

NATIONAL RECOVERY STRATEGY
FOR THE

North Pacific Right Whale
Eubalaena japonica

in
Pacific Canadian Waters



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EXECUTIVE SUMMARY

Historical distribution from offshore whaling data (1785-1913) show that right whales were present in BC waters during the months of April to October (Townsend 1935, Clapham et al. in review), possibly feeding or migrating to or from sub-tropical calving grounds. However, due to insufficient data, it is not possible to describe the current distribution of this species in Canada. Only seven right whales were taken by BC whalers (1900-1951), who worked mainly in coastal waters (Table 1). The last right whale sighting in BC waters was in 1970 by S. Wada while on board a Japanese scoutboat west of the Queen Charlotte Islands (Wada 1975).

The biology and ecology of the North Pacific right whale remain unknown. It is unclear how many individuals exist and the location of the calving grounds is still a mystery (Brownell et al. 2001). Whaling records from the 1800s show that right whales were once plentiful across much of the North Pacific (Maury 1852, Maury 1853, Townsend 1935, Scarff 1986, Scarff 1991, Brownell et al. 2001). The pre-exploitation abundance of North Pacific right whales has been estimated to be more than 11,000 animals (NMFS 1991). At this time, it is impossible to produce a reliable estimate of abundance for the North Pacific right whale or to know population trends, since since virtually nothing is known about population number, season distribution and movements.

Although right whales were the first whales to be protected internationally (in 1935) by the International Whaling Commission (Donovan 1992), the northern hemisphere species have shown very few signs of recovery after the whaling era. They appear to represent an extreme example of the inability of whale stocks to recover from severe depletion.

The Recovery Team identified threats and knowledge gaps that should be addressed to ensure recovery of North Pacific right whales. The primary threat to the survival of the North Pacific right whale is likely small population numbers. Additional threats include coastal development and ship strikes; entanglement in fishing gear; habitat degradation; noise; climate change and food supply; and pollution. Identified knowledge gaps are population structure and genetics; life history parameters and population dynamics; current presence, abundance, distribution, and habitat use in BC waters; and clarification of threats and human influences.

The goal of this recovery strategy is to restore the North Pacific right whale to Canadian waters and maintain long-term viability of the population. To achieve the goal of the North Pacific right whale recovery strategy, the Recovery Team identified that all of the following objectives should be met:

- Gather baseline data on occurrence, abundance and habitat to support recovery efforts.

- Obtain better information on potential threats to North Pacific right whales that frequent Canadian waters and the effectiveness of strategies to mitigate these impacts.
- Develop and implement tasks or programs to reduce impacts from human activities on the population of right whales that frequent BC waters.
- Conduct long-term monitoring of the status of North Pacific right whales and evaluate the effectiveness of mitigation strategies.
- Contribute to bilateral and multilateral cooperative efforts to conserve and recover the North Pacific right whale.
- Raise awareness and understanding of the status of and threats to North Pacific right whales, and engage Canadians in supporting national and international recovery efforts.

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1. INTRODUCTION

The North Pacific right whale, *Eubalaena japonica* (Lacepede 1818; Rosenbaum et al. 2000b), is a large, robust baleen whale. Adults can reach up to 18 metres in length, and may weigh up to 70 metric tons (Silber and Clapham 2001). Females are larger than males, and newborns are 4.5 to 6 metres long at birth (Kenney 2001). Right whales are distinguished by a stocky body, black colouration, sometimes with white patches on their ventral surface, lack of a dorsal fin, a large rostrum (about $\frac{1}{4}$ of the body length), strongly bowed lower lip, and callosities on the head region (Silber and Clapham 2001). These callosities are irregular patches of thickened, keratinized tissue, which are inhabited by dense populations of specialized amphipod crustaceans, known as cyamids (Kenney 2001). Two rows of long (up to about 2.5 m in length), dark baleen plates hang from the upper jaw, with about 225 plates on each side. The tail is very broad, deeply notched, and all black with a smooth trailing edge (Silber and Clapham 2001). They have a distinct V shaped blow, upwards of 5 metres in height. Right whales lack elastic throats, unlike other baleen whales that have pleated, elastic throats used to gulp food consisting of large krill or fish. The right whale feeds almost exclusively on copepods (*Calanus* spp.), which are gathered by 'skimming' through dense patches of these organisms with their huge mouths open. Typical feeding dives last for 10-20 minutes (Kenney 2001).

No significant morphological differences have been documented between right whales in the North Atlantic, Southern Oceans, and the North Pacific. However, recent genetic studies indicate that there are three distinct species with complete and long-established isolation (Kenney 2001). The Southern right whale has long been recognized as a separate species, *E. australis*. Genetic data show that the North Pacific right whale is more closely related to southern right whales than to those in the North Atlantic (Rosenbaum et al. 2000a). Based on this genetic evidence, the International Whaling Committee, the U.S. National Marine Fisheries Service, and many other authorities recommend that the three populations be considered as separate species. In this report, North Pacific right whales are referred to as *E. japonica*, North Atlantic whales are referred to as *E. glacialis*; and Southern Hemisphere right whales are referred to as *E. australis*. Note, however, that in most of the past scientific literature, North Pacific right whales are referred to as *E. glacialis japonica*.

Basic aspects of the biology and ecology of the North Pacific right whale remain unknown. It is unclear how many individuals exist and the location of the calving grounds is still a mystery (Brownell et al. 2001). Whaling records from the 1800s show that right whales were once plentiful across much of the North Pacific (Maury 1852, Maury 1853, Townsend 1935, Scarff 1986, Scarff 1991; cited in Brownell et al. 2001). Concentrations were present in waters around Japan, the Okhotsk Sea, the Kuril Islands, Kamchatka, the Aleutian Islands and southeastern Bering Sea, and the 'Northwest Ground' in the Gulf of Alaska (Brownell et al. 2001).

Right whales were once highly important commercially. They are large, slow swimming, tend to congregate, and their thick layer of blubber prevents them from sinking when killed. These attributes made them an easy and profitable species for early whalers, recording total catches estimated at between 26,500 and 37,000 right whales in the North Pacific (Scarff 2001). These were the first whales to be protected internationally (in 1935) by the International Whaling Commission (Donovan, 1992). However, illegal Soviet Union whaling (which continued into the 1960s) pushed the eastern population of North Pacific right whales even closer to the brink of extinction, killing at least 372 individuals (Doroshenko 2000, Brownell et al. 2001). Although they were among the first to be protected internationally, the Northern hemisphere right whales are still among the rarest of large whales (IWC 2001). They appear to represent an extreme example of the inability of whale stocks to recover from severe depletion.

2. BACKGROUND

2.1 Current Status

Common name:	North Pacific right whale
Scientific name:	<i>Eubalaena japonica</i>
Assessment summary:	April 1987
COSEWIC status:	Endangered
Reason for designation:	A rarely seen baleen whale found in coastal BC waters. Once highly prized by commercial whalers, right whales appear to represent an extreme example of the inability of whale stocks to recover from severe depletion. There is very little known about the abundance and distribution of these baleen whales.
Occurrence in Canada:	North Pacific
Status history:	Endangered status originally assigned by COSEWIC April 1980 (Hay 1985). Endangered status reaffirmed April 1985, 1987 (Gaskin 1987) and 1991 (Gaskin 1991).

2.2 Distribution

2.2.1 Global range

Whaling records indicate that right whales in the North Pacific ranged across the entire North Pacific, from the western coast of North America to the Russian Far East (Scarff 1986, Brownell et al. 2001, Clapham et al. In review). Before right whales in the North Pacific were heavily exploited by commercial whalers, concentrations were found in the Gulf of Alaska, eastern Aleutian Islands,

southcentral Bering Sea, Sea of Okhotsk, and Sea of Japan and offshore waters across much of the North Pacific (Braham and Rice 1984, Clapham et al. in review). Post-exploitation distribution is much more restricted. Post-whaling sightings have been reported as far south as central Baja California in the eastern North Pacific, as far south as Hawaii in the central North Pacific and as far north as the sub-Arctic waters of the Bering Sea and Sea of Okhotsk in the summer (Herman et al. 1980, Berzin and Doroshenko 1982, NMFS 1991).

There are very few data on the current summering and wintering grounds of the North Pacific right whale. In the western North Pacific, feeding areas have been found in the Okhotsk Sea and along the Kuril and Kamchatka coasts (Brownell et al. 2001). Gaskin (1987) pointed out that whaling data assembled by Nemoto (1957, 1959, and 1962) and Gaskin (1976) suggest that most remaining eastern North Pacific right whales gather together in summer on the southeastern shelf of the Bering Sea, around the eastern Aleutian Islands, and Kodiak Island. Further studies of historical concentrations and some recent summer sightings indicate that the Bering Sea and Gulf of Alaska may contain important feeding grounds (Scarff 1986, Goddard and Rugh 1998, Moore et al. 2000, Brownell et al. 2001, Clapham et al. in review).

North Atlantic and Southern right whales generally calve in very shallow coastal temperate to sub-tropical waters during the winter months. The western population of North Atlantic right whales calve off southeastern USA during the winter months (Kraus et al. 1986). Calving grounds for Southern right whales have been reported in the near-shore waters of the Auckland Islands (Patenaude and Baker 2001), Campbell Island (Stewart and Todd 2001), Peninsula Valdez (Rowntree et al. 2001), southern Brazil (de Oliveira Santos et al. 2001) and Namibia (Roux et al. 2001). In the western North Pacific, various calving areas have been proposed, including the Ryukyu Islands (Omura 1986), the Yellow Sea (Tomilin 1957), the Sea of Japan (Omura 1986) and offshore waters far from land (Scarff 1991). The calving/wintering grounds of the eastern North Pacific right whale are unknown. However, scattered reports exist of right whales seen off of BC, northern Oregon and Hawaii during winter months (Gaskin 1987).

Migratory patterns of the North Pacific right whale are unknown, although in other oceans right whales generally spend the summer on high-latitude feeding grounds and migrate to more temperate waters during the winter (Braham and Rice 1984). They are found across a wide range of latitudes during both summer and winter, which is evidence of a staggered migration (Scarff 1991, cited in Brownell et al. 2001). This seasonal movement is also evident in monthly plots of 20th century and historical records (Clapham et al. in review). It is important to stress that very few sightings exist, and because of low population numbers little is known about the current distribution of North Pacific right whales.

2.2.2 Canadian range

Historical concentrations from offshore whaling data (1785-1913) show that right whales were present in BC waters during the months of April to October (Townsend 1935, Clapham et al. in review), possibly feeding or migrating to or from sub-tropical calving grounds. Due to insufficient data, it is not possible to describe the current distribution of this species in Canada. Only seven right whales were taken by BC whalers, who worked mainly in coastal waters. The last right whale sighting in BC waters was in 1970 by S. Wada while on board a Japanese scoutboat west of the Queen Charlotte Islands (Table 1, [Figure 1](#)).

Table 1. Right whale sightings/catches in British Columbia waters, 1900-2002.

DATE	LOCATION	NUMBER	REFERENCE
1914	Naden Harbour	1	Nichol et al. 2002
1918	Rose Harbour	1	Nichol et al. 2002
1924	Naden Harbour (54°35 N, 133°55 W) (54°05 N, 133°40 W)	2	Pike and MacAskie 1969
1926	Naden Harbour (53°40 N, 133°45 W)	1	Pike and MacAskie 1969
1929	Rose Harbour	1	Nichol et al. 2002
1951	Coal Harbour (50° N, 128° W)	1	Pike and MacAskie 1969
1970	W of Queen Charlotte Islands (50-55° N, 130-140° W)	2	Wada 1975

An additional three sightings of seven animals were recorded in US waters near the B.C./Washington border (Table 2, [Figure 1](#)). The proximity of these sightings to Canadian waters is important, suggesting that these animals may be using similar habitats in Canadian waters.

Table 2. Right whale sightings/catches in waters adjacent to Canadian waters, 1900-2002.

DATE	LOCATION	NUMBER	REFERENCE
April 8, 1959	SW of Grays Harbour, Washington (45°55 N, 125°25 W)	3	Fiscus and Niggol 1965 (cited in Brownell et al. 2001)
January 17, 1967	W of Cape Flaherty, Washington (48°20 N, 125°06 W)	3	Rice and Fiscus 1968 (cited in Brownell et al. 2001)
May 24, 1992	NW of Grays Harbour, Washington (47°17 N, 125°11 W)	1	Rowlett et al. 1994 (cited in Brownell et al. 2001)

Between 1958 and 1977, only seven offshore records exist (i.e. outside the 200 mile limit to 145° W) (Table 3).

Table 3. Offshore right whale sightings/catches, 1900-2002.

DATE	LOCATION	NUMBER	REFERENCE
Post-1958?	50° N, 145° W	2	Pike and MacAskie 1969
1963	51° N, 145° W	200	Berzin and Doroshenko 1982 (cited in Brownell et al. 2001) [†]
1973	45-50° N, 140-150° W	1	Wada 1975
1974	40-50° N, 140-160° W	1	Anonymous 1976
1975	45-45° N, 140-150° W	2	Wada 1977
1977	40-50° N, 140-145° W	1	Wada 1979
1977	45-50° N, 135-140° W	2	Wada 1979

[†] Note : Berzin and Rovnin (1966) say 200 in all eastern North Pacific in 1963, and no large sightings are seen near this location in their figures (Brownell et al. 2001).

(Figure 1—The data in these tables will be plotted on a map)

Waters off of BC, Washington, Oregon, and California have been suggested as remnant wintering grounds for right whales (Gilmore 1956). Historical whaling information also supports coastal waters off BC as important habitat for feeding and migration.

2.2.3 Percent of Global Distribution in Canada

Again, due to insufficient data, it is not possible to estimate the percent of this species' global distribution or population abundance currently found in Canada.

2.3 Nationally significant populations

(Figure 2—Townsend map of historical RW distribution to come)

There appears to be a minimum of two populations of right whales in the North Pacific, at least with regard to feeding ground divisions—one in the east and one in the west, with the possibility that the western group may occur in two separate sub-populations (Klumov 1962, cited in Brownell et al. 2001). However, Kenney (2001) argues that there are insufficient genetic or resighting data to support this separation. Nevertheless, the literature strongly supports distinct western and eastern right whale populations, and therefore this report does so as well.

The putative eastern population of North Pacific right whales was hunted more intensively than the western population, which suggests the possibility that fewer right whales exist in the east today than in the west (Figure 2). What information exists on the eastern population is summarized by Brownell et al. (2001) and Clapham (in press). The degree of genetic exchange between the two

populations in high latitudes or on a possible offshore breeding ground is unknown (Brownell et al. 2001). Due to the implications of decreased genetic exchange on common breeding grounds, the status of all populations of right whales in the North Pacific is of concern.

2.4 Population Sizes and Trends

The pre-exploitation abundance of North Pacific right whales has been estimated to be more than 11,000 animals (NMFS 1991). Among the large whales, Northern hemisphere right whales have shown the least signs of recovery after the whaling era. Because so little is currently known about this population, it is impossible to produce a reliable estimate of abundance for the North Pacific right whale or to know population trends at this time. Most estimates appear to be speculations based upon general patterns of sightings not supported by any quantitative data (e.g. Berzin and Yabokov 1978, Braham and Rice 1984, Berzin and Vladimirov 1989, Vladimirov 1994, Vladimirov 2000, cited in Brownell et al. 2001). And even the most quantitative studies (e.g. Ohsumi and Wada 1974, Miyashita and Kato 1998, cited in Brownell et al. 2001) have problems of high variance in their estimates of abundance due to extrapolations from small sample sizes to large areas (Brownell et al. 2001). This problem has been attributed to the difficulty of accurately counting small populations of whales dispersed over wide geographical areas (Gaskin 1987).

North Pacific right whales probably number no more than those found in the western North Atlantic (~300) (IWC 1998), with most of these animals occurring in the western North Pacific. The western population is little studied but appears to be capable of reproducing (Miyashita and Kato 1998). No population estimate exists, but it is unlikely that there are more than a few hundred animals in the western population (Knowlton et al. 1994, IWC 1999, Best et al. 2001, Kraus et al. 2001). In the eastern North Pacific, recent sightings are rare, although a few animals—between four and 13 individuals—have been seen in the southeast Bering Sea each July since 1996 (Brownell et al. 2001, LeDuc et al. 2001). Acoustic data suggest that the animals in the southeast Bering remain in this area from August until November ([Lisa Munger data, ask Sue Moore about ref](#)). Eleven individual eastern North Pacific right whales have been photo-identified in the southeast Bering Sea (LeDuc et al. 2001). Of these, six individuals have been genetically identified between 1997 and 2000 (LeDuc et al. 2001). Nine additional skin samples were collected in 2002, including one from the mother of a calf. Although the 2002 samples are not yet genotyped, the only female known to date is the mother of this calf (www.publicaffairs.noaa.gov/releases2002/sep02/noaa02122.html--ask Sue Moore).

Ohsumi and Wada (1974) and Wada (1976) applied effort corrections to whaling data and estimated the population size at about 120 for the eastern North Pacific. More recently, the lack of sightings despite considerable survey effort by Japan

(Miyashita and Kato 1998) and the US (LeDuc et al. 2001) suggest that the population may number in the tens.

3. FACTORS AFFECTING VULNERABILITY AND CONTRIBUTING TO THREATENED STATUS

3.1 Habitat Requirements

3.1.1 Survival and Recovery Habitat

This idea of 'critical habitat' is difficult to define for baleen whales that are distributed over ocean basins. The current abundance, reproductive rates, distribution patterns, migration routes, and feeding and calving grounds of North Pacific right whales are not known. No studies or calculations have been conducted to identify the habitat required by North Pacific right whales to achieve and sustain a viable population. It is therefore impossible to identify either the habitat currently occupied by the species, or that extent needed to maintain the current population size.

3.2 Ecological Role

North Pacific right whales are a K-selected species (i.e. long-lived species with low reproductive rates and high, relatively uniform abundance), which are predicted to have the greatest effect in structuring their ecosystems (Ray 1981). They are low trophic level filter feeders highly specialised to "skim" the water surface by swimming forward with their mouth open (Kenney 2001). Despite their large size, they feed entirely on zooplankton, primarily copepods. A single whale can eat several tonnes of copepods a day. Their dependence on such large, dense aggregations of prey determines much of their distribution.

Bowen (1997) discusses the role of marine mammals in aquatic environments, and how the abundance and distribution of marine mammals can have important effects on the structure and function of some ecosystems. The range of prey sizes included in diets of filter feeding baleen whales has likely had important effects on the behaviour of prey (Bowen 1997). For instance, instead of tightly schooling in the presence of a predator, it would be more beneficial for copepods to scatter when faced with a right whale "skimming" the surface. However, the role that right whales play in shaping the behaviour of copepods has not been investigated.

It is thought that patterns of food consumption by large cetaceans have had strong effects on community structure in the Bering Sea (NRC 1996). Laws (1985) estimated that an enormous reduction in the biomass of large whales in the Antarctic may have released 150 million tonnes of krill annually to remaining predators, resulting in an increase in smaller whales, seals, seabirds, and fish.

Similarly, a reduction in major consumers of plankton (including the right whale), and the resulting increase in plankton, may have greatly contributed to the shift in dominant fisheries seen in the Bering Sea during the 1970s and 1980s (Bowen 1997).

The reduction of baleen whales and this shift in dominant fisheries occurred concurrently with physical changes throughout the Pacific. Primary and secondary production increased in the North Pacific, due to deepening and shallowing of the mixed layers of different regions (Venrick et al. 1987, Venrick 1994, Polovina et al. 1995). The combined changes in species abundance, community composition, trophic organization and physical factors indicate that a regime shift occurred (Benson and Trites 2002). An abrupt change in biomass of large whales could likely accelerate such a regime shift by increasing the amount of plankton available to remaining predators.

3.3 Biologically Limiting Factors

The following biologically limiting factors could possibly prevent the recovery of the North Pacific right whale, regardless of the additional threats to this species' population viability and habitat discussed in section 3.4 below.

3.3.1 K-selected Species

The two species of Northern Hemisphere right whales possess several biological characteristics that make a species particularly susceptible to disturbance and recovery difficult (Clapham et al. 1999). They are long-lived, females have a late age of maturity estimated at 9 or 10 years (Hamilton et al 1988), and they have a long calving interval, generally calving every three to four years (Knowlton et al 1994). Recently, the calving interval in the North Atlantic has been reported to have increased to more than five years (Knowlton and Kraus 2001).

3.3.2 Critically Low Numbers

North Pacific right whales have a critically small population, which could result in low genetic diversity (inbreeding depression) or depensation (Allee Effect), thus restricting their recovery. Indeed, evidence from mtDNA suggests that the North Atlantic right whale went through a very small genetic "bottleneck" (Schaeff et al. 1993), which may have resulted in a lowered reproductive rate and increased calving interval (Knowlton et al. 1994). Depensation, or negative density dependence, could also be affecting the recovery of this species (see section 3.4 on Threats).

3.3.3 Food Supply

Reduction in the abundance of their food supply has been suggested as a possible explanation for the low population growth rate in right whales. The consequences of inadequate food supply could be either a reduction in individual

growth rates, thus delaying sexual maturity, or insufficient blubber reserves needed for females to sustain pregnancy or lactation (Kenney et al. 1986). However, currently nothing is known about reproduction in North Pacific right whales. Calves have been reported in the western North Pacific (Omura 1986, cited in Brownell et al. 2001), but calculation of a reproductive rate is impossible. Until a recent sighting of a cow and calf in the Bering Sea on August 24, 2002 there had been no confirmed sightings of calves in the eastern North Pacific for 150 years.

3.4 Historic Threats

3.4.1 Subsistence/Native Harvest

Traditional whaling around Japan and Korea virtually extirpated right whales from the western North Pacific (Gaskin 1987). In the eastern North Pacific, Monks et al. (2001) states that right whales were hunted by central and northern Nuu-chah-nulth (Nootkan) tribes and that they were pursued whenever they were seen. Subsistence whaling may also have been conducted by the Haida of the Queen Charlotte Islands, although it is unknown whether right whales were taken (Acheson and Wigne 2002). Various aboriginal peoples from Washington State were also known to take this species (Mitchell 1979, Mitchell and Reeves 2001), although it was not usually the main target of their hunts, nor were they taken in great numbers (Brownell et al. 2001). Currently, subsistence hunters in Alaska and Russia are not reported to take animals from the eastern North Pacific right whale population (Ferrero et al. 2000). In Canadian waters, aboriginal whaling is not illegal, and should subsistence harvesting be renewed, it may represent a threat to remnant populations of the North Pacific right whale.

3.4.2 Commercial whaling

Commercial whaling in the North Pacific during the early 1800s recorded total right whale catches of at least 14,500 animals (Best 1987, IWC 1986). International protection dates from 1935, when commercial whaling for right whales was banned on the high seas. All whaling, including shore-based, was subsequently banned in 1946, however illegal whaling in the North Pacific continued. Brownell et al. (2001) factored in illegal hunting by the Soviet Union in order to address the question of the present status of North Pacific right whales. Hundreds of right whales were illegally hunted in the Kuril Islands and the Okhotsk Sea, and 372 were killed in the eastern North Pacific, notably the Gulf of Alaska and southeastern Bering Sea (Yablokov 1994, Zemsky et al. 1995, Tormosov et al. 1998, Doroshenko 2000, cited in Brownell et al. 2001). Remnant populations may have been gradually recovering from intense commercial whaling until the 1960s, when these illegal Soviet catches compromised this recovery (Brownell et al. 2001). The illegal hunting by the Soviets likely halted any nascent recovery of the remaining eastern and western North Pacific right whale population. However, because of the rarity of these animals and

international pressure, commercial whaling of the North Pacific right whale is no longer a threat and illegal whaling has seemingly come to an end.

3.5 Current Threats

We do not have sufficient data on occurrence, distribution, reproduction or genetics of North Pacific right whales to allow us to determine whether the following threats currently exist in BC waters. Despite this lack of knowledge, it is important that we consider all possible issues that may impact the individuals using BC waters. The threats listed in this section are currently affecting right whale populations in other national and international areas and should be investigated as potential threats off our coast.

Regardless of the ability to ultimately identify the primary threats affecting this population, we recognize that some of these threats cannot be rectified, regardless of what measures are taken. The effects of low genetic diversity, depleted population numbers and climate change will be impossible to reverse through human action.

3.5.1 Population Numbers and Genetic Diversity (inbreeding depression)

Each individual right whale is extremely important to this population in the North Pacific. Any mortality would certainly be significant, perhaps decreasing the chance of encountering a mate and lowering genetic diversity. The low number of known females in this area is particularly alarming, since losing a female could potentially reduce the rate of reproduction in such a small population.

Inbreeding depression is of major concern in the management and conservation of endangered species. The long-term effects of extreme population depletion by commercial whaling may include reduced genetic diversity and associated health and reproductive problems (Kenney 2001). Schaeff et al. (1997) demonstrated from nuclear DNA that the proportion of genetic material shared among unrelated North Atlantic right whales is significantly higher than that shared among unrelated right whales in the South Atlantic. Bearing in mind that the population of right whales in the North Pacific is probably fewer than in the North Atlantic, it is logical to assume that the proportion of genetic material shared among North Pacific right whales would be even higher than that of the North Atlantic. Katona and Kraus (2001) pointed out that it is not known how much genetic variation is needed in a mammalian population, and correlation to health and reproductive problems would be very difficult. However, genetic variation in North Pacific right whales must be considerably less than would be expected in a larger population. This low genetic variation is a potential threat to the health of a population because of the possibility of inbreeding depression (Schaeff et al. 1997). A population exhibiting inbreeding depression will have reduced reproduction and recruitment resulting from reduced fecundity, decreased neonate and juvenile survival, or lowered resistance to disease (Charlesworth and Charlesworth 1987, Haebler and Moeller 1993, Frankham 1995a, Frankham 1995b, Hedrick and

Kalinowski 2000). Presently, there are no data on the degree of genetic variation, disease, or reproductive and survival rates in North Pacific right whales. Nevertheless, because of the rarity of this species, inbreeding depression should be considered a severe threat to the North Pacific right whale.

3.5.2 Coastal Development and Ship Strikes

Ship strikes are the most significant human-related source of mortality for right whales in the North Atlantic (Kenney 2001), but this is not known to be a significant source of mortality in the North Pacific. Coastal development has increasingly displaced prime habitat for many marine species. Increasing marine traffic through dredging and shipping channels may disrupt right whales by displacing animals from prime habitat, as well as increasing the risk of ship strikes. As we learn of critical right whale habitats, their proximity to major shipping channels will determine whether ship strikes represent a potential threat to right whales in the North Pacific. This threat may be under-reported for right whales off the BC coast, due to the remoteness of most of the coast and the rotund right whale body—which makes it unlikely that they would be carried into port on the bow of a ship, such as seen with fin whales (Laist et al. 2001).

3.5.3 Entanglement in Fishing Gear

Entanglement in fishing gear is a major source of mortality for the North Atlantic right whale (Kraus 1990, Clapham et al. 1999, IWC 2001), and it is possible that right whales in the North Pacific are also vulnerable to this source of mortality. Entanglements that are not initially lethal may result in a gradual weakening, making these individuals more susceptible to other indirect causes of mortality, such as disease (Kenny and Kraus 1993). Due to the operation of Japanese salmon driftnet fisheries within the Russian Exclusive Economic Zone (EEZ) (inside the Okhotsk Sea and around Kamchatka) since 1991, entanglements in fishing gear may represent a major problem for the western population of North Pacific right whales (Brownell et al. 2001). There was a report in 1992 in the Okhotsk Sea of a right whale entangled in fishing gear (T. Miyashita, in Brownell et al. 2001). The Russian gill net fishery was implicated in the death of two right whales: one in 1983, and the other off the Kamchatka Peninsula (Russia) in 1989 (NMFS 1991, Kornev 1994). Although entangled whales have not been reported in the Bering Sea and further south into BC waters, there are extensive fisheries in the eastern Bering Sea and entanglements can be considered a threat to right whales in this area, which may also include individuals that use BC waters.

3.5.4 Habitat Degradation

Defining the three-dimensional habitat of right whales is difficult because these animals are wide-ranging and difficult to observe. However, as human activity expands into marine environments we can be sure that our impact on these and other cetaceans will become increasingly evident. A potential threat to the North Pacific right whale is habitat loss due to shipping channels, dredging of major

shipping channels, high traffic zones, undersea exploration and development of mineral deposits (Silber and Clapham 2001).

3.5.5 Noise

Right whales rely on sound for communication, navigation, attracting mates, or detection of predators and prey (Clark 1994). Disturbing any of these biologically important functions could interfere with behaviour, thus disrupting migration, feeding, breeding, and other critical activities (Todd et al. 1996). The effects of noise on right whales might range from subtle changes in behaviour to physiological damage, such as permanent hearing loss and mortality due to inner ear blast injuries (Ketten et al. 1993).

Anthropogenic noise includes seismic testing for oil and gas exploration, active sonar and explosives testing by the military, underwater noisemakers to deter marine mammals from fishing nets and fish pens, marine experiments that involve the use of loud sounds, and increasing levels of noise from everyday boat and ship traffic (Anonymous 2000). Man-made noise could potentially interfere with acoustic communication, particularly since the major sound energy from shipping overlaps the lower frequencies of right whale signals (Richardson et al 1995, Kenney 2001). This could lead to displacement from migration routes or important habitats. Evidence of displacement can be seen in a recent study indicating that seismic surveys for offshore oil and gas being conducted off Sakhalin in Russia have excluded grey whales from their primary feeding habitat (Brownell personal communication).

Underwater explosions from construction, military exercises, and oceanographic or geophysical research are known to directly affect the physiology of whales, and may result in mortality. In 1992, humpback whales off Newfoundland, were found with damaged ear structures after underwater blasting was used in constructing oil installations (Ketten et al. 1993, Lien et al. 1995). The testing and use of low frequency sonar have been linked to a mass stranding of beaked whales in the Canary Islands (Vonk and Martin 1989, Simmonds and Lopez-Jurado 1991) and the Ionian Sea (Frantzis 1998). And recently, the United States Navy has released a report in which it takes responsibility for the death of six whales found beached with haemorrhaging after a sonar test in the Bahamas (March 15 and 16, 2000). Such activities should be of great concern in BC waters, particularly in areas where oil and gas exploration, pipeline construction, and military exercises are conducted or proposed.

3.5.6 Climate Change and Food Supply

Climate-driven regime shifts cause major changes in ecological relationships over large-scale oceanographic areas (Francis and Hare 1994), and are manifested faster at lower trophic levels in marine ecosystems (Benson and Trites 2002). An increase in surface water temperature could result in a declining zooplankton population (Roemmich and McGowan 1995), thus changing the

carrying capacity of the Pacific (Venrick et al. 1987). Right whales feed exclusively on zooplankton, and preferably on large calanoid copepods. They have a narrow range of acceptable prey species and require prey concentrations of exceptionally high densities. The presence of such concentrations is dependent upon physical factors, such as water structure, currents, and temperature. Kenney (2001) suggested this might make the right whale (a low-trophic grazer) more sensitive than other cetaceans to impacts from global climate change. He also suggested that a reduction in the abundance of copepods, caused by either climate change or competition, is a possible explanation for the low population growth rate in right whales. Furthermore, any impacts may be amplified by matrilineal fidelity to feeding grounds, and possibly a low ability to locate new feeding grounds when conditions change (Kenney 2001).

Competition from sei whales (Mitchell 1975) and planktivorous fishes (e.g. herring, sandlance, basking sharks) (Payne et al. 1990) has also been suggested as a limiting factor on right whale populations on the North Atlantic, although there is no direct evidence for this. However, nothing is known about possible competition between North Pacific right whales and sympatric species. Inadequate food supply was addressed by Kenney et al. (1986), who suggested that the consequences could be either a reduction in individual growth rates, thus delaying sexual maturity, or insufficient blubber reserves needed for females to sustain pregnancy or lactation.

3.5.7 Pollution

Pollution may affect whales in various ways. Non-food items or contaminants could be ingested directly during feeding (Katona and Kraus 2001). Right whales feed in convergent zones and slicks where surface currents concentrate anything that floats, including contaminants, oil, and floating garbage (Carr 1985). Baleen whales would also be affected through impacts on marine productivity (O'Shea and Brownell 1994), especially right whales due to their specialized copepod diet.

Contaminants can enter the tissues either directly from the environment or through bioaccumulation from prey. Organochlorine compounds (Σ DDT and PCBs) and metals are the contaminants of most concern for marine mammals. Despite high concentrations of PCBs in fish- and mammal-eating cetaceans (i.e. St. Lawrence Belugas and Pacific killer whales) (Béland et al. 1993, Ross et al. 2000, Addison and Ross 2001, Grant and Ross 2002, Ross 2002a, Ross 2002b), right whales are low trophic level grazers, thus minimizing the concentrations of contaminants accumulating via their prey. O'Shea and Brownell (1994) reported that concentrations of contaminants in baleen whales were generally much lower than in odontocetes, and although they caution that additional samples would be valuable, they recommend that conservation-minded research and actions focus on measures to decrease human-caused mortality.

3.5.8 Depensation (Allee effect)

It is believed that populations at very low densities exhibit reduced reproductive rates. This is the opposite of what would be expected by populations that have positive density dependence. This negative density-dependence is called depensation, or the Allee effect. For example, a population of very low density may have difficulty reproducing due to the probability of finding another right whale, or density dependent courting behaviours necessary for reproduction. Courting and reproductive behaviours, such as seen in right whale “surface-active groups” that require many males, could be affected by low population densities, resulting in reduced reproduction (Anonymous 2000). However, it will always be difficult to verify that depensation is the cause of reduced reproductive success when alternative explanations exist.

3.6 Socio-economic Considerations

Right whales were once a valuable resource to early whalers (early 1800s) and were historically valued by Makah and Nuuchahnulth First Nations. Right whales were not the primary target of aboriginal hunts, nor does it appear that they were taken in great numbers (Brownell et al. 2001). The aboriginal right to hunt whales by First Nations in British Columbia still exists. However, right whales would not likely be targeted due to their rarity and offshore range.

A thriving whale-watching industry has developed on the BC coast during the past two decades, but there is currently no commercial whale-watching value for the North Pacific right whale. The species' is too rare to be of interest to whale-watch operators.

As one of the baleen whale species first hunted by humans, it has been present for at least 1000 years in Basque history, and can be traced back about 3000 to 4000 years in North American aboriginal whaling (Monk et al. 2001). The value of a right whale is no longer in its baleen and oil, but in its intrinsic worth (i.e. the perceived rather than the monetary value). The rarity of encountering this large charismatic mammal, so important to human history, gives right whales an enormous intrinsic value.

3.7 Knowledge Gaps

There is an urgent need for information on the distribution, biology, ecology and vulnerabilities of the North Pacific right whale. Knowledge of the species is not yet adequate to clearly define recovery objectives and/or approaches. In order to make knowledgeable and appropriate management decisions, it is essential that knowledge gaps be filled on the biology and ecology of this species.

3.7.1 Population structure, genetics

Genetic investigations in the North Pacific would delineate populations, perhaps providing support for the two-population hypothesis, or determining the number

of populations. Analyses using both mitochondrial and microsatellite DNA would address the question of genetic exchange between populations in high latitudes or on offshore breeding grounds (Brownell et al. 2001). These analyses would provide critical information on genetic diversity and determine whether a bottleneck has occurred in these populations, as found in the North Atlantic right whale. A genetic “bottleneck” could limit the recovery of the North Pacific right whale through reduced reproduction and recruitment resulting from reduced fecundity, decreased neonate and juvenile survival, or lowered resistance to disease (Ralls et al. 1988, Haebler and Moeller 1993). However, as Brownell et al. (2001) noted, the major obstacle to these genetic studies is finding a sufficient sample of right whales.

3.7.2 Life history parameters, population dynamics

Current data on the abundance and population dynamics of right whales in the North Pacific need to be collected and analysed. If evidence exists for delayed onset of sexual maturity, then potential causes such as insufficient food supply, low genetic diversity or depensation should be investigated.

3.7.3 Current presence, abundance, distribution, and habitat use in BC waters

The entire range of this species should be surveyed more thoroughly. Information on the occurrence, distribution and migration patterns of right whales in the North Pacific is critical to identifying the key factors affecting the recovery of this species. Feeding grounds remain unknown in BC waters, yet right whales likely exist in coastal waters, though in very low numbers. Without data on distribution, there is no way of knowing if a conflict exists between shipping channels and important habitats, or whether shifts in prey availability are decreasing the reproductive success of these animals. Determining habitat use and preference is critical to determining the abundance and distribution of right whales in BC waters.

3.7.4 Clarification of threats, human influences

The greatest threat to North Pacific right whales is likely their critically low population size. To investigate this threat, accurate information on the abundance and distribution of this species is necessary. Clarification is required on the extent that projects or developments on, in or under the water (e.g., shipping lanes, underwater explosives) pose a threat to the North Pacific right whale by direct and indirect impact(s). A thorough investigation of the potential for conflict between shipping lanes and right whale distribution may be critical to the survival of right whales, as seen in the North Atlantic. Preferred habitat and genetic delineation of populations must also be clarified. Without accurate information regarding the population structure of North Pacific right whales and the habitats used by them, we will be less effective at determining how human actions affect right whales and whether our management actions are having the desired result of reducing human impact on this species.

4. RECOVERY

It is important to note that it is not possible to develop measurable recovery criteria at this time due to the lack of data on the biology, distribution, abundance and threats affecting the North Pacific right whale. Nor will it be possible to gain enough data within a few years to develop and measure recovery criteria for such a long-lived species. Due of this uncertainty in measuring recovery for this species, it is essential that all the recovery objectives be met to ensure that the recovery goal is achieved.

4.1 Recovery Goal

Restore the North Pacific right whale to Canadian waters and maintain long-term viability of the population.

4.2 Recovery Objectives

To achieve the goal of the North Pacific right whale recovery strategy, all of the following objectives should be met.

- Gather baseline data on occurrence, distribution, abundance and habitat to support recovery efforts.
- Obtain better information on potential threats to North Pacific right whales that frequent Canadian waters and the effectiveness of strategies to mitigate these impacts.
- Develop and implement tasks or programs to reduce impacts from human activities on the population of right whales that frequent BC waters.
- Conduct long-term monitoring of the status of North Pacific right whales and evaluate the effectiveness of mitigation strategies.
- Contribute to bilateral and multilateral cooperative efforts to conserve and recover the North Pacific right whale.
- Raise awareness and understanding of the status of and threats to North Pacific right whales, and engage Canadians in supporting national and international recovery efforts.

4.3 Recovery Strategies

It is important to note that, for a long-lived species such as the right whale, it may take many decades before increases in this population can be observed. It is therefore critical that the long-term nature of this strategy is recognized in the development of the objectives and supporting strategies.

The following strategies include efforts that will not only be essential to the survival of North Pacific right whales, but may also be important for other baleen whale species that occur in the same habitats in the region (eg. Blue, fin, sei and humpback whales). This set of strategies should be coordinated with other baleen whale strategies in a multi-species approach.

Scientific Research

1. Conduct multi-species acoustically-aided surveys to examine the potential occurrence of North Pacific right whales in areas formerly occupied off the BC coast.
2. Deploy multiple remote acoustical recording packages to monitor for the presence of North Pacific right whales off BC.
3. Utilize platforms of opportunity and develop sighting networks to take advantage of opportunistic sightings.
4. Develop procedures and protocols to recognize and respond to any stranding of a right whale.
5. Coordinate with international research efforts on right whales to ensure that photographic identification, collection of skin samples and other procedures are done in such a way as to maximize knowledge and collaboration.
6. Evaluate information on preferred habitats of right whales worldwide to identify potential important habitats in BC waters.
7. Compile all historical information and a list of archived samples (including skeletal remains) available for the North Pacific right whale.

Threats Research

1. Evaluate information on human impacts on right whales and other cetaceans worldwide to determine whether similar human activities off BC could affect the right whale.
2. Review mitigation measures that have been effective in other regions and countries, and where appropriate, incorporate such measures into mitigation efforts for the North Pacific right whale.

Mitigation and Protection

Some of the strategies set for this objective address potential threats in BC waters that can be acted upon immediately, while others call for action following the identification and assessment of new threats.

1. Ensure no right whales are killed by commercial or aboriginal hunting. (e.g., Canada join the IWC).

2. Take immediate steps to minimize impacts of threats identified through research or circumstance.
3. Establish response programs for disentangling right whales in fishing gear and examine fishing practises of those gear types found to entangle right whales.
4. Review appropriate laws and infrastructure needed to enable possible changes in shipping lanes and shipping operations.
5. Ensure inter-agency coordination within and between provincial and federal governments to develop stringent assessment processes that explicitly consider potential impacts on right whales and their habitat from human activities, including:
 - broadcast of loud underwater sounds
 - oil and gas exploration and development
 - coastal development
 - aquaculture
 - industrial activities
 - military activities
 - new fisheries
6. Review national and international oil spill contingency plans to ensure they include measures to protect right whales and their habitats.

Monitoring and Evaluation

1. Evaluate whether current research efforts are effectively monitoring the North Pacific right whale, and take steps to improve research strategies where needed.
2. Continue long-term monitoring of the occurrence of North Pacific right whales.
3. Evaluate data on trends in North Pacific right whale distribution and abundance in BC waters and throughout their range.

Coordination

1. Ratify, respect, and/or contribute to international instruments, particularly the International Whaling Commission, that promote North Pacific right whale protection and recovery.
2. Initiate agreements and collaborative projects with countries that share the population of right whales that frequents Pacific Canadian waters.
3. Facilitate exchange of individuals from government, academia, industry, and non-government organizations for participation in international research and recovery programs (e.g., visas, internships, etc.).

Education and Awareness

This set of strategies should be coordinated with other cetacean strategies in a multi-species approach.

1. Promote awareness of North Pacific right whale conservation and recovery issues within government departments.
2. Develop public awareness campaigns and educational programs that highlight right whale status, distribution, biology, threats and recovery efforts in Canada.
3. Promote public involvement in stewardship programs.

4.4 Considerations for Recovery:

4.4.1 Ecological and technical feasibility of species recovery

At present, adequate knowledge does not exist for an accurate assessment of the feasibility of recovering North Pacific right whales.

4.4.2 Anticipated Conflicts or Challenges

The greatest foreseeable obstacle to the goal and objectives of this recovery plan is the rarity of the North Pacific right whales. Although there has been very little search effort in BC waters, sightings of right whales in adjacent US waters are rare despite considerable survey effort. When found, they are usually as single animals or in small groups. There have been only 13 individuals recently found in the eastern North Pacific.

Habitat protection may need to be large-scale, which could create opposition. Consideration of impacts on the North Pacific right whale in the environmental impact assessment for any off-shore developments could be seen as an obstacle to industry (e.g., ports, oil and gas exploration and dredging). Strategies to minimize entanglement in fishing gear may affect commercial fisheries through area closures and gear changes. Any restrictions on large-scale underwater noise could affect seismic and military activities. All of these measures will require cooperation from these industries, and could result in technical, economic, commercial, legal and political conflict.

The recovery strategy needs to ensure that conservation strategies on this long-lived species are maintained, and that long-term research and monitoring of trends are continued over time. This will require consistent and adequate levels of funding.

Clarification is needed on the position of aboriginal subsistence hunting. There should be no subsistence hunting of the North Pacific right whale due to its

extreme rarity. This may be a source of conflict if First Nations decide to pursue traditional hunts in the future.

4.4.3 Recommended Approach / Scale for Recovery

The long-term nature of both research and actions critical to the recovery of this species cannot be overemphasized. Right whales, like all baleen whales, occur over large oceanographic spatial and temporal scales. Thus, for this strategy to be successful, it will require dedicated long-term funding and research support.

A multi-species research program is the recommended approach for the recovery strategy. Future recovery strategies for other baleen whales at risk are anticipated to have similar objectives and strategies, and will directly benefit from the foresight of developing an efficient multi-species research program.

5. ACTIONS ALREADY COMPLETED OR UNDERWAY

5.1 Research in Canada

5.1.1 Pacific Canada

Until recently, research on the North Pacific right whale was absent on the Pacific coast of Canada. In 2002, the Department of Fisheries and Oceans conducted three multi-species acoustically-aided surveys to examine the potential occurrence of North Pacific right whales in areas formerly occupied off the BC coast. Remote acoustical recording packages (ARPs) for monitoring the presence of North Pacific right whales off BC have also been developed, and a prototype has been deployed 700 miles off-shore. There will be two new devices deployed and the prototype will be re-deployed in 2003. At least two multi-species acoustically-aided surveys will be completed in 2003.

5.1.2 Atlantic Canada

Right whale research on the Atlantic coast of Canada is years, if not decades, ahead of the Pacific. Dedicated surveys for right whales in the two known habitat areas in Atlantic Canada, the lower Bay of Fundy between Nova Scotia and New Brunswick and Roseway Basin on the western Scotian Shelf between Browns and Baccaro Banks began in 1980. During these surveys researchers have collected photographs for individual identification of right whales. The database on North Atlantic right whales is archived by member institutions of the North Atlantic Right Whale Consortium. The right whale research team at the New England Aquarium (Director: Scott D. Kraus) curates the database on the photographed sightings of individually identified right whales. As of February 11, 2003 there are 26,854 sightings of 438 right whales of which 322 are thought to be alive (IWC 2001; Kraus et al. 2001, NEAq, unpublished data), and appears to be recently declining in size (Caswell et al. 1999; Fujiwara and Caswell 2001).

As of 2001, there are also 415 genetic samples from 302 individually identified right whales. Michael Moore of Woods Hole Oceanographic Institute curates the database on blubber thickness measurements and blubber samples from necropsies and biopsy samples.

Western North Atlantic right whales have been subject to significant losses from anthropogenic mortalities, and have experienced a significant decline in reproductive rates during the last ten years (Knowlton and Kraus 2001; Kraus et al. 2001). Fujiwara and Caswell (2001) calculated the asymptotic population growth rates from 1980 to 1995 and found that the growth rate declined from $\lambda=1.03$ in 1980 to $\lambda=0.98$ in 1995 suggesting that if the 1995 growth rate were maintained, the population would go extinct in about 200 years. The current growth rate is negative and has led to international calls for immediate conservation management action (Fujiwara and Caswell 2001; IWC 2001).

In 1994, the Department of Fisheries and Oceans designated two conservation areas for right whales (Bay of Fundy and Roseway Basin). WWF and the Department of Fisheries and Oceans brought together a Northern Right Whale Recovery Team in 1997. This was the first major recovery team in Canada to include private stakeholders along with scientific experts, government agencies and conservation groups. This team developed the Canadian North Atlantic right whale recovery plan (September 2000).

Since 2000, a team of scientists, researchers and graduate students from the Defence Research Establishment Atlantic (DREA) and Dalhousie University have been testing sonobuoys and bottom-mounted hydrophones to determine whether right whales can be located in order to warn ships of their presence. WWF, the fishing industry, conservation organizations and a gear manufacturer have begun working together to test fishing gear that has been specially designed to release entangled whales or modified to reduce the incidence of entanglement. Representatives from the shipping, fishing, and whale watching industries have been working with right whale biologists from university, non-governmental organizations, Transport Canada Marine Safety, and the Department of Fisheries and Oceans to analyze right whale distribution and ship traffic in the Bay of Fundy, resulting in an amendment to the Traffic Separation Scheme lanes in the Bay of Fundy to protect the North Atlantic right whale population from ship strikes by reducing the probability of a ship strike. The measure was adopted by the International Maritime Organization and takes effect July 1, 2003.

5.2 Legal Protection

Right whales have been protected from commercial whaling by the International Whaling Committee (IWC) since 1949, when Japan and the Soviet Union joined the IWC. However, extensive illegal whaling by the Soviet Union into the 1960s has been documented (Doroschenko 2000, Brownell et al. 2001). Although Japan has continued to take cetaceans under scientific licenses, right whales have not been targeted.

Right whales in Canada, are protected under the Marine Mammal Regulations (MMR) of the Fisheries Act as well as under the new Species At Risk Act (SARA) (due to be proclaimed in June 2003). The SARA prohibits killing, harming and harassing a threatened or endangered species and protects their critical habitat. Recovery planning is also a legal requirement under the SARA.

5.3 Listing Status

5.3.1 Status in Canada

COSEWIC does not currently distinguish the North Pacific right whale as a separate species from the North Atlantic right whale. Right whales—both Pacific and Atlantic—were listed by COSEWIC as Endangered in 1987 (Gaskin 1987). North Pacific right whales are expected to be acknowledged as a distinct species and re-assessed by COSEWIC for June 2003. There is no danger of down-listing this species in the near future.

5.3.2 Status in the US

In US waters, northern right whales were first protected by the Endangered Species Conservation Act—the precursor to the ESA—and are now protected by both the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA).

The northern right whale—which included both the North Atlantic and North Pacific populations—was listed as endangered under the Endangered Species Conservation Act in June 1970. Right whales in the North Atlantic were then listed as “endangered” under the ESA in 1973, and listed as “depleted” under the MMPA that year. The North Pacific right whale was also listed as “endangered” under the ESA of 1973, and designated as “depleted” under the MMPA.

5.3.3 International Status

International assessment by the IUCN (The World Conservation Union) designated the Northern right whale (*Eubalaena glacialis*) as endangered in 1996. This assessment did not distinguish between species or populations in the Pacific, Atlantic and Arctic Sea.

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between Governments. Its goal is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Right whales were listed by CITES in 1975 in Appendix 1, which consists of species threatened most with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.

5.4 Recovery Strategies

The Canadian North Atlantic right whale recovery plan was completed in September 2000 (Anon 2000). It was prepared by the North Atlantic Right Whale Recovery Team, for World Wildlife Fund Canada and Fisheries and Oceans Canada.

The US has drafted updated recovery plans for both the North Pacific (*Eubalaena japonica*) and North Atlantic (*Eubalaena glacialis*) species. These recovery plans recognize distinct eastern and western populations for each species. However, the eastern population of the North Atlantic right whale is considered “functionally extinct”.

5.5 North Pacific Right Whale Recovery Team

A recovery team for the North Pacific right whale was formed in 2003. The team, which is coordinated by Fisheries and Oceans Canada, includes representatives from Fisheries and Oceans Canada, the U.S. National Marine Fisheries Service, Vancouver Aquarium Marine Science Centre, Cascadia Research, Center for Coastal Studies and Sierra Club. Section 10 provides further information on recovery team members.

6. ACTION PLANS

An action plan will be completed within two years of approval of the Recovery Strategy.

7. POTENTIAL MANAGEMENT IMPACTS FOR OTHER SPECIES OR ECOLOGICAL PROCESSES

As mentioned in the section 4.3, the recovery strategies include measures that will not only enhance the prospects for the recovery of North Pacific right whales, but may also directly benefit other baleen whales. These strategies are not only beneficial to baleen whales, but also to other species (i.e. benthic organisms, fish, birds, etc.) that occupy the same habitats and may be vulnerable to the same threats.

In the Southern Ocean (Laws 1985) and Bering Sea (NRC 1996), the removal of large cetaceans is thought to have had significant effects on community structure. If the impacts of large whale recovery in the North Pacific are the reverse of large whale removal in the Southern Ocean and Bering Sea, then right whale recovery might affect community structure through a decrease in zooplankton available to other species (i.e. fish, birds, other baleen whales), and an increase in nutrient storage and cycling. However, an increase in right whale

abundance and range of distribution will likely take place slowly, and the effects of recovery will be even more gradual.

8. EVALUATION

Category of Activity	Evaluation Questions
Scientific Research	<p>Were acoustically-aided surveys conducted and remote acoustical recording packages deployed in areas formerly occupied off the BC coast?</p> <p>Were platforms of opportunity used and sighting networks developed?</p> <p>Were procedures and protocols developed to recognize and respond to right whale strandings?</p> <p>Have research efforts been coordinated internationally on right whales to ensure that photographic identification, collection of skin samples and other procedures are done in such a way as to maximize knowledge and collaboration?</p> <p>Was information on preferred habitats of right whales worldwide evaluated and used to identify potential important habitats in BC waters?</p> <p>Has all historical information been compiled and a list of archived samples made available for the North Pacific right whale?</p>
Threats Research	<p>Was information on human impacts on right whales and other cetaceans worldwide evaluated and used to determine whether similar human activities off BC could affect the right whale?</p> <p>Were mitigation measures that have been effective in other regions and countries reviewed, and where appropriate, were such measures incorporated into mitigation efforts for the North Pacific right whale?</p>
Mitigation and Protection	<p>Have measures been implemented to ensure no right whales are killed by commercial or aboriginal hunting?</p> <p>Were immediate steps taken to minimize impacts of threats identified through research or circumstance?</p> <p>Were response programs established for disentangling right</p>

	<p>whales in fishing gear, and were fishing practises examined?</p> <p>Is there a completed review of appropriate laws and infrastructure needed to enable possible changes in shipping lanes and shipping operations?</p> <p>Was inter-agency coordination within and between provincial and federal governments successful in developing stringent assessment processes that explicitly consider potential impacts on right whales and their habitat from human activities? (see list of human activities in Section 4.3, Mitigation and Protection Strategies)</p> <p>Were national and international oil spill contingency plans reviewed to ensure they include measures to protect right whales and their habitats?</p>
<p>Monitoring and Evaluation</p>	<p>Are current research efforts effectively monitoring the North Pacific right whale, and can research strategies be improved?</p> <p>Has long-term monitoring of the occurrence of North Pacific right whales continued?</p> <p>Were data on trends in distribution and abundance evaluated for BC waters and throughout their range?</p>
<p>Coordination Efforts</p>	<p>Were ratifications and contributions made to international instruments that promote North Pacific right whale protection and recovery?</p> <p>Were agreements and collaborative projects initiated with countries that share the population of right whales that frequents Pacific Canadian waters?</p> <p>Were measures implemented to facilitate participation of individuals from government, academia, industry, and non-government organizations in international research and recovery programs?</p>
<p>Education and Awareness</p>	<p>Was awareness of North Pacific right whale conservation and recovery issues promoted within government departments?</p> <p>Have public awareness campaigns and educational programs been developed that highlight right whale status, distribution, biology, threats and recovery efforts in Canada?</p>

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