Status of Marine Mammals in the North Atlantic

THE BELUGA WHALE

(Photo: M.P. Heide-Jørgensen)

This series of reports is intended to provide information on North Atlantic marine mammals suitable for the general reader. Reports are produced on species that have been considered by the NAMMCO Scientific Committee, and therefore reflect the views of the Scientific Committee of NAMMCO.

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BELUGA WHALE *(Delphinapterus leucas)*

The beluga (Norwegian: *hvithval*; Greenlandic: *Qilalugaq qaqortaq*; Faroese: *Hvítfiskur*; Icelandic: *Mjaldur*) or white whale, is a medium-sized toothed whale that belongs to the family Monodontidae. The only other member of this family is the narwhal. The English name “beluga” comes from the Russian word *belukha*, which means “white”. Beluga whales have stout bodies, flexible necks and a disproportionately small head with a well defined beak and a prominent forehead bulge or "melon". They have short but broad paddle-shaped flippers, no dorsal fin, a narrow ridged back and a broad tail fluke with a deeply notched centre. The name “*delphinapterus*”, meaning “dolphin-without-a-wing” reflects the absence of a dorsal fin.

Adult beluga whales grow to lengths of 3-5 m, and can weigh up to 1,500 kg. Males grow slightly larger than females. Newborns are brown or slate-grey in colour and average 1.6 m in length and 78 kg in weight. They become bluish-grey as they mature, then progressively lighten in colour, fading to white after 6 years of age. Most females mature sexually while still light grey, while males become white before maturing. Older males have a marked upward curve at the tip of their flippers

Beluga mate in the early spring, and calving occurs a little over a year later. Calving for beluga in the Canadian High Arctic population occurs mainly during early July to early August, although calves have been reported there as early as May 31, and as early as late March off west Greenland (Koski *et al.* 2002).

Distribution and stock definition

Beluga whales have a discontinuous circumpolar distribution, and in general occur only in seasonally ice-covered parts of Arctic and sub-Arctic seas (Fig. 1). Some isolated populations, however, extend into subarctic regions as far south as the St. Lawrence River in Canada. Throughout their range belugas inhabit cold Arctic waters, living amongst pack ice, in leads and polynyas in winter and migrating to shallow bays and estuaries of large northern rivers in the summer. Their seasonal movements depend on both oceanographic conditions (primarily the dynamics of ice cover) and the distribution of their primary prey species (Boltunov and Belikov 2002). Belugas usually travel in pods of 2 to 10 whales, although larger pods are not uncommon. Females with young are found in calm shallow waters along reef edges, close to islands and in large bays. These areas have a warm surface temperature and sand, gravel or mud bottoms that support molluscs, crustacea and bottom fish. Adults and weaned young prefer areas where the water depth varies, where surface temperatures are cold, and where there are reef bottoms of sand and gravel or deep bottoms of sandy mud and coarse material.

A “stock” of animals is usually defined as a management unit, that is, a group of animals that can be managed independently of other groups. Because of their annual migration patterns, and with difficulties in sampling and studying these animals in the field, stock identification for beluga is currently not well defined. Determination of stocks for beluga is particularly important since in several areas beluga numbers have declined considerably over the past century. Because people wish to continue to hunt beluga, it is essential to have knowledge of stock structures, their distribution and population sizes in order to determine sustainable harvest levels.

Genetic studies have been used to try to differentiate beluga stocks, though results have not been as clear cut as with some other animals. Difficulties arise in using genetics for beluga because adequate sampling designs are hard to achieve (de March *et al.* 2002). Sample numbers are sometimes lower than desired, due to the difficulty and expense of obtaining samples, and sampling is usually concentrated in areas and times where belugas are hunted rather than throughout their seasonal range. As well, because beluga are social animals and occur in pods of closely related animals, sampled animals may be close relatives rather than random individuals from a stock (Palsbøll *et al.* 2002). These difficulties mean that genetic studies alone will probably not be enough to define beluga stocks, and that a combination of methods and information is needed. For beluga, the annual migration path

and the hunters who have access to the whales along this path may best describe the term “stock” (Innes *et al.* 2002b).

There are two main groups of belugas in the Russian Arctic. The “Karskaya” group inhabits the western and central parts of the Russian Arctic, including the Barents, White, Kara and Laptev Seas (Fig. 1) (NAMMCO 2000). Another group inhabits the Bering Sea.

A separate group of belugas is found in the Barents Sea and around Svalbard. In summer, belugas are observed close to shore on the west, south and southeastern parts of the archipelago (NAMMCO 2000). Their distribution overlaps the winter distribution of the Karskaya belugas, and it is possible that there could be mixing of these two groups.

Belugas are rare along the east coast of Greenland, likely due to lack of suitable habitat, and whales which do appear there from time to time probably belong to the Svalbard population (Dietz *et al.* 1994).

On the west coast of Greenland, belugas are found from Qaanaaq in the north to Paamiut in the south in the fall, winter and spring (Fig. 1). Belugas are rare along this coast in summer (NAMMCO 2000). Beluga migrate past the Upernavik region in October and are found later in the fall and winter between Disko Bayand Sisimiut (NAMMCO 2000). It is unclear how many stocks winter off the west coast of Greenland (Palsbøll *et al.* 2002).

Beluga occur throughout the Canadian Arctic. With the exception of one group in the Beaufort Sea, all other groups are found in the eastern Arctic (Fig. 1). Fifteen groups are currently recognised in the eastern and High Arctic, and it appears in general that there are more separate groups or populations than was previously thought (NAMMCO 2000). In the Canadian High Arctic, for example, both satellite tracking and genetic studies have been unable to determine the stock structure of the beluga which spend the summer there (NAMMCO 2002a). Some beluga from this area migrate to western Greenland in the winter, while others winter in the "North Water" in Baffin Bay and Smith Sound (Fig. 1). Heide-Jørgensen *et al.* (2003) estimated that the proportion of animals moving to West Greenland in the winter was approximately 15% (95% confidence limit 6-35%) based on satellite tagging data. It is likely that this “High Arctic” stock consists of 2 or more smaller stocks (de March *et al.* 2002), one or more of which winters off West Greenland and one or more of which winters in the North Water.

Ecology

Young beluga begin feeding on fish and invertebrates after their first year, but may continue to take milk from their mothers during their second year of life (Heide-Jørgensen and Teilmann 1994). As the animals grow, they are able to take larger food items, and gradually switch from benthic to more pelagic foraging.

Polar cod (*Boreogadus saida*) and Arctic cod (*Actogadus glacialis*) were found to contribute more than any other item to the diet of beluga in the Upernavik area in Greenland (Heide-Jørgensen and Teilmann 1994). Polar cod was also found to be the principle food item for Canadian High Arctic and Svalbard beluga (Koski *et al.* 2002, Dahl *et al.* 2000). Squid beaks were commonly found in beluga stomachs from western Greenland. Other prey items found were redfish (*Sebastes marinus*), halibut (*Reinhardtius hippoglossoides*) and northern shrimp (*Pandalus borealis*) (Heide-Jørgensen and Teilmann 1994). Polar cod was also found to be the main prey item for beluga in Russian waters, with various whitefishes (*Coregonidae*) contributing to the diet in summer (Boltunov and Belikov 2002).

Capelin (*Mallotus villosus*) are an important food for belugas in the St. Lawrence River and also in Hudson Bay (Kingsley 2002). Other important food items were sand-lance (*Ammodytes* spp.), Atlantic cod (*Gadus morhua*), tomcod (*Microgadus tomcod*), decapod and amphipod crustaceans and polychaete worms.

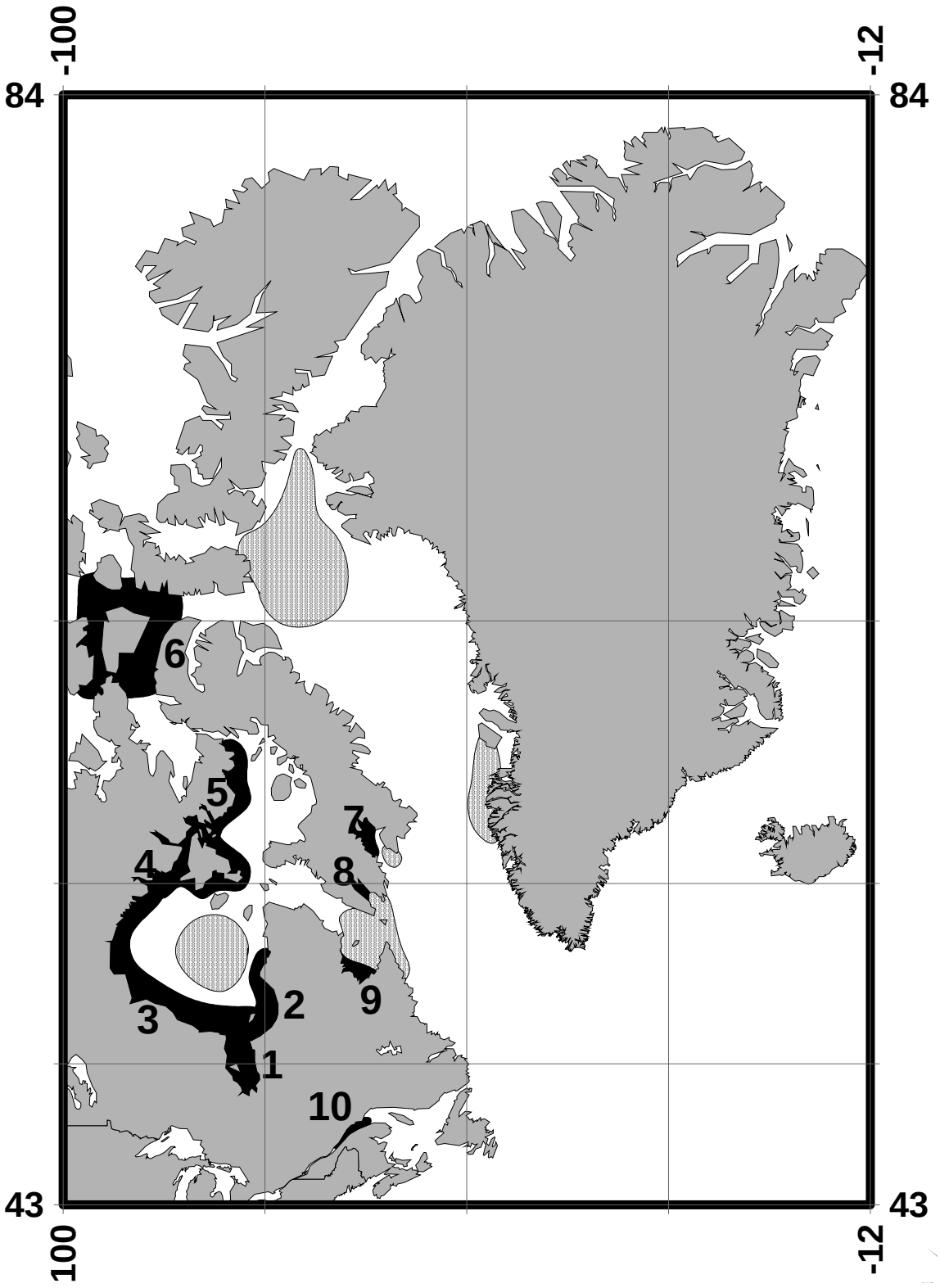

Fig. 1a. Beluga distribution in the western (a) and eastern (b) Atlantic. Summering areas are black and wintering areas are stippled. a) 1. James Bay; 2. Eastern Hudson Bay; 3. Western Hudson Bay; 4. Northern Hudson Bay; 5. Foxe Basin; 6. High Arctic; 7. Cumberland Sound; 8. Frobisher Bay; 9. Ungava Bay; 10. St. Lawrence River.

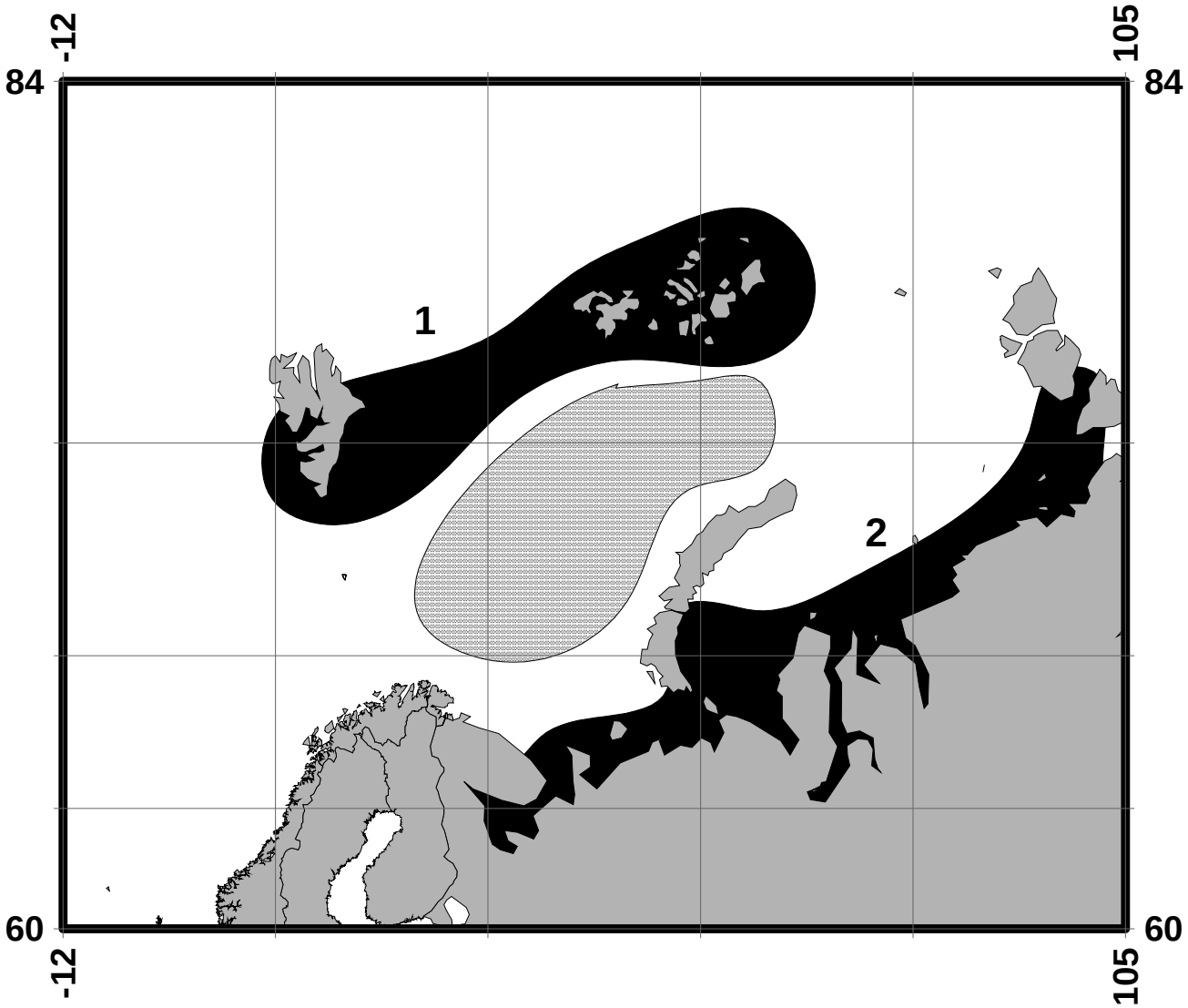

Fig. 1b. 1. Svalbard; 2. Karskaya..

Belugas have few natural predators. Killer whales (*Orcinus orca*) and polar bear (*Ursus maritimus*) may prey on beluga. Mainly calves and younger belugas are susceptible to such predation, although older animals can be taken by bears if they become trapped in ice. Ice entrapments of belugas usually occur during periods of very cold weather when ice forms rapidly. Belugas trapped this way usually die from predation, hunting or exhaustion. In Disko Bay, Greenland, there have been entrapments observed involving large numbers of belugas: at least 1,000 in 1915, and up to 3,000 in 1955 (Heide-Jørgensen *et al.* 2002). Entrapments, termed *sassat* in Greenlandic, occur fairly regularly in this area. Fewer entrapments are known from Canada, and ones that are known tend to involve smaller numbers of animals. This is likely due to the more stable ice conditions found in Canada relative to west Greenland (Heide-Jørgensen *et al.* 2002). As well, the lower human population density in the Canadian Arctic means that some entrapments would go unreported.

Abundance and trends:
Estimating the abundance of beluga is difficult due to the remoteness and large size of their distribution area and the mobility of the animals. Aerial surveys are most commonly used, but the results obtained must be corrected for both whales at the surface missed by observers, plus those that are below the surface out of sight when the survey airplane is overhead. Another problem is that direct comparisons between surveys are not always possible, since surveys rarely have the same timing or cover the same area.

Canadian High Arctic
The size of this population had not been estimated before the early 1970s. The first reconnaissance survey at that time, of concentrations of belugas in estuaries, gave a very rough estimate of 10,000 belugas (Koski *et al.* 2002). Surveys conducted in the late 1970s estimated that 10,250 to 12,000 belugas were involved in the fall migration out of the central Arctic (Koski *et al.* 2002). A survey in 1996 estimated 21,213 belugas (95% CI 10,985 to 32,619) in the waters surrounding Somerset Island.: Barrow Strait, Peel Sound and Prince Regent Inlet (Innes *et al.* 2002a). This estimate takes into account both whales missed by observers and those that might be unseen due to diving behaviour.

Any apparent trends of increase or decline in this population are difficult to assess since the confidence intervals for all estimates are quite large. Though beluga here were subject to commercial hunting in the past, hunting pressure today in Canada on these animals is low (NAMMCO 2000), but is higher for those beluga which migrate to Greenland.

Southeast Baffin Island
This area contains as many as 3 groups of beluga, which were previously believed to belong to a single stock. Commercial hunting of beluga occurred in this area, starting in the late 1800s. It is estimated that 7,000 animals were taken between 1868 and 1939, not counting those which were struck and lost, mainly in Cumberland Sound (DFO 2002b). The Cumberland Sound beluga numbers have been reduced by past overexploitation, and this group appears vulnerable as it is a relatively small population that is heavily harvested (NAMMCO 2000). This group is listed as “endangered” by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), however a survey of this group in 1999 suggested that this population is increasing (DFO 2002a). The Frobisher Bay and Hudson Strait components are migratory and are occur sporadically in these areas in the summer. The status of these two stocks is not known (NAMMCO 2000).

Ungava and Hudson Bay
Ungava Bay was formerly a summering area for a group of beluga, but these appear to have been extirpated by over-harvesting. Only very small numbers of belugas are observed there now, and are sometimes harvested. These animals may be remnants of the former stock, or transient or re-colonising animals (NAMMCO 2000). This stock is listed as “endangered” by COSEWIC.

There are 6 separate groups found in Hudson Bay. The North Hudson Bay group includes both summer resident beluga and migrants from other areas in the spring and fall. A recent genetic study

gave no clear picture of their stock structure. Beluga from this area were similar to other Hudson Bay collections, and had a relatively high genetic diversity. However, collections within the group were often significantly different from each other (de March and Postma 2003). The status of this group is difficult to determine. Northern Hudson Bay and Foxe Basin may include belugas from western Hudson Bay in early spring and summer, belugas from the High Arctic that are moving southward in late summer, and beluga that spend the summer in Foxe Basin (de March and Postma 2003).

In Eastern Hudson Bay, the population was subject to a large commercial harvest. This caused the fishery to experience a rapid decline by the late 1800s (de March and Postma 2003). Subsistence hunting continued after that time, but it was not until the 1980s that concerns about this population arose. The group is considered vulnerable, as it is a small population with relatively heavy exploitation (NAMMCO 2000), and is listed as "threatened" by COSEWIC.

The Belcher Islands area appears to have belugas which are both summer and winter resident. Recent genetic work indicates that these are probably a separate stock, although there is still the possibility that these beluga mix with those in Eastern Hudson Bay (de March and Postma 2003). There is no estimate available for the population size, but exploitation is fairly low. The status of this group is not known (NAMMCO 2000).

Western Hudson Bay has a large number of summer resident beluga. A partial survey in 1987 reported 25,100 beluga (95% CI 18,300 to 52,800) (NAMMCO 2000). Harvest of this group is estimated to be from 130 to 200 animals a year, which is likely a sustainable number for such a large group (NAMMCO 2000).

The coast of southern Hudson Bay has several large rivers where belugas congregate in the summer. James Bay also has a large summering population, probably exceeding 10,000 animals (DFO 2002c). Belugas in these areas are not hunted, although an unknown amount of harvest may occur during their migration (NAMMCO 2000). It is also unclear to what extent mixing between James Bay beluga and other groups occurs, and also between these and Western Hudson Bay beluga (de March and Postma 2003).

St. Lawrence River

The original size of this stock is unknown, but it has been back calculated to be in the low thousands. It has been estimated that about 16,000 animals were taken from the population between 1870 and 1960 (Kingsley 2002). This harvest, for commercial products, to protect fisheries and for recreation, was uncontrolled and led to serious depletion of the population. Studies in the early and mid 1970s found numbers in the low hundreds, and all hunting was prohibited in 1979 (Kingsley 2002). More recent estimates that the population is recovering and numbered about 1200 animals in 1997 (Kingsley 2002). This population was classified as "endangered" by COSEWIC in 1983.

West Greenland

Commercial harvesting of beluga in west Greenland and Baffin Bay began in the late 1800s. Their occurrence in west Greenland has changed over the past 90 years, largely due to changes in hunting patterns. The introduction of motor boats to the area in the early 20th century led to increased catches. After a period with large catches in Nuuk (from 1906-22) and in Maniitsoq (1915-29), beluga disappeared from the area south of 66° N (Heide-Jørgensen and Acquarone 2002). Between 1927 and 1951, large catches were reported in the southern part of the municipality of Upernavik, and since 1970 in the northern part. Catches in this area in the 1990s were about 700 whales per year (Heide-Jørgensen and Rosing-Asvid 2002).

Aerial surveys flown in west Greenland between 1981 and 1994 found that beluga numbers decreased by 62% during that period, probably because of overharvesting (Heide-Jørgensen and Reeves 1996). Further suveys in 1998 and 1999 confirmed the decline and found 7,941 (95% CI: 3650-17278) belugas in West Greenland, including whales missed by the observers and whales that were submerged during the survey (Heide-Jørgensen and Acquarone 2002).

Russia
Beluga exploitation in Russia goes back several centuries, although there is little data available on population or harvest numbers. One estimate, made in 1939, gave a population of 40,000 to 50,000 beluga in the Barents, Kara and Laptev Seas (Boltunov and Belikov 2002). These numbers are very rough, and were based on observations of beluga during mass inshore movements in the fall. Another estimate made later guessed that from 15,000 to 20,000 beluga inhabited the White, Barents and Kara Seas (Boltunov and Belikov 2002).

Harvests in Russia were quite variable, depending on the timing of migration and the numbers of animals moving inshore. The harvest did not likely cause any appreciable change in the population (Boltunov and Belikov 2002). One exception seems to be in the period 1954 to 1966, when annual harvests were high, averaging 1,500 individuals per year. This caused a noticeable decline in the number of beluga approaching Nova Zemlya and entering Baidaratskaya Inlet and Yugorskiy Shar Strait (Boltunov and Belikov 2002). Fewer whales were taken in the following decades.

Russians also harvested belugas at Svalbard, beginning in the 18th century. Little information is available on catch numbers. The best known year is 1818, when a crew overwintering caught about 1,200 belugas (Gjertz and Wiig 1994). Norwegians began hunting belugas at Svalbard in 1866, and continued up until the early 1960s. Over that period, more than 15,000 animals were taken (Gjertz and Wiig 1994). Belugas are thought to migrate to Svalbard in April or May, from wintering areas in the Barents Sea.

Current management and utilisation:
Belugas have long been a staple food resource for indigenous peoples throughout the Arctic, and continues to be an important part of northern diets today.

In West Greenland, beluga is one of the most important marine mammal species harvested, and the recent annual catches of between 500 and 1,000 belugas often exceeded the catch of all other whale species combined (Heide-Jørgensen and Rosing-Asvid 2002, see Table 1). There is evidence that the number of beluga wintering off West Greenland has declined since 1981. The Scientific Committee of NAMMCO has advised that the West Greenland stock is substantially depleted and that delay in reducing the catch to about 100 animals per year will result in further population decline and will further delay the recovery of this stock (NAMMCO 2001). Concern over this decline led to introduction of regulations during the 1990s with the intention of reducing catches. The drive hunt, which was the main method of beluga capture, was prohibited in 1995 (Heide-Jørgensen and Rosing-Asvid 2002). In 2004, a quota of 320 beluga per year was established for West Greenland.

Beluga were considered primarily a commercial resource in Russia up until the 1990s, and management activities were largely aimed at utilising the resource most efficiently. Harvests in the Barents, Kara and White Seas were as high as 3,000 beluga per year in the late 1950s and early 1960s (NAMMCO 2000). Harvests declined after that, and commercial harvest of beluga was prohibited in 1999. Currently the beluga harvest in the Russian Arctic has all but ceased, although harvest for subsistence is allowed (Boltunov and Belikov 2002). The State Fishery Committee of Russia (SFC) and its regional affiliates are responsible for beluga management in Russia.

Beluga were hunted commercially at Svalbard, beginning with the Russians in the 18th century. Norwegians also hunted beluga there, starting in 1866. The beluga hunt at Svalbard ended in the 1960s, and since 1961 beluga have been totally protected in Norwegian waters.

YEAR	CATCH
1992	900
1993	798
1994	618
1995	780
1996	542
1997	576
1998	744
1999	493
2000	606
2001	397
2002	399

Table 1. Recent catches of beluga in West Greenland. 1992-1998 from Heide-Jørgensen and Rosing-Asvid (2002), 1999-2002 are from NAMMCO (2002b, 2003, 2004, in prep.)

Beluga have long been a vital food resource for Canadian Inuit. The top layer of skin, called muktuk, is a good source of Vitamin C and other nutrients. Management of beluga and other marine mammals in Canada are a federal responsibility. The Canadian Department of Fisheries and Oceans (DFO) has lead responsibility for beluga management, and the Marine Mammal Regulations, which deal with beluga conservation and management measures, are part of the Fisheries Act. The establishment of land claim settlement areas in parts of northern Canada in recent years has led to increased co-management of marine mammals. Under the Nunavut Land Claims agreement of 1993, for example, the Nunavut Wildlife Management Board (NWMB) was established. The NWMB is a decision-making body within the Nunavut Settlement Area, with advisory authority in the adjacent waters. Ultimate responsibility for wildlife management, however, lies with the governments of Nunavut and Canada. These governments carry out NWMB decisions, once they are made. A similar board exists for the James Bay Settlement Area in northern Quebec.

Canada discontinued all commercial whaling in 1972, and hunting of beluga today is allowed for subsistence purposes only. Between 1988 and 1996, the total annual subsistence harvest of beluga varied between 400 and 700 (DFO 2002b). In some places, harvests take place under a quota system.

Belugas are listed under Appendix II of the Convention on International Trade in Endangered Species of Flora and Fauna (CITES). Special permits are required for both the export and import of beluga or beluga products between countries.

Threats

The major threat to beluga, apart from hunting, is pollution of their environment. Contaminants which enter the sea tend to become concentrated as they move up the food chain, and could pose a health risk to beluga and other top marine predators. Organochlorines such as PCBs, pesticides and other persistent organic pollutants (POPs) are of concern. In Russia, high levels of PCBs are found in the Kara and Laptev Seas, possibly due to inputs from several large rivers which flow into these seas. As well, concentrations of PCBs and other persistent organic pollutants (POPs) are high in some parts of the Barents Sea and around Svalbard (Boltunov and Belikov 2002)

Beluga found dead along the shores of the St. Lawrence river have contained high levels of organochlorines, lead and mercury, but it is not known what effect their presence has at the population level (Kingsley 2002). About 23% of dead adults found on the shores of the St. Lawrence have malignant cancers, but again it is not known if this has consequences for the population.

In some areas, such as Svalbard and the Barents Sea, habitat may be threatened by oil exploration or extraction activities. Beluga could be disturbed by increased ship traffic, and possible oil spills.

Status and Outlook

West Greenland

The stock that winters in this area is substantially depleted, the population is estimated to be only a fraction of its pre-exploitation size (Innes and Stewart 2002, Alvarez-Flores and Heide-Jørgensen 2004) and present harvests are several times the sustainable yield (NAMMCO 2002). If harvests continue at present levels, there is a high risk that the stock will become extinct within 20 years.

Svalbard
Belugas here are protected from hunting, and the population is assumed to be stable.

Eastern Hudson Bay
Although there is some uncertainty in the available data, it seems that this population has declined from about 4,000 whales in 1985 to 2,000 in 2001. If current levels of harvest continue, this population could disappear in the next 10 to 15 years (DFO 2002c).

Beluga in Ungava Bay are still being harvested, despite recommendations that no whales be taken from this group. In 2001, 91 beluga were taken by Ungava Bay communities, some within Ungava Bay and some outside of the bay (DFO 2002c). This group is classified as "endangered" by COSEWIC.

Cumberland Sound
Recent survey results and local Inuit knowledge suggest that this population is increasing. Current levels of harvest are thought to be sustainable, and it is anticipated that COSEWIC will reassess the status of this population in the next two or three years.

Canadian High Arctic
At least 2 stocks occupy the Canadian High Arctic in the summer, one of which winters in the North Water and one of which winters off West Greenland (see Fig. 1). There is evidence that the stock that winters in West Greenland is severely depleted (see above). However there is no evidence from surveys conducted in the Canadian High Arctic that the number of beluga occupying this area has declined (Innes *et al.* 2002a, Koski *et al.* 2002). More information is needed about stock structure in this area.

In all areas, better information is needed on beluga stock sizes, distribution and population parameters in order to determine the best possible management scheme for these whales.

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