

PAC 4415, CHECLESET  
BAY

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BACKGROUND REPORT  
CHECLESET BAY ECOLOGICAL RESERVE  
(E.R. 109)

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## SUMMARY

### 1.0 INTRODUCTION

Ecological Reserves protect representative ecosystems or special features for research and education. Checleset Bay (E.R. 109) was established in 1981 largely to protect sea otters and their habitat. This Background Report compiles available information for management planning purposes.

### 2.0 RESERVE DESCRIPTION

#### Location, Size and Access

This large marine reserve, 34,650 ha in area and 30 km across, is on the west coast of Vancouver Island between Brooks Peninsula and Kyuquot. Access is only possible by boat or aircraft.

#### Physical Features

Ninety-eight percent of the reserve is marine; the remainder consists of over 40 small islands. Forty km of Vancouver Island shoreline, predominantly rocky with a few small sandy beaches, is included. The largest islands (Bunsby Group) have rocky, indented shorelines and a few sheltered bays or lagoons. Low cliffs, sea stacks, and caves are fairly common shoreline features. Small islands and reefs extend offshore for 6 to 8 km. The sand and gravel seafloor between those islands and seaward from them is relatively smooth and slopes gently to the west. Water depths inshore from the outer reefs are generally under 55 m, increase to 90 m at the edge of the Continental Shelf, then plunge to 450 m on the Continental Slope in the southwest corner of the reserve.

#### Biotic Features

The larger islands support forest stands dominated by Sitka spruce, western hemlock and western redcedar. Three species of rare vascular plants are present. Seabirds totalling over 1,700 pairs - primarily Storm-petrels, Cormorants and Gulls - nest at 3 locations. Two Red-listed and 17 Blue-listed birds have been recorded. Several species of terrestrial mammals occur on the Bunsby Islands.

Diverse marine habitats are present. Kelp stands are extensive around reefs and 49 species of macro-algae have been reported. Eighty-eight species of marine invertebrates have been documented, many of which are important sea otter foods. Many show adaptations to heavy surf. Regularly occurring marine mammals include gray and killer whales, northern sea lions, harbour seals and sea otters. Up to 600 sea lions use two islets in the reserve as year-round haulouts.

Eighty-nine sea otters were introduced to Checleset Bay from 1969 - 1972. They have increased, colonized all suitable habitat in the reserve, and spread south to Nootka Sound and north to Brooks Bay. The present British Columbia population is estimated to be about 600, of which 250 to 350 regularly occur in Checleset Bay. The sea otters have caused dramatic changes in the community structure of reef habitats. Their predation on grazers such as sea urchins has resulted in much greater abundance of kelp.

#### Cultural Features

Virtually the entire reserve was once used by native people. At least 10 documented archaeological sites are present, including habitation, burial and fishing sites. Two Indian Reserves are inside E.R. 109.

### 3.0 LAND USE AND OTHER ACTIVITIES

The reserve is in a remote, sparsely populated area where commercial fishing and logging are the major economic activities.

Within-reserve uses include research on the abundance, distribution, and ecological effects of sea otters;

recreational kayaking; and commercial, sport, and sustenance fishing. Levels of use are currently low, but recreational activity appears to be increasing. Most fishing in the reserve is for finfish. Harvest of several species of shellfish important for sea otters (clams, sea urchins, abalone) is prohibited, however potential or actual fisheries for other species (mussels, sea cucumber, goose barnacle, crab, octopus, scallop) are present.

#### 4.0 RESERVE MANAGEMENT

Identified management issues include:

1. Increasing recreational use (potential disturbance of wildlife and of archaeological sites).
2. Commercial fishing (removal of sea otter foods; reduced research potential).
3. Logging adjacent land (siltation effects on sea otters; loss of avian nest sites).
4. Oil spills (sea otter mortality).
5. Reserve use by native people (removal of sea otter foods; reduced research potential).

Current management practices are as follows:

1. Regulation of research/educational use through permits.
2. Cooperative control of shellfish harvests.
3. Dissemination of information.
4. Monitoring of sea otter populations.

#### 5.0 KEY RESOURCE AND MANAGEMENT ISSUES

Key resources are sea otters and their habitat. Seabird colonies, sea lion haulouts, and archaeological sites are also important.

The following are felt to be key management issues:

1. Boundaries
  - no metes-and-bounds description available
  - not shown on marine charts or topographic maps; no signing
  - may not include winter shelter habitat of sea otters.
2. Resource Protection
  - lack of provincial control over marine resources; conflicting mandates of B.C. Parks and D.F.O.
  - non-protected species might be important sea otter foods, and their commercial and/or sustenance use may increase
  - sea otters could be adversely affected by increased recreational use, logging on adjacent lands, or oil spills.
3. Research and Education
  - marine resource harvesting could reduce opportunities for research on natural ecosystems
  - increasing recreational use could conflict with research and educational programs.

4. Wardenship

- large size and remote location make patrol and surveillance difficult.

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## 1.0 INTRODUCTION

The objective of B.C. Parks Ecological Reserves Program is to preserve representative ecosystems and unique or special biological and geological features for research and educational purposes. In contrast to Provincial Parks, recreational use is not an objective (British Columbia, 1971; 1975).

Checleset Bay Ecological Reserve (E.R. No. 109), a large (34,650 ha), remote, marine reserve on the West Coast of Vancouver Island, was established in 1981 to protect an introduced population of sea otters (*Enhydra lutris*) and their habitat. It also encloses important seabird colonies, sea lion haulouts, and a variety of marine ecosystems representative of the outer coast. The reserve is used for research and education on sea otters and their habitat, but is also subject to some recreational use and to commercial fishing, largely for finfish. Management activities primarily involve control of research/education uses by permit, sea otter inventory, control of shellfish harvests, and surveillance by volunteer wardens.

The purpose of this Background Report is to compile all available information about the reserve and surrounding lands or waters as a basis for management planning. It includes a description of the reserve, documentation of activities taking place in or around it, and discussion of past or present management practices. Key resources and management issues are identified for consideration in a Management Plan.

### Acknowledgements

A number of people and agencies provided information or comments which aided in the preparation of this report. A list of people contacted is included (Appendix 1).

## 2.0 RESERVE DESCRIPTION

### 2.1 Location and Access

Checleset Bay Ecological Reserve is located on the northwest coast of Vancouver Island, between the Brooks Peninsula and the village of Kyuquot (Figure 1). It is not accessible by road. Float plane access is possible from charter bases at Gold River (100 km SE of the reserve), Port McNeill (65 km NE) or Port Hardy (70 km N). Weekly motor vessel transport is available from Gold River to Kyuquot, which is 4 km from the east boundary of the reserve. From Kyuquot, kayak or small boat access into the reserve is possible in good weather. Trailered boats may be launched at Fair Harbour, the nearest road terminus to the reserve. Most of the 25 km distance from Fair Harbour to the east edge of the reserve is relatively sheltered.

### 2.2 Size and Boundaries

The reserve is 34,650 ha in size. Forty-eight islands that are identifiable at 1:36,493 scale (Marine Chart 3683) comprise about 400 ha, or 1.1% the reserve. The remaining area is intertidal and subtidal. The boundary is shown on Figure 2, however a metes-and-bounds description is apparently not available. Two Indian Reserves, Checkaklis Island in the Bunsby Group and Hub-toul Island 1.3 km northeast of Cuttle Island, are within the reserve but excluded from it.

### 2.3 History

Following a survey of potential sea otter introduction sites on the west coast of Vancouver Island in 1967 (Kenyon 1967) the Bunsby Islands were chosen as a release site, and a formal proposal for the release was prepared (MacAskie and Blood, 1968). Sea otters from Amchitka Island, Alaska, became available in 1969 and the first introduction was made in July of that year. Additional animals were released at the same site in 1970 and 1972. A proposal to establish an Ecological Reserve at Checleset Bay was submitted by I. MacAskie, J.B. Foster and J. Pojar in 1977 (Krajina *et al.* 1978). On December 10, 1981, the reserve in its present form was proclaimed by passage of Order-in-Council No. 2566. This Order-in-Council also deleted the terrestrial part of the reserve from the Kyuquot Provincial Forest. An Order-in-Council of March 11, 1982, reserved the area from any disposition under the Land Act.

### 2.4 Environment

#### 2.4.1 Climate

The reserve is within the Southern Hypermaritime climatic zone of Klinka *et al.* (1984), and is typically wet, mild and windy. Climatic data for Spring Island, located 1.5 km from

Figure 1.

the reserve boundary, are given in Table 1. August is the warmest month; December the coldest. Precipitation is very high from October to March. Total annual precipitation, almost all of which falls as rain, is about 315 cm. The freeze-free period should be similar to Tofino, about 213 days (Chilton 1981).

Climatic data for Tofino show that August is the peak month for fog, with an average of 15 days. The foggy period there lasts from about June to October and corresponds to the time of prevailing northwest winds. Fog forms when the warm, moist air carried by these winds contacts the colder coastal water (Thomson 1981). These conditions also apply to Checleset Bay. From October to March, when cyclonic winds are most prevalent over the open ocean, prevailing winds are from the southeast. In summer, the predominantly anticyclonic oceanic winds are from the west and northwest. Maximum winds of 115 km/hr have been recorded at Spring Island.

#### **2.4.2 Physical Setting**

##### Geology

Bedrock geology of lands surrounding the reserve has been described by Muller *et al.* (1974) and reviewed by Howes (1981). Rocks of volcanic and intrusive origin and Triassic or Jurassic age predominate in the region. The distribution of major bedrock types is shown in Appendix 2. Bedrock geology of the Bunsby Islands has not been specifically studied.

The offshore area is at the northern end of the Tofino Basin where thick (4,000 m) sections of sediments of late Tertiary age have been identified by seismic profiling (Procter *et al.* 1983). The sediments unconformably overlie early Tertiary and Mesozoic deformed volcanic, plutonic and sedimentary rocks. The sediment layer thickens seaward toward the base of the Continental Slope and include mainly marine, poorly consolidated, calcareous mudstones and minor siltstones of Miocene to Pliocene age.

##### Landform and Glaciation

The reserve is adjacent to the Fiord-land Subunit of the Vancouver Island Ranges, and at the northwestern extremity of the Estevan Coastal Plain (Holland 1964; Howes 1981). The Coastal Plain is largely under 50 m above sea level, but contains knolls up to 100 m, and extends seaward to include the shallow waters of the Continental Shelf. Therefore, most of the reserve is within this physiographic unit.

This large reserve, about 30 km in east-west extent, consists mostly of marine waters and seabed of the Continental Shelf. The farthest point seaward from Vancouver Island is about 12.4 km. Forty-eight identifiable islands are present,

**Table 1. Climatic Information for Spring Island, 1949 - 1979<sup>1</sup>.**

<b>Month</b>	<b>Mean High Temp. °C</b>	<b>Mean Low Temp. °C</b>	<b>Mean Monthly Temp °C</b>	<b>Mean Monthly Precip. (mm)</b>
January	6.9	2.2	4.6	373
February	8.0	3.0	5.5	316
March	8.3	2.6	5.5	303
April	10.2	4.1	7.2	222
May	12.8	6.6	9.7	138
June	14.9	9.1	12.0	128
July	16.9	10.8	13.9	97
August	17.1	11.3	14.3	122
September	16.3	10.1	13.2	215
October	12.9	7.5	10.2	405
November	9.6	4.7	7.2	405
December	7.9	5.5	3.2	432

Extreme High Temp. = 34.4 C

Extreme Low Temp. = -11.1 C

Annual Precip. = 3,155 mm

<sup>1</sup> 50°0'N 127°25'W at 11 m elevation. Information from Atmospheric Environment Service, Environment Canada, Vancouver.

plus numerous rocky reefs. The islands vary in size from <1 ha to 224 ha (West Bunsby), but in total comprise only 1.1% of the reserve area. The largest islands (the Bunsby Group) are near the Vancouver Island Shoreline; small islands and reefs occur as far as 9 km offshore. An outer tier of islands and reefs, the Barrier Group, extends in a relatively straight line from Quineex Reef at Brooks Peninsula to Lookout Island at the southeast corner of the reserve. The Bunsby Islands have irregular, indented, rocky shorelines, and rolling uplands with a maximum elevation of 80 m.

The marine part of the reserve consists of intertidal habitats along about 40 km of Vancouver Island shoreline and around the offshore islands and reefs, a large subtidal area on the Continental Shelf, and a small segment of Continental Slope. Most of the Vancouver Island shoreline is a rocky, high-energy environment, however a few small estuaries and pocket beaches are present. Low cliffs, sea stacks, arches, and caves are fairly common coastal features.

Between the islands and reefs the Continental Shelf seafloor is quite flat, with a gentle slope to the southwest. Inshore from the outermost reefs the water depth is mostly under 60 m, except for glacial deepening to about 100 m at the mouth of Ououkinsh Inlet. Seaward from the outermost reefs the ocean floor drops gradually to 90 m and then plunges to 450 m on the Continental Slope at the southwest corner of the reserve.

Most uplands bordering the reserve are believed to have been glaciated during the final phase (Fraser Glaciation) of the Pleistocene (Clague 1981). However, unglaciated refugia are believed to have occurred on the Brooks Peninsula and on other mountains in the area (Ogilvie and Ceska, 1984). Ice tongues undoubtedly moved southwestward along inlets such as Nasparti and Ououkinsh, over-deepening these troughs in relation to the adjacent Continental Shelf. It is doubtful that the entire shelf area in the reserve was ice covered during the Fraser Glaciation, and likely that some of it was subaerially exposed because sea levels were 100 m lower at the glacial maximum. Isostatic depression of 25 to 45 m occurred in ice-covered areas, particularly at the heads of inlets, but this probably did not occur over the entire shelf.

#### Surficial Deposits and Soils

Based on mapping in Howes (1981), surficial materials on the Bunsby Islands and much of adjacent Vancouver Island consist of colluvium. This colluvium is derived from bedrock by frost shattering and other weathering processes. Although most commonly found on mountain slopes, Howes (*op. cit.*) notes that bedrock-derived colluvial mantles occur on "hummocky, bedrock controlled topography on the Estevan Coastal Plain." Although not specifically examined in the Bunsby Islands, upland soils on forested sites are expected to be Ferro-Humic Podzols (Valentine *et al.* 1978).

Based on surveys on the Continental Shelf to the north and south of Checleset Bay (Luternauer and Murray, 1983; Carter 1973), seafloor materials in the reserve are expected to be predominantly sands and gravels, with some sand and mud in troughs. This blanket is punctuated by bedrock reefs and small islands in the northeastern half of the reserve. Shorelines consist largely of exposed bedrock, boulder and cobble, however small pockets of sandy or muddy beach occur.

#### Oceanography

From Barkley Sound to Cape Scott, tidal fluctuations occur almost simultaneously and have a mean range of about 3 m. Tidal ranges are slightly greater in June and December and smaller in March and September. Tides here are classified as mixed (both diurnal and semidiurnal frequency), but are predominantly semidiurnal. The range of tides changes progressively each day over a cyclic period of about 2 weeks (Thomson 1981).

Currents over the Continental Shelf are a result of tides and wind. Flood streams are northerly; ebb streams southerly. Maximum flood occurs within a few hours of high water at the coast and maximum ebb within a few hours of low water. Both attain maximum speeds of around 50 cm/s (1 km) during spring

tides. The strongest tidal streams likely to be encountered on the west coast occur near points of land such as Brooks Peninsula and around offshore islands. Despite largely semidiurnal tides in this area, nearshore tidal currents tend to be mostly diurnal in periodicity (Thomson 1981).

Surface salinity in offshore waters is about 32‰ (grams of salt per 1,000 g seawater), but nearshore salinity may drop to 29.5‰ at times of high freshwater discharge. Surface temperatures average about 8°C in winter; maximum summer temperatures are about 18°C but may reach 20°C in a thin top layer. There is little seasonal variation in temperature at depths below 200 m, which are about 7°C in this area (Thomson 1981).

### **2.4.3 Terrestrial Flora and Fauna**

#### Vegetation

The Bunsby Islands are within the very wet hypermaritime subzone of the Coastal Western Hemlock Biogeoclimatic Zone (CWHvh). This is the wettest forest subzone in British Columbia. The mean percent cover for zonal vegetation is given in Figure 20 of Pojar *et al.* 1991. This subzone was previously mapped and described as CWHd1 (Nuszdorfer *et al.* 1985; Klinka *et al.* 1984).



All islands in the reserve that are forested support old-growth. Forest cover maps indicate that Sitka spruce is the leading species on 18% of the area of the Bunsby Islands, western hemlock on 21%, and western redcedar on 60% (Appendix 3). Age classes vary from 7 (121 - 140 years) to 9 (251 + years), but age class 9 is most common. Height classes vary from 3 (19.5 - 28.4 m) to 6 (46.5 - 55.4 m), with Class 5 (37.5 - 46.4 m) being most common. Site (productivity) classes vary from poor to good, with medium being the most frequent rating.

A list of 91 vascular plants that have been recorded in the reserve is given in Appendix 4. This is based on Carl and Guiguet (1956) and subsequent reconnaissance by Ecological Reserves Programme staff. The list includes records for East Bunsby Island, which is outside the reserve. Rare plants include the following:

<i>Lasthenia maritima</i> (Hairy goldfields)	R2
<i>Stachys mexicana</i> (Mexican hedge-nettle)	R3
<i>Rhamnus alnifolius</i> (Alder-leaved buckthorn)	R4

Quantitative studies of plant community structure have not been done. However, IBP forms for E.R. 109 list two communities, as follows:

1. *Picea sitchensis* - *Tsuga heterophylla* - *Rubus spectabilis* - *Polystichum munitum*.
2. *Picea sitchensis* - *Gaultheria shallon* - *Maianthemum dilatatum* - *Eurhynchium* - *Isoetecium*.

This appears to be an incomplete list because forest cover maps indicate that western redcedar is the leading tree species on most islands.

#### Birds (including seabirds)

Written records of the avifauna of Checleset Bay include the following main sources:

1. Campbell and Summers (in press). This annotated list of 120 marine and terrestrial birds of Brooks Peninsula is based on a RBCM expedition in August 1981, and review of vertebrate observations made by 69 previous people since 1934. An important source was the migration watches made at Clerke Point by K.R. Summers and his co-workers from May 14 to June 27, 1973. All marine birds seen there would have been in the reserve.
2. Carson and Foster (1978 a). This is a typewritten, partially annotated list of 36 marine and terrestrial species seen in the reserve from June 13 to 16 and July 22 to 26, 1978.
3. Carl and Guiguet (1956). A non-annotated list of 36 species, primarily forest and shoreline birds, seen in the Bunsby Islands in August of 1955.
4. Campbell (1976) and RBCM Seabird Files. This includes a map and tabulation of Vancouver Island and adjacent seabird colonies (published by Friends of the Provincial Museum) and seabird survey record forms (Ecological Reserves Program files, Victoria). Some land birds were also recorded during the seabird surveys. Most surveys were in June or July. Data are available only for 1975 and 1978.

A list of birds known or expected to occur in the reserve (Appendix 5) was based on those sources. It includes 106 species, but is probably incomplete. Appendix 5 relies heavily on Campbell and Summers (in press), however some judgement had to be used in determining whether species on their list were

actually seen in the reserve (Clerke Point - Quineex Reef - Jacobsen Point area) or in other parts of the Brooks Peninsula. Species recorded very infrequently in the Brooks Peninsula area (e.g. Laysan Albatross; Pink-footed Shearwater; Green-backed Heron) are not included in Appendix 5 unless actually recorded inside the reserve.

Nesting seabirds have been recorded on 6 Islets or complexes (Figure 2) and are an important component of the avifauna. The only complete survey was done in 1975, when over 1,700 breeding pairs were present (Table 2). Leach's storm Petrel, Glaucous-winged Gull, and Pelagic Cormorant are the numerically most important species, and Thomas Island (and associated islets) is the most important site. A thorough and up-to-date survey is needed to assess population trends.

A second important component of the avifauna includes the pelagic and migratory species which occur seasonally in offshore parts of the reserve. Brooks Peninsula juts well out into the Pacific Ocean, making it one of the best places on the Pacific Coast to see wandering pelagic species and regular migrants from land. During migration watches in May and June 1973, an estimated 146,000 Sooty Shearwaters (up to 2,000/hr), 200,000 Red-necked Phalaropes, 44,000 Scoters, and 30,000 Bonaparte's Gulls passed by Clerke Point. Other migrants there included the Canada Goose, Brant, Parasitic Jaeger, and Black-legged Kittiwake.

Inlets adjacent to the reserve (Nasparti, Ououkinsh, Malksope), and particularly estuaries at their heads, are important for wintering waterfowl. The reserve itself is much less important, probably because of its lack of sheltered water. Ministry of Environment aerial waterfowl counts for the area from Clerke Point to Nasparti Inlet are given in Appendix 6.

**Table 2. Estimated number of breeding pairs of seabirds on islands in Checleset Bay<sup>1</sup>.**

Island <sup>2</sup>	Year	Species*					BLOY	TOTAL
		FTSP	LESP	PECO	GWGU	PIGU		
Thomas & Islets	1975	50	1,200		31	20	11	1,312
Thomas & Islets	1988		7,300					
Gull Islet	1975				190			190
Gull Islet	1978				125		2	127
Clara Islet	1975				39	10		49
O'Leary Islets	1975			83	115	20		218
O'Leary Islets	1978			41	54		1	96
Cuttle Islets	1975				2	1		3
Yule Rock	1975				1	1		2
<b>TOTAL (1975)</b>		<b>50</b>	<b>1,200</b>	<b>83</b>	<b>378</b>	<b>52</b>	<b>11</b>	<b>1,774</b>

<sup>1</sup> 1975 data from Campbell 1976. 1978 data (some islands only) from Ecological Reserves files, Victoria. 1988 data from Birds of British Columbia.

<sup>2</sup> see Figure 2 for locations.

\* FTSP = Fork-tailed Storm-Petrel  
 LESP = Leach's Storm-Petrel  
 PECO = Pelagic Cormorant  
 GWGU = Glaucous-winged Gull  
 PIGU = Pigeon Guillemot  
 BLOY = Black Oystercatcher

Nineteen of the species listed in Appendix 5 are included in B.C. Environment (1991) Red or Blue lists (Table 3). Of the two red-listed species, the Peregrine Falcon nests nearby at Solander Island (Beebe 1960), and has been seen hunting in the reserve, but probably does not nest inside it. The Marbled Murrelet forages in marine habitats in the reserve and probably nests in nearby forests. Of the 17 Blue-listed species, the reserve is most important for the two species of Storm-Petrels and the Bald Eagle, all of which nest there. It is also of some importance for foraging by Common Murres, Rhinoceros Auklets and Tufted Puffins which nest at other sites along the west coast of Vancouver Island. Most other species in Table 3 are on the Blue List because of small breeding populations elsewhere in the province and occur only sporadically in the reserve during the non-breeding season.

### Mammals

Mammals that have been recorded in the reserve or, based on nearby records are expected to occur there periodically, are listed in Appendix 7. For convenience, the list of 26 species includes both terrestrial and marine mammals. Information sources include Carl and Guiguet (1956), Watson (1989), Carson and Foster (1978 b), Bigg (1985), Campbell and Summers (in press), and vanZyll de Jong (1985).

The reserve provides very limited and somewhat isolated habitat for land mammals, however the Dusky Shrew, Deer Mouse, Townsend Vole, Red Squirrel and Black-tailed Deer are permanent residents on one or more of the Bunsby Islands. Raccoons probably do so as well. Mink and river otters are widespread in the reserve. The islands are too small to support Black Bears or Wolves, but they may occur there from time to time. Of 9 species of bats which could potentially occur, only the Little Brown Bat has been collected in the reserve. However, the Silver-haired and Hoary Bats have been collected nearby at Brooks Peninsula. Of the terrestrial mammals in Appendix 7, only Keen's Bat is on the B.C. Environment (1991) Red List, and none are on the Blue List. Checleset Bay is not likely to provide important habitat for Keen's Bat. None of the terrestrial mammals have evolved distinct forms, presumably because the Bunsby Islands are very close to Vancouver Island (Carl and Guiguet, 1956).

### Reptiles and Amphibians

The following species have been found in the Bunsby Islands (Carl and Guiguet, 1956):

Clouded Salamander (Little Bunsby)  
 Western Toad (East Bunsby; Cheekaklis)  
 Northwestern Garter Snake (East and West Bunsby)  
 Common Garter Snake (East Bunsby)

**Table 3. Red-listed and Blue-listed birds of the Checleset Bay area<sup>1</sup>.**

<b>Species</b>	<b>Red List</b>	<b>Blue List</b>
Pacific Loon		X
Western Grebe		X
Leach's Storm-Petrel		X
Fork-tailed Storm-Petrel		X
Brandt's Cormorant		X
Great Blue Heron		X
Bald Eagle		X
Peregrine Falcon	X	
Wandering Tattler		X
Least Sandpiper		X
Short-Billed Dowitcher		X
California Gull		X
Caspian Tern		X
Common Murre		X
Marbled Murrelet	X	
Cassin's Auklet		X
Rhinoceros Auklet		X
Tufted Puffin		X
Horned Puffin		X
<b>TOTAL</b>	<b>2</b>	<b>17</b>

<sup>1</sup> Based on B.C. Environment (1991) and Appendix 5.

Campbell and Summers (in press) also recorded the Northwestern, Long-toed and Western Red-backed Salamanders, Rough-skinned Newt, Pacific Treefrog and Red-legged Frog at Brooks Peninsula. In view of the scarcity of freshwater habitats on the Bunsby Islands, those species are unlikely to occur in the reserve. No species in the reserve are on Red or Blue Lists.

#### Terrestrial invertebrates

Carl and Guiguet (1956) reported 29 species of invertebrates from the Bunsby Islands. Their list is included as Appendix 8, however the taxonomy is likely to be outdated for some species. Cannings and Cannings (1987) collected over 500 species on the Brooks Peninsula, therefore the Bunsby Island list is undoubtedly very incomplete.

### **2.4.4 Marine Flora and Fauna**

Studies of sea otter food resources (Morris *et al.* 1979 a) and of effects of sea otter predation on invertebrates, and indirectly on algae (Breen *et al.* 1982; Stewart *et al.* 1982; Watson 1989, 1991) have resulted in a considerable body of information on invertebrates and algae in selected parts of the reserve, to a depth of about 12 m (6 fathoms). Although this is a small part of the total area of the reserve, it is the most productive and diverse. Both species diversity and community structure have been described in those limited, usually rocky locations. Much less is known about the fishes in general and about benthic invertebrates of sand/gravel substrates between the reefs and seaward from the Barrier Islands. There appears to be no available information on plankton.

#### Algae

A total of 49 species of macro-algae have been reported (Appendix 9). Distribution and abundance of the dominant species of kelp has been greatly influenced by sea otters through their predation on sea urchins which normally graze on kelp. Kelp communities throughout the reserve have flourished due to removal of sea urchins by the otters. In typical sea otter feeding sites, the bull kelp (*Nereocystis leutkeana*) forms a dense surface canopy and the understory contains *Pterygophora californica*, *Laminaria setchellii*, other *Laminaria* species, or a mixture of these species. These kelps occur from shallow water (near "datum") to a lower limit where the bottom changes to shell at 7 to 10 m depth. There is a characteristic dense turf of bladed red algae underneath the kelps. The most abundant and consistent species are *Constantinea subulifera* and *C. Simplex*, which have 10 to 75% cover, but several other species are also present. Large quantities of algal drift and detritus are trapped in crevices and depressions under these kelp stands. Studies of similar sites before sea otters had spread to them indicated that the dominant kelps were mostly the same species, however they were restricted to a very narrow near-surface zone, or other topographical sites not frequented by sea urchins. Watson (1991) has documented pronounced increases in brown algae abundance of several sites that were monitored over a period of 4 years as they became colonized by sea otters.

#### Invertebrates

A total of 88 species of marine invertebrates has been documented in the reserve (Appendix 10). In rocky habitats down to 12 m depth, molluscs are particularly diverse (32 species), followed by echinoderms (19 species) and crustaceans (14 species). Barnacles, tunicates, hydroids, bryozoans, polychaetes, and ascidians make up the remaining 23 species (Stewart *et al.* 1982; Morris *et al.* 1979 a).

Prior to sea otter colonization, subtidal reef communities were dominated by red sea urchins (up to 4 to 10 per sq. m, Chitons, limpets, turban snails, colonial polychaetes, and coralline algae. At sea otter feeding sites, sea urchins are now extremely scarce, small in size, and mostly confined to deep fissures or beneath rocks. Other scarce species, apparently due to sea otter predation, include abalones, crabs, turban snails, sea mussels, keyhole limpets and rock scallops. Species which are abundant in the otter-induced

kelp forests include barnacles, bryozoans, hydroids, sponges, colonial ascidians, tunicates, sea anemones, and small snails (Breen *et al.* 1982).

### Fish

Fishes that have been visually identified in the reserve are listed in Appendix 11, which is based on Stewart *et al.* 1982. Many additional species should occur, including 5 species of Pacific Salmon which pass through the reserve to spawning streams in Malksope, Ououkinsh and Nasparti Inlets.

### Pinnipeds and Cetaceans

Marine mammals recorded in the reserve are listed in Appendix 7. Regularly occurring pinnipeds include the northern sea lion and harbour seal. Northern sea lions have year-round haulouts at O'Leary Islets and Barrier Rocks (Figure 2) where average counts total about 300 animals (Table 4). Sea lions do not breed in the reserve. Harbour seals are abundant in nearshore waters. Based on a mean occurrence of 2.3 seals per km of shoreline on the West Coast of Vancouver Island, the reserve probably contains 100 or more seals.

The California sea lion and elephant seal occur sporadically at Brooks Peninsula (Campbell and Summers, in press) and probably also occur in the reserve from time to time. There are written records of only two species of

**Table 4. Numbers of Northern Sea Lions counted at Barrier Rocks and O'Leary Islets<sup>1</sup>.**

<b>Parameter</b>	<b>Barrier Rocks</b>	<b>O'Leary Islets</b>	<b>Total</b>
Summer (June - August)			
Mean count	115	155	270
Max. count	250	331	581
No. surveys	7	15	
Winter (September - May)			
Mean count	155	162	317
Max. count	298	305	703
No. surveys	4	14	
Year first noted	1955	1955	

<sup>1</sup> data from Bigg 1985. See Figure 2 for haulout locations.



cetaceous in the reserve (killer whale and gray whale) however several additional species should occur as transients in its offshore waters (Pike and MacAskie, 1969). Gray whales pass through the reserve primarily during spring migration (March -April). Transient killer whales pass through more regularly, attracted by the sea lions and seals which are their major prey.

### Sea otter

#### 1. Status in the Checleset Bay area

Sea otters were essentially exterminated on the British Columbia coast during the intensive period of maritime fur trade (Blood 1967; Munro 1985), however Cowan and Guiguet (1965) cite a 1929 record for Grassie Island, Kyuquot. This is the last known occurrence of the species in Canada. Following surveys in 1967 to locate a suitable re-introduction site (Kenyon 1969; MacAskie 1967), the Bunsby Islands were chosen and a formal proposal prepared (MacAskie and Blood, 1968). A total of 89 sea otters from Alaska were introduced at the Bunsby Islands, Checleset Bay, during 1969 - 1972 (Table 5).

The number of sea otters counted during surveys of Checleset Bay and adjacent areas from 1977 through 1992 is summarized in Table 6. The surveys varied greatly in intensity and geographic coverage (see footnotes to Table 6), however they allow some generalizations to be made concerning population increase and spread of the animals.

There is expected to have been some early post-release mortality of otters due to capture and transport-related stress, and some random dispersal of individuals out of Checleset Bay. It is very likely therefore that the 1972 population in Checleset Bay was lower than 89 individuals. In the late 1970's, about 50 to 60 otters were counted there. The population increased to nearly 200 by 1984, suggesting that the 1980 - 1983 counts in Table 6 are under-estimates. The maximum count to date in Checleset Bay, 328 otters on July 26, 1989, was obtained by Watson (1990). It included 30 animals just east of the reserve, near the entrance to Kyuquot Harbour. Her 1988 and 1989 survey route did not include the Quineex Reef or other areas along Brooks Peninsula.

By 1977, some otters had moved to the Bajo Reef area of Nootka Island, about 75 km south of the Bunsby Island release site. This was well before their spread to all suitable habitats in Checleset Bay, and apparently not motivated by food scarcity in Checleset Bay (Breen *et al.* 1982). A population has continued to occupy the Bajo Reef - Skuna Bay area to the present, where 149 otters were present by 1984, and 156 in 1988.

Table 5. Sex, maturity and health of 89 sea otters released at the Bunsby Islands<sup>1</sup>.

Transplant date	Origin	Adult		Number released					Health
		Transport	Total	Immature			?		
				♂	♀	?			
Jul.31 '69	Amchitka	Air	29	9*	19*			1	Fair-good
Jul.27 '70	Pr. William Sound	Boat	14	6	8				Excellent
Jul.15 '72	Pr. William Sound	Boat	46	8	22	7**	9**		Excellent
Total			89	23	49	7	9	1	

<sup>1</sup> from Bigg and MacAskie 1978.

\* Approximate.

\*\* Includes four male and two female pups.

Table 6. Sea otter surveys on the west coast of Vancouver Island, including Checleset Bay, 1977 - 1992.

Date	<u>Checleset Bay</u>			<u>Other areas</u>		Total	Source**
	Method*	No.	Location	No.	Location		
May - Sept/77	F.W.	55+	Bunsby Islands	15+	Bajo Reef	70+	1
June 15/78	Air	51	Humpback; Farout	16	Bajo Reef	67	2
July 14 - 18/80	Boat	29- 58	O'Leary to Lookout	-	--	-	3
Aug. 9/82 Lookout	Boat	35	Jacobsen to	-	--	-	4
Sept 1/83	Boat	58	O'Leary to Farout	-	--	-	5
1984	Boat/ Air	196	"Checleset Bay"	149	Bajo Reef	345	6
July 20/87	Air	234	Checleset/ Mission Grp.	136	Skuna-Bajo	370	7
Aug. 26/87	Air	231	Checleset/ Mission Grp.	97	Bajo Reef	328	7
Aug. 30/87	Boat	-	--	86	Bajo Reef	-	7
Aug. - Sept/88	Boat	213	Checleset/ Mission Grp.	156	Skuna-Bajo	369	8
July - Sept/89	Boat	328	Checleset	-	--	-	9
Mar. 30/92	Hel.	23	Bunsby and Thomas Isl.	57 114 9	Bajo-Skuna Nuchatlitz- Kyuquot N. side Brooks Pen	203	10
Sept. 17/92	Hel.	231	Checleset (except Mission)	138	N. side Brooks Pen		10

\* F.W. = Fixed-wing aircraft; Hel. = Helicopter; Air = Aerial survey  
but aircraft type not stated.

\*\* Sources of information:

- <sup>1</sup> Bigg and MacAskie. 1978. Based on four aerial surveys in a DeHavilland Beaver: May 11 (Bajo Pt. - Cape Scott); June 27 and September 8 (Bajo Pt. to Bunsby Islands) and July 2 (Bajo Pt. area).
- <sup>2</sup> Morris *et al.* 1981. Aerial survey carried out by B.C. Fish and Wildlife Branch, Bajo Reef to south side of Brooks Peninsula.
- <sup>3</sup> Farr. 1980. Boat survey carried out over 4 1/2 days.
- <sup>4</sup> Farr. 1982. Includes first observations in Cuttle Islands. One-day survey.
- <sup>5</sup> Breen *et al.* 1983. A quick 2 1/2 hour survey by boat.
- <sup>6</sup> MacAskie. 1987 a. Exact dates and kind of aircraft used not given. Aerial survey covered Nootka Sound to Quatsino Sound. Boat survey confined to Checleset Bay.
- <sup>7</sup> MacAskie. 1987 b. Aerial surveys from Tofino to south side of Brooks Peninsula. Kind of aircraft not stated. Boat surveys from Tofino to Bajo Reef. Weather ideal.
- <sup>8</sup> Watson. 1988. Includes 7 surveys in 1988 (111 to 213 otters). Quineex area not surveyed. Mission Group was included. One survey of Nootka Island.
- <sup>9</sup> Watson. 1990. Includes 8 surveys (149 to 328 otters). Quineex area not surveyed. Mission group apparently not included.
- <sup>10</sup> R. Simmons, personal communication. Data from B.C. Parks files, Parksville. Note that one survey was under winter conditions. Aircraft was a helicopter.

The maximum sea otter count for the west coast of Vancouver Island has been about 370 animals (1987 and 1988, Table 6). The variability in counts indicates that some animals are easily missed, even during intensive surveys, and suggests a population higher than 370. Watson (1991), estimated a total population of about 600 sea otters originating from the 1969 - 1972 introductions.

The spread of sea otters from the original point of release has two major components: 1) the widespread dispersal of pioneering individuals or small groups, usually males, and 2) the gradual spread of larger "resident" matriarchal groups, usually accompanied by evidence of marine community changes due to otter foraging. Following the initial releases, individual otters were reported at scattered locations along the British Columbia Coast from Barkley Sound to Harvey Island (Lat. 52° 30'). Within Checleset Bay, sea otters were first reported at Thomas Island in 1972 (Bigg and MacAskie 1978), in the Cuttle Island area in 1977, in the Mission Group in 1977, at Lookout Island in 1980 (Farr 1980) and Thornton Island in 1988 (Watson 1990). The spread of resident female/pup groups shows a more conservative pattern, based on otter observations and community studies of Morris *et al.* 1979 a, b; Breen *et al.* 1982, and Watson 1989; 1991. Approximate boundaries of the resident population over time are shown on Figure 3.

Sea otters were first recorded on surveys in Brooks Bay in early 1992, although they were probably there earlier. A winter (March 30) aerial survey from Nootka Sound to Brooks Bay in 1992 located only 203 sea otters, but suggested that winter distribution may be different than that in summer, and that most of the area between Checleset Bay and Nootka Sound may be used. Thirty otters were noted at Union Island, 24 in the Tatchu Creek - Tatchu Point area, and 60 near Nuchatlitz on the south side of Esperanza Inlet. Only 23 were counted in Checleset Bay, mostly in the Gay Passage area.

Radio monitoring studies in Alaska have shown that male sea otters may make lengthy movements (Garshelis and Garshelis 1984). Those authors documented movements of 11 km in 2 hours, and stated that "Adult males in both Prince William Sound and California ... frequently (at least yearly) make trips of 80 - 145 km between male and female areas ..." Similar movements can be expected on the coast of British Columbia.

## 2. Biology of Sea Otters

There is an extensive body of scientific literature on sea otters, based mostly on research done in Alaska and California. A monographic treatment prepared by Kenyon (1969), and a book on the community ecology of sea otters edited by Van Blaricom and Estes (1987) contain lengthy bibliographies. The status and biology of sea otters in

Figure 3.

Washington State was recently reviewed by Bowlby *et al.* (1988).

The biology of the sea otter was thoroughly and concisely reviewed by Estes (1980). That paper is included in this report as Appendix 12.

Other than the excellent work by Watson (1989; 1991), Breen *et al.* (1982), Stewart *et al.* (1982) and Morris *et al.* (1979 a, b) on the effects of sea otters at Checleset Bay and adjacent areas on marine invertebrates and algae, there has been little research on the biology of this species in British Columbia. Effects of the otters on marine communities were discussed previously under the headings of Algae and Invertebrates.

Based on spotting scope observations, Morris *et al.* (1987) concluded that the butter clam was the dominant food item at Checleset Bay, and that sea urchins, starfish, mussels, chitons and snails were also eaten. Based on comparisons of foraging and non-foraging sites, sea urchins appear to be the most important food, at least initially, and abalones are also taken.

Morris *et al.* (1979 b) documented movements of sea otters to more sheltered locations in Checleset Bay in response to stormy weather; segregation into female-juvenile and male groups; social interactions such as grooming, food sharing, nursing and play; and daily activity patterns. Travel between rafting areas and feeding locations occurred at all times of the day but was concentrated in early morning and late evening. Repeated use of the same feeding sites and travel paths was noted. The longest feeding session recorded was two hours on white clams. The longest food dive was 127 seconds; the shortest 45 seconds. The longest interval between food dives was 180 seconds.

### 3. Management of Sea Otters

Management activities in British Columbia include 1) the original re-introduction program, 2) establishment of E.R. 109 to protect the introduced population and its habitat, and 3) closure of fisheries for some invertebrates that are important sea otter foods. Related activities have included inventories of distribution and abundance, and research on sea otter effects on marine ecosystems. There has been no active management such as additional transplants, control of dispersal, or sea otter harvest. Some management activities in other jurisdictions are summarized in Appendix 13.

## 2.5 Cultural Values

### 2.5.1 Native Use and Archaeological Sites

Virtually the entire Ecological Reserve has been used by native people for several thousand years. Archaeological surveys have revealed primarily habitation and burial sites near present sea level (Table 7; Figure 2). Additional sites probably occur, some of which may have been inundated by rising sea levels. There are also many known archaeological sites in immediately adjacent areas such as Kyuquot, the Mission Group, Malksope and Ououkinsh Inlets, East Bunsby Island, Battle Creek, and Acous Peninsula.

The Ecological Reserve area was originally inhabited by the Checkliset Band, the northernmost of 6 Tribes or Bands of the Nootka ethnic division (Duff 1964). The Nootka-speaking people extended from Brooks Peninsula south to the Port Renfrew area.

At the time of white contact the Checklisets had a winter village at Acous, a summer village at Opsowis (on Vancouver Island adjacent to East Bunsby) and other seasonal camps on Nasparti, Ououkinsh, and Malksope Inlets. By the late 1800's the summer site at Opsowis became the main year-round village. By the 1930's there was no longer a school in the Checleset Bay area, and by the 1950's the Checklisets had all moved to Kyuquot (Mission Island = Kamils Island) where they became amalgamated, at least administratively, with the Kyuquot Band by 1963. Some remains of buildings were still present at Opsowis until at least the 1950's (Jones 1991).

Native people from the Kyuquot area continue to utilize marine resources in the Ecological Reserve for sustenance purposes.

### 2.5.2 Other Historical Values

Within reserve boundaries there are not known to be any visible sites of historical significance dating from the period of European/American exploration or settlement.

## 2.6 Representative and Special Features

### 2.6.1 Representative Features

#### 1. Marine ecosystems

A variety of intertidal and subtidal communities is present, although most have not been described. In view of the large size of the reserve, these communities should be representative of much of the exposed west coast of Vancouver Island and adjacent Continental Shelf.



2. Old-growth forest

Forest vegetation on the Bunsby Islands represents a variant of the very wet hypermaritime subzone of the Coastal Western Hemlock Biogeoclimatic Zone. This subzone has been extensively modified by logging, except on the Brooks Peninsula, where similar ecosystems may occur.

**2.6.2 Special Features**

1. Sea otters

E.R. 109 is of special significance as the site of re-introduction of the sea otter to Canada. Its present population of about 350 otters is a nucleus from which other parts of the coast are gradually being colonized. Pioneering research is being done on the impact of sea otters on marine communities and shellfish resources.

2. Other marine mammals

The reserve contains two of 12 known year-round haulouts of the northern (Steller's) sea lion, where up to 400 animals may be regularly found. Many harbour seals are also present. Gray and killer whales regularly pass through the reserve, and other cetaceans are expected to occur.

3. Nesting seabirds

Five species of colonial seabirds nest at 6 locations in the reserve. Two of these, Leach's and Fork-tailed Storm Petrels are on the B.C. Environment (1991) Blue List. Thomas Island is the most important nesting site. Up to 11,000 pairs of Leach's Storm-Petrels have been estimated at Thomas Island, making this one of the most important nesting sites in British Columbia.

4. Archaeological Sites

The reserve area has a rich native history and numerous archaeological sites. Although archaeological sites are legally protected wherever they occur, Ecological Reserve status provides additional control over public access and should help to control the degradation of sites which has been widespread along the coast.

5. Wilderness value

This reserve is relatively unique in terms of the size of marine area enclosed and its remoteness. Unfortunately, this has resulted in increasing levels of recreational use, a purpose for which Ecological Reserves are not intended.

### 3.0 LAND USE AND OTHER ACTIVITIES

#### 3.1 Regional Socio-economic Context

Checleset Bay Ecological Reserve is in a very remote and sparsely populated area. The roadless wilderness of Brooks Peninsula Recreation Area forms a natural boundary to the north (Figure 4). The nearest road terminus, Fair Harbour (25 km east of the reserve), is 265 km from Campbell River, 113 km from Port McNeill, and 33 km from Zeballos. Kyuquot, one of very few Vancouver Island communities with no road access, is located 3.5 km east of the reserve, and Chamiss Bay, a logging camp, is 12 km to the east.

The reserve is in Area 6 of the Comox-Strathcona Regional District. This huge area of over 5,000 sq. km, excluding the incorporated communities of Gold River, Tahsis and Zeballos, has a total population of only 477 people (Ministry of Municipal Affairs, 1988). Just over half the population lives on Indian Reserves. Kyuquot, with a population of about 200 people has a store, marine fuel and moorage, post office, Indian Band office, bed and breakfast accommodation, restaurant, nursing station, and school. It has scheduled air service by float plane and weekly motor vessel service (M.V. Uchuk III), both from Gold River.

Commercial fishing is the main economic activity at Kyuquot. Commercial fishermen from other south-coast communities also fish in the area. In D.F.O. Management Area 26 (Cape Cook to Tatchu Point), an average of about 800 tonnes of salmon, 800 tonnes of ground fish, and 400 tonnes of shellfish were taken per year from 1985 through 1989. Important catches include all 5 species of Pacific salmon, rockfish, sablefish, ling cod, halibut, Pacific cod, red snapper, geoducks, clams, sea cucumbers, goose barnacles, and sea urchins (Appendix 14). Virtually all seafood processing is done outside the region. There is only one aquaculture operation in the Kyuquot Sound area.

Logging is the only significant land-based economic activity in the region. Logging camps occur at Chamiss Bay and Ououkinsh Inlet. Although connected to Kyuquot by road, they appear to have little economic impact on that village.

Tourism is of growing importance, though still a minor contributor to the local economy, largely due to remoteness and difficult access.

Sustenance use of marine resources is of importance for most residents of Kyuquot and particularly for the native people.

Figure 4.

## 3.2 On-site Uses

### 3.2.1 Research and Education

Research since establishment of E.R. 109 in December 1981 has largely been on the impact of introduced sea otters on marine community structure. Surveys of sea otter distribution and abundance and of nesting seabird abundance have also been carried out. Some of this research began before the reserve was established (e.g. Morris *et al.* 1979 a, b).

Impacts of Sea Otters (Broen *et al.* 1982; Stewart *et al.* 1982; Watson 1989, 1990, 1991).

These have been pioneering baseline studies of dramatic changes in invertebrate and kelp abundance in reef communities. The reserve continues to be an important site for monitoring such changes. This research has tremendous implications for the future of the shellfish industry in British Columbia.

Sea Otter Status and Distribution (see sources listed in Table 6).

Surveys have not always involved the issuance of a research permit, and now usually involve areas well outside the reserve, as well as the reserve. Continued monitoring of population size, seasonal distribution, movements, and sexual segregation of sea otters within the reserve is anticipated. This will provide information on carrying capacity, population trend, and location of key seasonal habitats.

#### Other Species

Seabird surveys have been carried out but results do not appear to have been provided to B.C. Parks. The following agencies/institutions have sponsored research in the reserve:

B.C. Parks (Ecological Reserves Program), Victoria, B.C.  
 Friends of Ecological Reserves, Victoria, B.C.  
 University of Victoria, Biology Department, Victoria,  
 B.C.  
 D.F.O., Pacific Biological Station, Nanaimo, B.C.  
 University of California at Santa Cruz.  
 West Coast Whale Research Foundation, Vancouver, B.C.  
 Bamfield Marine Station, Bamfield, B.C.  
 Canadian Wildlife Service, Delta, B.C.

The reserve provides a variety of intertidal and marine habitats that are of interest for research purposes. However, similar habitats occur in the Bamfield - Barkley Sound area, which is more accessible and has an established university - sponsored research/education facility. The demand for research on species other than sea otters will probably not be substantial at Checleset Bay in the foreseeable future. However, research to document biodiversity in the reserve is desirable. Research programs to date have not had any adverse effect on flora or fauna of the reserve.

The reserve has served an educational role through the media of television, magazine articles and lectures. These programs/articles have largely featured the sea otter, including the conservation story resulting from its reintroduction, and its effects on the structure of reef communities. A smaller number of people, primarily kayakers, have received educational benefits from visiting the reserve, particularly those guided by local expedition operators. Educational programs have stimulated increasing recreational use, which may become a future management problem.

### 3.2.2 Recreational Use

Kayakers and sport fishermen from outside the Kyuquot area are the major recreational users.

Exact numbers are not known, but are felt to be relatively low in view of the remote location and relatively difficult access. However, recreational use is definitely increasing annually (personal communication with Kyuquot residents). Recreational use was negligible prior to completion of the road to Fair Harbour.

Kayakers mostly launch at Fair Harbour and paddle to the reserve via Kyuquot, or travel to Kyuquot in the Uchuk III from Gold River. Both un-escorted parties and organized tours are involved. The usual destination point is the Bunsby Islands, although some travel to Brooks Peninsula. Articles and advertisements in magazines such as the "Sea Kayaker" and "Wave Length" and descriptive guidebooks (Ince and Kottner 1982) have made the area well known to the kayak fraternity. West Coast Expeditions operates a summer base camp at Spring Island near Kyuquot (Figure 4) and caters primarily to kayakers. Their excursions involve areas inside and outside the reserve. Kayakers utilize a number of informal camping sites inside the reserve (Figure 2). These have resulted in minimal site damage to date, but continued and/or expanded use could result in localized site degradation.

Sport fishermen launch trailered boats at Fair Harbour and mostly fish in the Kyuquot Sound area, although some venture to the Bunsby Islands. Local residents expressed concern about increasing numbers of sport fishermen. These recreationists seldom go ashore in the reserve.

There is a potential for both kayakers and sport fishermen to disturb sea otters, but this is not known to be a problem at present.

### 3.2.3 Other Uses

Commercial fishing: Trolling for salmon in waters outside the Barrier Islands is the major commercial fishing activity in the reserve. The proportion of the Area 26 catch taken in the reserve is not known. Based on the list of species harvested in Area 26 (Appendix 14), it is likely that a variety of species beside salmon are also taken in E.R. 109.

Marine resource harvesting is regulated by the Federal Department of Fisheries and Oceans. Fisheries interests have been reluctant to institute or accept closures in the reserve, however recommendations from Ecological Reserve supporters/managers have resulted in harvest closures for some shellfish that are of importance to sea otters. In 1992 this included all species of intertidal clams; subtidal clams (geoducks and horse clams); red and green sea urchins; and abalone (closed on the entire coast). Closures are a condition of the commercial fishing license for the individual species affected (R. Harbo, personal communication). There have been documented fisheries for sea cucumbers and goose barnacles within the reserve. Crab, octopus and scallop fisheries occur in the area, possibly including the reserve. There is no mussel fishery at present, but commercial stocks occur. There are intertidal clam populations in the reserve which could be harvested commercially, if not for the closure.

The extent to which the above closures are violated and level of enforcement effort are not known. The nearest D.F.O. Officer is stationed at Tahsis.

Sustenance fishing: Residents of Kyuquot engage in some sustenance use of shellfish and finfish in the reserve. However, in view of the small human population involved, and availability of marine resources outside the reserve (e.g. Mission Group), this use is felt to be minimal and to presently be no threat to sea otters or to the general integrity of the reserve.

Other uses: Other activities in the reserve are few. Some marine traffic up and down the west coast of Vancouver Island passes through the outer part of the reserve. There is little marine transport through the reserve to Malksope or Ououkinsh Inlets, both of which are connected by road to Chamiss Bay. Navigation markers are present 2 km southwest and 1.5 km northwest of Thomas Island (Marine Chart 3683).

## 3.3 Off-site Uses

### 3.3.1 Logging

Lands surrounding the reserve, with the exception of Brooks Peninsula Recreation Area, are in the Kyuquot Provincial Forest (Figure 4). For administrative purposes these forestlands are in the Kyuquot Supply Block (S.B.) of the Strathcona Timber Supply Area (T.S.A.). Lands within the Ecological Reserve have never been logged. Logging has occurred to the reserve boundary (The Shoreline) along the slopes of Mt. Paxton from Malksope Point to the vicinity of McLean Island. This was mostly from 1980 to 1989, and is strikingly apparent from almost anywhere in the reserve.

Active logging operations are presently based at Chamiss Bay (International Forest Products) and the head of Ououkinsh Inlet (Hecate Logging). Operators under the Small Business Program also log along Ououkinsh Inlet. The Power and Nasparti River drainage basins are unlogged, and form part of the "Brooks Extension" which is presently (late 1992) subject to a logging moratorium pending a review by the Commission on Resources and Environment. Logging tenure in at least part of that area is held by Doman Forest Products. Near the reserve, logging occurred on East Bunsby Island in 1964/65 and 1976, along Johnson Lagoon in 1980, at scattered locations along the east side of Nasparti Inlet (to within 400 m of the reserve) from 1980 to 1990 and at various locations along Ououkinsh Inlet (1960's and 1983) and Malksope Inlet (1934 - 1969). Most of these were small hand-logging operations along the shoreline. More extensive logging is presently underway around the heads of Ououkinsh Inlet and Malksope Inlet, and at Clanninick and St. Pauls Creeks. These logs are trucked to Chamiss Bay.

Hand loggers along the inlets have moved their logs by water through the reserve. This may continue, particularly if hand logging is allowed in Nasparti Inlet and Johnson Lagoon.

Logging appears to have had little direct impact on the reserve. However Kyuquot residents state that heavy rainstorms in the winter of 1990/91 caused extensive siltation in the inlets, and this carried out into Cheeleset Bay. They blame this on logging, and claim that it caused sea otters to climb out of the water onto land, rocks or logs. There is no conclusive evidence that this resulted in sea otter mortality.

### 3.3.2 Commercial Fishing

Commercial fishing for finfish and shellfish is a major activity in waters surrounding the reserve. Recent commercial catches for D.F.O. Management Area 26 are given in Appendix 14.

### 3.3.3 Outdoor Recreation

The Brooks Peninsula Recreation Area borders the northwest side of the reserve (Figure 3). Except for limited recreational use of its shorelines by kayakers, this roadless wilderness is little used at present. A few kayakers and sport fishermen probe Nasparti, Ououkinsh and Malksope Inlets via the reserve. Sport fishing and kayaking also occur in the Kyuquot Sound area, southeast of the reserve. Low levels of sport hunting occur, and primarily involve local people. Black-tailed deer and black bears are widespread, though not particularly abundant in this area. Limited-entry hunting for Roosevelt elk occurs in the Klaskish, Power and Nasparti River valleys.

### 3.3.4 Mineral Exploration and Mining

There are many mineral claims in the surrounding area but no active mines. Almost all of the Brooks Peninsula is staked and other claims are present in the headwaters of the Nasparti and Power Rivers. The likelihood that any of these could become active mines is not known. Mineral extraction near the reserve boundaries could have an adverse impact, depending largely on the kind and scale of operation.

Offshore oil and gas reserves are predicted to occur in the Winona Basin, north of Brooks Peninsula, and Tofino Basin, south of Brooks Peninsula (Procter *et al.* 1983). Four wells have been drilled in the Tofino Basin, none in the Winona Basin. Exploration ceased when a moratorium on offshore drilling was declared in 1969. Should the moratorium be lifted, renewed drilling could have implications for the reserve.



## 4.0 RESERVE MANAGEMENT

### 4.1 Management Issues

Management issues are considered to involve any activities which have threatened or presently threaten the integrity of the reserve and the purposes for which it was established (preservation; research; education).

#### 1. Increasing recreational use

Potential adverse effects include:

- disturbance of sea otters
- disturbance of nesting seabirds
- damage/looting of archaeological sites
- site damage and littering at camps.

To date these problems have been minor, but they can be expected to increase in the future. Creation of a new Provincial Park in the East Bunsby Island - Battle Bay area, and provision of recreational facilities at Brooks Peninsula (Columbia Cove) could have implications for the Ecological Reserve. These developments could increase recreational use of the general area, with spin-off impacts on the reserve, or could draw some recreational use out of the reserve into adjacent sites having basic facilities. Two factors suggest that the above-mentioned developments would cause the existing situation to change little in the foreseeable future: 1) The area is remote and access to it is not likely to improve. Visitation at the new park and at Brooks Peninsula would be low. 2) Kayakers, the predominant recreational users at present, prefer to camp in remote, dispersed, unimproved locations. They would probably not be attracted to the new park or to facilities at Columbia Cove.

#### 2. Commercial fishing

Potential adverse effects include:

- removal of forage resources needed for survival of sea otters and other species
- reduced opportunity for research on natural, unexploited ecosystems.

The extent of this perceived problem has not been determined. Fishery closures on key invertebrates have been instituted, reducing the profile of this issue.

#### 3. Logging on adjacent lands

Potential adverse effects include:



- siltation of marine waters during heavy rainfalls, with adverse effects on sea otters and possibly other species
- loss of nesting sites for Red or Blue-listed birds which forage in the reserve (Marbled Murrelet; Bald Eagle)
- wildlife disturbance caused by movement of boats, barges or booms through the reserve.

Siltation of marine habitats has been reported and may have affected sea otters, but whether any mortality occurred or is likely from this source is not known. The expected frequency of siltation events, and extent to which logging is responsible are not reliably known. Increased logging in the Nasperti, Power, Ououkinsh or Malksope watersheds could cause more severe or more frequent discharge of turbid water into the reserve.

Logging to the shoreline on Mt. Paxton has removed potential nest trees of Bald Eagles, and any similar logging elsewhere along the boundary (e.g. between Ououkinsh and Nasperti Inlets) could do the same. Although the nest trees are outside the reserve proper, any eagles using them would forage in the reserve. Logging has probably also removed potential nesting habitat of Marbled Murrelets which feed in the reserve. Logging on adjacent lands therefore, can diminish the diversity and abundance of wildlife inside the reserve.

Movement of logging-related boat traffic through the reserve does not appear to have been a problem to date, and should not increase in the foreseeable future.

#### 4. Oil spills

Potential adverse effects include:

- sea otter mortality due to loss of insulation
- fouling of other marine organisms and beaches.

The Nestuca oil spill in the winter of 1988/89 resulted in at least one sea otter death in the reserve, and circumstantial evidence (oiled sea otter fur in a wolf scat) suggested that others also died (Watson 1990). Oil collected on a number of beaches, but subtidal communities appear not to have been directly affected. This spill did not have a measurable effect on size of the Cheeleset Bay sea otter population, or on its distribution. The threat of oil spills will always exist, but they should be of very infrequent occurrence.

#### 5. Native sustenance or commercial use of marine resources

Potential adverse effects include:

- removal of forage resources needed for survival of sea otters and other species
- reduced opportunity for research and education concerning natural, unexploited ecosystems.

This is not believed to have been an issue to date, but in view of recent and developing trends with respect to native land claims, resumption of traditional land uses, and co-management of resources, it is likely to be a future issue. There can be no doubt that the Cheekliset/Kyuquot people lived in and used the area for several thousand years. Two Indian Reserves (Hub-toul 2A and Cheekaklis Island No. 9) are completely surrounded by the Ecological Reserve, and 3 others (Quineex No. 8; Acous No. 1; Mahope No. 3) abut its boundary. The latter 3, plus Upsowis No. 6, Hisnit No. 4; Ououkinsh No. 5 and Malksope No. 5, can only reasonably be reached (by water) by travelling through E.R. 109. The reserve boundary also passes through the intertidal zone on the west side of Granite (McLean) Island No. 4, near Kyuquot. Five additional Indian Reserves (Yakats No. 5; Houpsitas No. 6; Ahmacinnit No. 3; Village (Aktis) Island No. 1; Mission (Kamils) Island No. 2) are within 4 km of the east boundary of the Ecological Reserve (Figure 4). Despite

this native presence it appears that the Kyuquot Band was not consulted about establishment of E.R. 109 (B.C. Parks File Update, June 1989). The Band appears to have constrained its criticism of the Ecological Reserve because E.R. status protects it from harmful exploitation, but does not, at least in the opinion of Band members, preclude their continued use of the area for sustenance or other traditional purposes.

#### 4.2 Management Practices

##### 1. Control of research and educational uses

This has been achieved through the Ecological Reserve permit system. Most, though not all permittees appear to have reported their results to B.C. Parks.

##### 2. Control of marine resource harvesting

D.F.O. has cooperated in instituting closures for important sea otter food species. Further research is needed to determine if additional closures are required. The degree to which the present closures are respected is not known.

##### 3. Dissemination of information

Magazine articles have helped to educate people about the purpose of the reserve. Past and present Volunteer Wardens regularly inform reserve users about reserve regulations. No boundary signs have been erected and no information brochures printed.

##### 4. Monitoring sea otter populations

Regular surveys have been sponsored or carried out by B.C. Parks. These have documented the growth and spread of the population.

#### 4.3 Key Management Agencies/Groups

The following is a list of government agencies and non-government organizations which have had or could have a role in management or protection of Checleset Bay Ecological Reserve:

<u>Agency or Group</u>	<u>Actual/potential Role</u>
B.C. Parks (Ministry of Environment, Land and Parks) - E.R. Program, Victoria - Strathcona District, Parksville - Strathcona Zone, Miracle Beach	- E.R. protection; planning; management; volunteer Warden Program. Parks and recreation planning on adjacent lands
B.C. Environment (Ministry of Environment, Land and Parks) - Wildlife program Nanaimo - - Conservation Officer, Port Hardy	Wildlife surveys - Wildlife protection
Canada Department Fisheries and Oceans - Management Biology Unit, P.B.S., Nanaimo - Marine Mammal Unit, P.B.S., - Nanaimo - Fisheries Officer, Tahsis	- Shellfish management and Native food fishery Inventory and Research Fisheries enforcement

Environment Canada - Canadian Wildlife Service, Delta	- Seabird inventory; protection
B.C. Ministry of Forests  - Campbell River Forest District	- Forest management, Kyuquot S.B.
B.C. Ministry of Tourism and Culture - Archaeology Program, Victoria	- Inventory and protection of sites
Regional District of Comox-Strathcona	- Regional planning
Kyuquot Indian Band - Sustenance fishery; pro-	tection of archaeology sites; access to reserves
Kyuquot Economic and Environmental Protection Society (KEEPS)	- Information on local conservation issues
Friends of Ecological Reserves, Victoria	- Support of research; dissemination of information
Ocean Kayaking Association of B.C.	- Promote ethical practices

## 5.0 KEY RESOURCES AND MANAGEMENT ISSUES

### 5.1 Key Resources

The reserve was established primarily to protect an introduced sea otter population and its habitat. A large reserve (34,650 ha) was needed in order to provide habitat for a viable, self-sustaining population. The otters have now spread to all suitable habitats in the reserve (Figure 2) and to sites outside it (Figure 3). They are expected to colonize the entire outer coast of British Columbia within a few decades; the population should reach 10,000 or more and could then be removed from the endangered list. E.R. 109 will become progressively less important in terms of the relative numbers of sea otters using it. However, in view of the extra protection that Ecological Reserve status gives to sea otters, their forage species and habitat in general, the reserve will always be a site of above-average importance for the species. The key resource is not just the otters, but must also include their forage resources and the complete reef ecosystems which they inhabit. Sheltered areas that are used by the otters during winter storms are probably also important. These have not been identified, but could include such areas as Columbia Cove, Battle Bay, and East Bunsby Island which are outside the reserve.

Seabird nesting colonies and archaeological sites are also significant resources.

### 5.2 Key Management Issues

#### 5.2.1 Reserve Boundary

The following boundary issues have been noted:

1. Lack of boundary description

There has apparently never been a metes-and-bounds description of reserve boundaries. Order-in-council 2566 and the Gazette Notice refer respectively to an area "... shown outlined in bold black on the plan attached hereto ..." and "... as shown outlined on a map deposited in the Ministry's Regional Office for Vancouver Island ...". The Boundary shown on various government maps is complicated and open to interpretation in some locations.

2. The boundary is not shown on Marine Charts or on 1:50,000 topographic maps.
3. There are no boundary signs in place.
4. As noted in Section 5.1, the boundary may not include winter habitats used by sea otters.

### 5.2.2 Resource Preservation

Significant issues involving preservation of key resources (sea otters and their habitat) are as follows:

1. Jurisdiction over resources

The Ecological Reserve designation is provincial but marine resources are under federal jurisdiction. D.F.O. has a mandate to promote economic benefit from marine resources; B.C. Parks has a mandate to preserve natural conditions. However, neither level of government has undisputed authority in the offshore area (Dorcey 1986). Under E.R. Regulations it is an offence to remove animals from an Ecological Reserve. Checleset Bay is a large reserve, contains economically significant and harvestable marine resources, and was subject to various fisheries prior to becoming a reserve.

The jurisdictional problem is one that all parties will have to live with. Conflicts can be reduced by more frequent communication and by providing scientific documentation in support of management recommendations.

2. Control of harvests of marine resources

This issue is related to the previous one. It seems to have been at least partially solved through commercial harvest closures on various invertebrates. However, sport and sustenance harvests continue and could increase. Further documentation of sea otter food habits and foraging sites and of shellfish and finfish populations is needed in order to identify potential conflicts.

3. Control of recreational use

Excessive recreational use could disturb sea otters and conflict with the objective of otter preservation. It could also interfere with research and educational programs. On the other hand, sea otters may be quite adaptable to non-threatening human activity. Evaluation of this potential problem is needed.

Damage to seabird colonies and archaeological sites could also occur.

4. Impact of logging adjacent lands

Siltation of marine waters as a result of logging may or may not be a problem for sea otters. Siltation could become worse if the Nasparti and Power drainages and the peninsula between Nasparti and Ououkinsh Inlets are logged. Sea otters and logging will soon occur along most of the coast of British Columbia. E.R. 109 is a suitable study area for evaluation of the contribution of logging to marine sedimentation, and the impact of that sedimentation on sea otters.

5. Oil spills

Oil spills some distance from the reserve have and can affect sea otters and their habitat at Checleset Bay. Though of infrequent occurrence the magnitude of such an impact can be high, as demonstrated by the Exxon Valdez incident.

### 5.2.3 Research Opportunity

Research to date has focused on the impact of sea otters on marine community structure. This is of considerable importance for prediction of sea otter impacts on shellfish resources along the entire outer coast of British Columbia. That impact is expected to be substantial.

As noted previously, harvesting of marine resources could preclude research on natural populations or communities, and excessive recreational activity could interfere with research on sea otters or perhaps other species. Such problems do not appear to have arisen to date.

#### **5.2.4 Educational Opportunity**

As in the case of research, excessive recreational activity could interfere with educational use of the reserve. However, levels of both recreational and educational use are relatively low, and no significant problems are anticipated in the foreseeable future.

#### **5.2.5 Recreational Use**

See Sec. 5.2.2

#### **5.2.6 Other Uses**

See Sec. 5.2.2

#### **5.2.7 Surrounding Land Uses**

See Sec. 5.2.2

#### **5.2.8 Wardenship**

Large, remote reserves such as this present unique problems for the wardenship program. Past and present wardens have done an admirable job of coping with those difficulties, however the same level of attention that is accorded smaller, on-land reserves having ready access cannot be expected here.

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