FINAL

Species at Risk Act
Management Plan Series

Management Plan for the Eastern Pacific Grey Whale (*Eschrichtius robustus*) in Canada

Eastern Pacific Grey Whale

January 2011

Fisheries and Oceans Canada
Pêches et Océans Canada
Canada

About the *Species at Risk Act* Management Plan Series

What is the *Species at Risk Act* (SARA)?

SARA is the Act developed by the federal government as a key contribution to the common national effort to protect and conserve species at risk in Canada. SARA came into force in 2003, and one of its purposes is "*to manage species of special concern to prevent them from becoming endangered or threatened*."

What is a species of special concern?

Under SARA, a species of special concern is a wildlife species that could become threatened or endangered because of a combination of biological characteristics and identified threats. Species of special concern are included in the SARA List of Wildlife Species at Risk.

What is a management plan?

Under SARA, a management plan is an action-oriented planning document that identifies the conservation activities and land use measures needed to ensure, at a minimum, that a species of special concern does not become threatened or endangered. For many species, the ultimate aim of the management plan will be to alleviate human threats and remove the species from the List of Wildlife Species at Risk. The plan sets goals and objectives, identifies threats, and indicates the main areas of activities to be undertaken to address those threats.

Management plan development is mandated under Sections 65–72 of SARA (http://www.sararegistry.gc.ca/approach/act/default_e.cfm).

A management plan has to be developed within three years after the species is added to the List of Wildlife Species at Risk. A period of five years is allowed for those species that were initially listed when SARA came into force.

What's next?

Directions set in the management plan will enable jurisdictions, communities, land users, and conservationists to implement conservation activities that will have preventative or restorative benefits. Cost-effective measures to prevent the species from becoming further at risk should not be postponed for lack of full scientific certainty and may, in fact, result in significant cost savings in the future.

The series

This series presents the management plans prepared or adopted by the federal government under SARA. New documents will be added regularly as species get listed and as plans are updated.

To learn more

To learn more about the *Species at Risk Act* and conservation initiatives, please consult the SARA Public Registry (http://www.sararegistry.gc.ca).

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Additional copies can be downloaded from the SARA Public Registry (http://www.sararegistry.gc.ca/).

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PREFACE

The Grey Whale is a marine mammal and is under the responsibility of the federal government. The Minister of Fisheries and Oceans is a "competent minister" for aquatic species under the *Species at Risk Act* (SARA). Since the Grey Whale is located in Pacific Rim National Park Reserve administered by the Parks Canada Agency (Parks Canada), the Minister of the Environment is also a "competent minister" under SARA for this species. The *Species at Risk Act* (SARA, Sections 65-66) requires the competent minister to prepare management plans for species listed as special concern, in cooperation and consultation with affected and interested parties. The Grey Whale was listed as a species of special concern under the SARA in 2005. Fisheries and Oceans Canada (DFO) – Pacific Region, led the development of this management plan, with support from Central and Arctic Region and in cooperation and in consultation with many individuals, organizations and government agencies (Appendix III).

Success in the conservation of this species depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in this plan and will not be achieved by Fisheries and Oceans Canada and Parks Canada or any other party alone. This plan provides advice to jurisdictions and organizations that may be involved or wish to become involved in activities to conserve this species. In the spirit of the Accord for the Protection of Species at Risk, the Minister of Fisheries and Oceans and the Minister of Environment invite all responsible jurisdictions and Canadians to join Fisheries and Oceans Canada and Parks Canada in supporting and implementing this plan for the benefit of the eastern Pacific Grey Whale and Canadian society as a whole. Fisheries and Oceans Canada and Parks Canada will endeavour to support implementation of this management plan, given available resources and varying species at risk conservation priorities. The competent ministers will report on progress within five years.

RESPONSIBLE AGENCIES AND JURISDICTIONS

Fisheries and Oceans Canada
Environment Canada
Parks Canada Agency
Government of British Columbia

AUTHORS

Dr. Volker Deecke (University of St. Andrew's, UK) and the DFO Technical Team developed this management plan for Fisheries and Oceans Canada.

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Fisheries and Oceans Canada would like to thank Dr. Volker Deecke, for his extensive contribution to the drafting of this management plan. Participants of the Cetacean Management Planning Technical Workshop (Appendix III) provided invaluable information on Grey Whale biology and threats to the species, to assist in completing this management plan.

STRATEGIC ENVIRONMENTAL ASSESSMENT

A strategic environmental assessment (SEA) is conducted on all SARA recovery planning documents, in accordance with the *Cabinet Directive on the Environmental Assessment of Policy, Plan and Program Proposals*. The purpose of a SEA is to incorporate environmental considerations into the development of public policies, plans, and program proposals to support environmentally-sound decision making.

Management planning is intended to benefit species at risk and biodiversity in general. However, it is recognized that plans may also inadvertently lead to environmental effects beyond the intended benefits. The planning process based on national guidelines directly incorporates consideration of all environmental effects, with a particular focus on possible impacts on non-target species or habitats. The results of the SEA are incorporated directly into the plan itself, but are also summarized below.

Through the development of this plan numerous factors that impact or have potential to impact the management of this population were evaluated and are presented. Principal among the anthropogenic factors or threats are human activities on the breeding grounds, feeding grounds and along the migratory corridor, degradation of benthic feeding habitat, acute noise and toxic spills. It was concluded that some threats can be mitigated through the use of existing legislation, policies and programs and, in fact, there are numerous examples of mitigation measures that are currently employed. However, in other cases the threat and/or the potential mitigation measure(s) require further research or evaluation before recommendations on specific actions or activities can be formulated. The general type of research, evaluation and approaches for mitigation are presented in this management plan.

Through the course of planning, specific activities for management will be evaluated and detailed for this population along with an evaluation of effects and costs for each activity or measure. Therefore, taking into account the general nature of the recommendations for new mitigation to manage this population and that many of the recommendations to protect habitat fall under existing legislation and policies, this plan will not entail any new significant adverse environmental effects.

EXECUTIVE SUMMARY

The Grey Whale (*Eschrichtius robustus*) is a medium to large mysticete (baleen) whale, with typical length of adult males falling between 11.1m and 14.3 m (Evans, 1987). Skin colour is variable and ranges from dark to light grey with various degrees of mottling. The animals often have barnacles attached to their skin and patches of whale lice are common. The Grey Whale is the only large whale in which the upper jaw extends beyond the lower jaw.

Grey Whales were extirpated in the North Atlantic in the 18th century (Mead and Mitchell, 1984; Lindquist, 2000) and the species is currently restricted to the North Pacific where it occurs in two distinct populations; a western or Korean population, and an eastern population. The western population was greatly reduced by whaling and its current size is estimated at 100 individuals (Weller et al., 2002; Bradford et al., 2006).

Eastern Pacific Grey Whales migrate between subtropical breeding lagoons in Baja California, and their main summer feeding grounds in the Bering, Chukchi and Alaskan Beaufort Seas. A small part of the population (e.g. a few hundred), termed the Pacific Coast Feeding Aggregation, (PCFA) does not undertake the entire migration to Arctic feeding areas, and spends the summer feeding in temperate waters between northern California and south-eastern Alaska. In recent years, small numbers (e.g. 4-6 animals) of Grey Whales have been observed feeding as far east as the Canadian Beaufort Sea during the month of August.

The population was severely depleted by commercial whalers in the last century; however, it appears to have recovered to near pre-exploitation levels. The best estimate for the current size of the eastern population is approximately 20,000 individuals (Rugh et al., 2008), which appears to be approaching the estimated current carrying capacity for this population (Rugh et al. 2005).

The size of the population at present is likely limited by the amount of available feeding habitat and killer whale predation may also be a factor. The primary threats affecting the eastern population of Grey Whales are disturbance by human activities within their breeding, feeding and migratory areas, corridor, and decreased benthic and pelagic productivity on feeding grounds. Direct threats potentially affecting individuals of the PCFA, also of concern are acute noise, toxic spills and potentially renewed interest in subsistence whaling.

As the eastern Pacific Grey Whale population is migratory and crosses international boundaries, the role of Canadian management of this species at risk will aim to protect the population within Canada while contributing to research and conservation initiatives in the U.S. and Mexico, where feasible. Ensuring that migration route(s) are accessible and that foraging habitat for Grey Whales in Canada is maintained is essential to effective management of Grey Whale abundance from a Canadian perspective. As both migratory and resident individuals utilize habitat in Canada, this diversity of behaviour within the population should be conserved, and in future separate management actions may be necessary to address each of these groups. Uncertainties remain regarding northern portions of migration route(s) within B.C. waters, ecology of the Pacific Coast Feeding Aggregation and impacts of some threats. Actions and objectives will address these and other issues, and efforts will be focussed for Grey Whales in Pacific Canadian waters.

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1. SPECIES INFORMATION

1.1. Species Assessment Information from COSEWIC

Date of Assessment: May 2004

Common Name (population): Grey Whale (eastern North Pacific Population)

Scientific Name: *Eschrichtius robustus*

COSEWIC Status: Special Concern

Reason for Designation: Grey Whales migrate each year from their winter calving grounds in Mexico to their summer feeding areas in northern Alaska, Russia and Canada. Most of the population passes along the BC coastline, and some individuals repeatedly spend the entire summer feeding in BC (about 80). The population increased by 2.5% per year following the cessation of whaling, and peaked, within the range of pre-exploitation estimates, at about 27,000 animals in 1998. The extent of recovery of the summer resident group is unknown. However, over one-third of the population died from 1998 to 2002 (possibly due to a lack of food in Alaska). Birth rates, survival rates and other indicators suggest that the decline has ceased and that the population is stable or increasing since 2002. The whales are susceptible to human activities in their 4 breeding lagoons in Mexico, as well as to entanglement in fishing gear and collisions with boats throughout their range. Underwater noise associated with proposed oil development in BC could alter migration patterns. The small group of summer-resident whales could also be threatened by subsistence whaling in the USA.

Canadian Occurrence: Pacific Ocean, Arctic Ocean

COSEWIC Status History: Designated Not at Risk in April 1987. Status re-examined and designated Special Concern in May 2004.

1.2. Description

The Grey Whale[1] is a medium- to large mysticete (baleen) whale. The typical body length for adult female Grey Whales falls between 11.7 and 15.2 m. Adult males typically measure between 11.1 and 14.3 m (Evans 1987). Skin colour is variable and ranges from dark to light grey with various degrees of mottling. The animals often have barnacles (*Cryptolepas rachianecti*) attached to their skin or bear barnacle scars. Patches of whale lice (*Cyamus scammoni*, *C. ceti*, and *C. kessleri*; Mead and Mitchell, 1984) are common. The Grey Whale is

[1] The common name Grey Whale is used in the COSEWIC status report (2004) for the eastern North Pacific population of Grey Whales in Canada. This species is also commonly called gray whale, mussel digger, devil fish, or gray back. In Nuu-chah-nulth dialects Grey Whales can sometimes be referred to as maa?ak^{w} (Stonham 2005) or m'aa?ak (BSDWG 2004) or ciłciłńi (www.nuuchahnulth.org).

the only large whale in which the upper jaw extends beyond the lower jaw. The 130-180 baleen plates are 5 to 25 cm long and uniformly cream to pale yellow in colour. On their ventral side, Grey Whales have between two and four throat grooves (pleats that allow the throat region to expand during feeding). Grey Whales do not have a dorsal fin, but have a low hump and a series of 7 to 15 knobs (called knuckles) along the dorsal ridge.

1.3. Populations and Distribution

Grey Whales were extirpated in the North Atlantic in the 18th century (Mead and Mitchell 1984; Lindquist 2000) and the species is currently restricted to the North Pacific where it occurs in two distinct populations. Both populations were commercially hunted from the mid-1800s until 1937, when Grey Whales were internationally protected. The western or Korean population was greatly reduced by whaling and its current size is estimated at 100 individuals (Weller et al. 2002; Bradford et al. 2006). A primary feeding ground of this population lies off the coast of Sakhalin Island (Weller et al. 1999; Weller et al. 2002). Western Pacific Grey Whales probably migrate along the coasts of Japan, Korea and China to breeding grounds off southern China (Wang 1984; Clapham et al. 1999). There appears to be no genetic exchange between the eastern and western Pacific populations (LeDuc et al. 2002; Swartz et al. 2006).

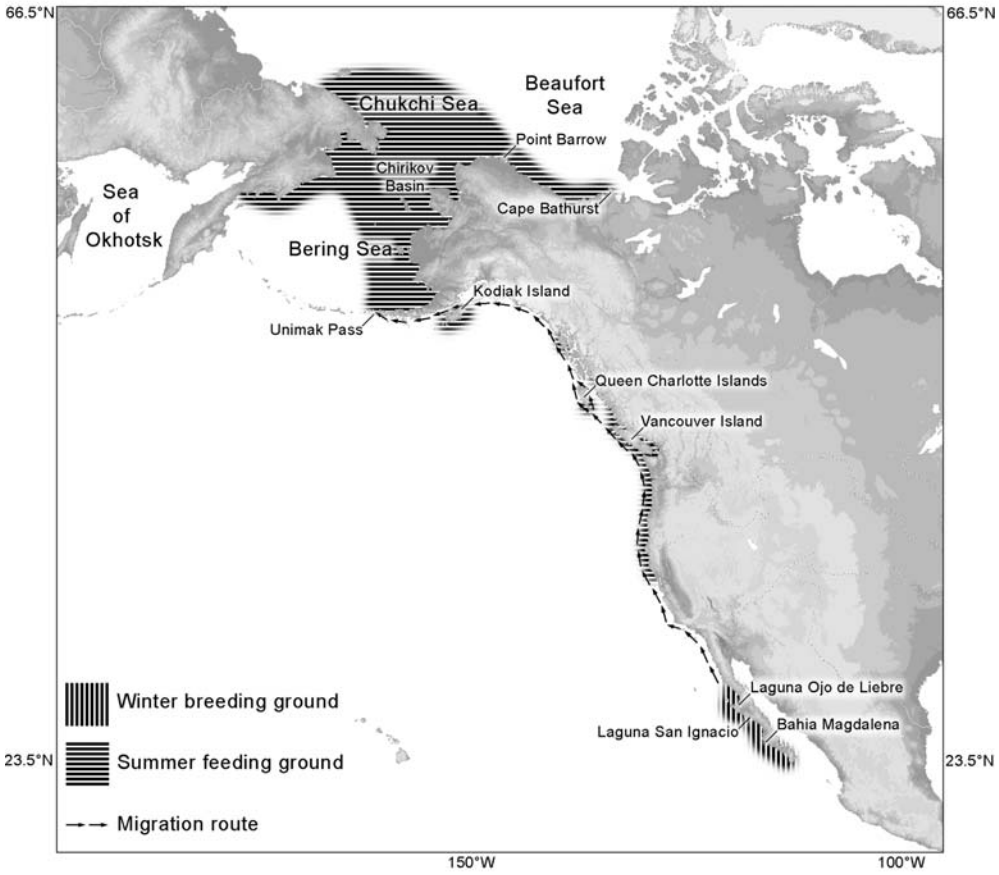

Figure 1. Map of the North Pacific showing the global distribution and migration route of the eastern Pacific population of Grey Whales.

The eastern or California population inhabits the coastal eastern Pacific between Baja California, Mexico and the Beaufort and Chukchi Sea. A recent genetic study suggests that historic carrying capacity for Grey Whales in the Pacific Ocean may have been as high as 96,000 individuals (Alter et al. 2007). However, there remains an extremely high level of uncertainty surrounding pre-whaling abundance estimates and habitat carrying capacities. Current carrying capacity is likely much lower than that listed in Alter et al. (2007). By the late 19th century, commercial whaling had reduced the eastern Pacific population to less than 2,000 individuals (Rice et al. 1984), a critically low level. The best estimate for the current size of the eastern Pacific population of Grey Whales is approximately 20,000 individuals (Rugh et al. 2008). This is approaching the estimated current carrying capacity for this population; between 20,000 to 30,000 animals (Rugh et al. 2005).

Large numbers of eastern Pacific Grey Whales congregate in winter in a number of shallow lagoons (primarily Laguna Guerrero Negro, Laguna Ojo de Liebre, Laguna San Ignacio, and Bahia Magdalena) along the west coast of Baja California, Mexico to mate and to calve (Rice et al. 1981). Though some breeding behaviour has been occasionally observed along the west coast of North America, these four breeding lagoons serve the majority of this single eastern Pacific population of Grey Whales and are therefore vitally important for the survival of the population. The southward migration from Arctic feeding grounds to Baja California typically begins between September and late November (Melnikov et al. 1997 cited in Rugh et al. 2001), with most whales passing by Vancouver Island in late December (Pike 1962), arriving in Baja around mid-February (Rugh et al. 2001). Grey Whales are also regularly seen in the Gulf of California and along the coast of the Mexican mainland in winter and spring (Tershy and Breese 1991; Silber et al. 1994; Sanchez-Pacheco et al. 2001). Between January and May (peaking around mid-February (Rugh et al. 2005), these animals leave the winter breeding grounds and travel north along the west coast of North America, usually staying within a few kilometres of shore (Braham 1984; Herzing and Mate 1984; Poole 1984; Green et al. 1995). Most of the population passes through Unimak Pass in the Aleutian chain between May and June (Pike 1962) to feed in the shallow waters of the Bering, Chukchi and Beaufort seas. The primary summer feeding ground of the eastern population (Figure 1) extends from Cape Bathurst (Northwest Territories; Rugh and Fraker 1981) west to Mys Billingsa in the East Siberian Sea (Miller et al. 1985; Kochnev 1998) and includes all of the shallow waters of the Bering Sea south to Unimak Pass (Braham 1984). Grey Whales have been reported to feed in the waters around Kodiak Island, Alaska (Moore et al. 2007). Stafford et al. (2007) report the presence of Grey Whales off Pt. Barrow, Alaska throughout the winter months suggesting that at least in some years some animals spend the winters on Arctic feeding grounds rather than migrating south.

Northbound migrants generally arrive in British Columbia waters west of Carmanah Point on Vancouver Island (Darling 1984; B. Gisborne, Juan de Fuca Express, Victoria, B.C., pers. comm.), and follow the island's west coast north to Cape Scott (Darling 1984). The migration route north of Vancouver Island remains poorly understood. The majority of animals probably cross Queen Charlotte Sound north to Cape St. James but it is unknown whether the migration follows the east or the west coasts of Haida Gwaii[1] (Pike 1962). The animals cross Dixon Entrance and leave Canadian waters. Many animals have been observed feeding inshore during

[1] Formerly known as the Queen Charlotte Islands

the northbound migration (Pike 1962; Sund 1975; Darling 1984). The southbound migration probably follows much the same route, although the animals tend to travel farther offshore and feed little (Pike 1962; Darling 1984).

A small part of the population spends the summer feeding in temperate near-shore waters off British Columbia (Figure 2) from northern California to south-eastern Alaska (Pike 1962; Patten and Samaras 1977; Flaherty 1983; Darling 1984; Mallonée 1991; Avery and Hawkinson 1992; Calambokidis et al. 1994). Individuals belonging to this sub-group of the population are termed either seasonal, or 'summer-residents', or more formally the 'Pacific Coast Feeding Aggregation' [PCFA] (Calambokidis et al. 2002). The best current estimate for the size of the Pacific Coast Feeding Aggregation is in the low hundreds (Calambokidis et al. 2002), and estimates are somewhat variable between locations and years.

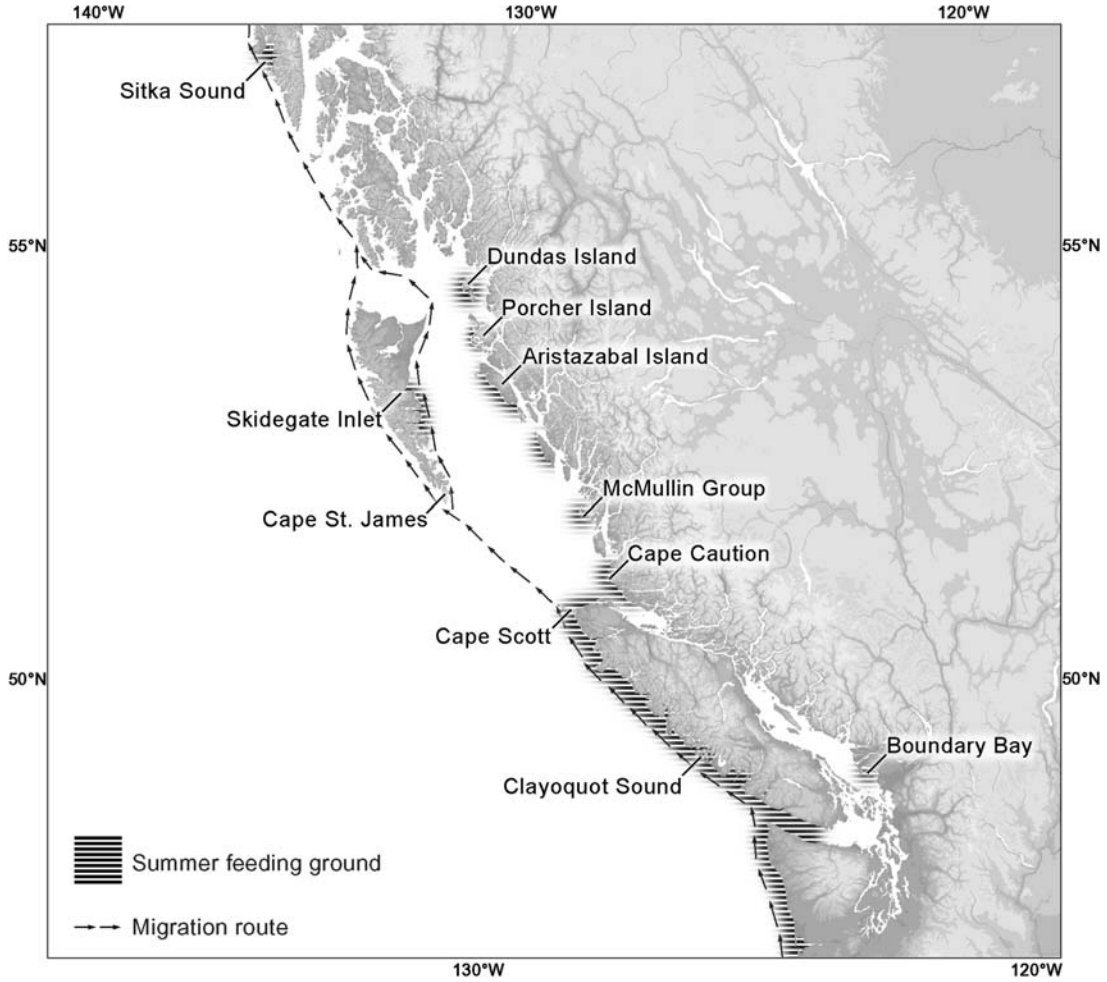

Figure 2. Map of the eastern North Pacific showing the migration route and known feeding sites of Grey Whales off British Columbia, Canada. The migration route north of Cape Scott remains poorly understood.

Site fidelity of summer resident Grey Whales is generally very high but appears to be primarily driven by prey availability, and thus may also be somewhat variable from year-to-year depending on food abundance. Typically, areas of feeding aggregations along the southwest coast of

Vancouver Island show very high site fidelity, and low variability in membership in this aggregation across years (J. Calambokidis, Cascadia Research Collective, Olympia, WA. pers. comm.).

In Canadian waters, the presence of summer-resident Grey Whales along the entire west coast of Vancouver Island is well documented (Darling 1984). Summer-resident Grey Whales are also regularly sighted along the north coast of Vancouver Island from Cape Scott to Cape Sutil, as well as along the British Columbia mainland from Shelter Bay to Cape Caution (Deecke 1996). Due to much lower observer effort, the occurrence and distribution of Grey Whales in the summer months on the north coast of British Columbia is less well understood. In Haida Gwaii, Grey Whales are frequently seen feeding on herring spawn in Skidegate Inlet and the east coast of South Moresby Island between May and July (Nichol and Heise 1992; Ford et al. 1994). Reports of feeding Grey Whales in the summer months come from the west coasts of Calvert Island (J. Darling, West Coast Whale Foundation, Tofino, B.C., pers. comm.), as well as Dundas, Aristazabal and Porcher Islands (G. Ellis, Fisheries and Oceans Canada, Pacific Region, Science, pers. comm.; J. Ford, Fisheries and Oceans Canada, Pacific Region, Science, pers. comm.), and known British Columbia summer-residents have been photographed in the McMullin Group, as well as Sitka Sound, south-eastern Alaska (Deecke 1996; Deecke 2003; Calambokidis et al. 2002). Summer-resident Grey Whales have also been sighted in the inside waterways of British Columbia, primarily in Boundary Bay (Deecke 1996; J. Ford pers. comm.), as well as occasionally in Haro and Georgia Straits (Calambokidis and Baird 1994; Malcolm 1999).

At the north-eastern extent of their known range, beyond the main summer feeding areas in the Bering, Chukchi and Beaufort seas of Alaska, small numbers of Grey Whales have been observed feeding in the Western Canadian Arctic. In the Canadian Beaufort Sea, there are extra-limital records for Grey Whales observed in offshore waters by researchers studying the bowhead whale (Rugh and Fraker, 1981; Renaud and Davis 1981; Wartzok, 1990; Harris et al. 2008; R. Harris, 2008, LGL Consulting, pers. comm.). A total of 4-6 whales have been seen opportunistically in late August off the Tuktoyaktuk Peninsula (Renaud and Davis 1981; Wartzok 1990), Cape Bathurst (Rugh and Fraker 1981), and most recently by observers on seismic ships in the southeast Beaufort Sea in August of 2007 and 2008 (Harris et al. 2008; R. Harris, pers. comm.). The number of Grey Whales using these waters and the locations of their target feeding areas are not known. They appear to be feeding on the continental shelf off the Tuktoyaktuk Peninsula where bowhead whales (*Balaena mysticetus*) are also aggregating to feed. However, these two species are likely not competing for resources as bowheads tend to feed on pelagic zooplankton in this area (L. Harwood, Fisheries and Oceans Canada, Central and Arctic Region, Science, pers. comm.). Ecosystem changes including decreasing ice cover in the Northwest Territories and Nunavut, combined with a possible decrease in the carrying capacity of the Bering Sea feeding grounds (Moore et al. 2003), could make the Western Canadian Arctic an increasingly important feeding ground for eastern Pacific Grey Whales.

1.4. Requirements of the Eastern Pacific Grey Whale

1.4.1. Habitat and Biological Needs

The winter habitat of eastern Pacific Grey Whales primarily comprises subtropical lagoons along the west coast of Baja California, Mexico. These calving lagoons are characterized by shallow (generally less than 4 m) water depths and have sandy or muddy bottoms covered in places by eelgrass beds and mangrove swamps (Rice et al. 1981). The breeding lagoons have winter water temperatures between 15 and 20°C and are hypersaline due to evaporation (Gardner and Chavez Rosales 2000).

On Arctic summer feeding grounds, Grey Whales are almost exclusively benthic feeders and are found in shallow (generally < 60 m) soft bottom habitats (Moore and Ljungblad 1984; Moore and DeMaster 1997; Moore et al. 2000). In the Bering Sea, Grey Whales are seen from 0.5 to 166 km from shore. Grey Whales will enter leads in sea ice (Stafford et al. 2007), but generally tend to avoid areas of heavy ice (Clarke et al. 1989). Grey Whales also enter shallow coastal lagoons to feed (Gill and Hall 1983).

In areas where they feed on amphipods (mainly *Ampelisca* sp., *Atylus* sp.) and ghost shrimp (*Calianassa californiensis*), summer-resident Grey Whales off British Columbia similarly prefer shallow nearshore habitats with mud or sand bottom. Feeding on ghost shrimp usually occurs in sheltered bays and inlets with muddy bottom and water depths below 3 m, whereas amphipods are found in sandy bays on the exposed outer coast in water depths of less than 35 m (Oliver and Kvitek 1984; Weitkamp et al. 1992; Darling et al. 1998; Dunham and Duffus 2001; Dunham and Duffus 2002). In addition, summer-resident Grey Whales are frequently seen over rock and boulder substrates in water of less than 30 m depth, and in kelp beds where they primarily feed on planktonic mysid shrimps or crab larvae (Wellington and Anderson 1978; Nerini 1984; Deecke 1996; Darling et al. 1998; Dunham and Duffus 2001; Dunham and Duffus 2002; Newell and Cowles 2006, Stelle et al. 2008). Eelgrass beds are the primary habitat where Grey Whales feed on the eggs and larvae of herring (Ford et al. 1994; Darling et al. 1998). It therefore appears that summer-resident Grey Whales feeding in temperate waters probably use almost all of the near-shore habitats along the outer coast of British Columbia (Darling et al. 1998) and also some sheltered bays in the inside waterways. The same areas probably provide important feeding opportunities for northbound migrants, especially after poor feeding seasons on the Arctic feeding grounds.

1.4.2. Ecological Role

As the major benthic predator in shallow Arctic waters of the Bering, Chukchi and Alaskan Beaufort seas, Grey Whales maintain the structure and diversity of benthic invertebrate assemblages (Nerini 1984; Oliver and Slattery 1985) and can be described as a keystone species. Nerini (1984) estimated that in the early 1980s, Grey Whales turned over an area of 3,565 km^2 in the Arctic or 9% of the available amphipod community each season. Given the growth of the Grey Whale population since Nerini's study, it is likely this figure has increased substantially since. Bottom-feeding Grey Whales rearrange soft sediments and thus mobilize chemical nutrients bound in benthic substrates (Feder et al. 1994; Oliver and Slattery 1985). By feeding on benthic biomass but defecating and urinating in the water column, Grey Whales also return nutrients to the water column (Reeves and Mitchell, 1988). Due to their coarse baleen, Grey Whales only filter relatively large (> 6 mm) invertebrates from the sediments and smaller invertebrates are expelled near the surface where they serve as food for marine birds and fishes

(Obst and Hunt 1990; Grebmeier and Harrison 1992). Grey Whale calves provide an important food source for mammal-eating killer whales (*Orcinus orca*) along the migratory corridor and on the feeding grounds (Baldridge 1972; Ljungblad and Moore 1983; Lowry et al. 1987; Goley and Straley 1994; Matkin et al. 2007; see also section 'Limiting Factors') and Grey Whale carcasses may provide important feeding opportunities for scavengers and detritivores (Goffredi et al. 2004; Sigler et al. 2006).

Historically, Grey Whales in the eastern north Pacific were harvested, both for subsistence use and by commercial operations. In the past, cetaceans may have made up to 36% of the diet of some coastal First Nations, such as Nuu-chah-nulth; equally matching their dependence on fish as a food source (Hendricks 2005). Marine mammal meat and blubber historically served as staple foods, and evidence of Grey Whale harvest was discovered at Ozette deposits (J. Scordino, Biologist, Makah Tribal Council, Neah Bay, WA., pers. comm.); whale bones and harpoons were dated at approximately 2,000 years old (http://www.makah.com/whalingtradition.html; J. Scordino pers. comm).

1.4.3. Limiting Factors

The factors limiting population growth can be broadly categorized as intrinsic, bottom-up processes mediated by the availability and quality of prey, and top-down processes such as predation. These factors are intrinsic to the biology of the species, and as such can not be mitigated or managed. However, human activities may contribute pressures which alter the balance of these limiting factors, and thus threaten the population. In such cases, actions are necessary to ensure that human activities do not place undue stress on limiting factors.

There is mounting evidence that Grey Whales feeding on Arctic as well as subarctic and temperate feeding grounds are currently limited by benthic and pelagic productivity. The increased mortalities, poor physical conditions, and decreased calf production of eastern Pacific Grey Whales in the winters and springs of 1999 to 2001 (Le Boeuf et al. 2000; Moore et al. 2001; Perryman et al. 2002) were preceded by two summers of unusually persistent ice cover in the Bering Sea (Perryman et al. 2002). Available feeding habitat on Arctic feeding grounds is primarily limited by the extent and duration of ice cover, and these factors are believed to have direct effects on calf production (Perryman et al. 2002).

At the same time the population may be approaching the carrying capacity of the Arctic feeding ground (Moore et al. 2001; Wade 2002). A major decline in benthic productivity has been documented since 2002 in the Chirikov Basin (Grebmeier et al. 2006; Moore et al. 2007), an important feeding area of eastern Pacific Grey Whales. The resulting decrease in carrying capacity is likely to affect movement patterns, mortality and calf production in this population. Newell and Cowles (2006) documented a drastic decrease in abundance of summer resident Grey Whales on the Oregon coast in the summer of 2005 while at the same time noting many animals in poor body condition. They attributed this to a change in the upwelling regime for that year leading to a virtual failure in recruitment of mysid shrimps (*Crustacea: Mysidae*). Summer-resident Grey Whales in poor body condition were also observed on the British Columbia coast that year (B. Gisborne, pers. comm.).

Grey Whales appear to be able to compensate for changes in the productivity of certain feeding grounds to some degree by moving to other feeding areas, or by switching to alternative prey. For example Moore et al. (2007) report increasing numbers of Grey Whales around Kodiak Island, Alaska since 1999, primarily feeding on cumaceans (*Crustacea: Diastylidae*). Intermittently used feeding areas along the British Columbia coast such as Boundary Bay or areas of herring spawn may therefore become increasingly important to food-stressed northbound migrants.

1.5. Threats

There are many current and potential threats which may affect the eastern population in British Columbia. Threats are processes which may pose stress to a species at risk or to its habitat, causing population decline. These may either be of anthropogenic origin, such as incidental-take in fishing gear or toxic contamination, or they may be natural ecosystem processes, such as an ecosystem regime shift. Limiting factors are environmental or biological factors that may naturally limit population size or slow population growth, and are typically not considered a 'threat' unless altered by human activities (EC 2007).

Given that the eastern population appears to be at or near environmental carrying capacity, natural or anthropogenic change to the quality or the amount of available feeding habitat will likely have rapid effects to population growth and survival. Additionally, changes in magnitude of identified or unidentified threats may have population-wide impacts, or alternatively may specifically impact the PCFA. Negative effects to the PCFA will impact Grey Whale abundance and distribution within Canadian waters.

Assessment of threats (Table 1) allows for prioritisation of recommended management and other actions to prevent this population from becoming threatened or endangered, and provide an indication of the mitigation feasibility for a threat.

1.5.1. Threat Classification

Threats were assessed based on their current likelihood of occurrence and severity of effect to the population. If the threat has specific effects on the PCFA, an additional 'level of concern' may be assigned for potential impacts specifically to the Pacific Coast Feeding Aggregation in Canadian waters (Table 1). In addition, uncertainty of effects of threats was incorporated into the assessments to provide a measure of confidence in the rating of 'level of concern' and provide an indication of areas where further monitoring or study may be useful in addressing uncertainties or knowledge gaps. In some cases, weight of scientific evidence for other cetaceans was deemed adequate to contribute to the assessment of the level of concern for a threat. Definitions of the terms used for rankings are available in Appendix I (Table 4).

Mitigation potential refers to the likelihood that measures (future or existing) adequately mitigate or prevent negative effects to the population. It should be noted that the level of concern rating reflects the current concern for impacts from a threat at this time, and future assessments may result in levels of concern which differ from those presented here. Therefore the importance of long-term monitoring of the population can not be overstated.

Table 1. Summary of Threat Classifications and Mitigation Potential for Identified Threats to eastern Pacific Grey Whales. Mitigation potential refers to the likelihood that measures (future or existing) may mitigate or prevent negative effects to the population. This assessment is a current view of the state of threats to the population, and as such assessment ratings may change over time. Asterisk (*) denotes naturally occurring threats to the population (i.e. limiting factors whose effects can be increased by human activities).

Threat	Stress to the Population	Severity of impact	Uncertainty	Current Level of Concern		Mitigation Potential
				Entire Population	PCFA	
Increased human activity in Mexican breeding lagoons	Reproductive rate Calf mortality May contribute to cumulative or synergistic effects (e.g. increase incidence of disease)	Potentially High	Medium to High	**Currently, MODERATE** Potentially High	Potentially HIGH	Negligible, from a Canadian perspective
Environmental variability • Persistent changes in ice cover at Arctic feeding grounds* • Ecosystem regime shift* • Climate change	Access to feeding grounds Prey limitation Reproductive rate Calf mortality May contribute to cumulative or synergistic effects of threats May increase occurrence of pathogens May impact migration	Potentially High	Low	Potentially HIGH	Potentially HIGH	At present, Unknown None, if due to natural fluctuation Low, if due to anthropogenic effects
Disruption or Destruction of Benthic Feeding Habitat	Prey limitation Decreased foraging success Reproductive rate Mortality	Likely Moderate	Medium to High	Potentially HIGH for Arctic feeding areas LOW on migration route	Potentially HIGH	Moderate
Acute Noise	May impact migration or feeding Mortality	Moderate to High	Low	**MEDIUM**	**MEDIUM**	High
Toxic Spills	Reproductive rate Calf mortality Increased effects of pathogens Displacement	High, dependent on spill location and timing	Low	**LOW-MEDIUM**	**HIGH**	Moderate

Threat	Stress to the Population	Severity of impact	Uncertainty	Current Level of Concern		Mitigation Potential
				Entire Population	PCFA	
	Mortality					
Whaling	Displacement Mortality	Historically, High Currently, Low	Low	Historically, High **Currently, LOW**	**Currently, LOW** Potentially, High	High
Chronic Noise	Social communication Decreased foraging success	Low	Medium	**LOW**	**LOW**	Moderate
Physical Disturbance	Reproductive rate Decreased foraging success (for PCFA) Displacement	Unknown	High	**LOW**	**LOW**	High
Fossil Fuel Exploration and Extraction	Displacement May impact migration Decreased foraging success Social communication Fouling	Unknown	Low to Medium	**LOW** Potentially High for Arctic feeding grounds	**NEGLIGIBLE**	High, in B.C. at present Low, for international activity
Prey Reduction • Competition with Fisheries	Prey limitation Altered habitat use, displacement Reproductive rate Calf mortality May contribute to cumulative or synergistic effects May cause regime shift	Unknown	High	**LOW**	**UNKNOWN**	Unknown, potentially High
Pollution • Biological	Reproductive rate Calf mortality	Unknown Unknown	High High	**UNKNOWN** **UNKNOWN**	**UNKNOWN** **UNKNOWN**	Low-Moderate for PCFA,

Threat	Stress to the Population	Severity of impact	Uncertainty	Current Level of Concern		Mitigation Potential
				Entire Population	PCFA	
• Regulated Chemicals • Non-regulated Chemicals	May increase effects of pathogens Displacement	Unknown	High	**UNKNOWN**	**UNKNOWN**	Low for population
Entanglement	Mortality	Unknown	High	**UNKNOWN**	**UNKNOWN**	Unknown, potentially Moderate-High
Boat Collisions	Mortality	Unknown, dependent on vessel size and speed	High	**UNKNOWN**	**UNKNOWN**	Low
Predation by Killer Whales*	Mortality	Low	Medium	**UNKNOWN**	**NEGLIGIBLE**	None

1.5.2. Description of Threats

Increased Human Activity at Mexican Breeding Lagoons

The principal threat to the eastern population likely lies in increased human activity in the breeding lagoons (Clapham et al. 1999). Certain lagoons or parts of lagoons have already become unsuitable because of boat traffic and salt extraction (Rice et al. 1981) and any further degradation would put the entire population at risk. Any natural or anthropogenic catastrophic event in this area (such as a major earthquake or an oil spill) could have immediate and serious effects on the population. The Mexican government has responded to this threat by protecting three of the four major breeding lagoons. Laguna Guerrero Negro, Laguna Ojo de Liebre and Laguna San Ignacio are all are part of the Reserva de la Biosfera "El Vizcaino" (El Vizcaino Biosphere Reserve). Whale-watching is regulated in the reserve by a permit system and confined to the entrance to the lagoons (Reeves and Mitchell 1988). In 1979, the Mexican government declared Laguna San Ignacio a Grey Whale refuge and restricted commercial traffic to the lower part of the lagoon (thus protecting the main nursing and calving areas) between December and March (Reeves and Mitchell 1988). No protective measures are currently in place in Bahia Magdalena. Although Bahia Magdalena is not a designated area of protection, all whale watching activities in Mexico are regulated by the Mexican Official *Norm NOM ECOL 131* issued in 1998.

As the entire population of eastern Pacific Grey Whales breeds in these four lagoons, negative impacts to these areas would affect the whole population.

Localized activities threatening breeding lagoons may occur on a recurrent basis, but measures are in place to prevent vessels and activity within most lagoons. While no negative impacts to the population have been directly attributed to increased human activity in lagoons, the effects of this threat on the population could nonetheless be severe if reproductive success or calf mortality were impacted. Therefore, concern for the population-wide impact of this threat is rated potentially high. As this threat is based outside of Canada, management is not under Fisheries and Oceans Canada's jurisdiction, and mitigation potential from a Canadian stand point is negligible. However international collaboration should be considered for conservation and protection of the species.

Environmental Variability

Changes in oceanographic conditions can have demonstrated effects on Grey Whales (Le Boeuf et al. 2000; Moore et al. 2001; Perryman et al. 2002). Of particular significance is the limitation of prey resources either at PCFA feeding sites in British Columbia, or in Arctic feeding habitats. The increased mortalities, poor physical conditions, and decreased calf production of eastern Pacific Grey Whales in the winters and springs of 1999 to 2001 (Le Boeuf et al. 2000; Moore et al. 2001; Perryman et al. 2002) were preceded by two summers of unusually persistent ice cover in the Bering Sea (Perryman et al. 2002). Unusual persistence of ice cover at Arctic feeding sites can limit access to prey resources, while a regime shift resulting in premature melting of ice at feeding sites

may provide extended access to Arctic feeding grounds. Available feeding habitat on Arctic feeding grounds is primarily limited by the extent and duration of ice cover, and these factors are believed to have direct effects on calf production (Perryman et al. 2002).

A major decline in benthic productivity in the Arctic has been documented since 2002 in the Chirikov Basin (Grebmeier et al. 2006; Moore et al. 2007), an important feeding area of eastern Pacific Grey Whales. The resulting decrease in carrying capacity is likely to affect movement patterns, mortality and calf production in this population. Newell and Cowles (2006) documented a drastic decrease in abundance of summer resident Grey Whales on the Oregon coast in the summer of 2005 while at the same time noting many animals in poor body condition. They attributed this to a change in the upwelling regime for this year leading to a virtual failure in recruitment of mysid shrimps (*Crustacea: Mysidae*). Summer-resident Grey Whales in poor body condition were also observed on the British Columbia coast that year (B. Gisborne, pers. comm.).

Grey Whales appear to be able to compensate for changes in the productivity of certain feeding grounds to some degree by moving to other feeding areas, or by switching to alternative prey. However, a prolonged ecosystem regime change altering prey diversity and abundance may have unknown effects on the distribution or viability of this population.

Severity of effects to the Grey Whale population as a result of environmental variability, regime shift and global climate change can be variable given the myriad of potential ecosystem fluctuations. However it is evident that this threat can severely impact the population through food limitation by changes to prey recruitment, and access to important Arctic feeding grounds (Le Boeuf et al. 2000; Moore et al. 2001; Perryman et al. 2002). Measures to address global climate change in general may assist in reducing effects of anthropogenic changes to ocean conditions in the Canadian Arctic, temperate feeding grounds and elsewhere, and monitoring the population may assist in forecasting cumulative negative effects of stresses. Natural regime shifts and environmental variability however, cannot be managed or mitigated.

Disruption or Destruction of Benthic Feeding Habitat

In many locations, Grey Whales are predominantly benthic feeders. Migrating Grey Whales typically do not forage in B.C. waters, though disruption of the substrate within Arctic or PCFA feeding areas could result in negative effects to the population (See also 'Environmental variability'). Examples of activities which may cause degradation of feeding habitats include dredging, drill or mud wastes, steep slope logging and coastal forestry (e.g. heli-logging, log booms), dock construction, installations for wave energy capture, aquaculture, and kelp harvesting (i.e. herring roe). These, and other activities disrupting coastal benthic habitats, may impact the availability or quality of benthic prey species, or activities and associated infrastructure may affect foraging success.

Recurrent or seasonal events resulting in the degradation or destruction of feeding habitat may have severe effects on Grey Whales if results include chronic, nutritional stress or

behavioural modification (i.e. displacement, relocating to new feeding areas). Knowledge gaps regarding habitat use in B.C., significance of habitat or prey types (e.g. ephemeral versus consistent prey sources) remain unaddressed, leaving considerable uncertainty for impacts resulting from habitat modification in B.C. Currently, overlap between the activities listed above and known PCFA sites have not been ascertained. Given that changes to B.C. and Arctic feeding habitats may have population wide implications, concern for this threat is potentially high. However, habitat degradation within B.C. will likely only affect members of the PCFA that feed here year-round. Management of these types of activities within known important feeding habitat in B.C. will assist in reducing this threat[1].

Acute Noise

Acute noise typically refers to impulsive sounds produced in the mid to low frequency range, including those produced during military tactical sonar use, seismic surveying, explosions, and the use of acoustic deterrent devices[2]. Many of these impulsive sounds are capable of traveling great distances through unrestricted open ocean areas (Niekurk et al. 2004), and as such migrating or summer-resident Grey Whales may be exposed to acute noise effects.

Acute noise has been demonstrated to affect cetaceans (e.g. Schrope 2002; Jepson et al. 2003; Fernández et al. 2004; Buck and Calvert 2005; Gailey et al. 2007), and severity of impact ranges from behavioural displacement to physical injury and mortality (e.g. Crum and Mao 1996; Todd et al. 1996; Schrope 2002; Jepson et al. 2003; Fernández et al. 2004; Buck and Calvert 2005). Recent workshop proceedings providing initial recommendations on sound exposure criteria for marine mammals, proposed injury criteria for the three functional hearing categories derived for cetaceans as unweighted peak sound pressure level of 230 dB peak re 1 uPa for all types of sounds and/or an M-weighted sound exposure level of 198 or 215 dB re 1 uPa^2-s for pulse and non-pulse sounds (Southall et al. 2008). However, Southall et al. (2008) recommends caution be exercised in use of these criteria as records indicate high variance and context specificity for behavioural responses and exposures eliciting a given response, and at this time criteria for individuals and single-exposure events cannot describe cumulative, synergistic or ecosystem-level effects.

Seismic surveying has been demonstrated to affect Grey Whales from both the eastern and western populations. Malme et al., 1986 findings indicate that a 173 dB re 1 uPa level of received sound pressure caused 50% of feeding eastern Grey Whales to cease foraging and avoid areas of exposure during seismic surveying. Migrating eastern Grey Whales have displayed avoidance behaviour from similar received sound levels (Malme and Miles 1985). Recent studies on impacts of seismic surveying on western Pacific Grey Whales in the Piltun Bay feeding area near the Sakhalin Islands, have shown behavioural modifications and local displacement in response to received seismic sound

[1] The main Arctic feeding grounds for eastern Pacific Grey Whales occur in U.S. waters, outside of Canadian jurisdiction, as such management focuses on mitigation of effects in Pacific Canadian waters.
[2] Use of acoustic deterrent devices in British Columbia is no longer permitted

pressure in excess of 163dB$_{rms}$ re 1uPa (Johnson et al. 2007; Rutenko et al. 2007; Yazvenko et al. 2007a; Gailey et al. 2007). Though Yazvenko et al. (2007b) found no effect of seismic surveying on feeding activity of Grey Whales, Weller et al. (2002b) found significant differences in the number of Grey Whales utilizing feeding habitat during seismic surveying, suggesting some displacement effects. Chronic displacement from habitat may lead to biologically significant effects. Although the means to assess population level effects of sound have not been developed, the need to assess biologically significant impacts is well recognized (NRC 2005).

At present, seismic surveying is conducted on a rare or recurrent basis in Canadian Pacific waters. The Statement of Canadian Practice with respect to the Mitigation of Seismic Sounds in the Marine Environment set out minimum standards that must be met during marine seismic surveys in all non-ice covered marine waters in Canada (http://www.dfo-mpo.gc.ca/oceans-habitat/oceans/im-gi/seismic-sismique/statement-enonce_e.asp), and prior to the start of seismic projects in B.C. waters, survey protocols must be reviewed and activities licensed under permits issued by Fisheries and Oceans Canada – Pacific Region. As the sound of air guns used in seismic surveys is known to elicit behavioural responses in feeding and migrating Grey Whales (Malme et al., 1983; Malme and Miles 1985; Malme et al. 1986; Johnson et al. 2007; Rutenko et al. 2007; Yazvenko et al. 2007a; Gailey et al., 2007) mitigation of this activity should consider effects to Grey Whales.

Effects of tactical sonar noise have been implicated in strandings of deep diving species (e.g. beaked whales) and behavioural changes (e.g. Crum and Mao 1996; Schrope 2002; Jepson et al. 2003; Fernández et al. 2004). While care must be taken when extrapolating effects between species or populations, the lack of specific information requires use of a growing weight of evidence on other cetaceans in order to estimate effects. Potential effects on individual Grey Whales could be severe, if exposure coincides with Grey Whale migration times or PCFA feeding locations. Currently, there is a Canadian military marine range off the west coast of Vancouver Island, within known summer-resident aggregation areas. The Canadian military has developed an internal operational protocol, which aims to mitigate acute noise effects on marine mammals.

The mitigation potential for the threat of acute noise is very high, as all activity producing underwater acute noise requires either permits, or the use of protocols, but in some cases information is not clear regarding application of, and effectiveness of mitigation measures. Continued review standards of practice will assist in providing effective mitigation of the acute noise threat to the population in Canadian waters. Additionally, the likelihood of effects to the population is very low, if testing is confined to periods outside of Grey Whale migration times, or avoids PCFA summer feeding sites. At this time, there remains a moderate level of concern for effects of acute noise on the population and for the PCFA.

Toxic Spills

Oil and gas extraction and the associated shipping traffic could increase the likelihood of an oil spill which could affect coastal benthic feeders such as Grey Whales. Though petrochemical extraction does not currently occur within B.C., Grey Whale migration routes and feeding aggregations do coincide with shipping lanes (O'Hara and Morgan 2006; EC 2006). Currently there are measures in place to minimize the risk of spills (e.g. *Transportation of Dangerous Goods Act*) as well as multi-jurisdictional spill response plans (e.g. Can-US Dix Plan, B.C. Marine Oil Spill Contingency Plan, Regional Environmental Emergency Teams) to implement clean-up and other mitigation measures. However, shipments of mixed goods (i.e. toxic materials, as well as non-toxic goods) are not required to provide Canadian authorities with ships' manifests, and therefore transport of toxic materials through Canadian waters may not always be recorded. Spills which occur offshore may be under-reported and are typically more difficult to coordinate responses for mitigation.

A spill at a feeding aggregation has the potential to impact feeding habitat as well as numerous animals at one time. Chronic or residual effects to sediments following catastrophic spills have the potential to impact feeding sites, and to contaminate whales (Figure 3), potentially decreasing the abundance of PCFA whales in B.C. As there is potential to affect many animals at feeding aggregations this threat is considered to be of high concern for impact to PCFA and feeding habitat.

The migratory nature of the Grey Whale population through B.C. waters reduces the likelihood that a spill might coincide with large numbers of animals at one time. However, as mentioned in 'Increased human activity in breeding lagoons', catastrophic events in breeding habitat have potential to impact the entire population during one event. Given the highly unpredictable nature of catastrophic spills, the combined concern for impacts of a single catastrophic oil spill on population viability is low to moderate. The potential for mitigation of this threat is considered moderate due to the inherent difficulty in, and low success of, post-spill clean-up measures (Graham 2004).

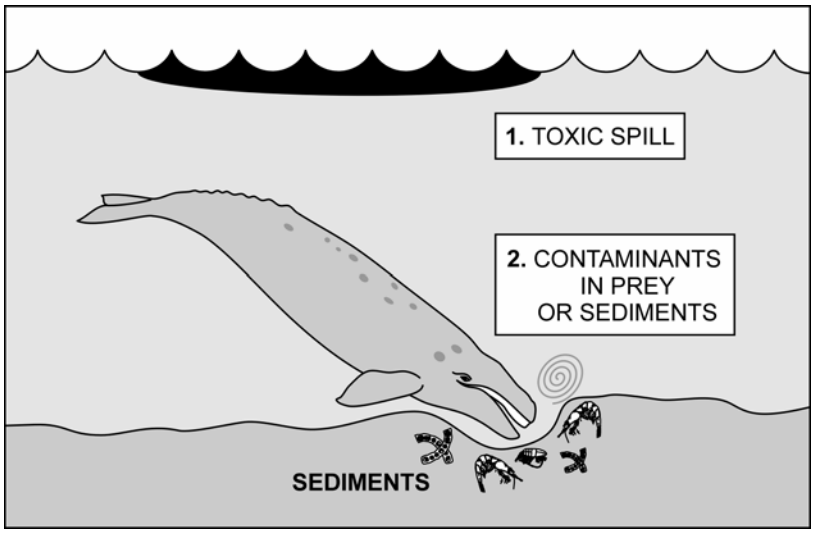

Figure 3. There are a wide variety of pollutants present in the coastal habitats occupied by Grey Whales. Grey Whales are vulnerable to the effects of

environmental contaminants via 1) direct exposure to contaminants via a toxic spill (e.g. oil), or 2) through the consumption of contaminated sediments and prey. Illustration courtesy of Dr. P. Ross, DFO, Institute of Ocean Sciences, Sidney, B.C.

Whaling

a) Commercial whaling
Commercial whaling for Grey Whales ended in 1937, when the abundance of Grey Whales reached a critically low point. Historically, whaling demonstrated a severe threat to the viability of Grey Whale populations, extirpating both Atlantic and Pacific Grey Whales from historic habitats. The commercial hunt of Grey Whales demonstrated severe impacts to the population, bringing them to near extinction in the Pacific Ocean. The fact that Atlantic Grey Whales were extirpated long before the onset of large-scale industrial whaling suggests that Grey Whales as a species, are susceptible to non-industrial whaling.

b) Subsistence Whaling
On the west coast of B.C. and Washington State, only a few coastal First Nations such as the Nuu-chah-nulth, Makah, Quinault and Quileute, historically specialized in whaling (Hendricks 2005). Hunts for grey whales typically began in late spring when the whales were 'running, like salmon' (Drucker 1951). The season extended through the summer months and hunts were carried out from large canoes using hand-thrown harpoons with sealskin floats (Hendricks 2005). Participants in the whale hunt were required to carry out rites to ensure a successful hunt and these preparations were considered as important as readying hunting equipment itself (Drucker 1951). A whale hunt brought considerable prestige to the community and leading chief, thus shaping the identities of such whaling communities (Hendricks 2005). Imagery of whales was, and still is, depicted in some coastal First Nations' dance and art (Hendricks 2005).

Grey Whales are currently hunted off Chukotka, and the Makah tribe in Washington State resumed subsistence hunting of Grey Whales in 1999. Subsistence whaling quotas (issued by the International Whaling Commission (IWC 2003a)) are currently shared between the Makah and Russian aboriginal groups. Subsistence hunting of Grey Whales in North America by First Nations is an established right, both in the U. S. and in Canada. Internationally, annual subsistence catches have ranged between zero (1944, 1992, 1993) and 374 (1967) individuals (IWC, 2003b).

The U.S. Treaty of Neah Bay (1855) secured the Makah Tribe's right to hunt Grey Whales in traditional hunting grounds in U.S. waters. The 1999 legal harvest of one Grey Whale off Neah Bay, Washington by Makah tribal members brought about renewed interest in traditional Makah culture within the tribe (J. Scordino pers. comm.). This was the first whale hunt by the tribe in approximately 70 years (http://www.makah.com/whalingtradition.html). As motives for traditional, or subsistence, whaling are aimed to reconnect First Nations with traditional food sources (versus financial incentives of commercial operations), it is unlikely that interest in large-scale hunting of whales in B.C. waters will re-emerge.

Summary
Currently, there is no harvest of Grey Whales in B.C. and little subsistence harvest in the U.S.; as such, current take levels are so low that they are considered inconsequential to

the population. Several Canadian First Nations have indicated their interest via treaty negotiation, in having subsistence whaling included as a treaty right. Any First Nations harvest would require a license or permit to carry out the activity. As the small PCFA sub-group depends on long-term utilization of coastal habitats in B.C., this may make them more vulnerable to hunting activity due to their geographic proximity to potential subsistence users. If whaling efforts were to target PCFA animals in the future, it is likely that these individuals would be displaced from feeding habitat due to targeted physical disturbances of whaling activities and impacts to PCFA abundance could be significant. Currently the mitigation potential is high as the activity does not occur in Canada and communication with interested parties is underway. Additionally, any hunt would require cooperation among users and regulators, as well as monitoring.

If concerted traditional whaling efforts re-emerge in B.C., co-management within a sustainable harvest regime would need to include knowledge of international subsistence harvests of eastern Pacific Grey Whales (i.e. in Russia and in the U.S.). In addition, consideration for site fidelity of members of the PCFA would ensure that activities do not cause local extinctions or extirpation of this feeding aggregation in Canadian waters. Should the International Whaling Commission revise its allowable harvest rates for eastern Pacific Grey Whales, this would require re-assessment and international collaboration to ensure conservation of the population in Canadian waters as well.

Chronic Noise

Alternative energy projects such as wind farms are proposed on Grey Whale migration routes within B.C. Behavioural responses to acoustic or vibrational disturbance during construction and operation of wind farms have been noted in other cetaceans (Carstensen et al. 2006). A review of noise disturbance in Moore and Clarke (2002) indicates a 50% probability of avoidance behaviour for migrating Grey Whales if exposed to continuous received sound levels from 117 to 123 dB. There remains potential for disruption of north or southward migrations, and impacts to feeding in Pacific and Arctic waters, from activities related to operation or construction (e.g. pile driving, dredging or drilling).

Increase in shipping, and disturbance from whale watching or other industrial activity can contribute to increased acoustic disturbance of migrating Grey Whales. Existing shipping lanes and migration routes of Grey Whales in British Columbia overlap (O'Hara and Morgan 2006). Thirty years of data on underwater sound off the coast of California shows an average increase of 10dB from the 1960s to the 1990s (which is a two-fold increase in noise level), most of which is attributed to increased shipping activity (Andrew et al. 2002). Bryant et al. (1984) found that Grey Whales abandoned the Guerrero Negro breeding lagoon in response to increased vessel traffic and dredging operations. However, upon cessation of these activities Grey Whales slowly re-colonized the lagoon area. Though these effects were recorded at breeding lagoons, similar effects may be applicable for other habitats used by Grey Whales. As Grey Whales are probably low-frequency specialists (Dahlheim and Ljungblad 1990), disturbance from chronic low-

frequency noise sources (e.g. vessel traffic) may affect navigation along migration routes, social communication or detection of prey or predators.

Further research is required to clarify the acoustic ecology of Grey Whales, and the contribution of synergistic effects of noise coupled with other stressors. Given that the population may be near carrying capacity, it appears that increasing ambient underwater noise levels have not impeded population growth; therefore, present concern for this threat is low.

Some mitigation of tanker traffic-related noise is provided by Canada's Economic Exclusion Zone (EEZ), which requires that large tanker traffic remain at minimum 200nm off Vancouver Island and the mainland coast of B.C., and 80nm off the west coast of Haida Gwaii[1]. However, many other large vessels (e.g. cruise ships, commercial goods traffic to Alaska, Coast Guard, Department of National Defence and other large vessels) frequently travel within the EEZ boundary. Mitigation potential for this threat is rated moderate as implementation of practical mitigation measures is deemed feasible.

Physical Disturbance

Commercial and recreational viewing of wild marine mammals occurs throughout North America. The historically endangered eastern Pacific Grey Whale population has received considerable attention in terms of whale watching activity throughout recent years. Viewing of Grey Whales can be a land- or vessel-based activity. While land-based viewing affords opportunity to view Grey Whales at key pinch points along the migration route, or at breeding grounds, it has relatively little impact in terms of disturbance to individuals. Motorized and self-propelled vessels however, bring viewers into close proximity with whales, and these viewing platforms result in more significant physical disturbance to marine mammals. Vessel-based viewing of Grey Whales occurs in Mexico, the U.S. and in Canadian waters, where Grey Whales are easily observed in coastal or lagoon habitats.

In Mexico, three of four breeding grounds are protected by law and viewing is permitted only at the entrance of breeding lagoons. This affords protection for calving grounds deeper within lagoon habitat. The impacts of chronic disturbance at breeding grounds by whale watching, or other activities is uncertain. However, stresses in these habitats do have potential to disturb the entire eastern population during the sensitive breeding and calving season.

In B.C., Grey Whales are primarily viewed on the southwest coast of Vancouver Island, off Tofino. Through photo-identification programs, it is known that most of these whales are members of the year-round PCFA (Duffus 1996; Calambokidis et al. 2002). As such, chronic pressure from whale watching may disrupt feeding behaviour, or displace animals from habitat. In Canada, the *Fisheries Act* Marine Mammal Regulations legally protect marine mammals from disturbance. In addition, the *Be Whale Wise* program and

[1] 80nm EEZ limit is based on the vessel traffic requirements for the protected area surrounding Bowie Seamount.

Parks Canada Agency marine mammal viewing protocols mitigate disturbance to marine mammals by providing guidelines for minimum viewing distances.

In general, whale watching is a seasonal, localized activity that targets whales during the breeding season at lagoons, at pinch points along the migration corridor, or in the summer time off the coast of Vancouver Island. On a population level, it is likely that whale watching activity in British Columbia has negligible impacts (Duffus 1996) and so level of concern is rated low. The certainty and severity of effects to Grey Whales resulting from whale watching disturbance is at present poorly understood. Disturbance at breeding lagoons may potentially pose risks during years of low food abundance, or through other synergistic effects of stresses. Given that measures are currently in place to mitigate impacts to whales from whale watching in B.C., and that these activities occur in coastal areas that may be relatively easy to monitor, mitigation potential is rated high for this threat within Canadian waters. It should be noted that possible expansion of tourism in the Beaufort Sea could potentially increase disturbance to whales utilizing those waters.

Fossil Fuel Exploration and Extraction

Oil and gas exploration, the associated anthropogenic noise and potential of spills can cause loss of habitat on arctic and temperate feeding grounds (Jayko et al. 1990; Moore and Clarke 2002). The sounds of air guns used in seismic surveys, as well as drilling noise are known to elicit behavioural responses in feeding and migrating Grey Whales (Malme et al. 1983; Gailey et al. 2007). Clapham et al. (1999) considers oil and gas exploration to be the greatest threat to the western population. The opening of oil and gas extraction on the Alaskan North Slope (and potentially in the Canadian Arctic) could mean a loss of Arctic feeding habitat for eastern Pacific Grey Whales.

Additionally, offshore reserves of methyl hydrate in B.C. could be developed in the future, which may lead to activities similar to those of oil and gas exploration. Associated impacts of both oil and gas or methyl hydrate extraction, could be habitat loss or degradation resulting from offshore mining and dredging (through noise pollution and by removing or covering feeding substrate (Jewett et al. 1999)), as well as increased shipping disturbance.

As the effects of food limitation on the population have been well demonstrated (Le Boeuf et al. 2000; Moore et al. 2001; Perryman et al. 2002; Grebmeier et al. 2006; Moore et al. 2007), activities with potential to impact food supply require continued mitigation and management to reduce the risk of impacts to the population.

Oil and gas exploration or extraction, and methyl hydrate mining do not currently occur in B.C. The severity of impacts to the population is poorly understood, though some level of impact is expected. At present, the concern for effects to the population is low, and as potential exploration and extraction in B.C. is likely to occur offshore, impacts to PCFA are negligible. Mitigation potential is very high as currently there is a moratorium on offshore exploration and extraction in B.C. Should the moratorium on exploration or

extraction in B.C. be lifted or the development of extraction activities open in the Canadian Arctic or on the Alaska North Slope, re-analysis of this threat with respect to impacts on Grey Whales should be considered.

Prey Reduction

Some known prey species of Grey Whales are also targeted by fisheries within B.C. and the U.S. Herring spawn and crab larvae are important summer food sources for Grey Whales, and an increase in fishing pressure on, for example, herring could have potential to impact an important food source for Grey Whales in British Columbian waters. As Grey Whales are considered generalist feeders (Nerini 1984), they are not likely to be food limited if one prey source declines. However, Grey Whale distribution in B.C. may be altered as feeding locations are likely dictated by prey abundance. It is unknown whether Grey Whales may have seasonally preferred prey species, or whether feeding aggregations temporally overlap with fisheries activities. At present due to uncertainties surrounding prey habitat requirements and seasonal dietary requirements, this threat is considered to be poorly understood or unknown for the PCFA. As migrating Grey Whales typically do not feed in B.C. waters, concern for effects to the population is low. At present, unknown components of Grey Whale feeding ecology in B.C. do not support the rating of mitigation potential.

Pollution

Their near-shore distribution and their benthic or epi-benthic feeding mode make Grey Whales potentially susceptible to environmental toxins (Figure 3). Biotoxins include paralytic shellfish poisoning and domoic acid, although confirmed cases of poisoning from these sources are rare (e.g. Moore et al. 2001).

Localized areas of nutrient loading from sewage or agricultural runoff may degrade or contaminate coastal feeding areas for Grey Whales. Nutrient loading increases the likelihood of harmful algal blooms (HABs) (S. Raverty, B.C. Ministry of Agriculture, Food and Fisheries, Abbotsford, B.C., pers. comm., P. Ross, Fisheries and Oceans Canada, Pacific Region, Science, pers. comm.). The specific effect of biologically or chemically contaminated sediments on Grey Whales is at present unknown, as is the level of contamination of their food source(s). It should however be noted that examination of stranded Grey Whales has shown some evidence of *Brucella* infection, which may not only pose risk to the Grey Whale population, but may also be a concern should Grey Whales be harvested as a food source for humans (S. Raverty pers. comm.).

Persistent chemicals (e.g. DDT) as well as emerging toxins with similar properties (e.g. PBDEs) may accumulate in prey species or in areas used by Grey Whales in Mexico, the U.S. and Canada. While Grey Whales may accumulate low to moderate concentrations of persistent, bioaccumulative chemicals through prey species, they may also be exposed to a myriad of sediment-bound contaminants when feeding in urbanized coastal environments (P. Ross pers. comm.). For example, sediment sampling in B.C. has revealed chronic contamination including that of both regulated and non-regulated toxins

(Macdonald and Crecelius 1994; Yunker et al. 2002; Johannessen et al. 2007). As Grey Whales regularly ingest sediments when feeding, they are potentially susceptible to these sediment-bound toxins. To date, two studies reported elevated levels of heavy metals (copper and lead) in juvenile Grey Whales stranded on the breeding grounds (Méndez et al. 2002; De Luna and Rosales Hoz 2004).

In B.C., point sources for contamination of marine habitats are well known and are monitored and regulated. Non-point sources of chemicals (e.g. runoff) however, are poorly known. Levels of organochlorines in Grey Whales are typically low (Varanasi et al. 1994; Jarman et al. 1996; Krahn et al. 2001; Tilbury et al. 2002), and the fact that Grey Whales feed at a relatively low trophic level likely provides them with some degree of protection from accumulating the high concentrations of persistent chemical pollutants found in some odontocetes feeding higher in the food chain (O'Shea and Brownell 1994).

The category of 'pollution' envelopes a wide variety of toxin types, that Grey Whales are continuously exposed to along the coast of North America. There is a high degree of uncertainty regarding severity of effects as a result of such contamination. Hence, concern for population-level effects and effects to the PCFA are both ranked unknown.

Management of biological and chemical contaminants in aquatic environments falls under the jurisdiction of Environment Canada. Though point sources of contamination can be regulated and monitored, potential to implement mitigation measures for this threat is rated low-moderate, due to the difficulty in mitigating or managing non-point sources of contamination. Additionally, sources of contamination which originate in Canada may be mitigated, whereas for contamination that may originate in international waters, the mitigation potential is very low from a Canadian management perspective.

Entanglement

Entanglement in fishing gear and other marine debris is another source of mortality for eastern Pacific Grey Whales, but its extent remains poorly understood. Heyning and Lewis (1990) report that Grey Whales are the most common species of baleen whale involved in entanglement off the coast of southern California. Both Calambokidis and Baird (1994) and Ford et al. (1994) suggest that entanglement in fishing gear represents an important anthropogenic threat to Grey Whales in British Columbia waters. Fishing gear found on entangled whales includes offshore drift nets used for swordfish, inshore gill nets used for seabass, halibut, salmon, and shark nets, as well as longlines, crab and lobster pots (Sumich and Harvey 1986; Heyning and Lewis 1990; Baird et al. 2002). Off British Columbia, Dungeness crab fisheries, seine and gillnet fisheries for salmon, as well as long-line fisheries for bottom fish are a source of mortality (Baird et al. 2002).

Rate of entanglement of Grey Whales remains poorly understood. Additionally, entrapment or entanglement in aquaculture net pens, anchor chains and other human-made devices may pose risk to individual whales, though the severity of injuries is poorly documented. The high degree of uncertainty regarding the occurrence, severity and extent of entanglement results in unknown level of concern for this threat. Despite this,

where modification of fishing gear has been successful in mitigating entanglement rates for cetaceans elsewhere (i.e. U.S. or Atlantic Canada) recommendations to enact cost-effective modifications to gear should be considered.

Boat Collisions and Vessel Traffic

Concentrated vessel traffic around urban centres, as well as in shipping lanes which overlap with migration routes (Figures 1, 2, and 4) or feeding aggregations, may result in collisions with Grey Whales. Laist et al. (2001) mention that Grey Whales are commonly struck by boats off the coast of California, and some individuals identified off British Columbia bear prominent propeller scars (Deecke, 2003). There remains some concern over Grey Whales that are habitualized to close approaches at breeding grounds, approaching vessels in B.C. This behaviour could pose risk not only to the whale but also for the vessel.

The current rate of collisions and extent to which ship strikes affect eastern Pacific Grey Whales at the population level is not currently well understood. Douglas et al. (2008) survey of ship strikes of large whales off the Washington coast indicates that approximately 5% of the stranded Grey Whales examined bore signs of trauma due to vessel strike. However, these data may be somewhat conservative as stranded Grey Whales are not typically necropsied in as great detail as other cetaceans. Additionally, animals which are struck and killed in offshore or remote areas may not be recovered adding to uncertainty of the severity of effects of vessel strikes on Grey Whales. The significance of temporal and regional (i.e. areas where Grey Whales are known to aggregate to feed, as well as migration route 'pinch points', such as Unimak Pass) occurrence and frequency of vessel strikes should also be investigated. At present, there remains an unknown or uncertain level of concern surrounding this threat. Continued enforcement and promotion of the Marine Mammal Regulations, *Be Whale Wise* and Parks Canada guidelines will ensure boaters are aware of the recommendations for vessel behaviour in the presence of whales, but as vessel strikes are accidental events, additional mitigation potential is low.

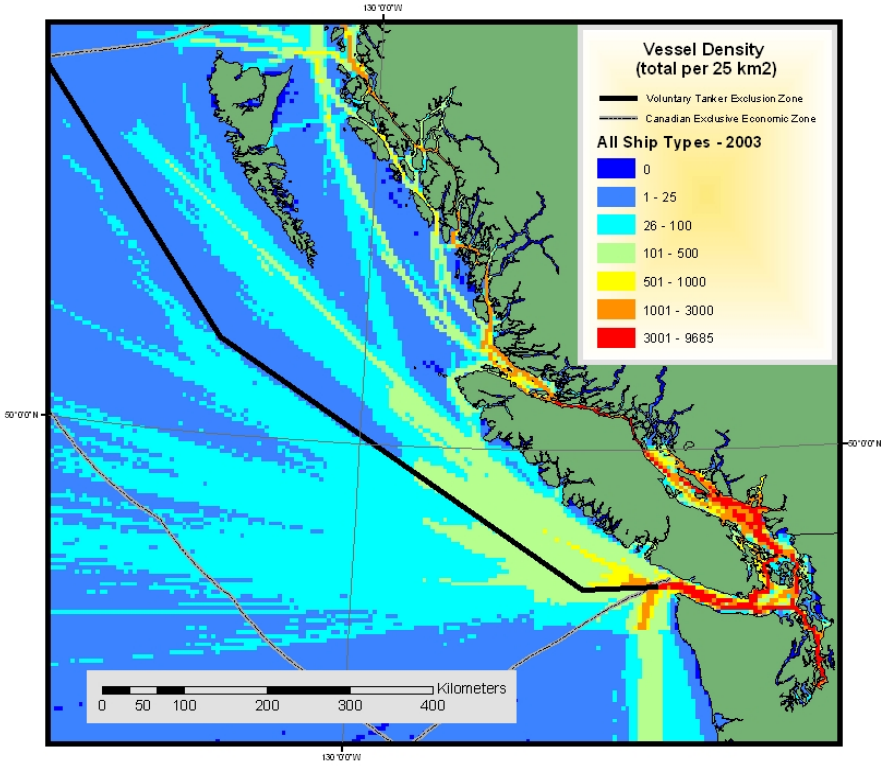

Figure 4. Vessel traffic density for all ships in 2003, as reported by Canadian Coast Guard, Marine Communications and Traffic Services. Map adapted from O'Hara and Morgan (2006).

Predation by Killer Whales[1]

Killer whale predation on Grey Whales has been documented in several locations from Monterey Bay, California to the Chukchi Sea (Baldridge 1972; Ljungblad and Moore 1983; Lowry et al. 1987; Goley and Straley 1994; Matkin et al. 2007). At least in some of these areas, killer whales appear to focus on Grey Whale calves (Goley and Straley 1994; Matkin et al. 2007) and Matkin et al. (2007) report 18 Grey Whale kills documented during 49 survey days around Unimak Island, Alaska. As killer whales appear to prey upon calves, threat to the individuals belonging to the PCFA (comprised primarily of adults) is very low. The eastern population produces between 280 and 1400 calves in a given year. In years when calf production is low, killer whale predation has the potential to substantially impact recruitment, however realized effects of killer whale predation on the population remain poorly understood.

1.5.3. Cumulative and Synergistic Effects

The effects of threats and limiting factors can be difficult to distinguish from one another, making conclusions regarding causes of population decline often difficult to ascertain. Synergistic effects between multiple stressors on a population have been suggested to result in a 'snowball effect' enhancing the effects of otherwise benign limiting factors or threats (e.g. Sih et al. 2004; Macdonald et al. 2005).

Though the eastern population has increased dramatically since the end of commercial whaling in 1937, it appears that the population is still vulnerable to the effects of natural limiting factors and human-induced stresses. As illustrated by the precipitous decline of Grey Whales from 1998 to 2002, synergistic effects of increase in mortality (LeBoeuf et al. 2000) coupled with low calf production (Perryman et al. 2002) can create severe conditions where significant cumulative negative effects are observed.

1.6. Actions Already Completed or Underway

1.6.1. International

Grey Whales have been protected internationally from commercial whaling since 1937. The eastern population was listed as endangered by the International Union for Conservation of Nature and Natural Resources (IUCN) until 1996 and is now in the 'lower risk' category. The western population is considered 'critically endangered'. Grey Whales are listed in Appendix 1 of the Convention on International Trade in Endangered Species (CITES), which prohibits international trade in Grey Whale products. The

[1] Predation is a naturally occurring threat to the population (i.e. a limiting factor whose effect can be increased by human activities).

International Whaling Commission sets a subsistence catch limit for the population for member countries to partition on a bilateral basis.

Mexico has protected a large proportion of the breeding grounds of the eastern population and has set up regulations for whale-watching in Mexican waters. In the United States, Grey Whales are protected by the *Marine Mammal Protection Act*, which makes it illegal to 'harass, hunt, capture, or kill, or to attempt to harass, hunt, capture, or kill' any marine mammal. Implementation rests with the U.S. National Marine Fisheries Service. Hunting marine mammals for native subsistence use is exempt from these regulations.

1.6.2. Canada and British Columbia

Grey Whales are currently protected under the following Canadian legislation, protocols and policies:

- Canada's federal *Fisheries Act* contains provisions for protection of fish and marine mammal habitat (S. 35, 36), and the Marine Mammal Regulations manage disturbance and injury of cetaceans, requiring licenses for any potential harvest or targeted disturbance of marine mammals (S. 5, 7, 11)

- Pacific Rim National Park Reserve provides protection under the *Canada National Parks Act.* Protections in the Park Reserve extend out to the 20 metre isobath. According to the Act, "Maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks."

- Department of National Defence [DND] 'Maritime command order: marine mammal mitigation procedures' mitigates disturbance from tactical sonar use

- Fisheries and Oceans Canada *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* set out minimum standards that must be met during marine seismic surveys in all non-ice covered marine waters in Canada (http://www.dfo-mpo.gc.ca/oceans-habitat/oceans/im-gi/seismic-sismique/statement-enonce_e.asp).

- A moratorium preventing oil and gas exploration or extraction in offshore areas along the B.C. coast minimizes potential seismic noise, vessel disturbance, habitat degradation (e.g. drilling waste) and potential risk of oil spills from vessels or extraction platforms along migration routes or at feeding sites

- Environmental Quality Guidelines for water, air, sediment and tissues are published by the Canadian Council of Ministers for the Environment [CCME] and the B.C. Ministry of Environment [MoE]

- Regional Environmental Emergency Teams [REET], regional, national and international spill response programs manage toxic spills and monitoring of contaminated sites (e.g. Can-US Dix Plan, B.C. Marine Oil Spill Contingency Plan)

- *Canadian Environmental Protection Act*, Polybrominated Diphenyl Ethers (PBDEs) Regulations and Environment Canada's Risk Management Strategy for PBDEs. To view the regulations, visit http://canadagazette.gc.ca/rp-pr/p2/2008/2008-07-09/html/sor-dors218-eng.html

- By-laws, Codes of practice and action groups are developed and implemented regionally and municipally for mitigation of environmental stresses

Regulatory Development and Review, Currently Underway

- *Fisheries Act* 'Marine Mammal Regulations' [MMR] are being amended to increase prevention and mitigation of disturbance to marine mammals

- Pacific North Coast Integrated Management Area [PNCIMA] aims to combine protection of habitat with sustainable use of resources in Queen Charlotte Basin and mitigate stress to species at risk found on the north coast of B.C.

- The June 2010 designation of the Gwaii Haanas National Marine Conservation Area [NMCA] and Haida Heritage Site, may protect the migration corridor(s) for Grey Whales on the north coast of B.C. via zoning and management planning efforts.

Stewardship Measures Currently in Place

- '*Be Whale Wise*: Marine Wildlife Guidelines for Boaters, Paddlers and Viewers' guidelines for human behaviour and minimum vessel distances around wild marine mammals

- Parks Canada Agency has viewing guidelines for eco-tour operators within Pacific Rim National Park Reserve boundaries

- Information on sightings of marine mammals are collected by the B.C. Cetacean Sightings Network (1-866-I-SAW-ONE; www.wildwhales.org), a partnership between the Vancouver Aquarium and DFO

- Information on incidents (e.g. strandings, entanglements) and marine mammal sightings are collected by the B.C. Marine Mammal Response Network [MMRN] (1-800-465-4336) as well as other organizations

- Several organizations, including Cetus Research and Conservation Society (http://www.cetussociety.org), and the B.C. Cetacean Sightings Network, educate boaters on marine mammal viewing guidelines and threats to marine mammals

- Public and industry initiatives such as, 'Toxic Smart' or 'Clean Print B.C.', increase awareness of chemical stress to marine habitats

- Remediation programs can be carried out on a case-by-case basis for disturbed habitat

- Pacific Whale Watch Association has implemented Best Management Practices (http://www.pacificwhalewatch.org) for all its members to ensure that operators behave in a manner which respects the spirit of the *Be Whale Wise*: Marine Wildlife Guidelines for Boaters, Paddlers and Viewers'.

Conservation Strategies Currently under Development

With the legislation of the SARA in 2003, recovery strategies and management plans for several 'at-risk' marine mammals have been produced. These documents include recommended actions for protection of marine mammal species. In a larger context, these management actions may also benefit Grey Whales. Please refer to Section 4.0 'Associated Plans' for specific recovery plans with actions relevant to the protection and management of eastern Pacific Grey Whales in Canada.

Current Research Actions

While directed research on Grey Whales in B.C. is ongoing, it is carried out by independent organizations and researchers[1] and is largely U.S.-funded. Findings from a recent systematic summer-time survey of inshore coastal waters of B.C. indicated few Grey Whales in inshore waters during the survey period (Williams and Thomas 2007). Information on incidents (e.g. strandings, entanglements) and marine mammal sightings are collected by the MMRN and the Vancouver Aquarium's B.C. Cetacean Sightings Network [B.C. CSN], respectively. Organizations currently carrying out research on Eastern Pacific Grey Whales are listed in Appendix II.

1.7. Knowledge Gaps

A primary knowledge gap regarding Grey Whale management in British Columbia is the migratory path of Grey Whales north of Cape Scott. While it is likely that the majority of animals cross over to Haida Gwaii rather than migrating along the eastern shore of Hecate Strait (Pike, 1962), it is not currently known whether the animals travel along the east or west coast of the Haida Gwaii. Likewise the abundance and distribution of summer residents north of Cape Caution requires further study.

A better understanding of the following attributes of the PCFA could help to improve the management of Grey Whales in Canada. The following data gaps should be addressed:

[1] Organizations and independent researchers which currently have active research programs for eastern Pacific Grey Whales are listed in Appendix II.

- Age / Sex ratios of the PCFA
- Year-to-year site fidelity of individuals from the PCFA
- The distribution of PCFA individuals north of Cape Caution
- The within year movement patterns of individuals (e.g. migration routes)
- Year-to-year variation in number of individuals belonging to the aggregation
- Effects of ship traffic with special reference to vessel effects on the PCFA

The importance of the Canadian Beaufort Sea as a feeding ground for the population is not yet fully understood, though a handful of Grey Whales are known to feed around Cape Bathurst (Rugh and Fraker, 1981). Aerial surveys flown by DFO in 2006-2008 with broad systematic regional coverage have not seen Grey Whales (L. Harwood, pers. comm.). In the future, these areas may become increasingly important to feeding Grey Whales if benthic productivity in the Bering, Chukchi and Alaskan Beaufort seas declines. Long-term monitoring will provide more precise information on Grey Whale abundance and distribution in these waters, in the context of a changing ecosystem and expansion of the range of this population.

Despite the heightened attention the Grey Whale population received following protection from whaling in 1937 and its designation as an endangered species under the IUCN (until 1996), there are several key knowledge gaps surrounding species biology. The potential for population-wide effects of changes in the Bering Sea are poorly understood, as are the basic bio-energetic needs of the species. Additional clarification of techniques which Grey Whales utilize for navigation of migration routes may answer questions regarding northern migration routes and the plasticity of these routes. Research efforts to clarify data gaps will assist in addressing uncertainties on the effects of identified threats to Grey Whales.

The sources of several anthropogenic threats to Grey Whales warrant further research. The frequency and significance of gear types for entanglement of Grey Whales in British Columbia are unclear. Though entanglement may not currently limit the population, there are data gaps and thus it is difficult to ascertain the extent of its effect. The rate of vessel collisions is poorly documented, and efforts to clarify this threat are underway and may provide an opportunity to determine severity of effects, as well as spatially or temporally significant aspects to risk of vessel strikes.

Though disturbance at breeding lagoons is ranked as a potentially significant threat to Grey Whales, the effects of disturbance remain poorly understood. Measures to close knowledge gaps will contribute to the protection of future generations of Grey Whales. The extent of killer whale predation on juveniles and adults has not been documented. Predation on older age classes may occur, and the extent to which this may limit the population is not clear. There is virtually no data on the physiological effects of chronic toxic or biological contamination of Grey Whales, and this information will dictate what measures may be required to mitigate effects.

2. MANAGEMENT

2.1. Goal

The goal of this management plan is to maintain the migration route and foraging habitat in British Columbia for eastern Pacific Grey Whales, in order to contribute to the maintenance of a self-sustaining population.

As the eastern population is migratory and crosses international boundaries, the role of Canadian management of this species at risk will aim to protect the population within Canada and contribute to research and conservation initiatives in the U.S. and Mexico, where feasible. Ensuring functional migration route(s) and foraging habitat for Grey Whales in Canada is essential to effective management of Grey Whale abundance from a Canadian perspective. As both migratory and resident individuals utilize habitat in Canada, this diversity of behaviour within the population should be conserved, and separate management actions may be necessary to address each of these groups. Uncertainties remain regarding northern portions of migration route(s) within B.C., ecology of the PCFA, and impacts of some threats. Actions and objectives will address these and other issues occurring in B.C. waters.

2.2. Objectives

Distribution Objective

The distribution objective for this population is;

D1 *Maintain the current known distribution, and migration route of Grey Whales in Pacific Canadian waters.*

Maintenance of distribution will ensure that this population and the PCFA are protected within Pacific Canadian waters. As breeding sites do not occur in Canada, and use of Canadian Arctic habitats appears to be very low at present, targeted efforts to maintain population abundance or distribution in the Canadian Arctic are not feasible; rather, measures to protect the distribution of animals within Pacific Canadian waters will assist population-level conservation efforts. Priority measures to achieve this objective should include actions to distinguish between levels of human-caused mortalities. Monitoring data can assist in forecasting of declines in population health, and changes in distribution.

Research and Monitoring Objectives

Research objectives are aimed to address knowledge gaps for this species (listed in 'Knowledge Gaps' Section 1.7) and those regarding the effects of the listed threats (Section 1.5) through Canadian-funded projects. Priority research and monitoring objectives for the next twenty years are:

R1 *Monitor abundance and distribution in B.C on an ongoing basis*

R2 *Contribute to, or foster the understanding of the habitat use and feeding ecology of Grey Whales in Pacific Canadian waters*

R3 *Contribute to, or foster the understanding of the migration route of Grey Whales through Pacific Canadian waters*

R4 *Support, foster and contribute to research addressing uncertainties surrounding degradation of benthic habitat, competition with fisheries, toxins, and effects of other identified (Table 1) and non-identified threats to this population*

R5 *Assess available methods, and estimate levels of annual human-caused mortality that the population can sustain while achieving distribution objective, D1*

Addressing knowledge gaps through Canadian-funded research programs will help to provide the framework on which to base future management actions within B.C. Knowledge gaps regarding feeding ecology and habitat use of eastern Pacific Grey Whales in Canada should be addressed in order to adequately mitigate threats and support the described management goal. Ongoing monitoring of abundance and the distribution of Grey Whales in B.C. and the Canadian Arctic will provide baseline and trend information with which population health and viability may be assessed in future years. Consideration of methods for assessment of sustainable human-caused mortalities will allow for more quantitative measure of threats to Grey Whales in B.C., and will assist in determining whether the distribution objective is reached. These research and monitoring objectives will directly address key threats to the population and contribute to achieving the overall management goal, as well as distribution and population objectives.

Management Objectives:

The following management objectives aim to mitigate the threats of high or medium concern, such that they do not affect the population abundance or distribution of eastern Pacific Grey Whales in B.C. While degradation of breeding habitat and environmental variability are considered significant threats to this population, mitigation feasibility is nil, and therefore no management objectives are set for those identified threats. Over the next twenty years, management objectives will be:

M1 *Reduce the risk of catastrophic spills impacting Grey Whales or their habitat in Canada*

M2 *Protect benthic feeding habitat from degradation, such that it does not displace PCFA whales from known feeding habitat in Canada*

M3 *Minimize the exposure of Grey Whales to acute sound levels (in excess of those considered to cause behavioural or physical harm in cetaceans), and prevent disturbance such that it does not*

displace Grey Whales from known migration routes or feeding habitat in Canada

M4 *Protect the population from commercial whaling in Canada, and reduce the likelihood of negative impacts to the PCFA from subsistence whaling activity*

M5 *Promote international collaboration, independent research, education and outreach on management and conservation initiatives*

The population appears to be at carrying capacity, and management objectives addressing threats with medium and high levels of concern aim to prevent altered distribution in Canada or overall population decline. Catastrophic spills, noise disturbance, whaling, toxins and habitat degradation were assessed to be the top threats to eastern Pacific Grey Whales (Table 1). The above listed management objectives address these threats.

Threats assessed at low or unknown level of concern do not have specific objectives or new recommendations for mitigation; instead knowledge gaps will be filled by opportunistic or cost-effective means, where feasible. Effects of some threats impact individual whales, but do not constitute a population level effect. Where mitigation feasibility is high (Table 1) and resources are available, it is prudent to manage and mitigate these threats. As the very few Grey Whales that have been observed in the Canadian Arctic represent extra-limitals exploiting previously unused areas, concerted efforts for management of Grey Whales in this region are currently not recommended. Should Grey Whale occurrence in Canadian Arctic waters significantly increase, adaptive management measures may be required in future.

2.3. Actions

The following actions (not listed in order of priority) are recommended to support the goal and objectives outlined in Sections 2.1 and 2.2. Some of the actions listed below are currently underway (see Section 1.6 ‘Actions already completed, or underway’), and may have been identified in other recovery planning documents to date (See Section 4 ‘Associated Plans’). The implementation and completion of these actions will facilitate a multi-species approach to cetacean conservation in British Columbia. Actions have been recommended where implementation is deemed to be practical and feasible, and those most likely to result in successful protection of the population in B.C.

Where responsibility for actions is determined to fall under Fisheries and Oceans Canada jurisdiction, actions will be implemented directly as availability of funding and other resources permits. However, collaboration with other responsible agencies and organizations will be necessary in some cases to complete actions. If responsibility for actions falls outside of the mandate of Fisheries and Oceans Canada, or outside of its jurisdiction, support for implementation of the action(s) and contribution to effort(s) will be a priority where feasible. Participating agencies and organizations and implementation timelines for each of the listed actions are presented in Section 3 (Table

3). Organizations currently involved in data collection on eastern Pacific Grey Whales are listed in Appendix II and other individuals and organizations are also encouraged to participate in activities listed below.

2.3.1. Protection

1. Continue to protect Grey Whales from acute acoustic disturbance in Canada to effectively mitigate potential negative population level effects.

    a. Apply the Fisheries and Oceans Canada *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* as well as associated regional implementation protocols to increase effectiveness in mitigation of seismic noise stress with respect to Grey Whales during their migration through Canadian waters, and to individuals of the PCFA.

    b. Request DFO engagement with DND to be updated on changes to the Canadian Department of National Defence 'Maritime command order: marine mammal mitigation procedures' and any new information on mitigation validation, and to minimize impacts of tactical sonar noise on Grey Whales during migration through Canadian waters, and to individuals of the PCFA.

2. To proactively protect Grey Whales from physical disturbance, vessel interactions and chronic noise stress in Pacific Canadian waters;

    a. Complete Marine Mammal Regulations amendments under the *Fisheries Act*[1] to reduce the risk of displacement from habitat, collisions with vessels, entanglement in gear, and the effects of acoustic disturbance on individuals of the PCFA.

    b. Continue enforcement of the Marine Mammal Regulations and relevant regulations for marine industrial development, as well as promote regional guidelines for marine mammal viewing.

2.3.2. Management

3. Continue to review project proposals with potential to impact Grey Whales, such as those including benthic habitat degradation, and use of seismic or sonar surveying (e.g. reviews triggered under *Canadian Environmental Assessment Act*). Provide project-specific advice for mitigation or avoidance with respect to Grey Whale habitat needs.

4. Develop comprehensive toxic spill response to mitigate or avoid impacts to Grey Whales or feeding habitat in Canada. This action is also listed in other DFO Pacific Region marine mammal SARA documents.

[1] To view the proposed amendments to the Marine Mammal Regulation, visit http://www-comm.pac.dfo-mpo.gc.ca/pages/consultations/marinemammals/mmr-update_e.htm

a. Develop an emergency response plan to identify marine mammal expertise required in spill response initiatives, when triggered.

b. Develop a marine mammal-specific operational manual to be included into existing catastrophic spill response plan(s)[1] to identify data collection and response protocols required for mitigation of short and long-term effects to marine mammals and habitat.

5. Continue the permitting of research, monitoring and assessment (Sections 2.3.3, 2.3.4 and 2.3.5) to address key knowledge gaps, clarify identified threats and to minimize duplication of research efforts facilitating efficient data collection on both the PCFA and the population.

6. Proactively mitigate for threats to the PCFA and Grey Whale population indicated to have high mitigation potential (Table 1).

a. Strengthen, support and foster, where feasible, the continued development of fisheries observer reporting standards and guidelines for marine mammal species identification and data collection to clarify the extent of fisheries interactions (i.e. entanglement, by-catch) and gather samples, where possible.

b. Promote development of alternative gear types, where appropriate, to proactively minimize likelihood of entanglement in marine debris, fishing and aquaculture gear. Of particular importance is the consideration of entanglement risk for seine- or gillnets, crab fishing gear, and long lines. This action will assist in the continued evolution of guidelines, best management practices, regulations and standards.

c. Develop co-management strategies for traditional harvest of Grey Whales in Canada, in support of treaty-negotiated rights.

d. Continue the implementation and development of the DFO led coast wide British Columbia Marine Mammal Response Network. The network reports, documents and responds to entangled or injured grey whale occurrences.

2.3.3. Research on Grey Whale Biology

7. The following areas are those that have been identified as priorities for research actions to address knowledge gaps surrounding species biology. Opportunistic data collection and multi-species research programs may be combined to provide a more cost-effective means of achieving research goals, where appropriate and feasible[2]. Other potential areas for research efforts have been listed in previous

[1] Include in the operational manual, measures outlined in the Fisheries & Oceans Canada 'Marine mammal incident response' manual (draft) and 'Sea otter oil spill response plan for Canada's Pacific coast' (working document).

[2] Independent researchers with active research programs for eastern Pacific Grey Whales are listed in Appendix II.

sections of this management plan and should also be considered in the context of supporting those topics listed below.

a. Undertake satellite-tracking during the northward migration of the Grey Whale population, to assist in determining the migration route north of Cape Scott.

b. Initiate studies to identify the abundance and distribution of PCFA individuals north of Cape Caution.

c. Contribute and collaborate, when feasible, on studies to address uncertainties regarding general habitat use by Grey Whales in British Columbia.

d. Contribute to, support and foster, when feasible, research programs addressing knowledge gaps on distribution of Grey Whale prey resources in British Columbia, and seasonally important prey species for the PCFA.

e. Continue photo-identification programs and genetics studies to further define the social and genetic identity of the PCFA sub-unit of the eastern population.

f. Assess methods for determining sustainable human-caused levels of mortality for the PCFA and population, in order to determine mortality levels which can be withstood without exhibiting stress on population viability.

2.3.4. Research to Clarify Identified Threats

8. Contribute to, support and foster analysis of photographs to assess scarring rates for individuals. This may assist in determination of the occurrence of direct threats such as entanglement and vessel collision on the population.
9. Conduct ongoing assessments of the vulnerability of Grey Whales to identified threats (Table 1), as this population's migration route and PCFA feeding sites are further identified.

    a. Continue to support the B.C. Marine Mammal Response Network, to facilitate standardized sample and data collection, and necropsy of carcasses to support comprehensive understanding of identified threats.

    b. Investigate the potential for increased risk of seismic noise stress, catastrophic spills and vessel disturbance to the population and to the PCFA that might result from lifting the moratorium on offshore fossil fuel exploration and extraction in B.C.

    c. Assess the potential for fisheries interactions in terms of temporal and spatial occurrence of species-specific fisheries based on distribution, and foraging areas, with respect to the likelihood of entanglement in gear, and competition for resources. The assessment of foraging areas, seasonal diet and distribution of Grey Whales will assist in carrying out this action.

d. Contribute to, and foster where feasible, tissue sampling to assist efforts to assess the chemical and biological pollutants in the population.

2.3.5. Monitoring and Assessment

10. Contribute and collaborate, when feasible, in monitoring efforts to increase the understanding of Grey Whale abundance and distribution in British Columbia.
    a. Conduct capture-recapture photo-identification programs to gather data for abundance estimates for the PCFA.
    b. Conduct annual population estimates during Grey Whale southward migration. The U.S. National Oceanic and Atmospheric Administration carries out annual surveys and leads this effort.
11. Contribute, when feasible, to measuring body condition of individuals, by sharing photographic data to assist in forecasting population-wide nutritional or environmental stress.
12. Continue to support the collection of sightings information to contribute data on distribution, occurrence and threats to Grey Whales in B.C.

2.3.6. Outreach and Communication

13. Foster improved communication networks to increase awareness of eastern Pacific Grey Whales.
    a. Build intra- and interagency networks for effective communication during catastrophic spill response to allow timely, effective and coordinated actions by responsible agencies and parties.
    b. Continue media communications and promotion of the Marine Mammal Regulations and *Be Whale Wise*: Marine Wildlife Guidelines for Boaters, Paddlers and Viewers (Revised 2006) to reduce physical and acoustic disturbance to Grey Whales.
    c. Support and contribute, where feasible, to trans-boundary and inter-jurisdictional collaboration on research and management initiatives to ensure a coordinated response to conservation of this population.

3. IMPLEMENTATION SCHEDULE

Fisheries and Oceans Canada and Parks Canada encourage other agencies and organizations to participate in the conservation of eastern Pacific Grey Whales through the implementation of this management plan. The agencies in Table 2 have been identified as partners for implementing the recommended actions.

Table 3 summarizes those actions that are recommended to support the goal and objectives. Where appropriate, partnerships with specific organizations and sectors listed will provide the necessary expertise and capacity to carry out the listed action. The activities implemented by Fisheries and Oceans Canada will be subject to the availability of funding and other required resources. Where appropriate, partnerships with specific organizations and sectors will provide the necessary expertise and capacity to carry out the listed action. However, this identification is intended to be advice to other agencies, and carrying out these actions will be subject to each agency's priorities and budgetary constraints. Organizations currently collecting data on eastern Pacific Grey Whales are listed in Appendix II.

Table 2. The management actions outlined in this plan are to be carried out, where and when appropriate, in partnership with the following organizations.

Organization	**Acronym**
Fisheries and Oceans Canada	DFO
Marine Mammal Response Network	MMRN
Department of National Defence	DND
Environment Canada	EC
Transport Canada	TC
Parks Canada Agency	PCA
Natural Resources Canada	NRCan
Canadian Coast Guard Services	CCG
National Energy Board	NEB
International Maritime Organization	IMO
First Nations	FN
Nuu-chah-nulth Tribal Council	NTC
B.C. Province	B.C. Prov
Ministry of Agriculture and Lands	MAL
Vancouver Aquarium Marine Science Centre	VAMSC
B.C. Cetacean Sightings Network	B.C.CSN
Straitwatch	Straitwatch
Universities having relevant research programs	Universities
U.S. National Marine Fisheries Service, National Oceanic and Atmospheric Administration, National Marine Mammal Lab	NOAA
Pacific Whale Watch Association	PWWA
Environmental non-Governmental Organizations	ENGOs
To be determined	TBD

Table 3. Implementation Schedule

Action	Obj.	Priority	Threats or concerns addressed	Participating Agencies*	Timeline
Protection					
1. Protect from acute acoustic disturbance, mitigate negative effects					
a)Apply DFO standards for mitigation of seismic noise, regional implementation protocols	D1; M3	LM	Disruption of migration; displacement from habitat due to seismic noise disturbance	DFO, EC, NRCan, NEB	Ongoing
b)Review of DND protocol, request updates on revisions	D1; M3	LM	Disruption of migration; displacement from habitat; injury to animals due to tactical sonar use	DFO, DND	As required
2. Protect from disturbance (physical and acoustic)					
a)Complete amendment of MMR	D1	L	Increase protection from physical and acoustic disturbance; vessel strikes	DFO	Ongoing, projected completion 1 year
b)Continue enforcement of MMR, promote regional guidelines	D1	L	Continued protection from physical and acoustic disturbance; vessel strikes	DFO, CCG, PCA	Ongoing
Management					

Action	Obj.	Priority	Threats or concerns addressed	Participating Agencies*	Timeline
3. Review project proposals, provide advice for mitigation or avoidance	D1; M2; M3	MH	Degradation of benthic habitat in B.C.; acute noise disturbance	DFO, DND, Industry, NRCan, NEB	Ongoing, enhance involvement where necessary
4. Develop comprehensive toxic spill response to mitigate impacts					
a)Develop emergency response plan to include marine mammal expertise into spill response initiatives	D1; M1; M2	M	Effective, coordinated response for toxic spills affecting marine mammals	DFO, EC, CCG, PCA B.C. Prov, NOAA, NTC, FN	1 year
b)Marine mammal-specific operational manual	D1; M1; M2	M	Effective, coordinated step-wise response to toxic spills and standardized data collection	DFO, EC, CCG	1 year
5. Permitting of non-DFO research, monitoring and assessments	R1 through R5; M1 through M5	H	Foster independent research; address knowledge gaps; clarify threats; ensure research efforts are not duplicated; efficient data collection	DFO, ENGOs, Universities, NOAA, TBD	Ongoing
6. Proactively mitigate for threats indicated to have high mitigation potential					
b)Promote development of alternative gear types (fishing, aquaculture)	D1; R4	LM	Reduce the risk of entanglements	DFO, Fishing industry, Aquaculture industry	5 years
c) Develop co-management strategies for traditional whaling, in support of treaty-negotiated rights.	D1; M4	M	Sustainable harvest protocols; foster communication; maintain population abundance and distribution	DFO, FN	3 years
Research on Grey Whale Biology					
7. Priority Research					

Action	Obj.	Priority	Threats or concerns addressed	Participating Agencies*	Timeline
a)Undertake satellite-tracking of animals during migration	R1;R2;R3	M	Determine northern migration route; habitat use	DFO, TBD	Initiated in 2009
b)Studies to identify PCFA occurrence north of Cape Caution	R1; R2	M	Clarify abundance and distribution of PCFA	Universities, TBD	3 years
c)Contribute and collaborate, when feasible, to studies addressing general habitat use in B.C.	D1;R2	LM	Habitat needs of PCFA and total population	Universities, TBD	4 years
d)Contribute to, support, foster, research on Grey Whale prey needs	P1; D1; R2	M	Seasonally important prey; prey distribution	Universities, TBD	3 years
e)Photo-identification and genetics studies for PCFA	P1; D1; R1	L	Define social and genetic identity of population sub-unit further	Universities, TBD	5 years
f)Assess methods for determining sustainable human-caused levels of mortality for PCFA and population	R5; M1 through M4	MH	Quantification of levels of sustainable mortality within the population	TBD	2 years
Research to clarify identified Threats					
8. Contribute to, support, foster analysis of scarring rates of individuals (photographs)	R4	L	Research collaboration; vessel collisions; entanglement	MMRN, TBD	5 years
9. Conduct assessments of vulnerability to identified threats					

Action	Obj.	Priority	Threats or concerns addressed	Participating Agencies*	Timeline
a)Collect data on incidents involving Grey Whales	R4	LM	Data collection; necropsy; assist in clarifying extent of threats	DFO, MMRN, MAL, TBD	Opportunistic
b)Investigate increased risk associated with lifting of moratorium on offshore fossil fuel extraction	D1; R4; M1; M2; M3	M	Determine associated risk regarding oil spills; acute noise; benthic habitat degradation	DFO, EC, B.C. Prov, NEB, NRCan	3 years
c)Assess potential for fisheries interactions	D1; R4	M	Food availability (e.g. herring roe); fisheries competition; entanglement	TBD	3 years
d)Tissue sample collection	R4	L	Determine pathogen and toxic loading	DFO, MAL, TBD	Opportunistic
Monitoring and Assessment					
10. Increase understanding of Grey Whale abundance and distribution in B.C.					
a)Contribute, collaborate, when feasible to photo-identification programs	R1	MH	Foster data sharing; abundance estimates for PCFA	DFO, NOAA, TBD	3 years
b)Annual population estimates during southward migration	R1; R3	H	Abundance; migration times	NOAA, TBD	Ongoing
11. Contribute, when feasible, to measuring body condition of animals (photographs)	D1; R1; R4	M	Foster data sharing; forecasting population-wide effects of nutritional or other environmental stress	DFO, TBD	3 years
12. Continue to support the collection of sightings information	D1; R1	L	Distribution; occurrence; threats; data collection; education; outreach	DFO, PCA, B.C.CSN, PWWA	Ongoing
Outreach and Communication					
13. Foster communication networks					

Action	Obj.	Priority	Threats or concerns addressed	Participating Agencies*	Timeline
a)Develop emergency response communication networks	M1; M5	LM	Effective intra- and inter-agency communication; catastrophic spill response	DFO, EC, CCG, B.C. Prov, Municipalities, ENGOs, NOAA, NTC, FN, TBD	Immediate
b)Promotion of BWW guidelines		L	Mitigate physical and chronic acoustic disturbance; outreach; communication	DFO, VAMSC, B.C. CSN, PWWA, Straitwatch, ENGOs	3 years
c)Trans-boundary, inter-jurisdictional collaboration	R1; R2; R3; M5	H	Data sharing; foster collaborative programs	DFO, NOAA, ENGOs, IMO, TBD	Immediate

4. ASSOCIATED PLANS

The following recovery plans outline several actions and research priorities which may assist in addressing some of the knowledge gaps and threats to Grey Whales in B.C. Other draft recovery plans may also outline actions, or goals which complement those listed in this management plan.

- Recovery Strategy for the Transient Killer Whale (*Orcinus orca*) in Canada [Final]
- Recovery Strategy for the Northern and Southern Resident Killer Whale (*Orcinus orca*) in Canada [Final]
- Recovery Strategy for the Sea Otter (*Enhydra lutris*) in Canada [Final]
- Action Plan for Blue, Fin and Sei Whales (*Balaenoptera musculus, B. physalus* and *B. borealis*) in Pacific Canadian Waters [Draft]
- Management Plan for the Pacific Harbour Porpoise (*Phocoena phocoena*) in Canada [Final].
- Management Plan for the Steller Sea Lion (*Eumetopias jubatus*) in Canada [Draft].
- Management Plan for the Offshore Killer Whale (*Orcinus orca*) in Canada [Final].

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6. APPENDIX I: Terminology Threat Assessment

Table 4. Details on Terms Used for Assessment of Threats to eastern Pacific Grey Whales.

TERMS	RATING	DEFINITIONS
Uncertainty	Low	Effect of threat is *causally linked* with decreased population viability and likely will result in failure to meet management plan objectives
	Medium	Effect of threat is *correlated* with decreased population viability and negatively impacts management plan objectives
	High	Negative effect of threat on population viability and/or management plan objectives is *assumed* or is plausible.
Severity	Negligible	Threat has no detectable effects on the population
	Low	Effects of threat are sub-lethal, potentially leading to short-term behavioural changes
	Moderate	Effects of the threat result in chronic physiological and/or behavioural changes (e.g. potential for long-term displacement from habitat)
	High	Effects of the threat are lethal
	Unknown	Available information is insufficient to gauge the degree to which the threat may affect the population viability
Mitigation Potential	Low	Implementation of measures to mitigate or prevent impacts on population viability, are not practical or are likely to be unsuccessful.
	Moderate	Implementation of measures to mitigate or prevent impacts on population viability are feasible, and are likely to be somewhat successful
	High	Implementation of measures to mitigate or prevent impacts on population viability are currently in place and future measures are likely to be very easy to implement, and are likely to be very successful.
	Unknown	Available information is insufficient to gauge whether mitigation of effects from the threat is possible.

7. APPENDIX II: Organizations Currently Involved in Research on Eastern Pacific Grey Whales

Organizations and independent researchers involved in active research programs on eastern Pacific Grey Whales:

- U.S. National Oceanic and Atmospheric Administration, Seattle, WA
- Cascadia Research Collective, Friday Harbor, WA
- Whale Research Lab, Geography Department, University of Victoria, Victoria, B.C.
- Parks Canada Agency, Pacific Rim National Park Reserve, Tofino, B.C.
- B.C. Province
- West Coast Whale Research Foundation, Tofino, B.C.
- Juan de Fuca Express, Victoria, B.C.

Organizations and independent researchers carrying out data collection on Grey Whales:

- B.C. Cetacean Sightings Network, Vancouver Aquarium Marine Science Centre, Vancouver, B.C.
- University of British Columbia, Vancouver, B.C.
- Marine Mammal Response Network, Nanaimo, B.C.
- Raincoast Conservation Foundation, Sidney, B.C.
- B.C. Ministry of Agriculture, Food and Fisheries, Abbotsford, B.C.
- Fisheries and Oceans Canada, Central and Arctic Region

8. APPENDIX III: Record Of Cooperation & Consultation

Eastern Pacific Grey Whales are listed as a species of "special concern" on Schedule 1 of the Species at Risk Act (SARA). As an aquatic species, Grey Whales fall under federal jurisdiction, and are managed by Fisheries and Oceans Canada (DFO) 200 - 401 Burrard Street, Vancouver, B.C., V6C 3S4. The Parks Canada Agency is also a competent minister under SARA for individuals of the species that occur in waters administered by Parks Canada (Pacific Rim National Park Reserve).

A Cetacean Management Planning Technical Workshop was hosted in November of 2007 to provide a forum for the sharing of knowledge and expertise on a number of 'special concern' cetaceans for which management plans were developed. A group of scientific and technical experts including independent researchers, environmental non-governmental organizations, and other governmental (federal and provincial) staff from both Canada and the United States were contacted to attend this workshop. An invitation letter was sent to all coastal First Nations soliciting their participation in the workshop. This workshop was invaluable in assisting the DFO internal working group in drafting the Management Plan for eastern Pacific Grey Whales in Canada. Given that the population of Grey Whales considered in this management plan frequent both Canadian

and United States (U.S.) waters, bilateral government and non-government input and collaboration was sought.

A draft version of the management plan was posted to the DFO Pacific Region website for a public comment period from April 7 to May 12, 2008. These consultations were web-based, and also included mail-outs to all coastal First Nations. The mail-outs to First Nations were followed up by email contact. An initial draft of the management plan, along with a discussion guide and feedback form, was made available. In addition, a message announcing the development of the management plan, was sent to a marine mammal list serve (MARMAM) with a broad local and international distribution to marine mammal researchers and interested parties, and to a distribution list of whale-related contacts provided to DFO in recent years from environmental groups, non-governmental organizations, government agencies and the eco-tourism sector. The draft management plan was also sent to the Fisheries Joint Management Committee for review and comment.

Comments on the management plan were received from eight independent sources and from three government agencies: the U.S. National Oceanic and Atmospheric Administration, Environment Canada and the Province of B.C. Processes for coordination and consultation between the federal and British Columbian governments on management and protection of species at risk are outlined in the *Canada-B.C. Agreement on Species at Risk* (2005). Natural Resources Canada, Department of National Defence, Parks Canada and Transport Canada provided no comments on the draft document. The Parks Canada Agency provided input during the development of the management plan through active involvement in the technical workshops and ongoing representation, as a competent agency under SARA. This negated the need to provide input through the public consultation mechanism. No First Nations responded to consultation letters.

A proposed version of the management plan was posted on the SARA Public Registry from April 15 to June 14, 2010 for a 60-day public comment period. Fisheries and Oceans Canada received a total of five comments on the proposed management plan.

Feedback from the public, government agencies and scientific experts has been carefully considered in the production of this management plan. Peer review of the document was not considered necessary as applicable experts were in attendance at the Cetacean Management Planning Technical Workshop and were provided an opportunity to provide input through the two public consultation periods.

DFO Technical Team for Eastern Pacific Grey Whales

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Cetacean Management Planning Technical Workshop Participants:

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