Status of Porpoises in the British Columbia/Washington Trans-Boundary Area: A Canadian Perspective

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Members of nine species of marine mammals inhabit the trans-boundary area and regularly cross the international border between British Columbia (B.C.), Canada, and Washington state (Calambokidis and Baird, 1994). Despite the shared occurrence of these species, efforts by the governments of the two countries have been very different in terms of their focus on marine mammal populations. While the mandate of the U.S. National Marine Fisheries Service includes a conservation focus, such a focus typically has been absent in the efforts of the Canadian Department of Fisheries and Oceans regarding marine mammals. While species which directly impact fisheries, such as seals and sea lions, receive some attention, others are largely ignored, even when evidence suggests that a conservation concern exists. University-based investigations in British Columbia have also been extremely biased in terms of the species of marine mammal studied. Between 1979 and 1991 a total of 9 graduate degrees were based on killer whale (*Orcinus orca*) research in British Columbia; only a single graduate study focused on any other species of cetacean (the gray whale, *Eschrichtius robustus*) as well as killer whales.

Thus at both government and university levels, research on smaller cetaceans in British Columbia has been generally lacking. While no information is available on trends in the abundance of Dall's porpoise (*Phocoenoides dalli*), there is evidence to suggest that the population of harbour porpoise (*Phocoena phocoena*) in British Columbia may be threatened. Yet the Canadian Department of Fisheries and Oceans has not supported any field research on these animals in British Columbia to date. So little is known about the abundance of harbour porpoise on the Canadian west coast that the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has been unable to classify the status of this population. However, anecdotal evidence implies that the harbour porpoise population has been declining in some areas of southern British Columbia since the 1940s. More recently, comparisons of harbour porpoise records around southern Vancouver Island from 1987 to 1993 (Baird and Guenther, 1991; Baird, unpublished) to survey information from the late 1970s (Everitt et al., 1980; Flaherty and Stark, 1982) indicate a large decline, or shift in habitat use, for this species in the trans-boundary areas of Haro Strait and Boundary Pass (see map in Figures 3 and 4). Considerably more research has been undertaken on the harbour porpoise populations on the east coast of Canada (Gaskin, 1992). Findings from these studies, undertaken principally through the University of Guelph in Ontario, have resulted in the Canadian east coast population being classified as threatened by COSEWIC.

Harbour porpoises are prime candidates among cetaceans for monitoring programs in the marine environment. Because they are the most common species found stranded in the province (Baird and Guenther, in press), the available sample sizes for toxicology and pathology are largest for this species. Consistent geographic variation in the ratios of several pollutants observed in porpoise tissues (Calambokidis and Barlow 1991), and their year-round presence throughout British Columbia (Baird and Guenther, in press), imply that harbour porpoise have fairly limited movements; thus animals found in the Strait of Georgia likely reside there year-round. As they are the only cetaceans in these waters restricted to a shallow habitat (< 100 m in depth), harbour porpoises experience the greatest exposure to anthropogenic influences. Their propensity for entanglement in fishing gear also puts harbour porpoise populations at risk in the province. Lastly, harbour porpoises have levels of dioxins and furans which are among the highest recorded for any species of cetacean in the Strait of Georgia, as well as high levels of organochlorines and heavy metals (Muir et al. 1991).

In an attempt to collect data on harbour porpoise, Dall's porpoise and other species of cetaceans in the province, a volunteer organization (the Marine Mammal Research Group - MMRG) first requested the public's assistance in reporting sightings and strandings of marine mammals in 1987. This approach to monitoring marine mammals has had consider-

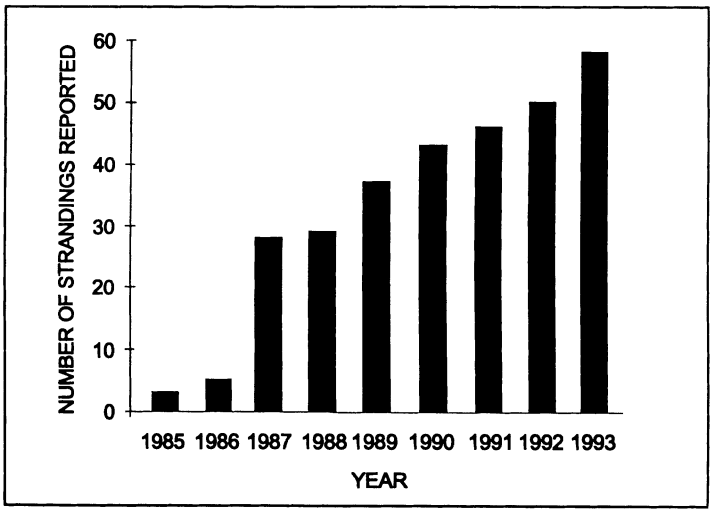

Figure 1. Trend in the numbers of cetacean stranding and incidental catch records in British Columbia since 1985. The sudden increase in records in 1987 represents the establishment of the Stranded Whale and Dolphin Program of B.C., while the steady increase in records since then represents a gradual increase in reporting effort.

able success, particularly in the Victoria area where the MMRG is based and promotion of its programs has been greatest. The public's response is particularly noticeable when examining the number of stranded cetaceans reported each year. As shown in Figure 1, since the Stranded Whale and Dolphin Program (SWDP) began in 1987, the number or records reported each year has increased steadily, and far exceeds the numbers reported for any other year prior to 1987. In most cases this increase reflects a growing awareness of MMRG's programs and the value of reporting such information, rather than an actual increase in the number of stranded animals.

Porpoise Die-off

The large number of porpoises which washed up in the Victoria area in the spring of 1993 was an exception to this (see Baird et al., 1994, for full details). Between 10 April and 7 June, 1993, 24 dead porpoises (11 harbour, 10 Dall's, and 3 unidentified) were found along the south and southwest coasts of Vancouver Island. In contrast, between 1987 and 1992, also during the months of April through June, an average of only 2.3 (range 1-4) dead porpoises were found in this same area each year (Figure 2). The great increase in strandings in 1993 appears to reflect an actual increase in the number of porpoises dying during that period; there is no indication of an increase in public reporting between 1987 and 1992, as public knowledge of the stranding program in this area has been high since its inception in 1987.

Necropsies were undertaken on 17 of the stranded animals, none of which showed signs of net entanglement. Stomach contents identified by W.A. Walker (National Marine Mammal Laboratory) indicated that the species composition of prey was generally similar to that from animals stranded in British Columbia in previous years. The analysis of a single sample of stomach fluids for biotoxins (saxitoxin and domoic acid) by the Department of Fisheries and Oceans was negative. Histopathological, toxicological, bacteriological and virological analyses of a variety of tissues were performed at the Animal Health Centre in Abbotsford, B.C. Out of 12 animals whose tissues were suitable for histological examination, eight had significant lesions due to parasites (cholangitis and pneumonia most commonly), and one had an extensive peritonitis in conjunction with a large intra-abdominal abscess. No specific indication of any other infectious agent was found, however, and limited microbiological examinations were unrewarding. Levels of some organochlorines were higher than in previous years (Tables 1 and 2), but these differences were not great, ruling out acute intoxication by any of the contaminants tested for. And so, despite these investigations, the cause or causes of this event remain undetermined. The impact of such a die-off on the populations of these species also remains unclear. The proportion of dead porpoises that were actually found, and the information on population sizes and trends for Dall's and harbour porpoise required to estimate the impact on these populations, are both unknown.

MMRG's stranding program receives very little funding, and since all individuals involved volunteer their time, collection of animals in remote places is often extremely diffi-

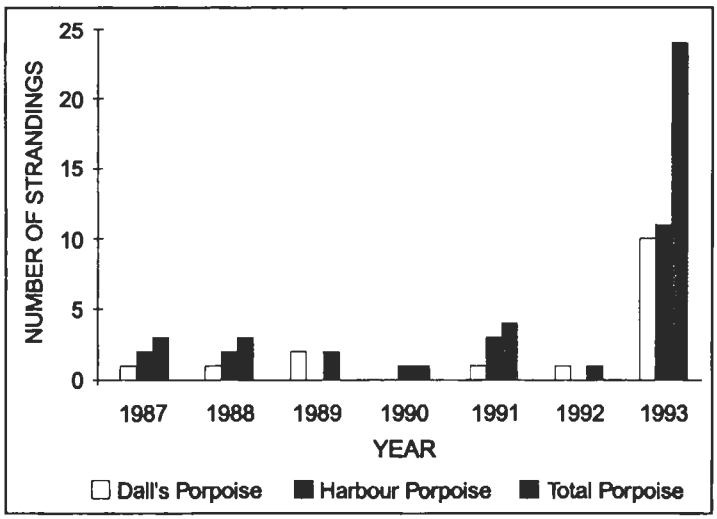

Figure 2. Number of dead porpoises recorded in the Victoria area during the months of April-June each year since 1987.

Table 1. Organochlorine levels for harbour porpoise blubber. Means were calculated using a value of zero for those parameters which were not detected (ND) at the minimum detectable limits.

	Harbour Porpoise 1993 N=8		Harbour Porpoise 1988, 1990, 1991 N=7	
Parameter (µg/g)	Mean	Range	Mean	Range
HCB [1]	0.09	0.001-0.03	0.081	ND-0.33
Alpha-BHC [2]	0.062	0.003-0.1	0.067	ND-0.24
Lindane [2]	0.011	ND-0.03	0.003	ND-0.022
Beta-BHC [2]	0.08	0.02-0.2	0.070	ND-0.29
Oxychlordane [3]	0.03	0.01-0.08	0.017	ND-0.12
t-Nonachlor [3]	0.3	ND-0.3	0.192	ND-0.45
Alpha-Chlordane [3]	0.1	ND-0.2	0.106	ND-0.37
p,p-DDE [4]	2.4	ND-3.7	1.238	ND-1.38
p,p-DDD [3]	0.21	0.01-0.5	0.188	ND-0.67
p,p-DDT [3]	0.15	0.01-0.3	0.119	ND-0.33
PCB [5]	4.0	0.3-11	1.257	ND-6.2

Minimum Detectable Limits (µg/g - wet weight basis)
[1]0.001 [2]0.002 [3]0.01 [4]0.005 [5]0.05
1988-1991 levels from Guenther and Baird (1993).

Table 2. Organochlorine levels for Dall's porpoise blubber. Means were calculated using a value of zero for those parameters which were not detected (ND) at the minimum detectable limits.

	Dall's Porpoise 1993 N=8		Dall's Porpoise 1987-1992 N=11	
Parameter (µg/g)	Mean	Range	Mean	Range
HCB [1]	0.20	0.001-0.07	0.15	0.02-0.7
Alpha-BHC [2]	0.10	0.002-0.16	0.11	ND-0.6
Lindane [2]	0.02	ND-0.05	0.03	ND-0.25
Beta-BHC [2]	0.13	ND-0.4	0.08	ND-0.6
Oxychlordane [3]	0.05	0.01-0.2	0.01	ND-0.1
t-Nonachlor [3]	0.25	ND-0.9	0.23	0.04-0.8
Alpha-Chlordane [3]	0.08	ND-0.2	0.60	ND-0.6
p,p-DDE [4]	4.0	ND-12	1.30	0.07-5.1
p,p-DDD [3]	0.3	ND-1.3	0.12	ND-0.4
p,p-DDT [3]	0.34	0.01-1.1	0.19	0.02-0.6
PCB [5]	4.2	ND-14	1.64	ND-6.2

Minimum Detectable Limits (µg/g - wet weight basis)
[1]0.001 [2]0.002 [3]0.01 [4]0.005 [5]0.05

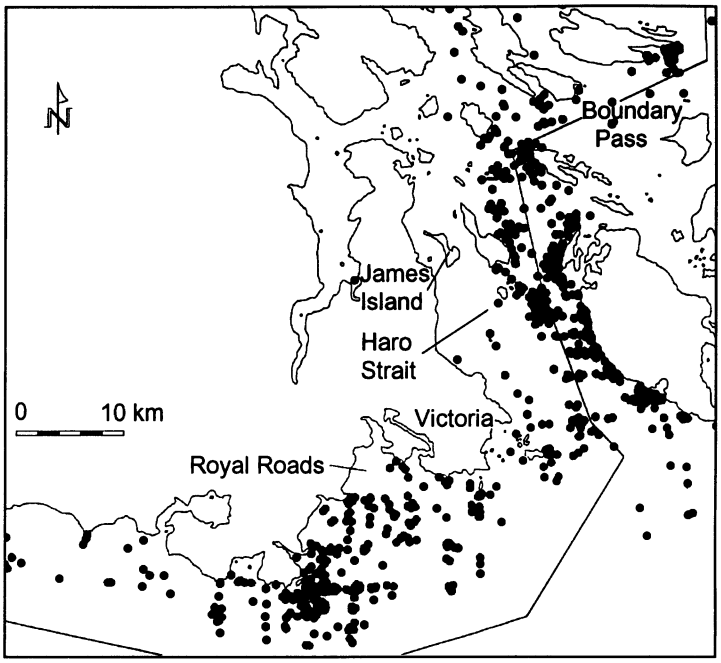

Figure 3. Distribution of sightings of Dall's porpoise in the Victoria area (1987-1991). Note the concentration of records in eastern Haro Strait and in Boundary Pass, and the lack of sightings around James Island and in the Royal roads area.

cult, if not impossible. However, we try to maximize the research and educational value of each animal we are able to collect by performing complete post-mortem examinations, with a qualified veterinarian in attendance if possible, and by donating skeletons to schools and museums. The B.C. provincial government's Ministry of Agriculture, Fisheries and Food has been extremely helpful, providing toxicological and histological analyses of samples from stranded animals. Ministry staff have analyzed samples of blubber, liver and kidney from stranded cetaceans for heavy metals and organochlorines at the end of each year, if funds remained in their wildlife budget (see results in Baird et al., 1994). Dr. Ron Lewis with the Ministry's Animal Health Centre in Abbotsford B.C. has volunteered his time to examine histological samples for parasites and pathology. Interestingly enough, MMRG's stranding program has received some direct funding from the National Marine Mammal Laboratory (NMML) in Seattle, Washington. The NMML has supplied funds to assist in the collection of harbour porpoise tissues for use in stock differentiation investigations (Guenther and Baird, 1993).

Another valuable outcome of the stranding program has been the identification of fisheries which incidentally catch marine mammals. No observer programs exist for marine mammal bycatch in inshore British Columbia fisheries, and fishermen are not required to report animals they catch. Until such a program exists, bycatches may be determined to occur by the observation of beach-cast animals with net marks still visible when they wash up on shore. While most of the incidentally caught animals are never discovered, we have been able to identify a variety of fisheries where incidental porpoise mortality occurs. These include a U.S. Native American fishery in the Semiahmoo Bay area, from which several net-caught harbour porpoises were washed up on the adjoining Canadian shoreline in Boundary Bay. Both Dall's and harbour porpoises have been killed by salmon drift gill-net fisheries and seine fisheries in the trans-boundary area, as well as by trawl fisheries for bottom fish and Canadian government test and research fisheries. The occasional porpoise is also caught on lines from sports fishing operations, but it is not clear whether animals are killed as a result.

MMRG's sighting program also has provided valuable information, particularly on the distribution and relative abundance of cetaceans around population centres such as Victoria. Figures 3 and 4 show the locations of Dall's and harbour porpoise sightings around Victoria, collected since 1987. Clear differences in habitat use of the two species are apparent. Harbour porpoise seem to prefer broad, shallow areas between 10 and 100 m in depth, while Dall's porpoise are rarely found in waters less than 50 m in depth. This kind of Information is particularly valuable when looking for areas where sufficient concentrations exist to undertake more directed studies, such as a proposed joint undertaking by the MMRG and the NMML to apply satellite transmitters to harbour porpoise in order to determine the extent of their movements within the trans-boundary area.

Despite the progress made in our efforts to understand the biology and status of harbour and Dall's porpoise in British Columbia, considerably more research is needed. Calambokidis and Baird (1994) list a variety of research needs for cetaceans in the trans-boundary area, most of which apply to these species. They include estimates of population sizes within the Canadian waters of the trans-boundary area for both species of porpoises through aerial or boat based surveys, and more detailed investigation of levels of incidental mortality in the various commercial and native fisheries in the area. Our investigations will continue, documenting the causes of mortality (both anthropogenic and natural), feeding habits, and life history of these two species.

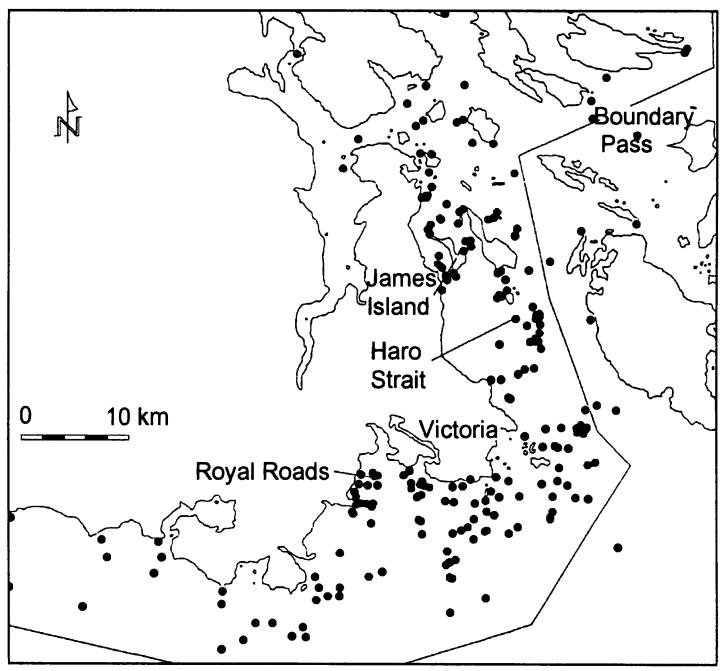

Figure 4. Distribution of sightings of harbour porpoises in the Victoria area (1987-1992), recorded from the same sources as in Figure. Virtually no harbour porpoises were recorded in eastern Haro Strait and Boundary Pass, while sightings around James Island and in the Royal roads area occurred regularly.

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