

COSEWIC
Assessment and Update Status Report

on the

Blue Whale
Balaenoptera musculus

Atlantic population
Pacific population

in Canada



ATLANTIC - Population
PACIFIC - Population
ENDANGERED
2002

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 2002

Common name

Blue Whale (Atlantic population)

Scientific name

Balaenoptera musculus

Status

Endangered

Reason for designation

Whaling reduced the original population. There are fewer than 250 mature individuals and strong indications of a low calving rate and a low rate of recruitment to the studied population. Today, the biggest threats for this species come from ship strikes, disturbance from increasing whale watch activity, entanglement in fishing gear, and pollution. They may also be vulnerable to long-term changes in climate, which could affect the abundance of their prey (zooplankton).

Occurrence

Atlantic Ocean

Status history

Entire Canadian range was designated as Special Concern in April 1983. Split into two populations in May 2002. The Atlantic population was up-listed to Endangered in May 2002. Last assessment based on an update status report.

Assessment Summary – May 2002

Common name

Blue Whale (Pacific population)

Scientific name

Balaenoptera musculus

Status

Endangered

Reason for designation

Blue Whales off the coast of British Columbia are likely part of a population based in the northeastern Pacific. The population was reduced by whaling. The rarity of sightings (visual and acoustic) suggests their numbers are currently very low (significantly less than 250 mature individuals). Threats for blue whales along the coast of British Columbia are unknown, but may include ship strikes, pollution, entanglement in fishing gear, and long-term changes in climate (which could affect the abundance of their zooplankton prey).

Occurrence

Pacific Ocean

Status history

Entire Canadian range was designated as Special Concern in April 1983. Split into two populations in May 2002. The Pacific population was up-listed to Endangered in May 2002. Last assessment based on an update status report.



COSEWIC
Executive Summary

Blue Whale
Balaenoptera musculus

Species information

The blue whale, *Balaenoptera musculus* (Linnaeus 1758) is the largest animal known to have lived on Earth with a maximum reported length of 33.6m (110ft) although the longest scientifically validated was 29.9m (98ft). Three subspecies have been designated: the largest *B.m. intermedia* is found in Antarctic waters; *B.m. musculus* in the Northern Hemisphere; and *B.m. brevicauda*, from the sub-Antarctic zone of the southern Indian Ocean and southwestern Pacific Ocean. Two geographically separated populations exist in Canadian waters, one in the western North Atlantic off eastern Canada and one off western Canada in the North Pacific.

Distribution

The blue whale is found globally and occurs in most oceans although it was historically most abundant in southern oceans. In the eastern North Pacific it is currently most common from California to Central American waters. It occurs in offshore waters off the west coast of Canada and was common there during commercial whaling in the 20th century although current sightings are rare. In the North Atlantic they are best known from Icelandic and eastern Canadian waters. The blue whale is sighted regularly in the Gulf and estuary of the St. Lawrence from April to December, while few have been sighted off Canada's west coast.

Habitat

Blue whales range widely inhabiting both coastal and pelagic waters. Blue whale feeding aggregations are often found at the continental shelf edge where upwelling produces concentrations of krill.

Biology

Blue whales mate and calve from late fall to mid-winter in the Northern Hemisphere and give birth to a single calf every 2-3 years after a 10-11 month gestation. Blue whales are known to feed almost exclusively on euphausiids worldwide. They feed by gulping large quantities of water and prey, which is then strained as it is forced out

through the baleen plates by the muscular action of the ventral pouch and tongue. After breathing 6-20 times at the surface over a 1 to 5 minute period, blue whales generally dive for 5 to 15 min; dives of 20 min are not uncommon and rare dives of as long as 36 min have been recorded in the St. Lawrence. Blue whales make an intense long-duration call that appears to have greater acoustic power than any other animal and which vary among populations geographically in the North Pacific and worldwide.

Population size and trends

Global blue whale population estimates are thought to range from 5000-12000, however, a reliable recent global population estimate does not exist. The blue whale population for the western North Atlantic was estimated to be in the low hundreds. A total of 372 blue whales have been photographically identified (up to 105 in a year) during 21 years of research primarily in the Gulf of St. Lawrence but it has been problematic using these to generate an abundance estimate. Estimates of blue whales around Iceland (likely a separate population) have been estimated to range from the mid-hundreds to more than 1000 and appear to be increasing at approximate 5% per year although the reliability of this rate has been questioned.

The healthiest stock of blue whales appears to be that from the northeast Pacific, where estimates off Mexico and California range from 1500-3000. There are indications that their occurrence off California has been increasing, although whether this represents a population increase or a shift in blue whale distribution is not clear. No estimate exists for the blue whales off western Canada where they were formerly abundant and where their vocalizations are still heard but the rarity of recent sighting reports suggest their numbers are currently very low.

Limiting factors and threats

The biggest factor responsible for the low numbers of blue whales off both eastern and western Canada is the historical take in commercial whaling. Approximately 1,500 blue whales were taken in eastern Canadian waters from 1898 to 1951 out of at least 11,000 taken in the North Atlantic through 1960. Throughout the North Pacific between 1910 and 1965, commercial whalers took at least 9500 blue whales of which some were caught by shore-based whaling stations in British Columbia from the early 1900s to 1965. Human threats since the end of commercial whaling include ship strikes, disturbance from increasing whale watch activity, entanglement in fishing gear, and pollution. They are also vulnerable to long-term changes in climate, which may already be affecting availability of prey off California.

Special significance of the species

The blue whale is the largest animal known to have existed on Earth, and is now extremely rare due to past uncontrolled whaling globally. Some populations could be endangered to the point of extinction before we know much about the natural history of the species.



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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**Update
COSEWIC Status Report**

on the

Blue Whale
Balaenoptera musculus

Atlantic population
Pacific population

in Canada

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2002

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SPECIES INFORMATION

The blue whale, *Balaenoptera musculus* (Linnaeus 1758), the largest animal known to have lived on Earth is found globally and ranges in most oceans. Its large size was of great commercial value and nearly caused its demise, with 325,000-360,000 killed in Antarctic waters alone during the first half of the 20th century (Small 1972; IWC 1996). Despite having been greatly reduced due to whaling, the blue whale remains a cosmopolitan species separated into populations from the North Atlantic, North Pacific, and Southern Hemisphere. Blue whales range from the pack ice in both hemispheres to temperate and tropical waters (Rice 1998). Although their population structure is not well understood, the IWC (International Whaling Commission) has assigned six stocks areas (Donovan 1991).

Three subspecies have been designated (Rice 1977, 1998): what has been considered the largest *B.m. intermedia* is found in Antarctic waters; *B.m. musculus* in the Northern Hemisphere; and *B.m. brevicauda*, from the sub-Antarctic zone of the southern Indian Ocean and south western Pacific Ocean, also colloquially known as the "pygmy" blue whale. While the latter designation is widely accepted, its validity remains in question, and may have been created to serve the purposes of the whaling industry.

The maximum body length recorded worldwide is of 33.6m (110ft) although the longest scientifically validated length was 29.9m (98ft) (Rice 1978). Body weights range from 80-150 tons (73,000 - 136,000 kg), although Tomilin (1957) reports a 190-ton (173,000 kg) female taken off South Georgia in 1947. Southern hemisphere blue whales are generally larger than northern hemisphere animals and females larger than males.

Blue whales have a tapered elongated shape, widest at the level of the eye, a broad, U-shaped head dorsally, accented by a prominent rostral ridge from the splashguard to the tip of the upper jaw, and massive mandibles. The baleen is black, to a maximum length of 1m, and includes 270-395 plates per side of the upper jaw (Yochem and Leatherwood 1985). There are 60-88 throat grooves or ventral pleats running longitudinally parallel from the tip of the lower jaw to the navel. The dorsal fin, anchored far back on the body, is proportionally smaller than in other balaenopteriids, though just as variable in shape.

The mottled pigmentation characteristic of blue whales is a varying blend of light and dark shades of gray. Two basic pigmentation patterns are found in blue whales, one where a darker dominant background is mottled with light patches, while in the other there is a predominantly light background mottled with sparser dark patches (Sears *et al.* 1990). Blue whale pigmentation can vary, however, from very sparse mottling, where the individual appears uniformly pale or dark, to densely mottled individuals, where the pigmentation is a highly contrasted variegation of splotches along the flanks, back and ventral surface, unique to each whale. These markings are stable through the animal's life and have allowed individuals to be identified and tracked through photographs of these natural markings (Sears *et al.* 1987, 1991; Calambokidis *et al.* 1990).

Blue whales appear to be largely stenophagus on euphausiids, which they prey upon by open-mouth gulping when encountering very high concentrations, as found in the Gulf of St. Lawrence and Canadian continental shelf waters.

Taxonomy

Class	Mammalia
Order	Cetacea
Family	Balaenopteridae
Scientific name	Balaenoptera musculus
Common names	Blue whale, baleine bleue, and rorqual bleu
Other names	sulphur-bottom whale, Sibbald's whale, great northern rorqual
Dutch	Blauwe vinvis
German	Blauwal, schanelwal, riesenwal, breitmaulige
Inuit	Tunnullik (Greenland), takerrkak (Alaska)
Icelandic	Steypireyður, hrefna, blahvalur
Japanese	Shironagasu kujira
Norwegian	Blåhval, heipe-reyður, finghval
Russian	blyuvala, sinii kit, goluboy kit, bolshoi polosatik
Spanish	Ballena azul

DISTRIBUTION AND STOCK STRUCTURE

Global range

Blue whales are found in all oceans of the world. As with other baleen whales, they generally are thought to make seasonal migrations from high-latitude feeding areas in the summer and fall to low-latitude areas in winter, although the winter distribution is not well understood for many populations.

North Atlantic

Overall North Atlantic

Historically, the summer distribution of blue whales in the North Atlantic is described as being from eastern Canadian waters to West Greenland (Davis Strait), Denmark Strait (west of Iceland) as far north as Jan Mayen and Spitsbergen (Figure 1) (Ingebrigtsen 1929; Jongsård 1955, 1966; Kapel 1979; Øritsland *et al.* 1989; Sears 1990; Øien 1990; Rice 1998). They were hunted from land stations off Newfoundland and Labrador, the Gulf of St. Lawrence, West Greenland, Iceland, Norway, Ireland, and the Shetland, Hebrides and Faroes Islands (Reeves *et al.* 1998). Most recent sightings have come from the Gulf of St. Lawrence (Sears *et al.* 1990), off the southern and eastern coasts of Newfoundland (Lien *et al.* 1987, 1990) and in the shelf waters off Nova Scotia (Sutcliffe and Brodie 1977; CETAP 1980).

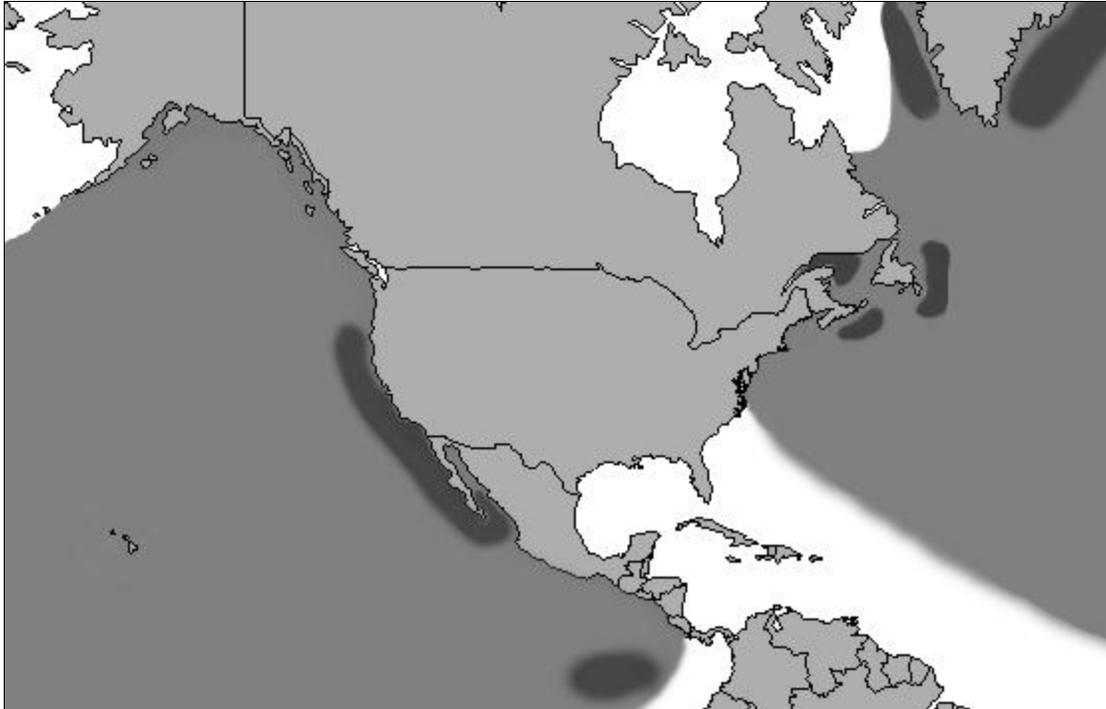


Figure 1. Map of North America showing blue whale occurrence off both the east and west coast of Canada and surrounding waters. Darker shading indicates known areas of concentration.

Little is known about the winter distribution of blue whales in the North Atlantic. Two strandings of blue whales have been reported from the Gulf of Mexico (Baughman 1946; Lowery 1974) and one blue whale was killed at the eastern entrance to the Panama Canal in 1922 (Harmer 1923). In the eastern North Atlantic, strandings have been reported at the Canary and Cape Verde Islands, Cape Blanc, Mauritania and Cape Vert, Senegal (Jongsård 1955, 1966; Sergeant 1966; Kapel 1979; Rice 1998). At least 15 blue whales have been observed off the Azores in recent years by whale-watching operators (Herbert, pers. comm.; Simas *et al.* 1998; Steiner, pers. comm.; Viallele, pers. comm.), and three were observed and photographed off the Canary Islands (Ritter and Brederlau 1998). None of the photo-identification pictures from the Azores or Canaries matched animals from the existing North Atlantic catalog. Acoustic surveys using US Navy bottom-anchored hydrophone arrays have detected blue whale vocalizations in winter out to the mid-Atlantic ridge, south of Bermuda, and west and south of the British Isles (Clark, pers. comm.).

Gambell (1979) suggested that there are two stocks of blue whales in the North Atlantic, the eastern and western. Photo-identification in eastern Canadian waters indicates that blue whales from the St. Lawrence, Newfoundland, Nova Scotia, New England and Greenland all belong to the same stock, while blue whales photographed off Iceland and the Azores appear to be part of a separate population (CETAP 1982; Wenzel *et al.* 1988; Sears and Larsen 2002).

Eastern Canada

Recent blue whale sightings have come predominantly from the Gulf of St. Lawrence (Sears 1983; Sears *et al.* 1990), along the southwest and eastern coasts of Newfoundland during winter and early spring, where ice-related strandings and entrapments have occurred (Mitchell 1974a, 1974b, 1975, 1976, 1977, 1978, 1979, 1980, 1981, and 1982; Sergeant 1966; Lien *et al.* 1987, 1990), and in shelf waters off Nova Scotia (Sutcliffe and Brodie 1977; CETAP 1982).

Blue whale photo-identification research from eastern Canada has focused on the whales found in the Gulf of St. Lawrence in spring through fall, where 382 individual whales have been cataloged since 1979 (Sears 1983; Sears *et al.* 1990). Most sightings have been made along the Quebec North Shore from the Mingan Island/ Anticosti Island region, off the Gaspé Peninsula, and west into the St. Lawrence Estuary to the level of the Saguenay River.

Blue whales enter the Gulf of St. Lawrence through Cabot Strait by the end of March - early April, when the ice breaks up (Lien *et al.* 1987; Sears *et al.* 1990) and are commonly seen in the St. Lawrence from late May to December.

Though blue whales can be found along the North Shore of the Gulf of St. Lawrence by early April, they are first regularly sighted off the eastern tip of the Gaspé Peninsula in late April and peak there in June. By late July they are found up into the St. Lawrence Estuary, where concentrations of 20-40 have been recorded in the Estuary from the level of Forestville to the Saguenay River during August. Photo-identification data shows that blue whales disperse from the Gaspé region to the Estuary and North Shore during June, July and August. Blue whale sightings in the St. Lawrence Estuary peak in August, with some individuals remaining in the Estuary for 2-3 months. Although sightings in the Estuary are still regular during September and October, some blue whales seen there in August travel back to the east along the North Shore to the Sep-Iles and Mingan Island regions, where blue whales are regularly found at that time. Blue whales are also observed, though more rarely, in the northeast Gulf from June to November.

Blue whales have been observed in the St. Lawrence (R. Sears, unpubl. data), as late as December and into January, with occasional sightings in February (J. Giard, pers. comm.). In fact blue whales are not uncommon off the eastern end of the Gaspé Peninsula in December. In January of 1997 8-10 blue whales were seen (R. Sears, unpubl. data) feeding near the surface in St. Margerite Bay near Sept-Iles under grease ice and in the immediate vicinity of pancake ice within four miles of shore. These observations indicate that in years where ice cover is light some blue whales may stay in the St. Lawrence much of the winter.

Aerial surveys carried out over the St. Lawrence by Sears and Williamson (1982) and by Kingsley and Reeves (1998) confirm the distribution of blue whales along the northern shore of the Gulf particularly from the Estuary to Anticosti Island region.

The number of blue whales photo-identified in the St. Lawrence each year can vary from 20 to, as many as 105 individuals. Of the 382 cataloged, a core group of 40% returns to the St. Lawrence regularly each year. The remaining 60% have been seen in less than three field seasons since 1979 and probably range outside the St. Lawrence to the edge of shelf waters, from the Labrador Sea and Davis Strait in the north, east to the Flemish Cap and south to New England.

Photo-identification data from outside the Gulf of St. Lawrence are limited. Twenty-six whales have been photographed in Newfoundland, Scotian Shelf, and Gulf of Maine waters (MICS, Unpubl. data). Nine of 18 whales photographed on the Scotian Shelf (Hooker *et al.* 1999; MICS, Unpubl. data) had also been seen in the St. Lawrence. Three from the southern Bay of Fundy (Tobin, pers. comm.) have not matched photographs of whales identified in the St. Lawrence, although this sample is quite small. Three of four blue whales photo-identified in the Gulf of Maine matched to the St. Lawrence (IWC 1982; Wenzel *et al.* 1988), indicating that they belong to the same eastern Canadian stock.

Blue whales were sighted regularly by whalers on the Scotian Shelf from June to November in the period from 1966 to 1969 (Sutcliffe and Brodie 1977), however, few sightings have been reported since (CETAP 1982; Scott Kraus, pers. comm.; Clapham, pers. comm.). Single blue whale strandings have been reported from Sable Island in 1958 (Sergeant *et al.* 1970) and from the north side of Sable Island in January 1974 (Lucas and Hooker 2000).

Blue whales have been sighted only sporadically off the Labrador coast (Sergeant 1966; Boles 1980). Whalers operating out of Labrador and Newfoundland caught blue whales predominantly along the south and west coasts of Newfoundland, in the northern Gulf of St. Lawrence and Strait of Belle Isle, but rarely east of Newfoundland or Labrador (Sergeant 1966). The regular presence of blue whales off southwestern Newfoundland is confirmed by strandings there in late winter and early spring as described by Sergeant (1982). Blue whales have also been reported on occasion from Saint Pierre & Miquelon (Desbrosse and Etcheberry 1987).

A blue whale seen regularly over 15 years in the St. Lawrence and re-sighted off west Greenland in 1988 and 1989 (Sears and Larsen 2002) supports Ingebrigtsen (1929) and Jonsgård (1955), who proposed that blue whales found in eastern Canadian waters in spring migrated to Davis Strait. Though some past sightings have been reported from Hudson Strait, none have been known to enter Hudson Bay (Yochem and Leatherwood 1985).

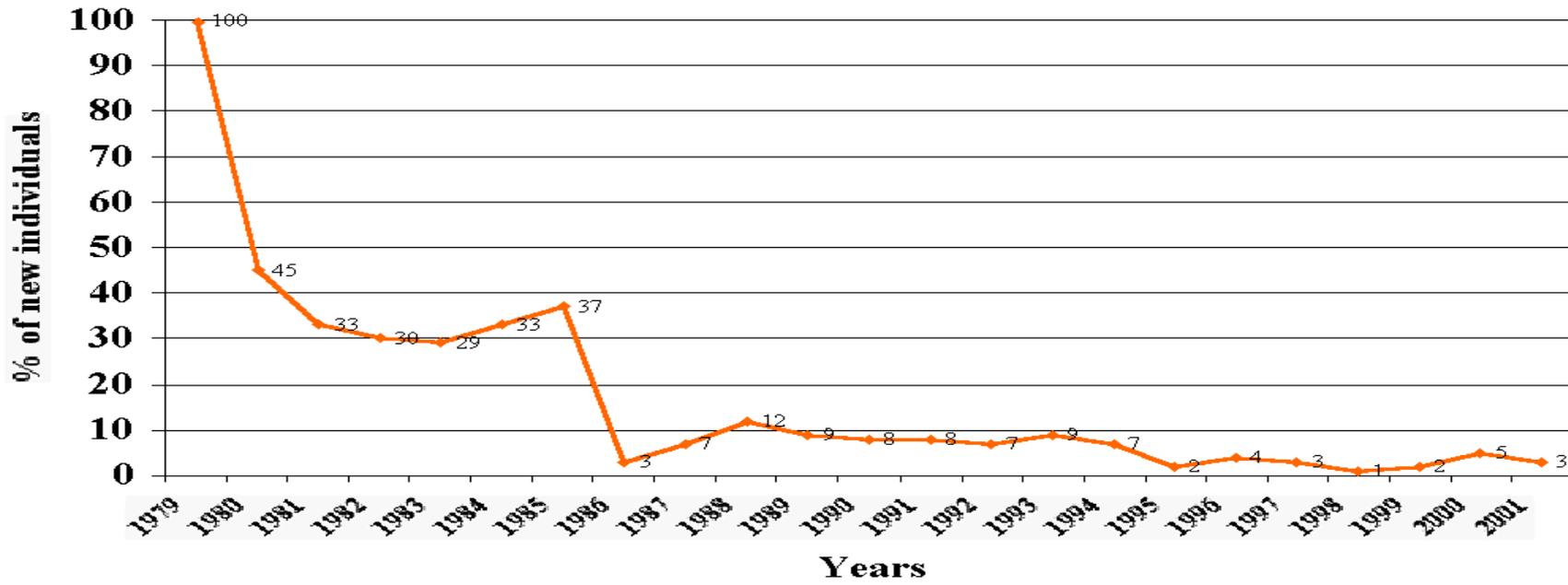


Figure 2. Percent of blue whales identified in the Gulf of St. Lawrence by Mingan Island Cetacean Study that had not been identified in a previous year.

North Pacific

Overall North Pacific

Blue whales are widely distributed throughout the coastal and pelagic waters of the North Pacific from southern Japan to Kamchatka and the western Aleutian Islands in the western North Pacific, Hawaii to the Aleutian Islands in the central North Pacific, and from the Eastern Tropical Pacific to the Gulf of Alaska in the eastern North Pacific (Figure 1). Distribution information has come from areas they were commercially whaled, sightings reports, and recordings of their vocalizations. Commercial whaling for this species occurred in the first half of the 20th century primarily off southern and northern Japan, off Kamchatka and the Kuril Islands, south of the Aleutian Islands and in the Gulf of Alaska, off British Columbia, off California, and off Baja California (Nishiwaki 1966; Brueggeman *et al.* 1985; Ohsumi and Wada 1972; Rice 1966; Pike and MacAskie 1969; Gregr *et al.* 2000).

The post-commercial whaling distribution of blue whales has been more ambiguous. Sightings in the western portion of the North Pacific remain rare. Sightings of blue whales were reported throughout large portions of the northern North Pacific by Japanese whale scouting vessels even after the end of most whaling pressure (Wada 1980). Surveys of former whaling grounds off the Aleutians and in the Gulf of Alaska have not found blue whales in these areas (Rice and Wolman 1982; Brueggeman *et al.* 1987, 1988; Reeves *et al.* 1985; Forney *et al.* 1995). Vocalizations of blue whales have been detected in many portions of the North Pacific, even those areas where sighting reports are rare (McDonald *et al.* 1995; Stafford *et al.* 1999, 2001; Stafford 2000; Watkins *et al.* 2000; Northrop *et al.* 1971; Thompson and Friedl 1982). While these call detections indicate a presence of blue whales in many portions of their former range, it is uncertain in what numbers.

The stock structure of blue whale populations in the North Pacific has not been clearly defined. The International Whaling Commission considers blue whales in the North Pacific as part of a single management unit (Donovan 1991). Gambell (1979) considered there were three main areas of summer blue whale concentrations in the North Pacific with some movement among these areas. Recently, Reeves *et al.* (1998) suggested the possibility of at least five subpopulations with an unknown degree of mixing between them: (1) southern Japan (probably now extinct), (2) northern Japan/Kurils/Kamchatka, (3) Aleutian Islands (wintering of north of Hawaii), (4) eastern Gulf of Alaska and (5) California/Mexico. Analysis of the vocalizations of blue whales has revealed two distinct call types; one prevalent in the western and central North Pacific and the other in the eastern North Pacific (Stafford *et al.* 2001). At a minimum, there appear to be at least two populations of blue whales in the North Pacific based on the call type differences with the potential for the existence of other populations, some of which were possibly extirpated during whaling.

Recent research on blue whales has been focused on a large population of blue whales that migrates at a minimum from the eastern tropical Pacific north to off California. Photographic identification effort has revealed extensive movements from the

Sea of Cortez and the west side of Baja California in late winter and spring to California in summer and fall (Calambokidis *et al.* 1990; Sears 1987). While considerable information has been obtained on the vocalizations, movements, feeding behavior, and population size of this group, several basic aspects of their movements and population structure have not been fully resolved.

Sightings have been reported in the eastern tropical Pacific (ETP) throughout much of the year suggesting either alternate use of these waters by northern and southern hemisphere populations or possibly a resident population (Reilly and Thayer 1990, Wade and Friedrichsen 1979). Blue whales in the ETP in winter have recently been shown to be part of this overall northeast Pacific population based on matches of photo-identified whales (Chandler *et al.* 1999), movements of satellite tagged whales (Mate *et al.* 1999), and similarity in acoustic calls (Stafford *et al.* 1999, 2001). Conversely, photographic identification has not as yet revealed matches between blue whales seen in the ETP in summer and those in the northeast Pacific. Two call types thought to be those of southern blue whales have also been detected in the ETP, although further south than where the eastern North Pacific calls were prevalent and also peaking in the opposite season (the austral summer) (Stafford *et al.* 1999). These findings suggest alternate seasonal use of the ETP by southern and northern hemisphere populations of blue whales.

The relationship between the blue whales seen from the ETP to California and those farther north to Alaska remains unclear. Recent sightings north of California have been rare, although a few recent sightings have been reported off Oregon, British Columbia and Alaska. Eastern North Pacific blue whale calls (identical to those heard in the ETP and off California), however, are regularly detected off Oregon, Washington, British Columbia, and in the Gulf of Alaska (Stafford *et al.* 2001; Stafford 2000; McDonald *et al.* 1995).

There are a number of indications that the blue whales that winter off Central America and Mexico and summer primarily off California are distinct from those that summer off Alaska. Evidence for this included: 1) the apparent presence of this entire population off Mexico and California indicated by the close agreement between line-transect estimates from ship surveys and mark-recapture estimates from individually identified animals (Barlow and Calambokidis 1995) and their presence off California in large numbers in spring, summer, and fall, 2) indications of significant length differences in blue whales caught off Alaska in commercial whaling and those caught or measured photogrammetrically off California (Gilpatrick *et al.* 1995), 3) the presence of warm water epizoots (including remora, barnacles, and copepods) on California blue whales that are not present on other baleen whale species that migrate to more northern colder waters (Rice 1992), and 4) the apparent lack of recovery of blue whales on their former whaling grounds in Alaska (Rice and Wolman 1982; Brueggeman *et al.* 1987; 1988, Reeves *et al.* 1985; Forney *et al.* 1995) in contrast to the large and increasing population off California and Mexico (Barlow 1994).

Western Canada

Although blue whales were hunted off British Columbia through 1967 (Pike and MacAskie 1969; Gregr 2000), they have only rarely been seen in recent years off British Columbia or the adjacent waters of Washington or southeastern Alaska. Additional survey effort is needed in the former areas blue whales were hunted off western Canada to insure that lack of survey effort is not responsible for the paucity of sighting reports. One blue whale was seen off the Queen Charlotte Islands in northern British Columbia on 12 June 1997 and is discussed in more detail below. There have also been a few isolated recent reports of blue whales sighted off southern Vancouver Island in the summer months (Brian Gisborne, pers. comm.) and a recent report of a blue whale off Cape Scott, N Vancouver Island on 1 October 2001 at 50°17.4'N and 132°13'W seen from the *R/V Tully*. Acoustic recordings have been made of blue whales to the north of the Queen Charlottes Islands by Cummings (pers. comm.) and blue whales were regularly detected on six bottom mounted hydrophones deployed off British Columbia and in the Gulf of Alaska (Stafford 2000). Blue whale vocalizations have also been heard from the waters offshore and adjacent to British Columbia including from sea-floor arrays in summer and fall off Oregon and Washington (Stafford 1995; Stafford and Fox 1998; McDonald *et al.* 1995).

Blue whales were reported in waters off British Columbia from Japanese whale scouting surveys conducted throughout the North Pacific from 1965 to 1978 (Wada 1980). Although sighting rates from these surveys are hard to translate into densities or abundances, they do show fairly high sighting rates for the two 5 degree blocks (latitude 45-55N and longitude 130-135W) off British Columbia compared to most other areas of the North Pacific surveyed.

Blue whale movements off British Columbia have been documented in several ways. Discovery tags shot into whales by whalers were used to look at movements based on where the whale was later killed and the tag recovered. Japan, Russia, and the United States (Omura and Ohsumi 1964; Rice 1966; Ivashin and Rovnin 1967; Ohsumi and Masaki 1975) conducted discovery tagging of blue whales in the North Pacific. The largest movement involving an animal off British Columbia was a blue whale marked on 4 May 1963 off Vancouver Island and recovered a year later on 21 June 1964 just south of Kodiak Island (Ivashin and Rovnin 1967). This supported the idea that blue whales taken off British Columbia were on route to and from feeding areas in the Gulf of Alaska.

Movements of a single blue whale off British Columbia have also been documented with photographic identification. This one whale (ID# 1110) was identified off the Queen Charlotte Islands in northern British Columbia on 12 June 1997 (photographed by Randy Burke). It was resighted in the Santa Barbara Channel on 10 July 1997 as part of the several hundred blue whales that are identified off California in Cascadia Research's long-term study. This movement represents a minimum distance of 2,500 km covered in a maximum time of 28 d. The minimum average swimming speed for such a transit is just over 3.7 km/h. This whale was sighted again a few days later on 14 July 1997 just west of the Santa Barbara Channel.

This is the first match found between blue whales identified off California and waters farther north. Although blue whales had been previously thought to move from California waters to feeding areas off Alaska (Rice 1974), there had been little direct evidence of this. The direction and timing of the movement from the Queen Charlotte Islands to California is also surprising. In spring and early summer, most of the blue whales along the coast of Mexico and California appear to be shifting northward. The southbound direction of movement of this animal in early summer is counter to these patterns. The whale was traveling south when it was seen off British Columbia.

These recent observations of blue whale movements and the similarity of call types between British Columbia and other areas of the eastern North Pacific indicate blue whales off western Canada are part of the larger eastern North Pacific population that principally summers off California. Despite a few pieces of information, however, the extent of their occurrence and their movement patterns are largely not known.

HABITAT

As discussed in previous sections blue whales range widely inhabiting both coastal and pelagic waters. Blue whale feeding aggregations are often found at the continental shelf edge where upwelling produces concentrations of krill (Fiedler *et al.* 1998; Schoenherr 1991; Kieckhefer *et al.* 1995).

GENERAL BIOLOGY

Reproduction

Blue whales mate and calve from late fall to mid-winter in the Northern Hemisphere, while peak mating season in the Southern Hemisphere is in July (Yochem and Leatherwood 1985). Sexual maturity in male and female blue whales is reached at 5-15 years of age in both hemispheres, females at a length of 21-23 m in the Northern Hemisphere and 23-24 m in the Southern Hemisphere. Male blue whales reach sexual maturity at 20-21m in the Northern Hemisphere and 22 m in the Southern Hemisphere. Female blue whales give birth to a single 6-7 m calf every 2-3 years after a 10 to 11 month gestation period. Calves are weaned at 7 to 9 months (Yochem and Leatherwood 1985). The blue whale's winter distribution is generally less well known, however, they are sighted regularly in the Sea of Cortez and off Baja's Pacific coast, and over the Costa Rican Dome in winter (Rice 1966; Sears 1987; Reilly and Thayer 1990).

Survival

Blue whales are thought to live for at least 70-80yrs. (Yochem and Leatherwood 1985) and possibly longer. Specific causes of mortality related to humans are discussed under Limiting Factors and Threats.

Feeding

Blue whales are known to feed almost exclusively on euphausiids worldwide (Yochem and Leatherwood 1985). In the North Atlantic *Thysanoessa inermis*, *Thysanoessa raschii*, *T. longicaudata*, and *Meganyctiphanes norvegica* have been recognized as the principal blue whale prey. In the North Pacific *Euphausia pacifica*, *T. spinifera*, *T. inermis*, *T. longipes*, *T. raschii*, and *Nematoscelis megalops* have reported taken by blue whales, as well as *Calanus* genus copepods and pelagic red crab (Fiedler *et al.* 1998; Schoenherr 1991; Kieckhefer *et al.* 1995; Yochem and Leatherwood 1985; Rice 1977). In the southern hemisphere blue whales feed principally on *E. superba* (Yochem and Leatherwood 1985; Perry *et al.* 1999). In the Sea of Cortez they are known to feed on *Nyctiphanes simplex* (Sears 1990; Gendron and Sears 1993).

Blue whales feed along productive cold water upwellings in temperate to polar waters from spring to early winter and though they have been described as fasting after leaving the feeding grounds (Yochem and Leatherwood 1985), they do, as reported from the Sea of Cortez (Sears 1987), feed in lower latitudes, during winter and spring (Sears 1990; Gendron and Sears 1993). Blue whales are estimated to eat from 2-4 tons (1,800 – 3,600 kg) of food per day (Yochem and Leatherwood 1985).

Blue whales feed by gulping large quantities of water and prey into their mouths, which is then forced by the muscular action of the ventral pouch and tongue out through the baleen plates. Once the water has been expelled, the prey trapped by the mat of intertwined fibers on the inner edge of the baleen, is swallowed. When blue whales feed at or just below the surface, they can be seen lunging up through the surface either rolling on their sides or with the lower jaw breaking the surface vertically then rolling dorsal side up to breathe, while emptying their ventral pouch. More commonly the ventral pouch and throat grooves are seen breaking the surface as the whale surfaces just after having taken a mouthful.

Behaviour

While blue whales can reached speeds of 32 to 36 km/hr they most often cruise at 2 to 8 km/hr while feeding and traveling. When chased by predators, such as killer whales, vessels, and interacting with other blue whales they can reach much higher speeds (Yochem and Leatherwood 1985; R. Sears, unpubl. data).

After breathing 6-20 times at the surface over a 1 to 5 minute period, blue whales generally dive for 5 to 15 min, dives of 20 min are not uncommon and rare dives of as long as 36 min have been recorded in the St. Lawrence. Off California and in the Sea of Cortez, 231 dives from seven tagged blue whales lasted up to 14.7 minutes and went to a maximum depth of 204 m (Croll *et al.* 2001) although dives approaching 300 m have been documented more recently off southern California (Calambokidis *et al.*, In prep.). Blue whales, as well as some other diving marine mammals, extend their aerobic dive duration by gliding and taking advantage of negative buoyancy at increasing depths during deep dives (Williams *et al.* 2000) although the maximum dives documented

remain well below their theoretical aerobic dive limit (Croll *et al.* 2001). In the St. Lawrence and the Sea of Cortez 15% of blue whales observed raise their flukes high into the air on terminal dives. If a normally fluking blue whale is harassed, however, during its stay at the surface the fluke will be raised at a much shallower angle or not at all, because the whale dives more quickly to avoid pursuit.

Blue whales make an intense long-duration call that appears to have greater acoustic power than any other animal (Aroyan 2000) with source levels in the eastern North Pacific measured at 186 dB (McDonald *et al.* 2001). These calls, which vary among populations geographically in the North Pacific and worldwide, have been described in some detail (Rivers 1997; Stafford *et al.* 2001; McDonald *et al.* 2001). Although the function of the call has not been determined speculation has included sensing the environment, prey detection, communication, or male display (McDonald *et al.* 2001). Preliminary indications are that the long-duration calls may be produced only by males (McDonald *et al.* 2001).

POPULATION SIZES AND TRENDS

Global blue whale population estimates are thought to range from 5000-12000, however, a reliable recent global population estimate does not exist. The status of the population in the Southern Ocean is of great concern since this is where the largest populations of blue whales (about 300,000) existed prior to whaling. The blue whale has been reduced to remnant populations in the Southern Ocean, where recent estimates of 710-1255 animals have been calculated, based predominantly on sightings from the summer feeding grounds in Antarctic waters (Butterworth *et al.* 1993; IWC 1990, 1996).

The blue whale population for the western North Atlantic was last estimated to be in the low hundreds by Mitchell (1974a). There are probably two stocks, one occupying the waters from New England to eastern Canada including the Scotian Shelf, Grand Banks, St. Lawrence Gulf and Estuary, and Labrador Sea, with some individuals traveling North into Davis Strait off West Greenland and occasionally as far South as Florida. Another stock, with most sightings from western Icelandic waters, ranges north to Jan Mayen and Spitsbergen. If one combines the photo-identification from eastern Canada, with recent estimates from Iceland and Norwegian waters (Sigurjónsson and Gunnlaugsson 1990; Christensen *et al.* 1992), it is possible that there could be 600-1500 blue whales in the North Atlantic. Sigurjónsson and Gunnlaugsson (1990) and Christensen *et al.* (1992) suggest numbers ranging from the mid-hundreds to more than 1000 blue whales for Icelandic waters. An approximate 5% yearly increase for blue whales in Icelandic waters has been suggested by Sigurjónsson and Gunnlaugsson (1990), however, more analysis seems to be warranted before such numbers can be relied upon (Holt 1992).

The wide distribution and dispersal of blue whales combined with sampling effort that cannot adequately match the movements of this species, has thus far yielded inconsistent population estimates for the North Atlantic. Some blue whales are resighted frequently within the Gulf of St. Lawrence and others are either never re-sighted, or

seen again after gaps of up to 17 years. This heterogeneity in capture probability makes estimates using mark and re-capture methods unreliable. Similarly, Brown (1954) suggested that a greater proportion of the blue whales marked in the Southern Ocean appeared to disperse over a wide region, though some individuals returned each year to the same area. In order to determine what constitutes a representative sample, photo-identification of blue whales must increase in areas outside the Gulf of St. Lawrence (Hammond *et al.* 1990). It may become apparent that blue whales, which visit the Gulf, are a variable component of a larger population in the northwest Atlantic or even the North Atlantic as a whole. If this proves to be true, it may never be possible to obtain a representative sample from the Gulf of St. Lawrence alone. It is likely, that in order to arrive at a valid estimate of the number of blue whales in the North Atlantic the long-term goal must be to identify other feeding areas and to sample blue whales photographically throughout.

The healthiest stock of blue whales appears to be that from the northeast Pacific, where estimates range from 1500-3000 (Calambokidis *et al.* 1990; Calambokidis and Steiger 1995; Barlow 1995; Barlow and Calambokidis 1995; Reeves *et al.* 1998). Estimates have been obtained by both mark-recapture using photographic identification of individual animals (Calambokidis and Steiger 1995) and line-transect estimates based on ship surveys (Barlow 1995, Barlow and Gerrodette 1996). These estimates have generally shown good agreement with estimates close to 2000 (Barlow and Calambokidis 1995). Recent line-transect estimates, however, have yielded slightly higher estimates close to 3000 (Calambokidis and Barlow, In prep.). These more recent estimates have included additional survey years, combined estimates for the U.S. west coast with those from off Mexico, and adjustments for missed or unidentified whales. There has not been any attempt to estimate the limited number of blue whales using the waters off western Canada.

There are indications that the eastern North Pacific population of blue whales has been increasing, although these may be confounded by shifts in blue whale distribution or habitat. Abundance estimates have not been conducted over a long-enough period to detect a trend. Sighting rates of blue whales off California coastal waters increased from 1979/80 to 1991 (Barlow 1994). Blue whale sightings off the Farallon Islands in central California also increased dramatically from 1973 to 1994 (Pyle and Gilbert 1996). Sightings of blue whales in other areas along the California coast have also shown increases in the 1980s and 1990s (Calambokidis *et al.* 1989, Calambokidis and Steiger 1995). No trend towards greater population size of blue whales was discerned by Larkman and Veit (1998), however, from their vessel surveys of southern California shelf waters.

LIMITING FACTORS AND THREATS

Whaling and Protection

Approximately 1,500 blue whales were taken in eastern Canadian waters from 1898 to 1951 (Sergeant 1966, Mitchell 1974), including 80-100 taken by a whaling

station in Sept-Iles, Quebec from 1911-1915 (Mitchell 1975). Norwegian and Greenlandic whalers operating in Davis Strait from 1922 to 1958, where catches were relatively low, took only 103 blue whales (Kapel 1979). In Davis Strait most blue whales were taken in the Disko Bay region, predominantly in July and August (Kapel 1979). In the period from the late 19th century until 1960 at least 11,000 blue whales were killed in the North Atlantic, with the peak catch years being from 1868-1920 (Sigurjónsson and Gunnlaugsson 1990). Approximately 6000 were taken in Icelandic waters, 3,500- 3,800 off Norway, with lesser numbers taken off the Faroe Islands, Ireland, Spitsbergen, and Shetland (Christensen *et al.* 1992).

Few blue whales were taken after 1951 in eastern Canadian waters; in fact whaling for this species in the North Atlantic was halted by the IWC in 1955. Iceland, however, did not ratify this moratorium until 1960. The blue whale was protected in all oceans, except for the North Pacific, by 1965 and finally protected globally in 1966 (Reeves *et al.* 1998). There were some exceptions with three illegal kills made at Canadian east-coast whaling stations during 1966-69 (Mitchell 1974a).

Throughout the North Pacific between 1910 and 1965, commercial whalers took at least 9500 blue whales (Ohsumi and Wada 1972). Blue whales were protected by the IWC in 1966. Tonnessen and Johnsen (1982) report that some 2000 blue whales were taken between 1919 and 1929 off the West Coast of North America. In a partially overlapping report, Rice (1992) reports that at least 1378 blue whales were taken by pelagic whalers off Baja California and California from 1913-1937.

Blue whales were hunted from shore-based whaling stations in British Columbia starting in the early 1900s (Pike 1962; Pike and MacAskie 1969; Tonnessen and Johnsen 1982; Webb 1988; Nichol and Heise 1992; Gregr *et al.* 2000). Blue whales were taken from three whaling stations (Sechart-Barkley Sound, Kyuquot, and Coal Harbour) along the West coast of Vancouver Island and two stations on the Queen Charlotte Islands (Rose and Naden Harbours) (Pike and MacAskie 1969). Over 600 were taken between about 1910 and 1965 when hunting was prohibited by the International Whaling Commission. This is a minimum estimate of numbers of blue whales killed because records from 1905 to 1912 are not complete. Nichol and Heise (1992) report that 640 blue whales were taken from 1910 to 1943 from Rose Harbour and Naden Harbour whaling stations based on examination of log books. The highest number of blue whales taken in a year was 62 in 1923. Throughout most of this period they were hunted off British Columbia, blue whales were a relatively small proportion of the catch with whalers taking humpback, fin, sei, and sperm whales in larger numbers than blue whales.

There is clear evidence that whaling depleted the populations of blue whales off British Columbia. Catches declined in later years of whaling and, from 1948 to 1965, mean lengths of blue whales caught declined as did the pregnancy rates (Gregr *et al.* 2000). Monthly patterns in numbers of whales killed led Gregr *et al.* (2000) to conclude that blue whales were migrating past Vancouver Island in summer months.

Entrapment

Known natural mortality in eastern Canadian waters caused by entrapment of blue whales in wind and current driven ice during late winter/early spring along the southwest coast of Newfoundland has been well documented (Sergeant 1982; Sears *et al.* 1990). Furthermore, St. Lawrence blue whales carry scars dorsally, which are most likely caused by ice (Sears *et al.* 1990).

Predation

Very few blue whales in the St. Lawrence carry the rake-like markings, which are thought to be caused by killer whales (*Orcinus orca*), and no attacks of killer whales on blue whales have been reported (Sears *et al.* 1990). In the Sea of Cortez at least 25% of the blue whales sighted (R. Sears, unpubl. data) carry rake-like marks deemed caused by killer whale attacks. Tarpy (1979) describes a group of killer whales attacking and mortality injuring a blue whale off Baja California, which indicates that blue whales can be killed by such predators.

Shipping traffic

Unnatural mortality caused by shipping may be a factor in the St. Lawrence, where vessel traffic is heavy, particularly in the Estuary where it is concentrated in a relatively restricted area, and shipping lanes run through areas regularly used by blue whales. Deep wounds and scars, which can be attributed to collisions with the propeller or hull of large vessels, have been observed on 16% of the blue whales found in the St. Lawrence. Though there is little direct evidence of mortality due to ship strikes, the relatively high numbers of blue whales (58) with scars that can be linked to ship strikes indicate that this is likely a serious problem. A juvenile blue whale was struck and killed off the New England by a tanker and carried into Narragansett Bay in March of 1998 (National Marine Fisheries Service 1998). Off California between 1980 and 1993, ship strikes caused the deaths of at least four and possibly six blue whales (Barlow *et al.* 1997). It is possible that whales struck and killed by fast moving vessels may just sink out of sight to the bottom and go unnoticed. High-speed container ships, common worldwide, including the St. Lawrence, are potentially one of the greatest threats. Large vessels traveling at more than 14 nmi/h (26 km/h) have been found to be the principal source of ship strike mortality in whales (Laist *et al.* 2001). Transport Canada reports 5000 large commercial vessels pass by the Escoumins pilot station in the St. Lawrence Estuary at an average speed of 12-15 kn. from April 2000 to January 2001 and another 500 enter the Gulf, but do not travel beyond Baie Comeau.

A significant example of how a population can be adversely affected by ship strikes is the case of North Atlantic right whales (*Eubalaena glacialis*). Along the eastern seaboard, where ship collisions have killed more right whales than any other documented causes of mortality, at least 17 have been killed in this manner (Kraus 1990; Kenney and Kraus 1993; Knowlton and Kraus, In press).

Whale watching

The recent substantial increase of whale watching in the St Lawrence Estuary from Les Escoumins to the Saguenay River at the eastern edge of the blue whale's range within the St. Lawrence, could be cause for concern. The number of boats (as many as 50), carrying more than 350,000 tourists per year, at a rate of over 9000 boat outings per May-October season, leads to situations where 7-13 boats have been observed simultaneously in very close proximity (within 20m) to blue whales. In the North Pacific, whale-watching focusing on blue whales have begun or expanded in several areas off California and in the Sea of Cortez, Mexico. Whale watch trips targeting blue whales have begun in the last 10 years in Monterey Bay and in the Santa Barbara Channel and now consist of more than a half-dozen boats in each area.

Whale-watching boats travel at speeds ranging from 10-35 kn, with most at the high end of the range. Though there is no clear evidence of impact on blue whales, the dedicated presence of boats at close quarters, often traveling at high speed through areas of high blue whale concentrations, could be a cause of stress to the whales, and warrants careful monitoring. A cautionary approach would seem wise when considering the congestion of whale watching and large commercial vessels regularly passing through this region.

Fishing

Fishing gear such as gill nets, which has caused the drowning death of at least three blue whales in the St. Lawrence since 1979, warrants monitoring even if overall direct impacts do not appear to be nearly as severe or regular as shipping for this species.

Pollution

For a marine species such as blue whales the impacts on habitat are not so much about loss but degradation, particularly in areas where they come into close contact with human populations. The effects of long-term degradation can be caused by accumulation of oil and other persistent contaminants such as PCBs and pesticides, which have a negative effect on the food chain and reproduction. Significant PCB and pesticide levels have been found in blue whales from the St. Lawrence (Sears *et al.* 1999). Levels of organochlorine pesticides and PCBs were analyzed in blubber biopsy samples from 38 male and 27 female blue whales sampled over the period from 1992 to 1999 in the Gulf of St. Lawrence. There were significant differences in the concentrations of PCBs and organochlorine pesticides in blubber biopsies from male and female whales, with female whales having lower levels because of maternal transfer of lipophilic contaminants to young through transplacental and lactational routes. However, patterns of contaminants (i.e. PCB congeners) did not appear to differ between the sexes. Concentrations of contaminants appeared to be stable over the sampling period, with concentrations of total DDT and total PCBs ranging from 210-730 ng/g lipid and 113-245 ng/g, respectively in male whales. Concentrations of

persistent contaminants in the blubber of blue whales are approximately two orders of magnitude lower than contaminant concentrations in beluga whales from the estuary of the St. Lawrence. This may be due to the fact that blue whales are more transient inhabitants of the region and feed at a lower trophic level than odontocete whales. However, balaenopterid whales may also mobilize their fat reserves during the winter months increasing exposure to contaminants. Contaminant concentrations in offspring are often similar to their mothers raising concerns over the toxicological impacts of exposure to contaminants during sensitive early life stages (Sears *et al.* 1999; Metcalfe and Koenig 2001). Whether there is a link between contaminants and the apparent low calving rate seen in the Gulf of St. Lawrence will require further study.

Prey abundance/Climate change

There have been several indications of broad scale changes prey abundance in the California current system that could affect blue whales. Dramatic declines in overall zooplankton abundance have been documented off California since the 1970s and have been linked to increased surface water temperature (Roemmich and McGowan 1995). These changes have apparently resulted in declines of 90% in another euphausiid-feeding marine predator, the Sooty Shearwater, off southern and central California and Washington (Veit *et al.* 1997). Overall seabird abundance off southern California has declined 40% from 1987 to 1994 (Veit *et al.* 1996). These changes have been associated with a gradual ocean warming and could have profound implications for other species like blue whales.

SPECIAL SIGNIFICANCE OF THE SPECIES

The blue whale is the largest animal known to have existed on Earth, and is now extremely rare due to past uncontrolled whaling globally. Some populations could be endangered to the point of extinction before we know much about the natural history of the species.

EVALUATION OF PROPOSED STATUS

There appear to be two populations in the North Atlantic Ocean currently numbering between 600-1500 blue whales. The western Atlantic population includes the waters from New England to eastern Canada (including the Scotian Shelf, Grand Banks, St. Lawrence Gulf and Estuary, and Labrador Sea and Davis Strait). A total of 372 blue whales have been photographically identified over the past 21 years in eastern Canada (up to 105 individuals in a single year). Whaling reduced the original population by over 70% (they removed over 1,500 blue whales in eastern Canada between 1898 and 1951). There is insufficient data to determine the current population trend, and there are fewer than 250 mature individuals capable of reproduction. Today, the biggest threats for blue whales come from ship strikes, disturbance from increasing whale watch activity, entanglement in fishing gear, and pollution. They may also be

vulnerable to long-term changes in climate, which could affect the abundance of their prey (zooplankton). This population meets the quantitative criteria for listing as endangered.

There may be as many as 5 distinct populations of blue whales in the North Pacific Ocean of which three occur along the coast of North America (California, Gulf of Alaska, and Aleutian Islands). Over 600 blue whales were commercially harvested in British Columbia between 1910 and 1965, and more were killed between 1905 and 1912 when records were poorly kept. Blue whales taken in British Columbia were likely migrating, and were reduced by more than 70% of their pristine abundance. There are no estimates of current abundance and no means of assessing current population trends. The rarity of sightings (visual and acoustic) suggests their numbers are currently very low (significantly less than 250 mature individuals). Threats for blue whales along the coast of British Columbia are unknown, but may include ship strikes, pollution, entanglement in fishing gear, and long-term changes in climate (which could affect the abundance of their zooplankton prey). This population meets the quantitative criteria for listing as endangered.

TECHNICAL SUMMARY

Atlantic Population

Balaenoptera musculus

Blue whale

Atlantic population

Range of Occurrence in Canada: Atlantic Ocean

Rorqual bleu

Population de l'Atlantique

Extent and Area information	
• <i>extent of occurrence (EO)(km²)</i>	>20,000 km ²
• <i>specify trend (decline, stable, increasing, unknown)</i>	Unknown
• <i>are there extreme fluctuations in EO (> 1 order of magnitude)?</i>	Unknown
• <i>area of occupancy (AO) (km²)</i>	> 20,000 km ²
• <i>specify trend (decline, stable, increasing, unknown)</i>	Unknown
• <i>are there extreme fluctuations in AO (> 1 order magnitude)?</i>	Unknown
• <i>number of extant locations</i>	N/A
• <i>specify trend in # locations (decline, stable, increasing, unknown)</i>	N/A
• <i>are there extreme fluctuations in # locations (>1 order of magnitude)?</i>	N/A
• <i>habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat</i>	Unknown
Population information	
• <i>generation time (average age of parents in the population) (indicate years, months, days, etc.)</i>	10-30 years?
• <i>number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values)</i>	<250
• <i>total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals</i>	Historic decline due to whaling.
• <i>if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)</i>	>70%
• <i>are there extreme fluctuations in number of mature individuals (> 1 order of magnitude)?</i>	No
• <i>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)?</i>	No
• <i>list each population and the number of mature individuals in each</i>	N/A
• <i>specify trend in number of populations (decline, stable, increasing, unknown)</i>	N/A
• <i>are there extreme fluctuations in number of populations (>1 order of magnitude)?</i>	N/A
Threats	
- Ship strikes, ice entrapment	
Rescue Effect (immigration from an outside source)	Low
• <i>does species exist elsewhere (in Canada or outside)?</i>	Yes
• <i>status of the outside population(s)?</i>	Increasing in Iceland, rare elsewhere
• <i>is immigration known or possible?</i>	Yes
• <i>would immigrants be adapted to survive here?</i>	Unknown
• <i>is there sufficient habitat for immigrants here?</i>	Unknown
Quantitative Analysis	Not available

Pacific Population

Balaenoptera musculus

Blue whale

Pacific population

Range of Occurrence in Canada: Pacific Ocean

Rorqual bleu

Population du Pacifique

Extent and Area information	
• extent of occurrence (EO) (km ²)	>20,000 km ²
• specify trend (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in EO (> 1 order of magnitude)?	Unknown
• area of occupancy (AO) (km ²)	>20,000 km ²
• specify trend (decline, stable, increasing, unknown)	Unknown
• are there extreme fluctuations in AO (> 1 order of magnitude)?	Unknown
• number of extant locations	N/A
• specify trend in # locations (decline, stable, increasing, unknown)	N/A
• are there extreme fluctuations in # locations (>1 order of magnitude)?	N/A
• habitat trend: specify declining, stable, increasing or unknown trend in area, extent or quality of habitat	Unknown
Population information	
• generation time (average age of parents in the population) (indicate years, months, days, etc.)	10-30 years?
• number of mature individuals (capable of reproduction) in the Canadian population (or, specify a range of plausible values)	<100
• total population trend: specify declining, stable, increasing or unknown trend in number of mature individuals	Historic decline due to whaling.
• if decline, % decline over the last/next 10 years or 3 generations, whichever is greater (or specify if for shorter time period)	>70%
• 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)?	No
• 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)?	N/A
Threats	
- Ship strikes.	
Rescue Effect (immigration from an outside source)	Low
• does species exist elsewhere (in Canada or outside)?	Yes
• status of the outside population(s)?	Very rare in Alaska
• is immigration known or possible?	Yes
• would immigrants be adapted to survive here?	Unknown
• is there sufficient habitat for immigrants here?	Unknown
Quantitative Analysis	Not available

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