

**COSEWIC**  
**Assessment and Status Report**

on the

**Sei Whale**  
*Balaenoptera borealis*

Pacific population  
Atlantic population

**in Canada**



**ENDANGERED - PACIFIC POPULATION**  
**DATA DEFICIENT - ATLANTIC POPULATION**  
**2003**

**COSEWIC**  
COMMITTEE ON THE STATUS OF  
ENDANGERED WILDLIFE  
IN CANADA



**COSEPAC**  
COMITÉ SUR LA SITUATION DES  
ESPÈCES EN PÉRIL  
AU CANADA

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## COSEWIC Assessment Summary

### Assessment Summary – May 2003

**Common name**

Sei whale (Pacific population)

**Scientific name**

*Balaenoptera borealis*

**Status**

Endangered

**Reason for designation**

This was one of the most abundant species sought by whalers off the British Columbia coast (with over 4000 individuals killed) and was also commonly taken in other areas of the eastern North Pacific. Sei whales have not been reported in British Columbia since whaling ended and may now be gone. There are few, if any, mature individuals remaining in British Columbia waters, and there is clear evidence of a dramatic decline caused by whaling and no sign of recovery.

**Occurrence**

Pacific Ocean

**Status history**

Designated Endangered in May 2003. Assessment based on a new status report.

### Assessment Summary – May 2003

**Common name**

Sei whale (Atlantic population)

**Scientific name**

*Balaenoptera borealis*

**Status**

Data Deficient

**Reason for designation**

This species is seen off Nova Scotia and Newfoundland. However, data are lacking to determine the degree of depletion caused by whaling, or to assess current population size, or to determine whether the population has recovered in any way since whaling ended. The effects of current threats, especially oil and gas exploration and development, are unknown. There is also uncertainty regarding possible population substructure.

**Occurrence**

Atlantic Ocean

**Status history**

Designated Data Deficient in May 2003. Assessment based on a new status report.



**COSEWIC**  
**Executive Summary**

**Sei Whale**  
*Balaenoptera borealis*

**Species information**

The sei (pronounced “say”) whale (*Balaenoptera borealis*) is the third largest member of the Balaenopteridae family, after the blue (*B. musculus*) and fin (*B. physalus*) whales. The name is an anglicization of “sejhval”, given by Norwegian whalers because its arrival in Scandinavian waters coincided with the “seje”, or pollock (*Pollachius virens*) (Andrews 1916).

The species is grey in colour, with a variable white region on the ventral and lateral sides from the chin to the umbilicus. These areas may appear mottled, with gray or white circular scars caused by various predators or parasites (Andrews 1916, Ivashin and Golubovsky 1978), lampreys (Pike 1951, Rice 1977), or cookie cutter sharks (Schevchenko 1977). The dorsal fin is tall and slender and further forward on the body when compared to blue or fin whales (Andrews 1916). The baleen is finer than that of the other rorquals, making it a reliable feature for species identification (Mead 1977).

In tropical waters, sei whales are difficult to distinguish from Bryde’s whales (*B. brydei*), while in temperate waters they are difficult to distinguish from fin whales. This potential for confusion with fin whales is noteworthy, since it could significantly impact our understanding of the species distribution and population size off Canada’s coasts.

**Distribution**

Sei whales are found in all the oceans of the world and make seasonal migrations from low-latitude wintering areas to high-latitude summer feeding grounds. While the locations of the wintering grounds are relatively unknown (Perry et al. 1999), summer distributions on the feeding grounds exhibit dramatic year-to-year differences (Andrews 1916, Jonsgård and Darling 1977, Waring et al. 2001). The species generally frequents more temperate waters than the other rorquals (Mizroch 1984, Horwood 1987).

There is evidence that at least three stocks of sei whales (western, central and eastern) occur in the Pacific (Masaki 1977). In Atlantic Canada, the Nova Scotia stock is presumed to be separate from the eastern North Atlantic stock (IWC 1977). Evidence for a second stock in Atlantic Canada – the Labrador stock – is equivocal.

There has been only a single confirmed sighting in the eastern North Pacific in recent years (Perry et al. 1999). However, the species is regularly sighted on the Atlantic seaboard. NMFS surveys have found concentrations of sei whales along the southern edge of Georges Bank in the Northeast Channel area (Waring et al. 2001). In Canadian waters, they are regularly seen during surveys of the Nova Scotian shelf. Difficulty distinguishing the species from fin whales may explain the lack of sightings in the eastern North Pacific.

## **Habitat**

Sei whales use primarily pelagic habitats, and are most often found in deeper waters. They appear to be associated with the continental shelf edge in the northwest Atlantic (Hain et al. 1985). The main characteristic of sei whale feeding habitat is likely a high pelagic concentration of zooplankton, especially copepods. Characteristics of preferred breeding grounds are unknown.

## **Biology**

Sei whales reach sexual maturity at between 5 and 15 years of age. The average size for adults is 15 m and 19 tonnes (Horwood 1987). They may live to 60 years of age (Lockyer 1974), and are the fastest of the rorquals, capable of short bursts in excess of 30 knots (Andrews 1916). The gestation period is estimated at 10 – 12 months (Masaki 1976) with conception and calving occurring at lower latitudes. The calving interval is 2-3 years, and calves are weaned on the feeding grounds prior to the fall migration. This suggests a lactation period of about 6 months. Migrations in both hemispheres are segregated based on age, sex and reproductive condition (Gambell 1968, IWC 1977, Gregr et al. 2000). Sei whales exhibit a diversity of feeding strategies. This may allow them to develop a more generalist diet than other balaenopterids, and likely explains the differences in diet composition reported in the different oceans of the world.

## **Population sizes and trends**

The best estimates of population size, still cited today, are 7,260 – 12,620 for the entire North Pacific (Tillman 1977), and 1,393 – 2,248 in the western Atlantic (Mitchell and Chapman 1977). These estimates are based primarily on catch per unit effort data collected during commercial whaling. Because of the lack of contemporary data, there are no recent abundance estimates or population trends available for this species in either the eastern North Pacific or the Northwest Atlantic. During commercial whaling, as many as 1,000 sei whales may have been killed by Newfoundland and Nova Scotia whaling stations, and at least 4,002 were taken off British Columbia.

## **Limiting factors and threats**

Factors that would limit the recovery of this species include inter-specific competition, disease, and human-induced stresses. The species is known to carry both endo- and ectoparasites, and is susceptible to an infection causing the shedding of

baleen plates (Andrews 1916, Rice 1974, 1977). The degree to which these infections are present today is unknown.

The level of competition between sei whales and other whale species is not known, but the most likely competitors would be fin and right whales, given their sympatric distribution and similarities in diet. However, the global depletion of all whale stocks and the sei whale's polyphagous feeding habits make it unlikely that competition with other whale species is currently a limiting factor. Rather, competition with planktivorous fishes may be a limiting factor for all balaenopterids (Payne et al. 1990, Trites et al. 1999).

Threats from human activities include ship strikes and entanglement, as well as acoustic and chemical pollution (Clapham et al. 1999). While very few ship strikes have been reported, they may go undetected because of the pelagic nature of the species. Similarly, while there are no reports of fisheries-related mortality, entanglement or injury on either coast (Perry et al. 1999, Carretta et al. 2001), offshore drift net fisheries pose a potential threat (Barlow et al. 1997).

The effects of acute and chronic acoustic and chemical pollution on this species are not well studied. Responses to vessel noise appear to depend on the behaviour of the animals and the approaching vessel (Perry et al. 1999). Habitat degradation resulting from chronic exposure to acoustic and chemical stresses may pose the greatest threats to this species.

### **Special significance of the species**

Since the sei whale is rarely found near shore, it is not the primary target of whale watching operations. Similarly, this offshore distribution means the species never played a role in the lives of coastal Aboriginal groups, except perhaps intermittently in the eastern North Pacific. However, the species likely has a significant ecological role.

### **Existing protection or other status designations**

The sei whale is listed as "Endangered" by the IUCN on the basis of large and rapid population declines and a reduction in range caused by 20th century exploitation (1960 – 1986). CITES lists the species under Appendix 1, the category that includes species threatened with extinction. Both the Nova Scotian and the eastern North Pacific stocks are listed as endangered under the United States Endangered Species Act. The IWC has classified both the North Pacific and the Nova Scotia stocks as "Protected". This designation prohibits commercial whaling, but not whaling for the collection of scientific data.

In Canada, the existing federal Fisheries Act and Marine Mammal Regulations prohibits disturbance of marine mammals except for purposes of hunting, for which a permit is required. None of the species' range is currently protected in Canadian waters.



## COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species, subspecies, varieties, and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fish, lepidopterans, molluscs, vascular plants, lichens, and mosses.

## COSEWIC MEMBERSHIP

COSEWIC comprises representatives from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership), three nonjurisdictional members and the co-chairs of the species specialist groups. The committee meets to consider status reports on candidate species.

## DEFINITIONS

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

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

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

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

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. Species designated at meetings of the full committee are added to the list.



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# **COSEWIC Status Report**

on the

## **Sei Whale**

*Balaenoptera borealis*

Pacific population  
Atlantic population

**in Canada**

2003

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## SPECIES INFORMATION

### Name and classification

The sei (pronounced “say”) whale (*Balaenoptera borealis*) (Lesson 1828) is the third largest member of the Balaenopteridae family, after the blue (*B. musculus*) and fin (*B. physalus*) whales. The name is derived from “sejhval”, the Norwegian name for the species. The species was so named by Norwegian whalers because its arrival in Scandinavian waters coincided with the “seje”, or pollock (*Pollachius virens*) (Andrews 1916). Other historic English names include coalfish whale, pollock whale, Rudolph’s rorqual, sardine whale and Japan finner. French names include rorqual du nord, rorqual de Rudolph, rorqual boréal, and baleine noire (Gambell 1985), although baleine noire is now used to refer to the Right Whale (Véronique Lesage, personal communication).

Gambell (1985) lists purported “Eskimo” and Aleut names as Komovokhgak and Agalagitakg. However, the cited source (Klinowska 1980) is obscure, and the names are not familiar to Inuit groups in Atlantic Canada, although Komovokhgak may have its origins in the western Arctic (Allan McNeill, personal communication).

As detailed in Horwood (1987), the classification of *B. borealis* is Lesson’s Latin translation of Cuvier’s (1823) “rorqual du Nord”. A southern hemisphere form, *Sibbaldius schlegelii*, was first proposed by Flower in 1865. However, this racial distinction between northern (*B. b. borealis*) and southern (*B. b. schlegelii*) hemisphere populations, based on size difference and little or no mixing (Tomilin 1967, Zemsky 1980 cited in Horwood 1987) has generally been ignored.

### Description

Sei whales are generally dark steel to bluish-grey in colour, with a tendency towards lighter pigmentation down the sides and on the posterior of the ventral surface (Horwood 1987). The ventral grooves almost always exhibit a white or light-coloured area that extends back from the chin sometimes as far as the umbilicus. However, Andrews (1916) warns that the colour variation for this species is enormous. The lateral and ventral sides may appear mottled with grey or white circular scars caused by various parasites and predators including ectoparasitic copepods, *Penella* spp. (Andrews 1916, Ivashin and Golubovsky 1978), lampreys (Pike 1951, Rice 1977), and cookie cutter sharks (Schevchenko 1977). The dorsal fin is tall and slender and further forward on the body when compared to blue or fin whales (Andrews 1916). The baleen is much finer than that of the other balaenopterids, making it a reliable feature for species identification (Mead 1977).

Sei whales are easily confused with Bryde’s whales (*B. brydei*), especially in subtropical waters where the species historically overlapped. The morphological differences between sei and Bryde’s whale are minor. While the sei whale is larger, the only reliable way of distinguishing between the two at sea is to examine the head. The Bryde’s whale has three distinct ridges along the length of the rostrum while the sei

whale has only one (Horwood 1987). However, since Bryde's whales tend to be restricted to warmer latitudes, generally below 40°N (Omura 1959), this is not likely to be a source of confusion in Canadian waters.

Sei whales can also be confused with fin and minke whales, especially by inexperienced observers (Horwood 1987). Distinguishing sei whales from fin whales requires observation of the right jaw or the ventral side of the animal to confirm that it is grey in colour, not yellowish-white, as in fin whales. Kate Wynne (personal communication) reports that there is considerable overlap in body size, colouration, and dorsal fin shape between sei and fin whales in the northeastern Pacific, and confirms that observation of the right jaw or the ventral fluke surface is necessary to confirm species identification.

The possibility of underestimating population sizes for this species due to uncertainties in distinguishing between the two species has been noted in Atlantic Canada (Whitehead et al. 1998 cited in Breeze et al. 2002). This effect is likely more pronounced on the Pacific coast, where observers generally have less familiarity with sei and fin whales.

## **DISTRIBUTION**

### **Global range and stock structure**

Sei whales are considered to be cosmopolitan in distribution (Figure 1), occurring in all the world's oceans. However, they appear somewhat restricted to temperate waters, occurring within a more restricted range of latitudes than all other rorquals except Bryde's whales. Gregr et al. (2000) suggested a northern limit in the northeastern Pacific of 55°N based on comparing the catch records from British Columbian and Alaskan shore stations (Figure 2). While pelagic catches of sei whales appear to have been made at least occasionally at higher latitudes in the North Pacific (Masaki 1977), their appearance in Alaskan waters is irregular (Kate Wynne, personal communication). In the eastern North Atlantic, sei whales were regularly caught between 60 and 65°N (Jonsgård and Darling 1977, Mitchell and Chapman 1977). This may be due to the intrusion of warmer Gulf Stream waters to higher latitudes.

Sei whales have historically been managed as "stocks" by the IWC. However, the stock boundaries are often based more on political or commercial convenience than on the biology of the species (Donovan 1991). The IWC managed sei whales in the North Pacific as a single stock until the species was protected from whaling in 1976. In the North Atlantic, three stocks (Nova Scotia, Iceland-Denmark Strait, and Northeast Atlantic) were defined in 1977, apparently based on the distribution of whaling at the time (Donovan 1991). The subsequent admission that identifying stock structure was extremely difficult effectively ended the discussion of sei whale stock identity by the IWC (Donovan 1991). However, a number of researchers considered the distribution and biology of sei whales in more detail and proposed biologically based stock structures for both the North Pacific and the North Atlantic (Fijino 1964, Rice 1974, Masaki 1977).

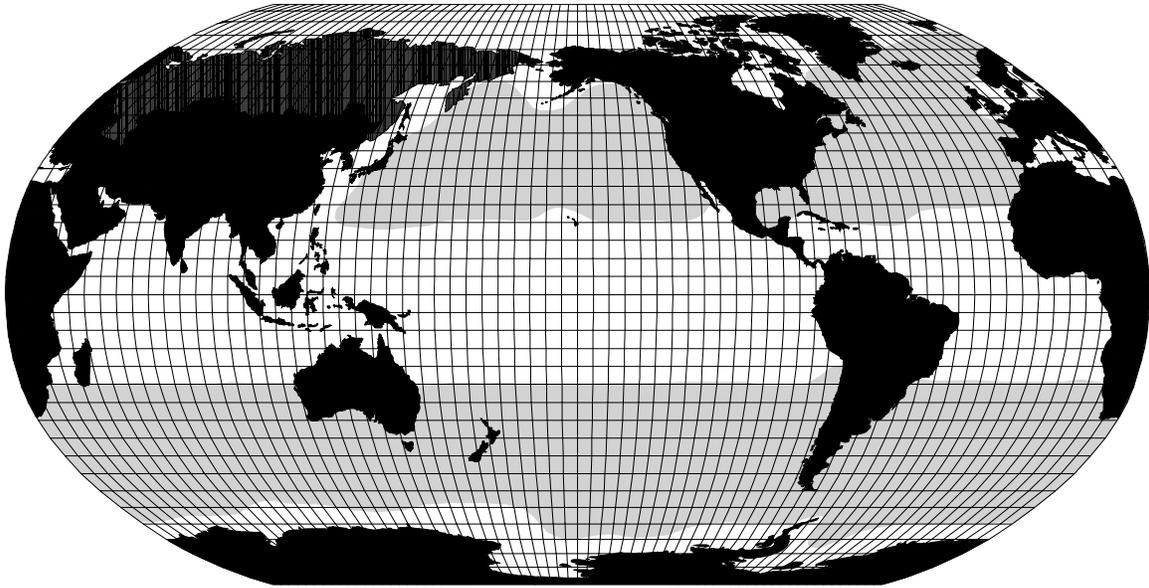


Figure 1. Global distribution of sei whales. From Perry et al. (1999). Reprinted with permission.

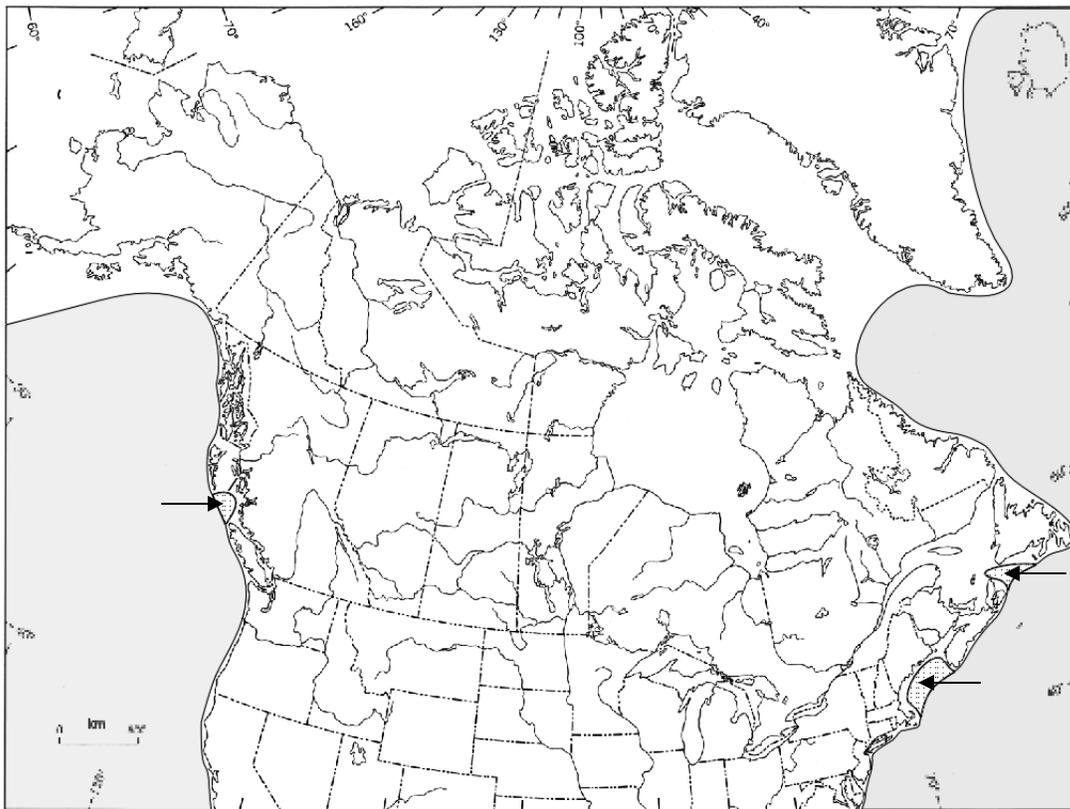


Figure 2. Sei whale distribution in and around Canadian waters. Stippled areas show possible areas of sporadic occurrence.

Masaki (1977) examined marking studies, catch distributions, sightings, and baleen morphology and concluded that the North Pacific contained three stocks, separated by 175°W and 155°W longitude. Examination of blood types (Fujino 1964) indicated differences between animals caught in the inner Gulf of Alaska and off Vancouver Island. Finally Rice (1974) described the different forms and species of parasites observed at opposite sides of the Pacific, implying the existence of at least an eastern and a western stock.

The US National Marine Fisheries Service (NMFS) has divided the North Pacific into an eastern and a western stock, separated by 180°W (Carretta et al. 2001). This arbitrary stock boundary is likely due to the inconclusive nature of the above analyses. It is also in keeping with a management-based analytical approach commonly employed by the IWC (Donovan 1991).

Historically, sei whales ranged throughout the North Atlantic, from the shelf waters of eastern North America, through the Labrador Sea, to the Denmark Strait and the Norwegian Sea (Figure 1). The IWC continues to recognize 3 stocks in the North Atlantic (Perry et al. 1999). Mitchell and Chapman (1977) proposed that the Northwest Atlantic contained two stocks, one off Nova Scotia and one in the Labrador Sea. These stocks were considered different from those in the Northeast Atlantic. The IWC scientific committee (IWC 1976) identified eight concentrations of sei whales throughout the North Atlantic, which were subsequently interpreted by Horwood (1987) as presumptive stock units. The Nova Scotia stock, which is the basis for NMFS stock assessments, is considered to range from the shelf waters of the Northeastern United States to the south of Newfoundland (Waring et al. 2001).

### **Canadian range**

There have been no recent sightings of sei whales off Canada's Pacific coast. However, there is no reason to believe that sei whales from the eastern North Pacific stock do not continue to frequent Canadian and U.S. waters given the lack of survey effort, and the difficulty in distinguishing this species from fin whales. On the Atlantic coast, a major portion of the Nova Scotia stock is centered on the Scotian Shelf (Mitchell and Chapman 1977). However, this stock makes use of both Canadian and U.S. waters (Figure 2).

A recent study of the Scotian Shelf (Breeze *et al.* 2002) reviewed both the historic whaling data (Sutcliffe and Brodie 1977) and contemporary sighting data (Reeves 1999). While these data are biased towards particular areas, seasons and species (Breeze *et al.* 2002), they were sufficient to produce an occurrence map for the shelf (Figure 3).

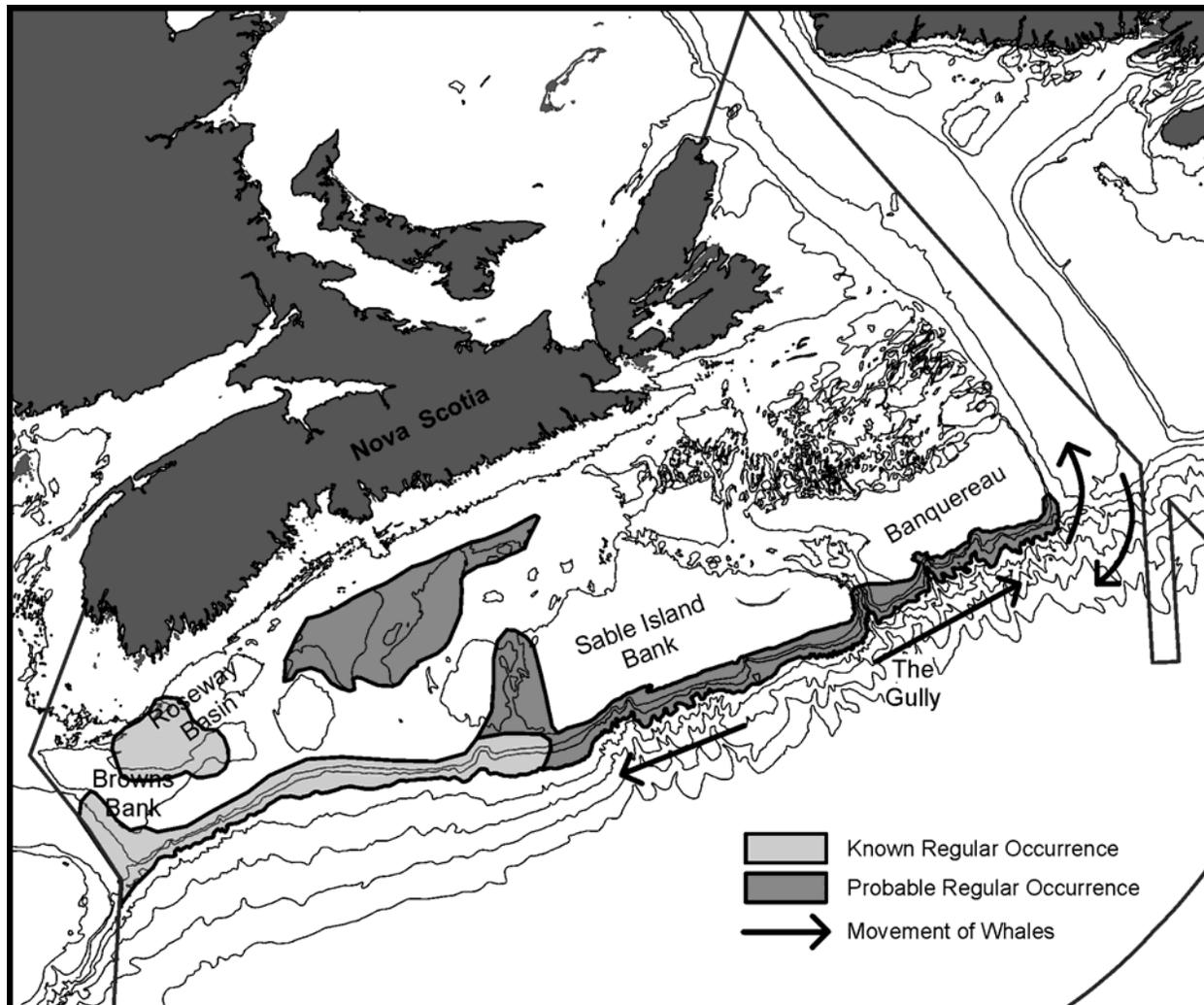


Figure 3. Modeled distribution of sei whales on the Scotian Shelf based on whaling records and sighting data. Reprinted from Breeze et al. (2002), with permission of the author.

Sei whale distributions on the Atlantic coast may have shifted around 1992, moving from Roseway Basin to the mouth of the Bay of Fundy. This corresponded with a similar shift by right whales. Sei whales continued to appear off the Bay of Fundy for about a decade, usually with right whales but sometimes with fin whales. The distribution may now be shifting back to the Roseway Basin area although this is still to be determined (Laurie D. Murison, personal communication).

A small number of sightings have been reported off the west coast of Cape Breton. Six observations were recorded by Parks Canada in 1982 (Corbett 1984), and one by charter operators in each of 2001 and 2002 (Gilbert Dubé, personal communication). While these observations may be misidentified fin whales, the occasional occurrence of the species on the edge of the Gulf of St. Lawrence cannot be ruled out.

The putative Labrador Sea stock proposed by Mitchell and Chapman (1977), does not fall into any IWC stock boundary, and this area has remained relatively unexplored since the cessation of commercial whaling for this species in the late 1970s. Only two confirmed sightings of sei whales have been reported since 1978, both off the southeastern shore of Newfoundland. Aerial (1980) and vessel-based (1992-1994) surveys of the Newfoundland and Labrador coasts reported no sightings of sei whales (Jon Lien, personal communication). However, observer records from the Northwestern Atlantic pelagic fishery, which carried observers from 1987-1993, appear to contain a significant number of new sightings – at least 20 sei whale sightings were reported for 1988 alone. Many of the locations appear to be off the northeast coast of Newfoundland and along the Labrador shelf. Recovery of these data is in progress (Jack Lawson, personal communication). The degree to which this region continues to be used by sei whales, and whether it is occupied by a unique stock, or is used by animals from the Nova Scotia or Iceland-Denmark Strait stock, is unknown.

## **HABITAT**

Sei whales are second only to blue whales in their use of offshore, pelagic habitats. They are usually found in deep waters, and appear to be associated with the continental shelf edge in the northwest Atlantic (Hain et al. 1985). Off British Columbia, less than 0.5% of the catch by coastal stations for which positions were recorded was on the continental shelf (Gregr 2002).

The wintering grounds used by sei whales remain largely unknown (Perry et al. 1999). Rice (1974) hypothesized that the majority of animals from the eastern North Pacific stock spend winters far offshore. The Nova Scotia stock likely winters somewhere off the continental United States.

### **Habitat requirements**

The main characteristic of sei whale feeding habitat is likely a high concentration of prey organisms, particularly copepods. However, Nemoto and Kawamura (1977) suggested that the sei whale's preference for open, pelagic waters may be more important than a preference for any particular prey, as the species was rarely observed in inland seas or gulfs, despite high concentrations of copepods found there.

Studies of the distribution of baleen whales in relation to oceanographic conditions indicate a strong association with oceanographic fronts (Uda 1954, Nasu 1966). Sei whales are reportedly found along major mixing zones and in eddies that had broken away from the fronts. Nasu (1966) also suggested that sei whales followed the fronts throughout the season. These fronts can be relatively permanent as in those surrounding the Alaskan gyre and major upwelling areas. Alternatively, they can be more dynamic, associated with eddies forming near topographic features, or shearing off the major currents (Horwood 1987).

## **Trends**

Historic shifts in habitat may have an effect on how the distribution of the species is viewed today. Nemoto and Kawamura (1977) suggested that sei whales expanded their range to higher latitudes after the depletion of fin and blue whales. If so, the data on which the “pre-exploitation” distribution and population estimates are based would be biased by the previous exploitation of other species.

Describing the change in habitat over time for a migratory, pelagic species is a difficult task. Sei whales are capable of searching large areas for suitable habitat. Thus, while localized, periodic changes in habitat quality may alter the spatial distribution of the species, it is unlikely that this variability reduces the overall habitat available. The effects of long-term oceanographic trends (such as ocean warming) are less clear, and depend on the trophic interactions between sei whales, their prey, and their competitors.

## **Habitat protection/ownership**

The habitat for this species is currently not provided any degree of protection. However, a portion of the range on both the Pacific and Atlantic coasts falls within the Exclusive Economic Zones of both the United States and Canada (see Existing Protection or Other Status, below).

# **BIOLOGY**

## **Reproduction**

Sei whales reach sexual maturity between 5 and 15 years of age. In both the hemispheres the apparent age at sexual maturity declined from 10-11 years to 8 years between the 1930s and the 1960s (IWC 1977). Estimates of pregnancy rates towards the end of the fishery ranged from 30 to 69% of mature females (Mizroch 1980). While it was thought for a time that the Antarctic baleen stocks were responding to depletion with an increased pregnancy rate, Mizroch (1980) demonstrated that this assumed density-dependent response was spurious, and likely the result of inappropriate pooling of data.

The gestation period is estimated at 10.5 months (North Pacific, Masaki 1976) to 12 months (Antarctic, Gambell 1968), with conception and calving occurring in winter. Calves are weaned on the feeding grounds after a lactation period of about 6 months, and the calving interval is 2 – 3 years (Gambell 1985a).

## **Survival**

Estimates for adult natural mortality range from 4.7 to 10.3% (IWC 1977) depending on sex and stock. Six percent was believed to be a reasonable approximation (IWC 1977). A mean juvenile mortality of 10% has also been reported.

Allen (1980) estimated adult mortality at 7.5% and suggested there was little evidence to assume a higher rate for juveniles.

The species is known to have carried both endo- and ectoparasites (Andrews 1916, Rice 1974, 1977). According to Rice (1974), sei whales are more prone to heavy infestations of parasitic helminthes (i.e. flatworms) than other baleen species. While these are not normally pathogenic, a sufficiently large infestation, particularly of the liver or kidneys, could cause mortality.

Rice (1974) also reported that 7% of sei whales landed in California between 1959 and 1970 were infected with a disease that caused the shedding of baleen plates. However, the stomachs of these whales contained fish, and they appeared to be in good condition. The degree to which this and parasitic infections continue to affect the species is unknown.

Predation by killer whales and sharks (Rice 1968, Perry et al. 1999), and aggressive interactions with swordfish (Brown 1960) are cited as potential sources of mortality for sei whales; however, no definitive reports of such attacks were found in the literature. While killer whales are known to feed on baleen whales, the interaction with swordfish and sharks appears to be coincidental. Townsend (1923) provided a number of explanations for the co-occurrence of these species with large whales, and concluded that any reported attacks on whales by sharks or swordfish were actually attacks by killer whales. Thus, interactions with sharks or swordfish are likely inadvertent and the result of co-occurrence in areas of high prey abundance.

The population level impacts of killer whale predation is not known. However, predation is more likely to affect immature or weakened individuals (Perry et al. 1999).

There are no contemporary estimates available for the growth rate of sei whale populations. The default maximum net productivity rate for cetaceans used by the NMFS is 4% (Waring et al. 2001).

### **Species characteristics and physiology**

The average size for adult sei whales is 15 m in length and 19 tonnes (Horwood 1987). The maximum reported size for a female in the northern hemisphere was 18.6 m, while in the southern hemisphere a maximum length of 20 m was recorded (Gambell 1985b). As with all balaenopterids, males are somewhat smaller. Sei whales in the northern hemisphere appear to be smaller than those in the southern hemisphere (Tomilin 1967 cited in Horwood 1987) while western Atlantic animals appear to be heavier for a given length than those in the North Pacific (Lockyer and Waters 1986). Sei whales can live up to 60 years (Lockyer 1974).

Sei whales are exceptionally fast swimmers. Andrews (1916) estimated that a sei whale could reach 30 knots (56 kmh) in its first rush after being struck with a harpoon. A marked sei whale in the southern ocean moved 2,200 nmi in a 10-day period implying

an average speed of 9 knots (17 kmh). However migration speeds are likely to be somewhat slower (Horwood 1987).

The sei whale is not considered a deep diver. On surfacing, it does not arch as much as the other rorquals. Instead, it approaches the surface at a shallow angle, and often exposes its dorsal fin at the same time as it blows. It then tends to sink below the surface rather than dive (Andrews 1916).

The reason for the restriction to temperate waters may be based on temperature. Antarctic catch records indicate that most sei whales were caught in waters between 8 and 18°C, with the Antarctic Convergence acting as a barrier to all but the larger whales (Kawamura 1974). In the northern hemisphere, the summer whaling grounds were in temperate waters containing major frontal systems. The range appeared to extend into more polar waters only with favourable temperatures (Horwood 1987).

## **Migration**

As is typical of baleen whales, sei whales in both hemispheres migrate from low-latitude wintering areas to high-latitude summer feeding grounds. There is evidence from catch records that migrations in all basins were segregated according to length (i.e. age), sex, and reproductive status. Pregnant females appear to lead the migration to the feeding grounds, while the youngest animals arrive last and leave first, and do not go as far poleward (Lockyer 1977, Horwood 1987, Gregr et al. 2000).

Off central California, sei whales were most abundant in late summer and early fall, but were widely and sparsely distributed in winter (Rice 1974). Numbers off British Columbia peaked in July, and the distribution moved progressively further offshore as the summer progressed (Gregr et al. 2000). The timing of these observations is difficult to interpret, but if sei whales peaked in abundance off California and British Columbia at the same time, and were from the same stock, then this suggests a widely dispersed migration, with significant segregation either by sex or age class.

In the Northwest Atlantic, sei whales were reported to migrate along the continental slope (northward) in July-August, and return through the same area in September-November (Mitchell and Chapman 1977). Mitchell (1974) assumed that the northward migration took the animals to the south coast of Newfoundland by August and September. However, Andrews (1916) suggested that their occurrence off Newfoundland was sporadic. The Atlantic catch record reflects this episodic availability (Mitchell 1974).

## **Diet composition**

Sei whales use both “skimming” and “engulfing” (or gulping) feeding strategies (Nemoto 1959). The finer baleen possessed by sei whales is more similar to that found in balaenids such as the right (*Eubaleana* spp.) and bowhead (*Balaena mysticetus*) whales (Mead 1977). Also like the balaenids, the sei whale feeds primarily on calanoid

copepods (*Calanus* spp.), but also takes euphausiids, amphipods, and a variety of schooling fish and squid, particularly in the North Pacific (Nemoto and Kawamura 1977, Flinn et al. 2002).

Stomach content analysis by Nemoto and Kawamura (1977) revealed that the diet composition of sei whales from the North Pacific and the Antarctic differed substantially. In the Antarctic, euphausiids (54%) were the primary prey item, followed by significant proportions of copepods (30%) and amphipods (14%). In the North Pacific, copepods (*Calanus* spp.) dominated the diet (83%), while euphausiids (13%) and fishes and squid (5%) provided minor contributions. This diet composition was confirmed by Kawamura (1982) who examined the contents of 1,072 stomachs from animals caught in the decade following Nemoto's study (1969 to 1979).

Nemoto and Kawamura (1977) suggested that sei whales caught in coastal waters had a more diverse diet. This is corroborated by Flinn et al. (2002), whose analysis of stomach contents from coastal British Columbia stations showed that copepods dominated the diet in 3 of 5 years, while fish and euphausiids each dominated in one of the other years.

This diversity is not apparent in the North Atlantic, where sei whales appear to be much more stenophagous. Of 52 stomachs examined at Norwegian whaling stations between 1952 and 1953, all were either empty or contained only crustaceans (copepods or euphausiids) (Jonsgård and Darling 1977). On the Nova Scotian shelf, Mitchell et al. (1986) reports that none of 134 stomachs examined in 1972, and only 2 of the 68 stomachs examined between 1966 and 1972, contained fish or squid.

Nemoto and Kawamura (1977) attributed the difference in stomach contents between the North Pacific and the Antarctic to the different trophic structures in the two basins: In the Antarctic, the majority of biomass is in the form of plankton. In the North Pacific, on the other hand, there is a greater abundance of plankton consumers, increasing the abundance at higher trophic levels. Thus, the diet preferences observed may be at least partially related to prey availability.

Differences in stomach contents may also be partially explained by seasonal differences in diet. Flinn et al. (2002) found a monthly trend in diet composition, with fish dominating in the early (May) and late (September) part of the season. Rice (1977) reported that sei whales off California fed primarily on anchovies in June through August, and on euphausiids in September and October.

## **Foraging**

Sei whales are unpredictable in their distributions, often appearing on the same feeding ground for a number of years and then disappearing for extended periods. These year to year differences in arrival time and distribution of sei whales on the summer feeding grounds have been documented wherever sei whales were caught. In the Antarctic, whalers spoke of "sei whale years" (Gambell 1985a), while in the eastern

Atlantic, years with high numbers of sei whales were called “invasion years” (Jonsgård and Darling 1977). The British Columbia whaling records also provide evidence for erratic annual abundances in the eastern North Pacific (Gregr et al. 2000).

The close association of sei whales with oceanic fronts suggests that sei whales take advantage of the physical oceanographic processes that enhance production and entrainment of plankton. These observations, combined with an apparent temperature limitation (Kawamura 1974, Horwood 1987), suggest that sei whales may use the warmer, poleward moving currents in each of the ocean basins to penetrate into higher latitude feeding grounds.

A close relationship between sei whale feeding grounds and oceanographic conditions explains the occurrence of “invasion years”. The well-documented dispersal of feeding sei whales after storm events (Horwood 1987) fits well with this assumption, if the weather was severe enough to break down the oceanographic feature being exploited by the whales.

Recently, occasional intrusions have been observed into the shallow inshore waters of the Northwest Atlantic (i.e. Stellwagen Bank, Great South Channel) in times of increased copepod abundance (Payne et al. 1990, Waring et al. 2001, Murison, personal communication). This could be related to shifts in preferred habitat, or degradation of more preferred habitats further offshore.

### **Interspecific interactions**

Sei whales appear to be opportunistic feeders, taking advantage of localized prey concentrations during their annual migrations. This would allow them to minimize competition with other baleen species. For example, in the southern hemisphere, a clear latitudinal segregation of baleen whales and preferred prey species has been observed (Laws 1977). There is also evidence for a staged arrival, with blue and humpback whales arriving first, and fin and sei whales arriving later in the season. In addition, there appears to be separation by depth, with minke, sei and right whales tending to feed at the surface, while fin and blue whales feed at greater depths (Horwood 1987). The extensive, early depletion of right whales (by the end of the 19th century) in both the North Atlantic and the North Pacific may have allowed sei whale populations to increase as a result of reduced competition for copepods.

On the Scotian shelf, sei whales were observed to have a sympatric distribution with right whales between 1966 and 1972 (Mitchell et al. 1986). Given the overlap in diets, this is not unexpected. However, more recently (1982 – 1988), the observed distributions of sei and right whales on the Atlantic coast have been mostly allopatric, except in years of high copepod abundance (Payne et al. 1990). Payne et al. (1990) present a strong argument for competition between right whales and sand lance (*Ammodytes* spp.) for copepods, and suggest that planktivorous fishes may play a significant role in the distribution of baleen whale populations.

## **Adaptability**

The flexible feeding strategy of sei whales is at least partially a function of baleen plates that are intermediate between the fine sieves of right whales and the coarser plates that facilitate gulping. With its ability to apply both skimming and gulping feeding strategies, the sei whale is also better able to adapt to fluctuations in prey populations than the more stenophagic right whale, but perhaps not as well as the more generalist fin whale. If competition is primarily with other planktivores (whales or fishes), then the ability to take advantage of a variety of prey items that become abundant under different oceanographic conditions or in different areas will enhance the survival of the species.

The diet information from the North Pacific and the Antarctic suggests that sei whales can adapt their diet to different prey distributions. However, recent observations, exclusively from the Nova Scotian shelf, suggest a continuing preference for copepods.

## **POPULATION SIZES AND TRENDS**

Historically, sei whales were never as abundant in the North Atlantic as in the North Pacific (Horwood 1987). However, there are no recent abundance estimates or population trends available for sei whales in either ocean. The best population estimates (still cited today) are based primarily on catch per unit effort data from commercial whaling.

Tillman (1977) estimated the entire (1974) North Pacific population at between 7,260 and 12,620 individuals, and estimated a pre-exploitation population of 42,000 animals. However, Nemoto and Kawamura (1977) suggested that the sei whale's range in the North Pacific was extended by the depletion of blue and fin whales. Combined with the earlier depletion of North Pacific right whales, this could have allowed populations of sei whales to increase prior to their becoming a target species. Thus, any pre-exploitation estimates for this species may be inflated.

Estimates for the entire North Atlantic range from 4,000 (Braham 1991 cited in Perry et al. 1999) to 12-13,000 (Cattanach et al. 1993). However, the estimate from Braham (1991) is considered imprecise (Perry et al. 1999), while that provided by Cattanach et al. (1993) combines Mitchell and Chapman's (1977) estimate for western Atlantic waters (2,248) with the results of a 1989 ship-based survey of Icelandic and adjacent waters (10,300 animals, CV=0.268).

Mitchell and Chapman (1977) estimated the size of the Nova Scotia stock using mark-recapture and census data. The mark-recapture analysis estimated the stock at 1,393 – 2,248 animals. The census study estimated the Northwest Atlantic population at 2,078, with minimums of 870 for the Nova Scotia stock, and 965 for the putative Labrador Sea stock.

A CeTAP (Cetacean and Turtle Assessment Program) estimate of 253 animals between Cape Hatteras, North Carolina and Nova Scotia, on the continental shelf and

shelf edge, was derived using data from aerial surveys conducted from 1978 to 1982 (Waring et al. 2001). This estimate, when corrected for dive time and probability of detection on the track line, is approximately the same as Mitchell and Chapman's (1977) mark-recapture estimate (Waring et al. 2001). The CeTAP data were also used to estimate a maximum population of 2,273 animals in U.S. Atlantic waters (Mizroch et al. 1984). However, these estimates are no longer considered reliable, nor are any of the pre-exploitation estimates for the North Atlantic (Perry et al. 1999).

Historically, few sei whales were caught in the Northwest Atlantic prior to the last fishery off Nova Scotia between 1966 and 1972, which took a total of 825 animals. Sei whales were not the preferred species in the Northwest Atlantic (Mitchell and Chapman 1977, Tonnessen and Johnsen 1982). On the Pacific coast, at least 4,002 sei whales were taken by coastal stations in British Columbia between 1908 and 1967, with the majority taken after 1955 (Gregar et al. 2000).

Today, the sei whale is considered rare in California waters, and a recent (2002) survey for large cetaceans off the coast of British Columbia, which included the shelf break, did not result in a single confirmed sei whale sighting (DFO, unpublished data). Extensive aerial and ship-based surveys of the United States Pacific coast conducted by NMFS (cited in Carretta et al. 2001), extending as far as 131°W, have produced only one confirmed sei whale sighting in six years of surveys (1989 – 1993, and 1996). This lack of sightings may well be due to the difficulty in distinguishing the species from fin whales through cursory surface observations.

On the Atlantic coast, sei whales are identified more frequently. Aerial surveys (1999 and 2000) found spring concentrations along the southern edge of Georges Bank (Waring et al. 2001). Also, an influx of sei whales into the waters off Maine and Massachusetts was observed between 1986 and 1989 (Waring et al. 2001). These animals very likely moved through Canadian waters later in the season.

Perry et al. (1999) report a 1991 estimate of 4,000 animals for the entire North Atlantic, but this is believed to be a low-precision estimate. The Iceland/Demark Strait stock has been estimated from ship-based surveys as 1,290 (1987) and 1,590 (1989). These estimates were reported without confidence intervals (Perry et al. 1999).

The limited survey data suggests that the British Columbian population is extremely small, and has shown no signs of recovery since the species was protected from commercial whaling after 1976. The Nova Scotia stock may contain around 2,000 individuals, but there is no information available to assess population trends for either coast.

## **LIMITING FACTORS AND THREATS**

General factors with the potential to affect baleen whale populations are discussed by Clapham et al. (1999) and include fisheries interactions, ship strikes, whaling, pollution, disease and habitat degradation. However, there are no species-specific

factors limiting the recovery of sei whales, and the threats to which they are exposed are indirect.

On the Atlantic coast, where vessel traffic is a serious threat to other whale species, there is a single reported ship strike of a sei whale (Waring et al. 2001). However, due to the pelagic nature of the species, a higher incidence of undetected vessel strikes is possible on both coasts. There are no reports of fisheries-related mortality, entanglement or injury on either coast, (Perry *et al.* 1999, Waring et al. 2001) although the offshore drift net fishery poses a potential threat (Barlow et al. 1997).

Acoustic disturbance and habitat loss are emerging concerns for all cetacean species, but the effects of acoustic pollution on rorquals is poorly understood. Sources of acoustic pollution include shipping, recreational speed boats, sonar, industrial and military activities, and acoustic thermography (Gordon and Moscrop 1996). The effect of vessel noise appears to depend on the behaviour of the animals and the approaching vessel (Perry et al. 1999). Sei whales are reported to exhibit more avoidance behaviour than fin whales when approached (Gunther 1949 cited in Perry et al. 1999).

Acute, intermittent noise from mineral exploration or military exercises is likely to elicit strong avoidance and at sufficiently high levels may result in mortality for some species (Gordon and Moscrop 1996). Chronic noise, such as that originating from oil platforms, has been shown to cause avoidance behaviour and change in habitat use. (Gordon and Moscrop 1996, Schick and Urban 2000). Recent oil exploration activities and the potential exploitation of reserves throughout Atlantic Canada (on the Nova Scotian shelf, the Grand Banks and the southern Labrador Shelf) could therefore result in habitat degradation for the Nova Scotian stock.

Factors that could potentially limit the persistence and recovery of this species are primarily indirect, and are a reflection of the overall state of the oceans. These include bioaccumulation of toxins, and inter-specific competition for prey items. While marine mammals generally appear to be at risk from immunotoxic chemicals (Ross 2002), O'Shea and Brownell (1994) concluded that there is no evidence of toxic effects from metal or organochlorine contamination on baleen species, largely because they feed at low trophic levels.

Perhaps the greatest threat is the potential replacement of large baleen whales in the ecosystem by ecologically equivalent finfish stocks (Payne et al. 1990). An initial attempt to answer a similar question for the Bering Sea suggests that some species of fish are significant competitors of whales (Trites et al. 1999).

The degree to which sei whales continue to suffer from baleen shedding and parasitic infections is unknown. Some information on mortality may be available from the examination of strandings; however, very little mortality data currently exist. The contribution of these infections to the natural mortality of the species may increase if the animals' immune systems are compromised by other factors, such as toxin loading.

The sei whale's use of relatively remote habitats may reduce the impact of some of the threats to which the species may be exposed. However, habitat loss through competition with commercial fisheries, vessel noise and traffic, or seismic exploration cannot be ruled out.

### **SPECIAL SIGNIFICANCE OF THE SPECIES**

The significance of the sei whale to the whaling industry was largely a function of its high quality meat. Andrews (1916) reports it tasting somewhere between pork and veal. Thus, the sei whale did not become a target species until the importance (and availability) of whale meat surpassed that of oil. In the Antarctic and the North Pacific, the sei whale became a target species in the second half of the 20th century (Perry et al. 1999, Gregr et al. 2000). In the eastern North Atlantic, sei whales were hunted since the late 1800s (Jonsgård and Darling 1977).

Since the sei whale is rarely found near shore, it is not the primary target of whale watching operations. Similarly, this offshore distribution means the species never played a role in the lives of coastal Aboriginal groups (Allan McNeill, Eric Grandison, personal communication), except perhaps intermittently in the northeastern Pacific. Nevertheless, as one of the largest animals in the marine environment, sei whales likely have a significant ecological role.

### **EXISTING PROTECTION OR OTHER STATUS**

As with all the large baleen whales, the sei whale is considered at risk worldwide. The severity of historic over-exploitation and the lack of contemporary data suggest a cautious approach to determining the status of this species. The sei whale is listed as "Endangered" by the IUCN on the basis of historic exploitation. CITES lists the species under Appendix 1, the category that includes species threatened with extinction. The IWC has classified both the North Pacific and the Nova Scotia stocks as "Protected". This designation recognizes stocks that are at less than 40% of their maximum sustainable yield levels, and therefore prohibits commercial whaling.

Both the eastern North Pacific and the Nova Scotia stocks have been listed as endangered under the United States Endangered Species Act (ESA) since 1973. The lack of information on population trends and human-caused mortality is the basis on which it remains listed (Waring et al. 2001). The US recovery plan for fin and sei whales is awaiting legal clearance (Waring et al. 2001).

In Canada, the existing Fisheries Act and Marine Mammal Regulations prohibits disturbance of marine mammals except for purposes of hunting, for which a permit is required. This has been broadly interpreted as a prohibition on harassment and has evolved into a series of whale watching guidelines. There has been no hunting of sei

whales in Canada for over 25 years and there is no indication that whaling on sei whales in Canadian waters will resume in the future.

The Oceans Act appears to be the legislation under which Fisheries and Oceans Canada will work to establish Marine Protected Areas (Hooker et al. 1999), while the Species at Risk Act includes provisions to protect habitat and develop recovery strategies for endangered species.

Currently, none of the species' range or territory is protected on either of Canada's coasts. However, the marine portion of Haida Gwaii (Pacific coast) may eventually protect some peripheral habitat, and the designation of the Gully (Atlantic coast) as a marine protected area may also afford the species a small degree of habitat protection. However, the pelagic, long-ranging nature of this species, and the difficulties associated with protecting extensive pelagic areas make protecting sei whale habitat difficult.

As with all large whale species, much of our existing knowledge is based on data collected during the twilight of commercial whaling (1948 – 1984). The difficulties associated with corroborating and extending this knowledge using surface observations is difficult and expensive. Work has necessarily involved less intrusive techniques, which focus more on the species' ecology (habitat use, migration, association patterns) than on the life history characteristics (mortality and reproduction parameters) necessary to refine population models. Line transect surveys are now conducted on a regular basis in the United States by NMFS for all large whale species.

## **SUMMARY OF STATUS REPORT**

Sei whales were the last commercially exploited species in Canadian waters, and the majority of exploitation by factory whaling occurred in the second half of the 20th century (1950s to 1980s). Considerably more information is available from the North Pacific and Antarctic whaling grounds than from the North Atlantic.

Very little is known about current population sizes or trends. Contemporary efforts to establish population sizes for this species using line-transect studies are likely complicated by the species' extensive range, its unpredictable use of high latitude feeding areas, and the difficulty in distinguishing it from the fin whale. The expense associated with extensive offshore surveys is also a significant limiting factor.

The diet of sei whales is one of the more diverse for baleen whales. Along with the fin whale, this species is able to forage on zooplankton as well as schooling fish, and possibly on other aggregations of small prey (i.e. squid). The diet differences observed between sei whales in the three major basins (North Pacific, Antarctic and North Atlantic) could well be the result of dietary adaptations to the trophic distribution of prey species within those basins.

While faced with similar threats as the other baleen species, the sei whale may be more adaptable to changing ecological conditions due to its intermediate morphology. Habitat degradation resulting from acoustic pollution, chemical contamination and ecosystem-level competition for prey is the most likely threat to this species.

We will likely never completely understand the ecosystem effects of removing so much biomass from the oceans through commercial whaling. However, we should not be surprised if the species that do recover exhibit significantly different distributions and habitat use patterns than they did prior to exploitation.

## TECHNICAL SUMMARY

***Balaenoptera borealis***

Sei whale

Rorqual boréal

Pacific Population

Eastern North Pacific

<b>Extent and Area information</b>	<i>Extreme fluctuations in EO and AO suggested because of sporadic, unpredictable occurrence over large areas.</i>
• extent of occurrence (EO)(km <sup>2</sup> )	> 10,000 km <sup>2</sup>
• specify trend (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in EO (> 1 order of magnitude)?	Yes
• area of occupancy (AO) (km <sup>2</sup> )	> 10,000 km <sup>2</sup>
• specify trend (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in AO (> 1 order magnitude)?	Yes
• number of extant locations	
• specify trend in # locations (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in # locations (>1 order of magnitude)?	Yes
• habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat	Habitat quality may be decreasing.
<b>Population information</b>	
• generation time (average age of parents in the population) (indicate years, months, days, etc.)	20 to 40 years
• number of mature individuals (capable of reproduction) in the Pacific population (or, specify a range of plausible values)	Unknown
• total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals	Unknown
• if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)	Unknown
• are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?	No
• is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., < 1 successful migrant / year)?	Unknown
• list each population and the number of mature individuals in each	n/a
• specify trend in number of populations (decline, stable, increasing, unknown)	n/a
• are there extreme fluctuations in number of populations (>1 order of magnitude)?	Yes
<b>Threats (actual or imminent threats to populations or habitats)</b>	
- Interactions with vessel traffic	
- Interactions with mineral exploration and extraction	
- Noise pollution	
- Chemical pollution	
- Competition	
<b>Rescue Effect (immigration from an outside source)</b>	Low
• does species exist elsewhere (in Canada or outside)?	Yes
• status of the outside population(s)?	Unknown
• is immigration known or possible?	Yes, possible
• would immigrants be adapted to survive here?	Likely
• is there sufficient habitat for immigrants here?	Likely
<b>Quantitative Analysis</b>	None available

## TECHNICAL SUMMARY

***Balaenoptera borealis***

Sei whale

Rorqual boréal

Atlantic Population

Northwest Atlantic Ocean

<b>Extent and Area information</b>	<i>Extreme fluctuations in EO and AO suggested because of sporadic, unpredictable occurrence over large areas.</i>
• extent of occurrence (EO)(km <sup>2</sup> )	> 10,000 km <sup>2</sup>
• specify trend (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in EO (> 1 order of magnitude)?	Yes
• area of occupancy (AO) (km <sup>2</sup> )	> 10,000 km <sup>2</sup>
• specify trend (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in AO (> 1 order magnitude)?	Yes
• number of extant locations	
• specify trend in # locations (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in # locations (>1 order of magnitude)?	Yes
• habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat	Habitat quality may be decreasing.
<b>Population information</b>	
• generation time (average age of parents in the population) (indicate years, months, days, etc.)	20 to 40 years
• number of mature individuals (capable of reproduction) in the Atlantic population (or, specify a range of plausible values)	Hundreds to several thousand
• total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals	Unknown
• if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)	Unknown
• are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?	No
• is the total population severely fragmented (most individuals found within small and relatively isolated (geographically or otherwise) populations between which there is little exchange, i.e., < 1 successful migrant / year)?	Unknown
• list each population and the number of mature individuals in each	Nova Scotia Stock Labrador Stock (putative) Populations unknown
• specify trend in number of populations (decline, stable, increasing, unknown)	n/a
• are there extreme fluctuations in number of populations (>1 order of magnitude)?	No
<b>Threats (actual or imminent threats to populations or habitats)</b>	
- Interactions with vessel traffic	
- Interactions with mineral exploration and extraction	
- Noise pollution	
- Chemical pollution	
- Competition	
<b>Rescue Effect (immigration from an outside source)</b>	Low
• does species exist elsewhere (in Canada or outside)?	Yes
• status of the outside population(s)?	Unknown
• is immigration known or possible?	Yes, possible
• would immigrants be adapted to survive here?	Likely
• is there sufficient habitat for immigrants here?	Likely
<b>Quantitative Analysis</b>	None available

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### **BIOGRAPHICAL SUMMARY OF CONTRACTOR**

Edward Gregr is an ecologist specializing in the distribution of and habitat use by marine mammals. His detailed examination of the historic whaling records from British Columbia provided insight into how the large whale species may have once used the waters off Canada's Pacific coast. Edward continues to study the distribution and spatial ecology of marine mammals in the eastern North Pacific through the development of spatially explicit habitat models. He is also searching for appropriate statistical methods to test these models.

### **AUTHORITIES CONSULTED**

All relevant federal (Fisheries and Oceans Canada, Parks Canada, Conservation Data Centres) and provincial (Wildlife and Parks Ministries) agencies were contacted for any available governmental information on this species. In addition, an information request was posted in the Marine Mammal discussion group, which provided anecdotal evidence regarding the contemporary distributions of sei whales in Atlantic Canada. Aboriginal organizations on both coasts were contacted for any available Traditional Ecological Knowledge (TEK).

The relevant contributions are cited as personal communications in the text.

### **COLLECTIONS EXAMINED**

No collections were examined in the preparation of this report.