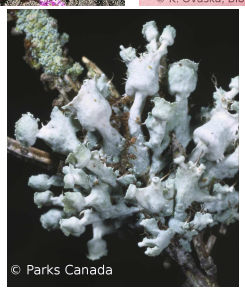
Species at Risk Assessment—Pacific Rim National Park Reserve of Canada



Prepared for Parks Canada Agency
by
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3rd May 2005

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0.1 Acknowledgments

The support and help of all individuals and organizations who contributed to this report is gratefully acknowledged and appreciated; without their help this report could not have been completed. I would like to extend special thanks to Barry Campbell who's endless effort and vast knowledge of the species and records/reports in the park (and of local species experts) made this report possible. I would also like to extend thanks to the photographers who gave permission for the use of their photographs in this report; credits are included with most photos with the exception of *Sparganium fluctuans*, and *Schoenoplectus americanus* for which credit is goes to USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. Illustrated flora of the northern states and Canada. Vol. 1: 330.

Chapter 1

Introduction

1.1 Background Information

Humans put pressure on ecosystems and species all over the world and many species will become extirpated or extinct without proper management and protection. The first step in management and protection of species at risk is an awareness of the risk level each species faces; to this end species are scientifically ranked according to their risk of extinction and tracked at global, national, and subnational scales. This ranking helps to prioritize resources for species protection. Further changes can be brought about by legislation such as Canada's *Species at Risk Act* (SARA), which creates a legal requirement to protect species at risk on federal lands, such as the Pacific Rim National Park Reserve of Canada (PRNPR) (Figures 1.1, 1.2, 1.3, and 1.4).

NatureServe, a non-profit conservation organization, ranks and tracks species globally and nationally. Global and national ranks are created based on subnational ranks determined by a network of conservation data centres located in the United States, Canada, Latin America, and the Caribbean. This NatureServe network uses a detailed ranking system based on a scale of one to five (critically imperilled to secure) with various modifiers (Appendix A).

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assigns national ranks for Canada. COSEWIC is independent and at arms length from the government of Canada, and is not associated with NatureServe. COSEWIC places species into one of seven categories: not at risk, data deficient, special concern, threatened, endangered, extirpated, or extinct.

The British Columbia Conservation Data Centre (BC CDC) ranks species at a provincial level. The BC CDC uses the NatureServe methodology to assign subnational ranks (Appendix A) to species within British Columbia. Additionally the BC CDC maintains the Red, Blue, and Yellow lists of species; a species' subnational NatureServe rank determines which coloured list is is on (Table 1.1). Species on the Red List are most at risk, Blue listed species are less at risk but still of concern; the Yellow List contains every other species in British Columbia. These coloured lists provide a quick intuitive means of organizing species, but provide less information than NatureServe ranks.

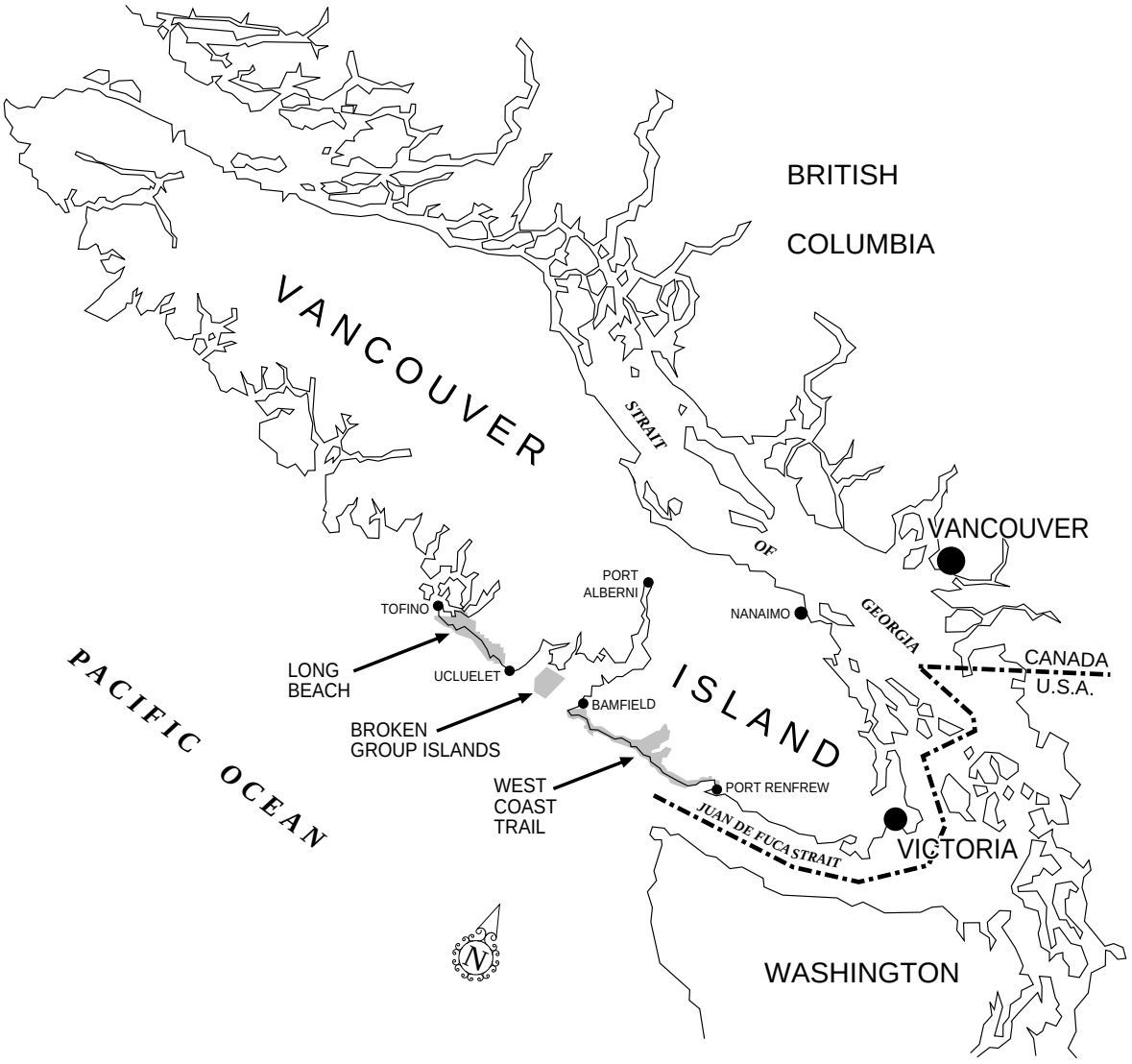

Figure 1.1: Pacific Rim National Park Reserve region.

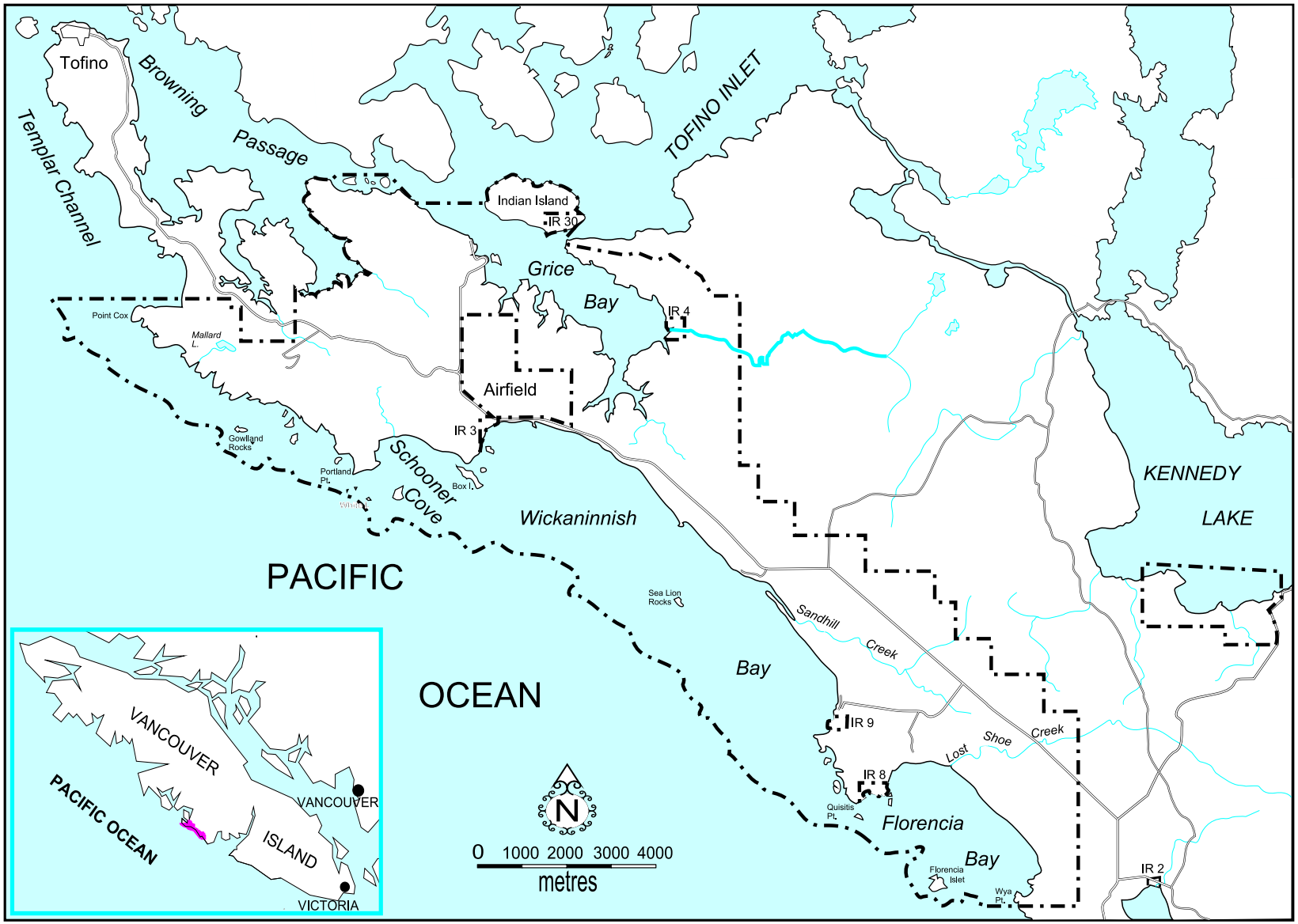

Figure 1.2: Pacific Rim National Park Reserve, Long Beach Unit.

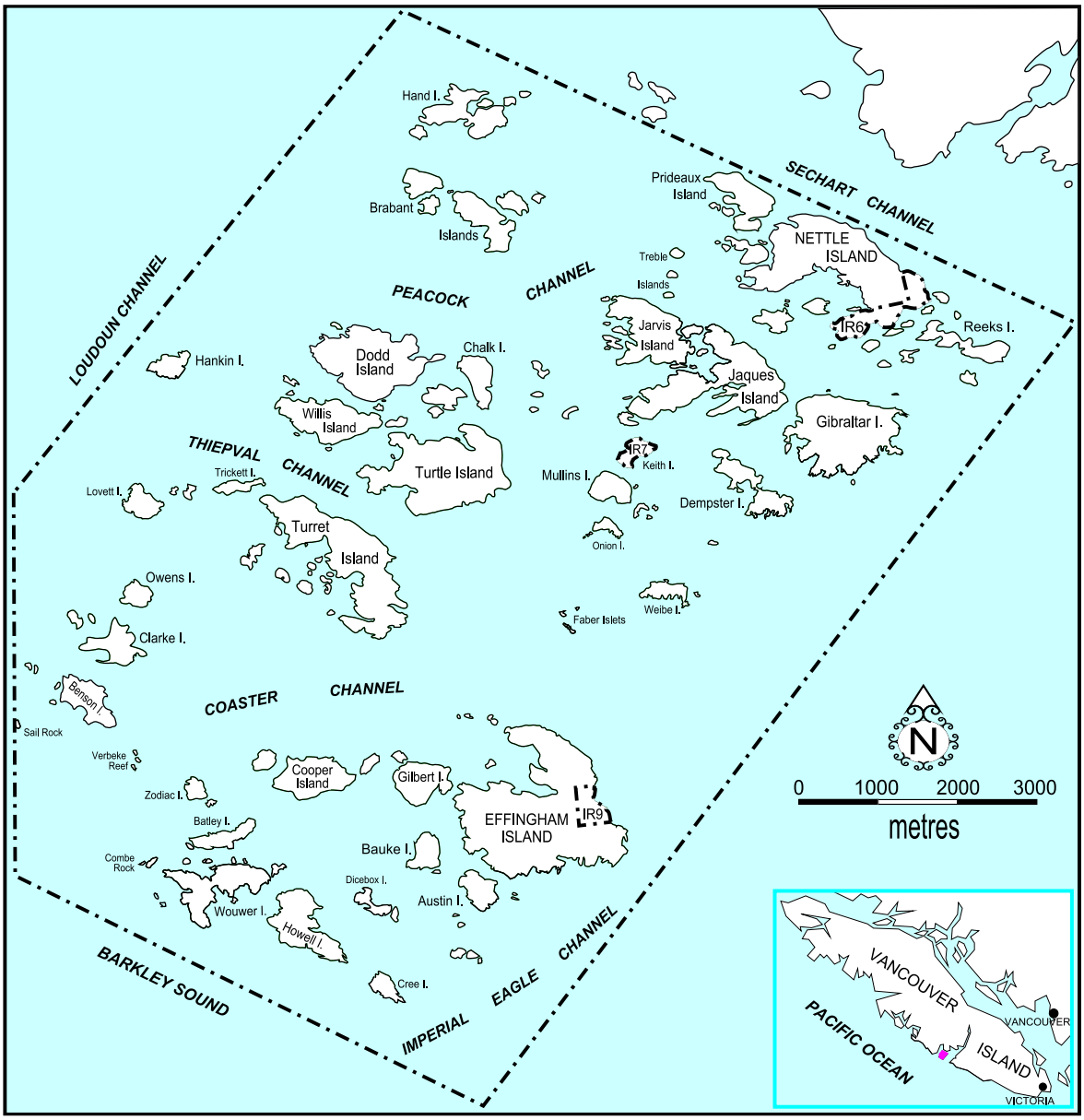

Figure 1.3: Pacific Rim National Park Reserve, Broken Islands Unit.

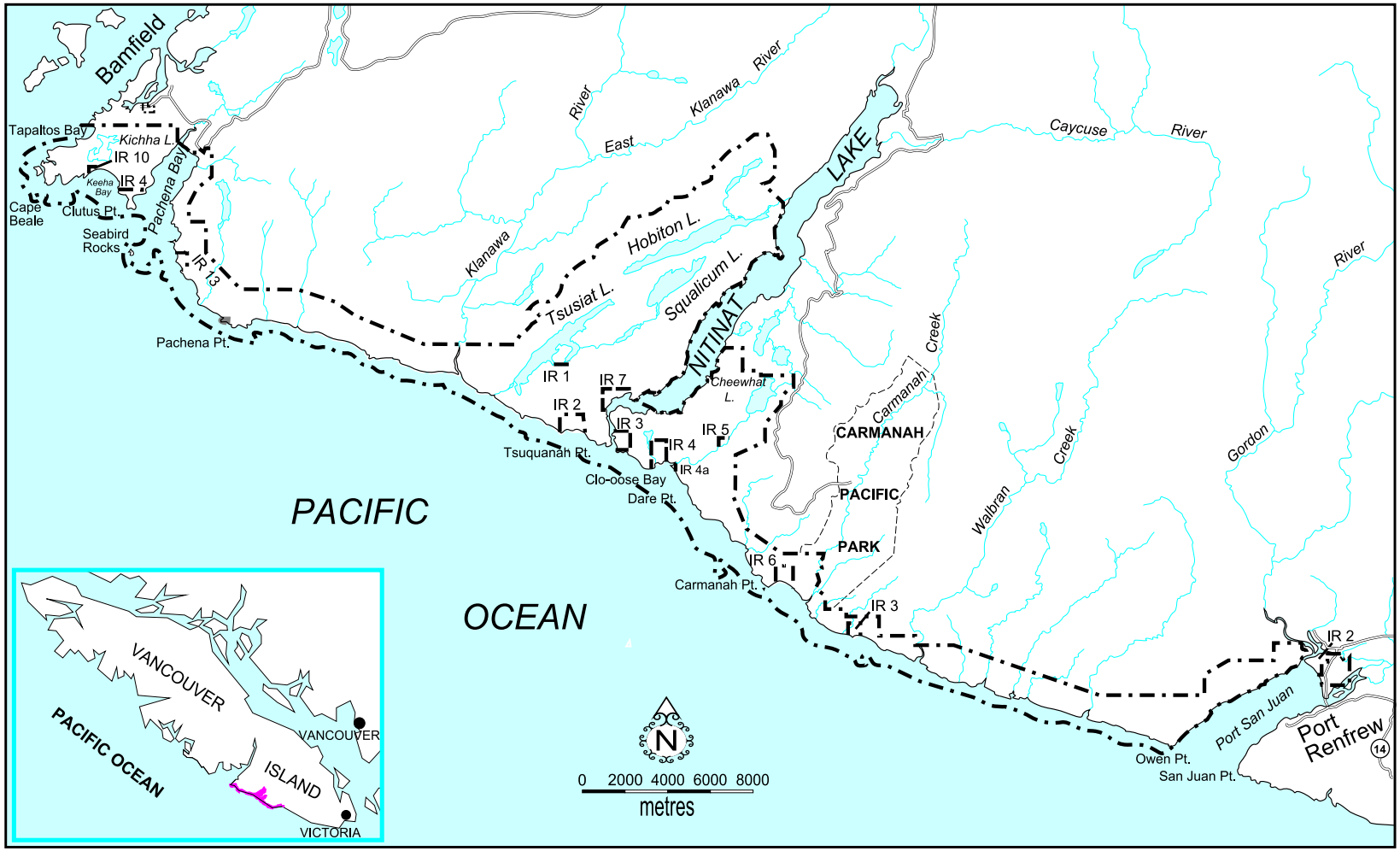

Figure 1.4: Pacific Rim National Park Reserve, West Coast Trail Unit.

Table 1.1: Relationship between British Columbia Conservation Data Centre coloured lists and NatureServe ranks.

List Colour	NatureServe Rank
RED	S rank of 1, 2, 1-2, 1-3, H, or X (extinct species are excluded)
BLUE	S rank of 2-3, 3, or 3-4 (animals only)
YELLOW	S rank of 4, 5, 4-5, or 3-4 (plants only)

The federal *Species at Risk Act* was proclaimed in June 2003. While most of the SARA provisions came into force in 2003, protection and enforcement provisions were deferred until June 2004. This act introduces a list of species called "schedule one" and creates a legal requirement to protect any species on this list. Species are automatically nominated for addition to "schedule one" when COSEWIC assesses them as special concern, threatened, endangered, extirpated, or extinct. Pending public consultation these species can be added to "schedule one" through a regulatory amendment. Prior to the implementation of SARA, COSEWIC had already determined a number of species to be at some level of risk. Many of these previously assessed species were automatically added to "schedule one" while those without a recent assessment and status report need to be re-assessed by COSEWIC before they will be considered for addition to "schedule one"; this re-assessment is ongoing at this time. Species on "schedule one" gain immediate protection if they are a migratory bird, an aquatic species, or reside on federal land. More information about SARA can be found on the public registry website[1].

Species at risk within PRNPR are protected under the *National Parks Act* and SARA; Furthermore, Parks Canada's mandate includes the protection of natural heritage and maintenance of ecological integrity.

1.2 Objective

The first step in protecting a species is awareness of its existence and level of risk. The primary objective of this project was to determine the presence/absence of species at risk in PRNPR and to determine a preliminary park rank (a measure of the risk level this species faces in the park). Additional objectives include:

- gathering and compiling background and management information about species which are likely to occur in the park,
- creating a database of species at risk which are present or potentially present within the park,
- gathering spatial information where possible.

[1] http://www.sararegistry.gc.ca/the_act/HTML/Guide_e.cfm

1.3 Methods

The first objective was to make a shortlist of species present or potentially present in PRNPR. This process began with the entire list of COSEWIC assessed species for British Columbia and the Pacific Ocean. This large list of COSEWIC species was culled by inspection of species habitat and distribution and by comparison with the BC CDC's list of species at risk in the south Vancouver Island district (from the British Columbia Species and Ecosystems Explorer web application). This resulted in a shortlist of COSEWIC species for further investigation; this list included species with a confirmed, likely, possible, or unknown presence in PRNPR. A BC CDC data request for all species at risk records within PRNPR was added to the shortlist to include species ranked by the BC CDC, but not COSEWIC.

The shortlist was further refined by looking though park records, performing literature searches, and discussions with experts. PRNPR records were searched, and park staff were asked for relevant species at risk information; Barry Campbell was instrumental in this and also added his own knowledge. Due to time constraints the literature search generally focused on status reports and review articles. Experts were consulted as needed or desired concerning various aspects of species occurrences in or around PRNPR.

With input from Brian Reader species in the shortlist were divided into three categories: full report, abbreviated report, or database only. Species were divided roughly by importance, based on their rank and likelihood or extent of occurrence in PRNPR. Species in the "full report" category are described in a multi-page species report including their current status, biological background data, habitat, detailed distribution, and management considerations. Species in the "abbreviated report" category received a 1–2 page write-up including their current status, and relevant information such as presence and distribution in the park. Species in the "database only" category received no write-up, they are included with some notes in the species summary list (appendix C) and the species database—an MS Excel spreadsheet: "Summary Species List" version 1.4). The spreadsheet database was provided by Ecological Integrity Information Scientist Ewen Eberhardt with the Parks Canada Agency, Ecological Integrity Branch, Ottawa.

A status assessment was performed for each species on the shortlist. This status assessment followed the Detailed Species Assessment process being developed by Parks Canada. Ewen Eberhardt provided a template and additional help with this process. The Detailed Species Assessment begins with an assessment of species presence and continues with a ranking process for species known to be present in the park. This ranking process is similar to the NatureServe process and uses a similar ranking system (Table 1.2, Appendix B).

Much of the reference material for this report was gleaned from on-line databases. To assist further research a list of important organizations and their Internet resources used during the writing of this report is included here:

General information Resources

BC Conservation Data Centre (BC CDC) ranks species at risk in British Columbia and tracks their element occurrences. The BC CDC database is accessible through the British Columbia Species and Ecosystems Explorer, which also has links to on-line

Table 1.2: Primary ranks used for the Parks Canada detailed assessment.

Rank	Meaning
PX	Eliminated
PH	Presumed Eliminated (Historic)
P1	Critically Imperilled
P2	Imperilled
P3	Vulnerable
P4	Apparently Secure
P5	Secure
PU	Unrankable

reports for each species when available.
<http://srmapps.gov.bc.ca/apps/eswp/>.

NatureServe ranks species at risk at the global level. NatureServe's database, accessed with NatureServe Explorer, has detailed reports and references, as well as element occurrence specifications for many species.
<http://www.natureserve.org/>.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC) ranks species at risk in Canada and has an on-line database with a short description about each species and links to the SARA Public Registry and Species at Risk websites for each species.
<http://www.cosewic.gc.ca/index.htm>.

SARA Public registry the repository for documents relating to SARA, including COSEWIC status reports for many—but not yet all—species.
<http://www.sararegistry.gc.ca/default_e.cfm>.

Environment Canada Species at Risk website pictures and fact sheets for SARA listed species.
<http://www.speciesatrisk.gc.ca/>.

Royal BC Museum (RBCM) maintains an on-line Object Database of items in their collection, unfortunately location information is not included but it is easily obtained via email.
<http://rbcm1.rbcm.gov.bc.ca/index_rc.html>.

Canadian Biodiversity Information Facility (CBIF) provides a few different services, the most valuable for this project being the Species Access. Species Access links the databases of many institutions to provide one source (the CBIF) for information about specimens housed in various institutions. Species Access includes the RBCM and includes location information. Searches can be based on geographical area; for instance

all records of *Accipiter gentilis* within a certain distance of a specific geographical (latitude/longitude) reference can be found. Furthermore, the found records often contain coordinates for the location and a link is provided to automatically map them using the DEMIS map server (described below). Other services, such as a catalogue of common and scientific names, including synonyms, is available at CBIF.
<http://www.cbif.gc.ca/>.

BC Ministry of Water Land and Air Protection has a good search engine that indexes many of their internal reports available in PDF format.
<http://wlapwww.gov.bc.ca/main/ministry_search_adv.html>.

Google Internet search engine which indexes many websites. The advanced options of Google can be used to limit the search to specific document formats; limiting the search to PDF is especially helpful for finding reports. Government reports can often be found easier this way than using the search on the government website. Hint: use quotes to search for an exact phrase like a title.
<www.google.ca>.

Department of fisheries and Oceans (DFO) DFO stock assessments and other reports. Canadian Science Advisory Secretariat:
<http://www.dfo-mpo.gc.ca/csas/Csas/English/Publications/Index_Pub_e.htm>
Pacific Scientific Advice Review Committee:
<http://www.pac.dfo-mpo.gc.ca/sci/psarc/ResDocs/res_docs_e.htm>.

Mapping and Coordinate Resources

Terrestrial Information of BC an on-line GIS resource for British Columbia from the British Columbia Ministry of Sustainable Resource Management, Resource information Branch. This resource also includes BC CDC element occurrences.
<http://maps.gov.bc.ca/imf406/imf.jsp?site=rrid_tib_ti>.

DEMIS map server A on-line GIS resource which can be used to determine where (roughly) in the world a geographic coordinate lies.
<http://www.demis.nl/mapserver/mapper.asp>.

Canadian Geographical Names a very good resource, especially the query by name for finding the location of Geographical names in Canada (cities, towns, lakes, cliffs, and more).
<http://geonames.nrcan.gc.ca/index_e.php>.

Coordinate conversion there are lots of utilities on the Internet for converting between various geographical coordinate systems such as geographic (latitude/longitude) and UTM. Natural Resources Canada, Geodetic Survey, Division has one such converter on their website:
<http://www.geod.nrcan.gc.ca/index_e/on-line_apps_e/appGSRUG_e/appgsrug_e.html>.
The Terrestrial Information of BC website (mentioned above) provides BC Albers, geographic, and UTM coordinates coordinates for locations clicked on the map (when using the “Drill Down Identify” tool).

Chapter 2

Species Reports

The following species reports are a summary of available information on Species at risk in Pacific Rim National Park. They are not a recovery or action plan for species in the park. More detailed information about each species can be found in the appropriate reference material.

2.1 Sample Species Report

***#.#.# Genus species* (Common name)**

Other names If appropriate, a list of other common and scientific names encountered during the writing of this report.

Taxonomic Group The taxonomic group the species belongs to. This section is designed to place the species in context and is generally the order but may be a higher or lower taxonomic level where appropriate.

Subgroup If needed this section indicates a subspecies, population, or other grouping below the species level.

Species Presence Describes the general presence of the species in and around PRNPR. Resident species regularly spend at least a portion of the year (generally a complete season or more) in the area; resident species can be non-breeding or breeding occurrences, but must regularly spend at least a portion of the year in the area. Transient species use an area less predictably and for shorter periods of time than residents, they are often just passing through.

Status Lists the ranks given to the species by various organizations, descriptions of these rankings can be found in the introduction to this report and in appendices A and B. The park rank is the preliminary ranking performed as part of this assessment.

A photograph of the species if copyright permission was obtained for a photo.

Or the following text:

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection The current status of recovery and or protection for this species.

Description Provides a general physical and life history description of the species.

Habitat Describes the species habitat.

Distribution Description of the species' distribution with a focus on the Pacific Rim National Park. Geographic coordinates have been included where available; however, it should be noted that the accuracy of these coordinates varies depending on the accuracy of the source.

Population sizes and trends The overall population trends and size for the species outside and within the park as data is available.

Threats and limiting factors General threats and limiting factors over the entire species' range and those of particular concern to management in the national park.

Data Gaps Not meant to be a comprehensive list of all data gaps, but rather a list of data gaps pertaining to management in the national park.

Management Considerations Summarizes points of particular interest for Pacific Rim National Park and suggests some management options. This section is often general and in most cases further research is required to determine specific management actions. More detailed information can often be found in the appropriate reference material. Furthermore, species' authorities or recovery teams should be contacted to obtain updated information before initiating recovery actions.

Bibliography

[1] The bibliography/reference list is not only a list of cited material but also a list of reference material consulted in the preparation of the report for this particular species. Certain information, usually specific data, has a source cited, but citations have been kept to a minimum for readability. The bibliography list is meant to be a list of available reference material for further reading on the species. Reference material that is not species specific, or contains information on many individual species, can be found in the General Reference Material section at the end of this report. Citations in the form [#] can be found in the species specific reference material at the end of each species report; citations in the form (author date) can be found in the General Reference Material section at the end of this report.

2.2 Amhibia (Amphibians)

2.2.1 *Bufo borea*s (Western toad)

Taxonomic Group Anura (frogs and toads)
Species Presence Year-round breeding resident of the surrounding area and likely PRNPR.
Status **NatureServe**: G4; **COSEWIC**: Special Concern, Last examination/Change: November 2002 (New); **SARA**: Schedule 1; **BC**: S4 & YELLOW; **PRNPR**: P2P3

Status of recovery/protection This species is protected under the *Species at Risk Act* and British Columbia's *Wildlife Act* (prohibits collection of native British Columbia amphibians). Research and monitoring activities are ongoing. British Columbia is a responsible jurisdiction for this species.

Description

> "The Western Toad has dry bumpy skin, horizontal pupils, and a distinctive white or cream-coloured stripe down its back. The toad varies in colour from olive-green to reddish-brown to almost black. The belly is pale and coarsely mottled, and the back feet have two tubercles (small, knoblike projections) that help with digging. In young toads, these tubercles are yellow. The paratoid glands (paired, wart-like glands above the eyes), characteristic of this family of toads, are larger than the upper eyelids and well separated." (Environment Canada, Species at Risk Branch 2004)

Females reach 12.5 centimetres and are larger than the 6–11 centimetre long males. Recently metamorphosed toadlets are approximately 1 centimetre long and have the characteristic dry bumpy skin, but the dorsal stripe is faint or absent. Eggs are less than 2 millimetres in diameter, black above and white below; they are arranged in long strings intertwined with other eggs or vegetation.

Breeding occurs in the spring: during May in south central British Columbia and January in more southern regions; the earliest breeding in British Columbia probably occurs in April on Vancouver island. While males mate in consecutive years and may even mate more than once a season, it appears that females don't breed every year and may even breed only once in their lifetime. Breeding in the Okanagan highlands occurs at temperatures above freezing and below 10° centigrade. Adults congregate at traditional breeding sites where males can outnumber females by twenty to one. Males actively search for females and will clasp anything that resembles them: rocks, sticks, other toads or frogs, and male toads. Likely as a result of this behaviour, male toads will utter a release call when clasped by a male; females do not make a release call. Mating is prolonged as females produce 5,000–15,000 eggs in strings up to 10 metres long. Eggs are generally found entangled with other eggs and vegetation, or lying on the bottom of the pool.

Embryos hatch within 3–12 days. Metamorphosis takes roughly 6–8 weeks and is usually complete within 3 months of egg laying. Toadlets form post-metamorphosis aggregations throughout the species' range. These aggregations can be more than 7 centimetres deep and are hypothesized to be the result of either a deteriorating larval environment, an inability to disperse, desiccation protection, and/or predator saturation. Western toads reach maturity in 2–6 years—males earlier than females—and their life expectancy is 9–11 years. Few older females are observed at breeding sites and it is presumed that males generally live longer than females. Western toads are explosive breeders with wide population fluctuations from year to year.

Western toads consume a variety of food items. Tadpoles eat filamentous algae, organic detritus, and scavenge carrion. Adults are generally nocturnal and wait on the ground surface or in burrows for their prey to wander by; they feed on a wide variety of invertebrates and some small vertebrates—Sharp-tailed snakes have been found in their stomachs.

In spite of their mildly toxic skin, a variety of creatures including coyotes, skunks, foxes, raccoons, crows, ravens, and garter snakes prey upon adult Western toads. Tadpoles and metamorphs are particularly vulnerable to snakes and birds during metamorphosis and migration. Tadpoles are preyed upon by birds, garter snakes, and aquatic invertebrates, but are unpalatable to trout and newts.

Habitat (aquatic/breeding) Western toads do not have specific breeding requirements and will breed in a wide range of fishless aquatic habitat from shallow lake margins to roadside ditches; the amount of tree cover, coarse woody debris, or emergent vegetation does not seem to matter.

PRNPR contains some suitable habitat for Western toads, but while permanent water bodies and swamps are present, they are not widespread and many of the water bodies in the park contain fish (B. Campbell pers. comm.).

The following information regarding potential Western toad breeding habitat in PRNPR was provided by Barry Campbell: A shallow, open water community type capable of supporting tadpoles may occur in Hitchie Lake, Tsuquadra Lake (although it is known to have fish populations), Clo-oose Lake, or Whyac Lake in the West Coast Trail unit; Mallard Lake in the Long Beach unit (although this lake does have native cutthroat trout populations); and a lake on Effingham Island in the Broken Group islands. In the West Coast Trail unit dozens, perhaps more than 100, small water filled gravel pits (2x2x1–2 metres) dug by the trail building crew along the West Coast trail from Pachena Bay to Pachena Point may provide toad habitat. Swamps are present in PRNPR, but are neither common nor widespread—more occur outside the park; this type of habitat is located behind the sand dune ecosystems at Wickaninnish Beach (Long Beach unit) and Clo-oose (West Coast Trail unit). While a variety of small water bodies may provide suitable habitat for Western toads, roadside ditches in PRNPR probably don't; due to the glacial clay soil in the area most water runs off quickly and only a minority of ditches in the park retain water for more than a few days after rainfalls.

Habitat (terrestrial/non-breeding) When not breeding Western toads spend the majority of their time in terrestrial habitat. They appear to prefer dense shrub cover and can be found in forested areas, wet shrub-lands, avalanche slopes, meadows, and clear-cuts.

Habitat requirements for hibernation in Canada are unknown; in Colorado individuals often used the burrows of Golden-mantled grounds squirrels.

Distribution The Western toad is widely distributed in North America. East of the Rocky Mountains its range includes western Alberta and portions of many states in the western United States. West of the Rockies the Western toad can be found from southern Alaska to Baja California, Mexico. It ranges across most of British Columbia including Queen Charlotte and Vancouver islands.

A variety of evidence indicates that Western toads are present in at least the Long Beach and West Coast Trail units of PRNPR: Western toads are present, but appear to be rare in nearby Clayoquot sound. In spring 2004 a large number of Western toad tadpoles were found in Rae Lake, Cougar Annies garden property (B. Campbell pers. comm.). The Canadian Museum of Nature has two Western toad records near Ucluelet. While Francis Cook did not collect toads within the park during a 1971 herpetology survey of the park, he was aware of verbal reports of the toad within the park. Barry Campbell occasionally sighted adult Western toads during his employment at PRNPR (1972-1992); these sightings amount to less than three sightings per year on the Rainforest Trail, West Coast Trail (particularly Pachena Bay to Pachena Point) and possibly other trails[1] (B. Campbell pers. comm.). On July 22 2004 Tanya Dowdall (Park Warden) recorded a 3.8 centimetre Western Toad in PRNPR near the Kennedy Lake swim beach[2] (B. Campbell pers. comm.). Senior park Warden (Rick Holmes) has not seen Western toads on the West Coast Trail in the past several years, but a resident at Clo-oose and the chief lighthouse keeper at Carmanah Point did see Western toads (mostly small ones) in 2004[3] (B. Campbell pers. comm.). No information was found regarding the presence of Western toads in the Broken Group.

Population sizes and trends The Canadian population of Western toads is estimated at >10,000 individuals; however, there are no good data sets for calculating population trends [9]. Trends are difficult to determine because Western toad populations fluctuate widely from year to year. The Western toad appears to be doing well in Canada, but population declines are apparent in southern and central Vancouver Island and the Lower Mainland. In the United States Western toads are experiencing rapid declines in many areas.

There are no empirical data on Western toad population size or trends with in PRNPR. The small number of sightings within and around the park (summarized under distribution) suggest that Western toads are present in PRNPR at low densities. Anecdotal evidence suggests that populations in PRNPR could be declining: this species has not shown up in any SPLAT surveys[4] and Barry Campbell "does not recall seeing an adult western toad in the

[1]Barry was not actively searching for toads; he saw them during the normal course of his work. Barry visited the Pachena Bay to Pachena point section of the West Coast trail more often than other sections due to its ease of access. While uncommon, Western toads were not considered rare in the 1970s and 1980s (B. Campbell pers. comm.).

[2]Tanya Dowdall co-ordinates and collates amphibian SPLAT survey information for the lead researcher (Dr. Barb Beasley); thus, her report should be viewed as reliable and accurate.

[3]Both individuals are amature naturalists and known to Barry Campbell; their statements are likely reliable.

[4]SPLAT surveys consist of nighttime road surveys for live amphibians and morning road surveys for dead amphibians along portions of Highway #4 between Ucluelet and Tofino. Since 2000, 100–150 individual

park and neighbouring area for a long time, likely in excess of 10 years" (B. Campbell pers. comm.).

Threats/limiting factors There are a number of threats and limiting factors affecting Western toads; the primary threats are habitat loss and degradation. The practice of stocking lakes with fish has removed potential habitat and may be the biggest threat; Western toads prefer fishless water bodies and may be susceptible to fish borne disease [9]. Western toads seem to be particularly sensitive to various pathogens, fungus, and a parasite that causes deformities. Western toads are sensitive to UV-B and exposure is likely to increase in the near future with the thinning ozone layer. These toads are attracted to open areas (roads and clear-cuts) where they are more easily preyed upon or run over by vehicles. Western toads are also vulnerable to introduced predators such as bullfrogs. Populations of Western toads are prone to large fluctuations and are at greater risk in low population years.

The use of road side ditches or similar water bodies in PRNPR could negatively affect Western toad breeding success because only a minority of ditches in the park retain water for more than a few days after rainfalls—eggs or larva could die when ditches dry out; However, while Pacific Tree Frogs, Northwestern salamanders and Red-legged frogs are known to use PRNPR roadside ditches, Western toads have not been recorded using ditches in the park. Furthermore, the tendency for Western toads to use traditional breeding areas should limit the damage that could be caused by using inappropriate habitat.

Data Gaps

- There is no accurate information on Western toad distribution, population size, or population trends within PRNPR.
- The extent of Western toad habitat in PRNPR and the extent of Western toad occupation within this habitat is poorly known.
- In many parts of their range (including PRNPR) Western toad populations appear to be in decline, but the specific causes of these declines are unknown.

Management Considerations Low densities of Western toads are distributed sporadically within PRNPR. Anecdotal evidence indicates that their numbers may be declining; however, there are no empirical data on population size or trends.

While potential habitat is protected within the park at the landscape scale, Western toads often rely on small water bodies which may be easily overlooked and even destroyed—either directly, or indirectly by nearby hydrological changes. Furthermore, the tendency of Western toads to use traditional breeding habitat underscores the necessity of finding and protecting existing breeding areas, no matter how small.

Certain knowledge gaps must be filled for informed management of this species in PRNPR. Habitat, even small habitat areas, must be identified and surveyed for the presence of Western toads. Long-term monitoring data is especially important to assess population size and

surveys (or more) have been conducted; Western Toads were not recorded at any time (up to the end of fall 2004).

trends for this species because populations may be subject to large fluctuations. Due to the length of time required to attain adequate long-term monitoring data it is not feasible to wait for this information before assessing and addressing potential threats to this apparently declining population. Unfortunately, many factors threaten Western toad populations and the specific causes of the declines in many parts of this species range are unknown; further study is likely required.

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2.2.2 *Rana aurora* (Red-legged frog)

Taxonomic Group Anura (frogs and toads)
Species Presence Year-round breeding resident of the area surrounding PRNPR. Non-breeding individuals occur in PRNPR and it is possible that they breed within the park.
Status **NatureServe**: G4T4[a]; **COSEWIC**: Special Concern, Last examination/Change: May 2002 (No Change); **SARA**: Schedule 1 **BC**: S3S4 & BLUE; **PRNPR**: P2P3

[a]This NatureServe rank is specifically for the Northern Red-legged frog (*R. a. aurora*). The British Columbia Conservation Data Centre and COSEWIC have not separately listed *R. a. a.*

Status of recovery/protection This species is protected under the *Species at Risk Act*, British Columbia's *Wildlife Act* (prohibits collection of native British Columbia amphibians), and is an identified wildlife species in British Columbia. The province of British Columbia is the lead jurisdiction for this species. Research and monitoring activities are ongoing.

Description Red-legged frogs are medium sized brown frogs. Males reach approximately 7 centimetres in snout-vent length, while females can reach 10 centimetres. Their backs tend in colour to either dark brown, gray, olive, or reddish black and are covered with small irregular black spots. A dark mask usually surrounds their gold coloured eyes and a whitish stripe above their lip runs to the shoulder. The lower belly and the inside of thighs are a characteristic bright red colour described as translucent (as if you can see through the skin to red tissue below). Features such as the red belly and thighs, and white lip may be less obvious in juveniles.

Hatchlings are ~12.4 millimetres long and tadpoles can reach 28.7 millimetres in length at metamorphosis. Tadpoles are oval in shape and the dorsal fin is taller than the tail trunk is thick. The underside of tadpoles is tan or gold with brassy blotches; the dorsal fin may be golden with light and gold dots, or colourless. Tadpoles are herbivorous and feed on algae and possibly decaying plants.

Red-legged frogs breed in a variety of wetlands including both temporary and permanent ponds, slow-moving streams, and lakes. The breeding season begins in early spring, usually late February to early March in British Columbia. Breeding activity is weather dependant and the frogs become active during rainy periods with daytime temperatures greater than 4–5° centigrade. Males arrive at breeding sites up to 1 week before females and call from up to 1 metre below the water surface; individuals may return to the same breeding areas year after year. Breeding lasts 2–4 weeks and females lay clutches of ~600 eggs in 20–30 centimetre gelatinous clusters attached to vegetation below the water surface. The eggs hatch in approximately 4 weeks and the tadpoles metamorphose after 4–5 months; young emerge between late July and early October. Red-legged frogs reach sexual maturity 3–4 years after metamorphosis.

When not breeding Red-legged frogs are highly terrestrial—newly metamorphosed individuals tend to remain near water. They feed on insects and small invertebrates until November when they begin hibernation. Hibernation occurs on land or in water and lasts until late winter.

Habitat (aquatic/breeding) Red-legged frogs are associated with lower elevation streams, ponds, or marshes. They prefer to breed in slow to still water bodies which contain appropriate vegetation and are at least 50 centimetres deep. Breeding sites show wide variation in size, depth, permanency, and community structure, but low water flow and greater microhabitat complexity appear to be important factors. Permanent or temporary water bodies may be used as long as open water remains throughout tadpole development.

Potential breeding habitat exists within PRNPR. In 1971 Francis Cook observed that "*...Rana aurora* are abundant in a variety of pond and ditch habitats in the Park, and seem to have thrived under the man-made disruptions of logging and road building which have gone on in the past, because of the numerous pond-type situations which have been created by the bulldozing associated with these activities" [5, page 2][5]. However, Red-legged frogs prefer habitat that now appears to be quiet limited in PRNPR (B. Campbell pers. comm.): There are only a few ponds in the Long Beach unit: Mallard Lake which supports a fish populations and two man made ponds (one off Grice Bay road at Long Beach Golf Course on Tofino Airport Lands and the other off Highway #4 about 2.5 kilometres west of Wickaninnish Road junction). In the Broken Group islands there is one lake on Effingham island, but it is not known if Red-legged frogs are present there. On the West Coast Trail dozens, perhaps more than 100, small water filled gravel pits (2x2x1-2 metres) dug by the trail building crew along the trail from Pachena Bay to Pachena Point may provide Red-legged frog habitat. Swamps behind the the Clo-oose sand dunes are also potential breeding habitat. Other potential habitat includes the water-filled holes left by blown over trees, springs in stream floodplains, and pools in bogs—though bogs may be too open and acidic.

Habitat (terrestrial/non-breeding) This species spends up to 90 percent of its time in terrestrial habitat. Red-legged frogs appear able to utilize a wide range of habitat types characterized by an abundance of moist leaf litter and fallen logs. Moisture availability appears to be the predominant feature of this habitat—forest age does not seem to be important—and Red-legged frogs can be found far from water in damp forest environments.

The area near Swan Lake appears to be a hot-spot for Red-legged frogs. While Red-legged frogs in the area may breed outside the park in Swan Lake they do use terrestrial habitat within the park as evidenced by SPLAT survey detections.

Distribution Red-legged frogs occur along the west coast of North America from southern Canada to Baja California, Mexico. Red-legged frogs are at the northern edge of their range in Canada and only occur in southwestern British Columbia where they are classified as the Northern Red-legged frog (*R. a. aurora*). A number of sources indicate that Red-legged frogs are present in the Long Beach unit of PRNPR and there have been sightings in the West

[5]Cook was probably only present in the Long Beach Unit of PRNPR (B. Campbell pers. comm.).

Coast Trail unit; information concerning their presence and in the Broken Group Island units is lacking.

The Canadian Museum of Nature has nine records of Red-legged frogs near PRNPR: Seven of these records consist of specimens collected in 1971 by Francis Cook just north of Alberni inlet and east of the Long Beach unit between highway #4 and Smith Creek (Figure 2.1). Of the remaining two collections, one was from Ucluth Peninsula by Charles H. Young in 1909 and the other from near Bamfield by Leslie A. Lowcock in 1989 (Figure 2.2).

Dr. Francis Cook, Curator of Herpetology, National Museum of Natural Sciences, surveyed PRNPR for amphibians during June 6-14, 1971; he collected twenty-three (13 lots) of adult Red-legged frogs and 3 larva/tadpole lots. Neither collecting intensity nor collecting areas are mentioned in Cooks report; however, the dates of the seven Canadian Museum of Nature records previously mentioned coincide with the dates of Cook's visit and these collections may represent some of Cooks lots. Barry Campbell mentioned that Cooks collecting was likely "done in the Long Beach unit of the Park and immediate surrounding area and not in the other park units", a statement which is not contradicted by the Canadian Museum of Nature records.

Red-legged frogs were the second most common amphibian detected in recent studies of amphibian highway mortality on the Long Beach unit of PRNPR. The SPLAT surveys have identified areas along the highway where Red-legged frogs are concentrated these are 7, 13, and 33 kilometres from Tofino: the 7 and 13 kilometre concentrations are near a boggy area and the 33 kilometre concentration is near a wetland called Swan Lake (Figure 2.1). Egg-masses have been found in Swan Lake wetland. Furthermore, as part of this research Dr. Beasly has surveyed roadside ditches for amphibian eggs and found Pacific tree-frog, Red-legged frog, and northwestern salamander egg masses in wet areas at several locations along the highway in PRNPR.

Other recent Red-legged frog records include incidental sightings from terrestrial gastropod surveys. One Red-legged frog was found within the Long Beach unit along the northwest side of Grice Bay (49° 06' 40.34" N, 125° 47' 26.84" W) (Figure 2.1). Three Red-legged frogs were found within the West Coast Trail unit of the park south of Bamfield on the Cape Beale Trail (48° 48' 25.71" N, 125° 09' 41.20 W) (Figure 2.2).

There appear to be no data on the distribution of Red-legged frogs in the Broken Group unit of PRNPR.

Population size and trends It is clear that Red-legged frog populations are declining in many parts of its range, but little is known concerning actual numbers [1].

Threats and limiting factors The main threats to the Red-legged frog are habitat destruction and degradation, mainly from agriculture, urban development, and forestry. While habitat will be protected within the park this species may still be subject to the effects of land use on adjacent property, potential development of visitor infrastructure within the park, disturbance by park visitors, and introduced species such as Bullfrogs (*Rana catesbieana*), Green frogs, and predatory fish. Any environmental changes that lower water levels, raise water temperatures, or change flow patterns pose a threat to this species. Further threats are

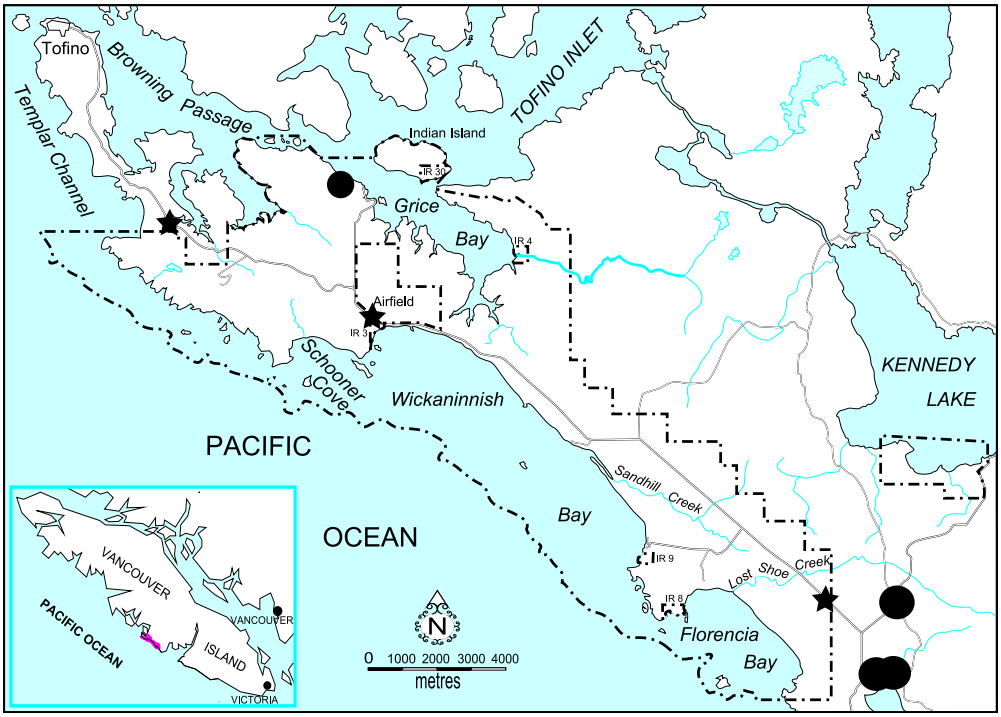

Figure 2.1: Red-legged frog (*Rana aurora*) sighting or collection localities (black circles and stars) in and around Pacific Rim National Park Reserve. Black stars indicate localities of increased Red-legged frog highway mortality [2, 6] (CBIF 2004).

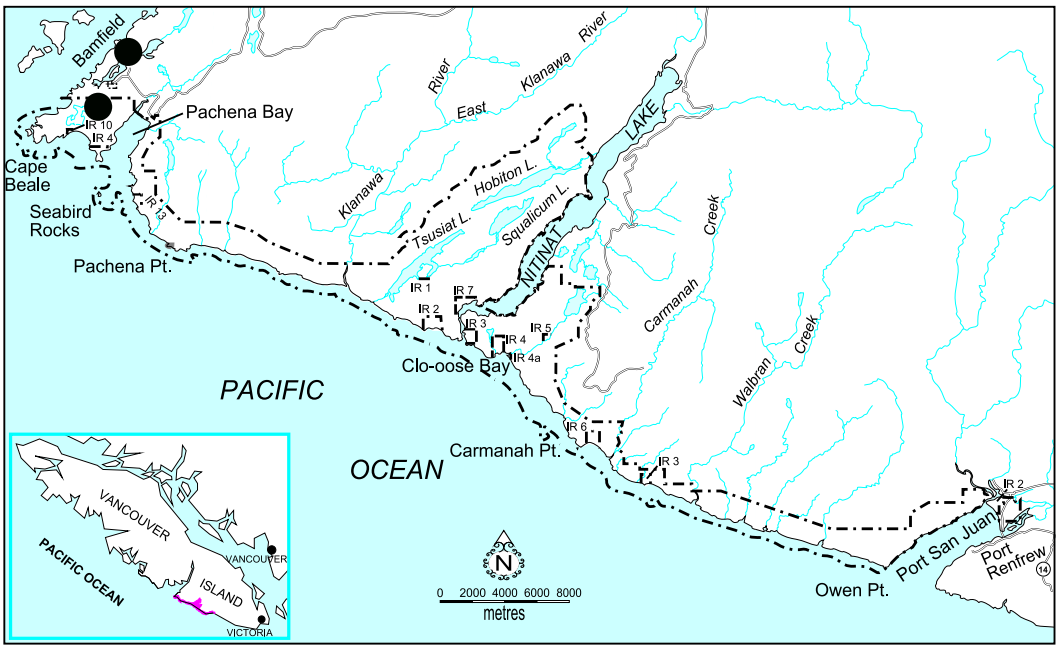

Figure 2.2: Red-legged frog (*Rana aurora*) localities (black circles) in and around Pacific Rim National Park Reserve [6] (CBIF 2004).

increased incidence of UV-B radiation[6], disease, and pollutants. Road mortality is also a threat to this species if heavily used roads cross dispersal or migration routes such as those indicated in the SPLAT data.

A further threat to Red-legged frogs is the potential for roadside ditches to act as a population sink; Red-legged frogs have been found in deeper ditches along the highway in PRNPR, but even these deeper pools may dry up during the summer, potentially killing tadpoles before they can metamorphose.

Data Gaps

- There there is little data on Red-legged frog population size or trends within PRNPR.
- More information is required concerning Red-legged frog habitat distribution within PRNPR and the Red-legged frog's distribution with in this habitat.

Management Considerations Red-legged frogs are known to occur in the Long Beach and West Coast Trail units of PRNPR. They appear to be distributed sporadically with the highest concentrations related to nearby breeding habitat which may be relatively scarce within the park.

Amphibians are frequently killed along highway #4 in the Long Beach unit and SPLAT surveys have indicated areas of concentration where red-legged frogs attempt to cross the highway. Further surveys are needed to determine if the number of frogs killed on the highway is significant and what management options to consider; other survey methods mentioned in the SPLAT report are pitfall traps and a calculation of the probability of death when crossing the highway. Management options mentioned in the SPLAT report include fencing to direct frogs to existing culverts and the construction of underground passages. Mitigation measures (drift fences) are being tested along the highway near Swan Lake were SPLAT surveys detected the highest Red-legged frog mortality; their effectiveness is yet to be determined.

Potential habitat—especially near concentrations of highway mortality—should be surveyed to identify important habitat (breeding and non-breeding). Small unclassified wetlands are important to this species and should not be overlooked. Furthermore, it is important to note that any breeding habitat within the park (ponds, streams, and marshes) may be influenced considerably by factors originating within the surrounding watershed, but outside the park area. Effective management of this species will be enhanced by, and may require the cooperation of surrounding landowners.

Invasive species monitoring is necessary and control may be required. Any negative impacts on Red-legged frogs caused by invasive species will continue and likely increase without intervention; however, Red-legged frog reaction to invasive species is unpredictable, invasive species appear to have a negative impact in some areas, but no impact in others [4]. Monitoring within PRNPR will be needed to determine appropriate management actions.

[6]Studies reviewed in [4] showed no difference in survival between Red-legged frogs exposed to ambient UV radiation and those shielded; however under experimentally increased levels of UV-B radiation Red-legged frog eggs and larva experienced high mortality compared to the Pacific tree-frog (*Pseudacris regilla*).

In general monitoring such as SPLAT surveys should continue and be expanded to other areas of the park. Monitoring provides the data required to determine which threats need to be mitigated and to judge the success of implemented mitigation measures.

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2.3 Aves (Birds)

2.3.1 *Accipiter gentilis laingi* (Queen Charlotte goshawk)

Other Names Northern Goshawk laingi subspecies

Taxonomic Group Falconiformes (raptors)

Species presence The Queen Charlotte goshawk is a rare year-round occurrence in PRNPR and the surrounding area; there is the potential for breeding within the park.

Status **NatureServe**: G5T2; **COSEWIC**: Threatened, Last examination/Change: November 2000 (In a higher risk category); **SARA**: Schedule 1; **BC**: S2B,SZN & RED; **PRNPR**: P1P2B, PNAN

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection The Northern goshawk is protected under the *Species at Risk Act*. The province of British Columbia is the lead jurisdiction for this species; Parks Canada is participating. The provincial recovery team (chaired by Erica McClaren) is working on the recovery strategy.

In British Columbia this species is further protected by the *Wildlife Act* and it is identified wildlife.

Description The Northern goshawk is a medium sized raptor (length 53–66 centimetres)—males are smaller than females—with wide, short, rounded wings and a wedge shaped tail. The under-parts are white to light grey with dense, grey streaks. The upper parts are medium to dark bluish-grey. Their faces have a bluish-grey or mottled white mask with blackish-blue beaks. There is a white stripe[7] above their red eyes and the tops of their heads are blackish-slate coloured. Juveniles are brown above with heavy streaking underneath and yellow eyes. The laingi subspecies is smaller and has darker plumage than other Northern goshawks. The Northern goshawk alarm call is a loud, high pitched, non-raspy *ki ki ki ki ki*.

The northern goshawk breeding and rearing season lasts from February until September. Goshawks tend to form monogamous pair bonds between individuals who reuse the same nesting area—but may choose and alternate nest site—from year to year. Males are more likely than females to choose the same nest site year to year as some females will choose a different nest site and breed with a different male. Breeding pairs are formed in early spring and three to four eggs are laid in a stick nest between mid-April to late-May. The female incubates the eggs for roughly 30 days during which the male mainly hunts and brings food to her; he may also help with incubation occasionally. The chicks fledge roughly 35–42 days after hatching and remain near the nest for another 40–60 days before dispersing between early August and early September. In most studies the large majority of nesting attempts result in at least one fledged offspring; however, the survival rate and recruitment of these

[7] In adults greater than 2 years old.

juveniles into the breeding population is unknown. Yearling females are capable of breeding but generally females do not breed until they are greater than 2 years old.

Goshawks are opportunistic hunters and feed on a wide variety of organisms from small reptiles and insects to medium sized mammals and birds such as squirrels, rabbits, bats, crows, grouse, jays, Marbled murrelets, and woodpeckers. Prey is generally hunted from a number of perches below the forest canopy. When prey is sighted goshawks rely on great speed and agility to capture it while avoiding the surrounding trees; this method of hunting requires an open understory characteristic of older forests.

Habitat Mature- to old-growth forests with larger trees, a closed, multilayer canopy, and an open understory characterize Northern goshawk breeding-habitat. These areas typically have high structural diversity with hunting perches for goshawks and coarse woody debris for prey. Breeding home ranges vary widely throughout the goshawks range and are on the order of one thousand to many thousand hectares. The breeding home range appears to be divided into a small nest area which contains the nest tree, a larger post-fledging area (PFA) which the fledglings use before becoming independent, and a large foraging area where adults hunt. The size of these areas varies and the laingi subspecies appears to use larger areas; nest areas of the laingi subspecies are approximately 200 hectares and appear to be equivalent in size to the PFA. The foraging area is likely less than the home range, especially for the laingi subspecies which appears to preferentially forage in mature forest. The laingi subspecies also uses edge habitat less often and may require more contiguous areas of mature forest than other goshawks. Non-breeding habitat has been poorly studied, but appears similar to breeding-habitat.

Habitat is protected within PRNPR and further habitat may become available as forests within the park age.

Distribution The Northern goshawk is widely distributed in the boreal forests of the world. The laingi subspecies is distributed within coastal British Columbia and southwestern Alaska, primarily on coastal islands—especially Queen Charlotte and Vancouver Islands; it may also be present on the coastal mainland of British Columbia and the Olympic peninsula.

Northern goshawks are seen in small numbers year round on the west coast of Vancouver Island—one to two records in each season per year—and have been seen within PRNPR. They are also known to breed on the west coast of Vancouver Island and there are likely a few nesting pairs in PRNPR[8] (E. McClaren pers. comm.).

Population sizes and trends Population size is difficult to determine for such a secretive species, but there is an estimated 350 pairs on Vancouver Island and the Queen Charlotte Islands; this population estimate rises to >450 if other coastal islands and the coastal mainland is included as occupied habitat [5].

Though statistical proof is lacking, it is suspected that the overall population trend is one of decline due to logging of mature- and old-growth forests.

[8]It should be noted that it is more difficult for goshawks to find prey in the dense west coast understory and few nests are found right on the west coast (E. McClaren pers. comm.).

Threats and limiting factors Queen Charlotte goshawks are particularly sensitive to logging due to their preference for large amounts of mature- to old-growth forest. This age of forest is the most valuable, hence, the most likely to be harvested. A tendency towards shorter logging rotations further limits goshawk habitat by removing trees just as the forest is becoming suitable habitat for goshawks. Goshawks can also be sensitive to human disturbance.

Data Gaps

- Accurate population estimates are hard to establish which makes estimates of population viability and trends difficult to determine.

- There is a distinct lack of information about winter (non-breeding) ranges. Goshawks are especially difficult to monitor during the winter and even if a goshawk is detected during the winter it would be difficult to distinguish if it was transient or resident.

- Little is known about goshawk use of PRNPR; there have only been occasional sightings and no nests have been found within the park to date.

Management Considerations Goshawks are present within PRNPR and some breeding—probably only a few pairs—is likely to occur in the park; however, due to the size and shape of PRNPR (generally a 1–2 kilometre strip along the coast) it is unlikely that more than a portion of a goshawk home range would be contained within the park. Furthermore, forests with a dense understory, as found along the west coast of Vancouver Island, are unsuitable habitat and may limit goshawk breeding to the inland portions of PRNPR.

There are few management actions required for such a limited occurrence; however it is important to note that goshawks tend to use the same breeding area from year to year and can be sensitive to human disturbance. Reports of goshawk activity should be investigated and any discovered breeding areas should receive appropriate management. It is important for rangers to be aware of what to watch for[9] and report any breeding locations to the recovery team (E. McClaren pers. comm.).

[9] "Egg laying is from early April to mid-July and young are at the nest from late May to late August. Nests are made of sticks and are placed in crotches near the trunk. In deciduous trees, the nest is often at the base of the crown [...]. In conifers, the nest is usually located next to the trunk at the base of the crown. Nests in aspen are particularly visible in early spring before leaf-out, and nests from previous years (often closely spaced) can alert ground or air surveyors to the fact that the area is used by Northern Goshawks, who may return to breed.

[...]If you are close to the nest the birds will often fly around the area calling and may attack. The whitewash 'streak' of the Northern Goshawk is an identifying feature. The area around the nest site is decorated with long thin white streaks beneath perch sites and plucking sites. These plucking sites, where the birds dismember and eat their prey, are low branches, stumps, deadfall logs, or even mounds of earth. Visual searches of suspected nesting areas are aided by the presence of scattered feathers, pellets, and bones, especially hare and grouse feet. Pellets of Northern Goshawks can be distinguished from those of other accipiters by their size (about 5 cm x 2 cm), and from those of other raptors by their location under dense forest canopy." (Resources Inventory Committee 2001, pp 66)

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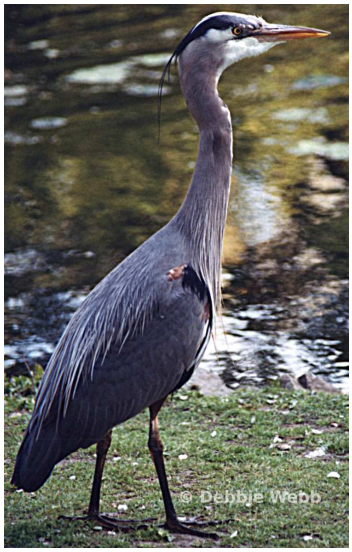
2.3.2 *Ardea herodias fannini* (Pacific Great Blue heron)

Other names Great Blue heron fannini subspecies
Taxonomic Group Ciconiiformes (wading birds)
Species presence Pacific Great Blue herons occur year-round in PRNPR and the surrounding area; there is a small possibility of breeding in the area.
Status **NatureServe**: G5T4; **COSEWIC**: Special Concern, Last examination/Change: April 1997 (New); **SARA**: Schedule 3; **BC**: S3B,S4N & BLUE; **PRNPR**: P3P4N
Status of recovery/protection COSEWIC last assessed the the Pacific Great Blue heron prior to October 1999; a new assessment is required before the Pacific Great Blue heron is considered for protection under the *Species at Risk Act*.



In Canada herons are currently protected by the *Migratory Birds Convention Act* and corresponding *Migratory Birds Regulation*s. In British Columbia they are protected under the *Wildlife Act* and are identified wildlife.

The Canadian Wildlife Service is the lead jurisdiction for this species; British Columbia is participating. There is a heron working group. A management plan has not yet been drafted for this species.

Description

> "The Great Blue Heron is the largest heron in Canada. In addition to the long neck, long legs and short tail that characterizes this group of water birds, the Great Blue Heron has mainly greyish-blue upper parts and markings of black and white on the crown and under parts. It stands over 1 metre tall; in flight the neck is doubled back so the head is against the shoulders. The Pacific subspecies is the darkest in colour of the Great Blue Heron subspecies." (Environment Canada, Species at Risk Branch 2004)

Pacific Great Blue herons assemble at breeding colonies on the coast around mid-January (the interior subspecies has different phenology). Some colonies may remain in the same place for many years, while other colonies have been known to move frequently. Males arrive at the colony site first and establish a territory; females arrive about one week later. Courtship and nest building (or repair) last from several days to one month; nest building is generally initiated in March. Herons form monogamous pairs for the season and each pair typically lays three to five eggs at 2 day intervals beginning in March or April. Incubation begins with the first egg resulting in asynchronous hatching. Chicks hatch after approximately 27 days of incubation and are raised for approximately 60 days. Chicks are raised between April and August. In the Strait of Georgia one breeding cycle lasts approximately 100 days and herons reproduce for approximately 200 days; herons in this area can potentially breed again

if the first attempt fails. Reproductive success is highly variable but generally ranges from two to three fledged young per successful nest. Mortality of young over their first year is high (approximately 65–70 percent), declining to roughly 30 percent over the second year and about 20 percent thereafter. Most herons first breed in their second spring.

Herons are often seen in various types of water bodies where they prey on fish up to 30 centimetres long, crayfish, crabs, and frogs. They also forage in grasslands for salamanders, snakes, large insects, and small mammals.

Habitat The non-migratory fannini subspecies occurs in coastal areas; habitat can be divided into breeding, summer feeding, winter feeding, and roosting habitat. Herons prefer to nest in forested areas, usually less than 6 kilometres from feeding grounds. They will nest in conifer, deciduous, or mixed forest and prefer to use the tops of the tallest trees. During the summer a variety of shallow salt and freshwater bodies are used for feeding. In winter herons may move inland away from tidal zones to feed in fields and pastures with an abundance of small mammals; this behaviour is more prevalent in the lower mainland where the Townsend's vole is abundant. Herons will roost on a variety of artificial and natural structures, especially in trees near feeding areas and, during the breeding season, in trees overlooking the colony or on their nests.

Tofino mudflats appear to provide important habitat and can support up to 100 herons in August; however few herons stay during the breeding season. While much of the Tofino mud flats lie outside PRNPR, the park does include Grice Bay (Long Beach unit). Herons are also seen along the outer coast standing on floating kelp, logs, or on rocks around the current wave splash zone; they rarely use exposed sand beaches (B. Campbell pers. comm.).

Distribution The Great Blue heron (*A. herodias*) is widely distributed in the western hemisphere from southeast Alaska east to the Maritimes and south to northern South America and the Galapagos. The Pacific Great Blue heron (*A. h. fannini*) is found year-round along the pacific coast of North America from southeastern Alaska south to Puget Sound, Washington. Pacific Great Blue herons in British Columbia are more common in the Strait of Georgia and only "very sparsely distributed" on the North Coast, the Queen Charlotte Islands, and the West Coast of Vancouver Island [5, pp. 32].

Herons are common in PRNPR and the surrounding area. They concentrate on the Tofino—and other—mudflats: most park sightings are from Grice Bay (Long Beach Unit); however, numbers of herons are also seen on the exposed, outside coastline (B. Campbell pers. comm.).

While Pacific Great Blue herons are present in the area, breeding has not been confirmed and appears unlikely—or at least very rare. While herons do breed throughout coastal areas, most breeding occurs in the Georgia depression; historical records from Port Alberni and Tahsis are the closest confirmed breeding records to PRNPR. There are, however, unconfirmed reports of heron rookeries in and near PRNPR: A rookery was apparently found in Tofino (near the junction of Gibson Street with Campbell Street), but the old-growth trees were removed for a development project about 1999–2000 (A. Dorst pers. comm. with B. Campbell). There were also reports of a rookery in the interior of Turtle Island in the Broken Group Islands, but it has never been found (B. Campbell pers. comm.). Few nesting sites

have been reported from the outer coast of Vancouver Island in spite of extensive foraging habitats such as the Tofino mudflats, but herons are known to nest in groups as small as a single pair and small groups on a largely inaccessible coast would be difficult to detect. Only the West Coast trail unit of PRNPR is included within an area indicated as potential breeding habitat in the British Columbia status report [5, figure 2].

Population sizes and trends The Pacific Great Blue heron population is estimated at 3000–6000 birds, though this number is by no means definitive [5]. Population numbers are difficult to census and there is no clear population trend; however, some data does indicate a decline (especially in areas outside of the Strait of Georgia). It is possible that birds from abandoned colonies in other parts of the province may move to the Strait of Georgia and bolster numbers there, thus partially masking an overall population decline.

A dozen or more herons forage in Grice Bay during low tides (Bary Campbell pers. comm).

Threats and limiting factors The largest threats to herons affect breeding and are not of general concern within PRNPR—unless a breeding occurrence is discovered.

British Columbia does not lack heron habitat, but the heron population is concentrated in the area of highest human occupancy where habitat loss and degradation (mainly urban development and human disturbance) continues; quiet forested areas close to suitable foraging habitat are becoming quite rare. Herons are generally very sensitive to human disturbance, especially loud noises and are quick to temporarily or permanently abandon their nests; thus, young are exposed to increased predation by Bald eagles, Crows, and other natural predators. Frequent disturbance by humans or eagles can result in breeding failure. On the other hand, herons can be quite adaptable and some colonies (such as Beacon Hill park, Victoria; and Stanley park, Vancouver) fledge young within urban areas.

Other threats include pollutants and environmental effects. Some pollutants are known to reduce chick growth and egg shell thickness. Inclement weather decreases reproduction and storms can blow down nest trees; the frequency of extreme weather events may increase as global climate changes.

The majority of known nests are in mature deciduous trees and most of these will have fallen naturally by 2010 [5]. As nest trees are lost to natural or human causes there may be a lack of replacement habitat within urbanized areas.

Juvenile survival is very low in the first year.

Data Gaps Data on heron habitat usage, population size, and population trends within PRNPR is lacking.

Management Considerations Pacific Great Blue herons are present in all PRNPR units all year-round, but only non-breeding birds have been confirmed. While herons are primarily a non-breeding occurrence within PRNPR, there is a possibility that limited breeding occurs or will occur. Herons are known to breed outside the Strait of Georgia and there have been unconfirmed reports of breeding in and near PRNPR; furthermore, the West Coast trail unit has been identified as potential breeding habitat. Reports of heron nesting within the park

should be investigated and appropriate actions should be taken to protect any nest sites. A commonly suggested management practice is limiting human access and/or activities within a buffer zone surrounding heron colonies.

At the moment foraging habitat in the PRNPR is far from known breeding colonies, but this foraging habitat is still important to herons year-round. Grice Bay is a part of the extensive Tofino mudflats which together support up to 100 foraging herons in August each year and may be an important staging ground. Herons are one of the reasons why the Tofino mudflats have been identified as an important bird area by the Canadian Important Bird Area Program[10]. Important areas such as Grice Bay should be identified and managed to protect their value as heron foraging sites.

Important heron conservation activities include: protection and enhancement of foraging habitat (such as marsh restoration), population monitoring in foraging areas to help determine overall population trends, and the identification and protection of potential nest sites [2, 5].

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2.3.3 *Asio flammeus* (Short-eared owl)

Taxonomic Group Strigiformes (owls)
Species Presence Rare transient (migrant) in PRNPR and the surrounding area.
Status **NatureServe**: G5; **COSEWIC**: Special Concern, Last examination/Change: April 1994 (New); **SARA**: Schedule 3; **BC**: S3B, S2N & BLUE; **PRNPR**: PNAN
Status of recovery/protection COSEWIC last assessed the the Short-eared owl prior to October 1999; a new assessment is required before the Short-eared owl is considered for protection under the *Species at Risk Act*. In Canada these birds are not protected by the *Migratory Birds Convention Act* or corresponding *Migratory Birds Regulation*s. In British Columbia they are protected under the *Wildlife Act* and are identified wildlife.

Management Considerations This species breeds within every province and territory in Canada: from the southern border to the low arctic. In British Columbia Short-eared owls breed on the south mainland coast and a few locations in the interior. In the winter they withdraw from northern areas of Canada and remain only in the southern portions of most provinces; the Fraser River delta is the main wintering area in British Columbia with a few birds wintering on southeastern Vancouver Island and in the southern Interior. They are an uncommon migrant throughout British Columbia.

Small numbers of Short-eared owls have been seen in PRNPR, but they do not breed in the area. There are three records of Short-eared owls in PRNPR between the late 1960s and mid 1970s, including a dead specimen found on the Goldmine Trail, Long Beach unit (Hatler *et al* 1978). Generally there are only a few sightings per year, most in the spring and a few in the fall (Anonymous 1985, Dorst 2002).

Short-eared owls prefer open areas such as grass and marshland; they are generally absent from heavily forested areas. Within PRNPR this species is most likely to be seen in areas such as estuarine grasslands at the end of Grice Bay (adjacent to Browning Passage) and vegetated sand spits like at the mouth of Sandhill Creek.

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pp. <http://wlapwww.gov.bc.ca/wld/documents/identified/iwABNGA04011.pdf> (accessed: 2005-02-11).

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2.3.4 *Brachyramphus marmoratus* (Marbled murrelet)

Taxonomic Group Alcidae (auks, murres, puffins)

Species Presence Year-round non-breeding occurrence and a potential (though probably limited) breeding occurrence in PRNPR. This species has a strong breeding occurrence in the area immediately surrounding PRNPR.

Status **NatureServe**: G3G4; **COSEWIC**: Threatened, Last examination/Change: November 2000 (No Change); **SARA**: Schedule 1; **BC**: S2B,S4N & RED; **PRNPR**: PUB, P3N

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection The Marbled murrelet is protected by the *Species at Risk Act*, *Migratory Birds Convention Act* of 1916 and the provincial *Wildlife*, *Parks*, *Ecological Reserves*, *Museum*, *Fisheries*, and *Firearms* acts of British Columbia; it is also identified wildlife in British Columbia.

The Canadian Marbled murrelet Recovery Team (CMMRT) was formed in 1993 and both the recovery strategy and action plan have been published but are out of date. The original recovery plan identified the need for more basic data about Marbled murrelets and spurred research and monitoring. To help with the development of a new recovery plan the recovery team has performed a conservation assessment that produced three documents; a review of the biology of Marbled murrelets [9], an advisory on conservation and management [12], and an assessment of risks to Marbled murrelet populations [18]. The information compiled in these reports will be used to update the recovery plan.

The Canadian Wildlife Service is the lead jurisdiction for this species; the province of British Columbia and Parks Canada Agency are participating.

Description Marbled murrelets are small (length 24–25 centimetres, weight 190–270 grams), non-colonial, coastal seabirds. Winter plumage is generally black above and white below with white wing patches adjacent to the body (on the scapulars). Breeding plumage is dark above and mottled-brown below. Juveniles are coloured similarly to adults, but they are mottled below. Chicks are yellow or grey-yellow with spotted upper parts. Marbled murrelets are highly vocal and their call is a series of loud, high *kree* notes.

Marbled murrelets spend most of their time at sea, only returning to land to breed in late April through early September. Murrelets aren't colonial and nest sites are scattered throughout available habitat. One egg is generally laid in a depression in the moss or duff layer on a large old-growth tree limb; occasionally nests are found on cliffs. The male and female share incubation which lasts 28–30 days. If the first breeding attempt fails a pair may lay another egg. When the chick is 1–2 days old it is left alone at the nest while both parents hunt and bring back fish. The chicks develop in the nest for 27–40 days before they fledge and fly to the sea. The average age of first breeding is unknown, but similar sized birds in the same family first breed between 2–5 years old. Though the average life span of Marbled murrelets is not known, they are long lived—the oldest captured was 10 years old.

Migratory movements are not well known. A bird banded in Desolation Sound, British Columbia wintered in the San Juan Islands, Washington. These birds appear to leave exposed coastal areas in British Columbia to overwinter in more sheltered waters.

Murrelets spend most of their time singly or in pairs, foraging for small schooling fish or pelagic crustaceans which they catch by diving. Raptors and other birds such as crows and small mammals prey upon Marbled murrelets.

Habitat (Marine) Marbled murrelets are generally found less than 2 kilometres from land, closer to shore in exposed areas and farther from shore in protected areas. They feed mostly in water less than 30 metres deep—commonly on sand lance and herring within the upper 5 metres—, but have been observed in deeper waters. While associations with marine habitat features are variable and difficult to generalize, murrelets do form loose, transient or reoccurring concentrations of more than one hundred birds in areas of high prey availability; such areas appear to include sand and gravel substrates which provide habitat for sand lance, these substrates are likely to be important predictors of localized murrelet distribution.

PRNPR contains suitable marine habitat and regular use of certain areas has been reported in all units of the park including the Long Beach unit, the waters from Gowlland Rocks to Portland Point, inside a series of reefs and islets; Barkley Sound, particularly near Swale Rock; and off the West Coast Trail, a number of areas which often coincide with areas where grey whales feed (see Grey Whale, section 2.6.3 on page 105). Regular use of these areas is likely due to high prey concentrations.

Habitat (Terrestrial) Most Marbled murrelets nest on large limbs in mature- to old-growth trees but ground nests have also been reported. Nest sites are often within 30 kilometres of the ocean; however forest within 0.5 kilometres of the sea appears to be less suitable. General characteristics of tree nest sites are: sufficient height (allowing easy landing and takeoff), canopy openings (providing unobstructed flight paths), large diameter limb (to provide a platform with space for nesting and landing), soft substrate (epiphytes or accumulated litter in which to build a nest cup), and overhead foliage cover. Though Marbled murrelets do not appear to require a specific tree species, one tree species is likely to provide the most nest sites in any particular area. Ground nests in British Columbia are generally on cliffs with mossy platforms. Little is known about site fidelity, but there is evidence that individual Marbled murrelets reuse suitable forest stands—not nests.

While PRNPR does contain old growth forest, much of it is located in a narrow strip along the coast and is thus less suitable for nesting murrelets. Inland areas of PRNPR, mainly around Nitinat lake, are the most likely localities for nesting Marbled murrelets.

Distribution Marbled murrelets occur along the coast of North America from Alaska to California; this includes the entire coast of British Columbia. During the breeding season they can be found up to 80 kilometres inland, but most nests are within 30–50 kilometres of marine foraging areas.

Marbled murrelets have been found by at-sea surveys in all units of the park. They are common in summer and fall and uncommon (or rare) in winter and spring. Large predictable

feeding concentrations[11] have been reported in the Long Beach unit (the waters from Gowland Rocks to Portland Point, inside a series of reefs and islets), Barkley Sound (particularly near Swale Rock), and off the West Coast Trail (a number of areas which often coincide with areas where grey whales feed; see Grey Whale, section 2.6.3 on page 105) (B. Campbell pers. comm.). The West Coast Trail unit of PRNPR supports particularly high densities of Marbled murrelets during the breeding season—higher than any other of the 80 areas where boat surveys were made in British Columbia during 1991–1995 [4]; more than 2000 murrelets have been regularly counted in the West Coast Trail unit during the breeding season (A. Burger pers. comm.).

To date no nests have been found in PRNPR—most of the park may provide less suitable nesting habitat—, but the park has not been the target of extensive nest searches (B. Campbell pers. comm.).

Population sizes and trends A rough estimate of the population in British Columbia is 66,000 individuals; the west and north Vancouver Island population is estimated at 19,400–24,500 birds with 6,000–8,000 around Clayoquot Sound and Long Beach, 3,000–3,600 in Barkley Sound, and 3,000–3,300 between Owen Point and Cape Beale (West Coast Trail unit) [9].

Population trends and causes remain difficult to determine due to variability in at-sea surveys and complicating factors such as the effect of ocean temperature on distribution; however, anecdotal evidence and most quantitative data indicate declines of up to 40 percent in Clayoquot and Barkley Sounds.

Threats and limiting factors Many factors have the potential to negatively impact Marbled murrelets; these have been reviewed in a number of sources [2, 9, 11, 1]. While the relative significance of these factors is not known, the reproductive capacity of this species is small and population models indicate that murrelet populations are most susceptible to adult survival[12]. Threats to adults are mainly at sea and include, both large tanker and small chronic oil spills, entanglement in fishing gear, anthropogenic and natural changes in prey availability, predation (both at sea and inland during breeding), and disturbance at foraging grounds.

This species has a low reproductive capacity that will limit recovery from population reductions. A lack of breeding habitat will exacerbate this limiting factor. Indeed, the greatest risk to this species is loss of breeding habitat [12].

Global warming may also pose a problem for this species since breeding seems to be inhibited by warmer ocean temperatures.

Data Gaps

[11]The word concentration in this sense refers to relative abundance of murrelets in certain areas versus other areas; it does not necessarily indicate large absolute numbers of birds.

[12]It is important to note that this does not mean that poor adult survival is the only factor which could cause a population decline; sufficiently poor recruitment could still cause a population decline in this species and shouldn't be ignored.

- There appears to have been relatively little effort invested in searching for nesting murrelets in PRNPR. These birds are difficult to detect and easily overlooked by casual observation; it is likely that unknown, breeding sites exist within PRNPR, especially in the inland areas.

- The impacts of heavy boat traffic on Marbled murrelets are not known, nor is the impact of the sport fishery. At least one area of Marbled murrelet concentration (Cox to Portland point, Long Beach unit) is becoming a very popular route for salmon and halibut fishing charters. Recreational boat traffic and any subsequent impacts on Marbled murrelets are likely to increase.

Management Considerations Marbled murrelets have been detected on the water in all units of PRNPR and breeding is expected in the park—at least limited breeding in the inland areas near Nitinat Lake. Three important bird areas[13] overlap PRNPR, two of these (BC075, Barkley Sound; and BC073, Carmanah Walbran Forest) list the importance of the area to Marbled murrelets as a major reason for their designation.

PRNPR appears to be more important as a foraging area than a breeding area. Most of the park is a narrow (few kilometre) strip along the coast and since murrelets are generally found 0.5–30 kilometers from the coast the park appears to protect relatively little nesting habitat. On the other hand, because Marbled murrelets are generally found less than 2 kilometers from land, the long narrow shape of PRNPR encloses much potential foraging habitat. Even with relatively little breeding habitat, PRNPR (along with Carmanah-Walbran Provincial Park) may become an important stronghold of the Marbled murrelet population in the area as logging of older forests continues along the west coast of Vancouver Island.

Some recommendations for further study within foraging habitat in the area have been made [9, 10, 11]: The sport fishery catches an unknown number of Marbled murrelets and its impact is unknown; further study is recommended in areas such as Barkley Sound where sport fishing and murrelet concentrations overlap. Further study and monitoring of Marbled murrelet disturbance by boaters is also recommended in areas such as Barkley Sound were the concentrations of both murrelets and boaters is high.

Overall, further research and monitoring of Marbled murrelets within the park is necessary to detect any breeding areas, important marine habitat, and population trends. At sea surveys should continue and surveys should be undertaken to determine the extent of nesting areas within the park[14]. Any foraging or nesting areas should receive adequate protection and management. Marbled murrelets have been studied extensively and there appears to be large amount of pre-existing data on this species including transect counts within PRNPR performed by Alan Burger (1991–1996, West Coast Trail unit) and park staff (1999–2004, Broken Group area, and West Coast Trail unit); further research, collection, and analysis of all data related to PRNPR is needed. Pre-existing data pertaining to the park should be analyzed to determine important habitat associations, foraging areas, and likely breeding areas

[13]The Canadian Nature Federation and Bird Studies Canada have partnered with BirdLife International to maintain a list of sites which provide essential habitat for one or more species birds. An on-line map and database of these areas can be accessed at http://www.bsc-eoc.org/iba/regional.jsp

[14]Guidelines and more detailed habitat associations can be found within documents listed in the references section, especially those cited here [2, 9, 12].

within the park; there is already a plan in place to combine all seabird transect data done by Parks Canada and Alan Burger into one report.

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2.3.5 *Columba fasciata* (Band-tailed pigeon)

Taxonomic Group Columbiformes (sand grouse; pigeons; doves; extinct dodos and solitaires)

Species Presence Year-round breeding resident of the area; however it is much less common in the winter compared to spring, summer and fall. This species is present and breeds in PRNPR.

Status **NatureServe**: G4; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3S4B,SZN & BLUE; **PRNPR**: PU

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

The Band-tailed pigeon is listed as a game species in British Columbia.

Management Considerations The Band-tailed pigeon is locally common in western North America. Some sources recognize two subspecies: The Interior Band-tailed pigeon (*Columba fasciata fasciata*) which primarily breeds in the rocky mountains south of Wyoming and the Pacific Coast Band-tailed pigeon (*Columba fasciata monilis*) which breeds west of the Cascade and Sierra Nevada mountain crests from southeastern Alaska south to Baja, California.

Band-tailed pigeons in British Columbia breed only in the southern portion of the province where they are uncommon to locally very abundant; they are an uncommon to locally common transient in more northerly coastal portions of the province and rarely visit the interior. Dorst (2002) indicates that the Band-tailed pigeon is known to breed on the west coast of Vancouver Island and lists it as "uncommon" (must search for) in spring, summer and fall and "casual" (1-2 records every year) in winter. It is present in PRNPR: Hatler *et al* (1978) indicated that this was a common summer bird in PRNPR and cited evidence that it bred in the area. Anonymous (1985) indicates that this bird is common in summer and nests in PRNPR. Barry Campbell (pers. comm.) has seen flocks of 5–10 Band-tailed pigeons at Wickaninnish Sand Dunes during the summer where they forage on Kinnikinnick (*Arctostaphylos uva-ursi*) mats. The change in status from common (Hatler *et al* 1978; Anonymous 1985) to uncommon (Dorst 2002), could represent a population decline in the area; however care must be taken as Hatler (*et al* 1978) and Anonymous (1985) are referring to PRNPR while Dorst (2002) refers to the west coast of Vancouver Island in general.

There appears to be very little information regarding this species' use of PRNPR: Habitat association, areas of concentration—aside from Barry Campbell's sightings at Wickaninnish Sand Dunes—, population size, and population trends are not known. Indeed this type of data is lacking for all of British Columbia and the BC CDC [1] recommends further research on specific habitat requirements in all life stages and seasons and species specific inventory such as point counts and mineral site surveys because this bird is not well monitored by general bird surveys.

The largest threat to this species appears to be habitat loss and degradation as well as historical over hunting; however, these should be relatively minor threats within PRNPR. This species also appears vulnerable to the protozoan disease Trichomoniasis which may cause periodic large scale mortalities. This species is limited by its low reproductive capacity (one egg laid 1–3 times a year).

Overall more research and inventory is required to more accurately understand the occurrence of and threats to this species in PRNPR. This species exhibits high fidelity to nesting and foraging sites; thus, localized areas of PRNPR may be very important.

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2.3.6 *Falco peregrinus* (Peregrine falcon)

Taxonomic Group Falconiformes (raptors)

Subspecies anatum
Species Presence Not likely present; the birds breeding on the west coast are generally accepted to be the pealei subspecies.
Status **NatureServe**: G4T3; **COSEWIC**: Threatened, Last examination/Change: May 2000 (No Change); **SARA**: Schedule 1; **BC**: S2B,SZN & RED; **PRNPR**: Not ranked

Subspecies pealei
Species Presence The birds breeding on the west coast are generally accepted to be the pealei subspecies. Peregrine falcons are present and breed in and around PRNPR.
Status **NatureServe**: G4T3; **COSEWIC**: Special Concern, Last examination/Change: November 2001 (No Change); **SARA**: Schedule 1; **BC**: S3B,SZN & BLUE; **PRNPR**: PHP1B, PNAN

Photo not identified to subspecies, likely anatum.

Status of recovery/protection Both the anatum and pealei subspecies are protected by the *Species at Risk Act*. There is a recovery team for the anatum subspecies and a national recovery plan was published in 1988; an update to the recovery plan is in development. The management plan for the pealei subspecies is not yet drafted. The Canadian Wildlife Service is the lead jurisdiction for the anatum subspecies; Parks Canada Agency is participating. The province of British Columbia is the lead jurisdiction for the pealei subspecies; Parks Canada Agency is participating.

A wide range of legislation protects falcons: endangered species acts in Manitoba, Ontario, and New Brunswick, *Wildlife* acts in other provinces and the *Environment Act* in Nova Scotia. Nunavut protects the species from non-native hunting, live possession, and trade. Alberta has authority to protect habitat on a case-by-case and area-by-area basis. The Peregrine falcon is also protected by the *Convention on International Trade in Endangered Species of Wild Fauna and Flora*. On the coast, many important seabird colonies are variously protected.

Description Peregrines are crow-sized falcons and average 42 centimetres in length. They have a 105 centimetre wingspan and their long wings taper to a point. Peregrines fly with quick wing-beats and soar on flat wings. They weigh approximately 0.5–1.0 kilogram; females are larger than males.

Both sexes are similar in colour: They are bluish grey or slate above and white to buff below. A heavy black stripe or wedge extends below the eye and combined with the dark colour on the crown and nape gives a distinctive hooded appearance. Brown horizontal bars

decorate the sides and thighs, the abdomen is spotted, and underneath the wing is white with black bars. Young Peregrines have brownish upper parts and buff underparts that are vertically streaked blackish brown. Juvenile tails have buff bars and white tips. Peregrine falcon subspecies show some variation in these characteristics; the anatum subspecies is medium sized with a salmon breast while the darker pealei subspecies is the largest and has heavy dark spotting on a whitish breast.

Reproductive cycles are similar among subspecies, but the timing differs. The anatum subspecies lays eggs in May while the pealei lays eggs in April. A pair may use the same nest area year-to-year but choose a different nest site within this area, especially if the previous nest failed. Two to five eggs are laid in a scrape, depression, or another species' abandoned stick nest; more eggs are laid in the south than the north and southern pairs will even lay a new clutch if the first one is destroyed. For 30 days the eggs are incubated primarily by the female while the male hunts and guards. The young can fly 5–7 weeks after hatching but they remain dependent on their parents for approximately 5 more weeks. On Langara Island (pealei subspecies) successful pairs produced 1.67–3.33 young per year. Peregrine falcons breed in their second year and can live up to 20 years in the wild.

Peregrines prey on an extremely wide range of species weighing up to 1.2 kilograms. Most prey items are birds in the 50–500 gram range. Smaller prey is caught in flight while larger prey is knocked from the air and retrieved on the ground. The proportion of different species in the falcon diet depends primarily on prey availability in the environment.

Habitat Peregrine falcon nesting habitat is widely variable. The basic attributes are a well drained area, on a stable substrate with enough room for three chicks, preferably 10 or more metres off the ground, with a nearby, abundant prey source. Cliffs are the most commonly chosen area that satisfies these requirements, but a wide range of other sites have been used including flat ground, tall buildings, quarries, flat bog, clay cut-banks, small boulders, eskers, low tundra hummock, sand dunes, sink-holes, industrial smoke stacks, trees, cavities in trees, churches, castles, Egyptian pyramids, and bridges [4]. Peregrines tend to hunt in open areas such as wetland, tundra, seacoast, savanna, and mountain meadow, but they will also use open forest. Home ranges can extend 27 kilometres from the nest. The pealei subspecies prefers island cliff ledges near colonies of seabirds and tends to hunt over the sea within several kilometres of the nest site.

Distribution The Peregrine falcon is found worldwide. There are three subspecies in North America: tundrius, anatum, and pealei. The tundrius subspecies breeds in the tundra of North America and is highly migratory. The anatum subspecies is found south of the tree line in populations scattered throughout North America, northern populations are migratory while southern populations are resident. The pealei subspecies is found along the North American west coast from central British Columbia north to Alaska and does not migrate.

Both the anatum and pealei subspecies are found in British Columbia; the anatum subspecies breeds in southwest British Columbia, while the pealei subspecies breeds in the Queen Charlotte Islands and along the central coast. Adults of the pealei subspecies are resident, but the juveniles winter as far south as northern Baja, California. The birds breeding on the west coast are generally accepted to be the pealei subspecies (M. Chutter pers. comm.);

thus, the birds in PRNPR are likely the pealei subspecies.

Peregrine falcons are present, within and around PRNPR; they are also known to breed in the area—though there are very few breeding records within PRNPR. They can be seen year-round, but are are more common during spring and fall. At least one pair has nested high on a bluff on Effingham Island (Broken Group Islands unit), this nest was located by park warden Bob Hansen in 2002 and 2003, but not in 2004; unfortunately Bob Hansen was unable to see inside the nest to determine the presence of chicks (B. Campbell pers. comm.).

Population sizes and trends During the 1960s the anatum falcon population crashed and was nearly extirpated due to the effects of DDT. Bans on the use of DDT and releases of captive bred birds have helped rebuild the population. An estimated 500 pairs nested in Canada during 2000; the extent of the former population is unknown.

Unlike the anatum subspecies, the pealei subspecies did not experience a DDT related population crash. In 1995 the breeding population in Canada was estimated at 100 pairs and the non-breeding component was estimated to be at least 50 percent the size of the breeding population [3]. In Alaska 600 and 500 pairs were counted in 1988 and 1989, respectively. There is not enough long-term data to determine accurate population trends; however, in recent years, populations around Vancouver Island have been considered stable or slightly increasing (M. Chutter pers. comm.). They are not a common sight in PRNPR, but the number of sightings may be on the rise in recent years (B. Campbell pers. comm.).

Threats and limiting factors Agricultural pesticides were a major threat to the anatum subspecies, but it is now limited primarily by a small population size and human disturbance. The pealei subspecies is threatened primarily by changes in prey abundance. Sea bird colonies such as those of the Ancient murrelet are at risk from mammalian predator introductions to nest islands, oils spills, and other anthropogenic disturbances. Both falcon subspecies are threatened locally by recreational use of cliffs.

Loss and lack of nesting habitat is not considered to be a threat or limiting factor for the Peregrine falcon [3, 4].

Data Gaps

- The population in the area of PRNPR is generally accepted to be stable or increasing; however, there appears to be a lack of empirical data to back this up.
- Falcon distribution in and use of PRNPR does not appear to be well characterized.

Management Considerations Peregrine falcons are present in and, at least occasionally, breed within PRNPR. The falcon subspecies generally accepted to breed on the west coast of Vancouver Island and thus the subspecies likely present in PRNPR is the pealei subspecies. There is not much cliff nesting habitat in the park so while PRNPR contains a number of seabird colonies, Peregrine breeding within the park is likely to remain rare (B. Campbell pers. comm); any cliffs with ledges in the park have the potential for peregrine nests (D. Doyle pers. comm.).

General peregrine use of PRNPR should be monitored and nest sites should be appropriately monitored and protected. A national survey is performed every 5 years and if funding is received, 2005 is the year a Canada-wide survey of nesting peregrines will be undertaken (M. Chutter pers. comm.). Active nests should be protected from all direct and indirect human disturbances [3].

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2.3.7 *Fratercula cirrhata* (Tufted puffin)

Taxonomic Group Alcidae (auks, murres, puffins)
Species Presence Uncommon along the west coast of Vancouver island in spring, summer, and fall; rare in winter. This species is uncommon in PRNPR, but there is limited breeding within the park.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3B,S4N & BLUE; **PRNPR**: P1B,PNAN
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act*.

Management Considerations Tufted puffins may nest (unlikely) at Florencia Islet (Long Beach unit) and are known to nest at Seabird Rocks in Pachena Bay (West Coast Trail unit). Hatler *et al* (1973) estimated "very few pairs" possibly breeding on Florencia Island and up to 20 nesting pairs at Seabird Rocks. Rodway (1991)—the last comprehensive review of seabird populations in British Columbia—lists 1 bird at Florencia Islet in 1982 (suspected, but not confirmed breeding) and 8 Tufted puffin pairs at Seabird Rocks in 1988 (A. Burger pers. comm.). Over the past 5 years P. Clarkson (pers. comm.) has checked around Florencia Islet on a number of occasions (while studying oystercatchers) and never seen sign of puffin burrows, but there has been regular observations of 1-2 adults in the water between Great Bear Reef and Florencia Islet over the past few years; however, they had no obvious affinity with any breeding area. A burrow search on Seabird Rocks in the late 1980s located three confirmed and possibly a few potential Tufted puffin burrows all near the top of the little hill where the navigation light is; recent surveys by Dr. Alan Burger (every couple of years) over the last 10 years indicate that the breeding population at Seabird Rocks is likely 2–4 pairs (A. Burger pers. comm.). The Tufted puffin population in PRNPR is relatively small compared to the British Columbia population which probably includes 78,000 breeders [1]. The BC CDC (2004) breeding colony element occurrence for Seabird Rocks (feature ID: 4206) has a poor estimated viability.

While there are breeding occurrences in PRNPR, Tufted Puffins are pelagic birds and foraging areas are generally offshore. It appears that most sightings of puffins in PRNPR relate to the vicinity of Seabird Rocks or small numbers in waters of the Long Beach unit, but over the past two years there have also been occasional mid-summer sightings of (3-4) puffins in the area between Cheewhat River and Carmanah Point (West Coast Trail unit) (B. Campbell pers. comm.). Hatler *et al* (1973) noted that this species is "remarkably uncommon among the Broken Group Islands".

The small size of the breeding population in PRNPR makes it particularly vulnerable to extirpation. General threats to this species include introduced predators, oil spills, fishery by-catch, and human disturbance. Indeed there is an unmanned Coast Guard light on Sea

Bird Rocks which requires maintenance; recently a protocol was developed to protect the ecological integrity of the island during maintenance (B. Campbell pers. comm.). A further threat to this species is climate change as high ocean temperatures can affect puffin hatch dates, chick growth, and fledging success; Tufted puffins may be even be more vulnerable to high ocean temperatures than other birds as they were the only bird to exhibit near-zero fledgling success at a sea surface temperature greater than 9.9° centigrade [2].

Fraser *et al* [1] recommend a number of inventory and management activities in relation to Tufted puffins in British Columbia:

- standardized (Resources Inventory Committee document #13) surveys of nesting colonies periodically (every 5 years) to monitor trends in the size and distribution of breeding populations,
- identification and mapping of important marine habitats, particularly areas of spring concentration,
- removal of mammalian predators and development of measures to prevent their introduction to breeding colonies,
- evaluation and amendment (as necessary) of marine oil spill response plans to address the needs of Tufted Puffin populations,
- regulation of Gill-net fisheries to reduce the threat of by-catch,
- develop guidelines for visitation of seabird colonies which include minimum altitudes and aircraft restrictions.

Due to the small size of their occurrence, Tufted puffins in PRNPR are at greater risk than the British Columbia population as a whole; breeding colonies in PRNPR need to be closely monitored.

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2.3.8 *Glaucidium gnoma swarthi* (Northern pygmy-owl, swarthi subspecies)

Taxonomic Group Strigiformes (owls)
Species Presence Rare year-round breeding resident of PRNPR and the surrounding area.
Status **NatureServe**: G5T3Q; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3 & BLUE; **PRNPR**: PU
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Management Considerations There are records of Northern pygmy-owls in and around PRNPR; this subspecies is generally listed as rare in PRNPR and the surrounding area (Hatler *et al* 1973, Hatler *et al* 1978, Anonymous 1985, Campbell *et al* 1990, Dorst 2002). Most records are from the Long Beach unit of the park, but there is one near Port Renfrew. This subspecies is non-migratory and thus is likely a year-round breeding resident of PRNPR.

There appears to be little to no information about this subspecies in PRNPR beyond its presence—and even that is based on relatively old records. The situation is very similar for this Vancouver Island subspecies in general and further research is needed on virtually all aspects of its biology, habitat associations, taxonomy, and population status (size and trends) throughout its range [1, 2]. It has also been suggested that public education programs encouraging the retention of wildlife trees on public lands should be expanded [2].

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2.3.9 *Megascops kennicottii kennicottii* (Western screech-owl, kennicottii subspecies)

Other names *Otus kennicottii kennicottii*
Taxonomic Group Strigiformes (owls)
Species Presence Rare, year-round breeding resident.
Status **NatureServe**: G5T4; **COSEWIC**: Special Concern, Last examination/Change: May 2002 (Reassigned); **SARA**: Schedule 1; **BC**: S3 & BLUE; **PRNPR**: P2
Status of recovery/protection The kennicottii subspecies of the Western screech-owl is protected by the *Species at Risk Act*. A habitat stewardship program is ongoing under RENEW. This species is protected under British Columbia's *Wildlife Act* and is listed along with other owls in Appendix II of the *Convention on International Trade in Endangered Species of Wild Fauna and Flora*. The province of British Columbia is the lead jurisdiction for this species.

Western screech-owl, unidentified subspecies

Description Western screech-owls are a small streaked owl with yellow eyes and ear tufts. They are 19–26 centimetres long and weigh approximately 120–300 grams—females are larger than males. The sexes look the same and their overall colour is grey-brown: The breast is off-white with thin, dark, wavy lines; the remainder of the feathers are mottled and streaky. The kennicottii subspecies is darker than the macfarlanei subspecies and some kennicottii individuals are reddish-brown. Western screech-owls have two common calls: a series of short whistles which accelerate in tempo and a short trill followed by a longer trill.

Western screech-owls are monogamous and territorial year-round. They nest in the cavities of larger trees—over 25 centimetres in diameter at breast height—and use no nesting material [1]. One clutch of 2–7 eggs is laid with an average of 3.4 eggs per pair in coastal and Great Basin areas of North America. In British Columbia eggs are laid between mid March and the end of May—half of the eggs are recorded in the middle half of April; young have been recorded between the latter halves of April and August—half of these records are from May. Most individuals may begin breeding at one year, but an average breeding age is not known. The oldest recorded wild Western screech-owl was found in California and aged at almost 13 years old; another in Idaho lived to 11 years old. The average life span is likely much shorter than these maximum ages as breeding males and females in Idaho had an average life span of 1.73 and 1.83 years respectively.

This species is nocturnal and feeds on a variety of animals including small mammals, birds, fish, reptiles, and a wide variety of insects and other invertebrates. Western screech-owls are preyed upon in turn by other owls and raccoons.

Habitat Western screech-owls use a wide variety of lower elevation habitat including forest to semi-open woodland, treed urban areas, and cactus deserts. The forest type and proportion of tree species varies but they appear to prefer riparian areas and mixed forests. At least one study found the highest concentration of Western screech-owls in coniferous forest [2]. Western screech-owls require trees with cavities for nesting.

Territories can be quite small; the 306 hectare Newcastle Island supported several pairs, while the University of Victoria Campus had fourteen pairs (D. Fraser pers. comm.).

Distribution The Western screech-owl is found in western North America from Alaska south to Mexico. There are two subspecies in Canada and both are found primarily in British Columbia; the kennicottii subspecies is found along the coast (excluding the Queen Charlotte Islands) while the macfarlanei subspecies resides in the interior.

Western screech-owls have been recorded year-round within PRNPR and are known to breed in the area; they are considered rare (lucky to see). This species is often encountered near roads and hit (or almost hit) by passing vehicles. Screech-owl encounters with vehicles generally occur during late fall to late winter: hot-spots include highway #4 near Long Beach and Tofino airport (Long Beach unit), along Wickaninnish Road (Long Beach unit), and the stretch of highway #4 from the Tofino Cemetery to Pacific Sands Resort, Cox Bay (in the District of Tofino, immediately north of the Park boundary) (B. Campbell pers. comm.).

Population sizes and trends There is little data on Western screech-owl population size. A rough estimate of the kennicottii subspecies population in British Columbia is 3,000–10,000 individuals [1].

With the exception of southwestern British Columbia the kennicottii subspecies is still relatively common and populations may be stable along much of the coast; however, local bird experts Adrian Dorst and George Bradd have stated that the number of Screech-owls they have seen in and around PRNPR appears to have declined (B. Campbell pers. comm).

Threats and limiting factors The recent range expansion of Barred owls appears to threaten Western screech-owl populations. For unknown reasons Barred owls have expanded west across the continent[15] and appear to have negative impacts on other owls such as the Western screech-owl and the Spotted owl. It is generally accepted that wherever Barred owl populations increase, Western screech-owl populations decline, probably due to predation [1], (D. Fraser pers. comm., J. Hobbs pers. comm.).

There appears to be a fair amount of Western-screech owl road mortality in and around PRNPR. The effect of this mortality on the population is unknown, but could be significant.

Nest cavities are required for breeding and a lack of suitable nesting sites will limit reproduction. Settled and recently logged areas have relatively few old dead snags with cavities.

[15]There are a number of hypotheses for the range expansion of the Barred owl including fire suppression and tree planting in the prairies, declining Great Horned owl populations, and climate change.

Data Gaps

- Further surveys are needed to determine the current distribution and size of the Western screech-owl population in PRNPR.

- Research is needed to confirm the population trend and determine reasons for the apparent decline. Barred owls and road mortality are possible causes of a downward trend, but their significance is not known and there could be other causes.

Management Considerations The Western screech-owl is present and likely breeds in PRNPR; however there appears to be little data on this species in the park. Surveys should be conducted to determine the current population size, trend, and distribution of Western screech-owls in PRNPR. Monitoring should be focused on mesic areas near water bodies (J. Hobbs pers. comm.).

Habitat management within PRNPR should include retention of snags with cavities for nesting (D. Fraser pers. comm.). Furthermore, a nest-box program may help the Western screech-owl population (D. Fraser pers. comm., J. Hobbs pers. comm.).

This species appears to be under heavy pressure from the Barred owl and has experienced rapid population declines in other areas (presumably related to Barred owl population increases). If the Barred owl is causing Western screech-owl population declines in PRNPR then habitat protection alone may not be enough to maintain Western screech-owl populations in the park; a Barred owl control program may be necessary (D. Fraser pers. comm.). It has been suggested that refuges of less than 10 hectares may enhance Western screech-owl survival by reducing competition with, or predation by, larger owls [2]; thus the Broken Group unit could be a stronghold for this species. Barred owls have been sighted and heard in the PRNPR area (B. Campbell pers. comm. with George Bradd).

Road mortality may be a significant threat to this species in the area; an unknown, but possibly large number of screech-owls are hit on roads within and near the park. Even if road mortality is not significant alone, certainly it would combine with other sources of mortality—such as Barred owls—to put further pressure on Western screech-owl populations in PRNPR.

Overall more research is needed on Western screech-owls in PRNPR and the surrounding area. Long-term monitoring is necessary to assess population trends and thus the effects of management.

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15-19 Feb., 1999. Vol. 1. BC Ministry Environment, Lands and Parks. Victoria, BC, and Univ. College of the Cariboo, Kamloops, BC. 490 pp.

2.3.10 *Phalacrocorax penicillatus* (Brandt's cormorant)

Taxonomic Group Pelecaniformes (pelicans; frigate birds; gannets; cormorants)
Species Presence Year-round resident of PRNPR with occasional and limited breeding in the park; more common in fall, winter, and spring.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S1B,S4N & RED; **PRNPR**: PHP1B, P4PNAN
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. Occurrences on Parks Canada land are protected by the *National Parks Act*.

Description Brandt's cormorants are 89 centimetres long with a wing span of 122 centimetres. At all ages they have pale buffy feathers which border the throat pouch. During the breeding season the throat pouch is bright blue and the head, neck, and scapulars grow fine white plumes. Juveniles are dark brown above and only slightly paler below.

While nesting has been observed in British Columbia from June 20 to September 9, most occurs from early July to early August. In British Columbia Brandt's cormorants nest close together on the lee side of bare rocky islands, mostly on the tops or shoulders of slopes. Colonies vary in location and number; colonies in British Columbia have varied between 3 and 110 pairs. Often nests are built, but no eggs laid; when eggs are laid the average clutch is 2–3 eggs which are incubated for 28–32 days. It takes another 40–42 days for the chicks to fledge. Individual Brandt's cormorants may live more than 9 years in the wild (Carey and Judge 2002).

Brandt's cormorants are gregarious and often fish in large flocks. They feed mostly on fish; in California Anchovy (*Engraulis*), Rockfish (*Sebastes*), Oxyjulis, and Chromis are the most prevalent food items.

Habitat Brandt's cormorants are often found in bays, harbours, lagoons, and narrows where currents are strong and nearby roosting islets are available. They feed in upwelling areas and choose nest sites near foraging areas.

Distribution This species is distributed from approximately the Queen Charlotte Islands south to Baja California and the Gulf of California, but they only breed in the area from northern Vancouver Island south to Baja California plus one tiny colony near Prince William sound, Alaska. In British Columbia non-breeding birds are distributed throughout the inshore coast, but are most common in Gulf Islands and Juan de Fuca Strait; breeding occurs at offshore islands on the outer coast of Vancouver Island.

This species has been detected in all units of PRNPR and colonies have been located in the Long beach unit and in Barkley Sound (near, but not in the Broken Group Islands unit).

Breeding in PRNPR was first discovered in 1965 when 110 nests were located on Sea Lion Rocks, Long Beach unit; since then colony locations and numbers at colonies within PRNPR have varied from year to year—this species is a variable breeder with the number, size, and location of colonies changing from year to year (Campbell *et al* 1990a). Within PRNPR Brandt's cormorants have nested on Sea Lion Rocks and White Island (off Schooner Cove), both in the Long Beach unit (B. Campbell pers. comm.). In Barkley Sound they have nested in Loudoun Channel on Great Bear Rock and Starlight Reef. Band returns indicate that California is the origin of the Brant's cormorants nesting in and around PRNPR (Campbell *et al* 1990a).

Population sizes and trends There is only a small breeding population in British Columbia (estimated at 91 pairs in 1991), but the non-breeding population in the Georgia Depression is 10,000–15,000 [2]. Long term trends are difficult to determine due to variability in size and location of colonies. The population of this species may fluctuate with large scale ocean cycles and may currently be in decline.

Threats and limiting factors Colonies are threatened primarily by human disturbance [2]. Cormorants are very sensitive to human disturbance and will temporarily desert nests when humans or boats approach within 100 metres—leaving eggs and chicks vulnerable to predators. Other threats include oil spills, fishery by-catch, and environmental contaminants such as (organochlorine pesticides).

The very small breeding occurrence of this species in both PRNPR and British Columbia makes it especially vulnerable to any increase in mortality, or decrease in reproductive success.

It appears that ocean cycles such as El Niño have a large effect on this species and that there may be a long term cycle of population growth and decline tied to ocean cycles (Campbell *et al* 1990a).

Data Gaps

- Populations trends remain to be determined in British Columbia and PRNPR.
- The effect of environmental contaminants on reproductive success in PRNPR is poorly known.
- The current status of this species in PRNPR is not well understood; no recent data was found to indicate population size or breeding occurrences within the last 10 years.

Management Considerations Brandt's cormorants are present year-round in all units of PRNPR and are known to have bred in the Long Beach unit and near the Broken Group unit. Current data on the occurrence of this species in PRNPR appears to be lacking; surveys are necessary to determine the current nature of their occurrence (breeding/non-breeding), population size, and trends in the park. It should be noted that these birds are a variable breeder and the location and and number of birds at breeding colonies varies with changes in upwelling patterns and long term ocean cycles such as El Niño.

Fraser *et. al* [2] have recommended a number of research, inventory, and management actions which could be applied to PRNPR:

- any research and inventory methods should be designed to reduce disturbance;
- collect egg shells regularly for analysis and monitoring of environmental contaminants. This would be most useful in conjunction with data on reproductive success;
- regular monitoring of current and historical breeding sites should be implemented and should follow the standardized methods of the Resources Inventory Committee [1]. This will help to determine trends in population size and reproductive success, as well as colony persistence;
- guidelines to reduce human disturbance near cormorant colonies should be developed and implemented. Also public education should be an important part of an overall plan to increase public awareness of the vulnerability of cormorant colonies.

Further monitoring is needed to establish the current status and trend of this species in PRNPR. Cormorants are very sensitive to human disturbance and colony sites in PRNPR should be appropriately protected; however, it should be noted that this species' population and distribution fluctuates in response to ocean conditions and ultimately the presence of Brandt's cormorant in PRNPR may depend on outside factors regardless of conservation activities within the park. This is not to say that conservation within PRNPR is futile, but that larger scale population and distribution patterns should be considered. Furthermore, only breeding birds have been designated at risk, non-breeding birds are ranked S4N which equates to a British Columbia colour rank of yellow.

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2.3.11 *Ptychoramphus aleuticus* (Cassin's auklet)

Taxonomic Group Alcidae (auks, murres, puffins)

Species Presence This species is present year-round offshore of PRNPR. It is uncommon in the park and there is a very small breeding colony within PRNPR.

Status **NatureServe**: G4; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2S3B,S4N & BLUE; **PRNPR**: P1B, PNAN

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. This species is identified wildlife in British Columbia and in PRNPR it is protected by the *National Parks Act.*

The Working Group on Raccoon-Seabird Interactions has written and implemented a management plan which includes Cassin's auklet colonies on the Queen Charlotte Islands.

Management Considerations Cassin's auklet is present and breeds within PRNPR. It has always been uncommon in the park and surrounding area as it is a pelagic bird which forages offshore (Hatler *et al* 1978, Anonymous 1985, Dorst 2002). It is present offshore of PRNPR in all seasons (Palm 1994–2001, Dorst 2002). Fewer than 100 pairs of Cassin's auklet were thought to breed at Seabird Rocks in the late 1970s (Hatler *et al* 1978). In 1988 the nesting population was estimated at 164 pairs by A. Burger, and D. Garnier (BC CDC 2004). This breeding population is very small compared to the total breeding population in British Columbia which was estimated (in the early 1990s) at 2.7 million birds which use 70–80 colonies throughout British Columbia [1]. The BC CDC (2004) breeding colony element occurrence at Sea Bird Rocks (feature ID: 4202) has a poor estimated viability.

There are a number of threats to this species. The most devastating to date has been introduced mammalian predators. Other threats include oil spills, warmer ocean temperatures, and disturbance by humans. Fraser *et al* [1] have recommended a number of inventory and management concerns/actions for this species including:

- regular (every 5 years) monitoring of colonies to determine population trends, reproductive success, and presence/absence of mammalian predators,
- control of mammalian predators (the highest priority), including development of measures to prevent their introduction,
- disturbance by researchers (or other humans) can cause nests to be abandoned,
- oil spill response plans should be evaluated and amended as necessary to address the needs of Cassin's Auklet,
- seabird colony visitation guidelines should be developed.

It should be noted that only the breeding occurrences of this species are blue listed by the BC CDC; the non-breeding rank (S4N) equates to the yellow list. Breeding occurrences at Seabird Rocks should be monitored and threats should be assessed and addressed.

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2.3.12 *Synthliboramphus antiquus* (Ancient murrelet)

Taxonomic Group Charadriiformes (shorebirds and coastal diving birds)
Species presence Year-round transient with a small potential for breeding.
Status **NatureServe**: G4; **COSEWIC**: Special Concern, Last examination/Change: April 1993 (New); **SARA**: Schedule 3; **BC**: S2S3B,S4N & BLUE; **PRNPR**: PNA

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection The Ancient murrelet was assessed prior to October 1999 and must be reassessed by COSEWIC before it is considered for addition to SARA's schedule one. This species is protected under the federal *Migratory Birds Convention Act* of 1917, the *Wildlife Act* of British Columbia, and it is identified wildlife in British Columbia.

The Canadian Wildlife Service is the lead jurisdiction for this species; Parks Canada is participating. The Working Group on Raccoon-Seabird Interactions has written and implemented a management plan which includes major colonies on the Queen Charlotte Islands.

Description The Ancient murrelet is a small sea bird of the North Pacific Ocean (wing length ~14 centimetres, weight 200–250 grams). During the breeding season (April to June) the Ancient murrelet has a black bib and a white breast, the sides of the neck are white, the bill is pale, and a white stripe over the eye extends onto the nape of the neck. During winter the Ancient murrelet is blackish above, the feathers of the back have a bluish tip, there is a narrow white band on the back of the neck, and the underparts are white. Immature birds lack the white head streaks and the throat is mostly white; they appear similar to winter Marbled murrelets, but immature Ancient murrelets have a heavier, paler bill and a sharp contrast between the head and back colouring. Their call is a short energetic *chirrup*.

Ancient murrelets nest in large colonies on small coastal islands. The breeding season in the Queen Charlotte Islands extends from April to June—the birds begin to arrive at colonies in march. They dig burrows under the base of trees, stumps, fallen logs, roots of grass tussocks, or use rock crevices. They line their nests with dry grass and leaves and lay one clutch of two eggs per year. Egg laying begins between April 1–10 and continues over the next 45 days; no replacements are made if this clutch is lost. Both parents share incubation equally until the eggs hatch approximately one month after laying. The chicks are not fed in their burrows and two to three days after hatching they run under cover of darkness to meet their parents at sea. Family groups quickly leave the breeding area and are rarely seen inshore. Both parents feed their chicks until they are full grown (approximately one month). Breeding probably begins at age three or four.

They forage in marine waters and feed on planktonic crustaceans and fish.

Habitat (Terrestrial) Ancient murrelets are primarily marine birds and only come ashore to breed. Ancient murrelets breed on small coastal islands; most known breeding islands are 22–2,000 hectares. Breeding sites are generally less than 300 metres from the sea (400 metres is exceptional). Habitat use is variable and while they prefer burrows dug in forest,

dense shrub, or grassland, they will also utilize rock crevices. With the exception of the River otter, a lack of mammalian predators appears to be a necessity.

Habitat (Marine) During breeding Ancient murrelets are found primarily offshore over the continental shelf and slope in water 4°–20° centigrade. They spend most of the day away from their colonies and generally move inshore only in early evening and near dawn when they gather next to their colonies.

Similar habitat is used during the winter when murrelets are found over the continental shelf and slope with aggregations in upwelling areas.

Distribution Ancient murrelets breed in an arc around the North Pacific Ocean and are more abundant towards British Columbia. Most breeding appears to take place from the Queen Charlotte Islands north but there is some evidence of breeding farther south. A nest with eggs was found on Carroll Island, Washington State in 1924 and small numbers are seen offshore during the summer with a fledgling recorded in 1978 [3].

Ancient murrelet non-breeding distribution changes with the seasons: The birds are rarely seen in British Columbia waters between late summer and early fall, the whereabouts of the birds at this time is unknown. In winter some Ancient murrelets disperse as far north as the Bearing Sea while others can be found in California and Taiwan. Wintering birds occur throughout coastal British Columbia from October to February with larger concentrations around Vancouver Island: Queen Charlotte Strait, Strait of Juan de Fuca, Haro Strait, and Active Pass.

A small number of Ancient murrelets appear to be present year-round off PRNPR and occasionally, generally during summer, some birds venture inshore; Ancient murrelets have been seen in the marine components of all PRNPR units[16].

Population sizes and trends The total world population of Ancient murrelets is estimated to be a half million breeding pairs; about half of these (approximately 256,000 pairs) breed in the Queen Charlotte Islands [1, 3]. Several colonies in the Queen Charlotte Islands have disappeared and others are declining—some by as much as 90 percent. The primary cause of these declines are introduced predators such as rats, foxes, and raccoons.

Threats and limiting factors The main limiting factor for Ancient murrelets has been the introduction of exotic predators to breeding islands. Rats and raccoons appear to have caused

[16]There appears to be some confusion (likely a result of a lack of data) regarding the presence of this species in the PRNPR. Hatler *et. al.* (1973) contains summer and early fall records of the species, but the authors mention that the species should be resident over a wider range of seasons; they suggest that the bird is resident, but due to its highly pelagic nature, not observed. Hatler *et. al.* (1978) adds a winter PRNPR record in addition to the summer and fall records in Hatler *et. al.* (1973). Anonymous (1985) regards the Ancient murrelet as a rare (observed on a few occasions each year) overwintering bird in PRNPR while Dorst (2002) considers this species to be casual (one or two records each year) during spring and fall. Strawberry Island Research Society's pelagic boat trips record Ancient murrelets from mid autumn to late spring (B. Campbell pers. comm.). Taken together these sources appear to indicate that Ancient murrelets could be seen any time of year in PRNPR, but not necessarily every season each year. Their distribution is likely erratic as they follow prey concentrations.

NB: Citations can be found in the General reference section of this report.

the loss of several colonies and drastically reduced the number of birds at others.

Ancient murrelets are very sensitive to disturbances. Disruptions such as tourists can limit reproduction and even the presence of light sources is a threat because adults and chicks are strongly attracted to light and are prone to confusion or collisions when influenced by artificial light sources.

The Ancient murrelet is also very vulnerable to oil spills and small chronic spills could be a problem for these birds.

Data Gaps

- While the Queen Charlotte Islands are the only known location of regular breeding colonies in Canada there is some evidence that these birds will—very occasionally—breed farther south. There is little evidence to determine the extent of this southern breeding and there is a possibility that it is, or was, more extensive than currently believed.

- There does not appear to be enough data (pelagic surveys) to accurately determine when and in what numbers this species is present offshore of PRNPR.

Management Considerations While there are some records within in PRNPR waters, Ancient murrelets are primarily marine and generally forage along the continental shelf and slope; their presence in the marine portions of PRNPR is very limited.

This species is found offshore during the breeding season and there is a small possibility that limited numbers breed or will breed within PRNPR. There is some evidence that Ancient murrelets may occasionally breed south of the Queen Charlotte Islands and it would be easy to miss a few breeding birds since they only come ashore at night. Reports of fledglings in the area during the breeding season should be investigated. Any nesting sites will require appropriate management, primarily protection from disturbance during the breeding season.

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2.3.13 *Uria aalge* (Common murre)

Taxonomic Group Alcidae (auks, murres, puffins)
Species presence Year-round in PRNPR and the surrounding area, significantly more common in the summer and fall than winter and spring; occasionally breeds in PRNPR.
Status **NatureServe**: G5; **COSEWIC**: Not assessed **SARA**: Not on a schedule; **BC**: S2B,S4N & RED; **PRNPR**: PHP1B, P4PNAN
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*.

Description Common murres are large (45 centimeter long) birds with a long slender pointed bill. Breeding plumage consists of dark sooty grey upper parts, with a brownish head and white underparts. In winter their colouring is similar except white extends up the throat and the side of the head to under the bill and behind the eye; a dark stripe extends from the eye across the cheek. Juveniles are similar to winter adults, but they have a shorter thinner bill, paler upper parts, and the stripe behind the eye is smaller and does not connect with the white of the under parts.

In British Columbia Common murres nest in colonies on offshore islands, rocky islets, and reefs. They don't build a nest, rather they lay directly on rock or soil (they prefer cliff faces), or among grass tussocks on the crest of headlands. A single egg is laid 4–91 metres from the high tide mark between mid-June and mid-July (in British Columbia); it is incubated by both sexes for 28–35 days. Chicks leave the nest after 18–25 days and join their parents at sea. Approximately 34–81 percent of eggs hatch, and 67-89 percent of the chicks survive to fledge [1]. Individual Common murres may live more than 26 years in the wild (Carey and Judge 2002).

Common murres forage in protected marine areas, particularly areas of upwelling or mixing where they catch both fish (including Sand lance and herring) and invertebrates (such as euphausiids).

Habitat Breeding habitat includes offshore islands, bare rocky islets, and reefs. Foraging habitat includes sheltered waters off straits, inlets, bays, and channels; they particularly prefer areas of upwelling and mixing. During migration Common murres prefer offshore waters.

Distribution Common murres are a widely distributed bird found in the Bearing Sea, the North Pacific Ocean, and the North Atlantic Ocean. In the Pacific they are found from the limit of open water in the north, south to Korea and Hokkaida, and to extreme northwestern Mexico; they breed from the Bering Strait south to Korea and Hokkaido, and to central California. In British Columbia they are widespread as a non-breeding bird, but there are only a few breeding sites scattered from the southern tip of the Queen Charlotte Islands

south to Barkley Sound. Regular breeding sites include Sartine Island, Triangle Island, and the Kerouard Islands; minor breeding occurs on Cleland Island and Florencia Islet.

This species is seen year-round in all PRNPR units. It is noticeably less common in the winter and spring compared to summer and fall when concentrations of over 1000 birds have been seen. It appears that numbers are bolstered in the late summer and fall by large numbers of birds from Washington and Oregon. There is evidence of minor breeding on Florencia Islet, Long Beach unit—one broken egg found in July 1969 and two adults seen on nearby cliffs (Hatler *et al* 1973).

Population sizes and trends The breeding population in British Columbia is estimated at 4, 320 pairs [1] . The wintering population is much higher due to an influx of southern birds. There is not enough data to determine overall trends, but several small colonies have been lost.

Bob Hanson, PRNPR wildlife warden (pers. comm. with B. Campbell) has indicated that while Common murres still occur in Broken Group and Cape Beale area seabird transects, the number of birds in groups is much smaller than even 10–15 years ago—there are fewer large groups and large groups appear to contain fewer birds; this decline is most apparent in Loudoun Channel and Trevor Channel, Barkley Sound (B. Campbell pers. comm.).

Threats and limiting factors The concentration of 95 percent of the breeding population at a single colony on Triangle Island makes this species very vulnerable to catastrophic events such as oil spills. Furthermore, Common murres appear to be more vulnerable to oils spills than other seabirds as a large percent the seabirds killed by the Nestucca oil spill (80 percent in Washington and 42 percent in British Columbia) were Common murres (Campbell *et al* 1990b). This species also appears more vulnerable to gill-nets than other species and breeding birds are sensitive to intrusions [1].

Data Gaps

- The current status of this species in PRNPR is not well known as no recent breeding records were discovered; was the breeding in 1969 and isolated occurrence or has it continued?

Management Considerations Common murres are present and do occasionally breed within PRNPR: Overall they occur mostly as non-breeding birds in the late-summer and fall, but they are present year-round. Breeding is very limited and irregular—there appear to be no recent records of breeding.

It should be noted that non-breeding birds are ranked S4N which equates to a British Columbia colour rank of yellow. Only the breeding population is red-listed and this is because of their restricted breeding of which 95 percent is confined to the colony on Triangle Island. Florencia Islet and other potential breeding sites should be regularly surveyed to monitor the extent of breeding within PRNPR and breeding birds should be protected from disturbance.

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2.4 Bivalvia (Oysters; clams; scallops; mussels)

2.4.1 *Ostrea conchaphila* (Olympia oyster)

Taxonomic Group Ostreidae (oysters)
Species Presence Year-round breeding resident in and around PRNPR.
Status **NatureServe**: G5; **COSEWIC**: Special Concern, Last examination/Change: November 2000 (New); **SARA**: Schedule 1; **BC**: Not tracked; **PRNPR**: P1P2
Status of recovery/protection The Olympia oyster is protected under the *Species At Risk Act*; the management plan is not yet drafted. The Department of Fisheries and Oceans Canada is the responsible jurisdiction; Parks Canada is participating.

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Commercial oyster fishing is regulated by the province of British Columbia and commercial harvesting of Olympia oyster is prohibited; however, recreational harvest of Olympia oyster is allowed and current bag limits may represent 400 Olympia oysters/day due to their small size[17]; recently the Fisheries Regulations for the PRNPR were amended to prohibit possession of any Olympia oyster.

Description

> "The Olympia oyster is a small oyster species, whose maximum size is about 90 millimetres in diameter, and whose shape is roughly elliptical or circular. The valves of this oyster are different. Its lower (left) valve is deeply cupped and upper (right) valve is flat and fits inside the edges of its lower valve. The outside of the oyster ranges from white to purplish-black in colour and the insides of the valves range from white to iridescent green to purple in colour." (Environment Canada, Species at Risk Branch, 2004)

Olympia oysters in Barkley sound are generally 60 (or fewer) millimetres in diameter.

Spawning can occur in spring, summer, and fall depending on ambient water temperature. Olympia oysters commonly reproduce at 14°–16° centigrade, but reproduction can occur at temperatures as low as 12.5° centigrade. In British Columbia broods are detectable about mid-May to June. Spawning lasts for about three months with planktonic larva settling throughout July, August, and September. It is important to note that development is tightly regulated by temperature: higher temperatures result in faster development than lower temperatures; this applies to both larval and adult sexual development—sexual development even halts during periods of low temperature, resuming in warmer temperatures.

[17] The current daily bag limit is 15 oysters/person or 0.5 liters of shucked oyster meats/person. It would take approximately 400 Olympia oysters to make 0.5 liters of shucked meats [1].

Olympia oysters are alternating hermaphrodites; they mature first as males and then alternate between male and female phases. The switch from female to male stages takes approximately 8–12 days.

The male phase releases balls of sperm into the mantle cavity where they are expelled through pumping contractions of the shell. Upon contact with sea water these sperm balls dissolve and release spermatozoa. Hundreds of thousands of sperm balls are released during the first male phase and each sperm ball contains ~2,000 sperm. Self fertilization is not believed to occur due to the requirement of sea water to dissolve the sperm balls.

The female stage lasts for several weeks and entails two cycles of ovulation and egg release. Eggs are released into the mantle cavity and fertilized by sperm brought in on the respiratory current. The brood develops in the mantle cavity for approximately two weeks before the larval shells have developed and the brood is released into the water column. The brood size for marketable oysters has been estimated at 250,000–300,000 larva.

Larva are planktonic for approximately 2–3 weeks before they settle. During this time they may disperse at least 56 kilometres. Settling is biased towards the underside of objects. Larva grow quickly during the planktonic stage: from 165–189 micrometers when released to ~300 micrometres upon settling. Growth slows after settling; a size of 50 millimetres is reached after 4-5 years and growth may slow further after this point. Age at first reproduction depends on both the time of settling and the ambient temperature. In British Columbia the first male sexual maturity is reached approximately 1 year after settling. The maximum age of Olympia Oysters is unknown; fossil evidence indicates they live to at least 10 years old.

Adult oysters are filter feeders, while larva actively swim and feed on organic material.

Habitat Olympia oysters are found in a variety of marine areas: tidal channels, bays, splash pools, sounds, estuaries, saltwater lagoons, mud-gravel tidal flats, near freshwater seepage, on the undersides of floats, and attached to pilings. They are found singly, in clusters, or in beds from the lower intertidal zone to 50 metres deep. They prefer protected areas and are restricted to them on the outer coast. Hard substrates are required for successful settlement—even very small pieces of hard substrate will do—, but older individuals can be found free on the substrate.

Distribution Olympia oysters are only found on the west coast of North America, from Sitka, Alaska to Panama. In British Columbia they are found in Georgia Strait, on the west coast of Vancouver Island, and a few sites in Queen Charlotte Strait and the coastal mainland of Queen Charlotte Sound. Olympia oysters are locally common in Barkley sound, notably Useless Inlet, Effingham Inlet, Pipestem Inlet, Toquart Bay, Congreve Islands, Mayne Bay and Vernon Bay.

In PRNPR Olympia oysters are known to occur on three beaches in in the Broken Group unit [1].

Population sizes and trends There are no quantitative estimates of population size or trends. Anecdotal evidence indicates that current populations are lower than historical populations where these oysters were commercially harvested. Populations may be stable at low

numbers based on the persistence of populations 50 years or more after the major fishing impact.

Threats and limiting factors Threats to Olympia oysters have been reviewed in the status report [1] and include introduced species (predators, competitors, and diseases), pollution, siltation, recreational harvest, and temperature extremes—

- Introduced predators (such as Oyster drills and the Japanese oyster leech) may threaten Olympia oysters if they become present in PRNPR, but they currently appear localized to the inner coast in British Columbia;

- European flat oysters have been recovered from a number of sites in Barkley Sound not known to be areas of direct transplants. While further investigation is required to confirm the presence of reproducing populations of European flat oysters in British Columbia, if established they—or another introduced species—could pose a threat through competition or as a disease reservoir;

- Three introduced diseases are of concern in British Columbia (S. Bower pers. comm.): Nocardiosis (bacterial pathogen) which to date has only been detected in Pacific oysters (*Crassostrea gigas*) and flat oysters (*Ostrea edulis*) from the Strait of Georgia. Bonamiasis (protistan parasite) helped devastate the flat oyster industry in Europe and has recently been detected in British Columbia (Malaspina Inlet)[18]. Denman Island Disease (protistan parasite) is known to kill Olympia oysters and there seems to be an outbreak in Lemmens Inlet, Meares Island just north of PRNPR;

- Pollution in the waters of PRNPR may be of concern. In particular the anti-fouling paint TBT has been associated with reproductive failure in other marine invertebrates;

- Silt can smother Olympia oysters—and other animals; thus activities which increase the amount of silt entering the waters of PRNPR such as digging related to shellfish harvest could smother Olympia oysters;

- While commercial fishing is closed the current recreational oyster bag limit (0.5 litres of shucked meats) has the potential to seriously harm Olympia oysters because it amounts to approximately 400 individuals of this small oyster. The Olympia oyster's small size which makes the bag limit a problem coupled with this oysters presence in the lower intertidal zone may limit its desirability and thus limit the direct impact of recreational harvest; furthermore, the Fisheries Regulations for PRNPR were recently amended to prohibit possession of any Olympia oyster. It should be noted that shellfish harvest still poses an indirect threat to Olympia oysters through their being crushed by harvesters or their boats and by burial or smothering caused by digging (G. Gillespie pers. comm.).

[18]Dr. Ralph Elston, in Sequim WA, is conducting a cohabitation exposure experiment with Bonamiasis infected flat oysters and stocks of Olympia oysters from around Puget Sound. The experiment is still on-going and final results are not expected until June 2005.

- Cool temperatures in the northern portion of their range (including British Columbia) limit reproduction because successful spawning and settling may only occur in warm years. A low population density coupled with a broadcast spawning habit likely limits reproduction even further.

Data Gaps

- The extent of self reproducing exotic oyster species in Barkley Sound and PRNPR is not fully known.
- Pollution levels (i.e. TBT) and current effects on Olympia oysters in the PRNPR area is unknown.
- The effect of shellfish harvest on Olympia oysters in PRNPR requires more study.
- Population size and trends in PRNPR are unknown.

Management Considerations Olympia oysters occur in the Broken Group islands and considering the tendency of these oysters to live at low tidal levels they may be more common there (and in other areas of the park) than casual observation would suggest. Surveys are required to assess the presence and distribution of Olympia oysters in PRNPR.

Olympia oysters in PRNPR do not appear to be imminently threatened, but there are some reasons for concern. The primary concern for populations in PRNPR is disease and there appears to be an outbreak of Denman Island Disease north of PRNPR. Dr. Susan Bower, Fisheries and Oceans Canada, is involved in oyster disease research and has expressed an interest in assaying diseases in Olympia and introduced oysters from PRNPR and the surrounding area (S. Bower pers. comm.). Also, the indirect effects of harvesting other shellfish are of concern (G. Gillespie pers. comm.).

Management of Olympia oysters in PRNPR should include monitoring and studies to determine population size and trends as well as the relative impact of the various threats to populations in PRNPR.

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2.5 Gastropoda (Snails; slugs)

2.5.1 *Haliotis kamtschatkana* (Northern abalone)

Other Names Pinto abalone
Taxonomic Group Haliotidae (abalones)
Species Presence Year-round breeding resident of PRNPR and the surrounding area.
Status **NatureServe**: GNR; **COSEWIC**: Threatened, Last examination/Change: May 2000 (No Change); **SARA**: Schedule 1; **BC**: Not tracked; **PRNPR**: P1
Status of recovery/protection This species is protected under the *Species at Risk Act*; the abalone recovery team was formed in 2001, the recovery strategy was completed in 2002, and the recovery action plan is in draft. Responsible jurisdictions for this species include the Department of Fisheries and Oceans, Parks Canada, and the province of British Columbia.

All abalone fishing is banned in British Columbia and various habitat stewardship programs are underway with local communities along the coast of Vancouver Island and the mainland. Parks Canada is involved in continuing research and restoration activities (H. Holmes pers. comm.).

Unfortunately abalone have not been recovering under current protections.

Description Northern abalone is a marine snail with a thin, low, oval, mottled reddish, purple or greenish shell with areas of white or blue. There are three to six holes on tubular projections around the shell margin. The shell is covered with irregular bumps. The inside of the shell is an iridescent pearly white.

Abalone are broadcast spawners; between April and August they release eggs and sperm into the water column where fertilization occurs. The eggs hatch within a day and the larvae float with the ocean currents for 2–11 days before settling to the bottom. Chemical secretions from their food algae may trigger larval settling. The relatively short time that larva remain adrift may limit their dispersal ability, but recent genetic studies indicate that dispersal has been sufficient—at least in the past—to prevent the development of genetically distinct populations in British Columbia [14].

The growth rate of abalone depends on food availability and water temperature, but is generally slow—it takes 6–10 years to reach 100 millimetres. The fastest growth rates occur in warm kelp forests while the slowest growth rates occur on cold exposed rocks with lots of wave action. Slow growing or stunted abalone from exposed areas resume growth when transplanted to more hospitable areas. Abalone are sexually mature when their shells are approximately 50 millimetres across and may live up to 50 years.

Juveniles feed on diatoms and crustose algae while adult abalone feed on large pieces of drifting algae.

Habitat Northern abalone live on shallow rocky substrates in cool turbulent water. Compared to highly exposed areas growth is faster in moderately exposed areas with Bull kelp forests. Abalone can be found at depths from 0 to >100 metres. Adult abalone are generally found in the first few metres of water while juveniles are found deeper.

Distribution Northern abalone can be found along the west coast of North America from Yakutat, Alaska to Turtle Bay, Baja California. Within this area abalone are patchily distributed.

Northern abalone are present at a number of locations within PRNPR.

Population sizes and trends Populations of northern abalone are generally small and declining [6]. At index sites on the central coast the total mean density of abalone declined from 2.4 to 0.2 abalone per square metre during 1979–1997. Similar declines (2.8 to 0.5 abalone per square metre) were observed in the southeast Queen Charlotte Islands during 1977–1998. Abalone populations declined 75 percent overall between 1977 and 1984 and either remained low but stable, or continued to decrease through 1998 [6].

It should be noted that abalone populations in the 1970s were likely larger than historic populations due to the prior extirpation the Sea otter; the relation of current population levels to historic Sea otter controlled abalone population levels are not known.

Threats and limiting factors The primary threat to northern abalone is the over-harvesting which lead to its decline and continues today as illegal poaching. Wallace [13] found a much greater abundance of abalone in areas where protection from poaching was higher than normal. Abalone is particularly sensitive to harvesting because of its slow growth and the tendency for adults to concentrate in the low inertial zone where they are easily harvested. Harvesting targets the largest individuals [4]; these larger individuals may account for the bulk of successful spawning and are slow to be replaced at inherently slow growth rates. Furthermore, the broadcast spawning habit of abalone requires a relatively high density for effective reproduction and there is likely a threshold density below which the population can no longer maintain itself and will decline to zero.

A further threat to the northern abalone is the reintroduction of one of its predators, the Sea otter. While the Sea otter is a natural predator of abalone its reintroduction will have an unknown effect on depressed abalone populations.

Data Gaps

- The current level of poaching in PRNPR is not known.
- Sea otter reintroduction will have an unknown effect on abalone populations in PRNPR [6].
- Critical habitat can not be defined without further research [6].

Management Considerations Abalone is present in PRNPR and extant populations will likely require conservation actions. Potential conservation actions include, but are not limited to those outlined in the National Recovery Action Plan for Northern abalone [7]; the most urgent of these actions relate to stopping the illegal harvest, improving reproductive success, obtaining baseline population abundance data, and researching growth and reproduction.

Parks Canada is currently involved in multiple abalone restoration activities and should continue; details on specific restoration activities can be obtained from PRNPR staff.

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2.5.2 *Hemphillia dromedarius* (Dromedary jumping-slug)

Taxonomic Group Stylommatophora (terrestrial snails and slugs)

Species Presence Year-round breeding resident of PRNPR and the immediately surrounding area.

Status **NatureServe**: G2; **COSEWIC**: Threatened, Last examination/Change: May 2003 (New); **SARA**: Schedule 1; **BC**: Not tracked; **PRNPR**: P1P2

Status of recovery / protection The Dromedary jumping-slug is protected under the *Species at Risk Act*. The British Columbia Invertebrates Recovery Team is working on this species; the recovery strategy is in the draft stages (J. Heron pers. comm.). British Columbia is the lead jurisdiction for this species.

Description The Dromedary jumping-slug is a relatively large slug which measures approximately 60 millimetres when extended. As is common in this genus the visceral pouch forms a pronounced hump and a portion of the internal shell plate is visible through an opening in the mantle. The tail is laterally compressed and terminates in a horn-like structure. The predominant colour is gray above with cream mottling on the sides, the sole of the foot varies and can be pale yellow, orange-yellow, or cream coloured. While jumping-slugs are rather distinct and unlikely to be confused with other genera, the Dromedary jumping-slug could be confused with other members of its genus.

Dromedary jumping-slugs are generally active at night.

Habitat Dromedary jumping-slug habitat associations are poorly understood. It has been found at high and low elevations in mature, older, and selectively logged forest; the selectively logged forest—near Bamfield on Vancouver Island—retains characteristics of older forests. The low elevation occurrences of this species are associated with the wet west coast environment of Vancouver Island. These slugs have also been found on sparsely wooded, high elevation, sub-alpine talus slopes. Coarse woody debris or other cover providing desiccation protection may be a critical habitat feature.

Within PRNPR Dromedary jumping-slugs have been found inland of the salt spray zone in older coniferous forest with the following features [2]:

- dominance of Western redcedar and Western hemlock;
- high canopy closure (> 70%);
- sparse understory (generally Salal, Evergreen Huckleberry, Red Huckleberry, False Azalea, and Deer Fern), very sparse or absent herbaceous layer and low to moderate moss coverage;

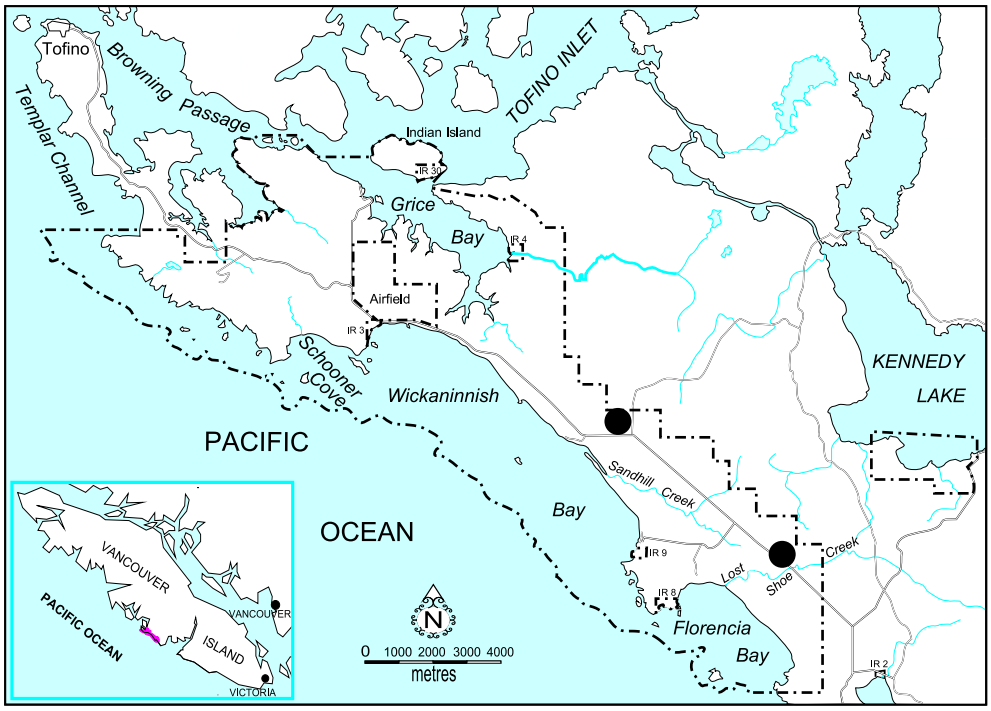

Figure 2.3: Dromedary jumping-slug (*Hemphillia dromedarius*) localities (black circles) in Pacific Rim National Park Reserve (Long Beach unit) [2].

- abundant (often layered) coarse woody debris including very large diameter logs;
- thin litter layer of mostly needles and decaying wood;
- moderate to well drained moore-type soil;
- limited diversity and abundance of other gastropods.

PRNPR contains a fair amount of this habitat.

Distribution Dromedary jumping-slugs are distributed in western Washington and extreme southwestern British Columbia. In British Columbia these slugs have only been found at ten locations on southwestern Vancouver island [2].

Dromedary jumping-slugs have recently been found at four locations within PRNPR [2]. In the Long Beach unit they have been found on route A of the Rainforest trail (49° 02' 36.44" N, 125° 40' 52.56" W) and southeast of the Goldmine trail (49° 00' 41.23" N, 125° 37' 17.21" W) (Figure 2.3). Localities in the West Coast Trail unit are near Thrasher Bay (48° 33' 44.18" N, 124° 28' 18.00" W) and 100 metres from Cheewhat Cabin (in the Clooose area) about 1 km south of Nitinat Narrows (Figure 2.4). It should be noted that there are older records from Kennedy Flats ~3.2 kilometres from the park boundary and from Bamfield.

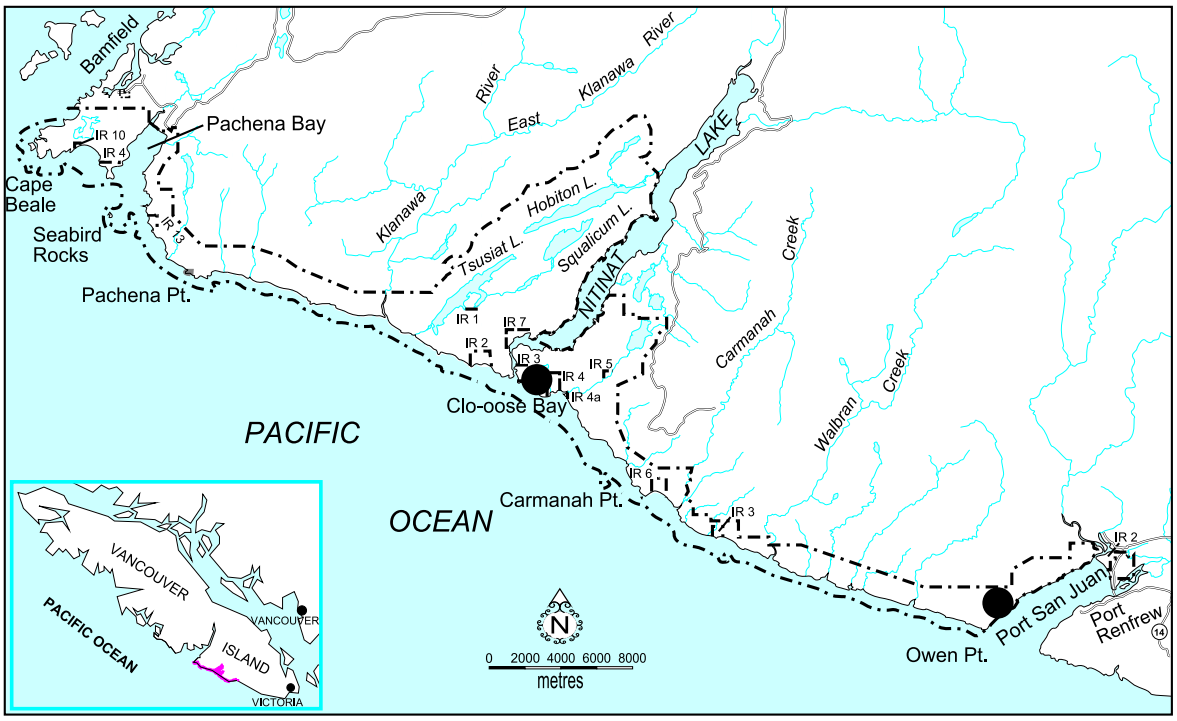

Figure 2.4: Dromedary jumping-slug (*Hemphillia dromedarius*) localities (black circles) in Pacific Rim National Park Reserve, West Coast Trail unit [2].

Population sizes and trends Populations size and trends for this species are unknown, but wherever this species is found it is appears to exist at very low densities.

Threats and limiting factors Dromedary jumping-slugs appear to have specific habitat requirements (i.e. forests with mature to old-growth characteristics). This specific habitat requirement combined with habitat loss, fragmentation, and resulting edge effects is a significant threat. Furthermore, in British Columbia this species is at the edge of its range making it potentially more vulnerable to climatic shifts. Introduced predators and other gastropod competitors are also a threat to this species. Trampling could also be a significant threat where this species occurs near heavily used trails.

Data Gaps There is a general lack of knowledge about this species. Select topics requiring further study are included below:

- the minimum size of viable habitat patches is unknown making it difficult to assess habitat suitability,
- the extent of Dromedary jumping slug distribution and detailed habitat requirements within PRNPR are not well known,
- the effects of introduced gastropods are largely unknown.

Management Considerations Dromedary jumping slugs have been found at four locations within PRNPR. This species is difficult to find due to secretive habits and low population densities; there is a good possibility that they are more widely distributed within the park. Further surveys coupled with GIS analysis have been recommended to more accurately determine the distribution and habitat associations of Dromedary jumping slugs within PRNPR.

PRNPR appears to support a large portion of the Canadian Dromedary jumping slug population and may be a stronghold for Dromedary jumping slugs as logging continues to destroy nearby habitat. Known and new occurrences of these slugs within PRNPR should be assessed for threats and managed appropriately. Introduced gastropods are are present within PRNPR, their effects are largely unknown and should be assessed.

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2.6 Mammalia (Mammals)

2.6.1 *Cervus elaphus roosevelti* (Roosevelt elk)

Taxonomic Group Cervidae (moose, elk, caribou, deer)

Species Presence This species is present in the area surrounding PRNPR, but it has only a transient occurrence within the park.

Status **NatureServe**: G5T4; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2S3 & BLUE; **PRNPR**: PNA

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*.

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Management Considerations Hatler *et al* (1972) concluded that elk may have existed in both the Long Beach and West Coast Trail units of PRNPR and that occasional wandering individuals might show up; however the situation has now changed somewhat as Roosevelt elk definitely have a transient presence in some areas of the park (B. Campbell pers. comm.). In the Long Beach unit: employees of the Tofino airport Golf Course reported an elk about 2000-02, and a large ungulate track, felt to to be from an elk, was seen near the south end of Grice bay ("the fingers of the Bay angling down to just behind Long Beach") by Barry Campbell (pers. comm.) and Park Warden Peter Clarkson. In the West Coast Trail unit: Barry Campbell (pers. comm.) has found lots of elk droppings and very fresh tracks during the winter on Park land in the delta between the San Juan and Gordon Rivers by Port Renfrew. A group of elk has been transplanted to the lower Klanawa River; there is no information on whether they have been seen on park land in the area, but the park is only about 1 kilometre wide at the mouth of the Klanawa—most of the watershed is outside the park.

This species currently has a transient presence in specific areas of PRNPR. Sightings should be investigated and recorded to monitor elk usage of PRNPR and determine if there is a more extensive or regular occurrence of this species.

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2.6.2 *Enhydra lutris* (Sea otter)

Taxonomic Group Mustelidae (weasels, badgers, skunks, otters, wolverines, and relatives).

Species Presence Sea otters currently occur transiently in PRNPR. They are a year-round breeding occurrence nearby and their range is expanding; they will very likely be a year-round breeding resident of PRNPR in the future.

Status **NatureServe**: G4; **COSEWIC**: Threatened, Last examination/Change: May 2000 (No Change); **SARA**: Schedule 1; **BC**: S2 & RED; **PRNPR**: PNA

Status of recovery/protection The Sea otter is protected under the *Species At Risk Act*. The Sea Otter Recovery Team is working on this species; the recovery strategy is written and the action plan is in final draft. The Department of Fisheries and Oceans is the lead jurisdiction for this species; Parks Canada Agency is participating.

In 1911 Sea otters were protected under the *International Fur Seal Treaty* signed by the United States, Russia, Japan, and Great Britain (for Canada). The *Fisheries Act* and British Columbia's *Wildlife Act* also protect the Sea otter.

The fur trade extirpated Sea otters from British Columbia by 1929. They have since been successfully reintroduced; their population and range are currently expanding.

Description One of the smallest marine mammals, Sea otter males typically reach 150 centimetres in length and weigh 45 kilograms; females are slightly smaller. Their dense soft fur varies among rust, dark brown, and black; it is lighter on the head, throat, and chest. They have a short stout tail and a large flat head with big teeth, a blunt nose, long whiskers, black eyes, and very small ears.

Mating and birthing occurs year-round but peaks in the fall and spring, respectively. Males are polygynous. Gestation takes 6–8 months and includes a period of delayed implantation. Births are usually in water and the single pup (twins are rare) is generally dependent for 6 months. Pup mortality varies among populations; it was found to be at least 40 percent in southern populations, but only 15–25 percent in Alaska. Females become sexually mature at 3–5 years old while males mature at 5–6 years of age; Sea otters remain reproductive until death. Females otters generally live for 15–20 years while males live for 10–15 years. During their lifespan females produce slightly less than one pup per year.

Sea otters live in groups (rafts) segregated by age and sex; male and female rafts are located in different areas. Otters feed on shellfish (including Northern abalone) and fish (in Alaska); seasonal food sources are often exploited. They consume food at the surface and regularly lie on their backs to eat off of their bellies. Rocks or other hard objects are used to crack open shelled prey. Bald eagles, sharks, Killer whales, and humans prey upon otters.

Habitat Sea otters are predominantly marine; however, they have been known to leave the water at low tide to feed on exposed invertebrates. They are generally found within 1–2 kilometres of land on shallow exposed coasts. They can be found farther than 2 kilometres from land in shallow areas or during calm periods, but they shelter close to shore in stormy weather. Sea otter foraging depth varies among populations, but is generally less than 30 metres. They appear to prefer kelp beds and high relief rocky bottoms; however, soft bottoms providing clams are also important. Habitat is not limiting.

PRNPR contains potential Sea otter habitat.

Distribution Sea otters were formerly distributed around the Pacific Rim from northern Japan to Baja, California. Decimated during the 18^{th} and 19^{th} century fur trade, Sea otter populations have recovered to the point where they occupy approximately half their former range. Today they can be found eastward from the Kamchatka peninsula and Kuril archipelago through the Aleutian archipelago to the northern Gulf of Alaska; populations are also scattered along the west coast of North America in parts of southeast Alaska, British Columbia, Washington, and California.

Current Sea otter ranges[19] lie to the north and the south of PRNPR. In British Columbia, Sea otters inhabit the northwestern coast of Vancouver Island (from Hesquiat Harbour northwest to Cape Scott and east to Hope Island) and a small portion of the central mainland coast (from the Goose Islands Group to the edge of Milbanke Sound). The Sea otter range in nearby Washington State is from Destruction Island north to Cape Flattery then east to to Pillar Point. It should be noted that Sea otters, especially males, move seasonally within and beyond the defined range.

Due to movements beyond their defined range Sea otter sightings within PRNPR should be expected and have been reported since the early 1970s, with increasing frequency in the past 10–15 years (B. Campbell pers. comm.)[20]. These sightings have occurred in all PRNPR units: Florencia Bay (Long Beach unit), Trevor Channel, Peacock Channel, Sargisson Bank, Great Bear Rock (in or near the Broken Group unit), Michigan Creek, Flat Rocks, Valencia Cliffs, Tsuquadra (West Coast Trail unit). Sightings have generally been of lone animals, probably males which are known to regularly move beyond the core range. The number of sightings in the park is still low, probably less than 10 animals per year (B. Campbell pers. comm.).

While PRNPR is not currently part of the defined Sea otter range, the Sea otter population and range has been expanding. In recent years increasing numbers of Sea otters, including winter rafts, have been reported off Flores Island (Rafael Point–Cow Bay). Up to sixty otters have been counted in this area by commercial tour guides (B. Campbell pers. comm.). Only about 35 kilometres lie between Cow Bay and the northwest end of PRNPR (Long Beach unit).

[19]The Sea otter range is defined as the area where Sea otters are regularly seen during the survey months of May to September.

[20]Campbell also indicates that many, but certainly not all of these Sea otter sightings may actually be sightings of River otter in the marine environment.

Population sizes and trends Prior to over-exploitation by the fur trade the Sea otter population is estimated to have been 150,000–300,000 individuals. Less than 2,000 individuals survived the fur trade. While many populations declined to extinction, some recovered and still others were recovered through reintroductions in the late 1960s and early 1970s. Recently the world population was estimated to be 126,000; however, current declines in southwest Alaska have reduced this number. A rough estimate of the world population is now 98,000 [3]. The expanding British Columbia population consists of approximately 2,500 otters: 500 off the central mainland coast, and 2,000 along the west coast of Vancouver Island.

Threats and limiting factors There are a number of threats to the continued health of Sea otter populations [2, 3, 5]. Oil spills are probably the largest risk factor; Sea otters form large single sex groups that make it possible for even a relatively small oil spill to kill hundreds of otters—an especially tragic event if it oiled a female raft. Sea otters also have low genetic diversity due to the drastic reduction in numbers during the fur trade; this lack of genetic diversity makes the species more vulnerable to environmental changes such as climate shifts. Other threats include predation—Killer whales in Alaska may be switching to Sea otters as their normal prey declines—disease, bio-toxins, pollution, entanglement in fishing gear, human disturbance, and illegal killing[21].

Management Considerations While Sea otters are not resident within PRNPR, their range in British Columbia and Washington is close to the park and further sightings should be expected within PRNPR. The Sea otter population is expanding and it should be expected that the population will expand into PRNPR; however, it is uncertain when Sea otters will establish themselves in PRNPR. For the moment sightings are most likely to be transient males.

Parks Canada Agency is involved as a lead or cooperator with a number of the recovery activities defined in the action plan:

- research (oil spill risk model, impact from oil and gas exploration);
- communications (communication with coastal Tribal Councils, First Nations & communities outside current sea otter range; education of eco-tourism, public (sea otter watching guidelines); general public education);
- protection (minimize disturbance in important areas or habitats);
- population assessment (surveys).

Sea otter sightings in the area should be monitored and investigated; appropriate management actions should be taken to protect any group of Sea otters that takes up residence in PRNPR. It should also be noted that the expansion of Sea otters populations into PRNPR will have an impact on local invertebrates including the threatened Northern abalone. Habitat assessments

[21] "One dead sea otter washed ashore at Chesterman Beach (in District of Tofi no immediately north-west of the park) in Sept 2004. The specimen was examined; x-rays revealed many shotgun pellets in the carcass." (B. Campbell pers. comm.).

within PRNPR could be used to identify likely Sea otter habitat; this would help increase the efficiency of monitoring, enable an estimate of the Sea otter population size PRNPR is able to support, and help to assess the potential impact on abalone.

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2.6.3 *Eschrichtius robustus* (Grey whale)

Taxonomic Group Cetacea (whales and dolphins)

Species Presence Non-breeding summer resident whales occur along the entire coast of Vancouver Island; a number of these whales feed in PRNPR.

Status **NatureServe**: G4; **COSEWIC**: Special Concern, Last examination/Change: May 2004 (In a higher risk category); **SARA**: Not yet on a schedule; **BC**: S2N & BLUE; **PRNPR**: P2N

Status of recovery/protection The Grey whale must be added to schedule one before it is protected under the *Species at Risk Act*; the Department of Fisheries and Oceans Canada (DFO) is currently conducting consultations regarding the addition of this species to schedule one.

Grey whales are legally protected under a variety of statutes in Canada, Mexico, and the United States. In Canada they are protected under the *Fisheries Act* (*Marine Mammal Regulations*) and DFO has developed whale watching guidelines.

Grey Whales were almost hunted to extinction have made a remarkable recovery after they were protected.

Description Grey whales are medium sized baleen whales. Adult females are generally 11.7–15.2 metres in length, while adult males are generally 11.1–14.3 metres long. Their skin is a mottled dark to light grey and individuals often bear patches of whale lice, as well as barnacles or barnacle scars. The jaws contain 130–180 cream to pale yellow baleen plates, each 5–20 centimetres long. Grey whales are the only large whale in which the upper jaw extends past the lower jaw. Along the throat are 2–4 grooves which allow it to expand during feeding. Grey whales sport a low hump and seven to fifteen knobs instead of a dorsal fin.

Grey whales migrate between southern birthing grounds and northern feeding grounds; while sexual activity has been observed year round, most calves are conceived between late November and early December during the southbound migration. Conception is followed by a 13–14 month gestation of a single fetus; individual females are generally seen with calf every other year. Grey whales arrive on the birthing grounds from December to January and the median time of birth is late January. Calving is mostly confined to breeding lagoons in Mexico; however, occasionally a calf is born off the coast of California. Calves stay with their mother on her northward migration, suckle for 6 months and grow rapidly from a birth length of 4.6 metres to 7.0 metres; they are weaned on the northern feeding grounds. Growth then slows and yearlings reach ~8.0 metres; Grey whales continue to grow until they are ~40 years old. Both males and females reach sexual maturity at about 8 years old.

Recent studies indicate that Grey whales are opportunistic feeders rather than obligate benthic feeders as previously thought. On the Arctic feeding grounds Grey whales feed on benthic amphipods by sucking sediment into their mouth and straining the slurry of sediment

and small animals through their baleen plates. Little feeding has been observed on the winter birthing grounds, but when it has been observed amphipods and crab larvae have been the primary prey. Those individuals which spend the summer along the west coast of North America have a more varied diet including benthic prey (amphipods, ghost shrimp, and associated small clams), planktonic invertebrates (mysid shrimps and planktonic crab larva), and herring spawn and larvae.

Habitat Grey whales are migratory and require different winter and summer habitat. During migration Grey whales generally remain within a few kilometres of shore and many have been observed feeding inshore. Winter habitat consists primarily of four shallow subtropical lagoons along the coast of Baja California, Mexico where females give birth. For most Grey whales summer habitat is located in the Arctic where they are are benthic feeders and require shallow soft bottom habitats; however a small group of Grey whales spend the summer along the coast of N. America.

Grey whales spending the summer along the coast of N. America use most near-shore habitats (mud, sand, and rock) and have been observed foraging for ghost shrimp in sheltered water with a muddy bottom <3 metres deep, for amphipods in exposed bays with a sandy bottom <35 metres deep, and for herring larva and eggs in Eelgrass beds. Additionally, these whales are frequently seen in water <30 metres deep with a rock or boulder bottom. These N. American summer-resident whales have high site fidelity.

PRNPR contains foraging habitat for Grey whales.

Distribution Grey whales are only found in the northern hemisphere. There are two separate populations: a small western Pacific population and a much larger eastern Pacific population. The eastern population is the only group found in Canada and they range from their wintering grounds in Baja California, Mexico north along the west coast of N. America to summer feeding grounds in the Bering, Chukchi and Beaufort seas—a small number spend the summer in temperate near-shore water from northern California to southeastern Alaska.

During the northbound migration (from late February to mid May) Grey whales generally arrive in British Columbia west of Carmanah Point, Vancouver Island and move up the west coast of the island to Cape Scott. For some the migration stops here; the presence of summer-residents along the entire west coast of Vancouver Island is well documented. Most others continue across Queen Charlotte Charlotte Sound, along either the east or west coast of the Queen Charlotte Islands, across Dixon Entrance and out of Canadian waters. The southbound migration occurs between early December and early January.

Grey whales have been sighted throughout PRNPR and a number of areas within the park are recognized as Grey whale feeding areas (Figures 2.5, 2.6, and 2.7; Table 2.1).

Population sizes and trends In 2002 the Pacific Grey whale population was estimated to be 17,414 individuals; this represents an decline from 1998 when the population was estimated to be 26,635[22][1].

[22]The COSEWIC report states that it is unclear if all whales made the 2002 southward migration and that because Grey whales are counted during their migration, if a number of animals did not make the full southern migration in 2002 then 17,414 individuals would be an underestimate of the true population size.

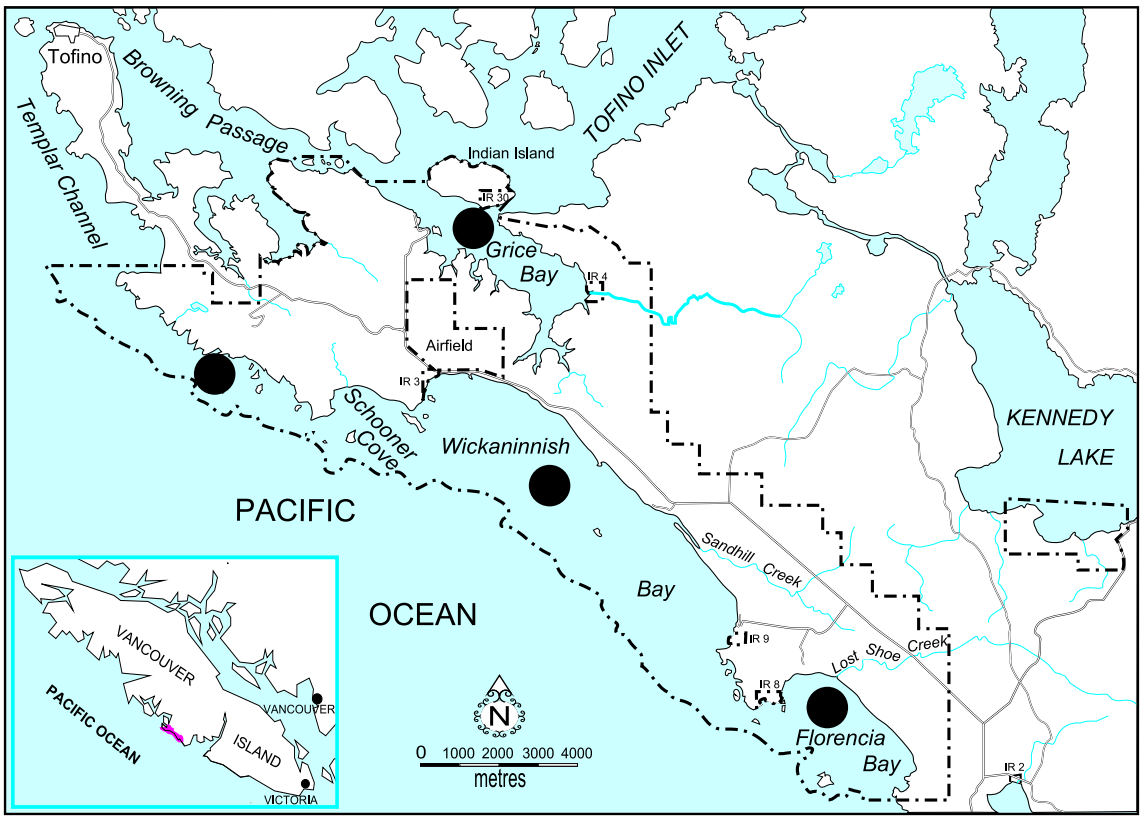

Figure 2.5: Grey Whale (*Eschrichtius robustus*) feeding areas in the Long Beach unit of Pacific Rim National Park Reserve (BC CDC 2004).

Table 2.1: Grey whale (*Eschrichtius robustus*) element occurrences in Pacific Rim National Park Reserve, coordinates are for the approximate centre of the element occurrences (BC CDC 2004).

CDC Feature ID	Park Unit	Coordinates
4344	Long Beach	49° 6’ 30" N, 125° 46’ 10" W
4356	Long Beach	48° 59’ 41" N, 125° 38’ 24" W
4358	Long Beach	49° 2’ 47" N, 125° 44’ 19" W
4340	Long Beach	49° 4’ 29" N, 125° 51’ 23" W
4354	Broken Group	48° 51’ 55" N, 125° 22’ 27" W
4334	West Coast Trail	48° 47’ 21" N, 125° 7’ 31" W
4336	West Coast Trail	48° 47’ 15" N, 125° 13’ 14" W
11423	West Coast Trail	48° 41’ 25" N, 124° 55’ 37" W
11426[a]	West Coast Trail	48° 43’ 11" N, 125° 5’ 52" W 48° 45’ 8" N, 125° 8’ 5" W

[a]This element is composed of two separate circles the two coordinates are for the centre of each circle. Each circle in this element is mapped as a separate dot in Figure 2.7.

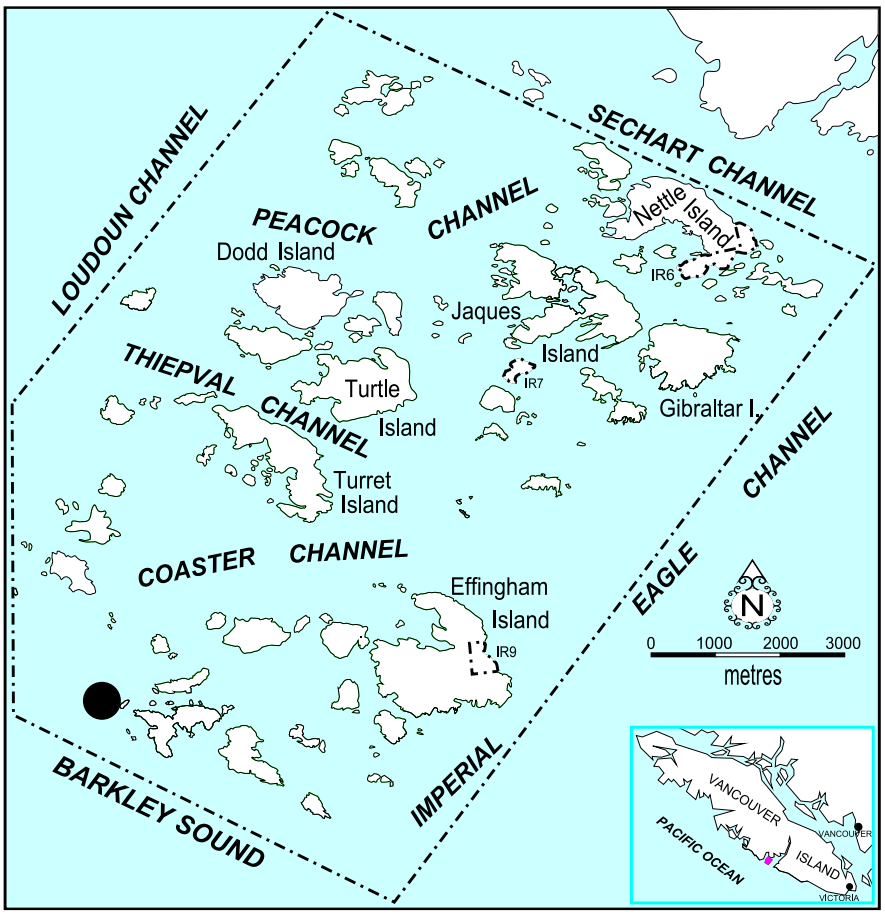

Figure 2.6: Grey Whale (*Eschrichtius robustus*) feeding areas in the Broken Group Island unit of Pacific Rim National Park Reserve (BC CDC 2004).

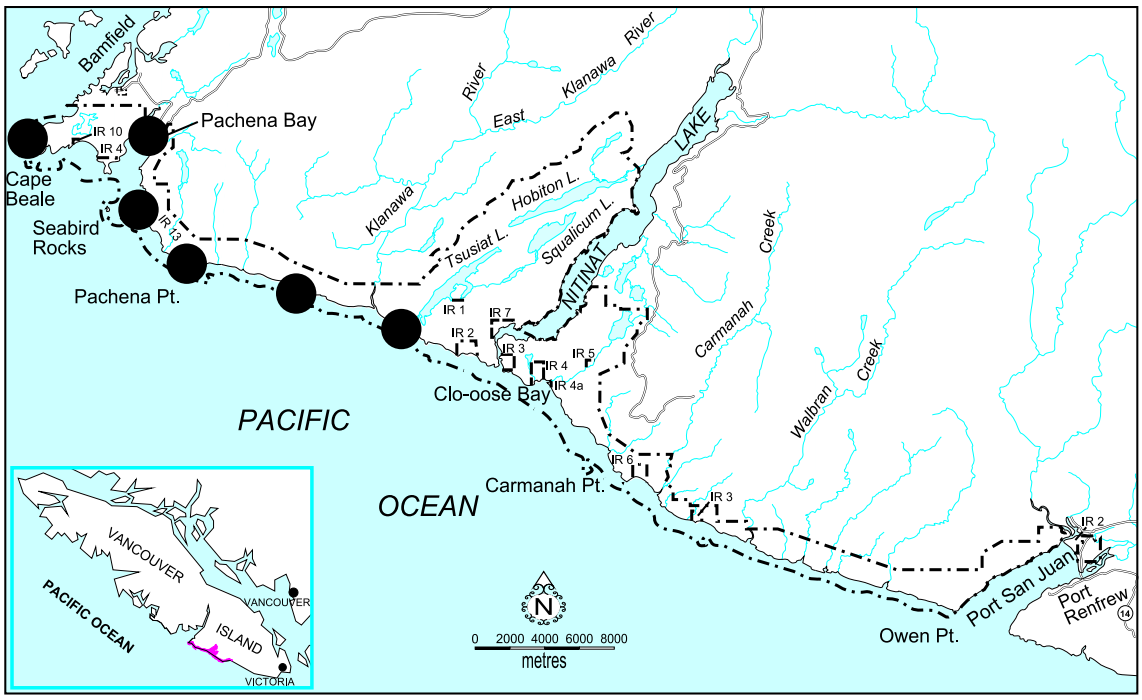

Figure 2.7: Grey Whale (*Eschrichtius robustus*) feeding areas in the West Coast Trail unit of Pacific Rim National Park Reserve (BC CDC 2004).

The recent population decline is a result of a drastic change in population parameters. During 1998–1999 there was a two to three fold increase in mortality and calf production dropped significantly. Mortality was also high in 2000. The cause of these changes was likely a shortened feeding period resulting from a shorter ice free period in the Bearing Sea in 1998–1999 [1]. Mortality and calf production have since returned to normal.

The summer-resident community from northern California to southeast Alaska is estimated to be 179 individuals based on 1987 and 1998 data. In 2004 there may have been approximately 100 individual Grey whales between Port Renfrew (south end West Coast Trail unit) and Flores Island (Clayoquot Sound): 60–70 off the West Coast Trail and others in Barkley Sound and off the Long Beach unit (B. Campbell pers. comm. with Wendy Szaniszlo, quoting whale researcher Jim Darling); this represents an increase from the early to mid 1980s when 35-50 summer-resident Grey whales were estimated along the entire coast of Vancouver Island.

Threats and limiting factors Threats and limiting factors include habitat degradation (noise pollution, toxins, natural or anthropogenic changes in food availability, and disturbance) and direct kills (hunting, boat collisions, and entanglement), these are reviewed in the COSEWIC report [1]; the largest threat is from human activity in the breeding lagoons. Hunting deserves special note because while current takes are low and of little significance to the population as a whole, high site fidelity may make it relatively easy to cause extinctions of local feeding aggregations.

Whale watching is increasing and may pose a threat to local feeding aggregations. The largest number of tour vessels on the west coast of Vancouver Island operate out of Tofino and Ucluelet, smaller but significant numbers operate out of Bamfield and Port Renfrew (B. Campbell pers. comm.). Most of these tours run during the summer and thus target summer-resident whales in and around PRNPR.

A further limiting factor may be the carrying capacity of the habitat as Grey whales reach pre-exploitation population levels.

Data Gaps

- Data on individual whale use of PRNPR appears to be lacking.

Management Considerations Eleven Grey whale feeding areas recognized by the British Columbia Conservation Data Centre are distributed throughout PRNPR (Table 2.1; Figures 2.5, 2.6, and 2.7). Grey whales are present in the park for at least the period of April to October (B. Campbell pers. comm.). It should be noted that distribution of whales and feeding areas are likely to change over time due to changes in prey availability—these animals remove a huge amount of biomass from the local ecosystem; for example Grice Bay has not been use in the last 10 years (B. Campbell pers. comm.).

Two distinct groups of Grey whales are present within PRNPR: Those which pass through the area during their migration along the coast to summer feeding grounds in the Arctic and those which are present along west coast of Vancouver Island throughout the summer. Approximately 100 Grey whales are present between Port Renfrew and Flores Island during the summer, mostly off West Coast Trail (60–70 individuals in 2004).

Grey whales exhibit a high degree of site fidelity—individuals tend to return to the same feeding sites year after year; thus, PRNPR may be extremely important to those individuals which use it. A further result of high site fidelity is that summer resident whales off the coast of N. America could be locally extirpated; summer residents in this area may need to be managed separately from those in the Arctic. To this end Vancouver Island summer-resident Grey whales using PRNPR should be identified and their use of the park should be monitored to determine and deal with potential threats to these individuals.

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2.6.4 *Eumetopias jubatus* (Steller sea lion)

Other Names Northern sea lion
Taxonomic Group Otariidae (eared seals: sea lions and fur seals)
Species Presence A number of year-round and seasonal haulouts are located in PRNPR; however there are currently no rookeries in the park[a].
Status **NatureServe**: G3; **COSEWIC**: Special Concern, Last examination/Change: November 2003 (In a higher risk category); **SARA**: Not yet on a schedule; **BC**: S2B,S3N & RED; **PRNPR**: P2N

[a] A few pups have been observed during the breeding season at a haulout in PRNPR; these pups could indicate that limited breeding occurs within the park, or that the haulout is turning into a rookery, but breeding has not been observed.

Status of recovery/protection This species must be added to schedule one before it gains the protection of the *Species at Risk Act*; consultations occurred in fall 2004. Sea lions have been protected since 1970 by regulations enacted under the *Fisheries Act*. A rookery at Cape St. James is protected by *The National Parks Act*, the Scott Islands rookeries are part of a British Columbia Ecological Reserve.

Description Steller sea lions are the largest member of the Otariidae family and exhibit sexual dimorphism. Males have a more robust head with a flatter snout than females, but the real difference is size; females are generally 2.1–2.4 metres long and weigh 200–300 kilograms, while males are 2.70–3.1 metres long and average 400-800 kilograms—males can weigh up to 1,100 kilograms prior to the breeding season. Pups weigh 16–23 kilograms at birth.

Pelage is short, coarse, pale yellow to light tan, and darkens to chocolate brown on the underside and near the flippers; mature males have a mane of this hair on their neck and chest. When wet their pelage is greyish white in colour. Pelage is moulted annually from late June (non-reproductive females) to early December (other age classes). Newborn pups bear a thick, blackish brown lanugo which is moulted between 3–6 months of age. Sea lion flippers are black with no hair and unlike the true seals members of the Otariidae family can rotate their rear flippers forward and use them in conjunction with their front flippers to aid in locomotion on land.

A small variety of vocalizations have been heard from Steller sea lions. Adults make deep-throated bellows and roars, territorial males wheeze and make a loud guttural sound in both air and water, while newborns may bleat like sheep.

This species is polygynous and reproduction appears synchronized throughout their range. Sexually mature adults—and any dependant pups—return to traditional rookeries in May.

Males arrive in early May to compete for territory with other males; dominant males will hold their territory for 20–68 days without food. Females exhibit high site fidelity and arrive at their island of birth in the later half of May. The ratio of cows to bulls at rookeries is about 10–15:1. Females give birth to a single pup within a few days of arrival at the rookery (pups are born throughout late May to early July). Females stay with their newborn pups for approximately 1 week after birth; copulations between adult males and females usually occur during this time. Most females conceive each year, but there appears to be a high rate of reproductive failure and abortion. Fertilization is followed by a 3 month period of delayed implantation and the subsequent gestation lasts 8–9 months.

Pups may stay with their mother for up to three years. After their pups are 1 week old females go on regular feeding trips lasting 1 day followed by 1 day on shore. At 4 weeks pups can can swim in open ocean and their mothers move them to nearby haulouts—few animals remain at rookeries by the end of august. While most pups wean prior to 1 year, females do occasionally suckle two pups at rookeries. Females mature sexually at 3–6 years of age. Males are sexually mature by 3–7 years old, but only territory holders mate; most territory holders are 9–13 years old and they will hold a territory sequentially for 1–7 years. The oldest aged wild individuals are an 18 year old male and a 30 year old female.

Sea lions are opportunistic feeders and prey on a wide variety of animals including schooling fish, bottom fish, sometimes squid and octopus, and occasionally birds and other mammals. Their favorite prey appears to be small- to medium-sized schooling fish; in British Columbia these include species such as herring, hake, sand lance, salmon, dogfish, eulachon and sardines.

Habitat Sea lions utilize both terrestrial and ocean habitats; while there is much information concerning terrestrial habitat, little is known about their use of aquatic habitat.

Terrestrial habitat includes rookeries, year-round haulouts, and winter haulouts. Rookeries are located in remote areas of high current and salinity, low surface temperatures, and shallow waters; they include some of the most barren and isolated rock outcrops in the North Pacific. They are flat, accessible, have no terrestrial predators, and provide protection from swell and waves; sea lions use protected areas during storms and wet areas during hot days. In British Columbia rookeries are generally rocky ledges (use of gravel beaches has recently been reported). Year-round haulouts include rocky islets and ledges in exposed areas on the outer coast. Winter haulouts are in protected areas on natural- or man-made substrate and include log-booms, floats, jetties, and docks. Winter haulouts in southern British Columbia are often shared with adult- and sub-adult male California sea lions. Sea lions will also rest together in the water, forming rafts when haulouts are awash or there is no suitable haulout near a prey source.

Aquatic habitat is poorly understood. Sea lions generally stay within 60 kilometres of land and in less than 300 metres of water; however, they are also known to go several hundred kilometres offshore and appear to feed over the continental shelf and along the shelf break. They occasionally use fresh water and have been seen in the lower Fraser River during the spring eulachon run, occasional rafts are seen to 35 kilometres up river. Sea lions are also known to use estuaries in in autumn to feed on pre-spawning salmon.

PRNPR protects a variety of terrestrial and marine habitat suitable for sea lions.

Table 2.2: Steller sea lion (*Eumetopias jubatus*) haulouts in Pacific Rim National Park Reserve (BC CDC 2004).

Park Unit[a]	Locality (BC CDC Feature ID)	Coordinates[b]	Type of use
LB	Sea Lion Rocks (11480)[c]	49° 2' 0" N, 125° 42' 53" W 49° 2' 6" N, 125° 43' 17" W 49° 2' 19" N, 125° 43' 13" W	year-round haulout and potential occasional breeding site
BG	West of Wouver Island (11503)[d]	48° 51' 36" N, 125° 22' 16" W	winter haulout
BG	North of Wouver Island (11503)[d]	48° 51' 53" N, 125° 21' 42" W	winter haulout
BG	South Bately Island (11503)[d]	48° 52' 3" N, 125° 21' 28" W	winter haulout
WCT	Carmanah Point (4382)	48° 36' 53" N, 124° 45' 40" W	year-round haulout
WCT	Flat Rocks, Pachena Point (4392)	48° 43' 29" N, 125° 6' 23" W	winter haulout

[a]Long Beach (LB) Broken Group (BG) West Coast Trail (WCT)

[b]Coordinates are for the approximate centre of polygons mapped by the BC CDC.

[c]The BC CDC maps the Sea Lion Rocks element occurrence as three nearby polygons, hence three different coordinates.

[d]The BC CDC records these three nearby sites as one element occurrence, hence the same feature ID. The primary site is west of Wouver Island; secondary sites are North Wouver Island and Bately Island.

Distribution Steller sea lions inhabit the North Pacific Ocean from Channel Islands off southern California north to the Bering Strait and south along the Asian coast to Hokkaido, Japan. Within this range sea lions disperse widely, but aggregate at 55–60 rookeries for breeding. Based on mitochondrial DNA, Steller sea lions are divided into a western population (Gulf of Alaska to Russia) and a eastern population (California to southeast Alaska).

Only members of the eastern population occur in British Columbia where there are three main breeding areas: Scott Islands, northwest tip of Vancouver Island, rookeries on Triangle, Beresford and Maggot Islands; Cape St. James, off the southern tip of the Queen Charlotte Islands, rookeries on Kerouard Islands; and Banks Island, on the northern mainland coast, rookeries on North Danger Rocks[23]. Twenty-one year-round haulout sites area located in British Columbia, mainly on the outer coast. Numerous winter seasonal or irregularly used sites are located throughout British Columbia.

PRNPR contains winter and year-round haulout sites distributed throughout all park units (Figures 2.8, 2.9, and 2.10; Table 2.2). Numbers at Sea Lion Rocks (Long Beach unit) peak in late spring/early summer and diminish to a minimum in September. A small number of pups have been observed at Sea Lion Rocks including 2 in 2004 (B. Campbell pers. comm.); these may be isolated incidents or could indicate the transition of Sea Lion Rocks to a Rook-

[23]A fourth rookery on the Sea Otter Group off the central mainland coast was extirpated through intense predator control during the early to mid 1900s. This site is still used as a haulout.

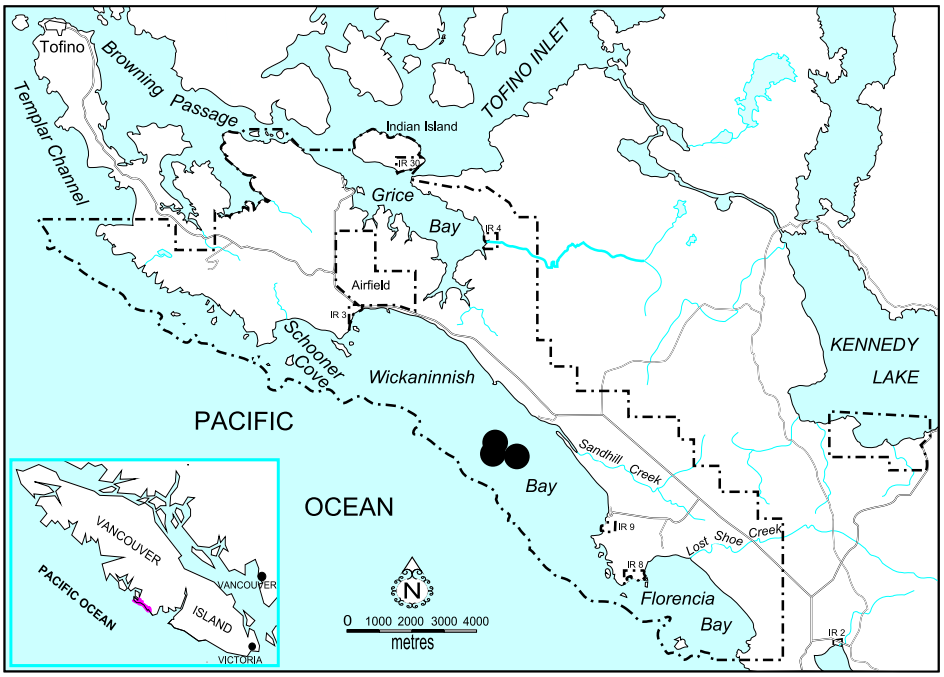

Figure 2.8: Steller sea lion (*Eumetopias jubatus*) localities (black circles) in Pacific Rim National Park Reserve, Long Beach unit (BC CDC 2004).

ery. The winter haulout on Wouwer Island (Broken Group unit) is located on the north shore and occupied from late September through late March by a mix of Steller and California sea lions. Sea lions on Wouwer Island use rock shelves, beaches, and even forested environments (up to 20 metres inland from the intertidal zone). All of the BC CDC element occurrences have an estimated viability of fair, except for the occurrence at Flat Rocks, Pachena Point which has an estimated viability of poor.

Population sizes and trends Steller sea lions are currently divided into two populations: the western pacific population (Gulf of Alaska to Russia) with 50,000 individuals and the eastern pacific population (California to southeast Alaska) with 45,000 individuals [1]. The western population has declined drastically from roughly 225,000–270,000 individuals in the 1950s and 1970s; the cause is generally accepted to be a lack of food related to large scale changes in species abundance within the Bearing Sea ecosystem. In contrast, Eastern stocks have increased from roughly 25,000–30,000 individuals in the 1950s–1970s. Only members of the eastern population occur in British Columbia.

Steller sea lions in PRNPR have been counted by various organizations in various years (including Department of Fisheries and Oceans, park staff, and Strawberry Island Research); however, there appears to have been no study to assemble count data and determine trends in PRNPR (B. Campbell pers. comm.). Sea lion use of the park appears to be increasing with less than 400 sea lions counted (all haulouts combined) in the park during 1971 and roughly 1,000 counted during 2002 [1]; similar numbers may have used the park in 2004 (B. Campbell pers. comm).

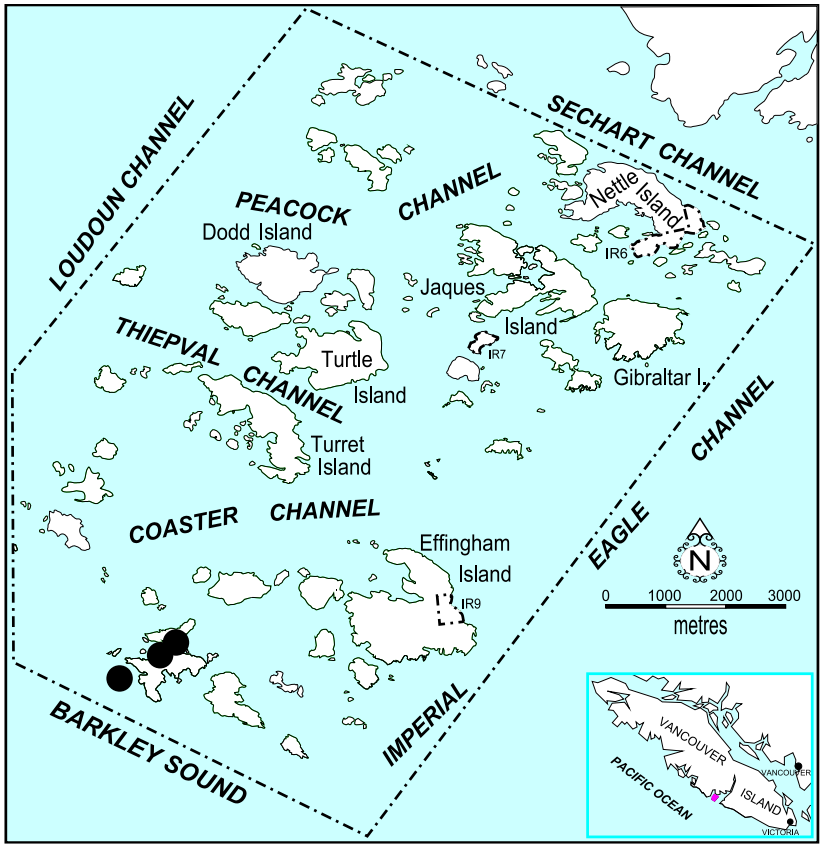

Figure 2.9: Steller sea lion (*Eumetopias jubatus*) localities (black circles) in Pacific Rim National Park Reserve, Broken Group unit (BC CDC 2004).

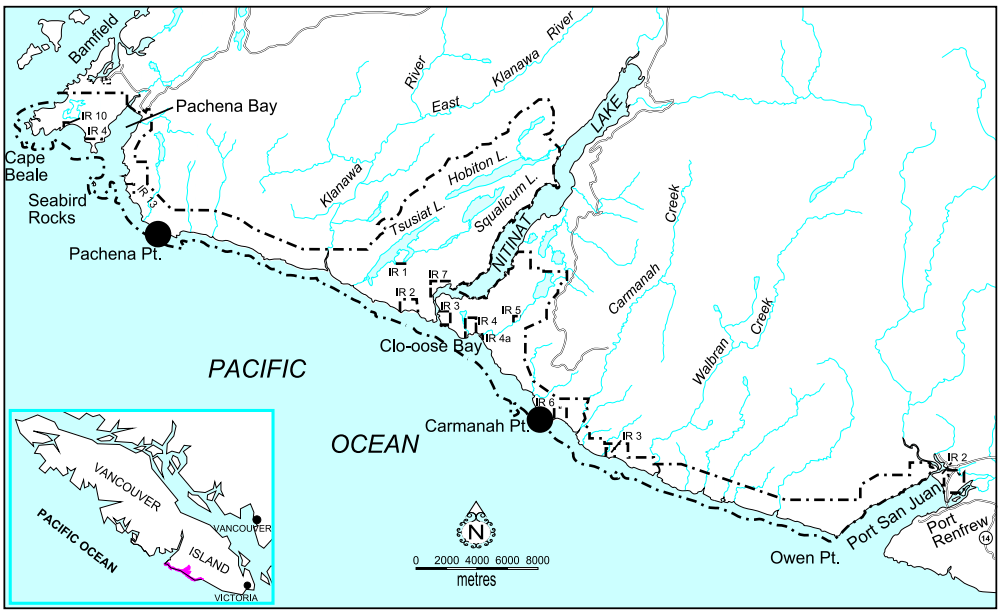

Figure 2.10: Steller sea lion (*Eumetopias jubatus*) localities (black circles) in Pacific Rim National Park Reserve, West Coast Trail unit (BC CDC 2004).

Threats and limiting factors A number of threats and limiting factors are reviewed by COSEWIC [1]: shooting (legal and illegal), incidental takes, entanglement, catastrophic accidents (oil and chemical spills), habitat degradation (disturbance, toxins, environmental contaminants, natural and anthropogenic changes in prey populations), predation by killer whales, and disease. The largest (and increasing) threat in British Columbia appears to be lethal predator control at a growing number of fish farms.

Of particular concern in PRNPR is disturbance. While sea lions often habituate to disturbances and some haulout sites are located in high traffic areas, hauled-out sea lions will go into the water if closely approached by humans, boats, or aircraft and repeated disturbances may lead to permanent abandonment of haulouts. Park wardens have many reports of commercial fishermen harassing hauled out sea lions and in most years visitors, park staff, or lighthouse staff record and report incidents of someone on a vessel shooting at hauled out sea lions; probably 10–20 dead sea lions wash onto PRNPR beaches each year, many with puncture wounds that could be attributed to bullets (B. Campbell pers. comm.).

Data Gaps

- While Steller sea lion populations are regularly censused by a number of organizations, there appear to be no compilation of this data for PRNPR.
- While pups have been observed on Sea lion rocks is is not clear if breeding actually occurs there.

Management Considerations Steller sea lions are present at winter and year-round haulouts within PRNPR; limited birthing has even been observed at Sea Lion Rocks in the Long Beach

unit (B. Campbell pers. comm.). While there are currently no rookeries within PRNPR breeding does occur both north and south of PRNPR and some year-round haulouts in Alaska have recently become rookeries. There is a possibility that the limited birthing observed at Sea Lion Rocks may be the beginning of a new rookery, though this remains to be seen.

Of primary concern for park management is the sensitivity of sea lions to disturbances. There appears to be a documented problem with harassment and shooting of sea lions in the area, but the overall impact is not known. Sea lions may permanently abandon haulouts after repetitive disturbance so important areas such as haulouts or resting areas should be protected to prevent the possibility of abandonment.

In addition to their use of established haulouts Sea lions may go ashore or rest in irregular locations throughout the park. Sea lions are a dynamic species and are not confined to regular haulouts; they tend to follow prey concentrations so there are likely to be transient areas of aggregation within PRNPR. Furthermore, sea lions in British Columbia are part of the increasing eastern sea lion population and the number of haulout sites has been increasing. Steller sea lion use of the park should be monitored and any areas of importance should be appropriately protected.

Overall the Steller sea lion population in the area appears to be growing and not in any immediate danger; however, sea lion use and population trends in the park should be monitored so that any problems which arise can be detected and dealt with in a timely manner.

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2.6.5 *Gulo gulo* (Wolverine)

Taxonomic Group Mustelidae (weasels, badgers, skunks, otters, wolverines, and relatives).
Species Presence Rare transient in PRNPR and the surrounding area; possibly extirpated from Vancouver Island.
Status[a] **NatureServe**: G4T1Q; **COSEWIC**: Special Concern, Last examination/Change: May 2003 (No Change); **SARA**: Not on a schedule; **BC**: SH & RED; **PRNPR**: PH

[a]The COSEWIC rank is for *Gulo gulo* while the NatureServe and BC ranks are for *Gulo gulo vancouverensis* (Vancouver Island subspecies).

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species is not protected by the *Species at Risk Act*, but it is an identified wildlife species in British Columbia.

Management Considerations Wolverines are a wide ranging species found across Eurasia and North America; Wolverines on Vancouver Island have been considered a separate subspecies (*Gulo gulo vancouverensis*, Vancouver Island wolverine), but there is some debate about this classification.

Wolverines have very large home ranges, on the order of hundreds of square kilometres for females and a thousand square kilometres for males. Due its size and shape, PRNPR could not likely contain more than a small portion of a wolverine's home range. Furthermore, PRNPR is a coastal park and wolverines are generally associated with higher elevations.

There have, however, been a few records of wolverines on the west coast of Vancouver Island near PRNPR [3, 5, 6]. Additionally, Park wardens recorded 2 wolverine observations near Radar Hill (Long Beach unit) in the early 1970s, but these records are very vague and may be third hand (B. Campbell pers. comm). Barry Campbell tells that he briefly observed "what he thought was a wolverine on logging roads several kilometers east of the east Long Beach boundary about 1993-95. The animal ran across the road in front of his vehicle. Unfortunately he was unable to find tracks."[24] (B. Campbell pers. comm.).

The Vancouver Island population is currently considered to be very small and possibly extirpated. If a wolverine is sighted within PRNPR the sighting should be investigated; if accurate, such a sighting would confirm that the Vancouver Island wolverine is extant. There is little else that can be done for this species within PRNPR. In the unlikely event that wolverines are discovered to be using a portion of the park consistently then appropriate management should be undertaken to ensure the persistence of such wolverine use.

While it appears unlikely that wolverine were ever very common in PRNPR it should be noted that changes in predator abundance can have a profound effect on ecosystems.

[24]Barry Campbell also states that he has seen wolverine in Banff National Park prior to his sighting on Vancouver Island.

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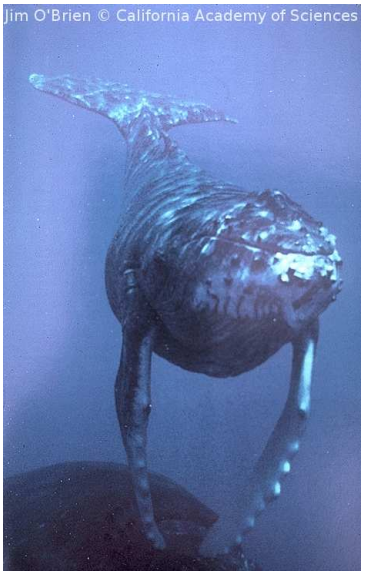
2.6.6 *Megaptera novaeangliae* (Humpback whale)

Taxonomic Group Cetacea (whales and dolphins)
Subgroup North Pacific Population
Species Presence Non-breeding summer resident in the area surrounding PRNPR with at least transient occurrences in the park.
Status **NatureServe**: G3TNR; **COSEWIC**: Threatened, Last examination/Change: May 2003 (No Change); **SARA**: Schedule 1; **BC**: S1N & BLUE ; **PRNPR**: P1N
Status of recovery/protection This species is protected under the *Species at Risk Act*. Humpback whales are also legally protected under a variety of international and national statutes. Internationally both the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* and the International Whaling Commission (IWC) ban trade and regulate harvest of Humpback whales; the IWC currently allows small numbers of Humpbacks to be taken for Aboriginal subsistence purposes. In Canada Humpbacks are protected under the *Fisheries Act* (*Marine Mammals Regulations*) and DFO has developed whale watching guidelines.



The Department of Fisheries and Oceans Canada (DFO) is the responsible jurisdiction for this species.

Humpback whale populations are recovering under current protections.

Description

> "The Humpback Whale is distinguished by long jagged fins, which can measure up to a third of the whale's body length. The whale has a black back and white belly. A small dorsal fin is located near the centre of the back. Deep grooves in the Humpback's throat permit it to open its mouth wide to swallow large amounts of prey at one time. Small bumps are found on the head and neck. Adults measure between 14 and 19 m, and weigh between 34 000 and 45 000 kg. The tail of a male adult measures about 80 cm in width." (Environment Canada, Species at Risk Branch 2004)

These whales are most well known for their long and complex song.

Little is known about humpback whale reproduction. Calving occurs in three areas: south of Japan to the northern Philippines, the Hawaiian Islands, and off the coast of Mexico and central America south to Panama. A single calf is born after an 11–12 month gestation; the calving period is long, from December to April with a peak between January and February. Breeding behaviour (males escorting females and defending access to them from other males) has been observed during the calving period, but mating has not been positively documented. Calves nurse for 1–2 years, most for one year. Some females have been seen with a calf annually, but more common calving intervals are 2–3 years. Females reach sexual

maturity at a mean age of 5 years. The oldest recorded individual is a 48 year old[25] from western Australia, but humpbacks certainly live longer.

Humpbacks use a variety of methods to feed on krill, small fish, and squid; they show a high degree of fidelity to feeding sites.

Habitat Humpback whales are a migratory species and use different habitat for feeding and reproduction. They feed in northern coastal waters and may venture into offshore waters. Summer feeding habitat consists of areas where prey is abundant and preferred areas may change from week to week and year to year as prey concentrations change. Humpbacks breed in southern waters far from British Columbia and PRNPR: south of Japan to the northern Philippines, the Hawaiian Islands, and off the coast of Mexico and central America south to Panama.

Distribution Humpback whales are distributed around the world in tropical temperate and sub-polar waters; they can be found either in southern breeding areas, northern feeding areas or migrating between the two. The following distribution details apply only to the North Pacific population: The three main southern breeding areas are south of Japan to the northern Philippines, the Hawaiian Islands, and off the coast of Mexico and central America south to Panama. Humpbacks feed from California north along the west coast of North America through to the Aleutians and west to Kamchatka peninsula. Individuals show a relatively high degree of fidelity to feeding areas and a number of discrete stocks can be defined accordingly. Two of the three stocks recognized by the U.S. National Marine Fisheries Service are found in British Columbia, the Eastern North Pacific stock extending north to southern British Columbia and the Central North Pacific stock extending from northern British Columbia west to Kodiak Island, Alaska; however, the stock structure in British Columbia is more complex than this and has yet to be clearly defined. The group of whales using British Columbia waters appear to utilize all three of the breeding areas and due to inconsistencies between individual migration times, Humpbacks may be present year-round in our waters. Migration routes between feeding and breeding areas are poorly known.

Humpback whales are now seasonally present in PRNPR (B. Campbell pers. comm.). Inshore Humpback whales were rarely seen prior to the last 10–15 years; only a small number migrated past the park around October and were observed by commercial fishermen at Big Bank (part of LaPerouse Bank, about 25–40 kilometres off Ucluelet). Now, in most years small numbers of Humpback whales are present in the Broken Group Islands park unit (and Clayoquot Sound) for several months between May and September. They also appear periodically off the Long Beach and West Coast Trail units.

Population sizes and trends The pre-exploitation population has been estimated at 15,000 individuals, 90–95 percent were killed by whaling and estimations of the the post-whaling population have been between 1,200—1,400 individuals [1]. The population has been rebuilding under current protections and the most recent (1997) population estimate is 6,000–8,000 individuals [1].

[25]This individual was from a population that had recently been exposed to a considerable period of whaling which likely removed the largest and oldest individuals.

Table 2.3: Humpback whales (*Megaptera novaeangliae*) harvested by Sechart whaling station 1908–1917 (Inglis no date).

Year	1908	1909	1910	1911	1912	1913	1914	1917	Total
Number of Humpbacks harvested	201	334	389	403	224	236	34	48	1,869

There are no estimates or counts of Humpbacks that use only British Columbia waters, but 115 individuals were identified off southern British Columbia and northern Washington between 1990 and 2000 [1]; based on the number of new individuals seen in 2000 the population may not be much larger than this. Off northern British Columbia 500 individuals have been identified between 1989 and 2001 [1].

The historic number of whales in British Columbia was certainly larger that current numbers. At least 5,638 Humpbacks were killed off British Columbia from 1908 to 1967 with the largest catches prior to 1917 [1]; 1,869 were taken from local[26] waters by Sechart whaling station (located in Barkley Sound) prior to its closure in 1917—Humpbacks were the most frequent whale taken by Sechart (Table 2.3; Inglis no date). After 1917 the population in British Columbia declined with a different trend than nearby California and Alaska populations; this indicates that the British Columbia whales were a distinct feeding aggregation which was extirpated [1].

The North Pacific Humpback population has been increasing: an estimated 6 percent annual increase off California between 1988 and 1999 and and annual increase of 7 percent off Hawaii from 1993 to 1998 [1]. Over the last 10–15 years an increasing number of whales have been staying off Vancouver Island during the summer—apparently the formation of a new local feeding aggregation. In 2004 approximately 24 or more Humpbacks spent the summer in Clayoquot sound; during this year lesser numbers were also present in Barkley Sound (Barry Campbell pers. comm. with Wendy Szaniszlo quoting whale researcher Jim Darling). A population census in the vicinity of PRNPR is underway using photo-identification (B. Campbell pers. comm.).

Threats and limiting factors A number of threats and limiting factors are reviewed in the COSEWIC reports [1, 4, 5]. The most important factor to affect Humpback whale populations was direct killing from historic whaling which caused drastic population declines. While some Humpback whale hunting still occurs, it may now be less important than other factors causing direct mortality such as entanglement in fishing gear and ship strikes. Currently the most important threat appears to be disturbance (from a variety of sources) on breeding grounds. Other current threats are reduced prey availability due to human fishing

[26]The Canadian Federal Government required all whales caught in a trip to be killed and processed within 24 hours of the first kill. So the whales processed by Sechart were caught within a relatively small local area including Barkley Sound and approaches (from off Cape Flattery, across the entrance of Juan de Fuca Strait to the West Coast Trail area, up to Cape Beale, then north-west to off Wickaninnish Bay).

activities[27] and disturbance from whale watching.

Data Gaps

- As the return of Humpbacks to inshore British Columbia is a relatively recent event, it is perhaps not surprising that there is little information about the occurrence of this species in PRNPR. Informed management requires more information on a variety of topics including the number of Humpbacks using the park, their distribution (within and outside the park), and habitat associations within the park (especially any areas which are used consistently). Of particular interest is the nature of their occurrence in the park, are they transient or resident: do a relatively small number of individuals return to the park year after year (seasonal resident occurrence) or do a larger number of individuals each use the park irregularly such that there are usually whales in the park but not necessarily the same individuals (seasonal transient occurrence). Some of this missing data may be filled by a current population census in the area.

- The stock structure in British Columbia is not well defined.

- The impact of whale watching on feeding aggregations in the area is not well known.

Management Considerations Humpbacks are present within PRNPR; however the nature of their occurrence is not well defined and more research is needed. It is not clear whether a small number of individuals reside in the park and surrounding area each summer, or if individual whales are only transiently present in PRNPR from year to year. The nature of the Humpback occurrence will impact the importance of the park to these whales as the park would be relatively more important to a small number of resident whales compared to a larger number of transient whales. A humpback whale photo-identification program in PRNPR and the surrounding area will help to clarify this.

Whale watching is a big draw in the area, in Tofino alone 30,000 people go whale watching each year (B. Campbell pers. comm.). Whale watching is known to negatively affect Humpbacks on breeding grounds and the disturbance could have negative effects on feeding grounds as well—preferred habitat could be abandoned if disturbance is high; further research is warranted.

While Humpback whales appear to be in good shape with increasing populations, further study and monitoring is necessary to more clearly understand Humpback use of PRNPR. Humpback whale use of PRNPR should be monitored to detect any areas of importance which require further protection. Monitoring and research will also help detect any potential problems which can then be dealt with appropriately. It should be noted that there is an on-line photographic catalogue of Humpback Whales in British Columbia[28].

[27] For example North Pacific herring are under consideration for listing as *"Threatened"* under the U.S. *Endangered Species Act.*

[28] http://www.pac.dfo-mpo.gc.ca/sci/sa/cetacean/humpbackwhale/default_e.htm

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2.6.7 *Mustela erminea anguinae* (Ermine, anguinae subspecies)

Other Name(s) Vancouver Island Ermine
Taxonomic Group Mustelidae (weasels, badgers, skunks, otters, wolverines, and relatives)
Species Presence This species is secretive and sparsely distributed. There are old records from the area in and around PRNPR; Vancouver Island Ermine may still be present.
Status **NatureServe**: G5T3; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3 & BLUE; **PRNPR**: PH

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*.

Management Considerations This subspecies is endemic to Vancouver Island and there are historical records of this species in and around the Long Beach and West Coast trail units of PRNPR[29] (Hatler 1972, B. Campbell pers. comm.); none of these records are more recent than 20–25 years ago and many are much older. More recently (1992, 1993, and 1994) this subspecies has been recorded in other areas of Vancouver Island [1, 2], (BC CDC 2004). Even though the Short-tailed weasel (*Mustela erminea*) this is the most common weasel in British Columbia—possibly the most abundant land carnivore—it is an uncommon sight because it is mainly active at night in areas with heavy cover [3]; there is the possibility that the Vancouver Island ermine is still present in PRNPR.

There is very little known about this subspecies and further research and inventory is required on a variety of topics including habitat preferences and requirements, prey interactions, distribution, population size, and population trends. Cannings *et al* [2] note the need for inventories specifically aimed at detecting this weasel in order to determine its distribution. Further inventory work for this species is needed in PRNPR to determine if it is still present or if it has been extirpated[30].

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[29] It is interesting to note that some of the Vancouver Island records in Hatler *et al* (1972) mention white weasels while Eder and Pattie [3] indicate that Short-tailed weasels (*Mustela erminea*) do not turn white on Vancouver Island.

[30] It should be noted that changes in predator abundance can have a profound effect on ecosystems.

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2.6.8 *Myotis keenii* (Keen's long-eared bat)

Other names Keen's bat, Keen's Myotis, and Keen's long-eared Myotis
Taxonomic Group Chiroptera (bats)
Species Presence Potential resident
Status **NatureServe**: G2G3; **COSEWIC**: Data Deficient, Last examination/Change: November 2003 (Changed); **SARA**: Not on a schedule; **BC**: S2 & RED; **PRNPR**: Not ranked

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species must be designated as at risk by COSEWIC before it can be added to schedule one and receive protection under the *Specie at Risk Act*. In British Columbia this species is protected under the *Wildlife Act* and is identified wildlife.

Management Considerations Overall there is a general lack of knowledge about Keen's long-eared bats—and other bats in Canada for that matter [4]. Even the taxonomic status of Keen's long-eared bat is unresolved; in the field they are indistinguishable from Western long-eared bats (*M. evotis*) and mtDNA analysis suggests that Keen's and Western long-eared bats may be con-specific[31] [4]. It must be considered that any Western long-eared bats could be Keen's bats and vice versa.

Keen's long-eared bats are restricted to the pacific coast in western Washington, British Columbia, and southeastern Alaska. They have been recorded on Vancouver Island and the adjacent mainland. At least one Keen's long-eared bat has been identified near Simcoe Lake in Clayoquot Sound; however this identification was based on external measurements and western long-eared bats have also been identified in the same area [9, 10]. There is potential for Keen's long-eared bats to occur in PRNPR, but no Keen's long-eared bats have yet been reported from the park. Little bat research has been conducted within the park (B. Campbell pers. comm.).

Bat surveys should be conducted in the PRNPR to determine important areas that require protection such as hibernacula. Hibernating bats are sensitive to winter arousal and any hibernacula should be protected from disturbance.

Bats are generally unpopular with the public and may be susceptible to persecution by park visitors.

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2.6.9 *Orcinus orca* (Killer whale)

Taxonomic Group Cetacea (whales and dolphins)

Subgroup Northern residents
Species Presence Transient in and around PRNPR.
Status **NatureServe**: G4G5T3Q[a]; **COSEWIC**: Threatened, Last examination/Change: November 2001 (Reassigned); **SARA**: Schedule 1; **BC**: S2 & RED[a]; **PRNPR**: P2

Subgroup Southern residents
Species Presence Transient in and around PRNPR.
Status **NatureServe**: G4G5T3Q[a]; **COSEWIC**: Endangered, Last examination/Change: November 2001 (Reassigned); **SARA**: Schedule 1; **BC**: S2 & RED[a]; **PRNPR**: P2

Subgroup Transients
Species Presence Transient in and around PRNPR.
Status **NatureServe**: G4G5T3Q; **COSEWIC**: Threatened, Last examination/Change: November 2001 (In a higher risk category); **SARA**: Schedule 1; **BC**: S2 & RED; **PRNPR**: P2

Female (top) and male (bottom) Killer whales, likely members of the southern resident group; transients generally have more pointed dorsal fins. The top photo also shows the saddle patch.

[a]NatureServe and the British Columbia Conservation Data Centre do not rank the northern and southern residents separately; the rank listed here is for the resident population as a whole.

Status of recovery/protection This species is protected under the *Species At Risk Act*. A recovery team has been formed for the resident populations (northern and southern) and a recovery strategy is in development; recovery planning is not yet underway for the transient population.

Killer whales are also protected under the *Marine Mammal Regulations* of the *Fisheries Act* of Canada and the Department of Fisheries and Oceans Canada (DFO) has written whale watching guidelines. In the United States they are protected under the *Marine Mammal Protection Act* and through amendments to other acts. The *Convention on International Trade in Endangered Species of Wild Fauna and Flora* provides further protection for Killer whales.

DFO has lead responsibility for this species, Parks Canada Agency is participating.

Description While a formal division of Killer whales into subspecies has not been widely recognized, the existence of several non associating populations with distinct behavioural, morphological, and genetic characteristics has been generally accepted. The three main populations in British Columbia are the transients, offshores[32], and residents; the resident population in British Columbia can be further subdivided into northern residents and southern residents. It should be noted that the names of these populations may not represent an accurate description of movement or site fidelity and should not be considered descriptive categorizations.

The primary physical characteristics of Killer whales are their black and white colouring, blunt head shape, and their tall dorsal fin located in mid-back. Maximum lengths recorded are a 9.0 metre male and a 7.7 metre female; average lengths in British Columbia waters are generally much smaller than this. The male dorsal fin is triangular and is known to have reached 1.8 metres in height, female and juvenile dorsal fins are more hooked and reach only 0.9 metres in height. Transients generally have a straighter, more pointed dorsal fin, and a less complex pigmentation pattern behind the dorsal fin (the saddle patch) when compared to residents; however, overlap does exist within these characteristics.

The following life history data is derived mainly from the northern and southern residents—the best-studied populations[33]. Calving occurs year round, but is most common between fall and spring. Reported gestation periods range from 15–18 months and the interval between births of viable calves is 2–12 years (mean of 5 years). Calf length at birth is 2.18–2.57 metres. Average life expectancy from birth is 17 years for males and 29 years for females; however, mortality is high from birth to 6 months (up to 50 percent in one study). The average life span from 6 months of age is approximately 29 years for males (estimated maximum 50–60) and 50 years for females (estimated maximum 80–90). Sexual maturity is reached at an average age of 15 years for both males and females.

Killer whales eat a large variety of prey including squid, octopus, bony and cartilaginous fish, sea turtles, sea birds, sea and river otters, dugongs, pinnipeds, other cetaceans, and occasionally terrestrial mammals such as deer, moose, and pigs; however, different populations tend to specialize on certain prey. It has been observed that residents tend to feed on fish, especially Chinook salmon, while transients appear to feed predominantly on marine mammals, especially Harbour seals.

Transient Killer whales have been observed hunting and sometimes killing marine mammals within PRNPR at places including Gowlland Rocks, Sea Lion Rocks (both Long Beach unit), and Carmanah Point (West Coast Trail unit) (B. Campbell pers. comm.).

[32] Baird [5] classified offshores as a subgroup of the residents (i.e. offshore residents) and cited mitochondrial DNA evidence from [11]; however, based on more recent DNA evidence and larger sample sizes Barrett-Lennard and Ellis [6, pp. 20] have indicated that three population "units of northeastern Pacific killer whales should be recognized as distinct populations or evolutionarily significant units (ESUs): resident, transient, and offshore killer whales". Barrett-Lennard and Ellis [6] also found evidence to support the further division of the residents and the transients each into three stocks: AT1 transients, Gulf of Alaska transients, west coast transients, Alaska residents, northern residents, and southern residents.

[33] Characteristics may vary between populations so care should be taken with their application to other populations such as the offshore or transient groups.

Habitat Killer whales do not appear to be limited by depth, water temperature, or salinity. They have been sighted in inshore and offshore as well as in temperate and tropical waters, but they they seem to prefer the colder waters of both hemispheres and the greatest numbers are within 800 kilometres of major continents. Both transients and residents utilize a wide range of depths, but transients tend to spend more time in water less than 5 metres. While Killer whales are marine, they will occasionally spend time in brackish water and even enter rivers.

Distribution Killer whales have been recorded in all of the world's oceans but they tend to concentrate in colder, highly productive, coastal waters. The usual range of the southern resident population includes British Columbia (from the middle of of Vancouver Island south) and Washington; their winter range is not well understood and there is evidence that some individuals use the entire outer coast Vancouver Island in winter—they are seen entering the Georgia Strait from the north in the spring. The northern residents usual range includes British Columbia waters from roughly the middle of Vancouver Island north and Alaskan waters. It should be noted that the northern and southern residents are not confined to their usual ranges and are occasionally sighted well within each others normal range. Transient and offshore Killer whales have a large range along the coast of North America with some transient individuals identified in both southeastern Alaska and central California. Members of the offshore group are generally seen more than 15 kilometres off the west coast of Vancouver Island or off the Queen Charlotte Islands.

Members of the southern, northern, and transient groups are seen within and around PRNPR ([12], B. Campbell pers. comm.). Southern resident whales belonging to J, K, and L pods are infrequently and unpredictably seen within PRNPR: mostly in the West Coast Trail unit of the park near Port Renfrew—park interpreters have photographed members of these pods off Owen Point—, but approximately once a year southern residents are sighed in the Tofino, Long Beach, Ucluelet area. Northern residents are mostly seen in the Long Beach unit of PRNPR, but again they are neither frequent nor predictable. Transient Killer whales are seen in all units of the park; however they appear more common in the Clayoquot Sound/Long Beach area—most whales seen in the inside and outside waters of the Long Beach unit belong to the transient group. Transients are sighted year-round in the Clayoquot Sound/Long Beach area, but appear more common between March and September.

Population sizes and trends The southern resident population numbered 89 individuals in 1998 and 78 in 2001; it has declined 20 percent between 1997 and 2003 [5]. Prior to this recent decline the population had been increasing—though not consistently—from a low of approximately 66 at the end of the extensive live-capture fishery in the early 1970s; the extensive live-capture fishery had reduced the population from a peak of approximately 95 in the mid 1960s.

The northern resident population is estimated to be at least 723 individuals, though only approximately 200 use British Columbia waters [1].

The transient population inhabiting the waters of British Columbia to southeast Alaska appears to be at least 219 individuals [1]. One hundred eighteen individual transients in 35 pods have been photo-identified in the Clayoquot Sound/Long Beach area (Quisitis Point to

Barney Rocks) since the mid 1980s—perhaps 10 or so may be dead and some have only been seen once, but many have been seen many times over multiple years (B. Campbell pers. comm. with Rod Palm).

Threats and limiting factors Killer whales have relatively small population sizes and low population growth rates; this makes them susceptible to a variety of natural and anthropogenic risk factors [3, 5, 12]. Natural threats include predation (of young or sick whales), parasitism, disease, changes in prey availability, accidental stranding or entrapment. Anthropogenic threats include pollutants, reduction in prey abundance, harassment from whale watching, underwater noise, boat collisions, entanglement in fishing gear, culling, and live-capture. Due to its location, the southern resident population is more susceptible to anthropogenic interference than other populations.

Data Gaps

- Relatively little is known about the transient population and it is this population which appears to have the largest presence in PRNPR.
- Areas of importance for Killer whales within PRNPR do not appear to be known. There may not be any areas of particular importance within the park, especially considering the transient nature of the Killer whale presence; however, there doesn't seem to have been enough study to say with certainty whether there are important regularly used areas or not.

Management Considerations Northern resident, southern resident, and transient Killer whales all use PRNPR to some extent. Northern residents are more common in the Long Beach unit while southern residents are more common in the West Coast Trail unit, but the park is outside the core range of both groups and they are seen infrequently and unpredictably within the park. Members of the transient group are seen in all units of the park and may be more common in the Long Beach unit, but this is difficult to determine due to observer bias. PRNPR may be more important to members of the transient population, because of the parks distance from the core ranges of the residents and the tendency of transients to spend more time in shallow water.

Overall few references have been found to particular areas where Killer whales of any group concentrate or visit repetitively. Transient Killer whales have been observed hunting and sometimes killing marine mammals at a few places within PRNPR including Gowlland Rocks, Sea Lion Rocks (both Long Beach unit), and Carmanah Point (West Coast Trail unit) (B. Campbell pers. comm.). Southern residents come into the outer Juan de Fuca Strait during salmon runs and will appear within 10–15 metres of shore at times (B. Campbell pers. comm.). In general, Killer whale use of the park appears to be transient: though sightings within the park are certain, specific times and locations are irregular and uncertain.

Much of the distribution data in PRNPR is derived from general sightings data and it is important to note that sightings are biased to where and when people are on the water; furthermore, the number of reported sightings per capita may vary between park units. Formal studies are needed to accurately determine Killer whale distribution in all units of the

park. Also, Killer whale use of the PRNPR should be monitored to determine any areas of importance that require special protection.

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2.6.10 *Phocoena phocoena* (Harbour porpoise)

Taxonomic Group Cetacea (whales, dolphins, and porpoises)
Species Presence Year-round breeding resident in the surrounding area, it does occur in PRNPR but the nature of its occurrence is not well understood.
Status **NatureServe**: G4G5; **COSEWIC**: Special Concern, Last examination/Change: November 2003 (Changed); **SARA**: Not yet on a schedule; **BC**: S3 & BLUE; **PRNPR**: P3

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection The Harbour porpoise must be added to schedule one before it is protected under the *Species at Risk Act*—it is currently under consideration. The Department of Fisheries and Oceans Canada is the responsible jurisdiction for this species.

In Canada Harbour porpoises are managed under the *Marine Mammal Regulations* in the federal *Fisheries Act*; these regulations require non-Aboriginals to hold a fishing licence to hunt Harbour porpoises. Issuance of these licences is at the discretion of the Minister of Fisheries and oceans—none have been issued.

Outside of Canada Harbour porpoises are not protected by the International Whaling Commission or, the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (though the latter does mandate that records of international trade be kept). In the United States they are protected by a variety of legislative instruments.

Description Harbour porpoises average 1.6 metres long and 50 kilograms, but occasionally individuals—likely females which are larger than males at all ages—reach lengths of 2 metres; they are one of the smallest cetaceans. The snout is bluntly pointed without a beak. Their dorsal fin is small and triangular, often with an anterior ridge of tubercles. Their colour is generally dark grey to black on their backs with white belly, chin, and variable white areas on the flanks. A grey stripe usually runs from the eye to the anterior angle of the flipper. Females and males are coloured the same.

Group sizes are generally small, a single animal or groups of 2–3 are typical; however, they will form larger groups, especially in summer or early fall when groups of 50 or more are seen. Larger groups may be associated with mating activity.

Births occur in British Columbia from May through September. Mating occurs between July and August (after the majority of births). Conception is followed by a 6–7 week period of delayed implantation and a 9–11 month gestation period during which the mother raises her newborn calf. Calves generally begin to show independent behaviour by early autumn, but mother and calf may remain together for up to 18 months before the calf is completely independent. In spite of the long bond between mother and calf, lactation probably lasts only 9 months as solid food is found in calf stomachs at about 5 months when they are approximately 104 centimetres long. Off California females give birth every other year; in the North Atlantic females may give birth every year.

In a sample of 100 Harbour porpoises caught in the western Strait of Juan de Fuca between 1988 and 1990, females were mature at 3 years old with a body length of approximately 153 centimetres, while males were mature at 4 years old and were approximately 132 centimetres long. Longevity has not been determined, but 10–13 years is a likely estimate of average lifespan in British Columbia.

Harbour porpoises prey on small schooling fish and squid. In southern British Columbia important prey species are market squid (*Loligo opalescens*), Pacific herring (*Clupea harengus pallasi*) and Pacific hake (*Merluccius productus*).

Habitat While Harbour porpoises are primarily marine they do occasionally enter fresh water[34]. Generally they prefer 5–16° centigrade water < 200 metres deep. Harbour porpoises rarely use water shallower than 7–10 metres though they may be found in such shallow water if there is a sandy bottom, low current, and appropriate prey. In British Columbia they are more abundant in water <125 metres deep and avoid high current areas. They do use deeper water in certain areas such as off the northern San Juan Islands and in the Strait of Georgia, Newfoundland basin, and Labrador Sea. Seasonal changes in abundance attributed to use of deeper offshore waters in late winter have been observed off western Washington and Oregon.

Distribution Harbour porpoises are found throughout the temperate and sub-arctic coasts (and offshore shallows) of the northern hemisphere. They tend to be found were prey is abundant, especially at coastal upwelling zones. In pacific Canada they are distributed in suitable habitat throughout coastal waters including the west coast of Vancouver Island and in PRNPR. They are present year-round and there is no evidence of migration; in fact a few factors point to relatively limited movements by Harbour porpoises on the west coast of North America: regional differences in pollution ratios, cranial morphology, and genetic patterns.

Harbour porpoises are present in all units of PRNPR; however, they are much more commonly seen outside the park boundaries (B. Campbell pers. comm.). In the Long Beach unit Barry Campbell has seen them in the vicinity of Tsapee Narrows and "observed numbers surfacing and diving, travelling back and forth along Browning Passage in the winter months"; he can not recall observing them in Grice Bay (B. Campbell pers. comm.). They are also sighted in Barkley Sound and the Broken Group Islands unit where they are regularly seen along the margins of Imperial Eagle Channel (south-east side of Broken Group) by Park Wardens during seabird transect surveys (B. Campbell pers. comm.). Harbour porpoises are also seen off the West Coast Trail.

Population sizes and trends There is little data on populations in British Columbia and what does exist is for southern inshore parts of the province. The overall population size is not well known; there is a relatively recent (1996) estimate of 2,895 individuals in southern British Columbia [1] and an older (1991) rough estimate of perhaps 15,000–20,000 individuals in all of western Canada—though even the author of the latter estimate views it with

[34]There is a record of a Harbour porpoise 55 kilometres up the Fraser River in British Columbia [1].

scepticism [6]. Regional differences in pollution ratios, cranial morphology, and genetic patterns indicate that there may be a number of distinct sub-populations within British Columbia (and other areas).

Anecdotal evidence indicates populations have declined since the 1940s and 50s—Harbour porpoises are now rarely seen in the developed areas around Victoria, Harrow Strait, and Puget Sound—, but recent quantitative estimates of abundance in the Strait of Juan de Fuca and San Juan Islands do not indicate declines in recent years.

Threats and limiting factors There is little information pertaining to the magnitude and impact of individual threat factors on the British Columbia population. Threats to Harbour porpoises include disease, agonistic interactions with other cetaceans, predation by killer whales or sharks, natural and anthropogenic[35] toxins, lowered prey availability (from natural or anthropogenic[36] causes), incidental kills in fisheries, disturbance by vessel traffic and other sources of noise such as "scarers", and marine debris [1, 6]. Harbour porpoises appear particularly sensitive to human activity and anthropogenic noise, a trait aggravated by their use of inshore habits. Furthermore, Harbour porpoises have a relatively limited reproductive capability.

Data Gaps

- There appears to be a general lack of knowledge concerning Harbour porpoises. Specific information needed for management are data on population size, units[37], and trends, as well as critical habitat areas such as breeding and birthing habitat.
- The effect of increased boat traffic on this shy species is not well known.
- Harbour porpoise distribution within PRNPR is not well known and while Harbour porpoises are typically found in shallow water, the water protected by PRNPR tends to be quite shallow (primarily < 20 metres), especially in the Long Beach and West Coast Trail units. The relative importance of this very shallow water to Harbor porpoises is unknown; most water in PRNPR may be too shallow for them as they are rarely seen in water < 7–10 metres deep.

Management Considerations Harbour porpoises are present in marine areas of PRNPR, but the park generally protects water < 20 metres deep and this very shallow water may be less important to Harbour porpoises. Indeed, Harbour porpoises are much more commonly seen outside the park boundaries (B. Campbell pers. comm.).

The distribution of Harbour porpoises in PRNPR does not appear to be well known. No formal studies of Harbour porpoises in the area could be found and it is questionable to rely

[35]Harbour porpoises appear to have the highest levels of dioxins and furans of any cetacean in the Strait of Georgia as well as high levels of organochlorines and heavy metals.

[36]Harbour porpoises prey on a number of commercially important species such as herring.

[37]Based on recent genetic data it appears that the overall Harbour porpoise population may be composed of relatively small discrete population units.

on sighting records to determine the distribution of this species; their shyness coupled with their small size makes them difficult to sight, even in moderate seas.

Harbour porpoises are particularly sensitive human activity and attempt to avoid it; as a result Harbour porpoises may be excluded from important habitat by the simple presence of boats. The increasing number of recreational boat traffic in the park could have a large impact on Harbour porpoises in the area and further study is warranted.

Overall more information about this species is needed for management both within and outside PRNPR. Of particular interest is data on population units, size, trends, distribution, and critical habitat features. It may turn out that the park protects relatively little habitat for this species, but any areas of importance that are discovered should be appropriately protected—any such areas will be of relatively greater importance if the overall Harbour porpoise population is composed of a number of small discrete units, each with a small range.

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2.6.11 *Sorex palustris brooksi* (Common Water shrew, brooksi subspecies)

Taxonomic Group Soricidae (shrews)
Species Presence Year-round breeding resident in Lost Shoe Creek upstream from PRNPR; this species may occur in the park.
Status **NatureServe**: G5T2; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2 & RED; **PRNPR**: Not ranked
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species At Risk Act*.

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

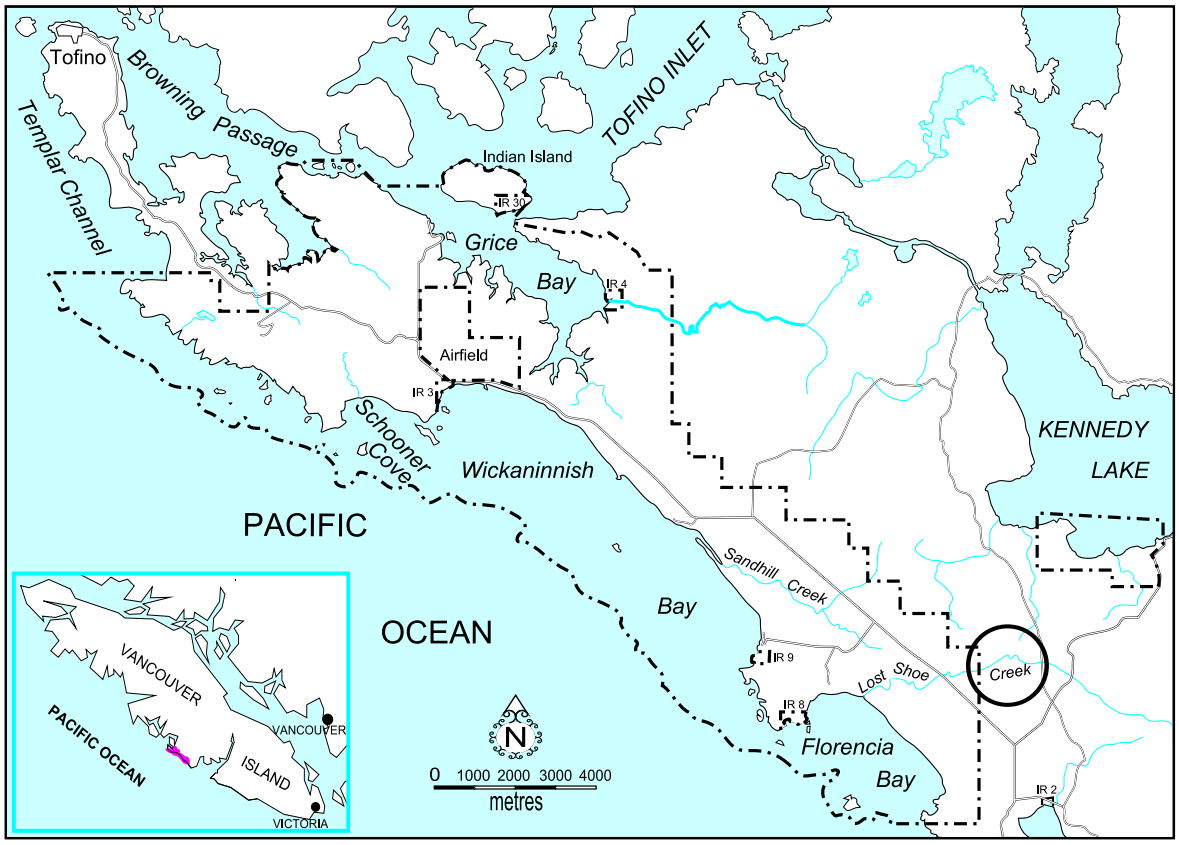

Figure 2.11: Common Water Shrew, Brooksi Subspecies (*Sorex palustris brooksi*) element occurrence (open circle; feature ID: 12057) near Pacific Rim National Park Reserve (BC CDC 2004).

Management Considerations While Common Water shrews (*S. palustris*) range from southern Alaska, through Canada and down the Coastal Rocky and Appalachian mountains, the brooksi subspecies of the Common Water shrew is endemic to Vancouver Island. This

subspecies has not been found within PRNPR, but has been found in Lost Shoe Creek upstream from the Long Beach unit. The British Columbia Conservation Data Centre element occurrence is centred well outside the park boundary; however, the edge of the occurrence does overlap the park and the lower portion of Lost Shoe Creek does run through the Long Beach unit of PRNPR (Figure 2.11). This species may be present within the park.

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2.7 Osteichthyes (Bony fishes)

2.7.1 *Acipenser spp.* (sturgeon)

Taxonomic Group Acipenseridae (sturgeons)

Subgroup *Acipenser transmontanus* (White sturgeon)
Species Presence Potential transient
Status **NatureServe**: Kootenay River (G4T1Q), Columbia River (G4T3T4Q), Nechako River (G4T1Q), Lower Fraser River (G4T2Q), Upper Fraser River (G4T1Q); **COSEWIC**: Endangered, Last examination/Change: November 2003 (In a higher risk category); **SARA**: Schedule 3; **BC**: Kootenay River (S1), Columbia River (S1), Nechako River (S1), Lower Fraser River (S2), Upper Fraser River (S1) & all populations are on the RED list; **PRNPR**: Not ranked

Subgroup *Acipenser medirostris* (Green sturgeon)
Species Presence Likely transient
Status **NatureServe**: G3; **COSEWIC**: Special Concern, Last examination/Change: November 2004 (No Change); **SARA**: Schedule 3; **BC**: S1S2B,S3N; RED **PRNPR**: Not ranked

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
FishBase
<http://www.fishbase.org/search.cfm>
Google Image Search
<http://images.google.com/>

Status of recovery/protection Neither species is currently protected by the *Species at risk Act.*

Management Considerations There are no records of White or Green sturgeons in PRNPR, but these anadromous fish are present in the area. White sturgeon have been observed in the Somass River—some authors indicate that these are merely transients—and Green sturgeon have been caught in Nooka Sound (Royal BC Museum record, July 05 1993) and Kyuquot Sound. Closer to the park, Green sturgeon are on a list of fishes of the Bamfield region and crab fisherman Jeff Edwards of Ucluelet (pers. comm. with B. Campbell) believes he has seen sturgeon jumping out of the water on at least two occasions: in the vicinity of Browning Passage/Tofino Inlet, behind Indian Island (near but not in the Long Beach unit, approximately 1997–2000) and near Strawberry Island/Usatzes Point (District of Tofino).

Little is known about these species on the west coast of Vancouver Island, but it appears that they may be at least transiently present in PRNPR. Green sturgeon are likely more common in PRNPR because White sturgeon appear to be mainly freshwater fish while Green

sturgeon are more marine. Further research may be warranted to determine the extent of sturgeon occurrence within PRNPR.

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2.7.2 *Oncorhynchus clarki clarki* (Coastal cutthroat trout)

Other Name(s) Yellowbellies, cutties, cutts harvest trout, sea trout

Taxonomic Group Salmoniformes (salmons and trouts)

Species Presence Coastal cutthroat trout are a year-round breeding resident in PRNPR and the surrounding area.

Status **NatureServe**: G4T4; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3S4SE & BLUE; **PRNPR**: P2P3

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
FishBase
<http://www.fishbase.org/search.cfm>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act*.

Management Considerations Coastal cutthroat trout are found from southern Alaska south to the Eel River, California, generally less than 150 kilometres from the coast. In British Columbia they are found in practically all streams and lakes. This subspecies is found in PRNPR and many parts of the park have been characterized as excellent habitat for both resident and sea-run populations.

The Long Beach unit of the park is dominated by relatively small, relatively low gradient/energy streams, which appear to be good cutthroat trout habitat; the amount of this stream habitat is is far greater than depicted on official maps [3, 4]. Similar streams can be found in the West Coast Trail unit and should offer good potential cutthroat trout habitat (B. Campbell pers. comm). The only creek in the Broken Group Islands unit drains the lake on Effingham Island and has a waterfall barrier immediately above the shoreline, any cutthroat trout in this lake would be land-locked (B. Campbell pers. comm.).

The Coastal cutthroat trout is blue listed (considered vulnerable) mainly due to its reliance on small, easily altered or destroyed streams and declines of many runs—some to extinction—(particularly on the east coast of Vancouver Island and the Lower Mainland, near Vancouver). While streams completely contained within PRNPR are protected, those with headwaters outside the protected area are still vulnerable. Overfishing is also of concern for this species.

While Barry Campbell (pers. comm.) indicates that some freshwater fishing does occur in PRNPR[38], he does not think there is much freshwater fishing pressure. There may however, be reason for concern about the Cutthroat trout population—if any—in Mallard Lake; fishing occurs in the lake and any Cutthroat population might now be isolated due to creek morphology (B. Campbell pers. comm.).

There appears to be little to no data on population size and trends or distribution in PRNPR; further research is necessary to assess the health and distribution of Cutthroat trout populations in this area. Genetic analysis could be used to detect reproductively isolated

[38] Long Beach unit: in the lower reaches of Sandhill Creek, at Lost Shoe Creek, and at Mallard Lake; West Coast Trail unit: along the West Coast Trail and in Cheewhat Lake.

stocks in the park. Any sub-populations (land-locked or otherwise) will likely need to be managed separately from the main population.

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2.7.3 *Oncorhynchus kisutch* (Coho salmon)

Taxonomic Group Salmoniformes (trouts and salmons)
Subgroup Interior Fraser population
Species Presence Transient
Status **NatureServe**: NA[a]; **COSEWIC**: Endangered, Last examination/Change: May 2002 (New); **SARA**: Not on a schedule; **BC**: NA[a]; **PRNPR**: PNAN

[a]Neither NatureServe nor the British Columbia Conservation Data Centre currently track the Interior Fraser population of Coho Salmon, their listings for the Coho Salmon species as a whole are G4 and S4SE; YELLOW respectively.

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
FishBase
<http://www.fishbase.org/search.cfm>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species must be added to schedule one before it gains the protection of the *Species at Risk Act*. The minister of environment has proposed that it not be added to schedule one. The recovery strategy for this species has been drafted. The Department of Fisheries and Oceans is the lead jurisdiction.

New restrictions on the Canadian salmon fishing industry reduced fishery exploitation of this population from a mean of 68 percent during 1987-1997 to 3.4 percent in 2000 [1].

Management Considerations Coho from the interior Fraser population have been caught along the west coast of North America from Alaska to Oregon; the majority are caught off the west coast of Vancouver Island and in the Strait of Georgia. Coho are generally found nearer to shore than other salmon species; thus they are more likely to be found within PRNPR, but PRNPR represents a relatively small portion of the interior Fraser Coho population's marine range and none of its breeding range. Marine distribution shifts with climate changes (water temperature) and the proportion of of this salmon population using the PRNPR varies; during warm water events (El Niño periods) most fish return to the Fraser River via the Johnstone Strait instead of the the Juan de Fuca Strait. Numbers of this population are known to remain on the west coast of Vancouver Island for extended periods in some years before migrating to the Fraser River[39] (B. Campbell pers. comm).

The primary threats to this species are habitat loss and degradation affecting breeding grounds and marine survival. New Canadian salmon fishing regulations have greatly reduced fisheries impacts, but marine survival is still threatened by climate change.

It should be noted that field identification of individual Coho populations is difficult to impossible which makes it hard to determine if individuals caught in the ocean are part of an endangered population. This makes monitoring the presence of this population in PRNPR difficult.

[39]This information has been gained through analysis of genetic markers and scale samples taken from sport or commercially caught coho in the area.

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2.7.4 *Oncorhynchus nerka* (Sockeye salmon)

Taxonomic Group Salmoniformes (salmons and trouts)

Subgroup Sakinaw Population
Species Presence Unlikely to be found in or around PRNPR.
Status **NatureServe**: NA[a]; **COSEWIC**: Endangered, Last examination/Change: May 2003 (No Change); **SARA**: Not yet on a schedule; **BC**: NA[a]; **PRNPR**: Not ranked

Subgroup Cultus Population
Species Presence Migrant which may pass through PRNPR and the surrounding area.
Status **NatureServe**: NA[a]; **COSEWIC**: Endangered, Last examination/Change: May 2003 (No Change); **SARA**: Not on a schedule; **BC**: NA[a]; **PRNPR**: PNAM

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
FishBase
<http://www.fishbase.org/search.cfm>
Google Image Search
<http://images.google.com/>

[a]Neither NatureServe nor the British Columbia Conservation Data Centre currently track Sockeye salmon sub-populations, their listings for the Sockeye salmon species as a whole are G5 and S4SE; YELLOW respectively.

Status of recovery/protection The Sakinaw and Cultus lake Sockeye salmon sub populations must be added to schedule one before they gain the protection of the *Species at Risk Act*; the minister of environment has proposed that they not be added to schedule one. The recovery strategies for both sub-populations have been drafted. Fisheries and Oceans Canada is the lead jurisdiction for this species.

Management Considerations Sockeye are present along the west coast of Vancouver island as transient, non-breeding occurrence. Sockeye spawn in lakes and rivers and after hatching juveniles spend one to three years in their rearing lake before migrating to the Gulf of Alaska; after one to four years the adults return to their birthplace where they spawn and die. It is during their migration that Sockeye may pass through the PRNPR.

Of the two endangered Sockeye sub-populations only the Cultus lake population may be seen in the PRNPR. Upon departure from the Fraser River, Cultus lake Sockeye migrate northwest through the Georgia and Jonstone Straits. In August, during their return to the Fraser River, Cultus lake Sockeye enter the Georgia Strait through both the Jonstone and Juan de Fuca Straits[40]; it is at this time that they may pass through PRNPR. The Sakinaw lake sockeye population, however, uses only the Jonstone Strait during migration.

[40]Less Sockeye use the Juan de Fuca Strait in El Niño years

It should be noted that field identification of individual Sockeye populations is difficult to impossible which makes it hard to determine if individuals caught in the ocean are part of an endangered population. This makes monitoring the presence of this population in PRNPR difficult.

Bibliography

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[2] ———. 2003b. COSEWIC assessment and status report on the Sockeye Salmon *Oncorhynchus nerka* (Sakinaw population) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. ix + 35 pp.

2.7.5 *Sebastes paucispinis* (Bocaccio)

Other name(s) Rock Salmon; Salmon Rockfish; Pacific Red Snapper; Pacific Snapper; Oregon Red Snapper; Oregon Snapper; Longjaws

Taxonomic Group Scorpaenidae (scorpionfishes and rockfishes)

Species Presence This species is present in the surrounding ecosystem, but it is a deep water fish and adults are not likely present in PRNPR. Juveniles prefer shallower water and are a potential non-breeding resident in the park.

Status **NatureServe**: G4; **COSEWIC**: Threatened, Last examination/Change: November 2002 (New); **SARA**: Not yet on a schedule; **BC**: Not tracked; **PRNPR**: Not ranked

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
FishBase
<http://www.fishbase.org/search.cfm>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species must be added to schedule one before it gains protection under the *Species at Risk Act*. The Department of Fisheries and Oceans (DFO) is the lead jurisdiction.

DFO has been working on the Rockfish/Lingcod Conservation Strategy which was announced in May 2002. Their goal is to close 50 percent of the rock fish habitat in the Strait of Georgia and 20 percent on the West Coast of Vancouver Island; the first rockfish conservation areas came into force on April 1 2004 and new areas are to be added.

Description

> "Adult Bocaccio range in colour from olive-orange to burnt-orange or brown on the back and pink to red on the stomach. The most distinctive feature of this fish is its long upper jaw, which extends at least as far as the eye socket. Young fish less than 25 cm long are light bronze with small brown spots on their sides. Their colour darkens and their spots disappear as they mature. The Bocaccio is one of the largest of the rockfish. It typically reaches 64 to 74 cm in length; however, 91-cm-long females and 75-cm-long males have been found." (Environment Canada, Species at Risk Branch 2004).

Mating occurs in the early fall, but fertilization is delayed. The number of eggs produced by a female varies with her size and ranges from 20,000 eggs at ~38.1 centimetres in length to >2,300,000 eggs above 77.5 centimetres. After fertilization the eggs mature for 40–50 days, hatch and continue to develop within the female for about one week. In British Columbia waters the larva are released in winter when they are 4–5 millimetres long. By late spring they begin settling to the coastal sea floor and metamorphose over the next several months into pelagic juveniles 19–40 millimetres long. Juveniles grow rapidly and can reach 24 centimetres by the end of their first year. Age at maturation appears variable, 50 percent are mature at about 4–5 years of age. Bocaccio live 40–50 years.

Newly hatched Bocaccio feed on plankton while juveniles prefer fish, especially other rockfish. Adults will feed on sablefish, anchovies, lantern fish, and squid.

Habitat Larval Bocaccio live near the surface of the ocean for the first few months before settling to the bottom. Juveniles have been caught at sub-tidal depths near shore on western Vancouver Island and mostly at depths of 30–120 metres in California. Juveniles may be associated with kelp beds.

Adults can be found on a variety of bottom types from 60–340 metres; they are also present in mid-water trawl catches at 60–200 metres indicating that they can be semi-pelagic.

Water within PRNPR is not deep enough to provide habitat for adult Bocaccio; however, the park may provide habitat for juveniles.

Distribution Bocaccio are found in the eastern Pacific Ocean from Alaska to Baja California, Mexico. In British Columbia they are found on both the outer and inner coasts. The outer coast supports a commercial fishery and the largest catches are from the northwest corner of Vancouver Island and Queen Charlotte Sound. There is little information concerning Bocaccio distribution in inlets and near shore waters because distribution data is largely associated with the commercial fishery. There are at least two records of Bocaccio in Barkley Sound (one from 1975 and the other from 1997) [1]; however, rockfish surveys by park staff in the Broken Group Islands over the last 3 years have failed to turn up juvenile Bocaccio in spite of looking for them (B. Campbell pers. comm.).

Population sizes and trends All populations with sufficient data appear to have suffered large declines over the last couple decades. Over the last two decades Bocaccio populations off the west coast of Vancouver Island and south of the border in Washington State have declined by over 90 percent [1]. The population in British Columbia appears to have been stable—albeit at diminished density—since about 1995.

Threats and limiting factors This species is limited by a number of life history characteristics: It is relatively long lived and takes approximately 4–5 years to reach maturity. Fecundity is lowest in young individuals and increases with age. Considering the relatively large number of eggs produced, juvenile survival and recruitment is probably very low. This combination of life history characteristics indicates a species that may react poorly to harvesting.

Harvesting is a major threat and limiting factor for Bocaccio. This species is fished commercially and recreationally, and is caught as by-catch during commercial fisheries for other species. Commercial fisheries for this species are currently reduced, but continuing. The recreational fishery may pose a larger threat if it switches from salmonids to other species. This species has a swim-bladder that cannot adjust to rapid pressure changes; Bocaccio die if they are brought to the surface from greater than 20–30 metres.

Bocaccio appear sensitive to cyclic ocean conditions which alternate between favorable and unfavorable for recruitment; prolonged periods of unfavorable conditions can lead to poor recruitment and population decline, while favorable conditions boost recruitment and can lead to population increases. A period of favorable conditions may have begun in 1999 and could explain the recent population stability.

Accumulation of pollutants may also be a threat for this long-lived predator.

Data Gaps

- There is little known about the inshore distribution of this species.
- The overall importance of areas protected by PRNPR to the Bocaccio population in the area is unknown.

Management Considerations There is potential habitat for juvenile Bocaccio within the PRNPR; however, this species has not yet been found in the park. Further research is required to determine the extent of this species' occurrence in the park and to determine the overall importance of habitat within PRNPR to the Bocaccio population. Considering the low recruitment, increased fecundity with age, and long life span, it is probably of greater concern to protect adult Bocaccio than juveniles.

Bibliography

[1] Core Team for EFH for West Coast Groundfish. 1998. DRAFT Essential fish habitat west coast groundfish appendix. National Marine Fisheries Service, Seattle, WA.

[2] COSEWIC. 2002. COSEWIC assessment and status report on the Bocaccio *Sebastes paucispinis* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. vii + 43 pp.

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2.8 Reptilia (Reptiles)

2.8.1 *Dermochelys coriacea* (Leatherback turtle)

Taxonomic Group Testudines (tortoises and turtles)
Species Presence Rare non-breeding transient in British Columbia waters. This species is a potential transient in PRNPR waters.
Status **NatureServe**: G2; **COSEWIC**: Endangered, Last examination/Change: May 2001 (No Change); **SARA**: Schedule 1; **BC**: S1S2N & RED; **PRNPR**: Not ranked
Status of recovery/protection The Leatherback turtle is protected under the *Species at Risk Act* and is listed in the *Convention on International Trade in Endangered Species of Wild Flora and Fauna;* it is also protected by provincial legislation in New Brunswick and Nova Scotia. The Leatherback Turtle Recovery Team has drafted the recovery strategy and action plan for the pacific population. The Department of Fisheries and Oceans is the lead jurisdiction for this species.

Management Considerations Leatherbacks are occasionally seen in Canadian North Pacific waters between July and September. They have been sighted along the west coast of Vancouver Island from Pachena Pt. north to Brooks Bay and on La Perouse Bank [4] and a few dead ones have been recorded washed up on beaches around—but not in—PRNPR (B. Campbell pers. comm.). This marine species does not breed or permanently reside in British Columbia, but it is known for its long distance dispersal. Occasionally a Leatherback turtle may wander through PRNPR, but their presence is very rare and limited.

A primary knowledge gap concerns the occurrence and distribution of Leatherback turtles [4]. The most valuable information sought by the recovery team are sightings information: in order to determine Leatherback frequency in, and use of, Canadian North Pacific waters (C. Eros pers. comm.). In addition to a Vancouver Aquarium website for reporting sightings[41] and a toll-free sightings phone number, there are a variety of printed materials[42] which advertise the sightings network. Any sightings within PRNPR should be reported and the park should encourage visitors to report sightings.

[41] http://www.vanaqua.org/conservation/turtle-sightings.html
[42] Available from the recovery team.

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[1] Gregory, P.T. and R.W. Campbell. 1994. The Reptiles of British Columbia. British Columbia Provincial Museum Handbook 44. Royal British Columbia Museum: Victoria, BC. 103 pp.

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<http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/leatherback-turtles/default_e.htm> (accessed: 2004-03-25).

[4] Pacific Leatherback Turtle Recovery Team (PLTRT). 2003b. DRAFT National Recovery Strategy for the Leatherback Turtle (*Dermochelys coriacea*) in Pacific Canadian Waters. Fisheries and Oceans Canada. 43 pp.
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2.9 Anthophyta (Vascular flowering plants)

2.9.1 *Abronia latifolia* (Yellow sand-verbena)

Taxonomic Group Caryophyllales
Species Presence Year-round breeding resident of PRNPR and surrounding area.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3 & BLUE; **PRNPR**: P2
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations This species is a year-round resident in both the Long Beach and West Coast Trail units of PRNPR; it is not likely present in the Broken Group islands (Bell 1973). In the Long Beach unit it is known from the sand dunes and occasionally on the upper beach adjacent to the sand dunes at Wickaninnish Beach, Schooner Cove, and Radar Beach (B. Campbell, pers. obs., Bell 1972). On the West Cost Trail it is known from the sand dunes at Keeha Beach and Clo-oose (east of the Cheewhat River mouth) (Cordes *et al* 1974, J. Hamilton, pers. obs. 2001). The BC CDC (2004) records four localities of this species in PRNPR: Long Beach (1 mile west of Wickaninnish Lodge), Wickaninnish Bay (near mouth of Sandhill Creek), Pachena Bay, and Keeha beach (Cape Beale).

Barry Campbell (pers. comm.) estimates that there are likely less than 1000 individuals in the entire park. PRNPR likely contains a large portion of the Yellow sand-verbena plants on the west coast of Vancouver Island because it contains a large proportion of the sand-dominated shoreline habitat on the west coast of Vancouver Island (See 3.1 on page 227).

"The rank of S3 and Blue List status were assigned due to the limited number of extant occurrences in the province (25+), restricted range, and uncertain level of protection for this taxon" [1].

Threats to Yellow sand-verbena in PRNPR include high volumes of recreational use, storms (which also disperse seeds), and invasive exotic species. Yellow sand-verbena populations in PRNPR should be monitored to assess size and trend which have not yet been determined for PRNPR or British Columbia in general. The removal of exotic invasive species from the sand beaches and dunes of PRNPR would benefit this and other species at risk.

Bibliography

[1] British Columbia Conservation Data Centre. 2001. Conservation Status Report: *Abronia latifolia* (Yellow sand-verbena). [on-line report]. British Columbia Ministry of Sustainable Resource Management, Victoria, BC. 2 pp.

<http://srmwww.gov.bc.ca/atrisk/documents/PDNYC010C0.doc>. (accessed: 2005-03-10).

[2] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PDNYC010C0.pdf> (accessed: 2005-03-10).

2.9.2 *Abronia umbellata* (Pink sand-verbena)

Full species name *Abronia umbellata* ssp. *breviflora*

Taxonomic Group Caryophyllales

Species Presence Sporadic, currently extirpated from PRNPR and British Columbia, but may survive in the seed-bank.

Status **NatureServe**: G4G5T2; **COSEWIC**: Endangered, Last examination/Change: May 2004 (New); **SARA**: Not on a Schedule; **BC**: SX & RED; **PRNPR**: PH

Status of recovery/protection This species must be added to schedule one before it is protected under the *Species at Risk Act*.

Description Pink sand-verbena in Canada is generally referred to as *Abronia umbellata*, but individuals in Canada actually belong to the infraspecific taxon *Abronia umbellata* ssp. *breviflora*; this recent determination was made by comparing British Columbia and Oregon plants using morphometric analysis of greenhouse grown plants and DNA.

> "The Canadian plants have trailing stems up to 1.5 m long with short branches and opposite, thick, fleshy, densely glandular leaves. The leaves are lanceolate to narrowly egg-shaped, 2-6 cm long, 0.8-3.5 cm wide with stalks 2.5-7 cm long. The many-flowered, rounded heads occur on stout, 2-4 cm stalks. The flowers consist of a 6-8 mm long, greenish to pinkish perianth tubes that flare into pink, 5-lobed limbs 5-6 mm wide. The fruits consist of 10-12 mm achenes, which are prominently 3- or 4-winged. The wings of the achenes are wider than the achenes. Each achene has a single, brown seed approximately 1.5 mm wide and 3 mm long." [1]

Pink sand-verbena is an ephemeral perennial plant which reproduces only by seed. Seed production begins in its first year—a good thing since individuals may well not survive the winter. Two plants in Clo-oose bay produced approximately 5,200 seeds. A high percentage of seeds are viable and experimental germination rates are in the third quartile; however, the hard seed coat must be abraded before germination is likely and germination rates in the wild appear to be much lower than in experiments.

Habitat Pink sand-verbena grows just below the drift wood zone on sand beaches, an area regularly exposed to high tides and scoured by winter storms. This habitat is similar to that of Yellow sand-verbena.

PRNPR does contain Pink sand-verbena habitat, but much of it (particularly in Wickaninnish Beach and Schooner Cove) has been largely degraded by invasive European beachgrass (*Ammophila arenaria*) and American beachgrass (*A. breviligulata*) [1]; the rest remains threatened by these invasive species. Pink sand-verbena is not expected to occur anywhere where beachgrass cover is extensive.

Table 2.4: Pink sand-verbena (*Abronia umbellata*) occurrences in Pacific Rim National Park Reserve. Data from COSEWIC [1] and personal communications with B. Campbell.

Location	Observation Date	Observer(s)	Population size / Status
Pachena Bay	<1915	Henry	?/Extirpated
Pachena Bay	1927	Evans	?/Extirpated
Clo-oose Bay[a]	1941	?	?
Clo-oose Bay[b]	2000	Hamilton; Parks Canada; Douglas, Penny & Rogers	2
Clo-oose Bay[b]	2001	Hamilton; Douglas	3
Clo-oose Bay	2002	Parks Canada	0
Clo-oose Bay	2003	Douglas & Smith	0
Clo-oose Bay	2004	Parks Canada; Hamilton	0

[a] Approximately 3 kilometres east of Nitinat Lake outlet; the area of "white" settlement, on Dare Beach, immediately east of the Cheewhat River outlet.

[b] In front of the Dare Beach sand dune just east of the Cheewhat River mouth; the location was at or very near the site of the purported 1941 sighting.

Potential habitat in PRNPR includes Florencia Bay (particularly the central part), Clo-oose Bay, and Pachena Bay which are relatively free of beachgrasses and contain potential Pink sand-verbena habitat.

Distribution Historically, Pink sand-verbena (A*bronia umbellata*) ranged from southwestern British Columbia south to Mexico. The subspecies *A. umbellata* ssp. *breviflora* has occurred from British Columbia (along the outer coast of Vancouver Island) south through Washington and Oregon to northern California.

Pink sand-verbena has occurred within PRNPR; all records are from the West Coast Trail unit (Table 2.4, Figure 2.12). Historical populations are known from Pachena Bay (Bamfield area), Ahousat (Tofino area), and Clo-oose Bay prior to 1941. More recently, in 2000 and 2001, Pink sand-verbena was found at Clo-oose Bay in PRNPR (48° 39' 15.1" N, 124° 48' 28.7" W); however, no plants have been found there since. A potential Pink sand-verbena was reported in Pachena Bay during 2001–2002, but it is uncertain who reported this plant and who finally inspected it; Campbell believes it was probably a Yellow sand-verbena due to the lack of interest generated (B. Campbell pers. comm.).

Since 2002, during the course of casual beach walks or invasive species patrols, Barry Campbell has looked for Pink sand-verbena plants on beaches in the Long Beach unit and found none; furthermore he has not noticed[43] Pink sand-verbena prior to 2002 (1970—2002) during his extensive and frequent travels on on beaches in PRNPR (and other local beaches).

[43] Barry Campbell is familiar with Yellow sand-verbena and feels that he certainly would have noticed the uniqueness of Pink sand-verbena.

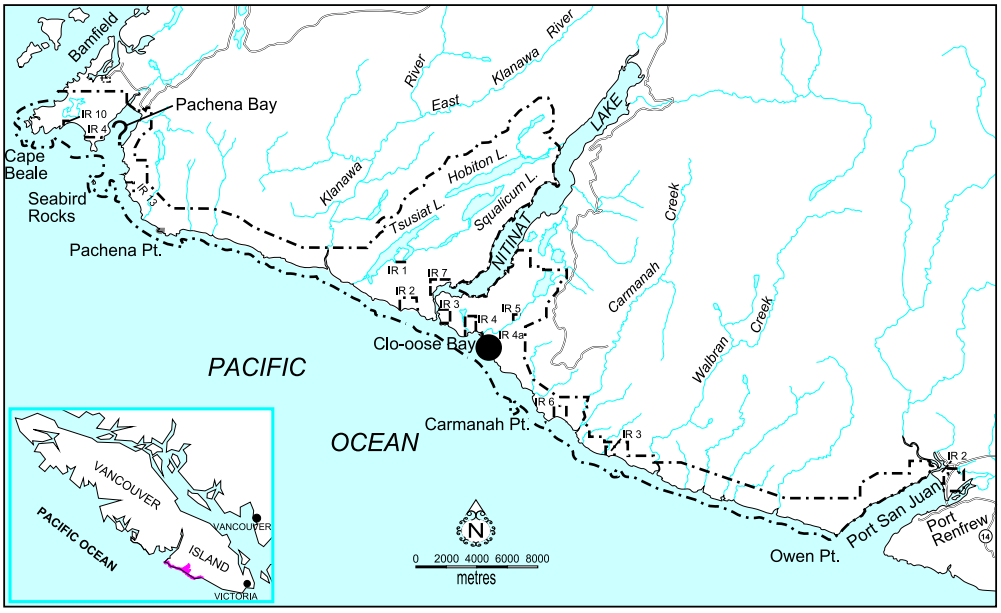

Figure 2.12: Pink sand-verbena (*Abronia umbellata*) in the West Coast Trail unit of Pacific Rim National Park Reserve. Black circle indicates recent records and the BC CDC element occurrence (feature ID: 22841); "?" indicates uncertainty (locational or identity) surrounding records in the general area. Data from the British Columbia Data Centre, COSEWIC [1], and personal communications with B. Campbell.

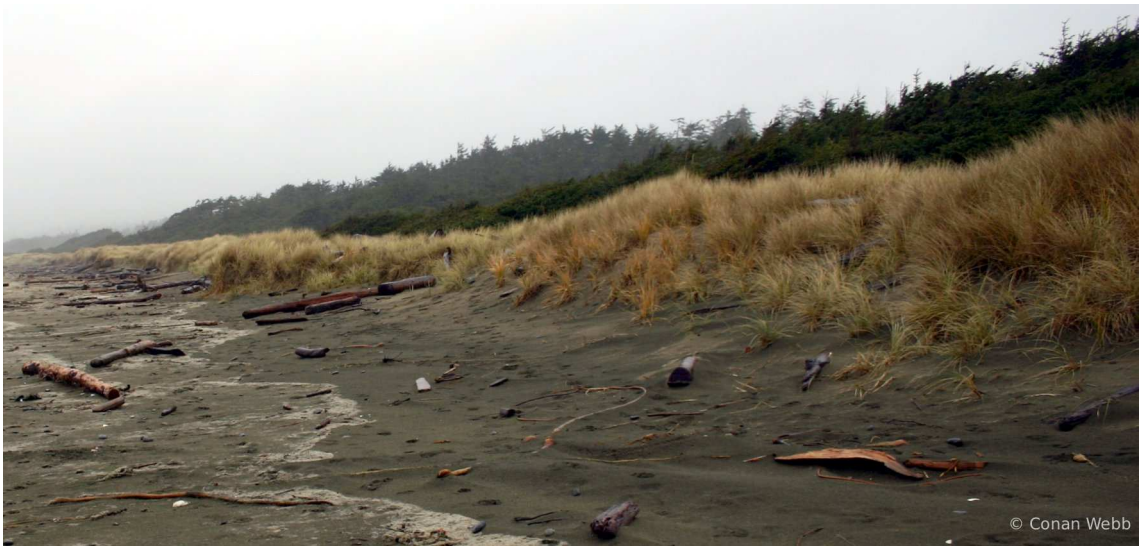

Figure 2.13: Beachgrass (*Ammophila* ssp.) stabilization of the upper beach area at Wickaninnish Beach, Pacific Rim National Park Reserve.

Population sizes and trends The only known counts in Canada were done at Clo-oose bay where two and three plants were found in 2000 and 2001 respectively. There are no current records of Pink sand-verbena in Canada.

In other areas the population size of this species is known to fluctuate drastically: "At Otter Point, Oregon, numbers ranged from nine to 15 between 1993 and 1996, increased to between 136 and 177 from 1997 to 1999, declined to zero in 2000, then increased to three in 2001." [1, page 10].

Threats and limiting factors The greatest threat to Pink sand-verbena is stabilization of the upper beach area by invasive species, namely European beachgrass (*A. arenaria*) and American beachgrass (*A. breviligulata*) [1]. Beachgrass invasion at Wickaninnish Beach, one of the largest sand beaches on the outer coast of British Columbia, has greatly reduced the potential habitat for Pink sand-verbena in PRNPR. [1] (Figure 2.13).

Other threats include winter storms and trampling. Winter storms have wiped out populations in British Columbia; climate change may increase the frequency and strength of winter storms. Trampling is a relatively minor, but real threat within PRNPR.

This species is limited by low numbers (currently there are no known plants) in British Columbia and apparently poor germination in the wild.

Data Gaps In general there is little data on Pink sand-verbena, in particular—

- The historical distribution of Pink sand-verbena in PRNPR is not well known, but is likely a pattern of disappearing and appearing occurrences controlled by poorly understood re-establishment mechanisms such as seed banking or long distance dispersal on ocean currents—or both. Research on re-establishment mechanisms is required in order to understand the distribution of this species.

- There is little data on population size and trends in PRNPR, and British Columbia in general.

Management Considerations Two and three plants were counted within PRNPR at Clo-oose Bay in 2000 and 2001; however, no plants have been seen there since. It is quite possible that new plants will germinate from the seed bank in PRNPR or from seeds carried on ocean currents from more southern populations. The status of the seed bank is unknown, but sand-verbena fruits are sturdy and Pink sand-verbena seeds may persist for years. Similarly little is known about long distance dispersal in this species, but its sporadic appearance indicates some mechanism for re-establishing extirpated populations.

Habitat must be available for re-establishment mechanisms to be effective and large portions of potential habitat such as Wickaninnish beach and Schooner Cove have already been destroyed by invasive species. Invasive beachgrass will continue to spread into Pink sand-verbena habitat unless it is controlled. Without invasive species control remnant habitat (such as in Florencia Bay, Pachena Bay, and Clo-oose Bay) faces a fate similar to Wickaninnish and Schooner Cove beaches. Existing habitat must be protected while destroyed and degraded habitat must be rehabilitated to ensure Pink sand-verbena continues to appear in PRNPR. G. Douglas has assessed the beachgrass problem in the Long Beach unit and indicated that beachgrass should be removed—this has not happened to date; furthermore he recommended that Florencia Bay (particularly the central part) be monitored for beachgrass growth and for the appearance of Pink sand-verbena (B. Campbell pers. comm.).

Surveys and monitoring will be an important part of any Pink sand-verbena management plan. Pink sand-verbena can be surveyed by helicopter and this may prove to be an efficient way to monitor the long coastline of PRNPR. Surveys should include all potential habitat despite previous search effort because of the sporadic nature of this plant and the possibility that it is transported on ocean currents.

Pink sand-verbena may always be present only sporadically in PRNPR making effective long-term management of individual occurrences impossible; management of Pink sand-verbena should focus on habitat availability and the ecosystem processes affecting it—fencing has been suggested to protect small numbers of plants from trampling by hikers in the short-term. Annual winter storm phenomena are an important factor controlling Pink sand-verbena occurrences and must be considered in any management plan, particularly reintroductions. Loss of habitat to invasive beachgrass is the primary threat to Pink sand-verbena in PRNPR and is likely to eliminate even the ephemeral and sporadic appearance of Pink sand-verbena if it remains uncontrolled. Several beaches such as those at Florencia Bay, Pachena Bay, and Clo-oose Bay are relatively Ammophila-free and should be the first targets of beachgrass control. It should be noted that along with Pink sand-verbena, a number of other species at risk and the entire sand dominated shoreline ecosystem of which they are a part is threatened by invasive species (see 3.1 on page 227).

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[2] Douglas, George. 2003. Pacific Coast Trail reconnaisance (Nitinat Narrows area) Report. Letter report by Douglas Ecological Consultants to Brian Reader, Parks Canada. 2 pp.

2.9.3 *Carex gmelinii* (Gmelin's sedge)

Taxonomic Group Cyperaceae (sedges)
Species Presence Gmelin's sedge is present in the Broken Group unit of PRNPR.
Status **NatureServe**: G4G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2S3 & BLUE; **PRNPR**: P1
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Management Considerations Gmelin's sedge has been found at two sites in the Broken Group unit of PRNPR (Table 2.5). Populations at these sites should be periodically monitored to determine population trends and to detect any problems.

Table 2.5: Locations of Gmelin's sedge (*Carex gmelinii*) in Barkley Sound (M. Cody pers. comm.).

Island / Islet	In PRNPR	Latitude	Longitude
Leach N	No	48° 49' 51.600" N	125° 14' 27.600" W
Folger	No	0 0 0	0 0 0
Chalk SE	Yes	48° 55' 1.200" N	125° 18' 46.800" W
Chalk SW	Yes	48° 55' 1.200" N	125° 18' 46.800" W

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2.9.4 *Carex pansa* (Sand-dune sedge)

Taxonomic Group Cyperaceae (sedges)
Species Presence This species is a resident of PRNPR and the surrounding area.
Status **NatureServe**: G4; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2S3 & BLUE; **PRNPR**: P2
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Management Considerations Sand-dune sedge is present at a number of locations in Barkley Sound, many in the Broken Group unit of PRNPR (Table 2.6). The rarity of this species in British Columbia may be over estimated by the BC CDC as this species now appears to be relatively common through out the west coast (N. Page pers. comm.). Populations of Sand-dune sedge should be inventoried to determine the abundance of this species and assess any threats.

Table 2.6: Locations of Sand-dune sedge (*Carex pansa*) in Barkley Sound (M. Cody pers. comm.).

Island / Islet	In PRNPR	Latitude	Longitude
Big Pig	Yes	48° 53' 31.2" N	125° 22' 58.8" W
Big Pig W Rks	Yes	48° 53' 31.2" N	125° 23' 6" W
Bog Pig SE Sat	Yes	48° 53' 27.6" N	125° 22' 58.8" W
Clarke	Yes	48° 53' 24" N	125° 22' 33.6" W
Little Pig E	Yes	48° 53' 31.2" N	125° 22' 48" W
Little Pig W	Yes	48° 53' 34.8" N	125° 22' 51.6" W
Owen	Yes	48° 53' 38.4" N	125° 22' 22.8" W
Pig Gully	Yes	48° 53' 27.6" N	125° 22' 58.8" W
Piglet	Yes	48° 53' 27.6" N	125° 22' 55.2" W
Puffin	Yes	48° 54' 10.8" N	125° 22' 55.2" W
Turtle	Yes	48° 54' 36" N	125° 19' 19.2" W
Walsh	Yes	48° 55' 4.8" N	125° 19' 12" W
Willis	Yes	48° 54' 54" N	125° 20' 24" W
Willis NW	Yes	48° 55' 12" N	125° 20' 45.6" W
Curwen	No	48° 56' 49.2" N	125° 21' 32.4" W
Folger	No	0 0 0	0 0 0
Geer N	No	48° 55' 48" N	125° 6' 39.6" W
Geer S	No	48° 55' 40.8" N	125° 6' 36" W

Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PMCYP03A20.pdf> (accessed: 2005-03-10).

2.9.5 *Castilleja ambigua* ssp. *ambigua* (Paintbrush owl-clover)

Taxonomic Group Scrophulariaceae (figwort family)
Species Presence Year-round breeding resident in the surrounding ecosystem, probably a resident of PRNPR.
Status **NatureServe**: G4T3T4; **COSEWIC**: Not assessed **SARA**: Not on a schedule; **BC**: S2 & RED; **PRNPR**: Not ranked
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*.

Management Considerations Paintbrush owl-clover is found near water (in moist to wet vernal sites, tidal marshes, or open grassy brackish sites) in lowland areas from southern Vancouver Island south to California.

There appears to be some room for debate as to whether Paintbrush owl-clover is actually in PRNPR. It is close to the park boundary: within 10 metres on Indian Island (49° 07' N, 125° 46' W) and within 20 metres near Port Renfrew (BC CDC 2004, M. Fairbarns pers. comm.). While the Port Renfrew occurrence is clearly outside the park boundary, on Indian Island the park boundary in the area of this species' occurrence involves terms like "natural boundary" which leaves some room for interpretation. It seems likely that these plants are actually outside the park (B. Campbell and M. Fairbarns pers. comm.); however, the BC CDC record for this occurrence notes that the plants lie within PRNPR. The location of Paintbrush owl-clover on Indian Island should be further surveyed to determine an accurate location. Leaving aside the location of the Indian Island population, Paintbrush owl-clover is likely present within the park (M. Fairbarns pers. comm.).

Bibliography

[1] British Columbia Conservation Data Centre. 2001. Conservation Status Report: *Castilleja ambigua* ssp. *ambigua* (Paintbrush owl-clover). [on-line report]. British Columbia Ministry of Sustainable Resource Management. 2 pp. <http://srmwww.gov.bc.ca/cdc/>. (accessed: 2005-01-18).

2.9.6 *Convolvulus soldanella* (Beach bindweed)

Other name(s) *Calystegia soldanella*, Beach morning-glory
Taxonomic Group Convolvulaceae (morning glory; bindweed; sweet potato)
Species Presence Year-round breeding resident in and around PRNPR.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3 & BLUE; **PRNPR**: P2

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations Beach bindweed is found on many sand beaches of southern Vancouver Island and present at a number of sites within PRNPR (Table 2.7; M. Fairbarns pers. comm., B. Campbell pers. comm., BC CDC 2004, Cordes *et al* 1974). In the Long Beach unit it can be found in the two dune blowouts at Schooner Cove, in the second blowout in the Wickaninnish Beach sand dunes, and at Florencia Bay; it may also occur at the dune blowout behind first Radar Beach. It has not been found in the Broken Group Islands (Bell *et al* 1973). Along the West Coast Trail it can be found in Topaltos Bay, on Keeha and Cheewhat Beaches, and near Clo-oose. It is interesting to note that along the West Coast Trail this species can be found on the top margins of beaches while it is not seen in this habitat in the Long Beach Unit (B. Campbell pers. comm.).

Approximately 300—1000 individual flowers are produced each year at all three sites in the Long Beach unit; the patch in the Wickaninnish Beach dunes is roughly 20 by 30 metres (B. Campbell pers. comm.). The entire known population in PRNPR is less than 1,200 plants (Table 2.7). There is no data on population trends in the park.

This species grows on sand beaches, sand dunes, and sand blowouts in the sand dominated shoreline ecosystem which is under great threat from exotic invasive species, specifically beachgrasses (*Ammophila* spp.; See 3.1 on page 227). The proliferation of exotic beachgrass in PRNPR is closing off sand flow to the dunes and is likely to accelerate dune succession; furthermore, beachgrass is starting to grow in the dunes themselves and poses a direct threat to species in the sand dominated shoreline ecosystem (B. Campbell pers. comm.). Populations of Beach bindweed in PRNPR should be periodically monitored to determine population trends and assess threats. Beach bindweed would benefit from invasive species control in the sand dominated shoreline ecosystems of PRNPR.

Table 2.7: Beach Bindweed (*Convolvulus soldanella*) locations and population sizes in Pacific Rim National Park Reserve (BC CDC 2004, N. Page pers. comm.).

Park Unit	Locality	Collector	Collection Date	Plant Number	Notes
Long Beach	Schooner Cove	N.A. Page	mid 2001	< 250	sporadic in dunes
Long Beach	Long Beach, 1 mile west of Wickaninnish Lodge	P. Barclay	1968-06-26	< 250	Collected on Long Beach sand dunes by J. Pojar (Jun 9 1971) and by R. Kuramoto (Jul 1964); last obs N.A. Page mid 2001: Wickaninnish Beach, < 250 pls, sporadic in dunes
Long Beach	Florencia Bay	N.A. Page	mid 2001	< 5	very few isolated plants
West Coast Trail	Topaltos Bay (NE of Cape Beale)	N.A. Page	mid 2001	< 25	in several patches
West Coast Trail	Keeha beach (48° 47' N, 124° 10' W)	R.T. Ogilvie	1983-06-23	< 350	last obs N.A. Page mid 2001: < 350, frequent along shore
West Coast Trail	Clo-oose (48° 39' N, 124° 49' W)	R.T. Ogilvie	1983-06-21	?	in dune habitat
West Coast Trail	Cheewhat Beach (south of Nitinat Lake)	N.A. Page	mid 2001	< 250	common on shore

Bibliography

[1] No Beach bindweed specific resources, only general resources were used.

2.9.7 *Corydalis scouleri* (Scouler's corydalis)

Taxonomic Group Fumariaceae (corydalis, bleeding heart, and fumitory)

Species Presence Year-round breeding resident in surrounding area and potentially present in PRNPR.

Status **NatureServe**: G4; **COSEWIC**: Threatened, Last examination/Change: May 2001 (New); **SARA**: Schedule 1; **BC**: S3 & BLUE; **PRNPR**: Not ranked

Status of recovery/protection This species is protected under the *Species at Risk Act* and is an identified wildlife species in British Columbia. A recovery strategy and action plan have been drafted by the recovery team.

Management Considerations Scouler's corydalis is currently not known from PRNPR; however, it is present nearby and there is potential for occurrences within the park. In Canada this species has been found in the Nitinat and Klanawa River watersheds; the lower 1 kilometre of the Klanawa River runs through PRNPR and one corydalis has been found in nearby Klanawa river ecological reserve (ecological reserve 138). Thick vegetation was noted to hamper searches of water courses (Cheewhat, Tsusiat, and Klanawa Rivers) in the West Coast Trail unit of PRNPR during 2003 and while no Scouler's corydalis plants were found their presence in the searched (or nearby water courses) was not ruled out; furthermore, this plant is dormant during the summer and would be missed during surveys (or casual observation) at this time. It is possible that this species resides within PRNPR.

Bibliography

[1] British Columbia Ministry of Water, Land and Air Protection. 2004. Scouler's Corydalis, *in* Accounts and measures for managing identified wildlife. British Columbia Ministry of Water, Land and Air Protection, Victoria, BC. 52 pp. <http://wlapwww.gov.bc.ca/wld/documents/identified/iwPDFUM030A0.pdf> (accessed: 2004-11-26).

[2] Douglas, G.W., D.V. Meidinger, and J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forest, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PDFUM030A0.pdf> (accessed: 2005-02-24).

[3] ———. 2003. Pacific Coast Trail Reconnaisance (Nitinat Narrows area) Report. Letter type report prepared by Douglas Ecological Consultants for Parks Canada. 2 pp.

[4] Fontaine, M. and G.W. Douglas. 1999. Rare Forest Plants. British Columbia Ministry of Environment Lands and Parks, Wildlife Branch, Victoria, BC. 6 pp. <http://wlapwww.gov.bc.ca/wld/documents/forestplants.pdf> (accessed: 2004-11-26).

2.9.8 *Glehnia littoralis* ssp. *leiocarpa* (American glehnia)

Other name(s) Beach silver top, Beach-carrot

Taxonomic Group Apiaceae (carrot family)

Species Presence Year-round breeding resident in and around PRNPR.

Status **NatureServe**: G5T5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3 & BLUE; **PRNPR**: P2

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations American glehnia is present at a number of sites within PRNPR (Table 2.8; M. Fairbarns pers. comm., B. Campbell pers. comm., BC CDC 2004, Cordes *et al* 1974). In the Long Beach unit it can be found in the sand dunes at Radar Beach, Schooner Cove, and Wickaninnish Beach. It has not been found in the Broken Group Islands (Bell *et al* 1973). In the West Coast Trail unit it has been found at Keeha Beach, in the Cheewhat River dunes, and on the blowout where the old Clo-oose golf course was built [44].

The number of plants in the park is likely less than 2000. Up to 1000 plants might be present in the Long Beach unit and and the number of plants in the West Coast Trail unit is not expected to be more than in Long Beach (B. Campbell pers. comm.). The true number of plants in the park may be much less than this (Table 2.8). The population appears to be stable (B. Campbell pers. comm.).

This species grows on sand beaches, sand dunes, and sand blowouts in the sand dominated shoreline ecosystem which is under great threat from exotic invasive species, specifically beachgrasses (*Ammophila* spp.; See 3.1 on page 227). The proliferation of exotic beachgrass in PRNPR is closing off sand flow to the dunes and is likely to accelerate dune succession; furthermore, beachgrass is starting to grow in the dunes themselves and poses a direct threat to species in the sand dominated shoreline ecosystem (B. Campbell pers. comm.). Populations of American glehnia in PRNPR should be periodically monitored to determine population trends and assess threats. American glehnia would benefit from from invasive species control in the sand dominated shoreline ecosystems of PRNPR.

[44]The Clo-oose golf course record is from Cordes *et al* (1974) and does not appear in BC CDC records.

Table 2.8: American glehnia (*Glehnia littoralis* ssp. *leiocarpa*) localities in Pacific Rim National Park Reserve (Cordes *et al* 1974, BC CDC 2004, N. Page pers. comm.).

Park Unit	Locality	Collector	Collection Date	Plant Number	Notes
Long Beach	Radar Beach	N.A. Page	mid 2001	< 50	sporadic in dunes
Long Beach	Schooner Cove	N.A. Page	mid 2001	< 100	sporadic in dunes
Long Beach	Long Beach, 1 mile W of Wickaninnish Lodge	P. Barclay	1968-06-26	< 250	last obs N.A. Page mid 2001: < 250 plants, sporadic in dunes
West Coast Trail	Keeha beach (48° 47' N, 124° 10' W)	R.T. Ogilvie	1983-06-23	< 25	last obs N.A. Page mid 2001; < 25 plants, sporadic in one dune / blowout
West Coast Trail	Cheewhat Dune (south if Nitinat Lake)	N.A. Page	mid 2001	< 25	sporadic in dunes
West Coast Trail	old Clo-oose golf course blowout	?	Recorded in Cordes *et al 1974*	?	

Bibliography

[1] No American glehnia specific resources, only general resources were used.

2.9.9 *Jaumea carnosa* (Fleshy jaumea)

Taxonomic Group Asteraceae (sunflower family)
Species Presence Year-round breeding resident of PRNPR and surrounding area.
Status **NatureServe**: G4G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2S3 & BLUE; **PRNPR**: Not ranked
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations Fleshy jaumea has been found at Keeha Bay in PRNPR[45] (BC CDC 2004). The population extends across most of the beach in the Fleshy jaumea–American glasswort (*Jaumea carnosa--Salicornia virginica*) band just below the high tide line. This occurrence was last observed in June 29 1998 and has an excellent estimated viability as it is of "good size and numbers" with "no disturbance" (BC CDC 2004).

This occurrence appears to be in good shape with few imminent threats; however, the last observation was over 5 years ago and the situation may have changed. This population should be monitored periodically to detect any threats or population declines early before they are of concern; this will enable early mitigation measures in the hopes of avoiding any major problems.

Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PDAST5B010.pdf> (accessed: 2005-03-14).

[45] BC CDC element occurrence feature ID: 5156

2.9.10 *Lathyrus littoralis* (Grey Beach peavine)

Taxonomic Group Fabaceae (pea family)
Species Presence Year-round breeding resident of PRNPR.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2 & RED; **PRNPR**: P1
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. It is currently under assessment by COSEWIC.

Description

> **"General**: Perennial herb from a wide-spreading rhizome; stems prostrate to erect, 10-60 cm long, angled but not winged, densely grey-silky. **Leaves**: Alternate, pinnately compound with 4 to 8 leaflets; leaflets oblong-lanceolate, 1-2 cm long, grey-silky, the axis 1.5-3 cm long, flattened and prolonged as a broad bristle but not tendril-like; stipules egg- to arrowhead-shaped, equal to or larger than the leaflets, sometimes constricted into upper and lower lobes. **Flowers**: Inflorescence a loose, long-stalked, axillary cluster of 2 to 6 pea-like flowers; corollas 12-18 mm long, the banner pink or red to purple (rarely white), 14-18 mm long, the banner-claw 2/3 as long as the blade, the wings and keel usually white, shorter than the banner; calyces 8-11 mm long, the lanceolate teeth nearly equal in size and about as long as the tube. **Fruits**: Pods, 3 cm long, 1 cm wide, grey silky-hairy; seeds 1 to 5." [1]

The flowers of this plant exude a powerful, pleasant, aromatic scent and it is often smelt long before it is seen (B. Campbell pers. comm.).

Habitat This species is found only on coastal sand dunes and beaches.

In PRNPR it can be found in fore-dune areas (such as in Wickaninnish Beach sand dunes, at the east end of Wickaninnish Bay) and in the more stable sand and buried log zone of sand beaches (at places such as Schooner Cove). It is associated with Kinnikinnick mats or the inside margin of the invasive beachgrass community. Other dune areas do occur in the park (such as Keeha Beach and Cheewhat River in the West Coast Trail unit), but this species has only been recorded in the Long Beach Unit.

Distribution Grey Beach peavine is scattered from the Queen Charlotte Islands and Vancouver Island south to northern California. It has been recorded at a few localities within the Long Beach unit of PRNPR (Table 2.9), but has not been found in the Broken Group Island or West Coast Trail units. Without more accurate locations it is not possible to know

if the two Long Beach and the one Wickaninnish Bay records represent one, two or three occurrences; Nick Page visited Wickaninnish Bay in 2003 and recorded several large patches which may include the two Long Beach localities.

Table 2.9: Grey Beach peavine (*Lathyrus littoralis*) records located in Pacific Rim National Park Reserve (BC CDC 2004, N. Page pers. comm.).

Locality	Observer	Date	Number
Schooner Cove	N.A. Page	mid 2001	10 plants
Radar Beach	N.A. Page	mid 2001	100 plants
Long Beach	Szczawinski	1957-06-09	
Long Beach	C.J. Clement	1974	
Wickaninnish Bay	J.H. Soper	1969-06-20	<250, in several large patches (N.A. Page, 2003)
Wreck (Florencia) Bay	J.K. Henry	1916-06-	

Population sizes and trends This species was considered "common" in the Wickaninnish Beach fore-dunes (Bell, 1972); however, it is likely that numbers have declined due to the invasion of exotic beachgrass (European beachgrass, *Ammophila arenaria* and American beachgrass, *A. breviligulata*) "which is progressively dominating the very area where the gray beach peavine occurs" (B. Campbell pers. comm).

There is no population estimate for all of PRNPR, but there are some counts of the plants in specific localities (Table 2.9). In addition, B. Campbell (pers. comm.) has made a rough estimate for the Wickaninnish fore-dune zone which places the number of plants in the neighbourhood of 200-600 individuals; this number is not based on actual counts but rather many years of seeing the plants. The total number of plants in PRNPR appears to be less than 1000.

Threats and limiting factors The primary threat to this species appears to be exotic invasive species, particularly European beachgrass *(A. arenaria)* and American beachgrass *(A. breviligulata*); however, disturbance by park visitors is also a threat.

Data Gaps

- There have been no recent surveys to determine distribution or estimate the population size in PRNPR.
- While the population is expected to be in decline due to exotic invaders there is no empirical data to support this.

Management Considerations Grey Beach peavine is present in PRNPR, but its population size and distribution is not well known. Anecdotal evidence indicates that the population is in decline due to an invasion of exotic beachgrass species (European beachgrass, *A. arenaria* and American beachgrass, *A. breviligulata*). Surveys are required to more accurately determine the distribution and population size of Grey Beach peavine in PRNPR and invasive species management is needed to protect this species.

It should be noted that Grey Beach peavine is a member of the sand-dominated shoreline ecosystem which harbours a number of species at risk and is itself at risk from beachgrass invasion (see 3.1 on page 227).

Bibliography

[1] No Grey Beach peavine specific resources, only general resources were used.

2.9.11 *Mimulus dentatus* (Tooth-leaved monkey-flower)

Taxonomic Group Scrophulariaceae (figwort family)

Species Presence An extant plant is very close to and possibly within the park boundary. At the very least it is resident in the surrounding ecosystem.

Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2 & RED; **PRNPR**: Not ranked

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species At Risk Act*.

Management Considerations Tooth-leaved monkey-flower is found from southern Vancouver Island south to northern California where it grows in moist forest or along stream banks. It has only been reported from two locations in British Columbia: in the northern Nitinat Lake area and at the mouth of the San Juan River (H. Roemer pers. comm.). The plant has never been seen again at Nitinat lake and the population at the mouth of the San Juan has declined from six clumps to currently only one plant; this plant is very close to—potentially within—the park boundary (H. Roemer pers. comm.). Occurrences along stream banks are likely to be transient as the locality will either be flooded by the river or succeed to unsuitable forest habitat (as is happening to the San Juan locality).

Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and BC Ministry of Forest, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PDSCR1B0X0.pdf> (accessed: 2005-01-19).

2.9.12 *Myrica californica* (California wax-myrtle)

Other name(s) California bayberry
Taxonomic Group Myricaceae (wax-myrtle family)
Species Presence Year-round occurrence in PRNPR and the immediately surrounding area.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3 & BLUE; **PRNPR**: P3
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations California wax-myrtle is a year-round occurrence in PRNPR. Two BC CDC element occurrences overlap the park (feature IDs: 2144 and 2148). It is locally abundant in the Long Beach unit: behind the top of the beach at Schooner Cove, fringing the Wickaninnish sand dunes, along the road at Grice Bay, on rocky shores fringing Grice Bay, and occasionally on outer rocky headlands such as Quisitis and Portland points; however, no where is it as dominant as at Schooner Cove (B. Campbell pers. comm.). California wax-myrtle has not been found in the Broken Group unit nor the West Coast Trail unit; it generally occurs from Gray's harbour, Washington to southern California with only an isolated population between Flores Island and the west shore of Barkley Sound.

While no population count has ever been undertaken Barry Campbell (pers. comm.) estimates the number of plants within the Long Beach unit at 3000–10000.

California wax-myrtle has a limited distribution in British Columbia, but is fairly common in PRNPR. Indeed, PRNPR appears to support a large portion of the population in British Columbia. There appear to be no immediate threats to its existence in the park; however, there appears to have been little data generated for this species. Further research should determine population size and trends as well as assess threats to this occurrence because PRNPR may represent a major stronghold for this species due to its limited distribution in Canada.

Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PDMCC02010.pdf> (accessed:2005-03-14).

2.9.13 *Oxalis oregana* (Redwood sorrel)

Taxonomic Group Oxalidaceae (wood-sorrel family)
Species Presence The British Columbia Conservation Data Centre (BC CDC) records two element occurrences for this species within PRNPR; however, they were last observed in the early to mid 1980s.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2 & RED; **PRNPR**: PHP1

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. Populations in PRNPR are protected by the *National Parks Act*.

Description Redwood sorrel is a small perennial which grows from scaly rhizomes and contains sour watery juice. Leaves are compound and clover-like with three heart shaped folded leaves attached by the narrow end to basal stocks 5–20 centimetres in length. Flowers are borne on 5–15 centimetre, hairy, brownish stems; they are 12–20 millimetres long, white to pale pink, and sometimes have red veins. Seeds are almond shaped and held in a five chambered, 7–9 millimetre long, football shaped capsule.

Habitat On Vancouver Island Redwood sorrel is found in moist, low to middle elevation, alluvial forest.

Distribution In British Columbia Redwood sorrel is a rare resident on the southern Queen Charlotte Islands and the southwest coast of Vancouver Island; it has been recorded in PRNPR.

Two BC CDC (2004) element occurrences for Redwood sorrel overlap the the West Coast Trail unit of PRNPR (Figure 2.14): One of these occurrences only slightly overlaps the park boundary near Pachena Bay while the other occurrence is completely within PRNPR (“the plants lie 200 metres from the mouth of the Klanawa River, near the cable trolley”). These occurrences were last observed in the early to mid 1980s (BC CDC 2004). The Klanawa River occurrence is part of a more extensive community that extends from PRNPR north to the Klanawa Ecological Reserve (H. Roemer pers. comm.).

Population sizes and trends No data.

Threats and limiting factors Potential disturbance by hikers.

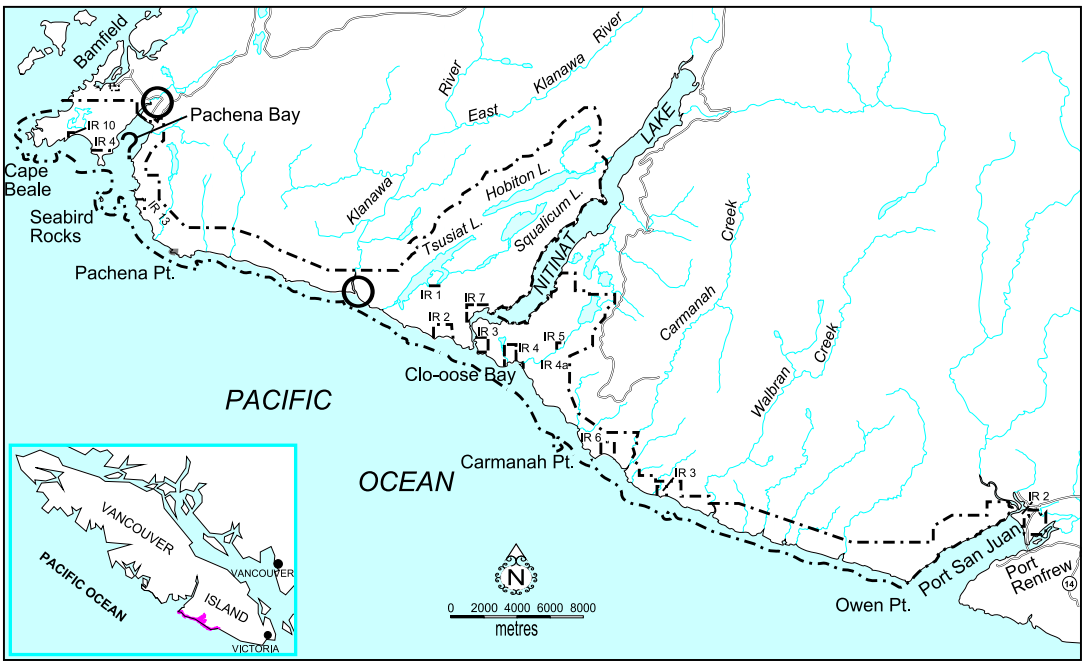


Figure 2.14: Redwood sorrel (*Oxalis oregana*) element occurrences (open circles; feature IDs: 2220, 2222) in and near Pacific Rim National Park Reserve (BC CDC 2004).

Data Gaps

- Very little information could be found concerning this species' occurrence within PRNPR: population size and trends, as well as threats all need to be assessed.

Management Considerations This species was found within PRNPR, but it was last observed in the early to mid 1980s; surveys are needed to determine its current status. Since PRNPR is on the fringe of the element occurrence near Pachena Bay it is likely that the plants from this occurrence are (or were) outside the park boundaries. The Klanawa River occurrence should be surveyed and monitored to verify that it is extant and determine the current population size and trends; threats to this population also need to be assessed and addressed. Further surveys should be conducted in suitable habitat throughout the park, especially in the vicinity of the BC CDC element occurrence near Pachena bay.

Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PDOXA010M0.pdf> (accessed: 2004-01-19).

2.9.14 *Polygonum paronychia* (Black knotweed)

Other name(s) Beach knotweed
Taxonomic Group Polygonaceae (buckwheat family)
Species Presence A number of year-round occurrences in PRNPR.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3 & BLUE; **PRNPR**: P1P2

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations Black knotweed is present at a number of sites within PRNPR (Table 2.10; M. Fairbarns pers. comm., B. Campbell pers. comm., BC CDC 2004, Bell 1972, Cordes *et al* 1974). In the long Beach unit it has been found in the sand dune blowouts at Schooner Cove and Wickaninnish Beach where Bell (1972) characterized it as common—he also mentioned that it is occasionally found in the stabilized transition zone of beaches; recently another population has been found at Radar Beach. The plant was not found in the Broken Group Islands (Bell *et al* 1973). In the West Coast Trail unit it has been found at Keeha beach, Clo-oose beach, and Cheewhat dunes; Cordes *et al* (1974) described this plant as sparse in the West Coast Trail unit.

Barry Campbell (pers. comm.) estimates that the population in the Long Beach unit is in the range of 500–1500 plants; he expects the West Coast Trail population to be equal or less than the Long Beach unit. The entire number of plants in PRNPR may well be less than 1500 plants (Table 2.10). There appears to be no data on population trends in PRNPR.

This species grows on sand beaches, sand dunes, and sand blowouts in the sand dominated shoreline ecosystem which is under great threat from exotic invasive species, specifically beachgrasses (*Ammophila* spp.; See 3.1 on page 227). The proliferation of exotic beachgrass in PRNPR is closing off sand flow to the dunes and is likely to accelerate dune succession; furthermore beachgrass is starting to grow in the dunes themselves and poses a direct threat to species in the sand dominated shoreline ecosystem (B. Campbell pers. comm.). Populations of Black knotweed in PRNPR should be periodically monitored to determine population trends and assess threats. Black knotweed would benefit from from invasive species control in the sand dominated shore line ecosystems of PRNPR.

Table 2.10: Black knotweed (*Polygonum paronychia*) localities in Pacific Rim National Park Reserve (BC CDC 2004, N. Page pers. comm.).

Park Unit	Locality	Collector / Observer	Date	Plant Number	Notes
Long Beach	Radar Beach	N.A. Page	mid 2001	< 100	sporadic in dunes
Long Beach	Schooner Cove	N.A. Page	mid 2001	< 250	sporadic in dunes
Long Beach	Long Beach	V.J. Krajina	1963-05-26		sand dunes
Long Beach	Long Beach, 1 mile W of Wickaninnish Lodge	P. Barclay	1968-06-26	< 500	last obs N.A. Page mid 2001: < 500 plants, sporadic in dunes
West Coast Trail	Keeha beach (48° 47' N, 124° 10' W)	R.T. Ogilvie	1983-06-23	< 50	last obs N.A. Page mid 2001: < 50 plants, sporadic in dunes
West Coast Trail	Clo-oose beach	H. Roemer			based on a report in email; plentiful
West Coast Trail	Cheewhat Dune	N.A. Page	mid 2001	< 250	on large dune

Bibliography

[1] No Black knotweed specific resources, only general resources were used.

2.9.15 *Romanzoffia tracyi* (Tracy's romanzoffia)

Other name(s) *R. unalaschensis*, Tracy's mistmaiden
Taxonomic Group Hydrophyllaceae (waterleaf family)
Species Presence Year-round resident of PRNPR and the surrounding area.
Status **NatureServe**: G4; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S3 & BLUE; **PRNPR**: P2

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations Tracy's romanzoffia is rare on southern and western Vancouver Island, it is more common south to northern California; it is present at a number of locations in PRNPR. Bell (1972) wrote that it is "Sparse; on headlands at Green Point, Box Island, and occurring intermittently on rocks along Long Beach and Schooner Cove". It is currently known from a number of locations in the Long Beach unit including Box Island (Schooner Cove), "Grassy Island" (a small unnamed islet ~400 metres west of the west end of Box Island), First Radar Beach, Halfmoon Bay (Wya Point), and Green Point (B. Campbell pers. comm). The BC CDC (2004) has a number of records for the Long Beach unit which are mapped as one large element occurrence (feature ID: 2112; Table 2.11). In the Broken Group Islands unit Bell *et al* (1973) describes this species as "rare; found on a few rocky islets, as near Onion and Marchant Islands, in shallow soil pockets on wet rocks; flowers early and then dies back, so is easily passed over"; however, the BC CDC (2004) has no records of this species in the Broken Group Islands. There appear to be no records of this plant in the West Coast Trail unit (Cordes *et al* 1974, BC CDC 2004).

Tracy's romanzoffia occurs in patches. In the Long Beach unit there are likely ten or fewer locations were this species is found; the population at these locations is variable from well over 2000 at "Grassy Island" to a few hundred or a dozen plants at other locations (B. Campbell pers. comm.). There appears to be no data on Tracy's romanzoffia population trends in PRNPR.

Threats to this species include trail maintenance and hiking (NatureServe 2004). Periodic monitoring is necessary to determine the health of Tracy's romanzoffia populations in PRNPR and to keep tabs on population trends in this heavily used park.

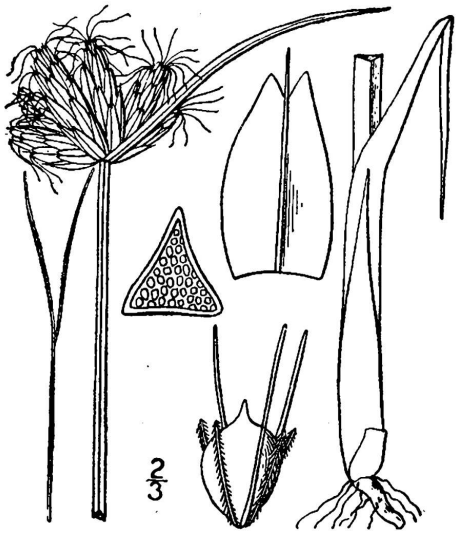
Table 2.11: Tracy's romanzoffia (*Romanzoffia tracyi*) records for the Long Beach unit of Pacific Rim National Park Reserve (BC CDC 2004).

Locality	Collector / Observer	Date	Habitat and notes
Schooner Cove	S. Kirkvold	2000-	update of old records from "long beach"
S End Of Long Beach	S. Mitchell	1966-05-22	rocky, found in crevice in rock face; wet; exp: n; slope: 90. lat/long given: 49°/125°
Long Beach	M. Benson	1963-05-18	bare rock face by sea in crevice. exp: s
Green Point	A. Harcombe	1971-05-18	alone in moist sheltered rock crevice on craggy headland; *potentilla vill.*, *plantago marit.*, exp: w; slope:10
Long Beach	M.C. Melburn	1968-06-23	@ shore on face of high rock

Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PDHYD0E030.pdf> (accessed: 2005-03-15).

2.9.16 *Schoenoplectus americanus* (Olney's bulrush)



Other Names *Scirpus olneyi*; *Scirpus americanus*; Three-square bulrush
Taxonomic Group Cyperaceae (sedge family)
Species Presence Doubtful; park studies record this species, but the records are likely misidentified specimens.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S1 & RED; **PRNPR**: Not ranked
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*.

Management Considerations There are park records for this species, but it has been suggested that these records are likely misidentified specimens of the relatively widespread *Schoenoplectus pungens* (M. Fairbarns pers. comm.). Bell (1972) records this species in the Long Beach unit and writes that it is apparently "rare in Park; in low wet ground along Sandhill Creek; prefers wet gravelly soil; flowering May-August." In the West Coast Trail unit it is "found only on the beach below Cribb's Point (near Cribb's Creek), where it was growing in large dense patches on the wet sand well below the Elymus herb community, and also in pools of brackish water trapped on the tidal flats" (Cordes *et al* 1974). However, there are no confirmed records of Olney's bulrush on the west coast and any voucher specimen's should be checked before park records of this species are believed (M. Fairbarns pers. comm.).

Bibliography

[1] No Olney's bulrush specific resources, only general resources were used.

2.9.17 *Selaginella oregana* (Oregon selaginella)

Taxonomic Group Selaginellaceae (clubmosses)
Species Presence Historical record in the Broken Group islands that has not been recently observed.
Status **NatureServe**: G4; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2S3 & BLUE; **PRNPR**: PXP1
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations Oregon Selaginella has been found in the Broken Group unit of PRNPR. The BC CDC (2004) records this species as "on leaning hemlock on the shore" in the Brabant Islands (element occurrence feature ID: 3818); this specimen is stored in the Canadian Museum of Nature Herbarium (CAN 433541) and the label information included indicates that it was collected Oct. 29, 1970 by W. B. Schofield[46] on West Brabant Island, Barclay Sound, Vancouver Island (48° 47' N, 125° 19' W) (M. Shchepanek pers. comm.)[47]. Interestingly these records indicate that this species was observed prior to the Broken Group plant survey, but it is not recorded in any PRNPR plant surveys (Bell 1972, Bell *et al* 1973, Cordes *et al* 1974).

The Brabant Island occurrence is one of only two occurrences in British Columbia [1] and needs to be field checked to verify that it is extant. There is also the possibility that there are other Oregon Selaginella occurrences to be discovered in the Broken Group.

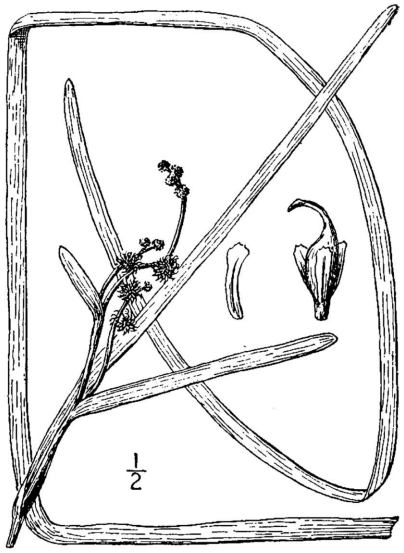
Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PPSEL010T0.pdf> (accessed: 2005-03-15).

[46] Canadian Museum of Nature Collector No. 4335948

[47] The Canadian Museum of Nature specimen was received from the University of British Columbia and Klinkenberg (2004) points to a UBC herbarium record of this species which appears to be the same specimen, but has a different date (Oct 27 1970), coordinates (48° 57' N, 125° 19' W—these coordinates are outside Barkley Sound), and habitat ("expose healand") (UBC 2000); this UBC specimen was also collected by W.B. Schofi eld (UBC Collector Number: 43365) and the discrepancies are likely data entry errors. The UBC label also indicates that this is the first specimen for British Columbia.

2.9.18 *Sparganium fluctuans* (Water bur-reed)



Other name(s) Floating bur-reed
Taxonomic Group Sparganiaceae (bur-reed family)
Species Presence Records from Broken Group and West Coast Trail units of PRNPR.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2S3 & BLUE; **PRNPR**: P2
Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*. In PRNPR this species is protected by the *National Parks Act.*

Management Considerations Water bur-reed has been found at two locations in PRNPR—both by Adolf Ceska (Table 2.12). There was one patch of Water bur-reed at the outflow of the lake on Effingham Island—the rest of the lake was not surveyed—while Cheewhat Lake contained several patches (A. Ceska pers. comm.). There appears to be no recent data on Water bur-reed populations at these locations; further surveys are necessary to confirm that these populations are extant and to determine their viability.

Table 2.12: Water bur-reed (*Sparganium fluctuans*) localities in Pacific Rim National Park Reserve (BC CDC 2004).

Park Unit	Locality	Collector	Date
Broken Group Islands	At the outflow from the lake on Effingham Island (48° 52’ N, 125° 18’ W)	A. Ceska	1990-07-28
West Coast Trail	Northeast end of Cheewhat Lake (48° 41’ N, 124° 45’ W)	A. Ceska	1986-07-28

Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PMSPA01060.pdf> (accessed: 2005-03-15).

2.9.19 *Triglochin concinna* (Graceful arrow-grass)

Taxonomic Group Naiadales (arrow-grass family)
Species Presence Rare year-round breeding resident nearby, but not known from PRNPR.
Status **NatureServe**: G5; **COSEWIC**: Not assessed; **SARA**: Not on a schedule; **BC**: S2 & RED; **PRNPR**: Not ranked

Species photos can be found on-line—
Environment Canada's Species at Risk Branch website
<http://www.speciesatrisk.gc.ca/>
CalPhotos
<http://elib.cs.berkeley.edu/photos/>
Google Image Search
<http://images.google.com/>

Status of recovery/protection This species must be assessed by COSEWIC and added to schedule one before it gains the protection of the *Species at Risk Act*.

Management Considerations This rare tidal marsh species is present in the surrounding ecosystem, but is not known from PRNPR. It is common in nearby Bamfield inlet, but plant surveys in PRNPR during the 1970s failed to find this species within park estuaries (Bell 1972, Bell *et al* 1973, Cordes *et al* 1974). There is a possibility that this plant may turn up within PRNPR.

Bibliography

[1] Douglas, G.W., D.V. Meidinger, J.L. Penny. 2002. Rare Native Vascular Plants of British Columbia 2nd. ed. British Columbia Ministry of Sustainable Resource Management and British Columbia Ministry of Forests, Victoria, BC. 359 pp. <http://wlapwww.gov.bc.ca/wld/documents/spsum/PMJCG02010.pdf> (accessed: 2005-02-25).

2.9.20 Other vascular plants of note

Barry Campbell's notes on unlisted vascular plants (plants neither assessed by COSEWIC nor on BC CDC's Red or Blue lists) that are of interest in PRNPR follow:

NOTE: The following plants have been selected by Campbell. These plants do not appear on the COSEWIC or CDC lists. They were selected because they were either very rare in the Park, or well out of their normal range, or both. Many plant species are listed in the plant inventories of Long Beach (Bell, 1972), Broken Group Islands (Bell et al, 1973) or the West Coast Trail (Cordes et al, 1974) are listed as "rare", "very rare" or "extremely rare", followed by the term "found only". It would dilute the value of this report to include all of these plants. Therefore following plants do not represent the totality of rare or unique plant species found in the Park.

2.9.20.1 *Brodiaea coronaria* (Harvest brodiaea)

This plant was found by Barbara Campbell after the plant inventory of the Long Beach unit was completed. Therefore it does not appear in the Long Beach report by Bell (1972).

All of the Brodiaea plants are found in one area, covering perhaps 10 square metres, on the backside of a rock headland/island approximately 200-250m east of the Wickaninnish Centre. The headland/island (an island at higher tides, attached to shore at lower tides) forms the west edge of a 100m long gravel/sand beach locally known as Lismer Beach (after the Group of Seven painter who regularly stayed at the nearby Wickaninnish Inn or Wickaninnish Lodge in the 1950's and 1960's). Lismer Beach is the last small cove immediately south-east of the Wickaninnish Centre and abuts the start of a large projecting headland, part of Quisitis Point.

The plants are growing on a sloping rock rib perhaps 2m above high tide level, on the "backside" (facing inland) of this island/headland. Mosses, grasses, Indian paintbrush comprise some of the associated species, a few dwarfed Sitka spruce occupy the top of the island/headland. Campbell or other park staff have not checked the patch every year, thus the year to year variation in number of plants and number of blooms is not known. However it appears there are perhaps 20-50 individual plants and 40-100 blooms on average.

The plant was found about 1976 and was last visited by Campbell in 2002-03.

2.9.20.2 *Calypso bulbosa* (Calypso orchid)

In 2002 two plants were found by Campbell adjacent to a very large cedar that grew within 5-10m of the Schooner Trail within the Long Beach unit. The tree was about 50-60m from the parking lot start of the Schooner Trail. The plants were blooming.

Calypso orchid was not found during any of the plant inventories.

2.9.20.3 *Darlingtonia californica* (Cobra plant)

This plant was discovered by some visitors, reported to Park staff, and identified by Campbell, all in fall 2003. It was the subject of some interest, being far out of its natural range (springs in forests in coastal south to central Oregon). Articles were prepared for BEN

(Botanical Electronic News) in 2004 when it came to light that someone had deliberately spread seeds of this carnivorous plant from the Shorepine Bog Trail. This has lead to further articles in BEN.

The occurrence consists of up to 4 plants found within 2 m of each other and about 1m off the boardwalk of the Shorepine Bog Trail. In contrast to the startling 30-50cm tall "cobra-like" stalks of Oregon specimens the plants in our area are only 5-6cm tall at best. They survived frosts in winter 2003-04, the outcome of winter frosts in 2004-05 is currently unknown.

2.9.20.4 *Habenaria chorisiana* (Chamisso's orchid)

Some comments from Szczawinski, A.F. 1970. The Orchids of British Columbia. Handbook No. 16. British Columbia Provincial Museum, Victoria, BC. 124 pages.

"RANGE - Alaska, British Columbia. Also Japan. DISTRIBUTION IN BRITISH COLUMBIA - extremely rare with us. First collected in the Province by John Macoun at Ucluelet and not found again for many years. Reported recently by Clader, Saville, and Taylor from three localities in the Queen Charlotte Islands. COMMENTS -.....Chamisso's orchid and Behring Island Habenaria...are undoubtedly the rarest orchids in North America.....Chamisso's orchid is known in the American continent only from Alaska (Juneau fide Anderson), Aleutian Islands (Adak, Atka, Attu, and Analaska), and British Columbia. It also occurs in Japan. Until 1957 the only record from British Columbia was from Ucluelet on the west coast of Vancouver Island. However a few additional collections came recently from the Queen Charlotte Islands.....it is one of the rarest and most interesting orchids in our Province."

This orchid was found in one bog, located inland of Browning Passage, east of Tsapee Narrows. This bog is approximately 50m in diameter and lies within low hills and knolls. Campbell has reached this isolated bog just once, in the mid 1970's. The number of orchids seen was approximately 20-30. Campbell does not know if the bog has been visited since.

This bog may well have been the site of Macoun's collection about a century ago, although it is closer to Tofino than to Ucluelet. John Macoun likely stayed in Ucluelet and ventured out from there. A primitive network of cart trails and routes along sandy beaches would have lead towards the bog. About 1910 a townsite was proposed by a fishing company for the Browning Passage/Tsapee Narrows area and a road was cut through forest from the current Grice Bay road, near Tofino airport, towards Browning Passage. A number of bridges were constructed over creeks. The road was not complete - there is a gap of several hundred meters between portions of the road, but a completed part of the road runs right beside this bog. The National Topographic System 1:50000 Tofino 92F/4 map show this "road", the Pacific Rim National Park 1:70000 map does not show the road.

2.9.20.5 *Hemitomes congestum* (Gnome plant)

This saprophytic member of the Pinesap Family was only found in the Broken Group Islands during the course of the plant inventories of the three units. In Bell et al, 1973: "extremely rare; found only on Dodd Island in deep humus in the cedar-hemlock forest; saprophyte."

In the mid-1970's Campbell found gnome plant on a in deep thick forest on a rock ridge perhaps 100m above the native village site on south Indian Island (he was climbing the peak on the island). He saw several patches of the plant. This plant is on Indian Reserve 30. In the late 1980's Campbell found more of the plant in very shaded forest behind the bay on the north side of Indian Island, perhaps 75m behind the shore at an elevation of 15-20m.

In 2004 Campbell found a few plants on the north-west slopes of Radar Hill, in very shaded second growth forest growing upon rock rubble blasted during the construction of this Cold-War era radar installation.

2.9.20.6 *Hymenophyllum wrightii*/*Mecodium wrightii* (Filmy fern)

This fern was found at one site and reported in the 1972 Long Beach plant inventory (Bell). ("This fern is rare to North America, and the park is one of only 4 collecting locations; first found in park by Cordes and Krajina (1968) in Sitka spruce fringe on decaying wood.") In volume 5 of the Illustrated Flora of British Columbia (Douglas et al): "Habitat/Range: wet shady rock cliffs and boulders in forests and epiphytic on trees in the lowland zones; infrequent in coastal BC, sporophytes rare, found only on Queen Charlotte Islands, male gametophytes known from the coast from Alaska to Long Beach, Vancouver Island; amphiberingian, North to Alaska; eastern Asia." Distribution maps in volume 8 of the Illustrated Flora of British Columbia do not show any observations/collections on Vancouver Island.

2.9.20.7 *Valeriana sitchensis* (Mountain valerian)

This member of the Valerian Family was found in both the West Coast Trail (Cordes et al, 1974) and Broken Group Islands (Bell et al, 1973) units.

In Cordes et al, 1974 (West Coast Trail unit): "very rare; found on the banks of the Klanawa River growing on shaded, mossy rocks with Viola glabella and Trautvettaria. This is normally a subalpine species, and not usually found at sea level, as in this case. In its normal habitat, Valeriana has an upright growth form, but all of the Klanawa River plants were decument or prostrate."

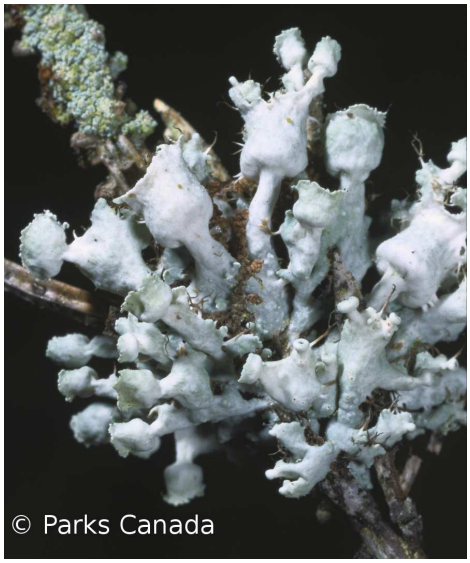
In Bell et al, 1973 (Broken Group Islands unit): "rare found only in moist soil pockets on the sheltered sides of Clarke, Benson, and Dicebox Islands."

Campbell also believes he has seen specimens growing on iron-rich cliffs on the south-east side of Wouwer Island, adjacent to the channel separating Wouwer and Howell Islands.

2.10 Lichens

2.10.1 *Heterodermia sitchensis* (Seaside Centipede lichen)

Taxonomic Group Lichenized Ascomycetes (lichens)
Species Presence Year-round breeding resident of PRNPR and the surrounding area.
Status **NatureServe**: G2G3; **COSEWIC**: Endangered, Last examination/Change: May 2000 (No Change); **SARA**: Schedule 1; **BC**: Not tracked; **PRNPR**: P2
Status of recovery/protection This species is protected under the *Species at Risk Act*. The *National Parks Act* further protects Seaside Centipede lichen sites in PRNPR. Parks Canada and the province of British Columbia are responsible for this species. A draft recovery strategy has been prepared [7].



Description The Seaside Centipede lichen is was originally described by T. Goward in 1984. Presented here is his less technical description from a recent report to Parks Canada.

> "[Seaside Centipede lichen] is a semi-erect, cushion-forming, foliose ("leaf") lichen to about 2 cm across (Figure 1). The lobes vary from short to elongate, are 1-2 mm wide, and have long thin marginal cilia ("eyelashes"). The upper surface is pale greenish, and often bears scattered whitish maculae ("spots"). Mature thalli usually have urn-shaped apothecia (sexual fruiting structures) near the lobe tips, these with prominent flaring rims that in turn bear ring-shaped soredia (powdery asexual reproductive propagules) on their inner surface. The lower surface is white and appressed-cottony." [3]

Seaside Centipede lichen is asexual and reproduces through ring shaped soredia. The soredia are enclosed in urn-shaped soralia which begin to develop early (in thalli lobes as small as 2 millimetres), but remain closed until the thallus is fully mature.

Seaside Centipede lichen is a short-lived pioneer species which must frequently disperse to new habitat as old habitat becomes unsuitable due to changes in nutrient enrichment (i.e. loss of a bird perch) or competitive exclusion (by other lichens and bryophytes) after perhaps 10–15 years.

Habitat Seaside Centipede lichen has a number of very specific habitat requirements:

- it has only been found on bark in defoliated portions of young (< 8–12 millimeters in diameter) Sitka spruce twigs within several metres of both the ground and the winter high tide line. It is generally found on live twigs (as dead twigs tend to loose their bark) and appears to favor older trees with a cylindrical canopy structure (perhaps due

to slower branch growth rates in older trees); young trees with more conical canopies rarely support Seaside Centipede lichen and those that do are generally found in conditions which cause slow growth;

- occurrences are in sheltered areas such as leeward sides of bays, inlets, islands and islets; however, one site on Wouwer Island is fully exposed to northwest winds;
- it requires high moisture levels such as in areas exposed to frequent fog or sea spray; however, excessive sea spray will kill Seaside Centipede lichen and it has been suggested that Seaside Centipede lichen can tolerate a higher level of dessication than previously thought [3];
- a further requirement is some form of nutrient enrichment (especially nitrogen): basic bedrock, bird droppings (localized areas under perches[48] or widespread fecal bombing near colonies), Sea lion haulouts (aerosol from breath and scat), Aboriginal midden sites, or simply shoreline sites or features which attract wildlife.

A recent defoliating event dating from 2000 may provide new habitat in portions of PRNPR.

Distribution Seaside Centipede appears to have a very limited world distribution: one record from Cape Lookout, Oregon and over 30 records from western Vancouver Island, British Columbia. Cape Lookout is the southern-most record and Kyuquot Sound, British Columbia is the northern-most record; however it is a small, cryptic species and likely more widespread than current finds indicate. Most sites on Vancouver Island are within PRNPR (Table 2.13). Park distribution maps can be found in [3]; the PRNPR GIS database also has locational information for this species.

Population sizes and trends In Canada 223 Seaside Centipede lichen thalli have been found, the vast majority distributed in only five localities: Florencia Islet, Wouwer Island, Folger Island, Lawrence Islets and the Spring Island area.

Both thalli numbers and health of existing thalli appears to be in decline in many areas including Florencia Islet, Wouwer Island, and the holotype location at Schooner Cove (Table 2.13). It should be noted that the location of Seaside Centipede lichen occurrences is likely dynamic; Seaside Centipede lichen must frequently colonize new sites before it is extirpated from old sites because it is a poor competitor and often relies on transient nutrient enrichment. It has also been suggested that population dynamics are cyclic with periods of decline and abundance.

Threats and limiting factors A number of threats to this species are discussed in the Recovery Strategy [7]—

- natural or anthropogenic climate changes (especially those leading to drying trends or increased severity of weather[49]),

[48] Birds whose perching behaviour could give rise to nutrient columns include the Bald Eagle, the Northwestern Crow, the Common Raven, and the Steller's Jay.

[49] Abnormally severe winter storms during the winter of 2001/2002 may have caused the loss of thalli and reduced vigour at many sites.

Table 2.13: Seaside Centipede lichen (*Heterodermia sitchensis*) locations within Pacific Rim National Park Reserve [3].

Locality	Coordinates	1991	2001	2002
Schooner Cove (Holotype Locality)	49° 04.056’ 125° 46.986’	15	1	1 (dying)
East of Schooner Cove Holotype locality	49° 04.072’ 125 46.896’	-	-	3(2 dying)
Quisitis Point (Florencia Bay North)	48° 59.899’ 125° 39.472’	-	3	-
Quisitis Point	48° 59.852’ 125° 39.552’	-	1	-
Quisitis Point	48° 59.831’ 125° 39.573’	-	1	-
Quisitis Point	48° 59.830’ 125° 39.590’	-	1	-
Florencia Islet	48° 58.775’ 125° 38.487’	-	-	8
Florencia Islet	48° 58.838’ 125° 38.556’	-	-	4
Florencia Islet	48° 58.840’ 125° 38.602’	-	-	1
Florencia Islet	48° 58.842’ 125° 38.602’	-	10	-
Florencia Islet	48° 58.832’ 125° 38.551’	-	2	-
Florencia Islet	48° 58.819’ 125° 38.526’	-	5	-
Florencia Islet	48° 58.779’ 125° 38.500’	-	13	-
Florencia Islet	48° 59.788’ 125° 39.517’	-	26	14
Florencia Islet	48° 58.858’ 125° 38.633’	-	4	-
Wouwer Island	48° 51.889’ 125° 21.314’	-	8	-
Wouwer Island	48° 53.887’ 125° 23.354’	-	15	-
Wouwer Island	48° 52.295’ 125° 21.615’	-	3	-
Wouwer Island	48° 51.752’ 125° 21.565’	-	4	-
Small Islet near Wouwer Island	48° 51.855’ 125° 21.038’	-	2	-
Wouwer Island	48° 51.829’ 125° 21.609’	-	12	6
Wouwer Island	48° 51.787’ 125° 21.720’	-	-	5
Wouwer Island	48° 51.813’ 125° 21.749’	-	-	1
Dicebox Island	48° 51.711’ 125° 20.056’	-	1	
Benson Island	48° 52.922’ 125° 22.673’	-		1

- habitat loss (foreshore development, logging, branch collection, pruning, or disturbance),

- changes in nutrient distribution or cycling pathways (change in use of Sea lion haulouts, a reduction in raptor or seabird populations, seabird colony disruption, or over fishing).

In addition to the aforementioned threats, Seaside Centipede lichen appears to be limited by its reproductive biology and habitat requirements. It is a pioneer species which must frequently colonize new habitat, but it appears to be late to mature and a poor disperser. Its habitat requirements are very specific and include young lower branches of Sitka spruce near both ground level and the high tide line in moist, sheltered areas with some form of nutrient enrichment.

Data Gaps A number of knowledge gaps exist and are discussed in the Recovery Strategy [7]. In general these data gaps pertain to the following:

- the overall distribution of Seaside Centipede lichen in British Columbia,

- the ability of localized nodes of nutrient enrichment from perching birds to sustain Seaside Centipede lichen over the long-term,

- a number of basic life history details such as which phases of life require nutrient enrichment.

Management Considerations The vast majority of Seaside Centipede lichen occurrences are located within PRNPR—most of these on Florencia Islet and Wouwer Island; thus Parks Canada has primary responsibility for the protection of this species. The recovery strategy [7] has been drafted and contains a number of recommendations for further work on this species including but not limited to the following:

- continue to survey for Seaside Centipede and other lichens both within and outside PRNPR;

- create a map of potential habitat based on prescribed site criteria;

- continue research on Seaside Centipede and associated lichens. This research should include studies of habitat and nutrient requirements, overall distribution, dispersal and development, and estimations of the amount and configuration of critical habitat needed of a self sustaining population;

- establish long-term monitoring of Seaside Centipede lichen to help determine risks, and the effectiveness of protective measures;

- further restrict camping and campfires within PRNPR to reduce the temptation to gather Sitka spruce branches for kindling.

A potential complication to management of this species is its life history. It appears that Seaside Centipede lichen must regularly colonize new habitat as previous habitat becomes unsuitable due to competition or shifts in nutrient enrichment. As a result, the existing spotty distribution may actually be a spotty distribution with a continually shifting pattern of spots. This sort of dynamic distribution, coupled with the cryptic nature of this species will make management more difficult than for static occurrences and necessitates a focus on habitat and ecosystem processes as well as existing occurrences.

Unfortunately Seaside Centipede lichen management within PRNPR may be further complicated by large external changes in ecosystem processes. Large scale factors such as climate change (natural cycles or anthropogenic) and overfishing which can alter ocean nutrient distribution and cycling may negatively affect Seaside Centipede lichen occurrences in the park.

Overall more information is needed. Research and monitoring must continue for the management of this species to be successful. Additionally, Seaside Centipede monitoring may fit into a broader environmental monitoring strategy as it, and associated species, could be used as indicator species.

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2.10.2 Other Lichens of note

During field work for Seaside Centipede lichen Trevor Goward documented eighteen other rare lichens in PRNPR including *Bryoria carlottae, Erioderma sorediatum, Heterodermia speciosa, Leioderma sorediatum, Leptogium brebissonii, Lobaria amplissima, Pannaria malmei, Parmotrema chinense, Peltigera* sp. nov., *Pilophorus robustus*, *Pseudocyphellaria mallota, Pseudocyphellaria perpetua, Ramalina subleptocarpha, Sticta* sp. nov., *Usnea ceratina, U. hesperina, U. rubicunda,* and *Vermilacinia cephalota.* Goward indicates that while none of these species have been studied in detail there is little doubt that they warrant designation by COSEWIC. More information about these incidental sightings can be found in Goward, T. 2002. The Seaside Centipede lichen (*Heterodermia sitchensis*): Notes on distribution and Ecology II. Unpublished report submitted to Parks Canada, appendix four.

Chapter 3

Ecosystem Reports

Pacific Rim National Park Reserve lies within the Coastal Western Hemlock (CWH) Biogeoclimatic Zone of British Columbia. While the large majority of the park lies in the CWHvh1 (Southern Very Wet Hypermaritime CWH) zone, two other zones are are present in the West Coast Trail unit: Inland areas of the West Coast Trail unit (mostly around Nitinat lake, but also the stretch along Port San Juan and other small portions) are in the CWHvm1 (Submontane Very Wet Maritime CWH) zone; and on Hobiton Ridge the park reaches into the CWHvm2 (Montane Very Wet Maritime CWH) zone. Within these Biogeoclimatic zones the BC CDC (2004) tracks sixteen RED or BLUE listed ecosystems (Table 3.1). The CDC has not yet mapped plant communities in the area of PRNPR and thus no BC CDC element occurrences overlap the park (C. Cadrin and M. Donovan pers. comm.; CDC 2004); however, the RED listed Large-headed sedge herbaceous vegetation community is present within PRNPR.

Overall there appears be a paucity of fine scale habitat and plant community characterization within PRNPR, but some data was available: N. Page [6] has assessed sand beaches and dunes (the BC CDC includes these habitats under the Large-headed sedge Herbaceous Vegetation plant community) within the park and three important bird areas overlap PRNPR. Much habitat within PRNPR remains to be classified in detail.

Regardless of the state of their classification, ecosystems in PRNPR—both rare and common—are threatened by invasive species. A number of invasive species pose a threat and are currently growing within PRNPR: ivy, beachgrass (*Ammophilla* spp.), Scotch broom, Blackberry, bamboo, Yellow iris (European iris), and holly to name a few (B. Campbell pers. comm.). Invasive species have already destroyed a large portion of rare native dune habitat in the park and impacted a number of species at risk in this ecosystem. Invasive species and their impacts will spread further within PRNPR, destroying more native habitat and threatening—possibly extirpating—more species without long term control and monitoring programs. This problem will continue to grow; thus control programs are better implemented sooner rather than later.

Barry Campbell (pers. comm.) has been working on invasive species in PRNPR over the years and continues to this day. His knowledge of where the invasive species are and what work he has already done should be captured for park records and should form the basis of future work. A GIS database may prove to be a useful tool for storing this data as well as tracking plant invasions and control efforts.

Table 3.1: British Columbia Conservation Data Centre tracked ecosystems at risk which are present within Biogeoclimatic Zones (BGC) of Pacific Rim National Park Reserve (BC CDC 2004).

Scientific Name	English Name	Provincial Rank	BC Status	BGC
Carex macrocephala Herbaceous Vegetation	Large-headed sedge Herbaceous Vegetation	S1S2	RED	CDFmm/00; CWHvh1/00
Picea sitchensis / Maianthemum dilatatum Very Wet Hypermaritime 1	Sitka spruce / False lily-of-the-valley Very Wet Hypermaritime 1	S2	RED	CWHvh1/08
Picea sitchensis / Rubus spectabilis Very Wet Maritime	Sitka spruce / Salmonberry Very Wet Maritime	S2	RED	CWHvm1/09
Picea sitchensis / Trisetum canescens	Sitka spruce / Tall trisetum	S2	RED	CWHvh1/09; CWHvh2/09; CWHwh1/08
Abies amabilis - Picea sitchensis / Oplopanax horridus	Amabilis Fir - Sitka Spruce / Devil's Club	S3	BLUE	CWHvm1/08; CWHvm2/08
Alnus rubra / Maianthemum dilatatum	Red alder / False lily-of-the-valley	S3	BLUE	CWHvh1/10; CWHvh2/10
Picea sitchensis / Calamagrostis nutkaensis	Sitka spruce / Pacific reedgrass	S3	BLUE	CWHvh1/16; CWHvh2/16; CWHwh1/15
Picea sitchensis / Carex obnupta	Sitka spruce / Slough sedge	S3	BLUE	CWHvh1/18; CWHvh2/18; CWHwh1/17
Picea sitchensis / Eurhynchium oreganum	Sitka spruce / Oregon beaked-moss	S3	BLUE	CWHvh1/15; CWHvh2/15; CWHwh1/14
Picea sitchensis / Malus fusca	Sitka spruce / Pacific crab apple	S3	BLUE	CWHvh1/19; CWHvh2/19; CWHwh1/18
Picea sitchensis / Polystichum munitum	Sitka spruce / Sword fern	S3	BLUE	CWHvh1/17; CWHvh2/17

Scientific Name	English Name	Provincial Rank	BC Status	BGC
Populus balsamifera ssp. *trichocarpa / Cornus stolonifera*	Black cottonwood / Red-osier dogwood	S3	BLUE	CWHdm/09; CWHds1/09; CWHds2/09; CWHmm1/09; CWHms1/08; CWHms2/08; CWHvm1/10; CWHwm/06; CWHws1/08; CWHws2/08; CWHxm1/09; CWHxm2/09
Thuja plicata - Picea sitchensis / Lysichiton americanus	Western redcedar - Sitka spruce / Skunk cabbage	S3	BLUE	CWHdm/12; CWHds1/12; CWHds2/12; CWHmm1/12; CWHms1/11; CWHms2/11; CWHvh1/13; CWHvh2/13; CWHvm1/14; CWHwh1/12; CWHwh2/06; CWHws1/11; CWHxm1/12; CWHxm2/12
Thuja plicata - Picea sitchensis / Polystichum munitum	Western redcedar - Sitka spruce / Sword fern	S2S3	BLUE	CWHvh1/05; CWHvh2/05; CWHwh1/03
Thuja plicata - Tsuga heterophylla / Polystichum munitum	Western redcedar - Western hemlock / Sword fern	S3?	BLUE	CWHmm1/04; CWHmm2/04; CWHvm1/04; CWHvm2/04
Tsuga heterophylla - Picea sitchensis / Rhytidiadelphus loreus	Western hemlock - Sitka spruce / Lanky moss	S3	BLUE	CWHvh1/04; CWHvh2/04; CWHwh1/01; CWHwh2/01

3.1 Sand dominated shoreline

Sand dominated shoreline (beaches and dunes) are a rare ecosystem type in British Columbia and PRNPR contains a large percentage of this ecosystem on the west coast of Vancouver Island. This ecosystem is included under the RED listed (S1S2) Large-headed sedge herbaceous vegetation plant community (Table 3.1). N. Page [6] has assessed plant communities in sand beaches and dunes on western Vancouver Island, his work included a number of beaches in PRNPR (Figure 3.1; Tables 3.3, and 3.3); N. Page's study area (104 hectares) included the majority of sand beach and dune habitat on the west coast of Vancouver Island and 38.27 percent of it was in PRNPR.

The following information is derived from Page [6]. A number of the rarest sand-dominated shoreline plant communities in are found in PRNPR (Table 3.3): The Dune bluegrass sparse vegetation association appears to be rare (not present at many sites on the West Coast of Vancouver island), but locally common where it does occur; it is present on a number of beaches in PRNPR and is prevalent at Wickaninnish Beach. The Kinnikinnick dwarf shrubland vegetation community was found on five beaches in PRNPR and only four other beaches on the rest of western Vancouver Island; overall this community has a very low abundance on the West Coast of Vancouver Island. The Red fescue–Coastal strawberry herbaceous vegetation community is uncommon and while it is only found in abundance on the northern end of Vancouver Island, this community was found on four beaches in PRNPR.

Invasive exotic plants are the primary threat to this ecosystem in PRNPR (N. Page pers. comm.). The American Searocket–Gmelin's orache sparse vegetation community and the European beachgrass herbaceous vegetation community are are present on most beaches within PRNPR; both of these communities are dominated by exotic species. Beachgrass is a huge problem along the pacific coast of the U.S. and a variety of methods have been developed to control it [7]. Exotic beachgrass invasion has driven many plants and plant communities to near extirpation in the U.S. and poses a similar threat in PRNPR (Figures 2.13 and 3.2). Indeed, there are a number of at risk species in the dune ecosystems of PRNPR including the red listed Pink sand-verbena and Gray beach pea, as well as the blue listed Yellow sand-verbena, Beach bindweed, Black knotweed, and American glehnia. Scotch broom also threatens the sand ecosystem in the Long Beach unit (B. Campbell pers. comm.). Beachgrass and other exotic invasive species must be controlled: their advance into, and alteration of the remaining native habitats must be stopped and degraded habitat must be restored in the sand beach and dune ecosystems of PRNPR if native habitats, species, and plant associations are to be maintained in the park.

Disturbance such as trampling by park visitors is another significant threat to this ecosystem (N. Page pers. comm.). Trampling can be as important as soil water content in affecting the presence and distribution of dune plants [5]; further literature research and possibly field studies in PRNPR are warranted to determine to overall impact of this type of disturbance within the park. Mitigation measures may be necessary.

Other factors affecting this ecosystem which should be considered in any management plant are log debris accumulation and the natural cycles of sediment movement; tsunamis may have initiated some of the dunes and may be a factor in a long term cycle of dune creation (N. Page pers. comm., B. Campbell pers. comm.).

The park rank for the sand dominated shoreline ecosystem in PRNPR is likely P1. This

rank has been assessed primarily because this ecosystem represents a very small area of the park (approximately 0.4 km^2) and much of it is already heavily invaded by exotic beach grass.


a


b


c


d


e


f


g

Figure 3.1: Plant associations of sand beaches on the west coast of Vancouver Island: a) American Searocket–Gmelin‘s orache [*Cakile edentula-Atriplex gmelinii*] Sparse Vegetation (Vargas Island); b) Dune wildrye–Beach pea [*Leymus mollis* spp. *mollis-Lathyrus japonicus*] Herbaceous Vegetation (Vargas Island); c) Red fescue–Coastal strawberry [*Festuca rubra--Fragaria chiloenis*] Herbaceous Vegetation (Guise Bay); d) European beachgrass [*Ammophila arenaria*] Herbaceous Vegetation (Vargas Island); e) Kinnikinnick [*Arctostaphylos uva-ursi*] Dwarf Shrubland Vegetation (Schooner Cove, PRNPR); f) Oregon beaked-moss / Salal [*Eurhynchium oreganum* / *Gaultheria shallon*] Shrubland Vegetation; and g) Dune bluegrass [*Poa macrantha*] Sparse Vegetation (Wickaninnish Beach, PRNPR). All photos by N.A. Page, 2001; 2002. Figure reproduced with permission from [6].

Table 3.2: Summary descriptions of floristically-defined plant associations including characteristic species and environmental characteristics. Species richness values are mean number of species per 4 metre plot. Characteristic species are ranked according to their frequency (% of plots in which they were present) in the association. * denotes an exotic species. Adapted from [6].

Plant Association	General Description of Vegetation and Soil Chemistry	Characteristic Species
Association 1: American Searocket–Gmelin's orache [*Cakile edentula-Atriplex gmelinii*] Sparse Vegetation	Common, sparsely vegetated, species-poor, lower beach community; high disturbance from waves and tides; generally fine sand substrates. Vegetation characteristics: mean percent cover 8.7%; mean percent bryophyte and lichen cover 0.0%; mean species richness: 2.2 species. Soil chemistry characteristics: mean soil pH 8.07; %N 0.004; %C 0.100	*Cakile edentula**, *Cakile maritime**, *Atriplex gmelinii, Honkenya peploides, Rumex maritimus, Leymus mollis* spp. *mollis*.
Association 2: Dune wildrye–Beach pea [*Leymus mollis* spp. *mollis-Lathyrus japonicus*] Herbaceous Vegetation	Common, native upper beach community; may have declined because of development of European beachgrass (*Ammophila arenaria*) Herbaceous Vegetation association. Vegetation characteristics: mean percent cover 40.5%, mean percent bryophyte and lichen cover 7.8%; mean species richness: 4.5 species. Soil chemistry characteristics: mean soil pH 7.29; %N 0.012; %C0.232	*Leymus mollis* spp. *mollis, Lathyrus japonicus, Vicia gigantea, Rubus spectabilis, Fragaria chiloensis, Epilobium ciliatum, Eurhynchium oreganum*.
Association 3: Red fescue–Coastal strawberry [*Festuca rubra-Fragaria chiloenis*] Herbaceous Vegetation	Late-successional meadow community with organic-rich substrates; species-rich and productive; tall grasses and forbs; shrubs occasional; includes wet dune slacks in depressional areas. Vegetation characteristics: mean percent cover 96.3%; mean percent bryophyte and lichen cover 17.5%; mean species richness: 9.3 species. Soil chemistry characteristics: mean soil pH 6.10; %N 0.043; %C 0.566	*Festuca rubra, Fragaria chiloensis, Achillea millefolium, Poa pratensis, Dactylis glomerata**, *Equisetum arvense, Juncus breweri, Plantago lanceolata**, Aster species, *Taraxacum officinalis**, *Hypochaeris radicata**, *Rhytidiadelphus triquetrus, Holcus lanatus**.

Plant Association	General Description of Vegetation and Soil Chemistry	Characteristic Species
Association 4: European beachgrass [*Ammophila arenaria*] Herbaceous Vegetation	Dry, open meadow dominated by European beachgrass. Includes fore-dune ridge and stabilized dune areas. Shrub cover generally absent. Bryophytes and lichens common. Vegetation characteristics: mean percent cover 61.6%; mean percent bryophyte and lichen cover 21.1%; mean species richness: 9.0 species. Soil chemistry characteristics: mean soil pH 6.46; %N 0.018; %C 0.266	*Ammophila arenaria**, *Aira praecox**, *Leymus mollis* spp. *mollis*, *Hypochaeris radicata**, *Lathyrus japonicus*, *Fragaria chiloenis*, *Cladonia* species, *Ceratodon purpurea*, *Ammophila breviligulata**, *Peltigera* species.
Association 5: Kinnikinnick [*Arctostaphylos uva-ursi*] Dwarf Shrubland Vegetation	Distinct mat of Kinnikinnick along margin of dunes and between the upper beach and conifer forest. Relatively species-rich bryophyte and lichen layer. Vegetation characteristics: mean percent cover 103.7%; mean percent bryophyte and lichen cover 25.5%; Mean species richness: 8.1 species. Soil chemistry characteristics: mean soil pH 5.92; %N 0.011; %C 0.252	*Arctostaphylos uva-ursi*, *Ammophila arenaria**, *Gaultheria shallon*, *Hypochaeris radicata**, *Eurhynchium oreganum*, *Aira praecox**, *Leptogium corniculatum*, *Cladonia* species, *Peltigera* species.
Association 6: Oregon beaked-moss / Salal [*Eurhynchium oreganum* / *Gaultheria shallon*] Shrubland Vegetation	Late-successional phase which includes shrub and tree seedling dominated fringe along forest edge. Transitional from Kinnikinnick Dwarf Shrubland Vegetation. Vegetation characteristics: mean percent cover 105.4%; mean percent bryophyte and lichen cover 38.3%; mean species richness: 11.2 species. Soil chemistry characteristics: mean soil pH 5.88; %N 0.023; %C 0.489	*Eurhynchium oreganum*, *Gaultheria shallon*, *Picea sitchensis*, *Vaccinium ovatum*, *Ammophila arenaria**, *Aira praecox**, *Tsuga heterophylla*, *Leymus mollis* spp. *mollis*, *Hypochaeris radicata**, *Peltigera* species.
Association 7: Dune bluegrass [*Poa macrantha*] Sparse Vegetation	Regionally rare but locally abundant plant association; generally species-poor with very sparse plant cover (<5%); actively moving sand surface in some areas. Vegetation characteristics: mean percent cover 3.4%; mean percent bryophyte and lichen cover 0.1%; mean species richness: 3.5 species. Soil chemistry characteristics: mean soil pH 6.31; %N 0.004; %C 0.057	*Poa macrantha*, *Polygonum paronychia*, *Abronia latifolia*, *Glehnia leiocarpa*, *Carex macrocephala*, *Convolvulus soldanella*, *Poa confinis*, *Tanacetum bipinnatum*.

Table 3.3: Sand beach and dune plant communities present in Pacific Rim National Park Reserve [6].

PRNPR unit	PRNPR Beach	Plant Association[a]
Long Beach	Radar Beach	1, 2, 4, 5, 6, 7
Long Beach	Schooner Cove	1, 4, 5, 6, 7
Long Beach	Wickaninnish Beach	1, 2, 3, 4, 5, 6, 7
Long Beach	Florencia Bay	1, 2, 3, 6
West Coast Trail	Keeha Bay	1, 2, 5, 6, 7
West Coast Trail	Pachena Bay	1, 2, 3, 7
West Coast Trail	Cheewhat Beach	1, 2, 3, 4, 5, 6, 7

[a]Plant associations: **1**) American Searocket–Gmelin's orache [*Cakile edentula-Atriplex gmelinii*] Sparse Vegetation; **2**) Dune wildrye–Beach pea [*Leymus mollis* spp. *mollis-Lathyrus japonicus*] Herbaceous Vegetation; **3**) Red fescue–Coastal strawberry [*Festuca rubra-Fragaria chiloenis*] Herbaceous Vegetation; **4**) European beachgrass [*Ammophila arenaria*] Herbaceous Vegetation; **5**) Kinnikinnick [*Arctostaphylos uva-ursi*] Dwarf Shrubland Vegetation; **6**) Oregon beaked-moss / Salal [*Eurhynchium oreganum* / *Gaultheria shallon*] Shrubland Vegetation; and **7**) Dune bluegrass [*Poa macrantha*] Sparse Vegetation.


a


b

Figure 3.2: Dune habitat behind the exotic beachgrass dominated fore-dune at Wickaninnish Beach, Pacific Rim National Park Reserve. a) Large-headed sedge behind a wall of beachgrass b) the dune area inland of photo a). Photos by C. Webb fall 2004.

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3.2 Other areas of Conservation Value

3.2.1 Important Bird Areas

The Canadian Nature Federation and Bird Studies Canada have partnered with BirdLife International to maintain a list of areas which provide essential habitat for one or more bird species—they maintain an on-line map and database of these areas[1]. Three of these Important Bird Areas overlap PRNPR (Figure 3.3):

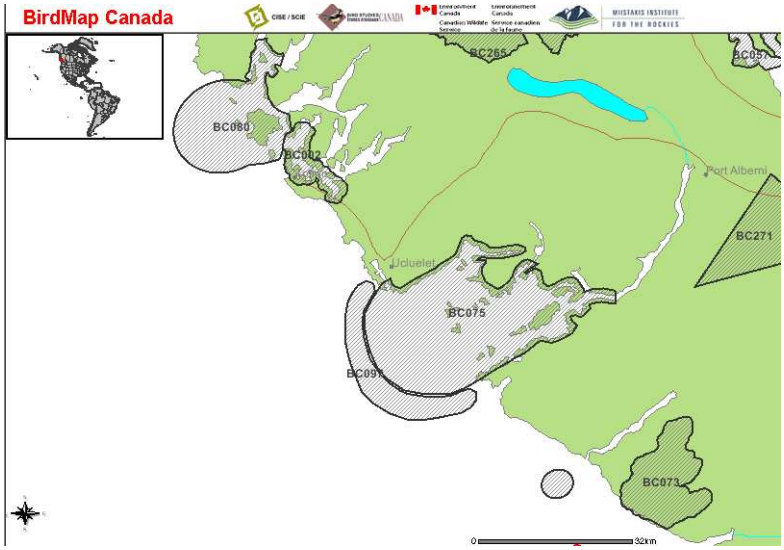

Figure 3.3: Important Bird Areas on Vancouver Island near Pacific Rim National Park Reserve. Source: Bird Studies Canada's interactive mapping application BirdMap Canada, 2005. <http://www.bsc-eoc.org/birdmap_e.htm#>.

- BC002, Tofino Mudflats—This IBA includes all of Grice Bay (Long Beach unit of PRNPR). It is important for a number of bird species including Pacific Great Blue heron and Western sandpiper as well as numerous other Shorebirds and Waterfowl. It has been designated because of its global significance (Congregatory Species, Shorebird Concentrations) and continental significance (Congregatory Species). The site summary can be viewed on-line[2].

- BC075, Barkley Sound—This IBA encompasses all of Barkley sound which includes all of the broken group unit of PRNPR. It is important to a number of bird species including Marbled murrelets, Surf scoters, Mew gull, Western grebes, Surfbirds, Brandt's cormorants, Black oystercatchers, and Glaucous-winged gulls. It has been designated because of its global significance (to threatened and congregatory species, as well as high waterfowl concentrations) and its national significance (to congregatory species). The site summary can be viewed on-line[3].

[1] http://www.bsc-eoc.org/iba/regional.jsp
[2] http://www.bsc-eoc.org/iba/site.jsp?siteID=BC002&lang=EN
[3] http://www.bsc-eoc.org/iba/site.jsp?siteID=BC075&lang=EN

- BC073, Carmanah Walbran Forest—A very small portion of this IBA overlaps PRNPR in the West Coast Trail unit. It is important to the Marbled murrelet. It has been designated because of its national significance to a threatened species (the Marbled murrelet). The site summary can be viewed on-line[4].

[4]http://www.bsc-eoc.org/iba/site.jsp?siteID=BC073&lang=EN

Chapter 4

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Appendix A

NatureServe Ranks

A.1 Global Conservation Status Definitions

Listed below are definitions for interpreting NatureServe global conservation status ranks (G-ranks). These ranks reflect an assessment of the condition of the species or ecological community across its entire range. Where indicated, definitions differ for species and ecological communities.

A.1.1 NatureServe Global Conservation Status Ranks

A.1.1.1 Basic Ranks

GX Presumed Extinct (species)—Not located despite intensive searches and virtually no likelihood of rediscovery.
Eliminated (ecological communities)—Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.

GH Possibly Extinct (species)—Missing; known from only historical occurrences but still some hope of rediscovery.
Presumed Eliminated— (Historic, ecological communities)-Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration, for example, American Chestnut Forest.

G1 Critically Imperiled—At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.

G2 Imperiled—At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.

G3 Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.

G4 Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

G5 Secure—Common; widespread and abundant.

A.1.1.2 Variant Ranks

G#G# Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the status of a species or community. Ranges cannot skip more than one rank (e.g., GU should be used rather than G1G4).

GU Unrankable—-Currently unrankable due to lack of information or due to substantially conflicting information about status or trends. Whenever possible, the most likely rank is assigned and the question mark qualifier is added (e.g., G2?) to express uncertainty, or a range rank (e.g., G2G3) is used to delineate the limits (range) of uncertainty.

GNR Unranked—Global rank not yet assessed.

GNA Not Applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

A.1.1.3 Rank Qualifiers

? Inexact Numeric Rank—Denotes inexact numeric rank (e.g., G2?)

Q Questionable taxonomy—Taxonomic distinctiveness of this entity at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority conservation priority.

C Captive or Cultivated Only—At present extant only in captivity or cultivation, or as a reintroduced population not yet established.

A.1.1.4 Infraspecific Taxon Conservation Status Ranks

Infraspecific taxa refer to subspecies, varieties and other designations below the level of the species. Infraspecific taxon status ranks (T-ranks) apply to plants and animal species only; these T-ranks do not apply to ecological communities.

T# Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles outlined above for global conservation status ranks. For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T-rank cannot imply the subspecies or variety is more abundant than the species as a whole-for example, a G1T2 cannot occur. A vertebrate animal population, such as those listed as distinct population segments under under the U.S. Endangered Species Act, may be considered an infraspecific taxon and assigned a T-rank; in such cases a Q is used after the

T-rank to denote the taxon's informal taxonomic status. At this time, the T rank is not used for ecological communities.

A.2 National and Subnational Status Definitions

Listed below are definitions for interpreting NatureServe conservation status ranks at the national (N-rank) and subnational (S-rank) levels. The term "subnational" refers to state or province-level jurisdictions (e.g., California, Ontario).

Assigning national and subnational conservation status ranks for species and ecological communities follows the same general principles as used in assigning global status ranks. A subnational rank, however, cannot imply that the species or community is more secure at the state/province level than it is nationally or globally (i.e., a rank of G1S3 cannot occur), and similarly, a national rank cannot exceed the global rank. Subnational ranks are assigned and maintained by state or provincial natural heritage programs and conservation data centers. National (N) and Subnational (S) Conservation Status Ranks

NX,SX Presumed Extirpated—Species or community is believed to be extirpated from the nation or state/province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

NH,SH Possibly Extirpated (Historical)—Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become NH or SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The NH or SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.

N1,S1 Critically Imperiled—Critically imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

N2,S2 Imperiled—Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

N3,S3 Vulnerable—Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

N4,S4 Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

N5,S5 Secure—Common, widespread, and abundant in the nation or state/province.

NNR,SNR Unranked—Nation or state/province conservation status not yet assessed.

NU,SU Unrankable—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

NNA,SNA Not Applicable—A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

N#N#,S#S# Range Rank—A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

Not Provided Species is known to occur in this nation or state/province. Contact the relevant natural heritage program for assigned conservation status. Contact information for individual natural heritage programs is available at the website[1].

A.2.1 Qualifiers

A.2.1.1 Breeding Status Qualifiers

B Breeding—Conservation status refers to the breeding population of the species in the nation or state/province.

N Nonbreeding—Conservation status refers to the non-breeding population of the species in the nation or state/province.

M Migrant—Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the nation or state/province.

Note A breeding status is only used for species that have distinct breeding and/or non-breeding populations in the nation or state/province. A breeding-status S-rank can be coupled with its complementary non-breeding-status S-rank if the species also winters in the nation or state/province, and/or a migrant-status S-rank if the species occurs regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. The two (or rarely, three) status ranks are separated by a comma (e.g., "S2B,S3N" or "SHN,S4B,S1M").

A.2.1.2 Other Qualifiers

? Inexact or Uncertain—Denotes inexact or uncertain numeric rank. (The ? qualifies the character immediately preceding it in the S-rank.)

[1] http://www.natureserve.org/visitLocal/index.jsp

Appendix B

Park Ranks

B.1 Protected Area Status Status Definitions

The following is quoted from "Detailed Assessment Form Status Ranking for Parks Canada Agency
Draft v1", Appendix 1:

Status Definition

X Presumed Extirpated—Species or community is believed to be extirpated from the PA (or GPE). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.

H Possibly Extirpated (Historical)—Species or community occurred historically in the PA (or GPE), and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become H without such a 20-40 year delay if the only known occurrences in a PA or GPE were destroyed or if it had been extensively and unsuccessfully looked for. The H rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.

1 Critically Imperiled—Critically imperiled in the PA (or GPE) because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.

2 Imperiled—Imperiled in the PA (or GPE) because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the PA or GPE.

3 Vulnerable—Vulnerable in the PA (or GPE) due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.

4 Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.

5 Secure—Common, widespread, and abundant in the PA (or GPE).

U Unrankable—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

NA Not Applicable —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

P#P# Range Rank —A numeric range rank (e.g., P2P3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., PU is used rather than P1P4).

B.2 Breeding Status Qualifiers

Qualifier Definition

B Breeding—Conservation status refers to the breeding population of the species in the PA (or GPE).

N Nonbreeding—Conservation status refers to the non-breeding population of the species in the PA (or GPE).

M Migrant—Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the PA (or GPE).

Note: A breeding status is only used for species that have distinct breeding and/or non-breeding populations in the nation or state/province. A breeding-status S-rank can be coupled with its complementary non-breeding-status S-rank if the species also winters in the nation or state/province, and/or a migrant-status S-rank if the species occurs regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. The two (or rarely, three) status ranks are separated by a comma (e.g., "S2B,S3N" or "SHN,S4B,S1M").

B.3 Other Qualifiers

Rank Definition

? Inexact or Uncertain?Denotes inexact or uncertain numeric rank. (The ? qualifies the character immediately preceding it in the rank.)

Appendix C

Species summary list

Summary table of species at risk found or with potential to be found in PRNPR. Note that this is not not a comprehensive list of potential species. The table starts on the next page.

Park Presence Codes:

P Probably Present

Y Present year round and breeds,

B Present only as temporary, breeding Element,

N Present year round, non-breeding Element,

T Present only as transient, non-breeding Element,

H Historically Present,

E Extirpated,

A Accidental = (seen less than once every 10 years),

? No Information on presence or absence,

F False record.

S Rank Codes: See Appendix A; NA indicates that a species is not ranked by the BC CDC
P Rank Codes: See Appendix B

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Amhibia (Amphibians)						
Bufo boreas	Western toad	Y, possibly N	S4	Special Concern	P2P3	This species, including young, has been seen within the park; however, breeding has not been confirmed
Rana aurora aurora	Red-legged frog	Y, or N	S3S4	Special Concern	P2P3	Adults are known from the park, but breeding has not been confirmed
Aves (Birds)						
Accipiter gentilis laingi	Northern goshawk laingi subspecies	Y, or N	S2B, SZN	Threatened	P1P2B, PNAN	Seen in PRNPR and while breeding has not been confirmed it is likely.
Ardea herodias fannini	Great Blue heron fannini subspecies	N, possibly Y	S3B, S4N	Special Concern	P3P4N	Pacific Great Blue herons are present in all PRNPR units all year-round, but only non-breeding birds have been confirmed; there is a possibility that limited breeding occurs or will occur in PRNPR.
Asio flammeus	Short-eared owl	T	S3B, S2N	Special Concern	PNAN	Small numbers of Short-eared owls have been seen in PRNPR, but they do not breed in the area.
Brachyramphus marmoratus	Marbled murrelet	Y	S2B, S4N	Threatened	PUB, P3N	Marbled murrelets have been detected on the water in all units of PRNPR and breeding is expected in the park—at least limited breeding in the inland areas near Nitinat Lake.
Branta canadensis occidentalis	Canada goose, occidentalis subspecies	Potentially T	S1N	Not Assessed	Not ranked	"Thus we have geese heading north some distance offshore in the last half of April—these may be the occidentalis subspecies. The geese heading south in August are a bit of a mystery." (B. Campbell written comm. to C. Webb)

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Butorides virescens	Green Heron	A	S3S4B, SZN	Not Assessed	Not ranked	Very few records in surrounding area, none in PRNPR
Columba fasciata	Band-tailed pigeon	Y	S3S4B, SZN	Not Assessed	PU	This species is present in PRNPR, but further information is needed to fill many information gaps.
Falco peregrinus anatum	Peregrine falcon anatum subspecies	Not likely Present	S2B, SZN	Threatened	Not ranked	Peregrine falcons are present, within and around PRNPR; they are also known to breed in the area—though there are very few breeding records within PRNPR. The subspecies present in PRNPR is not confi rmed but likely pealei.
Falco peregrinus pealei	Peregrine falcon pealei subspecies	Y	S3B, SZN	Special Concern	PHP1B, PNAN	Peregrine falcons are present, within and around PRNPR; they are also known to breed in the area—though there are very few breeding records within PRNPR. The subspecies present in PRNPR is not confi rmed but likely pealei.
Fratercula cirrhata	Tufted puffi n	Y	S3B, S4N	Not Assessed	P1B, PNAN	Present in all units of PRNPR., nests at Sea Bird Rocks, and perhaps Florencia Islet.
Glaucidium gnoma swarthi	Northern pygmy-owl, swarthi subspecies	Y	S3	Not Assessed	PU	"known to have been present in Park area, but very rare. Current status unknown." (B. Campbell written comm. to C. Webb)

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Icteria virens auricollis (British Columbia population)	Yellow-breasted chat auricollis subspecies	A	S1B	Endangered	Not ranked	"Two records: one Ucluelet summer 66, on Carmanah Pt. fall 70; This bird is not listed in the 1985 Birds of Pacific Rim pamphlet, nor the 1978 Birds of Pacific Rim N.P. book, nor the 1973 Birds of Pacific Rim National Park study. The bird is listed as "accidental" (meaning "five or fewer records") in the 2002 WPT Pocket Checklist. All records appear to be in autumn season. The book, Birds of British Columbia, Volume 4 (Campbell, Dawe, McTaggart-Cowan et al) lists the bird as casual on western Vancouver Island. Sightings have occurred at Ucluelet (August 1966) and at Carmanah Point (West Coast Trail unit)(October 26, 1950)" (B. Campbell written comm. to C. Webb)
Megascops kennicottii kennicottii	Western screech-owl kennicottii subspecies	N or Y	S3	Special Concern	P2	The Western screech-owl is present and likely breeds in PRNPR.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Melanitta perspicillata	Surf scoter	N	S3B, S4N	Not Assessed	Not ranked	"Surf scoters are a part of all park units and found in both protected and exposed waters." (B. Campbell written comm. to C. Webb). Only the breeding occurrence is BLUE listed (S3B), the non-breeding rank (S4N) equates to the YELLOW list; only non-breeding birds are present in PRNPR; however, the BC CDC does have two element occurrences (large feeding concentrations) for this species in the Broken Group islands (feature IDs: 4294, 4292).
Numenius americanus	Long-billed curlew	A	S3B, SZN	Special Concern	Not ranked	Transient migrant or lost if present; "does not appear in the 1985 Birds of Pacific Rim National Park checklist, nor the 1978 Birds of PRNP book, nor the 1973 Birds of PRNP study. It is listed as "casual" in spring in the 2002 WPT Pocket Checklist pamphlet. Volume 2 of the Birds of British Columbia book series says that on the south coast (lower mainland and Vancouver Island) it is a rare spring migrant, and casual in the summer and autumn and accidental in winter. Sightings include Tofino Inlet (outside of Long Beach unit) in May 1983. Appears to be very rare in our area. Breeds in southern dry interior" (B. Campbell written comm. to C. Webb)

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Oreoscoptes montanus	Sage thrasher	A	S1B	Endangered	Not ranked	Spring accidental.; "no records in the 1973 Bird study, the 1978 Birds of PRNP book, nor the 1985 Birds of Pacific Rim National Park checklist. It appears in the 2002 WPT Pocket Checklist as "accidental" (five or fewer records) in the spring season. The third volume of The Birds of British Columbia (1997) has one record of this bird on the west coast of Vancouver Island—at Grant Bay, near Cape Scott May 1969. All coastal B.C. records are from 1969 to 1990 and not since (Birds of BC book). Nesting is in interior BC (barely), with most breeding distribution in U.S. dry western states. (B. Campbell written comm. to C. Webb)
Phalacrocorax penicillatus	Brandt's cormorant	Y	S1B, S4N	Not Assessed	PHP1B, P4PNAN	Brandt's cormorants are present year-round in all units of PRNPR and are known to have bred in the Long Beach unit and near the Broken Group unit.
Phoebastria albatrus	Short-tailed albatross	A	SZN	Threatened	Not ranked	Pelagic Bird present offshore of PRNPR

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Pinicola enucleator carlottae	Pine grosbeak, carlottae subspecies	A or T	S3B, SZN	Not Assessed	Not ranked	"4 sightings of...in the 1973 bird study The Birds of Pacific Rim National Park; Ucluelet during winter, 1970, about 15 birds near the Kennedy Lake swim beach (Kennedy Lake unit of the Park(November 1971, one at the head of Ucluelet Inlet January 1972, and one bird near the boat launch site at Grice Bay March 1972...The 1978 Birds of Pacific Rim National Park adds two sightings in January 1974 on the Rain Forest Trail and at Long Beach (2 birds each sighting)....There appears to be no more additional sightings relating to the Park region that have been reported in the Birds of British Columbia Volume 4 Passerines (2001)." (B. Campbell written comm. to C. Webb)

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Pooecetes gramineus affi nis	Vesper mparrow, affi nis subspecies	A	S1B	Not Assessed	Not ranked	"The Birds of British Columbia Volume 4 Passerines (2001) lists the vesper sparrow as is a casual visitor to western Vancouver Island and the Northern Mainland coast. Occurrences happen in the mid-April to mid-May period. Apparently there were only 2 specimen records and 10 observational records prior to 1947 for Vancouver Island and the lower Mainland region. Since 1970 there have been sightings every year but one. This book has a record of a bird on the Wickaninnish sand dunes on May 7, 1969 and again on April 25, 1981. The bird is not mentioned in the study birds of Pacifi c Rim National Park (1973) nor in the book Birds of Pacifi c Rim National Park (1978) . It is listed as "accidental" in the 1985 Birds of Pacifi c Rim National Park checklist, and as "accidental" ("fi ve or fewer records") in the 2002 WBT Pocket Checklist to the Birds of the West Coast of Vancouver Island British Columbia (Adrian Dorst, compiler)." (B. Campbell written comm. to C. Webb)

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Progne subis	Purple martin	A	S2B	Not Assessed	Not ranked	"not mentioned in either the 1973 study Birds of Pacific Rim National Park nor the 1978 book Birds of Pacific Rim National Park. It is listed as "very rare" ("may not be seen every year") in the 1985 Birds of Pacific Rim National Park checklist and as "accidental" ("five or fewer records") in the 2002 WBT Pocket Checklist of the Birds of the West Coast of Vancouver Island British Columbia. Volume 3 of the Birds of British Columbia (1997) lists the bird as "accidental" on the west side of Vancouver Island. Appearances occurred in July—there is one record of 1 bird in Tofino July 11, 1979." (B. Campbell written comm. to C. Webb)
Ptychoramphus aleuticus	Cassin's auklet	Y	S2S3B, S4N	Not Assessed	P1B, PNAN	Pelagic bird seen rarely year-round and breeds in park on Sea Bird Rocks
Puffinus creatopus	Pink-footed shearwater	A or T	SZN	Threatened	Not ranked	Pelagic Bird which rarely enters PRNPR waters
Sialia mexicana pop. 1	Western bluebird (Georgia Depression population)	A?	SHB, SZN	Not Assessed	Not ranked	"the 2002 WBT Pocket Checklist to the Birds of the West Coast of Vancouver Island British Columbia the western bluebird is shown as "accidental" ("five or fewer records") in the fall. In Volume 3 of the Birds of British Columbia (1997) the bird's status is casual on western Vancouver Island. The fall record was not listed in this book."(B. Campbell written comm. to C. Webb)

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Sturnella neglecta	Western meadowlark	T	S4S5B, SZN	Not Assessed	Not ranked	A few individuals of this species occasionally pass through the area during migration. There are a few records in the area and "Barry Campbell has seen the bird several years in the fall in the foredune area of the Wickaninnish Beach sand dunes (south end of Long Beach). Always only one bird is seen." (B. Campbell written comm. to C. Webb).
Synthliboramphus antiquus	Ancient murrelet	T, unlikely B	S2S3B, S4N	Special Concern	PNA	While there are some records within in PRNPR waters, Ancient murrelets are primarily marine and generally forage along the continental shelf and slope; their presence in the marine portions of PRNPR is very limited. There is some evidence that Ancient murrelets may occasionally breed south of the Queen Charlotte Islands
Uria aalge	Common murre	Y	S2B, S4N	Not Assessed	PHP1B, P4PNAN	Common sea bird in area, present in PRNPR year-round with minor breeding on Florencia Islet
Bivalvia (oysters; clams; scallops; mussels)						
Ostrea conchaphila	Olympia oyster	Y	NA	Special Concern	P1P2	There area at least 3 Olympia oyster occurrences PRNPR and considering the tendency of these oysters to live at low tidal levels they may be more common there (and in other areas of the park) than casual observation would suggest.
Gastropoda (snails; slugs)						
Haliotis kamtschatkana	Northern abalone	Y	NA	Threatened	P1	Northern abalone are present at a number of locations within PRNPR.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Hemphillia dromedarius	Dromedary jumping-slug	Y	NA	Threatened	P1P2	Dromedary jumping slugs have been found at four locations within PRNPR and there is a good possibility that they are more widely distributed within the park.
Hemphillia glandulosa	Warty jumping-slug	P	NA	Special Concern	Not ranked	Found nearby
Invertebrates						
Danaus plexippus	Monarch	A	S3B, SZN	Special Concern	Not ranked	The range of this species overlaps the park; however, it is rare and there are no Milkweed populations to support breeding
Emerita analoga	Pacifi c sand crab	H or Y	S2N	Not Assessed	Not ranked	BC CDC element occurrence over Long Beach, last observed in 1983; the BC CDC rank for this species is preliminary, has not been reviewed recently, and may not accurately represent the current status, during the course of this assessment the BC CDC decided to stop the public dissemination of data for this taxonomic group.
Pentamera trachyplaca	Sea cucumber	H or Y	S2	Not Assessed	Not ranked	BC CDC element occurrence in Broken group off Treble Islands, last observed in 1973; the BC CDC rank for this species is preliminary, has not been reviewed recently, and may not accurately represent the current status, during the course of this assessment the BC CDC decided to stop the public dissemination of data for this taxonomic group.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Saccoglossus sp.	?	H or Y	S1	Not Assessed	Not ranked	BC CDC element occurrence in Broken group, over Wouwer Island; Directions: west side of Great Tide Pool, Wouwer Island, Barkley Sound; last observed 1972; the BC CDC rank for this species is preliminary, has not been reviewed recently, and may not accurately represent the current status, during the course of this assessment the BC CDC decided to stop the public dissemination of data for this taxonomic group.
Mammalia (Mammals)						
Balaenoptera borealis	Sei whale	not present	SHN	Endangered	Not ranked	Sei whales would not be a component of the Park fauna, except as a dead or mortally wounded individual drifting ashore (B. Campbell pers. Comm.).
Balaenoptera musculus Pacifi c population	Blue whale	HT— Potentially a historic Transient	S1N	Endangered	Not ranked	In Sechart day whaling records so was present within half day boat travel; Whales may have occurred within Park waters on occasion; it is possible that as with increases in other whale populations individuals may return to the area

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Balaenoptera physalus	Fin whale	HT	S1N	Special Concern	Not ranked	"the fin whale was the second most common "take" of whalers at the Sechart Whaling Station...Due to whale processing restrictions this meant the fin whale was taken in or adjacent to Barkley Sound...."This species is the most abundant of the baleen whales found off the coast of British Columbia and has always formed a large part of the commercial catch. It occurs mostly offshore in the open ocean but frequently enters exposed coastal seas such as Hecate Strait and Queen Charlotte Sound and the Strait of Georgia. Part of the catch consists of migrants travelling between summer feeding grounds in high latitudes and winter breeding grounds in low latitudes. Some, mostly young animals, appear to be resident throughout the summer off British Columbia, where they find an abundance of food consisting mostly of euphausiids (Pike, 1950)" source: Pike, G.C. and I.B. MacAskie. 1969. Marine Mammals of British Columbia. Fisheries Research Board of Canada, Ottawa. 54 pages" (B. Campbell written comm. to C. Webb)
Cervus elaphus roosevelti	Roosevelt elk	T	S2S3	Not Assessed	PNA	This species currently has a transient presence in specific areas of PRNPR.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Corynorhinus townsendii	Townsend's big-eared bat	Potentially	S2S3	Not Assessed	Not ranked	"Hatler does not have much-species specific information on bats in his report; he does mention that this species has specimen records of August 1941 and July 1944, Cowichan Lake area. Source British Columbia Provincial Museum. Hatler felt this species may occasionally occur in the Park." (B. Campbell written comm. to C. Webb)
Enhydra lutris	Sea otter	T	S2	Threatened	PNA	While Sea otters are not resident within PRNPR, their range in British Columbia and Washington is close to the park and further sightings should be expected within PRNPR. The Sea otter population is expanding and it should be expected that the population will expand into PRNPR
Eschrichtius robustus Eastern North Pacific population	Grey whale	T	S2N	Special Concern	P2N	Grey whales are present in the park for at least the period of April to October; Eleven Grey whale feeding areas recognized by the British Columbia Conservation Data Centre are distributed throughout PRNPR
Eubalaena japonica	North Pacific Right whale	unlikely	NA	Endangered	Not ranked	The records of the Sechart Whaling Station (1908-17) do not have a record of a right whale kill. Apparently 1 right whale was taken and processed at the Kyuquot Station. (year unknown, source is the Richard Inglis report).
Eumetopias jubatus	Steller sea lion	N	S2B, S3N	Special Concern	P2N	Steller sea lions are present at a small number of winter and year-round haulouts within PRNPR, but there are no rookeries within the park

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Gulo gulo vancouverensis	Wolverine	T, or E	SH	Special Concern	PH	Due its size and shape, PRNPR could not likely contain more than a small portion of a wolverine's home range. Furthermore, PRNPR is a coastal park and wolverines are generally associated with higher elevations. There have, however, been a few records of wolverines on the west coast of Vancouver Island near PRNPR
Kogia simus	Dwarf sperm whale	?	NA	Data Deficient	Not ranked	"our only information on this species relates to an individual (female) that washed ashore in Pachena Bay, north end of the West Coast Trail, in September 1981." (B. Campbell written comm. to C. Webb)
Megaptera novaeangliae North Pacific population	Humpback whale	T	S1N	Threatened	P1N	Small numbers of Humpbacks are present within PRNPR during the summer, but they breed elsewhere.
Mustela erminea anguinae	Ermine, anguinae subspecies	Y or E	S3	Not Assessed	PH	This subspecies is endemic to Vancouver Island and there are historical records of this species in and around the Long Beach and West Coast trail units of PRNPR; there remains a possibility that it is still present in the park.
Myotis keenii	Keen's long-eared bat	Potentially	S2	Data Deficient	Not ranked	There is potential for Keen's long-eared bats to occur in PRNPR, but no Keen's long-eared bats have yet been reported from the park.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Orcinus orca Northeast Pacifi c southern resident population	Killer whale	T	S2	Endangered	P2	Northern resident, southern resident, and transient Killer whales all use PRNPR to some extent. Northern residents are more common in the Long Beach unit while southern residents are more common in the West Coast Trail unit, but the park is outside the core range of both groups and they are seen infrequently and unpredictably within the park. The rank of S2 applies to all residents.
Orcinus orca Northeast Pacifi c northern resident population	Killer whale	T	S2	Threatened	P2	Northern resident, southern resident, and transient Killer whales all use PRNPR to some extent. Northern residents are more common in the Long Beach unit while southern residents are more common in the West Coast Trail unit, but the park is outside the core range of both groups and they are seen infrequently and unpredictably within the park. The rank of S2 applies to all residents.
Orcinus orca Northeast Pacifi c transient population	Killer whale	T	S2	Threatened	P2	Northern resident, southern resident, and transient Killer whales all use PRNPR to some extent. Members of the Transient group are seen in all units of the park and may be more common in the Long Beach unit

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Phocoena phocoena Pacifi c Ocean population	Harbour porpoise	T	S3	Special Concern	P3	Harbour porpoises are present in marine areas of PRNPR, but the park generally protects water < 20 metres deep and this very shallow water may be less important to Harbour porpoises. Indeed, Harbour porpoises are much more commonly seen outside the park boundaries (B. Campbell pers. comm.).
Sorex palustris brooksi	Common water shrew, brooksi subspecies	Potentially	S2	Not Assessed	Not ranked	This subspecies has not been found within PRNPR, but has been found in Lost Shoe Creek upstream from the Long Beach unit.
Osteichthyes (Bony fishes)						
Acipenser medirostris	Green sturgeon	Likely T	S1S2B, S3N	Special Concern	Not ranked	There are no records of White or Green sturgeons in PRNPR, but these anadromous fi sh are present in the area.
Acipenser transmontanus	White sturgeon	Potential T	S1–S2	Endangered	Not ranked	There are no records of White or Green sturgeons in PRNPR, but these anadromous fi sh are present in the area. The BC CDC ranks a number of White sturgeon populations and each is either S1 or S2.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Asemichthys taylori	Spinynose sculpin	?	NA	Data Deficient	Not ranked	"one individual found, about 2002, in a tidepool on Wizard Islet, off Bamfield. A photograph of the specimen was taken at the time of the capture. Park researcher Jenn Yakimishyn was assisting another the researcher. In January 2005 she called the researcher regarding the find, the researcher re-confirmed the fish identification. I do not know the name of the researcher, nor the exact date. Wizard Islet is off Helby Island, in the Deer Group, north-west of Bamfield. The Deer Group are not in the Park but lie between Bamfield and the Broken Group Islands of the Park." (B. Campbell written comm. to C. Webb)
Oncorhynchus clarki clarki	Cutthroat trout, clarki subspecies (Coastal Cutthroat trout)	Y	S3S4SE	Not Assessed	P2P3	This subspecies is found in PRNPR and many parts of the park have been characterised as excellent habitat for both resident and sea-run populations.
Oncorhynchus kisutch, Interior Fraser population	Coho salmon	N	S4SE	Endangered	PNAN	the majority are caught off the west coast of Vancouver Island and in the Strait of Georgia. Coho are generally found nearer to shore than other salmon species; thus they are more likely to be found within PRNPR
Oncorhynchus nerka, Cultus population	Sockeye salmon	T	S4SE	Endangered	PNAM	Sockeye are present along the west coast of Vancouver island as transient, non-breeding occurrence.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Sebastes paucispinis	Bocaccio	N-possibly non-breeding	NA	Threatened	Not ranked	There is potential habitat for juvenile Bocaccio within the PRNPR; however, this species has not yet been found in the park.
Reptilia (Reptiles)						
Dermochelys coriacea	Leatherback seaturtle	A	S1S2N	Endangered	Not ranked	Leatherbacks are occasionally seen in Canadian North Pacifi c waters between July and September. They have been sighted along the west coast of Vancouver Island from Pachena Pt. north to Brooks Bay and on La Perouse Bank
Algae						
Arthrocardia silvae	-	H or Y	S1	Not Assessed	Not ranked	BC CDC element occurrence "on exposed northwest point of Cape Beale cove", last observed in 1972; the BC CDC rank for this species is preliminary, has not been reviewed recently, and may not accurately represent the current status, during the course of this assessment the BC CDC decided to stop the public dissemination of data for this taxonomic group.
Dictyoneurum californicum	-	H or Y	S2	Not Assessed	Not ranked	Five BC CDC element occurrences along the West Cost trail (near mouth of Black river (1959), Darling river (1959), Klanawa river 1959), Tsusiat river (1970), and Walbran creek (1970); the BC CDC rank for this species is preliminary, has not been reviewed recently, and may not accurately represent the current status, during the course of this assessment the BC CDC decided to stop the public dissemination of data for this taxonomic group.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Laminaria sinclairii	-	H or Y	S2	Not Assessed	Not ranked	BC CDC element occurrences in Long Beach unit (Box Island, 1963) and West Coast Trail unit ('south of Darling river', 1979); the BC CDC rank for this species is preliminary, has not been reviewed recently, and may not accurately represent the current status, during the course of this assessment the BC CDC decided to stop the public dissemination of data for this taxonomic group.
Percursaria dawsonii	-	H or Y	S3	Not Assessed	Not ranked	BC CDC element occurrence in Long Beach unit (north end of Box Island, 1969); the BC CDC rank for this species is preliminary, has not been reviewed recently, and may not accurately represent the current status, during the course of this assessment the BC CDC decided to stop the public dissemination of data for this taxonomic group.
Anthophyta (Vascular flowering plants)						
Abronia latifolia	Yellow sand-verbena	Y	S3	Not Assessed	P2	There are some occurrences distributed in the Long Beach and West Coast Trail units of PRNPR; it is not likely present in the Broken Group Islands (Bell 1973).
Abronia umbellata breviflora	Pink sand-verbena	E	SX	Endangered	PH	Two and three plants were counted within PRNPR at Clo-oose Bay in 2000 and 2001; however, no plants have been seen there since. It is quite possible that new plants will germinate from the seed bank in PRNPR or from seeds carried on ocean currents from more southern populations.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Agrostis pallens	Dune bentgrass	Potentially	S3	Not Assessed	Not ranked	It is a sand dune species known from CWHvm1—and other—Biogeoclimatic zones, there are sand dunes in the park; no park records (1970s plant survey)
Callitriche heterophylla ssp. heterophylla	Two-edged water-starwort	Potentially	S2S3	Not Assessed	Not ranked	Park records of the species, but subspecies not identified (B. Campbell written comm. to C. Webb); possible but I don't know of any records (M. Fairbarns written comm. to C. Webb)
Carex gmelinii	Gmelin's sedge	Y	S2S3	Not Assessed	P1	Present on a small number of islands in the Broken Group (M. Cody written. comm. to C. Webb)
Carex pansa	Sand-dune Sedge	Y	S2S3	Not Assessed	P2	Found at a number of locations in the Broken Group Islands
Carex scoparia	Pointed Broom sedge	Potentially	S2S3	Not Assessed	Not ranked	"there is an old Ucluelet record shown in Volume 8 of the Illustrated Flora of British Columbia, but no records in the three park plant surveys. " (B. Campbell written comm. to C. Webb)
Castilleja ambigua ssp. ambigua	Paintbrush owl-clover	Potentially	S2	Not Assessed	Not ranked	Found 20 metres from the PRNPR boundary—likely outside the boundary, but the potential exists for populations within the park

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Claytonia rubra ssp. depressa	Redstem springbeauty	Y or H or F and potentially	S3	Not Assessed	Not ranked	"The plant inventory for the Long Beach unit (Bell, 1972) has no listing for C. rubra but does list Montia perfoliata ("Sparse; occurs on the moss-stabilized areas of Wickaninnish sand dunes; on sand with low organic matter content; flowering May-July")" (B. Campbell written comm. to C. Webb); The BC CDC has a record from 1964 in Long Beach sand dunes and notes "[original id on label, Montia perfoliata by RK; annot by J.M. Miller Jan-Aug 1990, OR State Univ. Herb., also annot C. perfoliata-putative coastal tetraploid, 78-10-30]" (BC CDC, 2004 bot_rec.xls); M. Fairbarns (written comm. To C. Webb) indicates that this species was not recognized until recently so was probably overlooked in past and is a potential for the park.
Convolvulus soldanella	Beach bindweed	Y	S3	Not Assessed	P2	Beach bindweed is present at a number of sites within PRNPR.
Corydalis scouleri	Scouler's corydalis	Potentially	S3	Threatened	Not ranked	Scouler's corydalis is currently not known from PRNPR; however, it is present nearby and there is potential for occurrences within the park.
Fraxinus latifolia	Oregon ash	Y or no	S1	Not Assessed	Not ranked	There is taxonomic debate over the single known Ash tree in PRNPR (125° 43' W, 49° 03' N). Some believe it to be *F americanus*, while others think it is *F. latifolia.*
Glehnia littoralis ssp. leiocarpa	American glehnia (Beach silver top)	Y	S3	Not Assessed	P2	American glehnia is present at a number of sites within PRNPR.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Hypericum scouleri ssp. nortoniae	Western St. John's-wort	Potentially	S2S3	Not Assessed	Not ranked	Found beside the Kennedy Lake portion of the Long Beach unit
Jaumea carnosa	Fleshy jaumea	Y	S2S3	Not Assessed	P2	Found in Keeha Bay, West Coast Trail unit. last observed 1998
Lasthenia maritima	Hairy goldfi elds (Maritime goldfi elds)	Potentially	S2S3	Not Assessed	Not ranked	"Found on Baeria Rocks which are located approximately 7 km north-east of Swale Rock/Reeks Island at the north-east corner of the Broken Group Islands unit." (B. Campbell written comm. to C. Webb)
Lathyrus littoralis	Grey Beach peavine	Y	S2	Not Assessed	P1	Grey Beach peavine is present in PRNPR, Long Beach unit
Mimulus dentatus	Tooth-leaved monkey-fbwer	Potentially	S2	Not Assessed	Not ranked	Found at the mouth of the San Juan, has declined from six clumps to currently only one plant which is very close to—potentially within—the PRNPR boundary (H. Roemer pers. comm.)
Myrica californica	California wax-myrtle (California bayberry)	Y	S3	Not Assessed	P3	California wax-myrtle is a year-round occurrence in PRNPR and is locally abundant in areas of the Long Beach unit.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Myriophyllum quitense	Waterwort water-milfoil	Potentially	S2S3	Not Assessed	Not ranked	"NOT recorded in any of the three plant inventories (Long Beach, Bell, 1972; Broken Group Islands, Bell et al, 1973; West Coast Trail, Cordes et al, 1974). Campbell speculates the surveys were not thorough for aquatic plants; particularly on the West Coast Trail, where a number of lakes and streams (the so-called Nitinat Triangle area) were not incorporated into the Park until the late 1980s, well after the inventories were done...Referring to the range maps in volume 8 of the Illustrated Flora of British Columbia (Douglas et al) there is a possibility M. quitense may be found in the Long Beach and West Coast Trail units..."Habitat/Range: large lakes and rivers in the lowland zone; rare on Vancouver Island...."" (B. Campbell written comm. to C. Webb)
Myriophyllum ussuriense	Ussurian water-milfoil	Potentially	S3	Not Assessed	Not ranked	See *Myriophyllum quitense* notes as they also apply to this species. "...referring to the range maps in volume 8 of the Illustrated Flora of British Columbia (Douglas et al) there is a possibility M. ussuriense may be found in the vicinity of the Long Beach unit..."Habitat/Range: lake margins and muddy river banks in the lowland zone; rare on Vancouver Island...."" (B. Campbell)
Oxalis oregana	Redwood sorrel	Y	S2	Not Assessed	PHP1	This species was found within PRNPR, West Coast Trail unit near Klanawa River, but it was last observed in the early to mid 1980s; surveys are needed to determine its current status.

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Pleuropogon refractus	Nodding semaphoregrass	Potentially	S3	Not Assessed	Not ranked	No records in park, but known from nearby the southern end of West Coast Trail unit (south side of Port San Juan)
Polygonum paronychia	Black knotweed (Beach knotweed)	Y	S3	Not Assessed	P1P2	Black knotweed is present at a number of sites within PRNPR.
Prosartes smithii	Smith's fairybells	Potentially	S3	Not Assessed	Not ranked	'This plant was not found during plant inventories in any Park unit (Long Beach, Bell, 1972; Broken Group Islands, Bell et al, 1973; West Coast Trail, Cordes et al, 1974).'(B. Campbell written comm. to C. Webb); There are two CDC element occurrences which overlap the park but they are centred north of the park property at head of Port San Juan.
Romanzoffi a tracyi	Tracy's romanzoffi a	Y	S3	Not Assessed	P2	Currently known from a number of locations in the Long Beach unit.
Sagina decumbens ssp. occidentalis	Western pearlwort	Potentially or unlikely	S3	Not Assessed	Not ranked	Collected near Ucluelet in 1909

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Sanguisorba menziesii	Menzies' burnet	Potentially	S2S3	Not Assessed	Not ranked	"the distribution map in volume 8 of the Illustrated Flora of British Columbia shows an old (pre-1950) record near Ucluelet and a post-1950 record near Port Renfrew in or near south end of the West Coast Trail...there may be a misidentification of the Ucluelet-area specimen, or if the record is correct the plant has not yet been found in the Park. Nothing is known of the record in the vicinity of the West Coast Trail unit of the Park." (B. Campbell written comm. to C. Webb)
Schoenoplectus americanus	Olney's bulrush (Three-square bulrush)	likley F unlikely Y	S1	Not Assessed	Not ranked	In park records, but the range map in *The Rare Plants of BC* shows no records of this species on the west coast; "possible, but your records are probably misidentified specimens of the relatively widespread Schoenoplectus pungens the real Schoenoplectus americanus was formerly called Scirpus olneyi and has not been recorded from west coast" (M. Fairbarns)
Selaginella oregana	Oregon selaginella	H or Y	S2S3	Not Assessed	PXP1	Not in park records (only Selaginella wallacei; B. Campbell written comm. to C. Webb), but BC CDC has record on Brabant Islands, Broken Group (first and last observed in 1970-10-29).
Sparganium fluctuans	Water bur-reed (Floating bur-reed)	Y	S2S3	Not Assessed	P2	Found by A. Ceska in both Effingham Island Lake, Broken Group Islands (1990) and at NE end of Cheewhat Lake (1986)

Scientific Name	English Name	Park Presence	S-Rank	COSEWIC Rank	P-Rank	Notes
Spergularia macrotheca var. macrotheca	Beach sand-spurry	Potentially	S2S3	Not Assessed	Not ranked	"The plant inventories in the Park, done in the early 1970s, did not find this plant...the distribution map for this species and variety in volume 8 of the Illustrated Flora of British Columbia shows collections coming from the general area of Barkley Sound (Broken Group Islands unit) and from the Port Renfrew area (West Coast Trail unit)...species description in volume 2 of the Illustrated Flora of British Columbia contains the following text: "Habitat/Range: wet to moist salt marshes and sandy coastal beaches in the lowland zone" (B. Campbell written comm. to C. Webb).
Triglochin concinna	Graceful arrow-grass	Potentially	S2	Not Assessed	Not ranked	No park records, but found nearby (B. Campbell written comm. to C. Webb); BC CDC element occurrence for Bamfield inlet overlaps West Coast Trail unit
Lichens						
Heterodermia sitchensis	Seaside centipede	Y	NA	Endangered	P2	The vast majority of Seaside Centipede lichen occurrences are located within PRNPR
Pseudocyphellaria rainierensis	Oldgrowth specklebelly	Potentially	NA	Special Concern	Not ranked	"Of the three lichens you name [Seaside Bone, Cryptic Paw and Oldgrowth Specklebelly lichens], only one – the oldgrowth specklebelly – is likely to occur in the area you indicate. As with other cyanolichens, however, you'd have to have a habitat underlain by calcareous substrates, if any such exists. Once again, it's a matter of digging out the geology maps." (Trevor Goward written comm. to B. Campbell)

Appendix D

Recovery team chairs or other species contacts

Listed below are recovery groups and their chairs or other contact person. An updated list of these groups can be found on-line at the British Columbia Ministry of Water, Land and Air Protection's "recovery planning" website[1] or Environment Canada's "Species at risk: Recovery" website[2].

Coho Salmon Coho Salmon (Interior Fraser population) Recovery Team chair: Bailey, Richard, Fisheries and Oceans Canada.

Dromedary Jumping Slug Invertebrates at Risk Recovery Team chair: Heron, Jennifer, British Columbia Ministry of Water, Land, and Air Protection.

Killer whale Recovery Team for Killer Whales chair: Joyce, Marilyn, Fisheries and Oceans Canada.

Leatherback turtle (Pacific) Pacific Leatherback Turtle Recovery Team chair: Eros, Carole, Fisheries and Oceans Canada, Telephone: (604) 666-3610 | Fax: (604) 666-3341.

Marbled murrelet Marbled Murrelet Recovery Team chair: Bertram, Doug, Canadian Wildlife Service, Telephone: (250) 363-6537 | Fax: (250) 363-6390.

Northern abalone Northern Abalone Recovery Team chair: Convey, Laurie, Fisheries and Oceans Canada, Telephone: (250) 756-7163 | Fax: (250) 756-7118 or 756-7162.

Northern Goshawk Northern Goshawk-Accipiter gentilis laingi Recovery Team chairs: McClaren, Erica, Government of British Columbia and Wijdeven, Berry, Government of British Columbia.

Pacific Water Shrew Pacific Water Shrew Recovery Team chair: Vennesland, Ross, British Columbia Ministry of Water, Land, and Air Protection.

[1] http://wlapwww.gov.bc.ca/wld/recoveryplans/rcvry1.htm
[2] http://www.speciesatrisk.gc.ca/recovery/default_e.cfm

Peregrine falcon (anatum) Anatum Peregrine Falcon Recovery Team chair: Holroyd, Geoff, Canadian Wildlife Service. British Columbia contact: Chutter, Myke, BC - Ministry of Water, Land, and Air Protection.

Scouler's Corydalis Scouler's Corydalis Recovery Team co-chair: Costanzo, Brenda, British Columbia Ministry of Water, Land, and Air Protection, co-chair: Lea, Ted, British Columbia Ministry of Water, Land, and Air Protection.

Sea otter Sea otter Recovery Team chair: Lawseth, Don, Fisheries and Oceans Canada, Telephone: (250) 756-7003 | Fax: (250) 756-7162.

Seaside Centipede lichen Seaside Centipede Lichen Recovery Team chair: Reader, Brian, Parks Canada, Telephone: (250) 363-8560 | Fax: (250) 363-8552.

Sockeye Salmon (Sakinaw) Sockeye Salmon (Sakinaw population) Recovery Team chair: Shaw, Bill,Fisheries and Oceans Canada.

Sockeye Salmon (Cultus) Sockeye Salmon (Cultus population) Recovery Team chair: Schubert, Neil Fisheries and Oceans Canada.

Western Screech owl Western Screech Owl Recovery Action Group chair: Dyer, Orville, BC - Ministry of Water, Land, and Air Protection.

While not a Recovery Team following group deserves mention:

Pacific Great Blue heron The Heron Working Group chair: Butler, Dr. Rob, Senior Scientist, Canadian Wildlife Service, Delta, BC.