COSEWIC
Assessment and Update Status Report

on the

Harbour Porpoise
Phocoena phocoena

Pacific Ocean Population

in Canada

SPECIAL CONCERN
2003

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION DES
ESPÈCES EN PÉRIL
AU CANADA

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For additional copies contact:

COSEWIC Secretariat
c/o Canadian Wildlife Service
Environment Canada
Ottawa, ON
K1A 0H3

Tel.: (819) 997-4991 / (819) 953-3215
Fax: (819) 994-3684
E-mail: COSEWIC/COSEPAC@ec.gc.ca
http://www.cosewic.gc.ca

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COSEWIC
Assessment Summary

Assessment Summary – November 2003

Common name
Harbour porpoise (Pacific Ocean population)

Scientific name
Phocoena phocoena

Status
Special Concern

Reason for designation
They appear to be particularly sensitive to human activities, and are prone to becoming entrapped and killed in fishing nets. They are a short lived shy species that are now rarely seen at the highly developed areas of Victoria and Haro Strait. Continued development and use of its prime habitat by humans are some of the main threats. They are displaced by underwater noise, and could be affected by contaminants in their food chain.

Occurrence
Pacific Ocean

Status history
Designated Data Deficient in April 1991. Status re-examined and designated Special Concern in November 2003. Last assessment based on an update status report.

COSEWIC
Executive Summary

Harbour Porpoise
Phocoena phocoena
(Pacific Ocean population)

Species Information

The harbour porpoise is one of the smallest cetacean species, born at 80-90 cm and only occasionally reaching lengths of close to 2 m. In general, harbour porpoises are dark grey to black on the dorsal surface, and white on the belly, with no differences between males and females. They are a shy and short-lived species. The oldest individual aged in British Columbia waters was 10 years old.

Distribution

Harbour porpoises are found throughout temperate and subarctic coastal waters of the northern hemisphere. In British Columbia they are found in shelf-waters throughout the province year-round, with the exception of some deep-water inlets. Density appears to be lower in deep-water basins, e.g., central Strait of Georgia.

Habitat

In general, harbour porpoises have been reported to typically inhabit waters less than 200 m in depth. There is one record from British Columbia of a harbour porpoise approximately 55 km up the Fraser River, suggesting that movements into large rivers occur occasionally.

General Biology

Reproduction is seasonal, with births in British Columbia occurring from May through September. Age at sexual maturity for females is usually 3 or 4 years of age, though this is known to vary between populations, and has not been determined for the British Columbia population. Several lines of evidence suggest limited movements for harbour porpoises off western North America. This includes regional differences in pollutant ratios, cranial morphology, movements by individuals, and genetic markers. Stomach contents from stranded or incidentally caught harbour porpoises from southern British Columbia indicate that they have a diverse diet of small fish and squid, and diet overlaps strongly with that of Dall's porpoise recovered from the same area. Squid seem to form a larger proportion of the diet of harbour porpoise in British Columbia than has been reported elsewhere. Associations with other species of cetaceans are uncommon, with some interactions being agonistic. Harbour porpoise appear to regularly hybridize with Dall's porpoise in southern British Columbia.

Population Size and Trends

No province-wide abundance estimate is available, though a 1996 estimate for the Strait of Juan de Fuca and Strait of Georgia indicates there are likely several thousand animals. Anecdotal evidence suggests a decline in numbers in the southern part of the province between the 1940s-50s and the 1980s. Limited quantitative information did not detect a population trend through the 1980s or 1990s.

Limiting Factors and Threats

Incidental mortality in a number of fisheries in British Columbia has been documented, particularly in gillnet fisheries. The estimated number killed in salmon gillnets in southern British Columbia was <100 individuals in 2001. Harbour porpoises are known to be susceptible to disturbance by vessel traffic and loud underwater sound sources, such as acoustic harassment devices associated with aquaculture operations. Natural sources of mortality in the province include predation by sharks or killer whales (*Orcinus orca*).

Existing protection or other status designations

Harbour porpoises are listed in Appendix II of CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973), thus international trade of harbour porpoises or parts thereof by any countries which are Parties to CITES requires export permits from the country of origin. Harbour porpoises are considered "small cetaceans" by the International Whaling Commission (IWC), and are not covered by the IWC. Within Canada, harbour porpoises are managed under the Marine Mammal Regulations of the Fisheries Act.

COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species and include the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal organizations (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership, chaired by the Canadian Museum of Nature), three nonjurisdictional members and the co-chairs of the species specialist and the Aboriginal Traditional Knowledge subcommittees. The committee meets to consider status reports on candidate species.

DEFINITIONS
(After May 2003)

Species	Any indigenous species, subspecies, variety, or geographically or genetically distinct population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.
** Formerly described as “Not In Any Category”, or “No Designation Required.”
*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

Update
COSEWIC Status Report

on the

Harbour Porpoise
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Pacific Ocean Population

in Canada

Robin W. Baird[1]

2003

[1]Biology Department
Dalhousie University
Halifax, NS
B3H 4J1

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SPECIES INFORMATION

Name, Classification and Taxonomy

Three subspecies of harbour porpoise, *Phocoena phocoena* (Linnaeus 1758), are generally recognized (Rice 1998), *P. p. phocoena* in the North Atlantic, *P. p. vomerina* in the eastern North Pacific, and an unnamed subspecies in the western North Pacific (see also Amano and Miyazaki 1992). Genetic evidence suggests that the North Pacific and North Atlantic populations have been isolated for between 1 and 5 million years (Rosel et al. 1995; Wang et al. 1996).

Morphological Description

The harbour porpoise (Figure 1) is one of the smallest cetacean species. In British Columbia they are approximately 80-90 cm at birth, and occasionally reach lengths of close to 2 m (Baird and Guenther 1995). Females grow faster and reach greater lengths than males (Read and Tolley 1997). In general, harbour porpoises are dark grey to black in colour on the dorsal surface, and white on the belly, with no differences in colouration between males and females (Koopman and Gaskin 1994). They are distinguished fairly easily from the other two relatively common small cetaceans on the British Columbia coast (Pacific white-sided dolphins, *Lagenorhynchus obliquidens*, and Dall's porpoise, *Phocoenoides dalli*), due to differences in colour pattern and body shape, as well as behaviour. Harbour porpoises typically travel in smaller groups (usually 1-8 individuals) than white-sided dolphins, usually avoid boats, and normally show very little of their body above water. Hybrids with Dall's porpoise (see Baird et al. 1998: Willis et al. 2004) can consistently be seen in some areas around southern Vancouver Island (e.g., 4 or 5 individual hybrids can often be seen in one day in Boundary Pass or Haro Strait; Baird, personal observations), and could easily be misidentified as harbour porpoise from a distance (e.g., from aerial surveys). At close range they are fairly easy to discriminate, as the hybrids are a lighter grey, regularly bowride on vessels, and commonly associate with Dall's porpoises.

DISTRIBUTION

Harbour porpoises are coastally distributed throughout the temperate and subarctic waters of the northern hemisphere, with several records in Canadian Arctic waters (Bree et al. 1977; Gaskin 1992). On the Pacific coast of Canada, harbour porpoise are found throughout coastal waters (Cowan and Guiguet 1965; Pike and MacAskie 1969; Baird and Guenther 1995), excluding some deep-water fjords and inlets (Figure 2). Harbour porpoises are present year-round along the coast, and there is no evidence of migrations (Baird and Guenther 1995), although limited effort has been expended to study this species in areas other than the southern Strait of Georgia and Juan de Fuca Strait.

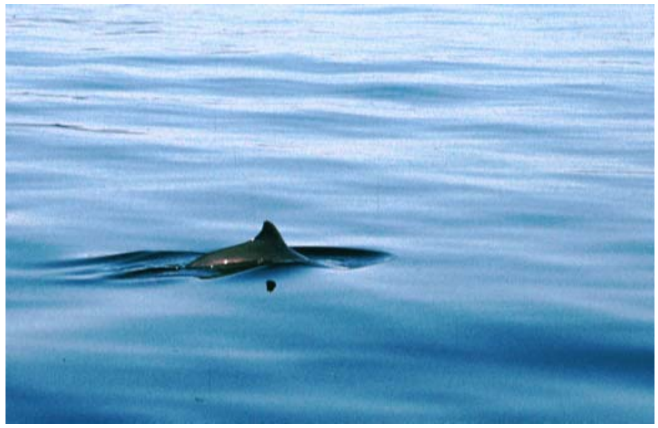

Figure 1. Harbour porpoise slow rolling (top) and high-speed swimming (bottom) off Victoria, British Columbia. Photos © R. Baird.

HABITAT

In general, harbour porpoises have been reported to typically inhabit waters less than 200 m in depth. There is one record from British Columbia of a harbour porpoise occurring approximately 55 km up the Fraser River (Guenther et al. 1993), suggesting that movements into large rivers occur occasionally (see also Scheffer and Slipp 1948). Off the outer Washington, Oregon and southern British Columbia coasts, Laake et al. (1998) noted that the density of harbour porpoises between 100 and 200 metres of depth was only one-sixth the density of those found in depths less than 100 metres. Aerial surveys by Calambokidis et al. (1997) found a much lower density of harbour porpoises (0.04 animals per km^2, uncorrected density) in the relatively deep Strait of Georgia than in the shallower waters around the Canadian Gulf Islands (0.16 animals per km^2) or on the Canadian side of Juan de Fuca Strait (0.24 animals per km^2). In British Columbia, based on a review of sighting and stranding records, Baird and Guenther (1991, 1994, 1995) noted that harbour porpoises appear to be generally

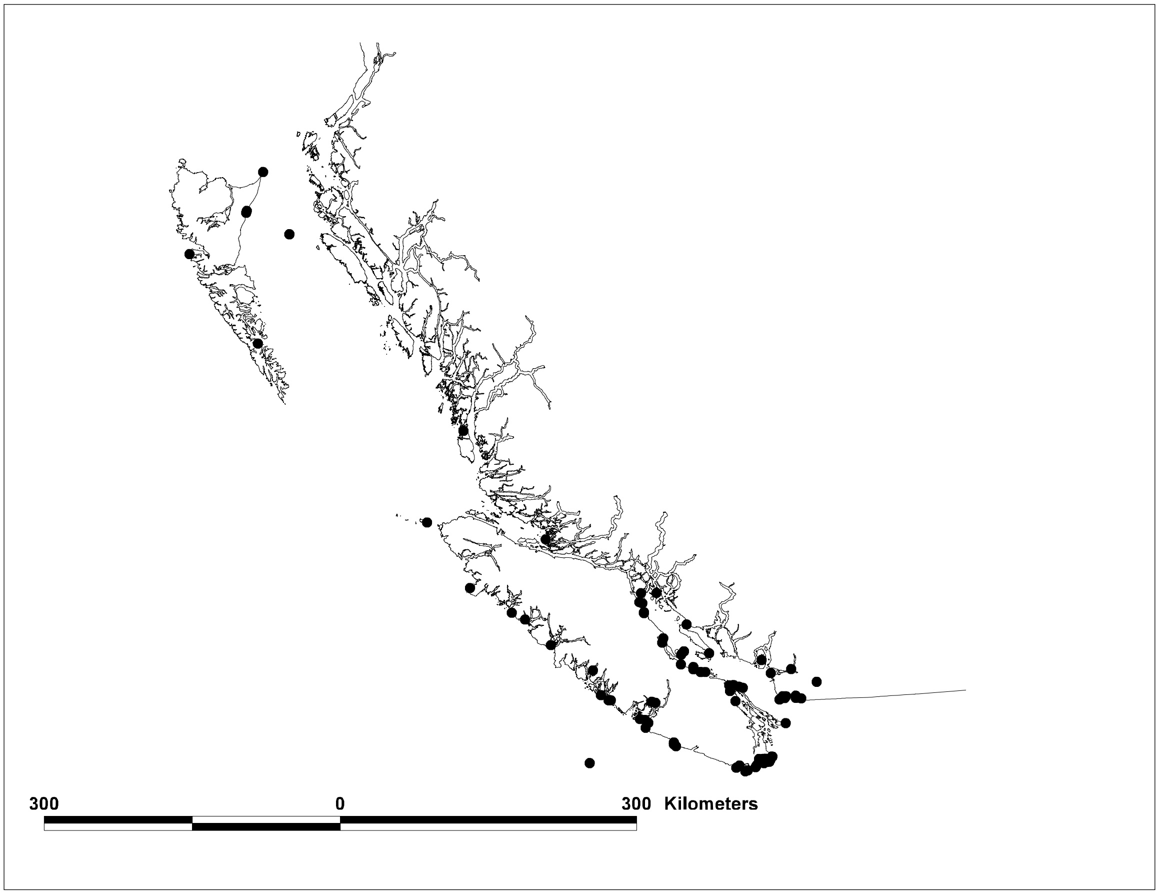

Figure 2. Distribution of sighting, stranding and incidental mortality records of harbour porpoises in British Columbia. Stranding and incidental mortality records were collected through the Stranded Whale and Dolphin Program of British Columbia; sighting records were compiled by the Marine Mammal Research Group, Victoria, B.C. (see references cited in the text). Recording effort is extremely heterogeneous, thus the distribution of records does not necessarily indicate true relative abundance. Map courtesy of Ellen Hines, University of Victoria.

restricted to shallow (<125 m) waters, and tend to avoid areas of high current flow (see also Watts and Gaskin 1985). As well, harbour porpoises tend to be absent from some areas of what appear to be suitable habitat based on depth and currents. These areas, however, are relatively small in size or otherwise separated from larger patches of suitable habitat (e.g., small areas in between islands, or small shelf areas adjacent to deep water habitats; Baird and Guenther 1991). In inshore waters, harbour porpoise distribution overlaps with that of Dall's porpoise, but there are clear differences in the distribution of sightings, with harbour porpoises generally being found in shallower waters (see maps in Baird and Guenther 1994). Thus some inshore areas on the British Columbia coast (e.g., the mainland fjords, central Strait of Georgia) appear to be marginal or unsuitable habitat for this species. Exceptions do exist, indicating that local conditions may be important. Raum-Suryan and Harvey (1998) studied habitat use by harbour porpoise off the northern San Juan Islands, and found them distributed over a depth range of 20 to 235 m, with a mean depth of 142 m, and with a greater than expected use of deeper (> 125 m) waters.

Also, in U.S. waters in the southern Strait of Georgia, Hanson et al. (1999) tracked a radio-tagged harbour porpoise over a 215-day period. It spent most of its time over a deep-water (approximately 200 metres maximum depth) basin.

GENERAL BIOLOGY

Reproduction

Information on the reproductive biology of harbour porpoises has been collected primarily from stranded animals. Reproduction is seasonal, with births in British Columbia occurring from May through September (Baird and Guenther 1995). Mean age at sexual maturity of females from the North Atlantic has been estimated to be three or four years of age, although this is known to vary between populations (Read 1999), and has not been determined for the British Columbia population. In the North Atlantic, females may give birth each year (Read and Hohn 1995), while off California females give birth only every second year (Read 1999). Average longevity has not been determined. Using a modelling approach, Trites and Pauly (1998) estimate longevity (defined as the 99th percentile of the age distribution) at 13 years, although maximum longevity based on aging of teeth has been reported as 24 years (Lockyer 1995; Read 1999). The oldest animal recovered from British Columbia (of 62 specimens aged) was 10 years of age (K. Robertson, SWFSC, NMFS, personal communication), and animals over 12 years of age are rare in other populations (e.g., Read and Hohn 1995).

Movements

Besides the relatively restricted habitat use noted above, several lines of evidence suggest limited movements by harbour porpoises off western North America. These include regional differences in pollutant ratios (Calambokidis and Barlow 1991; Osmek et al. 1995), cranial morphology (Yurick and Gaskin 1987) and genetic patterns. Chivers et al. (2002) provide evidence of genetic differentiation between harbour porpoise from inshore areas (such as the Strait of Georgia) versus offshore areas (such as the west coast of Vancouver Island), thus there appear to be at least two discrete stocks in the province. There has been very little genetic sampling of harbour porpoises in British Columbia north of southern Vancouver Island, thus it is not possible to state whether more population differentiation is occurring within the province. Radio-tracking data from two harbour porpoises tagged in Washington State (Hanson et al. 1999) also suggest limited movements by individuals. Flaherty and Stark (1982) photo-identified 29 harbour porpoise around San Juan Island, and resighted three individuals, all relatively close (8-30 km) to where they were originally photographed, up to seven months after they were first sighted. The U.S. National Marine Fisheries Service has used this combined evidence to classify (and treat as separate management units) a number of stocks along the U.S. Pacific coast. These are (from south to north): Moro Bay (CA); Monterey Bay (CA); San Francisco-Russian River (CA); northern California/southern Oregon; Oregon/Washington coast; and Washington inland waters stock (Carretta et al. 2002). Work on stock discrimination in U.S. waters is ongoing.

Nutrition and Interspecific Interactions

Harbour porpoises typically feed on small schooling fish. Prey taken may vary by season, reproductive status and age (see Read 1999). Stomach contents from 26 stranded or incidentally caught harbour porpoises from southern British Columbia indicate that they have a diverse diet of small fish and squid (Walker et al. 1998). Based on the calculated percentage of prey mass each type represented from the sample, market squid (*Loligo opalescens*) appears to be the most important prey item in this area. Other relatively common prey species (both of which were found in more than a quarter of the stomachs and, combined, represented about one quarter of the mass of prey) include Pacific herring (*Clupea harengus pallasi*) and Pacific hake (*Merluccius productus*). Prey items taken ranged in size from 80 to 371 mm in length, and from 4 to 317 grams in weight (Walker et al. 1998). Diet of harbour porpoise overlapped strongly with that of Dall's porpoise recovered from the same area (Walker et al. 1998). Squid seem to form a larger proportion of the diet of harbour porpoise in British Columbia than has been reported elsewhere (cf. Smith and Gaskin 1974; Recchia and Read 1989; Fontaine et al. 1994; Gannon et al. 1998).

Harbour porpoises are typically found in small groups, although lone animals are frequently seen (Read 1999). A study in the northern San Juan Islands, near southern Vancouver Island, found group sizes ranging from 1-8, with a mean group size of 1.87 (Raum-Suryan and Harvey 1998). Associations with other species of cetaceans are uncommon, with some interactions being agonistic (Ross and Wilson 1996; Baird 1998; Morton 1999).

POPULATION SIZE AND TRENDS

Little information is available on current or historic abundance or trends of harbour porpoises in British Columbia, and the information that is available is restricted to the southern inshore parts of the province (Juan de Fuca Strait, southern Strait of Georgia).

There have been some indications and anecdotal reports of declines of harbor porpoise in some areas of southern British Columbia. Cowan (1987) stated that harbour porpoise abundance in British Columbia seems to be declining, though no information was presented to assess the validity of this statement. One individual who spent considerable time on the Victoria waterfront from the 1940s through the 1980s recalls seeing harbour porpoises from shore on virtually a daily basis in the 1940s and early 1950s, and relatively few after that point (M. Goodwill, personal communication). Harbour porpoises are still found in that area (Baird and Guenther 1994), although sightings are not common, and sightings from shore in the same area as reported from the 1940s are extremely unusual (Baird unpublished). In the nearby waters of Puget Sound, Washington, harbour porpoise were considered the most common cetacean in the area in the 1940s (Scheffer and Slipp 1948), yet are largely absent from the region today (Osmek et al. 1996). Flaherty and Stark (1982) note anecdotal evidence that the population around San Juan Island in 1980 was considerably lower than it had been

20 years earlier. A comparison of sighting records from the area about 10 years after Flaherty and Stark's (1982) surveys (see also Everitt et al. 1980) suggest a further reduction in numbers or a contraction of range size (see maps in Baird and Guenther 1994). Considerable effort was expended in eastern Haro Strait in the Baird and Guenther (1994) study, shown by large numbers of Dall's porpoise sightings in the area, so the relative differences in sightings between the studies is likely not due to differences in effort. These sources, albeit anecdotal, suggest that abundance today is likely much smaller than was historically present in this area.

Flaherty and Stark (1982) estimated population size in the adjoining waters around the San Juan Islands in the early 1980s using mark-recapture from photo-identification and sighting rates from a small vessel. Sixteen individuals were photo-identified in each of two periods, and three of the individuals in the second period had been documented in the first. Two population estimates were given, the higher of which was 408 individuals (SE = 358). Flaherty and Stark (1982) also estimated a population of 176 individuals around the San Juan Islands from line-transects surveys.

Estimates of the harbor porpoise abundance in the inside waters of Washington and southern British Columbia were made in 1991 and 1996 (Calambokidis et al. 1992, 1997, Laake et al. 1997). A survey in 2002 has also been conducted but not yet analyzed. Estimates from the 1996 surveys are therefore the most recent available for southern BC waters and are summarized below.

Harbor porpoise abundance estimates for south British Columbia inside waters based on 1996 aerial survey data from Calambokidis et al. (1997).

Region	Area (km^2)	Effort (km^2)	No. sighted	Group size	Density (anim.)	Abund Uncor.	CV	Abund Cor.	CV
South BC inside waters									
BC Juan de Fuca St.	1,531	728	60	1.43	0.236	362	0.18	1,239	0.41
BC Gulf Islands	1,350	546	31	1.42	0.161	217	0.38	745	0.53
Strait of Georgia	6,370	1,102	20	1.15	0.042	266	0.45	911	0.58
Total for south BC	9,251	2,376	111	1.38	0.091	845	0.18	2,895	0.41
US inside waters (Straits & San Juans)	5,108	2,117	148	1.42	0.201	1,025	0.15	3,509	0.40
Total for US & S BC inside waters	14,359	4,493	259	1.40	0.130	1,870	0.12	6,404	0.38

Quantitative estimates of harbor porpoise abundance in the Strait of Juan de Fuca and San Juan Islands have not provided any indication of a recent decline. Estimates of abundance for the San Juan Islands from aerial surveys in the 1990s (1,121 and 1,616) were considerably higher than either the estimates from vessel transects or photo-ID made in the early 1980s by Flaherty and Stark (1982). This comparison is complicated by differences in methods and areas surveyed. Estimates from aerial surveys revealed higher density rates in 1996 than 1991 for the two subareas of BC and two in Washington inside waters surveyed in both years, although these differences were not statistically significant (Calambokidis et al. 1992, 1997).

Assessments of harbor porpoise in U.S. coastal waters to the north and south of British Columbia have revealed fairly large populations. In addition to the harbor porpoise in inland waters of Washington State, the stock for coastal waters of Oregon and Washington from Cape Blanco to Cape Flattery was estimated at about 40,000 in 1997 (Laake et al. 1998). To the north of British Columbia, populations of harbor porpoise in southeastern Alaska including both inside and outside waters have totalled about 10,000 animals (Angliss et al. 2001).

LIMITING FACTORS AND THREATS

A number of potentially limiting factors have been identified from both anthropogenic and natural sources, though the actual impacts of these on the British Columbia population(s) are unclear. Anthropogenic factors fall into two categories: 1) acute impacts (those which directly cause the death of individuals); and 2) long-term impacts, for example habitat loss, changes in prey availability, disturbance from vessels or other sound sources, or factors which might result in reduced reproductive rates or a compromised immune system.

Up until about 1900, harbour porpoises were regularly killed by First Nations people in British Columbia (Boas 1909; Drucker 1951; Suttles 1951; Barnett 1955; Waterman 1973). Today, the primary source of direct mortality is animals being killed incidentally in fisheries. Harbour porpoises seem to be extremely prone to entanglement in fishing gear (Jefferson and Curry 1994). Within British Columbia animals have been documented as being killed in salmon and dogfish drift gillnet fisheries, salmon troll and hake trawl fisheries (Pike and MacAskie 1969; Stacey et al. 1989; Langelier et al. 1990; Baird et al. 1991; Guenther et al. 1993, 1995; Baird and Guenther 1995). The complete loss of animals from the highly developed area of Puget Sound, and the apparent reduction in numbers in areas around Victoria and Haro Strait, are indicative of its sensitivity to human activities. There is little evidence of re-colonization of southern Puget Sound in the last 20 years (Flaherty and Stark 1982; Osmek et al. 1996), suggesting that when a local population is extirpated, recolonization by individuals from surrounding areas is unlikely (see also Chivers et al. 2002).

It is unclear whether incidental mortality may be limiting population growth. Stacey et al. (1990) used a questionnaire survey to examine small cetacean mortality in B.C. fisheries, and estimated that a minimum of 43-59 deaths per year occurred of three different species (harbour porpoise, Dall’s porpoise and Pacific white-sided dolphins). More recently, Hall et al. (2002) estimated harbour porpoise mortality using a questionnaire and fishery observer reports, based on 5% observer coverage of fishing vessels in southern B.C. No entanglements were reported in 2001 in seine net or troll salmon fisheries. However, salmon gillnet fisheries in southern B.C. killed an estimated 80 harbour porpoise in 2001. Surveying licence holders (1997-2001) suggested a province-wide by-catch of <100 harbour porpoises (Hall et al. 2002), though questionnaire surveys are known to be negatively biased in estimating incidental mortality of cetaceans (Lien et al. 1994).

Anthropogenic influences that could result in reduced reproductive rates include effects from accumulation of persistent toxins, disturbance by vessel traffic, and displacement from prime habitat by sources of high-level underwater sounds (e.g., high amplitude seal "scarers" used at aquaculture operations). In terms of effects of toxins, both long-term and acute effects might be important. Harbour porpoises appear to have among 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 (Muir and Norstrom 1990; Baird et al. 1994; Jarman et al. 1996). High levels could affect reproduction, immune function and endocrine function (Ross et al. 1996a, 1996b, 2000). Immune function suppression can result in acute (immediate) impacts on individuals or on the population. For example, the 1988 morbillivirus-associated mass mortality of harbour seals (*Phoca vitulina*) in northern Europe, which resulted in a population reduction of over 50%, may have been exacerbated by immunotoxic effects of contaminants (Ross et al. 1996a, 1996b; de Swart et al. 1996). However, whether toxins are currently impacting harbour porpoise in British Columbia is not known. Another source of mortality (most likely of young animals) could be ingestion of marine debris (Kastelein and Lavaleije 1992; Baird and Hooker 2000).

Harbour porpoise appear to be easily disturbed by vessels as well as other sources of high-amplitude underwater sounds, such as acoustic deterrent devices associated with finfish aquaculture operations (Nichol and Sowden 1995). Ferries between southern Vancouver Island and the mainland often travel through areas where harbour porpoise have been frequently observed (Keple 2002). No information is available to assess the impacts of high-speed (and loud) vessel traffic, nor quantify the impacts of sound sources associated with finfish aquaculture operations. However, given the wide distribution of such aquaculture operations within the province and their frequent use of acoustic deterrent devices, it is possible that this source of disturbance may be impacting populations.

Indirect effects, including reduction of their prey base due to habitat degradation or overfishing, may also be important. Assessing the magnitude of this threat is difficult, however. It should be noted that herring, one of the important prey items for this species in British Columbia and elsewhere, are currently being considered for listing as “threatened” in Washington State under the U.S. Endangered Species Act.

Natural limiting factors may include diseases, predation by killer whales (*Orcinus orca*) or sharks, competitive or agonistic interactions with other cetaceans (e.g., Dall’s porpoise), and die-offs due to biotoxins. In British Columbia, shark predation is probably quite rare (only one case has been documented – Baird and Guenther 1995, though see Arnold 1972; Anselmo and van Bree 1995), but this species is regularly killed by killer whales (e.g., Morton 1990; Baird and Dill 1995). Rates of mortality from killer whales have not been calculated, but they likely vary among different parts of the province, depending in part on the relative abundance of other preferred prey for mammal-eating killer whales (Baird and Dill 1995). Read (1999) notes that, in some areas, it is possible that agonistic interactions with bottlenose dolphins (*Tursiops truncatus*) may play a role in determining the limits of harbour porpoise range (see Ross and Wilson 1996). In British Columbia two cases of apparent agonistic interactions with Pacific white-sided dolphins have been documented (Baird 1998; Morton 1999). Osmek et al. (1995) discuss the possible role of competitive interactions with Dall's porpoise in the decline of harbour porpoise in southern Puget Sound. The diet of the two species around southern Vancouver Island does overlap substantially (Walker et al. 1998). Dall's porpoise were rarely seen in the Strait of Georgia in the 1950s and 1960s (Pike and MacAskie 1969), yet are relatively common there today (R.W. Baird, unpublished data). Similarly, in southern Puget Sound, when harbour porpoise were common in that area in the 1940s, Dall's porpoise were never seen (Osmek et al. 1995), yet Dall's porpoise are relatively common in the area today (Osborne et al. 1988; Miller 1990). Biotoxins or disease outbreaks could, in theory, result in large mortality events. Harbour porpoises are the most frequently reported cetacean to strand on the British Columbia coast (Baird and Guenther 1995), though all strandings are of single individuals, and most (over 90%) animals are dead when found. A number of disease processes contributing to morbidity of harbour porpoises in British Columbia have been identified, including parasitic cholangitis, zygomyotic gastritis, parasitic pneumonia, suppurative pneumonia, and parasitic brochnopneumonia (Guenther and Baird 1993). Unlike the eastern coast of the United States, where there is a spring peak in strandings (Polacheck et al. 1995), strandings are most frequently recorded in late spring and summer (May through September) in British Columbia (Baird and Guenther 1995). Baird and Guenther (1995) suggest that this is due primarily to effort, although the summer occurrence of the salmon fisheries in B.C. (where animals are incidentally caught) may be partly responsible. Two small-scale mortality events (where 10s of animals probably died in each) have been recorded in southern British Columbia. The cause of either event was not determined (Baird et al. 1994; T. Guenther, personal communication). A small-scale mortality event off the Washington coast in 1992 appeared to be caused by bio-toxin poisoning (Osmek et al. 1996).

SPECIAL SIGNIFICANCE OF THE SPECIES

As noted, harbour porpoises are the most common stranded cetacean in the province of British Columbia. Pollutant-ratio information, radio-tracking studies, and their year-round presence in the province implies that harbour porpoise have fairly limited ranges. Of all the cetaceans in the province, harbour porpoise appear to most consistently inhabit shallow, usually near-shore habitats. These features likely result in prolonged exposure to anthropogenic influences. For these reasons, of all the species of cetaceans in the province, they are the best candidate for an index species for programs monitoring the status of the marine environment (Baird 1994).

In southern British Columbia (and adjacent waters of Washington State) harbour porpoise are known to hybridize with Dall's porpoise (Baird et al. 1998; Willis 2001). This is only the second species-pair of cetaceans world-wide where hybridization is known to regularly occur in the wild. Willis et al. (2004) notes that "natural hybridization events among other mammalian species almost always involve disturbed habitats where one population is in decline (e.g. Carr et al. 1986, Lehman et al. 1991)".

EXISTING PROTECTION OR OTHER STATUS

Existing Legal Protection

Two factors are important in the legal protection of a species, the system that is in place to prohibit or regulate hunts or other threats (e.g., mortality in fishing operations), and how effective this system is, i.e., how much monitoring of impacts and enforcement of regulations exists. Where information is available, each of these is discussed below.

International

One international agreement that is relevant to the protection of harbour porpoises in Canadian waters is CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora 1973). All species of cetaceans are listed by CITES under one of two appendices. Appendix I includes species threatened with extinction (and which may be affected by trade), while Appendix II includes species which may become threatened with extinction unless trade is regulated, as well as species which must be subject to regulation in order that trade in threatened species of similar appearance may be controlled (Klinowska 1991). Harbour porpoises are listed under Appendix II for the latter of the above reasons. As such, international trade of harbour porpoise or parts thereof by any countries which are Parties to CITES requires export permits from the country of origin. According to Klinowska (1991) the European Community treats all cetaceans as if they were listed in CITES Appendix I - thus trade requires permits from both exporting and importing countries and such trade must not be primarily for commercial purposes. Some other countries (e.g., USA) also have similar domestic rules, requiring both export and import permits for Appendix II species. As of October 1998 there were 144 Parties to CITES, leaving approximately 90 countries world-wide which were not members (CITES Secretariat statistics). Listing on CITES Appendix II does not provide protection *per se*, though it does mandate recording of international trade.

Harbour porpoises are considered "small cetaceans" by the International Whaling Commission (IWC), and there is currently considerable disagreement within the Commission as to whether small cetaceans are covered by the IWC. Thus no international protection for harbour porpoises is provided by this agency.

The harbour porpoise is also listed as "Vulnerable" by the World Conservation Union (IUCN 1996).

National

Within Canada, management of harbour porpoises is a federal responsibility. From 1982 to 1993 harbour porpoises were covered under the "Cetacean Protection Regulations" (under the Fisheries Act of Canada of 1867). These regulations prohibited "hunting" without a licence. "Hunting" was defined as "to chase, shoot at, harpoon, take, kill, attempt to take or kill, or to harass cetaceans in any manner". No scheme, however, was in place to enforce such regulations, and Aboriginal hunting could be undertaken without a licence. In 1993, the federal government consolidated various marine mammal regulations, including the Cetacean Protection Regulations, under the new "Marine Mammal Regulations". These regulations stated that "no person should disturb a marine mammal except when under.... the authority of these regulations", with "marine mammal" defined as all species listed under a particular appendix. However, many species of cetaceans, including harbour porpoises, were not listed under that appendix, and thus no legal protection appears to have been in place. The definition of "marine mammal" was revoked in 1994, thus extending coverage to all species of marine mammals. Currently, hunting of harbour porpoises can occur if a "Fishing Licence" is obtained (except for Aboriginals who can hunt without a licence). However, no such licences have been issued, and issuance is at the discretion of the federal Minister of Fisheries and Oceans. As with the Cetacean Protection Regulations, little monitoring of entanglements in fishing gear or disturbance by vessel traffic takes place, thus the effectiveness of these regulations is unclear. The 1997 Oceans Act provides for the establishment of marine protected areas (MPAs) in federal waters, including those specifically to conserve and protect marine mammals and their habitats. However, as with other federal legislation regarding marine mammals, establishment of marine protected areas and exclusion of activities which might jeopardize harbour porpoise or other marine mammals are up to the discretion of the Minister of Fisheries and Oceans, rather than mandated. Regardless, there are general concerns about the efficacy of using MPAs to “protect” cetaceans (Duffus and Dearden 1992; Phillips 1996; Whitehead et al. 2000), due primarily to the large range of most species and the lack of boundaries in the marine environment. Whitehead et al. (2000) note that most marine protected areas have provided little or no change in the level of threats faced by cetaceans in an area. However, given the limited movements of harbour porpoise compared to many other species of cetaceans, areas which exclude vessel traffic or fishing activity could be an effective protective measure under the Oceans Act.

In the United States, all cetaceans are protected through the Marine Mammal Protection Act of 1972, as well as through other legislative instruments.

TECHNICAL SUMMARY

Phocoena phocoena
Harbour porpoise Marsouin commun
Range of Occurrence in Canada: Pacific Ocean

Extent and Area Information	
• *Extent of occurrence (EO)(km²)*	Throughout BC coastal waters > 20,000 km^2
• *Specify trend in EO*	Unknown
• *Are there extreme fluctuations in EO?*	Not likely
• *Area of occupancy (AO) (km²)*	Appears to be primarily associated with shallow coastal shelf waters < 2,000 km²
• *Specify trend in AO*	Unknown
• *Are there extreme fluctuations in AO?*	Not likely
• *Number of known or inferred current locations*	N/A
• *Specify trend in #*	N/A
• *Are there extreme fluctuations in number of locations?*	N/A
• *Specify trend in area, extent or quality of habitat*	Habitat decline suspected in coastal areas due to human activities, particularly in southern part of Canadian range (i.e., southern Georgia Strait, Haro Strait and eastern Juan de Fuca Strait.
Population Information	
• *Generation time (average age of parents in the population)*	Unknown. Estimated longevity is 13 years. The oldest animal aged in BC was 10 years old.
• *Number of mature individuals*	Total population in 1996 in the Canadian Strait of Juan de Fuca, Gulf Islands, and Strait of Georgia was 2,895 individuals (all ages). These three regions are a small portion of BC. The proportion of mature individuals is unknown. Age at maturity is believed to be 3-4 years.
• *Total population trend*	Unknown, local declines suspected in highly urbanized areas.
• *% decline over the last/next 10 years or 3 generations.*	Decline is suspected since the 1940s-50s, but the % change is unknown.
• *Are there extreme fluctuations in number of mature individuals?*	No

• *Is the total population severely fragmented?*	Unknown in BC, but there is evidence for localized populations in other regions of the eastern North Pacific.
• *Specify trend in number of populations*	Unknown
• *Are there extreme fluctuations in number of populations?*	No
• *List populations with number of mature individuals in each*	*N/A*
Threats (actual or imminent threats to populations or habitats)	
Entanglement in gillnets, contaminants, disturbance.	
Rescue Effect (immigration from an outside source)	Moderate
• *Status of outside population(s)?* **USA:**	**Washington:** ≈ 15,000 (outer coastal waters, mostly along southern coastline). **Alaska:** ≈ 10,000
• *Is immigration known or possible?*	Possible, but movement of animals appear limited.
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	Unknown
• *Is rescue from outside populations likely?*	
Quantitative Analysis	Unavailable

Status and Reasons for Designation

Status: Special Concern	**Alpha-numeric code:** N/A

Reasons for Designation:
They appear to be particularly sensitive to human activities, and are prone to becoming entrapped and killed in fishing nets. They are a short lived shy species that are now rarely seen at the highly developed areas of Victoria and Haro Strait. Continued development and use of its prime habitat by humans are some of the main threats. They are displaced by underwater noise, and could be affected by contaminants in their food chain.

Applicability of Criteria

Criterion A (Declining Total Population): Local declines are suspected, there is no evidence to support a population wide decline.

Criterion B (Small Distribution, and Decline or Fluctuation): Area of Occurrence is > 20,000 km2 , but Area of Occupancy is likely < 2,000 km2 given that they appear to be associated with shallow coastal shelf waters. However, there is no evidence of population fluctuations or population wide declines.

Criterion C (Small Total Population Size and Decline): Total population in a small portion of the BC range is about 3,000 individuals of all ages (southern Vancouver Island). Total population of mature individuals in BC is unknown, but there is no evidence of population declines.

Criterion D (Very Small Population or Restricted Distribution): Total population in BC exceeds 1,000 mature individuals.

Criterion E (Quantitative Analysis): Available information is insufficient to do a quantitative analysis of the probability of extinction.

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LITERATURE CITED

Amano, M., and N. Miyazaki. 1992. Geographic variation in skulls of the harbor porpoise, *Phocoena phocoena* 56:133-144.

Angliss, R.P., D.P. DeMaster, and A.L. Lopez. 2001. Alaska marine mammal stock assessments, 2001. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-124, 203p.

Anselmo, S., and P.J.H. van Bree. 1995. Shark predation on harbour porpoise *Phocoena phocoena* in the North Sea. Sula 9:23-25.

Arnold, P.W. 1972. Predation on harbour porpoise, *Phocoena phocoena*, by a white shark, *Carcharodon carcharias*. Journal of the Fisheries Research Board of Canada 29:1213-1214.

Baird, R.W. 1994. A program to monitor the status of small cetaceans in British Columbia. Pages 117-125 *in* Proceedings of the Pacific Ecozone Workshop, February 2, 1994, Institute of Ocean Sciences, Sidney, B.C.

Baird, R.W. 1998. An interaction between Pacific white-sided dolphins and a neonatal harbor porpoise. Mammalia 62:129-134.

Baird, R.W., and L.M. Dill. 1995. Occurrence and behaviour of transient killer whales: seasonal and pod-specific variability, foraging behaviour and prey handling. Canadian Journal of Zoology 73:1300-1311.

Baird, R.W., and T.J. Guenther. 1991. Marine mammals of the southern Strait of Georgia: compilation of information for an oil spill response atlas. Unpublished sub-contract report to LGL Ltd., Sidney, B.C.

Baird, R.W., and T.J. Guenther. 1994. Status of porpoises in the British Columbia/Washington trans-boundary area: a Canadian perspective. Puget Sound Notes 34:5-8.

Baird, R.W., and T.J. Guenther. 1995. Account of harbour porpoise (*Phocoena phocoena*) strandings and bycatches along the coast of British Columbia. Reports of the International Whaling Commission Special Issue 16:159-168.

Baird, R.W., and S.K. Hooker. 2000. Ingestion of plastic and unusual prey by a juvenile harbour porpoise. Marine Pollution Bulletin 40:719-720.

Baird, R.W., P.J. Stacey, and K.M. Langelier. 1991. Strandings and incidental mortality of cetaceans on the B.C. coast, 1990. Paper SC/43/O1 presented to the IWC Scientific Committee, May 1991. 6 pp.

Baird, R.W., T.J. Guenther, R.J. Lewis, M.L. McAdie, and T.E. Cornish. 1994. An investigation into the causes of an unusual porpoise (*Phocoena phocoena* and *Phocoenoides dalli*) mortality event in southern British Columbia. Final report to the Department of Fisheries and Oceans under Contract No. IIHS3-050.

Baird, R.W., P.M. Willis, T.J. Guenther, P.J. Wilson and B.N. White. 1998. An intergeneric hybrid in the family Phocoenidae. Canadian Journal of Zoology 76:198-204.

Barnett, H.G. 1955. Studies in anthropology. 4. The coast Salish of British Columbia. University of Oregon Press, Oregon. 320pp. University of Oregon Monographs.

Boas, F. 1909. The Kwakiutl of Vancouver Island – the Jesup North Pacific Expedition. Memoirs of the American Museum of Natural History 5(2):301-522.

Bree, P.J.H. van, D.E. Sergeant, and W. Hoek. 1977. A harbour porpoise, *Phocoena phocoena* (Linnaeus, 1758), from the Mackenzie River delta, Northwest Territories, Canada (Notes on Cetacea, Delphinoidea VIII). Beaufortia 26:99-105.

Calambokidis, J., and J. Barlow. 1991. Chlorinated hydrocarbon concentrations and their use for describing population discreteness in harbor porpoises from Washington, Oregon and California. NOAA Technical Report-NMFS 98:101-110.

Calambokidis, J., S. Osmek, and J.L. Laake. 1997. Aerial surveys for marine mammals in Washington and British Columbia inside waters. Final report for contract 52ABNF-6-0092 to the National Marine Mammal Laboratory, NMFS, NOOA, Seattle.

Carr, S.M., S.W., Ballinger, J.N. Derr, L.H. Blankenship, and J.W. Bickham.1986. Mitochondrial DNA analysis of hybridization between sympatric white-tailed deer and mule deer in west Texas. Proceedings of the National Academy of Science, USA 83: 9576-9580.

Carretta, J.V., M.M. Muto, J. Barlow, J. Baker, K.A. Forney, and M. Lowry. 2002. U.S. Pacific marine mammal stock assessments: 2002. NOAA Technical Memorandum SWFSC.

Chivers, S.J., A.E. Dizon, P.J. Gearin and K.M. Robertson. 2002. Small-scale population structure of eastern North Pacific harbor porpoises (*Phocoena phocoena*) indicated by molecular genetic analyses. Journal of Cetacean Research and Management 4:111-122.

Cowan, I. McT. 1987. The marine mammals of British Columbia, their status and distribution. Pages 95-104 in The wildlife of northern British Columbia – past, present and future. Spatsizi Association for Biological Research, Smithers, B.C.

Cowan, I. McT., and C.J. Guiguet. 1965. The mammals of British Columbia. British Columbia Provincial Museum Handbook 11.

Drucker, P. 1951. The northern and central Nootkan tribes. Smithsonian Institution Bureau of American Ethnology Bulletin 144:1-480.

Duffus, D.A., and P. Dearden. 1992. Whales, science, and protected area management in British Columbia, Canada. George Wright Forum 9:79-87.

Everitt, R.D., C.H. Fiscus and R.L. DeLong. 1980. Northern Puget Sound marine mammals. United States Environmental Protection Agency Report EPA-600/7-80-139.

Flaherty, C., and S. Stark. 1982. Harbor porpoise (*Phocoena phocoena*) assessment in "Washington Sound". Final report for Subcontract #80-ABA-3584 to the National Marine Mammal Laboratory, NMFS, Seattle, WA.

Fontaine, P.-M., M.O. Hammill, C. Barrette and M.C. Kingsley. 1994. Summer diet of the harbour porpoise (*Phocoena phocoena*) in the estuary and the northern Gulf of St. Lawrence. Canadian Journal of Fisheries and Aquatic Sciences 51:172-178.

Gannon, D.P., J.E. Craddock and A.J. Read. 1998. Autumn food habits of harbor porpoises, *Phocoena phocoena*, in the Gulf of Maine. Fishery Bulletin 96:428-437.

Gaskin, D.E. 1992. Status of the harbour porpoise, *Phocoena phocoena*, in Canada. Canadian Field-Naturalist 106:36-54.

Guenther, T.J., and R.W. Baird. 1993. Harbour porpoise (*Phocoena phocoena*) strandings and incidental catches on the B.C. coast: collection of tissues for examination of stock identity. Report prepared under Contract No. 40ABNF202252 to the National Marine Mammal Laboratory, National Marine Fisheries Service, Seattle, WA.

Guenther, T.J., R.W. Baird, J.K.B. Ford, K.M. Langelier, M.L. McAdie, S.G. Wishniowski and T.E. Cornish. 1993. Cetacean strandings and entanglement in fishing gear on the west coast of Canada during 1992. International Whaling Commission Meeting Document SC/45/O 4.

Guenther, T.J., R.W. Baird, R.L. Bates, P.M. Willis, R.L. Hahn and S.G. Wischniowski. 1995. Strandings and fishing gear entanglement of cetaceans off the west coast of Canada in 1994. International Whaling Commission Meeting Document SC/47/06.

Hall, A., G.E. Ellis and A.W. Trites. 2002. Harbour porpoise interactions with the 2001 selective salmon fisheries in southern British Columbia and license holder reported small cetacean by-catch. Selective Salmon Fisheries Science Program Report. Fisheries and Oceans Canada.

Hanson, M.B., R.W. Baird and R.L. DeLong. 1999. Movements of a tagged harbor porpoise in inland Washington waters from June 1998 to January 1999. In Marine Mammal Protection Act and Endangered Species Act Implementation Program 1998. AFSC Processed Report In press. National Marine Fisheries Service, Seattle, WA.

IUCN. 1996. 1996 IUCN red list of threatened animals. IUCN, Gland, Switzerland.

Jarman, W.M., R.J. Norstrom, D.C.G. Muir, B. Rosenburg, M. Simon and R.W. Baird. 1996. Levels of organochlorine compounds, including PCDDS and PCDFS, in the blubber of cetaceans from the west coast of North America. Marine Pollution Bulletin 32:426-436.

Jefferson, T.A., and B.E. Curry. 1994. A global review of porpoise (Cetacea: Pocoenidae) mortality in gillnets. Biological Conservation 67:167-183.

Kastelein, R.A., and M.S.S. Lavaleije. 1992. Foreign bodies in the stomach of a female harbour porpoise (*Phocoena phocoena*) from the North Sea. Aquatic Mammals 18:40-46.

Keple, A.R. 2002. Seasonal abundance and distribution of marine mammals in the southern Strait of Georgia, British Columbia. Masters thesis. University of British Columbia, Vancouver BC. 81 pages.

Klinowska, M. 1991. Dolphins, porpoises and whales of the world - the IUCN Red Data Book. IUCN, Gland, Switzerland.

Koopman, H.N., and D.E. Gaskin. 1994. Individual and geographic variation in pigmentation patterns of the harbour porpoise, *Phocoena phocoena* (L.). Canadian Journal of Zoology 72:135-143.

Laake, J., R.L. DeLong, J. Calambokidis and S. Osmek. 1997. Abundance and distribution of marine mammals in Washington and British Columbia inside waters, 1996. Pages 67-73 in Marine Mammal Protection Act and Endangered Species Act Implementation Program 1996. AFSC Processed Report 97-10. National Marine Fisheries Service, Seattle, WA.

Laake, J., J. Calambokidis and S. Osmek. 1998. Survey report for the 1997 aerial surveys for harbor porpoise and other marine mammals of Oregon, Washington and British Columbia outside waters. Pages 77-97 in Marine Mammal Protection Act and Endangered Species Act Implementation Program 1997. AFSC Processed Report 98-10. National Marine Fisheries Service, Seattle, WA.

Langelier, K.M., P.J. Stacey, and R.W. Baird. 1990. Stranded whale and dolphin program of B.C. – 1989 report. Wildlife Veterinary Report 3(1):10-11.

Lehman, N., A. Eisenhawer, K. Hansen, L.D. Mech, R.O. Peterson, P.J.P. Gogan, and R.K. Wayne. 1991. Introgression of coyote mitochondrial DNA into sympatric North American gray wolf populations. Evolution 45:104-119.

Lien, J., G.B. Stenson, S. Carver and J. Chardine. 1994. How many did you catch? The effect of methodology on bycatch reports obtained from fishermen. Report of the International Whaling Commission Special Issue 15:535-540.

Lockyer, C. 1995. Investigation of aspects of the life history of the harbour porpoise, *Phocoena phocoena*, in British Waters. Report of the International Whaling Commission Special Issue 16:189-197.

Miller, E.J. 1990. Photo-identification techniques applied to Dall's porpoise (*Phocoenoides dalli*) in Puget Sound, Washington. Report of the International Whaling Commission Special Issue 12:429-437.

Morton, A.B. 1990. A quantitative comparison of the behaviour of resident and transient forms of the killer whale off the central British Columbia coast. Reports of the International Whaling Commission Special Issue 12:245-248.

Morton, A. 1999. Return of the dolphins. Whale World 1(3):1.

Muir, D.C.G., and R.J. Norstrom 1990. Marine mammals as indicators of environmental contamination by PCBs and dioxins/furans. Paper presented at the 17th Annual Aquatic Toxicity Workshop, Vancouver, B.C. November 1990.

Nichol, L.M., and M.J. Sowden. 1995. The effect of an acoustic deterrent device on the relative abundance and distribution of harbour porpoise (*Phocoena phocoena*) at a study site in coastal British Columbia. Department of Fisheries and Oceans Contract Report No. FP597-4-3004/01/XSA.

Osborne, R., J. Calambokidis and E.M. Dorsey. 1988. A guide to marine mammals of greater Puget Sound. Island Publishers, Anacortes, Washington.

Osmek, S., B. Hanson, J.L. Laake, S. Jeffries and R.L. DeLong. 1995. Harbor porpoise *Phocoena phocoena* population assessment studies for Oregon and Washington in 1994. Pages 141-172 in Marine Mammal Assessment Program Status of Stocks and Impacts of Incidental Take. National Marine Mammal Laboratory report submitted to the Office of Protected Resources, Silver Spring, Maryland.

Osmek, S., J. Calambokidis, J. Laake, P. Gearin, R. DeLong, J. Scordino, S. Jeffries and R. Brown. 1996. Assessment of the status of harbor porpoise (*Phocoena phocoena*) in Washington and Oregon waters. U.S. Department of Commerce NOAA Technical Memorandum NMFS-AFSC-76.

Phillips, C. 1996. Conservation in practice: agreements, regulations, sanctuaries and action plans. Pages 447-465 *in* The conservation of whales and dolphins. Edited by M.P. Simmonds and J.D. Hutchinson. John Wiley and Sons, Ltd, Chichester.

Pike, G.C., and I.B. MacAskie. 1969. Marine mammals of British Columbia. Bulletin of the Fisheries Research Board of Canada 171:1-54.

Polacheck, T., F.W. Wenzel and G. Early. 1995. What do stranding data say about harbor porpoises (*Phocoena phocoena*)? Report of the International Whaling Commission Special Issue 16:169-179.

Raum-Suryan, K.L., and J.T. Harvey. 1998. Distribution, abundance, and habitat use of harbor porpoise (*Phocoena phocoena*) off the northern San Juan Islands, Washington. Fishery Bulletin 96:808-822.

Read, A.J. 1999. Harbour porpoise *Phocoena phocoena* (Linnaeus, 1758). Pages 323-355 in Handbook of Marine Mammals, Volume 6. Edited by S.H. Ridgway and R. Harrison. Academic Press, San Diego.

Read, A.J., and A.A. Hohn. 1995. Life in the fast lane: the life history of harbor porpoises from the Gulf of Maine. Marine Mammal Science 11:423-440.

Read, A.J., and K.A. Tolley. 1997. Postnatal growth and allometry of harbour porpoises from the Bay of Fundy. Canadian Journal of Zoology 75:122-130.

Recchia, C.A., and A.J. Read. 1989. Stomach contents of harbour porpoises, *Phocoena phocoena* (L.)., from the Bay of Fundy. Canadian Journal of Zoology 67:2140-2146.

Rice, D.W. 1998. Marine mammals of the world – systematics and distribution. Society for Marine Mammalogy Special Publication No. 4.

Rosel, P.E., A.E. Dizon and M.G. Haygood. 1995. Variability of the mitochondrial control region in populations of the harbour porpoise, *Phocoena phocoena*, on interoceanic and regional scales. Canadian Journal of Fisheries and Aquatic Sciences 52:1210-1219.

Ross, H.M., and B. Wilson. 1996. Violent interactions between bottlenose dolphins and harbour porpoises. Proceedings of the Royal Society, London 263:283-286.

Ross, P.S., R.L. DeSwart, H.Van Loveren, A.D.M.E. Osterhaus, and J.G. Vos. 1996a. The immunotoxicity of environmental contaminants to marine wildlife: a review. Annual Review of Fish Diseases 6:151-165.

Ross, P.S., R. De Swart, R. Addison, H. Van Loveren, J. Vos, and A. Osterhaus. 1996b. Contaminant-induced immunotoxicity in harbour seals: wildlife at risk? Toxicology 112:157-169.

Ross, P.S., G.M. Ellis, M.G. Ikonomou, L.G. Barrett-Lennard, and R.F. Addison. 2000. High PCB concentrations in free-ranging Pacific killer whales, *Orcinus orca*: effects of age, sex and dietary preference. Marine Pollution Bulletin 40:504-515.

Scheffer, V.B., and J.W. Slipp. 1948. The whales and dolphins of Washington State with a key to the cetaceans of the west coast of North America. American Midland Naturalist 39:257-337.

Smith, G.J.D., and D.E. Gaskin. 1974. The diet of harbor porpoises (*Phocoena phocoena* (L.)) in coastal waters of eastern Canada, with special reference to the Bay of Fundy. Canadian Journal of Zoology 52:777-782.

Stacey, P.J., R.W. Baird, and K.M. Langelier. 1989. Stranded whale and dolphin program 1988 report. Wildlife Veterinary Report 2(1):10-11.

Stacey, P.J., R.W. Baird and D.A. Duffus. 1990. A preliminary evaluation of incidental mortality of small cetaceans, primarily Dall's porpoise (*Phocoenoides dalli*), harbour porpoise (*Phocoena phocoena*), and Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), in inshore fisheries in British Columbia, Canada. International Whaling Commission Meeting Document SC/42/SM20.

Suttles, W.P. 1951. Economic life of the Coast Salish of Haro and Rosario Straits. Ph.D. Thesis, University of Washington. 512pp.

de Swart, R.L., P.S. Ross, J.G. Vos, and A.D.M.E. Osterhaus. 1996. Impaired immunity in harbour seals (*Phoca vitulina*) exposed to bioaccumulated environmental contaminants: review of a long-term feeding study. Environmental Health Perspectives 104 supplement 4.

Trites, A.W. and D. Pauly. 1998. Estimating mean body masses of marine mammals from maximum body lengths. Canadian Journal of Zoology 76: 886-896.

Walker, W.A., M.B. Hanson, R.W. Baird and T.J. Guenther. 1998. Food habits of the harbor porpoise, *Phocoena phocoena*, and Dall's porpoise, *Phocoenoides dalli*, in the inland waters of British Columbia and Washington. Pages 63-75 in Marine Mammal Protection Act and Endangered Species Act Implementation Program 1997. AFSC Processed Report 98-10. National Marine Fisheries Service, Seattle, WA.

Wang, J.Y., D.E. Gaskin and B.N. White. 1996. Mitochondrial DNA analysis of harbour porpoise, *Phocoena phocoena*, subpopulations in North American waters. Canadian Journal of Fisheries and Aquatic Sciences 53:1632-1645.

Waterman, T.T. 1973. Notes on the ethnology of the Indians of Puget Sound. Museum of the American Indian Heye Foundation Indian Notes Monograph Miscellaneous Series 59:1-95.

Watts, P., and D.E. Gaskin. 1985. Habitat index analysis of the harbour porpoise (*Phocoena phocoena*) in the southern coastal Bay of Fundy, Canada. Journal of Mammalogy 66:733-744.

Whitehead, H., R.R. Reeves and P.L. Tyack. 2000. Science and the conservation, protection and management of wild cetaceans. *In* Cetacean societies: field studies of dolphins and whales. Edited by J. Mann, R. Connor, P. Tyack and H. Whitehead. University of Chicago Press.

Willis, P.M., B.J. Crespi, L.M. Dill, R.W. Baird and M.B. Hanson. 2004. Natural hybridization between Dall's porpoises (*Phocoenoides dalli*) and harbour pospoise (*Phocoena phocoena*). Canadian Journal of Zoology, in press.

Yurick, D.B., and D.E. Gaskin. 1987. Morphometric and meristic comparisons of skulls of harbor porpoise *Phocoena phocoena* (L.) from the North Atlantic and North Pacific. Ophelia 27:53-75.

BIOGRAPHICAL SUMMARY OF THE REPORT WRITER

Robin W. Baird received his Ph.D. in Biology from Simon Fraser University in 1994, with his thesis focusing on the foraging behaviour and ecology of killer whales in southern British Columbia. In 1987 he co-founded a cetacean stranding program in British Columbia, and co-coordinated this program until the mid-1990s, during which time he collected samples for life history, population discrimination and diet studies, and studied causes of mortality of harbour porpoise and other species in the province. Dr. Baird has been involved in tagging and tracking studies of harbour porpoise in Washington State, is currently a Post-doctoral Fellow at Dalhousie University. He works with Cascadia Research Collective in Olympia, Washington.