island	92 K/5	50°28’42”N	125°52’07”W	7 Jul 1975	(265)
				23 Jun 1982	(259, 265)
Fanny Island	92 K/5	50°27’12”N	125°59’33”W	7 Jul 1975	from water only (265)
				23 Jun 1982	(259, 265)
Clarence Island	92 K/5	50°27’02”N	125°59’22”W	7 Jul 1975	from water only (265)
				23 Jun 1982	(259, 265)
Yorke Island	92 K/5	50°26’48”N	125°58’37”W	7 Jul 1975	from water only (265)
				23 Jun 1982	(259, 265)
Artillery Islets	92 K/5	50°26’28”N	125°58’47”W	7 Jul 1975	1 ad. GWGU (265)
				23 Jun 1982	(259, 265)
Helmcken Island	92 K/5	50°24’00”N	125°52’30”W	7 Jul 1975	from water only; 9 PIGU at west end (259, 265)
Bulkely Island	92 K/5	50°25’40”N	125°43’42”W	7 Jul 1975	from water only (265)
				23 Jun 1982	(259, 265)
Cinque Islands	92 K/6	50°17’43”N	125°24’02”W	10 Jun 1976	(265)
Brent Island	92 K/6	50°17’14”N	125°20’29”W	10 Jun 1976	(265)
Metcalf Islands	92 K/6	50°16’59”N	125°22’07”W	10 Jun 1976	(265)
Nixon Islet	92 K/6	50°15’57”N	125°21’57”W	10 Jun 1976	(265)
West Coast Vancouver Island					
Strange Rock	102 I/9	50°44’30”N	128°25’02”W	29 Jun 1975	from water only (265)
Helen Islands	102 I/9	50°40’04”N	128°21’25”W	29 Jun 1975	from water only (265)
Winifred Islands	102 I/9	50°39’40”N	128°22’02”W	29 Jun 1975	from water only (265)
“Topknot” Rocks	102 I/9	50°30’04”N	128°08’44”W	29 Jun 1975	along shore south of Topknot Point; from water only (265)
Ildstad Islands	92 L/12	50°30’59”N	127°41’58”W	28 Jun 1975	(265)
Diggs Islet	92 L/12	50°30’06”N	127°51’07”W	28 Jun 1975	(265)
Dockyard Islet	92 L/12	50°30’04”N	127°51’58”W	28 Jun 1975	(265)
Linthlop Islet	92 L/12	50°30’01”N	127°50’37”W	28 Jun 1975	(265)
Matthews Island	102 I/8	50°28’52”N	128°02’31”W	28 Jun 1975	(265)
Hunt Islets	102 I/8	50°28’22”N	128°01’56”W	28 Jun 1975	(265)
Pinnacle Island	102 I/8	50°27’15”N	128°01’34”W	28 Jun 1975	(265)
				Jun-Jul 1989	1 PIGU (84)
Kains Island	102 I/8	50°26’33”N	128°02’00”W	28 Jun 1975	(265)
Schloss Island	92 L/5	50°29’50”N	127°51’47”W	28 Jun 1975	from water only (265)
Brockton Island	92 L/5	50°29’13”N	127°46’05”W	28 Jun 1975	(265)
Lind Islet	92 L/5	50°29’08”N	127°47’52”W	28 Jun 1975	from water only (265)
Bedwell Islands	92 L/5	50°28’36”N	127°53’42”W	28 Jun 1975	from water only (265)
Koskimo Islands	92 L/5	50°28’26”N	127°51’06”W	28 Jun 1975	(265)
McAllister Islet	92 L/5	50°27’52”N	127°59’29”W	28 Jun 1975	(265)
Mabbott Island	92 L/5	50°27’36”N	127°53’41”W	28 Jun 1975	(265)
Chapman Islet	92 L/5	50°27’36”N	127°52’20”W	28 Jun 1975	(265)
Salmon Islands	92 L/5	50°27’49”N	127°48’24”W	28 Jun 1975	(265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
"Harvey" Islets	92 L/5	50°25'14"N	127°56'42"W	28 Jun 1975	SW of Harvey Cove(265)
Pilling Rock	92 L/5	50°24'05"N	127°59'24"W	28 Jun 1975	wave-washed (265)
"Restless" Islets	92 L/5	50°23'02"N	127°58'22"W	28 Jun 1975	N end of Restless Bight (265)
		50°21'27"N	127°59'25"W	28 Jun 1975	S end of Restless Bight (265)
Kwakiutl Point	92 L/5	50°21'00"N	127°59'40"W	28 Jun 1975	(265)
Keefe Island	92 L/5	50°20'22"N	127°53'19"W	28 Jun 1975	(265)
"Kwakiutl" Islets	92 L/5	50°20'18"N	127°59'26"W	28 Jun 1975	S of Kwakiutl Point (265)
Mayday Island	92 L/5	50°19'58"N	127°52'51"W	28 Jun 1975	from water only (265)
Half Moon Islets	92 L/5	50°19'39"N	127°52'45"W	28 Jun 1975	(265)
Martin Rock	92 L/5	50°18'53"N	127°53'30"W	28 Jun 1975	wave-washed (265)
"Scouler" Islands	92 L/5	50°18'32"N	127°48'42"W	28 Jun 1975	4 islands at Scouler Pass, NE of Anchorage I. (265)
Anchorage Island	92 L/5	50°18'15"N	127°49'18"W	27 Jun 1975	(265)
Morris Rocks	92 L/5	50°17'44"N	127°52'10"W	27 Jun 1975	2 PECO; 3 BLOY; 50 GWGU roosting (265)
Steele Reefs	92 L/4	50°18'07"N	127°53'15"W	27 Jun 1975	(265)
"Sapir" Rock	92 L/4	50°14'40"N	127°48'05"W	27 Jun 1975	SW off Sapir Point (265)
Bonner Islet	92 L/4	50°14'33"N	127°47'02"W	27 Jun 1975	(265)
McDougal Island	92 L/4	50°14'02"N	127°46'36"W	27 Jun 1975	(265)
Donald Islets	92 L/4	50°13'39"N	127°47'40"W	27 Jun 1975	much otter sign (265)
"Orchard" Islets	92 L/4	50°13'23"N	127°47'28"W	27 Jun 1975	NE of Orchard Point (265)
Crabapple Islets	92 L/4	50°11'09"N	127°50'02"W	27 Jun 1975	(265)
Hisnit Islands	92 L/4	50°09'57"N	127°28'33"W	26 Jun 1975	center not checked (265)
"Nasparti" Islands	92 L/4	50°09'41"N	127°39'14"W	26 Jun 1975	all unnamed islands on either side of Nasparti Inlet from Johnson Lagoon to O'Leary Islets (265)
Scarf Island (see Figure 666)	92 L/4	50°08'28"N	127°39'36"W	26 Jun 1975	1 imm. PECO; 2 BLOY; few old burrows (265)
"Battle" Islet	92 L/4	50°07'21"N	127°33'33"W	26 Jun 1975	E corner of Battle Bay (265)
Longback Rocks	92 L/4	50°07'15"N	127°32'52"W	26 Jun 1975	(265)
"Malksope" Islets	92 L/4	50°07'05"N	127°28'55"W	26 Jun 1975	mouth of Malksope Inlet (265)
Cutler Rock	92 L/4	50°06'27"N	127°41'32"W	27 Jun 1975	(265)
				9 Jul 1988 8	imm. PECO (265)
"Barrier" Rocks	92 L/4	50°01'56"N	127°33'46"W	26 Jun 1975	Barrier Islands – all rocks NW of Lookout I. out to these coordinates; 6 BRCO; 62 PECO; 36 GWGU roosting (265)
Expedition Islets	92 L/3	50°06'17"N	127°14'25"W	25 Jun 1975	(265)
Moketas Island	92 L/3	50°04'45"N	127°13'30"W	25 Jun 1975	from water only (265)
"Saint" Island	92 L/3	50°03'12"N	127°26'45"W	25 Jun 1975	W of St. Pauls Dome (265)
"Pauls" Peninsula	92 L/3	50°02'50"N	127°26'22"W	25 Jun 1975	SW of St. Pauls Dome, NW of McLean Island (265)
Copp Island	92 L/3	50°02'52"N	127°11'24"W	25 Jun 1975	(265)
"Crowther" Islands	92 L/3	50°00'40"N	127°20'38"W	25 Jun 1975	all unnamed islands in Crowther Channel from Surprise Island to SE of Amos Island (265)
Surprise Island	92 L/3	50°02'37"N	127°17'35"W	26 Jun 1975	1 mink (265)
Chutsis Island	92 L/3	50°02'30"N	127°15'56"W	25 Jun 1975	(265)
"Long" Rock	92 L/3	50°02'12"N	127°26'00"W	25 Jun 1975	NW of McLean Island (265)
"Pinnace" Islet	92 L/3	50°01'52"N	127°12'55"W	25 Jun 1975	W end of Pinnace Channel, S of Hohoae I. (265)
McLean Island	92 L/3	50°01'45"N	127°25'00"W	26 Jun 1975	from water only (265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
"Clanninick" Islet	92 L/3	50º01'37"N	127º23'29"W	25 Jun 1975	off SE point of Clanninick Cove (265)
Cole Rock	92 L/3	50º01'34"N	127º26'49"W	25 Jun 1975	43 PECO; 114 GWGU (mostly immature) (265)
				11 Jul 1988	22 non-br. PECO; 2 BLOY; 300 imm. GWGU (181)
Yakats Rock	92 L/3	50º01'33"N	127º24'28"W	26 Jun 1975	including islets to SW; Yakats Rock is wave-washed (265)
A:mak:nit Island	92 L/3	50º01'03"N	127º23'30"W	26 Jun 1975	Formerly Ahmacinnit Island (265)
Whiteley Island	92 L/3	50º00'45"N	127º12'15'W	25 Jun 1975	from water only (265)
Sobry Island	92 L/3	50º00'42"N	127º22'47"W	26 Jun 1975	(265)
Atkis Island	92 L/3	50º00'40"N	127º24'10"W	26 Jun 1975	from water only (265)
Tle:hoh Island	92 L/3	50º00'10"N	127º25'00'W	26 Jun 1975	formerly Spring Island; including islets to W and S; 1 mink (265)
Chatchannel Point	92 L/3	50º00'09"N	127º13'41"W	24 Jun 1975	(265)
"Lookout" Rock	92 L/3	50º00'03"N	127º27'42"W	26 Jun 1975	W of Lookout Island; 45 PECO roosting, some in breeding plumage (265)
Minx Rocks	92 L/3	50º00'01"N	127º22'01"W	26 Jun 1975	including other unnamed islets SE of Kamils Island (265)
				11 Jul 1988	(181)
Harbour Island	92 E/15	49º51'27"N	126º59'10'W	22 Jun 1975	from water only (265)
Fairway Island	92 E/15	49º51'14"N	126º58'34"W	22 Jun 1975	from water only (265)
Centre Island (see Figure 667)	92 E/15	49º50'47"N	126º55'52"W	22 Jun 1975	from water only (265)
Double Island	92 E/15	49º50'41"N	126º59'55"W	22 Jun 1975	from water only; including island to N (265)
Flower Islet	92 E/15	49º49'52"N	126º58'39"W	22 Jun 1975	(265)
Rosa Island	92 E/15	49º49'42"N	126º58'25"W	22 Jun 1975	(265)
"Nuchatlitz" Islets	92 E/15	49º48'47"N	126º59'37"W	22 Jun 1975	all islets W and S of Nuchatlitz village (265)
Colwood Rocks	92 E/15	49º47'19"N	126º56'31"W	22 Jun 1975	1 BLOY - no nest (265)
Fitz Island	92 E/15	49º46'19"N	126º54'31"W	22 Jun 1975	river otter paths (265)
Sara Islet	92 E/15	49º45'42"N	126º53'23"W	22 Jun 1975	2 BLOY - 1 empty scrape (265)
Lookout Island	92 E/14	49º59'54"N	127º27'06"W	26 Jun 1975	(265)
"Hill" Islets NE	92 E/14	49º59'11"N	127º15'30"W	24 Jun 1975	NE of Kyuquot Hill on Union I. (265)
"Hill" Islets W	92 E/14	49º58'53"N	127º17'38"W	24 Jun 1975	W of Kyuquot Hill on Union I. (265)
Rugged Point	92 E/14	49º57'54"N	127º15'27"W	23 Jun 1975	(265)
Grogan Rock	92 E/14	49º57'13"N	127º15'20"W	23 Jun 1975	1 imm. PECO; 1 BLOY; 4 GWGU (265)
Kapoose Rocks	92 E/14	49º56'54"N	127º13'59"W	23 Jun 1975	(265)
East Entrance Reef	92 E/14	49º56'09"N	127º16'29"W	23 Jun 1975	18 GWGU roosting (265)
Gregoire Point	92 E/14	49º54'12"N	127º11'36"W	23 Jun 1975	(265)
Tatchu Rocks	92 E/14	49º53'23"N	127º11'28"W	23 Jun 1975	21 BLOY (265)
Jurassic Point	92 E/14	49º52'47"N	127º10'42"W	22 Jun 1975	(265)
Sandstone Point	92 E/14	49º52'17"N	127º10'08"W	23 Jun 1975	(265)
Catala Island	92 E/14	49º50'15"N	127º03'00"W	22 Jun 1975	only shores checked; 1 PIGU; 1 mink; including islets off SE point (265)
				Jun-Jul 1989	3 PIGU (84)
Halftide Reef	92 E/14	49º49'47"N	127º04'55"W	22 Jun 1975	wave-splashed (265)
Black Rock	92 E/14	49º49'33"N	127º01'32"W	22 Jun 1975	(265)
Twin Islands	92 E/14	49º49'21"N	127º03'07"W	22 Jun 1975	3 BLOY feeding; signs of mink and deer on S island (259, 265)
Mid Rock	92 E/14	49º49'12"N	127º02'18"W	22 Jun 1975	(265)
Outer Black Rock	92 E/14	49º48'36"N	127º03'46"W	22 Jun 1975	(265)
Low Rock	92 E/14	49º48'26"N	127º04'14"W	22 Jun 1975	11 subadult GWGU (265)
Middle Reef	92 E/14	49º48'01"N	127º03'03"W	22 Jun 1975	(265)
Villaverde Islands	92 E/10	49º39'56"N	126º34'35"W	21 Jun 1975	from water only (265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Clio Island	92 E/8	49°23'38"N	126°11'01"W	12 Aug 1975	(265)
George Islands	92 E/8	49°22'56"N	126°11'00"W	12 Aug 1975	(265)
McKay Island	92 E/8	49°18'40"N	126°02'50"W	12 Aug 1975	(265)
McKinn Islets	92 E/8	49°15'15"N	126°03'19"W	13 Aug 1975	(265)
Welcome Island	92 F/5	49°15'14"N	125°53'34"W	14 Aug 1975	(265)
Garrad Group	92 E/1	49°14'38"N	126°07'26"W	13 Aug 1975	(265)
Shag Islet (see Figure 668)	92 E/1	49°13'45"N	126°03'32"W	18 Jun 1975	(265)
Bartlett Island	92 E/1	49°13'19"N	126°05'07"W	13 Aug 1975	(265)
Lawrence Islets	92 E/1	49°12'42"N	126°04'22"W	13 Aug 1975	(265)
Hagen Reef	92 E/1	49°12'31"N	126°04'56"W	13 Aug 1975	(265)
Blunden Island	92 E/1	49°11'02"N	126°03'34"W	18 Jun 1975	mink tracks (265)
Saranac Island	92 F/4	49°14'34"N	125°54'30"W	14 Aug 1975	(265)
Maltby Islets	92 F/4	49°14'15"N	125°46'07"W	14 Aug 1975	(265)
Morfee Island	92 F/4	49°13'18"N	125°57'30"W	14 Aug 1975	(265)
Dunlap Island	92 F/4	49°13'07"N	125°56'36"W	14 Aug 1975	(265)
Dark Island	92 F/4	49°10'56"N	125°46'40"W	14 Aug 1975	(265)
Kirshaw Islets	92 F/4	49°10'29"N	125°47'03"W	14 Aug 1975	(265)
Ridout Islets	92 F/4	49°09'04"N	125°42'52"W	14 Aug 1975	(265)
McCall Island	92 F/4	49°08'43"N	125°43'08"W	14 Aug 1975	(265)
Lane Islet	92 F/4	49°08'38"N	125°47'52"W	14 Aug 1975	(265)
Ducking Island	92 F/4	49°08'34"N	125°51'39"W	14 Aug 1975	(265)
Ocayu Island	92 F/4	49°08'27"N	125°45'24"W	14 Aug 1975	(265)
Warne Island	92 F/4	49°08'05"N	125°44'25"W	14 Aug 1975	(265)
Baxter Islet	92 F/4	49°07'56"N	125°46'50"W	14 Aug 1975	(265)
"Templar" Rock	92 F/4	49°07'36"N	125°54'40"W	20 Jun 1975	E side of Templar Channel; 2 BLOY - 1 empty scrape; 2 agitated GWGU (265)
Almond Islet	92 F/4	49°07'35"N	125°44'12"W	14 Aug 1975	(265)
McKay Reef	92 F/4	49°07'30"N	125°58'18"W	19 Jun 1975	(265)
"Browning" Islet	92 F/4	49°07'30"N	125°50'26"W	14 Aug 1975	Browning Passage west of Eik Islets (265)
McBey Islets	92 F/4	49°07'18"N	125°49'21"W	14 Aug 1975	(265)
Tonquin Island	92 F/4	49°07'18"N	125°55'30"W	19 Jun 1975	(265)
Nob Rock	92 F/4	49°06'46"N	125°56'17"W	19 Jun 1975	(265)
Lennard Island	92 F/4	49°06'40"N	125°55'20"W	19 Jun 1975	(265)
"Frank" Rock	92 F/4	49°06'36"N	125°54'02"W	20 Jun 1975	NW of Frank Island; from water only; 70 GWGU (adult and imm.) (265)
"Radar" Rocks (now designated **WV-445**)[d]	92 F/4	49°04'10"N	125°50'23"W	13 Jun 1972	off Radar Beaches; 1 empty BLOY nest (107)
Snowden Island	92 F/3	49°01'30"N	125°20'05"W	14 Jul 1975	(265)
"Toquart" Islet	92 F/3	49°00'37"N	125°20'30"W	14 Jul 1975	Toquart Bay, N of Hermit It. (265)
Hermit Island	92 F/3	49°00'26"N	125°20'22"W	14 Jul 1975	(265)
Shears Islands	92 F/3	49°00'06"N	125°19'14"W	14 Jul 1975	(265)
"Wya" Rock	92 C/13	48°57'56"N	125°36'48"W	11 Jul 1975	S of Wya Point (265)
Beg Islands	92 C/13	48°55'05"N	125°30'03"W	14 Jul 1975	1 PIGU (265)
Jenny Reef	92 C/13	48°54'58"N	125°31'34"W	12 Jul 1975	15 PECO; 7 GWGU; probably wave-washed (265)
Stopper Islands	92 C/14	48°59'54"N	125°20'32"W	14 Jul 1975	1 GWGU (265)
Larkins Island	92 C/14	48°59'24"N	125°21'33"W	14 Jul 1975	(265)
Staff Islet	92 C/14	48°59'12"N	125°21'47"W	14 Jul 1975	(265)
Spilling Islet	92 C/14	48°59'00"N	125°22'31"W	14 Jul 1975	(265)
Milhus Rock	92 C/14	48°58'54"N	125°09'28"W	17 Jul 1975	2 PECO; 2 BLOY - no nest found (265)
Rowlands Islet	92 C/14	48°58'48"N	125°22'41"W	14 Jul 1975	(265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Ottaway Islet	92 C/14	48°58’34”N	125°22’50”W	14 Jul 1975	7 GWGU (265)
George Islet	92 C/14	48°58’35”N	125°10’24”W	17 Jul 1975	(265)
Harold Islet	92 C/14	48°58’24”N	125°11’09”W	17 Jul 1975	(265)
				Jun-Jul 1989	1 PIGU (84)
St. Ines Island	92 C/14	48°58’22”N	125°21’46”W	14 Jul 1975	(265)
David Island	92 C/14	48°58’00”N	125°23’13”W	14 Jul 1975	1 GWGU (265)
Link Island	92 C/14	48°57’23”N	125°05’00”W	17 Jul 1975	(265)
Castle Islet	92 C/14	48°57’16”N	125°22’22”W	14 Jul 1975	(265)
Wilkins Islet	92 C/14	48°57’12”N	125°19’39”W	14 Jul 1975	2 imm. GWGU (265)
Bryant Islands	92 C/14	48°57’09”N	125°21’55”W	14 Jul 1975	1 GWGU (265)
Forbes Island	92 C/14	48°57’07”N	125°24’35”W	14 Jul 1975	including rocks to W; 2 PECO; 1 GWGU (265)
Hand Island	92 C/14	48°57’00”N	125°19’10”W	14 Jul 1975	(265)
Robinson Island	92 C/14	48°56’59”N	125°12’06”W	23 Jun 1982	1 PECO on half-built nest (265)
Curwen Island	92 C/14	48°56’47”N	125°21’36”W	14 Jul 1975	(265)
Prideaux Island	92 C/14	48°56’25”N	125°16’07”W	15 Jul 1975	(265)
Brabant Islands	92 C/14	48°56’18”N	125°18’53”W	14 Jul 1975	2 PIGU (265)
Treble Islands	92 C/14	48°56’01”N	125°16’51”W	15 Jul 1975	(265)
Nettle Island	92 C/14	48°56’00”N	125°15’07”W	15 Jul 1975	(265)
Diplock Island	92 C/14	48°56’00”N	125°06’40”W	17 Jul 1975	(265)
Page Island	92 C/14	48°55’55”N	125°23’01”W	14 Jul 1975	1 BRCO; 4 BLOY; 2 GWGU - possibly nesting (265)
Geer Islets	92 C/14	48°55’47”N	125°06’42”W	17 Jul 1975	including rock to W; 4 PECO; 4 BLOY; 1 PIGU (265)
Glen Islet	92 C/14	48°55’43”N	125°14’11”W	15 Jul 1975	(265)
Single Rock	92 C/14	48°55’29”N	125°21’22”W	14 Jul 1975	3 PECO (265)
Jarvis Island	92 C/14	48°55’30”N	125°17’06”W	15 Jul 1975	(265)
Reeks Island	92 C/14	48°55’24”N	125°14’00”W	15 Jul 1975	(265)
				Jun-Jul 1989	1 PIGU (84)
Dodd Island	92 C/14	48°55’20”N	125°20’00”W	14 Jul 1975	(265)
Jaques Island	92 C/14	48°55’13”N	125°16’25”W	15 Jul 1975	(265)
				Jun-Jul 1989	1 PIGU (84)
Chalk Island	92 C/14	48°55’13”N	125°18’54”W	15 Jul 1975	(265)
Turner Islet	92 C/14	48°55’11”N	125°13’57”W	15 Jul 1975	including rock to W; 2 BLOY -1 empty scrape (265)
Food Islets	92 C/14	48°55’07”N	125°28’37”W	14 Jul 1975	(265)
Tiny Group	92 C/14	48°55’06”N	125°18’19”W	15 Jul 1975	(265)
Walsh Island	92 C/14	48°55’04”N	125°19’16”W	15 Jul 1975	(265)
Marchant Islet	92 C/14	48°54’59”N	125°18’01”W	15 Jul 1975	(265)
Keith Island	92 C/14	48°54’43”N	125°17’17”W	15 Jul 1975	(265)
				Jun-Jul 1989	2 PIGU (84)
Fry Island	92 C/14	48°54’43”N	125°06’50”W	17 Jul 1975	(265)
				Jun-Jul 1989	1 PIGU (84)
Trickett Island	92 C/14	48°54’28”N	125°21’25”W	15 Jul 1975	including islets to W (265)
Chrow Islands	92 C/14	48°54’24”N	125°28’13”W	14 Jul 1975	7 BLOY; 2 PIGU (265)
Mullins Island	92 C/14	48°54’28”N	125°17’33”W	15 Jul 1975	(265)
Lovett Island	92 C/14	48°54’20”N	125°22’23”W	14 Jul 1975	(265)
“Sproat” Islets	92 C/14	48°54’17”N	125°04’35”W	16 Jul 1975	in Sproat Bay on Tzartus Island (265)
Onion Island	92 C/14	48°54’13”N	125°17’34”W	15 Jul 1975	(265)
Puffin Islet	92 C/14	48°54’08”N	125°22’31”W	13 Jul 1975	(265)
Elbow Islet	92 C/14	48°54’05”N	125°16’31”W	15 Jul 1975	including rock to NW (265)

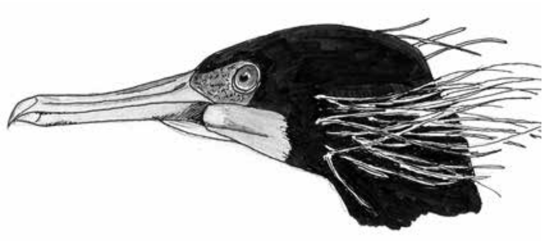
Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
Nantes Island (now designated **WV-602**)[d]	92 C/14	48°54’00”N	125°21’14”W	18 Jun 1972	2 BLOY - 1 empty scrape (107)
				13 Jul 1975	including rocks to W; 11 PECO; 20 GWGU (265)
Turret Island	92 C/14	48°54’00”N	125°20’10”W	15 Jul 1975	including islets on W side - 4 imm. GWGU; and rock on E side - 2 ad., 2 imm. GWGU (265)
Sykes Reef	92 C/14	48°53’48”N	125°28’04”W	12 Jul 1975	2 BRCO; 10 GWGU (265)
Wiebe Island (now designated **WV-665**)[d]	92 C/14	48°53’46”N	125°17’00”W	15 Jul 1975	including rock to E; 4 PECO on rock (265)
Owens Island	92 C/14	48°53’42”N	125°22’26”W	13 Jul 1975	2 BLOY (265)
Drum Rocks	92 C/14	48°53’34”N	125°23’15”W	13 Jul 1975	(265)
Clarke Island	92 C/14	48°53’22”N	125°22’37”W	13 Jul 1975	including islets to NW (265)
Heddington Reef	92 C/14	48°53’19”N	125°28’18”W	12 Jul 1975	25 BRCO; 2 GWGU (265)
Nanat Islet	92 C/14	48°53’06”N	125°04’36”W	16 Jul 1975	(265)
Benson Island	92 C/14	48°53’00”N	125°22’55”W	13 Jul 1975	1 BLOY; 1 mink (265)
Raymond Island	92 C/14	48°52’54”N	125°18’45”W	15 Jul 1975	(265)
Danvers Islet	92 C/14	48°52’38”N	125°05’25”W	16 Jul 1975	(265)
Verbeke Reef	92 C/14	48°52’37”N	125°22’23”W	14 Jul 1975	1 PECO; 4 BLOY; 6 GWGU (265)
Camblain Island	92 C/14	48°52’36”N	125°21’05”W	15 Jul 1975	including rock to W; 1 PECO on rock (265)
Moreton Island	92 C/14	48°52’36”N	125°20’02”W	15 Jul 1975	(265)
Mara Rock	92 C/14	48°52’30”N	125°28’44”W	24 Jul 1970	25+ BRCO; GWGU’s roosting; 1 TUPU (265)
				4 Jul 1972	2 BLOY - no nest found (107)
				12 Jul 1975	30 BRCO; 10 PECO; 100 GWGU roosting (265)
Cooper Island	92 C/14	48°52’30”N	125°20’35”W	15 Jul 1975	(265)
Gilbert Island	92 C/14	48°52’30”N	125°19’30”W	15 Jul 1975	including islets to N and NW (265)
Ross Islets	92 C/14	48°52’11”N	125°09’38”W	17 Jul 1975	(265)
Batley Island	92 C/14	48°52’04”N	125°21’30”W	14 Jul 1975	including islets to N (265)
Sandford Island (now designated **WV-775**)[e]	92 C/14	48°52’06”N	125°10’03”W	17 Jul 1975	including islets to N (265)
				Jun-Jul 1989	3 PIGU (84)
Bauke Island	92 C/14	48°52’00”N	125°19’24”W	15 Jul 1975	including islets to W (265)
Combe Rock	92 C/14	48°51’53”N	125°22’13”W	14 Jul 1975	from water only; 2 BLOY (265)
Ellis Islet	92 C/14	48°51’43”N	125°06’27”W	16 Jul 1975	(265)
Dicebox Island	92 C/14	48°51’38”N	125°20’01”W	15 Jul 1975	including rock to SE; 20 PECO on rock (265)
Howell Island	92 C/14	48°51’30”N	125°20’45”W	15 Jul 1975	including rock to W (265)
Ohiat Islet	92 C/14	48°51’17”N	125°11’04”W	16 Jul 1975	(265)
Pinnacle Rock	92 C/14	48°51’13”N	125°18’22”W	15 Jul 1975	10 PECO; 50 GWGU (mostly immatures) (265)
Dixon Island	92 C/14	48°51’10”N	125°07’11”W	16 Jul 1975	(265)
Helby Island	92 C/14	48°51’05”N	125°10’15”W	17 Jul 1975	(265)
Diana Island	92 C/14	48°50’35”N	125°11’35”W	16 Jul 1975	(265)
				Jun-Jul 1989	2 PIGU (84)
Seppings Island	92 C/14	48°50’24”N	125°12’26”W	16 Jul 1975	(265)
Haines Island	92 C/14	48°50’02”N	125°12’02”W	26 Jul 1970	2 BLOY; 10 GWGU; 4 PIGU - suspected nesting (2 pairs listed in Campbell [32]) (265)
				16 Jul 1975	no birds (265)
				Jun-Jul 1989	0 PIGU (84)
Taylor Islet	92 C/14	48°49’37”N	125°11’51”W	16 Jul 1975	(265)

Table A3-1. cont'd

SITE NAME	MAP GRID	LAT	LONG	DATE	COMMENTS (SOURCE[a])
"Cape" Rock	92 C/14	48°47'36"N	125°12'57"W	16 Jul 1975	N of Cape Beale; 3 PECO; 1 GWGU; from water only (265)
"Deadman" Cave (now designated **WV-844**)[e]	92 C/14	48°47'00"N	125°11'39"W	12 Jun 1970	between Deadman Cove and Keeha Bay; 2 PECO flushed from cave (95)
				14 June 1980	4 adult PECO flying out of cave (57)
				4 Sept 1982	2 adults present (57)
"Clutus" Islet	92 C/14	48°46'27"N	125°10'08"W	16 Jul 1975	W of Clutus Pt.; 2 PECO (265)
Sheringham Point	92 B/5	48°22'40"N	123°55'27"W	1958	PECO's reported nesting (77)
				31 Jul 1975	2 imm. PECO roosting (265)
Secretary (Donaldson) Island	92 B/5	48°19'59"N	123°42'26"W	4 Jul 1974	(265)
				Jun-Jul 1989	1 PIGU (84)
Wolf Island	92 B/5	48°19'57"N	123°37'37"W	4 Jul 1974	(265)
Lamb Island	92 B/5	48°19'49"N	123°37'15"W	4 Jul 1974	(265)
				15 Jun 1978	(265)
John Parker Islands	92 B/5	48°19'48"N	123°35'40"W	15 Jun 1978	(265)
Frazer Island	92 B/5	48°19'40"N	123°36'25"W	4 Jul 1974	including surrounding islets (265)
Village Islands	92 B/5	48°19'31"N	123°36'00"W	4 Jul 1974	(265)
				15 Jun 1978	6 GWGU (265)

[a] Numbers in parentheses refer to entries in the Literature Cited and other sources of information that begin on page 480.
[b] See Appendix 1, Northern Mainland Coast Post-1990, introduction.
[c] See Appendix 1, Queen Charlotte and Johnstone Straits Post-1990, introduction.
[d] See Appendix 1, West Coast Vancouver Island Post-1990, Table A1-6, Black Oystercatcher surveys.
[e] See Appendix 1, West Coast Vancouver Island Post-1990, introduction.



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]

[a] Names are official,[88] except for names in quotations, which we have assigned to unnamed sites.

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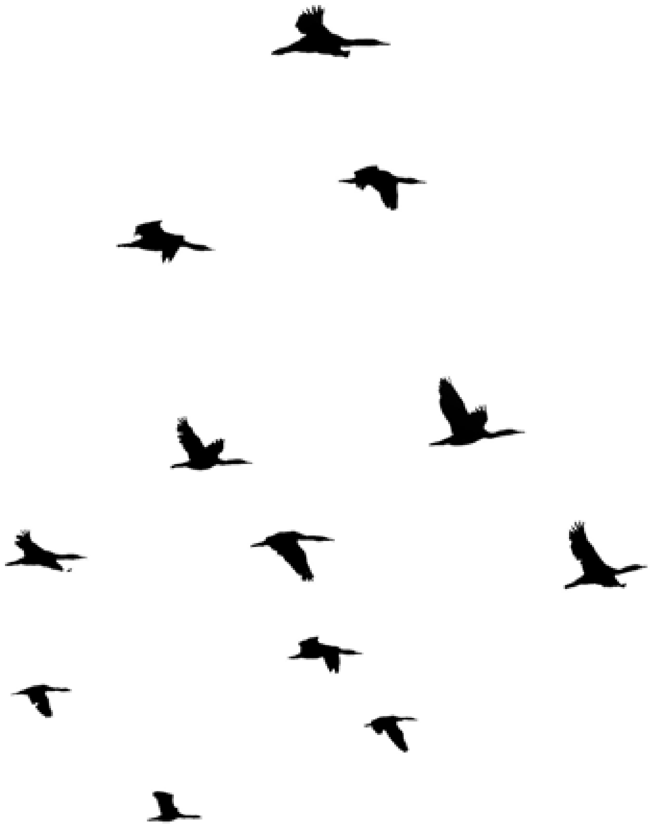

Southern Outer Coast, British Columbia

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