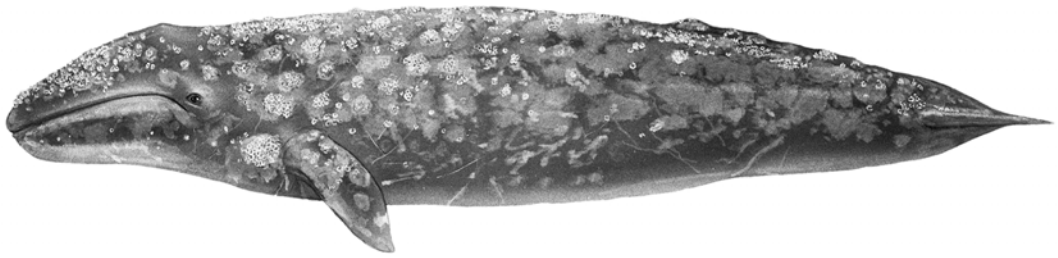
COSEWIC
Assessment and Status Report

on the

Grey Whale
Eschrichtius robustus
Eastern North Pacific Population

in Canada



SPECIAL CONCERN
2004

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION
DES ESPÈCES EN PÉRIL
AU CANADA

COSEWIC status reports are working documents used in assigning the status of wildlife species suspected of being at risk. This report may be cited as follows:

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Previous report:

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Production note: COSEWIC acknowledges Volker Deecke for writing the update status report on the grey whale (Eastern North Pacific population) *Eschrichtius robustus* in Canada. The report was overseen and edited by Andrew Trites, COSEWIC Marine Mammals Species Specialist Subcommittee co-chair.

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COSEWIC
Assessment Summary

Assessment Summary – May 2004

Common name
Grey whale (eastern North Pacific population)

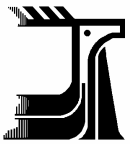
Scientific name
Eschrichtius robustus

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.

Occurrence
Pacific Ocean, Arctic Ocean

Status history
Designated Not at Risk in April 1987. Status re-examined and designated as Special Concern in May 2004. Last assessment based on an update status report.



COSEWIC
Executive Summary

Grey Whale
Eschrichtius robustus
Eastern North Pacific Population

Species information

The grey whale (*Eschrichtius robustus*) is a medium to large (11-15 m) baleen whale of dark grey colour. Grey whales lack a dorsal fin. The baleen plates are short and cream to pale yellow. Two to four throat grooves allow the throat to extend during feeding. The whales have mottled skin and are often covered with patches of barnacles and crustaceans.

Distribution

The North Atlantic population of grey whales was extirpated in the 18th century. Today grey whales occur in two populations in the North Pacific. The western North Pacific population migrates between winter breeding grounds off southern China to summer feeding grounds in the Sea of Okhotsk. The eastern North Pacific population winters along the west coast of Baja California, Mexico. Most eastern Pacific grey whales spend the summer feeding in arctic waters of the Bering, Chukchi, and Beaufort seas, but a small portion, called the summer-resident community, feeds in temperate waters from northern California to southeastern Alaska. In Canada, feeding grounds are in the southern Beaufort Sea, as well as in the coastal waters of British Columbia.

Habitat

Grey whales are usually found in shallow (< 60 m) water close to shore. The breeding lagoons are shallow, sheltered bays with relatively warm water and high salinity. On arctic feeding grounds, grey whales feed almost exclusively over mud or sand bottom and avoid areas of heavy ice. On temperate feeding grounds, they also feed over rocky bottom and in kelp beds. Summer-resident grey whales are most frequently sighted along the outer coast, but occasionally enter protected bays and inside waterways.

Biology

Grey whales reach sexual maturity at approximately 8 years and may live up to 70 years. Females give birth to a single calf in late winter in Mexico. The calf joins the mother on her northward migration and is weaned in late summer on the feeding grounds. Since the gestation period lasts 13-14 months, female grey whales usually only give birth in alternate years. Mortality of calves and yearlings is relatively high, but decreases as the animals approach sexual maturity.

On arctic feeding grounds, grey whales feed predominantly on amphipod crustaceans by scooping up sediment and straining it through their baleen. During the northward migration and on temperate feeding grounds, grey whales appear to have a more varied diet that includes herring eggs and larvae, mysid shrimps, ghost shrimps and crab larvae in addition to amphipods. Grey whales are infested with ecto- and endoparasites and are occasionally attacked by killer whales during the migration and on the feeding grounds.

Population sizes and trends

Commercial whaling reduced the size of the eastern North Pacific population to approximately 4,000 individuals in the last century. Protected internationally in 1937, the population increased steadily at an annual rate of about 2.5% to an estimated size of 26,000 in 1998. This may be close to the historic abundance. The population subsequently declined and was estimated to number around 18,000 in 2002. The best estimate for the number of summer-resident grey whales off the British Columbia coast is in the low hundreds. The western North Pacific population, which spends the summer feeding in the Sea of Okhotsk, has yet to recover from commercial exploitation. This population was estimated to number 100 individuals in 2002 and is considered endangered.

Limiting factors and threats

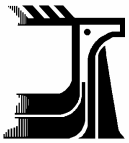
No coordinated program to determine the cause of mortality of stranded whales is currently in place in western Canada, and information on the cause of mortality of grey whales off British Columbia is therefore limited. Industrial development of shallow marine areas (e.g. oil exploration and offshore mining) and the associated noise pollution (e.g. seismic exploration) can cause loss and deterioration of habitat. Ice cover on the arctic feeding grounds limits the feeding season and thus affects mortality and calf production. In addition, grey whales are killed by entanglement in fishing gear and in collisions with ships. A subsistence harvest of grey whales from the eastern North Pacific population managed by the International Whaling Commission appears sustainable for the population as a whole.

Special significance of the species

Grey whales may be a keystone species in arctic marine ecosystems and are responsible for recirculating nutrients from the sediments into the water column. Grey whales are of cultural importance and were historically of economic importance for the subsistence of native peoples in the Arctic and along the west coast of North America, including Canadian First Nations. Grey whales are the focus of an expanding whale-watching industry in British Columbia and are of significant economic value to coastal communities.

Existing protection or other status designations

Grey whales are internationally protected from commercial whaling, and the trade in grey whale products is prohibited by CITES. Mexico has limited commercial activity in some of the breeding grounds of the eastern North Pacific population. Grey whales are protected by the Marine Mammal Protection Act in the United States and under the Fisheries Act and the Marine Mammal Regulations in Canadian waters, which make it illegal to hunt or disturb cetaceans except for subsistence use.



COSEWIC HISTORY

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

COSEWIC MANDATE

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

COSEWIC MEMBERSHIP

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

DEFINITIONS (AFTER MAY 2004)

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

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.

** Formerly described as “Not In Any Category”, or “No Designation Required.”

*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

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

Update
COSEWIC Status Report

on the

Grey Whale
Eschrichtius robustus
Eastern North Pacific Population

in Canada

2004

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SPECIES INFORMATION

Name and classification

The grey whale (*Eschrichtius robustus*, Liljeborg 1861) was named for its greyish colour. Suggestions that the animal was named in reference to J.E. Gray and hence should always be spelled 'gray' are not supported: Gray (1865) applied the generic name *Eschrichtius* to fossils found in Britain and Sweden and the link between him and the living animal (Van Deinse and Junge 1937) occurred long after the names 'grey whale' or 'gray whale' were commonly used (see for example Scammon 1874). English synonyms include gray whale (US spelling), scrag whale (antiquated for the extirpated Atlantic population, Mead and Mitchell 1984), hardhead, mussel-digger, devilfish, grayback, ripsack (antiquated whaling terms, Scammon 1874).

In other European languages the animals is also usually named for its colour: *Baleine grise* (French), *Ballena gris* (Spanish), *серый кит* (Russian). Indigenous names for the species include *mauk* (Nuu-chah-nulth; Happynook, pers. comm.), *balgina* (Kwakw'ala – western dialects; sometimes also applied to minke whales; Compton, pers. comm.), *gwa'yam* (Kwakw'ala – eastern dialects; generic name for any large whale; Sanborn, pers. comm.), *cetuqupak* (Yup'ik; Jacobson 1984), and *abvibluaq* (IñupiaQ; Institute of Social and Economic Research 2002)

The grey whale is the only extant species in the family Eschrichtiidae. Genetic analyses suggest that this family is most closely related to the rorquals (Balaenopteridae; Arnason and Best 1991; Milinkovitch *et al.* 1994). No living infraspecific taxa (subspecies) are currently recognized for grey whales.

Description

The grey whale is a medium to large mysticete (baleen) whale. Adult females typically range between 11.7 and 15.2 m in length, while adult males are somewhat smaller at 11.1 to 14.3 m (Evans 1987). The skin colour ranges from dark to light grey with various degrees of mottling and animals often bear barnacles (*Cryptolepas rachianecti*) or barnacle scars, as well as patches of whale lice (*Cyamus scammoni*, *C. ceti*, and *C. kessleri*; Mead and Mitchell 1984). The grey whale is the only large whale in which the upper jaw extends beyond the lower one. The 130-180 baleen plates are 5 to 25 cm long and cream to pale yellow in colour. Grey whales have between two and four throat grooves (pleats that allow the throat region to expand during feeding). They lack a dorsal fin, but have a low hump and a series of seven to 15 knobs (called knuckles) along the dorsal ridge instead (see Figure 1).

Figure 1. Illustration of a grey whale, *Eschrichtius robustus* (drawing by A. Denbigh, courtesy Fisheries and Oceans Canada).

DISTRIBUTION

Global range

Grey whales are restricted to the northern hemisphere. Subfossil skeletal remains (Mead and Mitchell 1984), as well as historical accounts (Mead and Mitchell 1984; Lindquist 2000) document the existence of a now-extirpated population of grey whales in the North Atlantic. In the eastern North Atlantic, grey whales were present in the Baltic and North Seas and the English Channel (Mead and Mitchell 1984), as well as the waters around Iceland (Lindquist 2000). In the western North Atlantic, subfossil remains were found from southeastern Florida north to Long Island (Mead and Mitchell 1984; Reeves and Mitchell 1988). Atlantic grey whales may have visited Canadian waters, including the Scotian Shelf, Gulf of St. Lawrence, and Grand Banks, and even entered Hudson Bay (Reeves and Mitchell 1988). Grey whales appear to have been extirpated from the eastern Atlantic around 1730 (Bryant 1995; Lindquist 2000), and from the western Atlantic in the mid- to late 18th century (Mead and Mitchell 1984).

In the North Pacific, grey whale fossils date to at least 50,000 years before present (Barnes and McLeod 1984). North Pacific grey whales fall into two distinct populations: the eastern or California population winters in a series 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 (Rice *et al.* 1981). Grey whales are also regularly observed 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; Sánchez-Pacheco *et al.* 2001). Between January and May, the animals leave the winter breeding grounds and head north along the west coast of North America, usually travelling within a few kilometres of shore (Braham 1984; Herzing and Mate 1984; Poole 1984a; 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 2) extends from Cape Bathurst (Northwest Territories; Rugh and

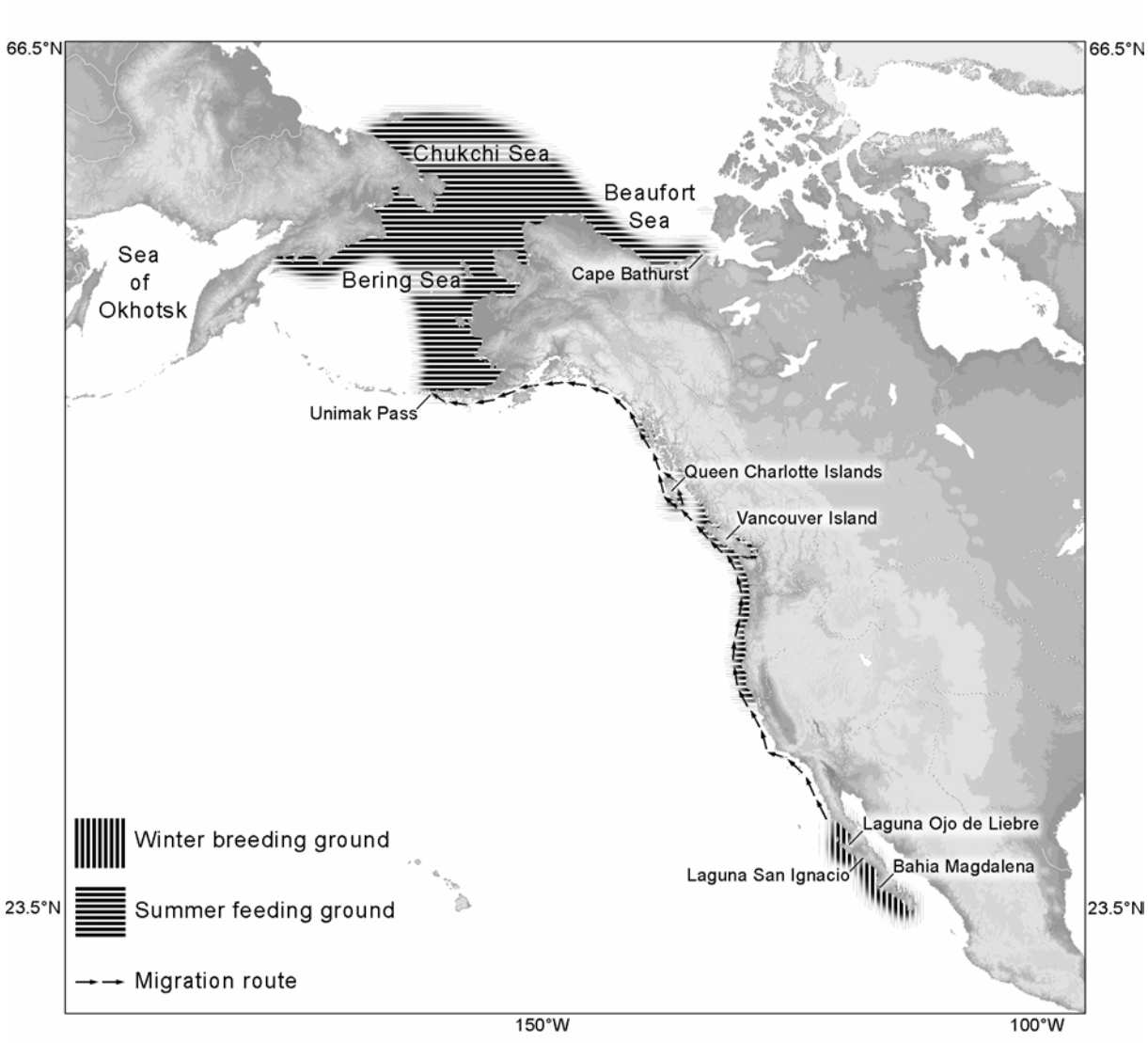

Figure 2. Map of the North Pacific showing the distribution and migration route of the eastern North Pacific population of grey whales.

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). A small part of the eastern North Pacific population of grey whales, termed the summer-resident community, spends the summer feeding in temperate near-shore waters (Figure 3) from northern California to southeastern Alaska (Pike 1962; Patten and Samaras 1977; Flaherty 1983; Darling 1984; Mallonée 1991; Avery and Hawkinson 1992; Calambokidis *et al.* 1994).

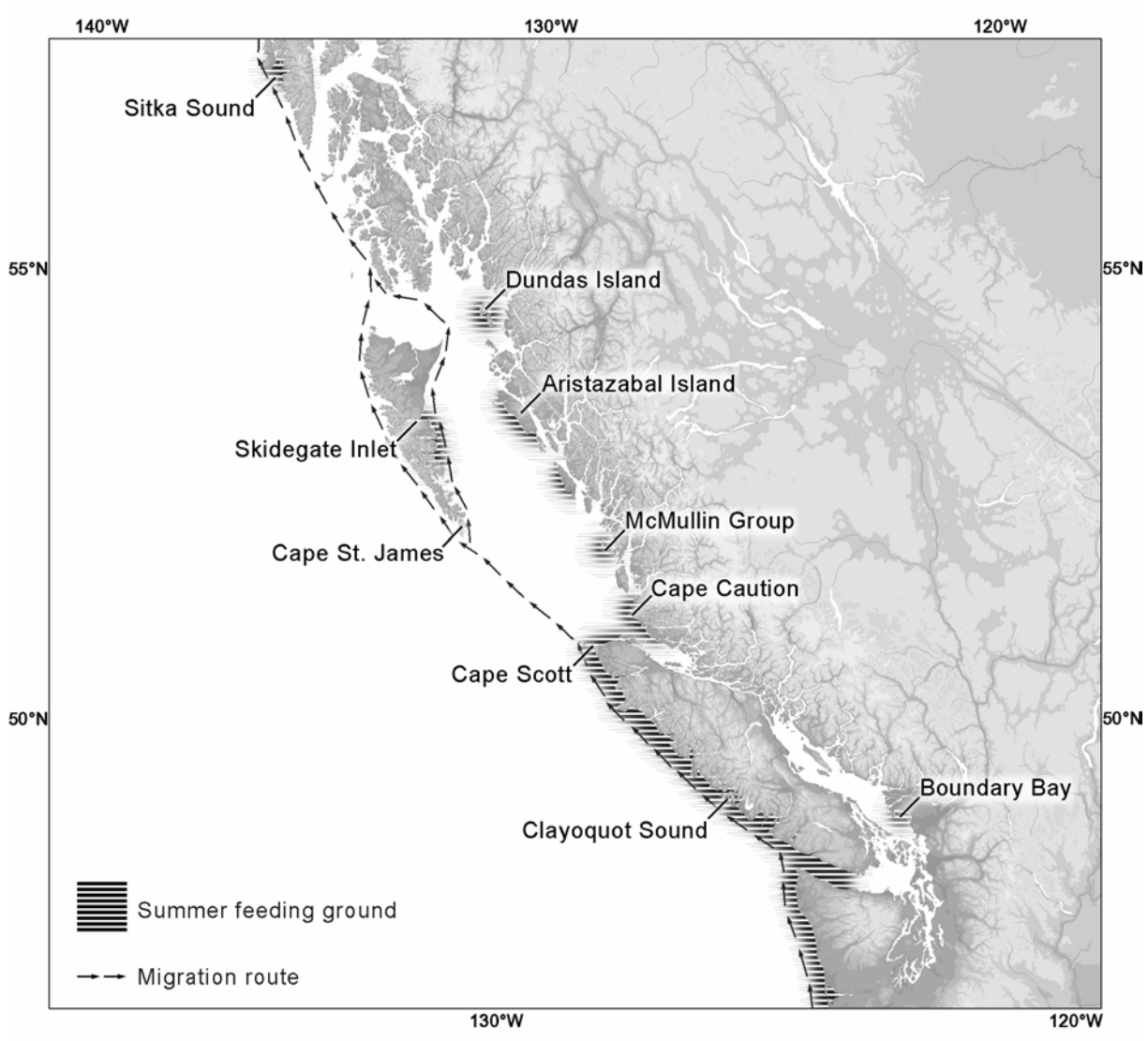

Figure 3. Map of the eastern North Pacific showing the migration route and known feeding sites of grey whales off British Columbia, Canada.

Much less is known about the western Pacific, or Korean, population of grey whales. This population was greatly reduced by whaling and its current size is estimated at 100 individuals (Weller *et al.* 2002a). A feeding ground has recently been discovered off the coast of Sakhalin Island (Weller *et al.* 1999; Weller *et al.* 2002a). 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 North Pacific populations (LeDuc *et al.* 2002).

Canadian range

Only grey whales belonging to the eastern North Pacific population occur in Canadian waters. Virtually the entire population (approximately 18,000 animals in 2002) passes through the coastal waters of British Columbia in spring and fall on their migration between summer feeding grounds and winter breeding grounds (Fig. 3). Northbound migrants generally arrive in British Columbia waters west of Carmanah Point on Vancouver Island (Darling 1984; Gisborne, pers. comm.), then follow the island's west coast north to Cape Scott (Darling 1984). The migration route north of Vancouver Island is poorly understood, but the majority of animals probably cross Queen Charlotte Sound north to Cape St. James and follow along the east and west coasts of the Queen Charlotte Islands (Pike 1962). The animals cross Dixon Entrance and leave Canadian waters. Many animals have been observed feeding inshore during the northbound migration (Pike 1962; Sund 1975; Darling 1984). The southbound migration follows much the same route, although the animals tend to travel further offshore and little feeding is observed (Pike 1962; Darling 1984).

Pike (1962) first noted that some grey whales did not complete the full migration to arctic feeding grounds, but spent the summer feeding in temperate waters off the British Columbia coast. Such summer-resident grey whales have since been reported from many other areas off the west coast of North America (Patten and Samaras 1977; Flaherty 1983; Mallonée 1991; Avery and Hawkinson 1992; Calambokidis *et al.* 1994). Summer-resident grey whales have a high degree of site fidelity and tend to return to the same feeding sites year after year (Darling 1984; Calambokidis *et al.* 1994; Calambokidis *et al.* 2002). 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 often seen 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 poorly understood. In the Queen Charlotte Islands, 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 (Darling, per. comm.), as well as Dundas and Aristazabal Islands (Ellis, pers. comm.; Ford, pers. comm.), and known British Columbia summer-residents have been photographed in the McMullin Group, as well as Sitka Sound, southeastern Alaska (Deecke 1996; 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; Ford, pers. comm.), as well as occasionally in Haro and Georgia Straits (Calambokidis and Baird 1994; Malcolm 1999).

While the primary arctic feeding ground of the eastern North Pacific population lies mainly within the waters of Russia and the USA, it also includes the waters off the Northwest Territories and possibly western Nunavut. Grey whales have been observed feeding off Cape Bathurst (Rugh and Fraker 1981), and are listed as a species in Tuktut

Nogait National Park (Alvo, pers. comm). The role of the Canadian Beaufort Sea as a summer feeding ground for grey whales is currently poorly understood. Further research appears warranted, especially since the importance of this area as a feeding ground may increase in the future if the carrying capacity of the western Beaufort, Chukchi and Bering Seas for grey whales is reached.

HABITAT

Habitat requirements

As a migratory mammal, grey whales require different habitats for foraging and for reproduction. The winter habitat of grey whale 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 bottom 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 Chávez-Rosales 2000). Total area of the four breeding lagoons is 2241 km^2 (Laguna Ojo de Liebre and Guerrero Negro 366 km^2; Bahia Magdalena 1700 km^2; and Laguna San Ignacio 175 km^2).

On arctic feeding grounds, grey whales are almost exclusively benthic feeders and are restricted to 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 and tend to avoid areas of heavy ice (Clarke *et al.* 1989). Grey whales are also observed to 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 *et al.* 1984; Weitkamp *et al.* 1992; Darling *et al.* 1998; Dunham and Duffus 2001; 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 mysid shrimps or crab larvae (Wellington and Anderson 1978; Nerini 1984; Deecke 1996; Darling *et al.* 1998; Dunham and Duffus 2001; 2002). 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.

Trends

As a primarily coastal species, grey whales are threatened to some degree by increased human use of coastal marine ecosystems (Reeves and Mitchell 1988). Habitat deterioration is a concern for grey whales (see section 'Limiting Factors and Threats'), and oil exploration is currently the main threat to grey whale habitat along the west coast of North America.

Protection/ownership

Since grey whales are restricted to shallow near-shore waters, virtually all grey whale habitat along the west coast of North America lies within the exclusive economic zones (200 nm limits) of Mexico, the USA, and Canada.

In Mexico, three of the four major breeding lagoons for grey whales are protected. Laguna Guerrero Negro and Laguna Ojo de Liebre 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.

Grey whale habitat is protected in the US as part of the Marine Protected Areas Program. Parts of the migratory corridor, as well as parts of the arctic and temperate feeding grounds lie within Marine Sanctuaries (Channel Islands, Monterey Bay, Gulf of the Farallones, Olympic Coast), marine components of US National Parks (Channel Islands, Redwood, Olympic, Bering Land Bridge) and a number of National Wildlife Refuges. All these prohibit or restrict some types of activities within their boundaries (US Dept. of Commerce 2000).

Jurisdiction over Canada's exclusive economic zone lies with the federal government. There are currently few marine protected areas in Canadian waters. Pacific Rim National Park recently extended protection to adjacent waters out to the 20 m depth contour, thus gaining the ability to limit some commercial activity in a portion of the migratory corridor and feeding habitat for summer-resident grey whales. A similar marine component is planned for South Moresby/Gwaii Haanas National Park Reserve. Both national parks and to a lesser extent Tuktut Nogait National Park along with several provincial parks protect lands adjacent to grey whale habitat and thus restrict development of the shoreline. In 1998, Race Rocks became Canada's first pilot marine protected area, and this general area is occasionally used by grey whales (Malcolm 1999).

BIOLOGY

General

The migration of the eastern North Pacific population of grey whales between its subtropical breeding grounds and temperate or arctic feeding grounds is the longest known migratory route of any species of mammal. Grey whales are generalist feeders and are the only species of baleen whale known to regularly feed on benthic prey. For large baleen whales, grey whales have a relatively high reproductive capacity.

Reproduction

Calving is largely confined to the subtropical breeding lagoons (Rice *et al.* 1981), although occasionally females give birth off the California coast (Sund 1975). Sexual activity has been observed year-round (Wilson and Behrens 1982; Clarke *et al.* 1989), but most calves are conceived in late November and early December during the southbound migration (Rice and Wolman 1971). The animals arrive at the breeding lagoons between December and January, and the median date of birth lies in late January (Rice and Wolman 1971). The gestation period is 13-14 months and females give birth to a single calf (Rice and Wolman 1971; Rice 1983). Only a single incident of twin foetuses has been reported (Blokhin 1987). Photographically identified females are usually seen with a calf every other year (Jones 1990), although the interbirth interval is probably larger in years of poor food abundance. During the 6-month lactation period, calves grow from 4.6 m at birth to 7.0 m. At one year of age, they typically measure 8.0 m (Sumich 1986). Grey whales continue to grow until they are approximately 40 years old (Rice and Wolman 1971). Male and female grey whales attain sexual maturity at an average age of eight years (Rice and Wolman 1971) and Heppell *et al.* (2000) estimate the average generation time to be 22 years. Data from subsistence whaling (Blokhin 1984) suggest that sexually mature individuals comprise approximately 60% of the population. An annual shore-based census of the population during its northbound migration at various locations along the migratory route determined that calves represented between 4.6 and 5.2% of the population (Herzing and Mate 1984; Poole 1984a, b). However, more recently, percentages as low as 1.1% have been reported (Le Boeuf *et al.* 2000; Perryman *et al.* 2002).

Survival

The age of dead grey whales can be determined from growth rings in the ear plugs thought to be deposited annually (Rice and Wolman 1971). Since growth rings may fuse in mature animals, age estimates from ear plugs could underestimate the true age of individuals (Rice and Wolman 1971; Reeves and Mitchell 1988). Rice and Wolman (1971) report a male with 70 growth rings in his ear plugs. No estimates of maximum life expectancy are currently available from studies of photographically identified individuals. However, one summer-resident grey whale first seen as an adult in 1974 was still alive 25 years later (Darling 1984; Deecke 2003).

Mortality of grey whales is highest during the first year of life. Swartz and Jones (1983) estimated calf mortality on the breeding grounds at 5.4%. Sumich and Harvey (1986) suggest that 75% of first-year mortality occurs within a few weeks of birth. Until recently, calves represented by far the largest proportion (91.4%) of dead grey whales on the breeding grounds, followed by yearlings (0-19.5%) and adults (0-5%; Jones and Swartz 1984). Analyses of population estimates suggest overall adult mortality rates of between 0.1 and 5.0% (Punt and Butterworth 2002; Wade 2002). High re-sighting rates of individual summer-resident grey whales between years similarly suggest relatively low levels of adult mortality (Darling 1984; Deecke 1996; Calambokidis *et al.* 2002). Recently, however, higher levels of adult mortality have been reported (see section 'Population Sizes and Trends').

Physiology

Since grey whales feed almost exclusively in the summer, female grey whales depend primarily on stored fats for reproduction (Perryman *et al.* 2002). A pregnant female has to nourish her foetus on the southward migration, give birth, and nurse her calf on the northward migration without any major intake of food. During this time, her offspring nearly doubles in length (Sumich 1986). Since females with calves are the last to depart from the breeding lagoons, her subsequent feeding season will be severely shortened (3.5 months as opposed to 6.9 months for newly pregnant females and males; Swartz 1986). The energy stores of a female grey whale are therefore probably severely depleted after she weans her calf. This means that interbirth intervals would lengthen under suboptimal feeding conditions, either through suppressed ovulation (Rice and Wolman 1971) or premature termination of pregnancies (Perryman *et al.* 2002).

Movements/dispersal

Calves stay with their mothers during their first northward migration and possibly learn the location of feeding grounds. In studies using photographic identification of individuals, a few calves were resighted on the same feeding ground as their mothers in following years suggesting some degree of maternally directed site fidelity (Weller *et al.* 1999; Calambokidis *et al.* 2002). However, genetic studies so far have failed to find evidence for such maternal transmission (Steeves *et al.* 2001).

Nutrition

Grey whales were believed to be highly specialized for feeding on benthic invertebrates. However, recent research has shown that grey whales feed on a much broader range of species, suggesting that grey whales are opportunistic feeders (Reeves and Mitchell 1988; Darling *et al.* 1998).

On the feeding grounds in the Bering, Chukchi and Beaufort Seas, grey whales predominantly feed on epibenthic and infaunal amphipods of the genera *Ampelisca*, *Atylus*, and *Anonyx* (Bogoslovskaya *et al.* 1981; Nerini 1984). Quantitative studies have

shown that amphipods represent 95% of the diet on arctic feeding grounds (Nerini 1984). Grey whales obtain these amphipods by diving to the bottom, rolling over on their side and sucking sediment into their mouth and straining the associated invertebrates through their baleen plates (Ray and Schevill 1974; Bogoslovskaya *et al.* 1981; Johnson and Nelson 1984; Nerini 1984; Oliver and Kvitek 1984). This benthic feeding can be easily identified by the plumes of mud trailing behind the animals as they surface, and the feeding activity leaves characteristic feeding pits in the sea floor (Johnson and Nelson 1984; Oliver and Kvitek 1984; Nerini 1984; Kvitek and Oliver 1986; Nelson *et al.* 1987; Weitkamp *et al.* 1992). Grey whales on arctic feeding grounds also occasionally forage on sand shrimp (*Crangon* sp.; Gill and Hall 1983).

It appears that the diet of summer-resident grey whales is more varied than that of grey whales feeding in the Arctic. Amphipods (*Ampelisca* spp., *Atylus borealis, Corophium spinicorne*) are also an important prey on the temperate feeding grounds off the west coast of North America (Oliver *et al.* 1984; Avery and Hawkinson 1992; Darling *et al.* 1998; Dunham and Duffus 2001; 2002), and grey whales feed preferentially in areas where large individuals (> 6 mm) are common (Dunham and Duffus 2001; 2002). Summer-resident grey whales have also been observed to feed extensively on ghost shrimps (*Callianassa californiensis*) and associated small clams (*Cryptomya californica*) in shallow muddy bays along the west coast of North America (Weitkamp *et al.* 1992; Darling *et al.* 1998; Dunham and Duffus 2001).

In addition to this benthic prey, summer-resident grey whales feed extensively on planktonic invertebrates. In the exposed waters off the west coast off Vancouver Island and elsewhere, mysid shrimps (primarily *Holmesimysis sculpta*, *Neomysis rayii*, *Acanthomysis* spp.) are an important prey (Wellington and Anderson 1978; Murison *et al.* 1984; Deecke 1996; Darling *et al.* 1998; Dunham and Duffus 2002). In addition, the animals commonly feed on planktonic crab larvae (*Pachycheles rudis*, *Petrolisthes* spp., *Cancer magister*; Darling *et al.* 1998; Dunham and Duffus 2001; 2002).

In many areas along the British Columbia coast, the arrival of northbound grey whales coincides with the spawning of herring (*Clupea harengus*) on coastal eelgrass beds. Grey whales have been observed foraging on herring spawn and larvae in Barkley Sound (Gisborne, pers. comm.), Clayoquot Sound (Darling *et al.* 1998), as well as the Queen Charlotte Islands (Nichol and Heise 1992; Ford *et al.* 1994). Feeding on herring spawn may represent an important ‘refuelling stop’ for grey whales migrating to arctic feeding grounds.

Very little feeding is thought to occur on the winter breeding grounds, but where feeding has been observed, amphipods (*Ampelisca* spp., *Aoroides columbiae*) and crab larvae again were the dominant food source (Oliver *et al.* 1983; Nerini 1984; Tershy and Breese 1991; Sánchez-Pacheco *et al.* 2001). In addition, unidentified bait fish have also been documented as grey whale prey on the breeding ground (Nerini 1984).

Interspecific interactions

In addition to exerting substantial predation pressure on many benthic and planktonic invertebrate communities in temperate and arctic waters, grey whales are of ecological importance to a number of species throughout their range. Grey whales are the hosts of many endo- and ectoparasites (e.g., Blokhin 1984; Dailey *et al.* 2000), and since grey whales lack close taxonomic relatives, they are the exclusive hosts for many of these species (e.g., grey whale barnacles, *Cryptolepas rachianecti* and the cyamid crustacean *Cyamus scammoni*).

Grey whales are part of a variety of symbiotic and commensal interactions. For example, Swartz (1981) describes a cleaning symbiosis between topsmelt (*Atherinops affinis*) and grey whales on the Mexican breeding grounds. On the arctic feeding grounds, many species of seabirds (e.g. northern fulmar, *Fulmarus glacialis*; red phalarope, *Phalaropus fulicaria*; black-legged kittiwake, *Rissa tridactyla*; and thick-billed murre, *Uria lomvia*) feed on invertebrates from grey whale mud plumes. Grey whales represent the only means of accessing benthic prey for these species of seabirds (Obst and Hunt 1990; Grebmeier and Harrison 1992).

Killer whales (*Orcinus orca*) frequently attack grey whales during the migration and on the feeding grounds (Ljungblad and Moore 1983; Lowry *et al.* 1987; Goley and Straley 1994; Craighead and Suydam 1998). They appear to target predominantly calves and may pose an important source of mortality for immature grey whales. Eighteen percent of grey whales landed at California whaling stations bore scars attributed to killer whale attacks (Rice and Wolman 1971).

Behaviour/adaptability

As generalist feeders, grey whales are probably able to adapt to changes in the abundance of certain food sources. However, it appears that the health of the eastern North Pacific population largely depends on the productivity of benthic habitats in the Arctic.

Increased human activity is probably the main factor affecting grey whale habitat along the migratory corridor. This includes increased industrial noise and increased vessel traffic for shipping, resource extraction and recreation. Grey whales have been shown to avoid loud sources of industrial noise (Richardson *et al.* 1995; Moore and Clarke 2002). Behavioural responses to boats range from actively seeking contact with boats to active avoidance (Jones and Swartz 1984; Heckel *et al.* 2001).

Although the importance of acoustic signals for communication and orientation in grey whales is currently poorly understood, it is known that grey whales produce a variety of communicative sounds both on the breeding and feeding grounds (Dahlheim *et al.* 1984; Moore and Ljungblad 1984; Crane and Lashkari 1996). An increase in anthropogenic noise associated with increased human activity in grey whale habitat may negatively affect this acoustic communication.

POPULATION SIZES AND TRENDS

Models of historical catches and available habitat suggest that the size of the eastern North Pacific population of grey whales was probably between 23,000 and 35,000 individuals before the onset of commercial whaling in 1846 (Reilly 1992; Punt and Butterworth 2002; Wade 2002). Grey whales were hunted during the migration from shore-based stations between Baja California and British Columbia from 1854 to 1901 (Sayers 1984). In addition, grey whales were also hunted from ships in the breeding lagoons between 1846 and 1874 at which time the whalers considered the population economically extinct (Henderson 1984). Between 1914 and 1946, pelagic whaling ships killed a reported 940 grey whales (Reeves 1984). There is evidence that Japanese and Soviet catches were underreported and continued past 1937 when grey whales were internationally protected (Baker *et al.* 2002). Rice *et al.* (1984) suggest that the eastern North Pacific population of grey whales reached its low point in the late 19th century at approximately 4,000 individuals.

The western North Pacific population of grey whales has yet to recover from commercial exploitation. This population is estimated to number approximately one hundred individuals (Weller *et al.* 1999; Weller *et al.* 2002a) and is considered to be one of the most endangered populations of baleen whale (Clapham *et al.* 1999).

Modern abundance estimates of the eastern North Pacific population are precise by standards of cetacean population data. Since migrating grey whales travel close to shore, the entire population can be counted at strategic points along the migration corridor (e.g., Reilly *et al.* 1983; Rugh 1984; Buckland and Breiwick 2002) and standard errors for estimates of population size are generally small (4-8%; Buckland *et al.* 1993). Shore-based counts along the California coast during the southbound migration have been conducted approximately every other year since 1967 and have detected an increase from 12,921 individuals in 1967 to 20,869 individuals in 1988 and 26,635 in 1998 (Buckland *et al.* 1993; Gerber *et al.* 1999; Buckland and Breiwick 2002). This indicates an average rate of population growth of approximately 2.5% (Buckland and Breiwick 2002).

In the winter of 1998-1999, a drastic change of mortality and recruitment patterns occurred in the eastern North Pacific population — mortality on the breeding grounds and during the 1999 northbound migration increased three- to fourfold (Le Boeuf *et al.* 2000). At the same time, calf production (usually between 4.6 and 5.2%; see section 'Reproduction') dropped to 1.7% (Perryman *et al.* 2002). Mortality was also high in 2000, but returned to normal in 2001 (Le Boeuf *et al.* 2000; Moore *et al.* 2001; International Whaling Commission 2003b). Calf production remained low in 2000 and 2001 (1.1% and 1.4% respectively; Perryman *et al.* 2002; International Whaling Commission 2003b), but increased to approximately 4.8% in 2002 and approximately 4.4% in 2003 (Perryman, pers. comm.). Based on ice distribution in the Arctic in summer 2003, Perryman (pers. comm.) predicts 2004 calf production to fall within the normal, pre-1999 range.

The estimated size of the eastern North Pacific population was 18,761 in 2001 and 17,414 in 2002 (International Whaling Commission 2003b) indicating an annual decrease of approximately 10% since 1998. It is unclear whether these lower population estimates reflect a true decline or are the result of many animals not migrating all the way south to the breeding lagoons in those years. In either case, close continued monitoring of the population is warranted to reassess population trends. However, no population census was conducted during the 2002/2003 southbound migration and none is scheduled for the 2003/2004 migration (Rugh, pers. comm.)

A preliminary analysis suggests that summer-resident grey whales are not genetically distinct from the eastern Pacific grey whales summering on arctic feeding grounds (Steeves *et al.* 2001). They probably migrate to the same lagoons to mate (Deecke 2003). Summer-residents therefore do not form a distinct population. However, factors that adversely affect summer residents or their habitat could cause local extinction due the high degree of site fidelity of summer-resident individuals and the possibility of site-specific recruitment (Calambokidis *et al.* 2002). For this reason and because of the cultural and economic importance of summer-resident grey whales in British Columbia (see section 'Special Significance of the Species'), this feeding aggregation may need to be managed as a separate unit. Darling (1984) suggests that 35-50 individuals feed along the west coast of Vancouver Island in the summer. Deecke (1996) found that between 12 and 20 individuals feed on a 57 km stretch of coastline near Cape Caution at any time during the summer. In the years 1996 to 1998, Calambokidis *et al.* (2002) identified a total of 155 summer-resident grey whales along the west coast of North America of which at least 80 individuals have been seen in British Columbia waters (Deecke 2003). Mark-recapture estimates using the 1997 and 1998 sightings suggest a size of 179 (95% C.I.: 171-187) individuals for the summer-resident community from northern California to Southeast Alaska (Calambokidis *et al.* 2002).

LIMITING FACTORS AND THREATS

The principal threat to the eastern North Pacific population of grey whales probably 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 continuation of this trend could eventually put the entire population at risk.

No coordinated program to determine the cause of mortality of stranded whales is currently in place in western Canada, and information on causes for the unusually high mortality grey whale strandings in British Columbia during the northbound migrations of 1999 and 2000 is currently limited. Studies in Mexico and the US (Le Boeuf *et al.* 2000; Moore *et al.* 2001) noted that many of the animals stranded there were extremely emaciated implicating nutritional stress as the cause for mortality and low recruitment. Perryman *et al.* (2002) documented that the Bering Sea remained ice free for an unusually short time in the summers of 1998 and 1999, thus substantially shortening the

feeding season in these years. The sudden increase in mortality and decrease in calf production were therefore probably caused by the combined effect of the population approaching the carrying capacity of its feeding ground and two subsequent suboptimal feeding seasons (Moore *et al.* 2001; Perryman *et al.* 2002; Wade 2002). Chronic or acute nutritional stress is also likely to increase the animals' susceptibility to disease (Moore *et al.* 2001).

As the eastern North Pacific population returns to its pre-whaling size, the population is increasingly limited by the amount of available habitat on the feeding grounds. The high mortality and low recruitment from 1998 to 2000 suggest that any changes in the availability of feeding habitat, through climate change or through anthropogenic factors will affect grey whales in the North Pacific.

Oil and gas exploration and 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). Airgun pulses used in the seismic exploration for oil and gas reserves have been shown to elicit strong behavioural avoidance in migrating grey whales at distances of up to 5 km (studies reviewed in Richardson *et al*. 1995; Moore and Clarke 2002), and seismic exploration appears to strongly displace feeding grey whales as well (Weller *et al*. 2002b). Clapham *et al.* (1999) consider oil and gas exploration as the greatest threat to the western North Pacific population of grey whales. Similarly, offshore mining and dredging, through noise pollution and by removing and covering feeding substrate, can lead to loss of feeding habitat (Jewett *et al.* 1999). The opening of the Alaskan North Slope to oil and gas extraction could mean a loss of grey whale feeding habitat. Lifting the moratorium on oil and gas exploration in British Columbia waters will lead to increased noise pollution along the migratory pathway and on the feeding ground of summer-resident grey whale.

In addition to noise pollution, increases in vessel traffic in the breeding lagoons, along the migratory corridor and on the feeding grounds can lead to increased mortality of grey whales from boat strikes. 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).

Entanglement in fishing gear and other marine debris is another source of mortality. Heyning and Lewis (1990) report that grey whales are the most common species of baleen whale involved in entanglement off 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 off British Columbia. 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, and crab and lobster pots (Sumich and Harvey 1986; Heyning and Lewis 1990; Baird *et al.* 2002). Off British Columbia, seine and gillnet fisheries for salmon, as well as longline fisheries for bottom fish, are probably the greatest source of mortality (Baird *et al.* 2002).

Their near-shore distribution and their benthic or epi-benthic feeding mode make grey whales potentially susceptible to environmental toxins. Biotoxins include paralytic shellfish poisoning and domoic acid, although confirmed cases of poisoning from these sources are rare (e.g., Moore *et al*. 2001). Since grey whales regularly ingest bottom sediments when feeding, it has been proposed that they may be severely affected by human pollution. However, aside from somewhat elevated levels of copper in one stranded individual (Méndez *et al.* 2002), no alarming levels of organochlorines or heavy metals have been detected (Varanasi *et al.* 1994; Jarman *et al.* 1996; Krahn *et al.* 2001; Tilbury *et al.* 2002). The fact that grey whales feed at a relatively low trophic level probably prevents them from accumulating the high concentrations of toxins found in some odontocetes (O'Shea and Brownell 1994).

Since the end of commercial whaling in 1937, grey whales are hunted off Chukotka under subsistence quotas issued by the International Whaling Commission, and the Makah tribe in Washington State resumed hunting grey whales in 1999. Annual subsistence catches have ranged between zero (1944, 1992, 1993) and 374 (1967) individuals (International Whaling Commission 2003a). Population models suggest a harvest of up to 463 animals to be sustainable for the eastern North Pacific population (International Whaling Commission 2003b). While the current take levels are low enough to be of little significance to the population as a whole, they could still cause local extinctions due to the high site fidelity of grey whales. For example, the take of up to five grey whales annually allotted to the Makah can be sustained by the migratory population, but could lead to local extinction if the hunt was to target summer-resident grey whales. 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 coastal community-based whaling.

SPECIAL SIGNIFICANCE OF THE SPECIES

Ecological significance

Grey whales have been described as a keystone species of benthic ecosystems in the Arctic. As the major benthic predator in shallow arctic seas, they maintain the structure and diversity of benthic invertebrate assemblages (Nerini 1984; Oliver and Slattery 1985). 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. 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).

Cultural and economic significance

Since grey whales usually travel close to shore, native peoples along the migratory corridor and the feeding grounds have relied on grey whales for subsistence for several millennia (O'Leary 1984). Subsistence use of grey whales continues in the Arctic and off Washington State. Several native groups including the Haida and Tsimshian in British Columbia used stranded whales for food (O'Leary 1984). Sanborn (pers. comm.) states that the Kwakwaka'wakw of northern Vancouver Island and the adjacent mainland coast did not actively hunt grey whales, but used bones from stranded whales to make tools.

In the waters off western Alaska, the Aleuts historically hunted grey whales from small skin boats (O'Leary 1984). The Koniaq inhabiting Kodiak Island and the adjacent coast of Alaska also hunted whales (O'Leary 1984). Along the Bering, Chukchi and Beaufort seas, the Yup'ik, IñupiaQ and Chukchi people occasionally hunted grey whales, but evidence suggests that they preferred bowheads (*Balaena mysticetus*) whenever they could get them (Marquette and Braham 1982; Krupnik 1987).

Along the west coast of North America, whaling was probably most developed among the Nuu-chah-nulth of southwestern Vancouver Island and the Makah of adjacent Washington State (O'Leary 1984). The two closely related groups hunted both humpback and grey whales, with a preference for humpbacks (Happynook, pers. comm.). The remains of humpback whales slightly outnumber those of grey whales at the pre-contact archaeological site of Ozette (Huelsbeck 1988). This is in spite of the fact that grey whales would presumably have been more accessible to the Makah inhabitants of Ozette due to their inshore distribution, and also suggests that humpback whales were preferred. Whaling was of great spiritual and economic importance to the Makah and Nuu-chah-nulth (O'Leary 1984; Huelsbeck 1988; Happynook 2002).

Whale-watching is now a major commercial activity and grey whales have become the mainstay of many whale-watching communities along the west coast of North America. In British Columbia, tour operators offer grey whale viewing along the west coast of Vancouver Island, with the greatest number of vessels operating out of Tofino and Ucluelet (Duffus 1996), and to a lesser degree Bamfield and Port Renfrew. While some trips operate during the northbound migration, most whale-watching activity takes place during the summer months. For this reason summer-resident grey whales are the primary focus of whale-watching trips in this area (Duffus 1996).

EXISTING PROTECTION OR OTHER STATUS

Grey whales have been protected internationally from commercial whaling since 1937. The eastern North Pacific 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 North Pacific 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 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 North Pacific population (see section 'Habitat – Protection/Ownership') and has set up guidelines 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 National Marine Fisheries Service. Hunting marine mammals for native subsistence use is exempt from these regulations.

Whales in Canadian waters are managed by the federal Department of Fisheries and Oceans under the Fisheries Act and the Marine Mammal Regulations (Canadian Department of Justice 1993). These laws make it illegal to hunt or disturb cetaceans except for subsistence use, but do not protect them from bycatch or entanglement. The Department of Fisheries and Oceans has developed a set of whale-watching guidelines, which prescribe that vessels maintain a distance of at least 100 m to any cetacean (e.g. Ford *et al.* 2000).

SUMMARY OF STATUS REPORT

The eastern North Pacific population of grey whales migrates between subtropical breeding grounds off Baja California and summer feeding grounds in the Bering, Chukchi and Beaufort seas. A small portion of the population, termed the summer-resident community, spends the summer feeding in temperate waters between northern California and southeastern Alaska. The eastern North Pacific population was severely depleted by commercial exploitation in the last century. Since 1967 it has increased by approximately 2.5% annually. In 1998 the population had increased to about 26,000 individuals and was assumed to be nearing pre-exploitation levels. Since then, however, eastern Pacific grey whales have declined and are currently estimated to number around 18,000 animals. As the population approaches its historical carrying capacity, it is increasingly limited by available feeding habitat. Acoustic and chemical pollution resulting from renewed oil and gas exploration poses a potential threat to habitat off British Columbia. Feeding grounds off the Northwest Territories, and western Nunavut, are not currently threatened, but very little grey whale habitat is actually protected in Canadian waters. Effects of biotoxins and disease on the population are poorly understood.

TECHNICAL SUMMARY

Eschrichtius robustus
Grey whale baleine grise
Eastern North Pacific Population
Range of Occurrence in Canada: Coastal waters of British Columbia and southern Beaufort Sea

Extent and Area Information	
• *Extent of occurrence (EO)(km²)* (Coastal waters of British Columbia and shallow sections of southern Beaufort Sea between Alaskan border and Cape Bathurst)	250,000 km²
• *Specify trend in EO*	Stable
• *Are there extreme fluctuations in EO?*	No, but EO depends on the extent of ice cover in arctic waters (see Perryman *et al.* 2002)
• *Area of occupancy (AO) (km²)* (Coastal waters of British Columbia)	150,000 km²
• *Specify trend in AO*	Stable
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	Not applicable
• *Specify trend in #*	
• *Are there extreme fluctuations in number of locations?*	
• *Specify trend in area, extent or quality of habitat*	Oil and gas exploration off British Columbia could lead to habitat loss and/or deterioration, some breeding lagoons in Mexico continue to be threatened by development
Population Information	
• *Generation time (average age of parents in the population)*	22 years (Heppell *et al.* 2000)
• *Number of mature individuals*	**Eastern North Pacific population:** 11,000 **BC summer resident community:** 110 (numbers represent 60% of population estimate)
• *Total population trend:*	**Eastern North Pacific population:** increasing before 1998, stable or decreasing since 1998 BC summer resident community: stable or increasing
• *% decline over the last/next 10 years or 3 generations.*	**Eastern North Pacific population**: **pre-1998:** 2.5% annual increase (Buckland and Breiwick 2002) **1998–2002:**10% annual decrease (calculated from population estimates, see page 15) **post-2002:** trend unknown but probably stable or increasing (based on mortality and calf production see page 14)
• *Are there extreme fluctuations in number of mature individuals?*	No
• *Is the total population severely fragmented?*	No
• *Specify trend in number of populations*	

• *Are there extreme fluctuations in number of populations?*	
• *List populations with number of mature individuals in each:*	
Threats (actual or imminent threats to populations or habitats)	
- Habitat loss or degradation (e.g., development of breeding lagoons in Mexico, oil and gas exploration along migratory pathways and on feeding grounds in US and Canadian waters, - Mortality from entanglement in fishing gear and marine debris (see page 16) - Mortality from boat collisions (see page 16)	
Rescue Effect (immigration from an outside source)	
• *Status of outside population(s)?*	Western North Pacific population: endangered (Weller *et al.* 2002a)
• *Is immigration known or possible?*	No (LeDuc *et al.* 2002)
• *Would immigrants be adapted to survive in Canada?*	Not known
• *Is there sufficient habitat for immigrants in Canada?*	Yes
• *Is rescue from outside populations likely?*	No
Quantitative Analysis	None
Other Status **COSEWIC: Not at Risk, April 1987.**	

Status and Reasons for Designation

Status: Special Concern	**Alpha-numeric code:** Not applicable

Reasons 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.

Applicability of Criteria:

Criterion A: does not apply, although Criteria A4 (Threatened) is close to being met. However, the documented decline appears to be a fluctuation. Vital rates and other indicators suggest the population will not continue to decline.

Criterion B: does not apply. The extent of occurrence is > 20,000 km^2.

Criterion C: does not apply.

Criterion D: does not apply. The number of mature individuals is 11,000.

Criterion E: no quantitative analysis has been undertaken.

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BIOGRAPHICAL SUMMARY OF THE REPORT WRITER

Volker Deecke received a Bachelor and Master of Science at the University of British Columbia, and a Ph.D degree from the University of St. Andrews, Scotland. He started an appointment as post-doctoral research fellow at the University of British Columbia's Marine Mammal Research Unit in January 2003. Since 1994 he has been actively involved in collaborative research on the summer-resident grey whales of British Columbia. This ongoing research has involved both data collection in the field, as well as preparation of reports of current and historic abundance of grey whales in the waters off the northwest coast of North America (e.g.: Deecke 1996; Calambokidis *et al.* 2002; Deecke 2003).

In the course of this study, Volker has gained extensive practical knowledge about the distribution and abundance of grey whales in Canadian waters, as well as familiarity with the relevant literature. In addition, the collaborative nature of the study has allowed him to establish a good working relationship with most experts on the ecology, distribution and abundance of grey whales in both Canada and the United States.

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