This document does not contain the entire 2004 COSEWIC status report for the beluga whale. It contains information about the Cumberland Sound beluga population and the Eastern High Arctic – Baffin Bay beluga population. For the complete report, go to http://www.sararegistry.gc.ca/.

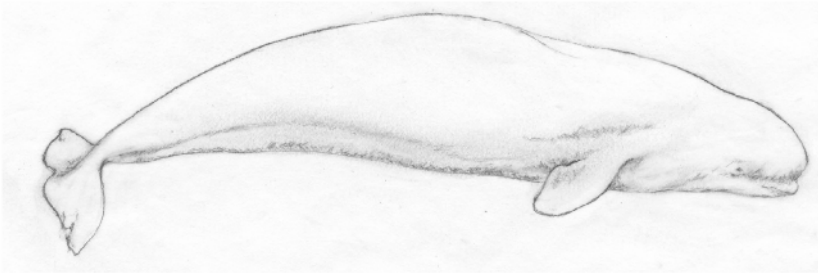
COSEWIC
Assessment and Update Status Report

on the

Beluga Whale
Delphinapterus leucas

in Canada

Cumberland Sound Population
Eastern High Arctic/Baffin Bay Population



CUMBERLAND SOUND POPULATION – THREATENED

EASTERN HIGH ARCTIC/BAFFIN BAY POPULATION – SPECIAL CONCERN

2004

COSEWIC

COMMITTEE ON THE STATUS OF

ENDANGERED WILDLIFE

IN CANADA

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DES ESPÈCES EN PÉRIL

AU CANADA

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

COSEWIC 2004. COSEWIC assessment and update status report on the beluga whale *Delphinapterus leucas* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 70 pp. (www.sararegistry.gc.ca/status/status_e.cfm).

COSEWIC

Production notes: COSEWIC acknowledges Thomas G. Smith for writing the update status report on the beluga whale *Delphinapterus leucas* in Canada. The report was overseen and edited by Hal Whitehead, COSEWIC Marine Mammals Species Specialist Subcommittee Co-chair. The Beluga Whale (Cumberland Sound population) was formerly designated by COSEWIC as Beluga Whale (Southeast Baffin Island/Cumberland Sound population). The Beluga Whale (St. Lawrence Estuary population) was formerly designated by COSEWIC as Beluga Whale (St. Lawrence River population). The structure of the southeast Baffin Island/Cumberland Sound population has been redefined and named Cumberland Sound population. The southeast Baffin Island population has been included as part of the western Hudson Bay population.

Assessment Summary – May 2004

Common name

Beluga whale (Cumberland Sound population)

Scientific name

Delphinapterus leucas

Status

Threatened

Reason for designation

Numbers of belugas using Cumberland sound have declined by about 1500 individuals between the 1920s and the present. The population decline is believed to have been caused by hunting by the Hudson Bay Company into the 1940s and by the Inuit until 1979. Hunting has been regulated since the 1980s. Current quotas (41 in 2003) appear to be sustainable. Concerns have been raised about increased small vessel traffic and the associated noise of outboard motors, as well as fishery removals of Greenland halibut, a food of belugas.

Occurrence

Nunavut, Arctic Ocean

Status history

The Southeast Baffin Island-Cumberland Sound population was designated Endangered in April 1990. In May 2004, the structure of the population was redefined and named "Cumberland Sound population", and the Southeast Baffin Island animals were included as part of the Western Hudson Bay population. Status re-examined and designated as Threatened in May 2004. Last assessment based on an update status report.

Assessment Summary – May 2004

Common name

Beluga whale (Eastern High Arctic/Baffin Bay population)

Scientific name

Delphinapterus leucas

Status

Special Concern

Reason for designation

The population overwinters in Baffin Bay and west Greenland and may consist of two distinct populations. It is heavily hunted in west Greenland. However, most of the population winters in Baffin Bay and the High Arctic where it is not hunted. Hunting pressure in Canadian waters is low in summer.

Occurrence

Nunavut, Arctic Ocean

Status history

Designated Special Concern in April 1992 and May 2004. Last assessment based on an update status report.

COSEWIC
Executive Summary

Beluga Whale
Delphinapterus leucas

Species information

The beluga, *Delphinapterus leucas,* is a medium-sized toothed whale, which becomes completely white when it reaches sexual maturity around seven years of age. Adult males attain a length of 4.5 meters and females 3.5 meters. Both are similar in appearance. Young are born a dark grey and gradually become paler as they mature.

Belugas are also known as white whale, béluga in French, and *qilalugaq* or *siqsuaq* in the Inuktitutt, Inuvialuktun and Inupiat dialects.

Distribution

Currently available evidence supports continuing to divide the Canadian belugas into seven populations, based on largely disjunct summer distributions and genetic differences: (1) the St. Lawrence Estuary population, (2) the Ungava Bay population, (3) the Eastern Hudson Bay population, (4) the Western Hudson Bay population, (5) the Eastern High Arctic – Baffin Bay population which spends its summer in the Lancaster Sound, Barrow Strait, Prince Regent Inlet and Peel Sound areas of the Canadian high Arctic, (6) the Cumberland Sound population which seems restricted to the Cumberland Sound area and concentrates in Clearwater Fiord during July and August., and (7) the Eastern Beaufort Sea population.

Migrations of all the populations occur from overwintering areas in the areas of open water to their spring and summer calving and feeding areas, which are usually river estuaries.

Population sizes and trends

There are large differences in both the extent of the range and size of the seven beluga populations. The Eastern High Arctic – Baffin Bay population is estimated to be in the order of 20,000 animals. It might consist of two distinct populations: the West Greenland population numbering around 5,000 belugas, which is heavily exploited, and the North Water population, which numbers approximately 15,000 belugas, and is only lightly hunted. The Cumberland Sound population numbers about 1,500 animals and is thought to have increased since the 1980s.

Habitat

Belugas spend the summer in coastal and offshore areas. Their distribution is centred on certain river estuaries, which they visit shortly after ice break-up and where they moult. They frequent these areas occasionally throughout the summer months. In the autumn they begin migrating to other locations, including certain deep-water areas, where they may feed intensively. They then continue to move to areas where pack-ice is of about 4/10-8/10 cover, in which they spend the winter.

Biology

Belugas have mean lifespans in the range of 15 to 30 years, although they may live beyond age 40, and are sexually mature at the ages of 5-7 years. Scientific evidence suggests that adults are capable of giving birth, on the average, every 3 years. They feed on a variety of fish and invertebrates. Little is known of their mating behaviour as this occurs in the winter offshore areas. Polar bears, killer whales and Inuit hunters are their main predators. Belugas occupy the level above fish, but below bears, in the Arctic trophic pyramid.

Limiting factors and threats

Sources of natural mortality include killer whales and polar bears, which often prey on belugas when they become entrapped in ice. Belugas are made vulnerable to both bear and human predation by their habit of returning to specific rivers and continuing to use these sites in spite of intense hunting pressure.

Existing protection or other status designations

The Cumberland Sound population is co-managed by the Pangnirtung Hunters and Trappers Association, the Department of Fisheries and Oceans Canada, and the Nunavut Wildlife Management Board with a current (2003) annual quota of 41 beluga whales. Efforts of management appear to have helped this population to stabilize their numbers.

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SPECIES INFORMATION

Name and classification

The beluga whale, *Delphinapterus leucas* (Pallas, 1776), derives its name from the Russian *belukha,* which means white. In English, it is also called the white whale; in French béluga is the current common name although marsouin blanc or baleine blanche were previously used; in the various Inuit dialects they are called *qilalugaq* (Inuktitutt, Inuinactun, Inuvialuktun) and *siqsuaq* by the Inupiat of the Alaskan north slope.

The beluga belongs to one of two monotypic genera of the family Monodontidae (Rice 1998), which includes the narwhal, *Monodon monoceros,* as the other member. These two species as well as the Arctic bowhead whale, *Balaena mysticetus,* lack dorsal fins, a common characteristic thought to be an adaptation to life in ice-filled Arctic waters.

Description

Adult belugas are distinct in being pure white and can weigh up to 1,900 kg (Fig. 1). They range in total length from 2.6 to 4.5 meters, adult females are approximately 80% of the adult male length (Degerbøl and Nielsen 1930, Vladykov 1944, Brodie 1989, Doidge 1990).

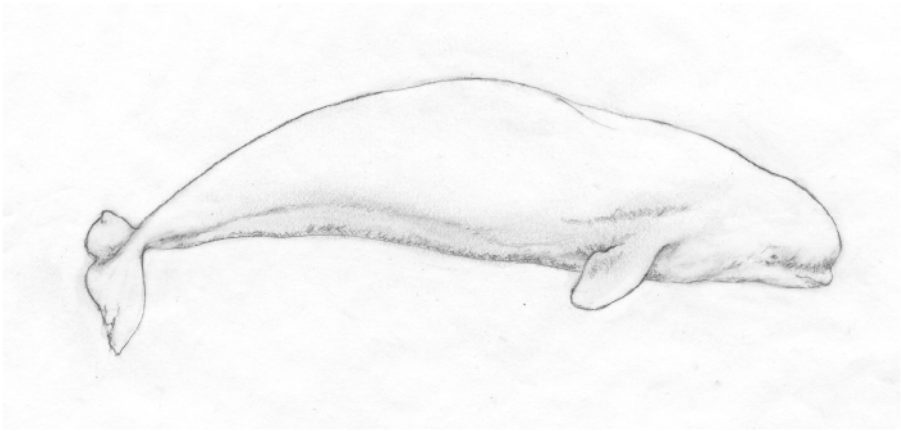

Figure 1. Line drawing of beluga whale, *Delphinapterus leucas,* by D. Codère, E.M.C. Eco Marine Corporation.

Newborn calves are grey at birth, sometimes with a darker mottled coloration, and 150 cm in length, which is 48% of the length of their mothers. Yearling calves are 6065% of their mothers' length (Caron and Smith 1990). Older juvenÎles gradually become paler in colour until they turn pure white at, or shortly after, the age of sexual maturity (Sergeant 1973, Heide-Jørgensen and Teilmann 1994).

Belugas are easily sighted in calm water because of their white coloration. During the spring migrations along the ice edges, or in leads, they may be seen in aggregations of several hundred animals in certain parts of the Arctic (Lønø 1961, Sergeant and Brodie 1975). Belugas are the only Arctic cetacean species that commonly frequent river estuaries, sometimes numbering thousands of individuals, where they may predictably be seen shortly after the break-up of the sea ice. There they rub on the bottom of the shallow river channels and frequent the warmer fresh-water for several weeks (Fraker *et al.* 1979, Smith and Martin 1994).

HABITAT

The habitat used by beluga whales varies seasonally. As the fast ice breaks up in late spring, beluga whales mass along the ice edges and penetrate the leads, which provide access into the ice-covered areas (Stirling 1980). Belugas will often appear in their traditional river estuaries, which have become ice-free, several weeks before the large areas of sea ice, outside these bays, have completely broken up.

During the summer when the fast ice has broken up or completely disappeared, belugas are found along the coastlines and in relatively shallow waters (Sergeant 1973, Brodie 1971, Ognetov 1981, Michaud *et al.* 1990, Smith and Martin 1994). It is during this period that belugas frequent specific river estuaries (Sergeant 1973, Smith and Martin 1994), and glacier fronts (Lydersen *et al.* 2001).

There remains some uncertainty about whether belugas are moulting (St. Aubin *et al* 1990), feeding or calving (Stewart and Stewart 1989) in these areas of summer aggregation. All three are possible and activity might vary from one geographical location to the other.

Beginning in mid-August, belugas commence to move away from the estuarine areas. Some populations, such as those of the High Arctic – Baffin Bay and the Eastern Beaufort Sea, appear to make long journeys to deep-water areas away from land (Smith and Martin 1994, Richard *et al.* 2001b) where they spend several weeks diving to the sea floor and engage in what appears to be intensive feeding activity. In mid-to late September, belugas begin to actively move towards their winter areas.

Aerial surveys in March indicate that belugas are found in loose pack ice or polynyas, preferring ice cover of 4/10 to 8/10 (Jonkel 1969, Finley and Renaud 1980, Koski and Davis 1979). Because satellite tag retention has been limited, their specific areas of feeding and possible interactions with other beluga populations sharing these same areas, during the winter, are not yet known. Many of the prey species of belugas have been described from stomach content collections obtained from shallow coastal waters during the summer (Vladykov 1946, Kleinenberg *et al.* 1964, Watts and Draper 1986). Nothing is yet known of their feeding strategies, or prey availability, as related to specific habitat features during the long winter season.

Barber *et al.* (2001) examined beluga habitat relationships using telemetry. They found a

bimodal distribution with respect to depth, animals preferring either shallow waters or those about 500m deep. Ice-free waters were proportionally more used than those with cover, and ice cover of 10/10 was avoided.

BIOLOGY

General

The ages of belugas are determined by counting annual growth layer groups (GLGs) in the dentinal or cemental tissues of their teeth. Uncertainty still exists as to whether one or two GLGs represent a year of growth (Sergeant 1973, Perrin and Myrick 1980, Brodie 1989). It is still generally accepted, and there is some pertinent evidence (Goren *et al.* 1987, Heide-Jørgensen *et al.* 1994), that two GLGs represent a one-year interval. The following description of life history is based on this assumption.

Reproduction

Female belugas mature sexually between 4-7 years, males somewhat older at 6-7 years (Brodie 1971, Sergeant 1973, Burns and Seaman 1985, Doidge 1990a, HeideJørgensen and Tielmann 1994). Mating occurs during late winter to early spring; there is likely a spread in the timing of implantation from March until late June (Kleinenberg *et al.* 1964, Brodie 1971), with the peak of mating occurring before mid-April (Burns and Seaman 1985). It is generally held that there is no delay in implantation of the single blastocyst but Burns and Seaman (1985) note that this cannot yet be stated with certainty. Gestation is estimated to be in the order 12.8 (Doidge 1990b) to approximately 14.5 months (Kleinenberg *et al.* 1964, Brodie 1971, Sergeant 1973).

The peak calving time is not well established. It appears to occur during the late spring migration in offshore areas (Béland *et al.* 1990) and thus is not easily observed. Calving in estuaries, in early summer, has been postulated (Sergeant 1973), but detaÎled studies, in at least two Canadian estuaries, have never recorded a calving event (Caron and Smith 1990, Smith *et al.* 1994). Instead it was seen that females arriving in these areas were already with neonate calves. Their number would gradually increase from mid-June to early July. It is assumed that calving is probably spread out from June to August (Brodie 1971, Sergeant 1973), with the peak probably occurring in mid-June to early July. Lactation is estimated to last from 20 months (Brodie 1971, Sergeant 1973, Burns and Seaman 1985, Heide-Jørgensen and Teilmann 1994) to 32 months (Doidge 1990).

Doidge (1990a) estimated that there was a period overlap of lactation and pregnancy of 175 days, resulting in a complete cycle between successive pregnancies of 3.25 years. This is similar to the estimates of other authors for full reproductive cycles of 36 months (Sergeant 1973, Burns and Seaman 1985), but differs in that the actual lactation period is estimated to be much longer and overlapping the new pregnancy.

Almost nothing is known of the breeding behaviour of belugas since mating occurs in the offshore ice-filled waters. Adult males segregate from females with calves and juvenÎles during

their period of summer aggregation in estuaries (Michaud 1993, Smith and Martin 1994, Smith *et al.* 1994). Some evidence from commercial net fishing in Russian and Norwegian (Ognetov 1981, Lønø 1961) waters indicates that there is also sexual segregation during the seasonal migrations. No direct information exists on mating systems in belugas which, in the future, might be elucidated by nuclear DNA studies.

Aboriginal traditional knowledge on the reproductive biology of belugas varies considerably between Inuit hunters and also differs depending on the location of their hunting areas. Mating is reported to occur along ice floe edges in the spring or far offshore. The timing of calving is reported to occur from spring to late autumn (Thomsen 1993, McDonald *et al.* 2002). Inuit from areas with major estuarine concentrations of belugas, such as Cumberland Sound or the Mackenzie Delta, report calving from July to September (Byers and Roberts 1995, Stewart *et al.* 1995, Stewart 2001).

Inuit hunters believe that adult females still accompanied by calves do give birth (Thomsen 1993). They cite this as evidence that the three year reproductive cycle postulated by scientists is wrong (Anon. 2001b, McDonald *et al.* 2002). In contrast, the Inuvialuit of the Beaufort Sea rarely see females with more than one calf. They feel that females with dependent offspring will not give birth (Byers and Roberts 1995).

Demographic parameters

Belugas are long-lived mammals with mean life spans in the range of 15-30 years. Results from aging of beluga whale jaws in the Eastern Beaufort Sea have identified whales reaching the age of 63 years, with many harvested whales of this population estimated to be in their 40s and 50s (Harwood et al. 2002). Most population parameters available for belugas have been derived from samples of animals harvested by Inuit.

The age specific frequencies obtained from hunted belugas, which form a survivorship series (l_x) type of life table, are subject to various collecting biases that make the accurate calculation of the survivorship of the neonate and juvenÎle age classes virtually impossible. Estimates of adult survivorship are in the 0.90 or greater range. In the older age classes, inaccuracy occurs because of tooth wear, which leads to underestimation of age. An independent estimate of the instantaneous rate of increase of the population is rarely available for whale populations so that accurate estimates of survival rates are difficult to obtain (Caughley and Birch 1971).

A different approach, but not free of sampling bias, is the attempt to obtain mortality rates from the age structure of recovered carcasses of animals that were not hunted. The problems of estimating such mortality factors as they occur in the live population (Martineau *et al.* 2002a) stem from the lack of representativeness in the age structures of the recovered carcasses (Theriault *et al.* 2002). Additionally when these rates are compared to other beluga populations, the comparisons are invalid largely because the age structures are derived using different sampling methods (Hammill *et al.* 2003).

From other lines of evidence in similar odontocete populations (Smith 1999) and a

limited amount of data from repeated aerial surveying (Kingsley 1998), it is felt that unexploited beluga populations, which are below carrying capacity, could increase at a rate in the range of 2.5 to 3.5 percent per annum.

Feeding and nutrition

Belugas have the lowest body fat content when they first occupy their estuarine summer habitat (Doidge 1990b). In late summer they appear to begin to feed intensively, often in deep areas somewhat distant from their centres of summer distribution (Smith and Martin 1994, Richard *et al.* 2001a,b). WhÎle we have as yet no direct evidence of the prey species involved, the Arctic cod, *Boreogadus saida,* is known also to have a deep water distribution in these same areas (Bradstreet *et al.* 1986, Welch *et al.* 1993). Large concentrations of Arctic cod in surface waters are also occasionally seen in the early autumn, which provide important feeding opportunities for belugas and other Arctic marine mammals and birds (Finley *et al.* 1990, Welch *et al.* 1993). The Inuit of Arctic Bay and Cumberland Sound also report that belugas feed extensively on Greenland halibut, *Reinhardtius hyppoglossoides,* at the floe edge (Stewart *et al.* 1995, Kilabuk 1998). In the Beaufort Sea they feed on a variety of fish (Byers and Roberts 1995). Elsewhere in the Arctic they consume capelin *(Mallotus villosus)* and saffron cod *(Eleginus novaga).* In most areas invertebrates are also frequently found in the stomachs of belugas (Vladykov 1946, Seaman *et al.* 1982, Sergeant 1962, 1973, Watts and Draper 1986).

To date there has been no indication of inter-annual changes in the body condition or nutritional state of wild-harvested belugas in any scientific studies. In Cumberland Sound, Inuit harvesters have noted that belugas appear to be thinner than in the past. They relate this to increased energy expenditure caused by avoidance of increased boat traffic (Kilabuk 1998). No detailed studies of energy budgets of free ranging belugas have yet been conducted.

Behaviour / adaptability

Belugas are vulnerable to predation and to over-hunting, and to other anthropogenic threats because of their strong philopatry to certain sites of summer aggregation. Belugas occupy these estuarine sites to moult, to avoid predation or to feed. It is thought that exposure to warm fresh water helps the sloughing of the dead *stratum externum,* and accelerates the epidermal cell growth (St.-Aubin *et al.* 1990). Past theories postulated that estuaries provided a thermal benefit to neonates and that they were calving areas (Sergeant 1973, Fraker *et al.* 1979), but this has been contradicted by behavioural studies in estuaries (Finley 1982, Smith *et al.* 1994), and by measurement of the insulative values of the epidermis of newborn belugas (Doidge 1990b). In some areas, river estuaries might be feeding sites and also provide shelter from predators such as killer whales (Brodie 1971).

Belugas are extremely tenacious in their occupation of their traditional centres of aggregation, even in the face of continued disturbance and threat of being killed (Caron and Smith 1990). In the past, commercial hunts, which harvested large numbers of belugas from such

areas as the Mucalic Estuary in Ungava Bay (Finley *et al.* 1982, Reeves and Mitchell 1989) and the Great Whale River in eastern Hudson Bay (Francis 1977, Reeves and Mitchell 1987), are thought to have exterminated whole populations. The Inuit of Ungava Bay, Hudson Strait and eastern Hudson Bay all mention that many small river estuaries, formerly frequented by belugas are now rarely used by the whales. It is generally held by Inuit that increased noise from outboard motors is the primary cause and that this has shifted distribution of belugas offshore (Doidge *et* al. 2002, Lee *et* al. 2002). In the St. Lawrence, the southernmost beluga population lives in a heavily traveled maritime route. There, its range has been reduced significantly and the remaining belugas continue to face anthropogenic challenges, such as increasing noise (Lesage 1993, Lesage *et al.* 1999), loss of habitat, and pollution (Béland *et al.* 1993).

In the autumn belugas leave their summer areas and migrate long distances to their winter habitats. Often these areas are shared by more than one population, but details of behaviour and distribution are still lacking from this time of year. It is in those areas that mating takes place.

POPULATION IDENTIFICATION

In the past, for management purposes, seven separate populations of belugas were recognized to be present in Canadian waters during at least part of the year (Fig. 2). These consist of (1) the St. Lawrence Estuary population (Pippard 1985) (2) the Ungava Bay population; (3) the Eastern Hudson Bay population (Reeves and Mitchell 1989, DFO 2001); (4) the Western Hudson Bay population (Richard 1993); (5) the Eastern High Arctic - Baffin Bay population (Doidge and Finley 1993); (6) the Cumberland Sound population (Richard and Orr 1991, DFO 2002a); (7) the Eastern Beaufort Sea population (DFO 2000).

Using this scheme of population division, the Canadian populations of belugas all have estuarine centres of aggregation during the summer open-water season. In most cases their summer coastal and offshore distribution is separate from other populations. Autumn, winter, and spring ranges are often contiguous or overlapping with other populations.

The first evidence for discriminating between beluga populations was based on apparent size differences between belugas collected in different parts of the Arctic (Sergeant and Brodie 1969). Reexamination of the data and methods of analysis confirm that minor differences do occur, but not to the degree that they might be practically used as criteria to differentiate closely adjacent beluga populations (Doidge 1990). Stewart (1994) found significant size differences between several populations, which were well separated geographically, but notes that body size differences are of waning importance to population identity issues, especially in the light of new genetic population discrimination techniques.

More generally accepted was the delineation of geographical populations based on their summer distributions, which were thought to be mainly coastal and centred on sites such as the estuaries where significant numbers of individuals gathered (Sergeant and Brodie 1975, Smith *et al.* 1985). This was supported by behavioural studies in estuaries, which showed that belugas are philopatric and strongly site tenacious (Caron and Smith 1990, Smith *et al.*

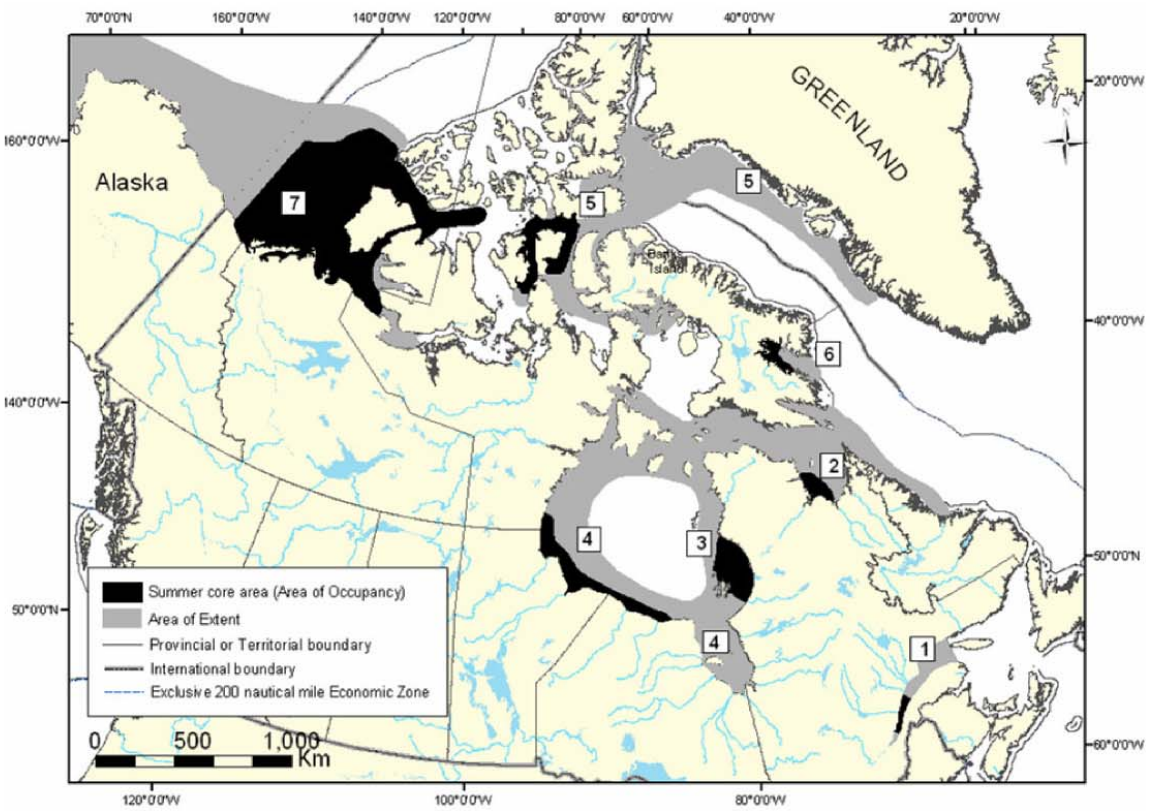

Figure 2. Location of the of Canadian Beluga Populations: (1) St. Lawrence Estuary population (2) Ungava Bay population (3) Eastern Hudson Bay population (4) Western Hudson Bay population (5) Eastern High Arctic – Baffin Bay population (6) Cumberland Sound population (7) Eastern Beaufort Sea population (modified from DFO 2002b).

1994). In one of those estuaries, individuals known by distinct scars were seen to return frequently, and in a short time, to the estuary after hunting had taken place (Caron and Smith 1990).

Recently, emphasis has been placed on the use of genetic analyses, both mitochondrial DNA (mtDNA) and microsatellites to differentiate populations of belugas (de March *et al.* 2001, 2002) (Fig. 3). There has been a gradual realization that there are a number of complex problems associated with the representative sampling of animals, the scope and breath of the genetic analyses themselves, and their standardization between studies, as well as in the types of statistical analyses which are appropriate in analysing the complex genetic data sets (de March *et al.* 2002, Palsbøll *et al.* 2002, de March and Postma 2003). These genetic studies confirm the existence of some previously defined populations. They also indicate the existence of new populations. Other types of studies, aimed at defining the timing of migration and routes, used satellite-tagged belugas (Martin *et al.* 1993), detaÎled aboriginal traditional knowledge, and other markers such as contaminant signatures (Innes *et al.* 2002a).

This report attempts to determine Designatable Units based on range disjunction and genetic divergence (COSEWIC APPENDIX F5 2003). In recent years, new genetic studies have

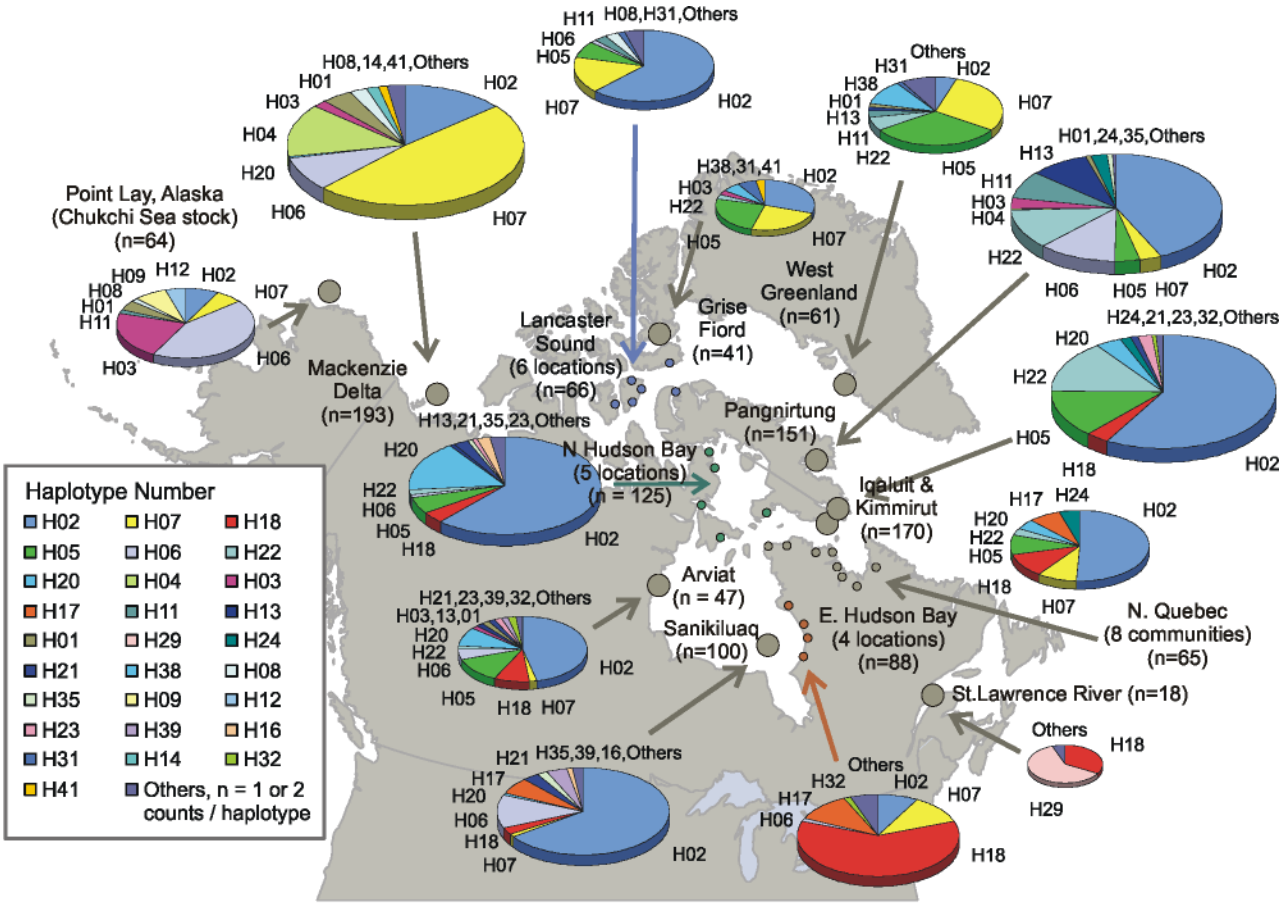

Figure 3. Beluga mtDNA haplotype frequencies at 13 locations in North America and Greenland. Areas of the pies are proportional to sample size (from de March *et al*. 2002, p 25, figure 2).

indicated that there are more beluga populations than was once thought, but because of sampling inadequacies, have not yet been able to define these precisely or practically for management purposes. Since none of the new genetic data contradict the existence of the previously recognized populations, which have all received status designations, these will form the basis and departure point of the present review. Where there exist strong genetic, range, migration or other ecological evidence for designating other Evolutionarily Significant Units (Waples 1991), these are noted.

Eastern High Arctic - Baffin Bay population

Belugas occupying the Canadian High Arctic regions of Lancaster Sound, Barrow Strait, Peel Sound and Baffin Bay during the summer open water season were commonly assumed to occupy the ice-free or pack–ice area along the West Greenland coast during the winter months. High harvests of belugas have been common in West Greenland during the last century (Reeves and Mitchell 1987).

In the 1980s, prior to genetic sampling and satellite telemetry studies, aerial surveys

documented the presence of belugas in the pack-ice areas as far south as 66°N along the Greenland side of Baffin Bay (Koski and Davis 1979). The western side of Baffin Bay, along the Canadian Baffin Island coast, has always had much more extreme land-fast ice and heavy concentrations of pack ice. Late winter aerial surveys found that an unknown number of belugas apparently remained to over-winter in the north Baffin Bay area of the North Water polynya (Finley and Renaud 1980, Stirling 1980, Richard *et al.* 1998a).

From 1987 to 2000 a significant number of belugas were tagged with satellite transmitters in the Canadian High Arctic, but only one of 39 animals was observed to move into the West Greenland area (Smith and Martin 1994, Richard *et al.* 1998b, Reeves and St. Aubin 2001). In 2001, 3 of 5 belugas tagged in Creswell Bay in the Canadian High Arctic, ended up in West Greenland (Heide-Jørgensen *et al.* 2003). This was the same location from which originated the only previous tagged beluga to end up in West Greenland (Smith and Martin 1994). A reanalysis of all belugas that retained their tags after October 1 (n=26), reveals that 15% of these animals ended up in West Greenland. This is still based on a small sample size and there are problems with the apparent non-random distribution of West Greenland belugas whÎle they are in their summer Canadian High Arctic habitat. This makes it difficult to obtain a clear picture on the proportion of belugas from the Canadian High Arctic which might over-winter in either the North Water / Lancaster Sound area, or along the West Greenland coast (Heide-Jørgensen *et al.* 2003).

Genetic evidence also suggests that at least two populations inhabit this large geographic area (de March *et al.* 2002). A high percentage of the belugas sampled from West Barrow Strait and Somerset Island locations have the most common Western Hudson Bay haplotype, which is less common in samples from Peel Sound and West Greenland (de March *et al.* 2002). One of the common haplotypes from Peel Sound is also common in West Greenland and the Beaufort Sea, but less common in West Barrow Strait and Somerset Island. Microsatellite allele frequencies also differ significantly in these two areas.

Genetic results to date point to overall differences between Lancaster Sound and Greenland belugas (de March *et al.* 2002). However, individual lots of samples from the same location, taken at different times, show different affiliations confirming that a mixture of populations coexist during the summer and also during the fall and spring movements. A clear picture of the number and geographical distribution of these populations will not emerge until much more systematic sampling is done.

Inuit from several West Greenland communities report the presence of distinctive belugas in their catches, which they assume come from Canadian waters (Thomsen 1993). These are generally described as longer animals that have an elongate caudal peduncle and are thought to be adapted to swimming in areas with strong currents. Some hunters also mention belugas with long teeth, which they term kigutikaat. Another type, infrequently seen, is nujalik, which refers to a hairy head (see Smith and Sleno 1986 for a possible explanation).

In summary, there exists considerable distributional (Richard *et al.* 1998a), movement, (Heide-Jørgensen *et al.* 2003), and genetic evidence (de March and Postma 2003) to indicate that the High Arctic – Baffin Bay population occupies two distinct winter habitats, one in the

North Water and the other along the West Greenland coast. It is not yet clear how or if those populations also separate in their summering areas in the Canadian High Arctic. Indications are that the belugas in West Greenland have been reduced significantly in numbers in the last decade (Heide-Jørgensen *et al.* 1993, Heide-Jørgensen and Aquarone 2002) and that current harvest levels cannot be sustained (Innes and Stewart 2002).

Cumberland Sound population

The belugas found during the summer in the Cumberland Sound area have long been thought of as a distinct population (Sergeant and Brodie 1975), possibly because of their summer aggregation, in significant numbers, in the inner reaches of Cumberland Sound, at Clearwater Fiord. There the Ranger River forms an estuary, which is utilized by belugas in much the same way as many other estuaries throughout the Canadian Arctic (Brodie 1971, Sergeant and Brodie 1975, Fraker *et al.* 1979, Smith et al 1994). There is no other such estuarine or other centre of aggregation for belugas in the southeastern Baffin area. The Cumberland Sound belugas are genetically diverse, with a notable number of uncommon haplotypes and microsatellite loci that are not found elsewhere.

In a reconsideration of the populations for management purposes, Richard and Orr (1986) argued that the belugas of Cumberland Sound belonged to a more dispersed group of belugas frequenting the Iqaluit, Kimmirut and Cumberland Sound region. They described this population collectively as the Southeast Baffin population (Richard and Orr 1991). However, recent evidence from satellite tagging, genetics, organochlorine contaminant signatures, and traditional knowledge (Kilabuk 1998), seem to point to Cumberland Sound as a separate population. Aerial surveys (Richard and Baratin 2002) and studies of belugas tagged with satellite linked VHF transmitters (Richard 2002) have shown that the Cumberland Sound whales remain within their immediate area, possibly throughout the winter (P. Richard *pers. com*., DFO, Winnipeg). DNA samples obtained over the years since the late 1980s also differentiate between Cumberland Sound belugas and others sampled elsewhere in the southeast Baffin region and the High Arctic (Brown-Gladden *et al.* 1997, de March *et al.* 2002).

The delimitation of the beluga populations occupying the rest of the southeastern Baffin region is not at all clear (see below). Genetic samples collected there show that many resemble the Western Hudson Bay haplotypes. They appear to be a mixed stock dominated by Western Hudson Bay belugas.

It is possible that more than one population summers in Cumberland Sound. Genetic and organochlorine contaminant signatures, even though showing significant differences among belugas hunted in Pangnirtung, Iqaluit, and Kimmirut, are not inconsistent with this possibility (B. de March, *pers. com*. DFO Winnipeg). Hunters in Cumberland Sound recognize three types of belugas (Kilabuk 1998, DFO 2002a). Those hunted at the floe edge in spring are smaller, thinner and very white. Those taken during July-August, in Clearwater fiord, are larger and have a yellow colouration showing signs of epidermal moult. Those taken outside of Clearwater Fiord, on the west side of Cumberland Sound, are smaller and thinner. Their epidermis (maayak or muktuk) is thicker and stronger tasting.

Overall, recent genetic, distributional and abundance data reinforce the historical view that the belugas of Cumberland Sound form a discrete population.

Problems with the identification of beluga populations in Canada

There are three principal areas of uncertainty with the beluga population identification scheme outlined above:

1. Southeast Baffin Island. The status of animals found off Southeast Baffin Island, but outside Cumberland Sound, is uncertain. Current information indicates that they are not part of the Cumberland Sound population. Inuit hunters from Iqaluit and Kimmirut, on the southeast Baffin coast, mention different body sizes and shapes in their landed catches and believe that they are harvesting from several different populations (Kilabuk 1998). These two villages are located near the assumed wintering areas of the Hudson Bay populations, and appear to harvest animals from these populations. Some of the genetic and organochlorine contaminant (de March et al. In press) sampling of Southeast Baffin belugas indicates that this might be the case. Since individual, or grouped samples, taken during spring or autumn migratory periods are expected to contain mixed populations of belugas, areas such as Southeast Baffin which are contiguous with wintering grounds shared by several populations pose a particularly difficult problem in population identification and management. Animals using these regions in the summer may share closest affinities with the Hudson Bay populations.

2. Southern Hudson Bay…

3. High Arctic. There is increasing evidence that the Eastern High Arctic - Baffin Bay population has important substructure (see above). However, with the data currently available splitting this population is probably not justified under COSEWIC guidelines.

DISTRIBUTION

Global range

Belugas are circumpolar in their distribution, being found in Alaskan, Canadian, Greenlandic, Norwegian and Russian waters. They are found in the Arctic as far north as 82°N, in the Pacific sub-Arctic, as far south as Cook Inlet, Alaska (60°N), and, on the Atlantic side, in the Canadian St. Lawrence Estuary further south to 47°N.

Sixteen populations of beluga whale were previously tentatively enumerated for the world-wide range in the Nearctic, based primarily on geographic distribution during the summer months (Donovan 1992). More recently, and in light of behavioural, genetic and contaminant signatures a total of 22 possible populations have been enumerated (Martin and Reeves 2000).

Many of these populations, which maintain distinct or contiguous geographical ranges during the summer months, mix together during the spring and autumn migrations and share common wintering quarters in areas of light ice or in reoccurring polynyas.

Canadian range

Considerable new information on the range of several of the seven previously designated Canadian beluga populations (Fig. 2) has been gained in recent years by the tagging of animals with satellite linked transmitters and from more intensive aerial surveys. The documentation of traditional knowledge of Inuit hunters (ATK) also has added to the information of movements and migrations of these populations.

Eastern High Arctic – Baffin Bay population

Aerial surveys indicated that a small number of belugas were present in March north of Baffin Bay in the area of the North Water polynya (Finley and Renaud 1980, Stirling 1980, Richard *et al.* 1998a). From 1987-2000, studies of the movements of tagged belugas showed that most belugas tagged in summer in the High Arctic archipelago remained in the High Arctic – North Water polynya area, at least until the tags stopped transmitting in early winter (Richard *et al.* 2001a; Fig. 8).

Baffin Island hunters note the gradual disappearance of belugas as the ice forms along the coastline. On northeast Baffin belugas appear to be moving to the east at that time. The Inuit living in Grise Fiord on Ellesmere Island are the only group of hunters who sight belugas throughout the winter along the floe edges of Jones Sound. In the spring belugas make their way into the hunting areas along east and north Baffin as the fast ice is broken up (Remnant and Thomas 1992, Stewart *et al.* 1995, Stewart 2001).

The presence of belugas during the winter along the West Greenland coast has long been known (Degerbøl and Nielsen 1930) and they have been the target of continuing subsistence hunting by the Inuit of that area (Thomsen 1993). A recent telemetry study of belugas tagged during the summer in one major summering area, Creswell Bay on Somerset Island, indicates that belugas from this area, are part of the population that goes to West Greenland in the winter. Heide-Jørgensen *et al.* (2003) have estimated from this study that approximately 15% of the belugas spending their summer in the High Arctic move to West Greenland in the winter.

Aerial surveys in 1998-1999 have been done during the winter along the West Greenland coastline between Qeqertarsuaq (69º30'N) and Paamiut (62º00 N) some extending as far as 80 km west off the coast (Heide-Jørgensen and Aquarone 2002). Previous similar surveys were flown in this area in 1981-1982 and 1993-1994 (HeideJørgensen and Reeves 1996). The pattern of winter distribution of belugas in all surveys since 1981 along the West Greenland coast has remained fairly constant. Most animals are sighted within 50 km of the coast. The greatest number of sightings were made in the northern strata, particularly on the northern edge of Store Hellfiske Banke, where the coastal shelf ends and where there is the edge of the

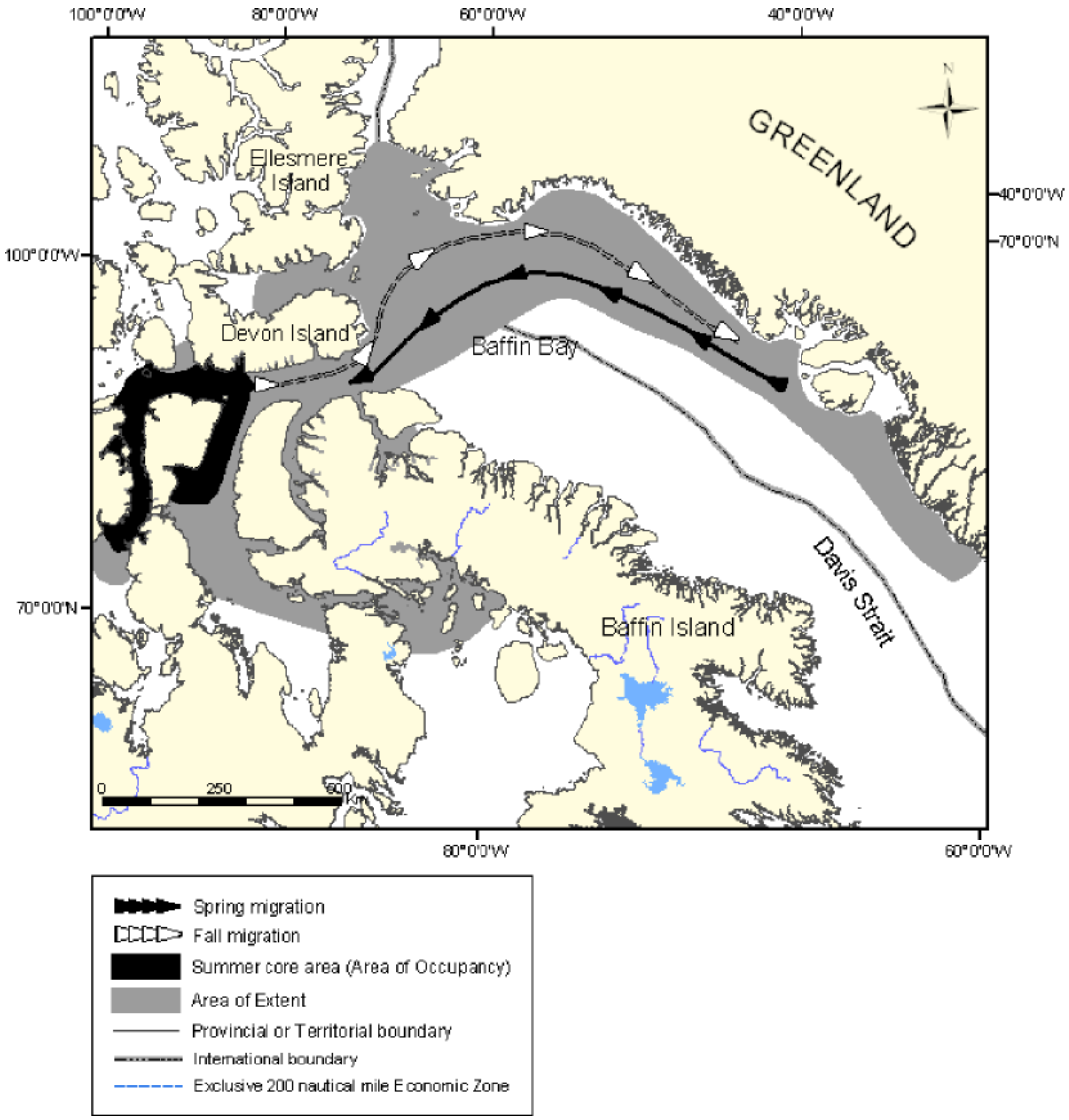

Figure 8. Extent of occurrence (area of extent) and summer core area of the Eastern High Arctic – Baffin Bay population of belugas (modified from DFO 2002b).

dense pack-ice covering Disko Bay (Heide-Jørgensen and Aquarone 2002). In southern areas, between Maniitsoq and Paamiut (65º N to 62º N), the distribution of belugas appears to be similar between survey years (Heide-Jørgensen and Reeves 1996).

In Western Greenland, belugas appear in late fall, and spend the winter in a large area of pack ice and open water from Disko Bay to Upernavik. Belugas are hunted mainly on their southward migration in late October or during their northward return in May – June (Thomsen 1993).

Cumberland Sound population

Aerial surveys in Cumberland Sound and along the south-east Baffin coast, have shown that the major summer aggregation of belugas is limited to the Clearwater Fiord area where they occupy the estuary of the Ranger River from mid-July to midSeptember. Previous studies speculated that some belugas seen in areas as far distant as Frobisher Bay and along the coast near Kimmirut during the summer months came from Cumberland Sound, which at that time was designated the South East Baffin population (Richard and Orr 1986). More recent aerial surveys and tagging of belugas with VHF satellite linked transmitters suggest that belugas remain in the Cumberland Sound area throughout the year (P. Richard, DFO, Winnipeg, *pers. com.)* (Fig. 9).

Inuit of Cumberland Sound report that belugas spend less time on their migration into Clearwater Fiord than previously. They relate this to the increased disturbance by motorboat traffic. They also feel that belugas leave Clearwater Fiord earlier in the season than in the past (Kilabuk 1998).

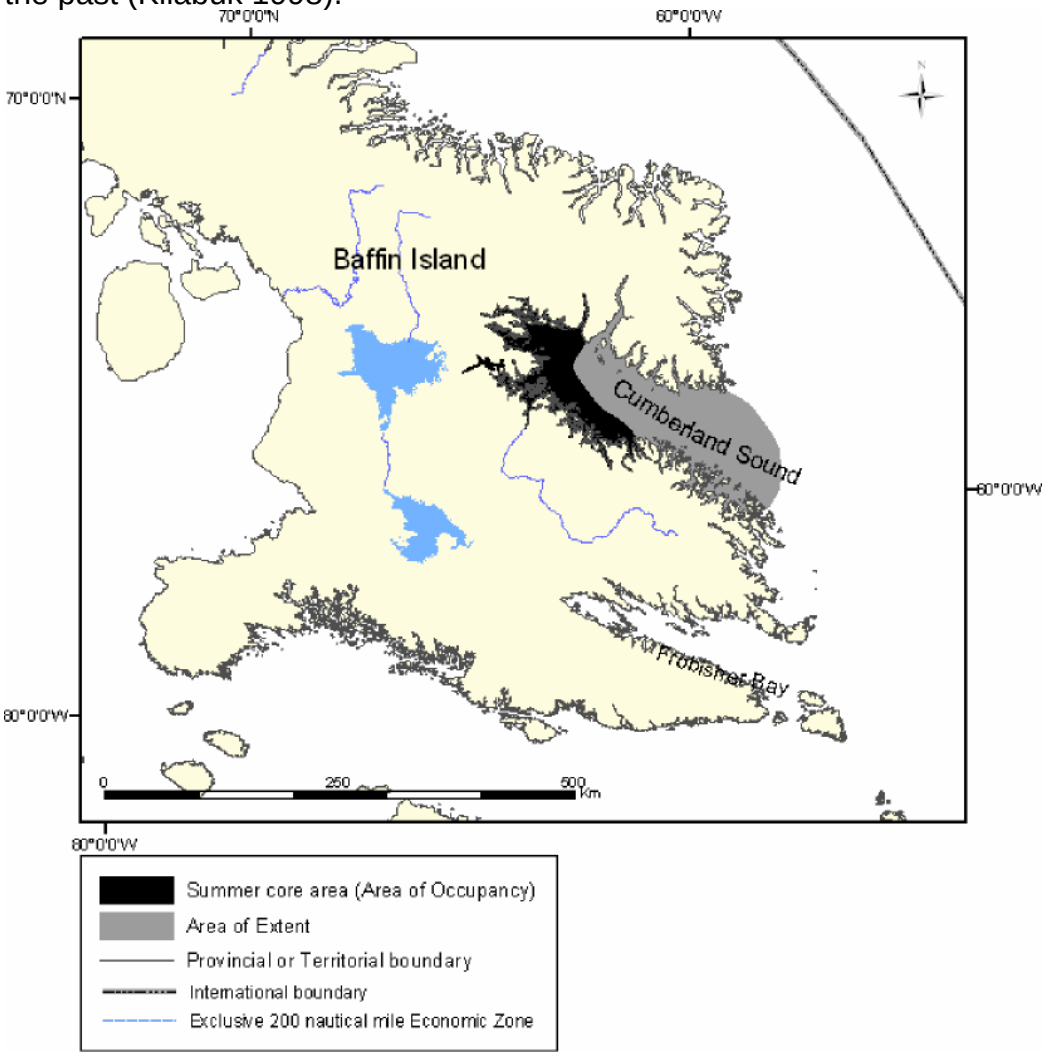

Figure 9. Extent of occurrence (area of extent) and summer core area of the Cumberland Sound population of belugas (modified from DFO 2002b).

POPULATION SIZES AND TRENDS

The Canadian populations of belugas have been a subject of conservation attention for some time (Table 1). All of the seven populations have received status designations from COSEWIC. Since the original COSEWIC population status assignments much research has been conducted, particularly to gain new information on their population size. Recent population estimates have contributed to several new population status reports produced by Department of Fisheries and Oceans Canada. Beluga populations are usually assessed by aerial surveys. Some estimates are not corrected for diving animals missed by the survey, and these will be substantial underestimates (a factor of very roughly two; National Marine Fisheries Service 2002).

Table 1. Summary of two Canadian beluga populations with approximate estimates or the total population (see text), a qualitative rating of the current population size relative to its pre-whaling value, and trends. The estimated numbers of mature animals (in Technical Summaries) are approximately 60% of these total estimates.

Stocks	Approximate current population size	Population size compared to original	Population growth trend
Eastern High Arctic – Baffin Bay	~21,213	?	?
Cumberland Sound	~1,547	Low	Increasing or stable

Eastern High Arctic – Baffin Bay Population

Recent aerial surveys of belugas occupying the Canadian High Arctic during the summer yield an estimate of abundance, corrected for submerged animals, of 21,213 (95% CI = 10,985 to 32,619) (Innes *et al.* 2002b). It is not possible to compare the results of this survey with previous ones (Smith *et al.* 1985), because the timing and area covered by the surveys were different. The detection of trends in abundance of belugas by aerial surveys of the Canadian high Arctic summer habitat will always remain problematical, because of the wide area of occupation by belugas, and the interannual differences in timing of ice break-up with its effect on the seasonal movements of belugas (Smith and Martin 1994, Richard *et al.* 2001a).

The summer harvest of belugas in the High Arctic totals less than 100 individuals a year (DFO 1999). Innes and Stewart (2002), in a modeling exercise, estimated that the number of belugas spending the summer in the High Arctic, and which also remained in the Baffin Bay – North Water area in the winter, was 17,328 (5,750 - 27,996) with a maximum sustainable yield of 317 (25 - 1,107). They conclude that current harvests are below MSY.

The aerial surveys of belugas spending the winter along the West Greenland coast have indicated a decline in numbers between 1981 and 1999. The estimate of abundance from 1998 and 1999 was 7,941 (95% CI = 3,650 – 17,278) and does not differ significantly from the estimate of 11,563 (8,560 – 15,621) from 1993-1994. However, when the 1981-82 index of abundance

(3,302 SE=958) and the 1998-99 estimates (735, SE=025) are compared, the difference is significant (Heide-Jørgensen and Acquarone 2002, Innes and Stewart 2002).

Annual catches of belugas off West Greenland, corrected for under-reporting and sinking loss, including ice entrapment mortalities, for the period from 1979 to 1999, ranged from an estimated low of 650 to a high of 941 (Heide-Jørgensen and Rosing-Asvid 2002). Innes and Stewart (2002), using the largest estimates of abundance for the West Greenland group, calculated that the sustainable yield for 1999 would have been a total of 109 landed belugas. Their model suggested a decline of 50% in this wintering group during the period 1981 to 1994, compared with 62% based on all winter aerial surveys analysed by Heide-Jørgensen and Reeves (1996).

Inuit from three of four west Greenland communities believe that the numbers of belugas have slightly decreased or remained stable. One community notes a possible increase. Most hunters indicate that there is a noticeable variation in beluga numbers from year to year (Thomsen 1993).

Cumberland Sound population

Large commercial hunts in Cumberland sound from 1868 to 1939, particularly in Clearwater Fiord, the main centre of aggregation, reduced the original population of some 5,000 whales (Mitchell and Reeves 1981) to less than 1,000 individuals in the 1970s (Brodie *et al.* 1981). Aerial surveys carried out in Clearwater Fiord have provided an index of abundance for this population. Surveys flown in 1979 produced a maximum count of 550 belugas; and from 1979 to 1982, a maximum count of 541 belugas (Richard and Orr 1986). In August 1990, maximum counts in Clearwater Fiord ranged from 454 to 497, while counts from two surveys in 1999 were in excess of 700 belugas. A significant number of belugas were also seen in 1999 in strip transect surveys of Cumberland Sound proper and offshore from Cumberland Sound (Richard and Baratin 2002).

The 1999 surveys estimated the numbers of belugas in the Cumberland Sound population, corrected for submerged animals, to be 1,547 (95% CI=1,187-1,970; DFO 2002a). The lack of past comparable data makes it difficult to comment on the trends of abundance in this population.

The numbers of belugas entering Clearwater Fiord in Cumberland Sound is reported to have declined from the 1940s to the present. The Inuit of Pangnirtung believe that the major cause of the decrease was the large commercial harvests in the early part of the 20th century (Kilabuk 1998). There is a current quota of 41 belugas for this population, taken by the community of Pangnirtung.

LIMITING FACTORS AND THREATS

Limiting factors may be viewed as belonging to two main categories; those which would generally be classed as natural and those which are anthropogenic.

Causes of natural mortality of Arctic mammals are difficult to document because animals may live far from human populations and carcasses are rarely ever found. The chance of finding dead mammals that live in the marine environment is even smaller. Here the combined scientific and aboriginal traditional knowledge (ATK) is relatively scarce and quantitative data are lacking. One exception to this is the beluga population in the confines of the St. Lawrence Estuary where ongoing long-term studies have gained considerable knowledge of disease and mortality factors from the recovery of dead carcasses (Martineau *et al.* 2002a, b).

Polar bears, *Ursus maritimus,* are a known predator of belugas throughout their Arctic range. They are known to kill belugas in the winter along the floe edges. At break-up, polar bears have been observed to take belugas by diving in on top of them from platforms of floating ice (Smith and Sjare 1990). During the open water season, polar bears are capable of killing belugas that have become entrapped in river streams when the tide has ebbed (Norris 1994).

Ice entrapments *(savsaat,* pl. *savsait)* of belugas are known to recur in several areas of the Beaufort Sea, Canadian High Arctic, in northern Foxe Basin and along the West Greenland coast. Polar bears and Inuit hunters take advantage of these incidents to harvest belugas. The proportion of mortality in these situations that is attributable to predation is not well documented and remains debatable (Kilabuk 1998).

Killer whales, *Orcinus orca,* are known to take belugas throughout most of the eastern Canadian Arctic (Reeves and Mitchell 1989) and Greenland (Thomsen 1993). Observations of killer whale occurrence are fewer in the high Arctic and the Beaufort Sea areas, but occasional sightings (Byers and Roberts 1995) and attacks have been documented. In the St. Lawrence Estuary, killer whales might have once been somewhat more abundant than in the present day, when almost no sightings are made, even in the outer Gulf of St. Lawrence. One observation was made of killer whales killing belugas as far upstream as Les Escoumins in the early 1960s (L. Otis, *pers. com.* 1967). No such incidents have been seen in the last 15 years, during which intensive beluga research has been conducted (R. Michaud, *pers. com.* 2002)

The Inuvialuit of the Mackenzie Delta mention that belugas are frightened of walruses, *Odobenus rosmarus,* and have possibly documented a wound resulting from a walrus tusk (Byers and Roberts 1995). There has also been an incident of a beluga that was found with the broken tip of a narwhal, *Monodon monoceros,* tusk imbedded in its melon (Byers and Roberts 1995, Orr and Harwood 1998). This might be indicative of aggressive interspecific behaviour (Reeves and Mitchell 1988), which could result in mortality. Belugas and narwhals occupy some of the same areas during the open water season in the Canadian High Arctic (Smith *et al.* 1985, Innes *et al.* 2002b).

The strong philopatry of belugas, which causes them to return to the same estuaries year after year, makes them highly vulnerable to overexploitation. This behavioural trait is undoubtedly the most important natural factor which has led to the extirpation of beluga populations by a combination of commercial and subsistence hunting (Francis 1977, Reeves and Mitchell 1987). Because of this strong philopatry and site tenacity (Caron and Smith 1990) native harvesters, hunting in these estuaries, continue to perceive that the numbers of belugas remain high even

though the populations might actually be declining.

Little is known of the role of infectious diseases in belugas. Recently, *Brucella* antibodies have been found in the tissues of Beaufort Sea animals, but no indications have been found that this has caused health problems at the population level. WhÎle viruses have been known to cause large-scale die-offs of seals and toothed whales (Hinshaw *et al.* 1984, Lipscomb *et al.* 1994), no such event has yet been documented for any known beluga population.

Anthropogenic threats act as strong limiting factors for many of the Canadian beluga populations. They must be discussed for each population separately because they vary greatly over the wide geographical range of the beluga.

Eastern High Arctic – Baffin Bay population

The Eastern High Arctic – Baffin Bay population, which spends its winter in the Jones Sound – North Water polynya area, does not appear to be adversely affected by over-exploitation or subject to any other negative anthropogenic impacts. The occasional ice entrapment occurs in this area (Freeman 1968, 1973, Heide-Jørgensen e*t al.* 2002b), which is not unexpected since belugas are living throughout the winter in an area of heavy shifting and consolidating ice. The magnitude of mortality from these events is not well documented.

Overexploitation by Greenland Inuit, who harvest belugas along the West Greenland coast, is a serious concern for the animals which winter in this area (Innes and Stewart 2002). Although commercial fisheries for Greenland halibut and pink shrimp, *Pandalus borealis,* take place in the area occupied by belugas in the winter, deleterious effects of competition by fisheries for resources have not yet been studied.

Inuit of West Greenland report changes in the distribution of belugas which now are found more to the west of Disko Island, and in some cases are reported to stay further offshore. Increased trawler and hunting boat traffic and drive fisheries in such areas as Upernavik have been cited as the causative influence (Thomsen 1993).

Cumberland Sound population

Apart from subsistence hunting pressures there are no apparent important anthropogenic impacts on this population. Commercial fisheries for Greenland halibut, *Reinhardtius hippoglossoides,* are conducted in the area. Belugas are known to feed on this species at the floe edge (Stewart 2001).

Inuit of Pangnirtung report changes in the behaviour of belugas related to increased boat traffic and the associated noise caused by outboard motors (Kilabuk 1998). This noise is considered the reason for the decline in numbers of belugas, which were formally more numerous in areas such as Clearwater Fiord. Hunters also note a decrease in the fatness of whales, which they relate to more energy being spent in avoidance of motorboats. Less selective hunting resulting from faster-moving motorboats is blamed for higher proportion of

belugas being scarred with bullet wounds. This is seen as being exacerbated by the annual quota which obliges hunters to rush their hunting period in order to obtain their part of the catch (Kilabuk 1998). The quota was increased from 35 to 41 in 2003.

SPECIAL SIGNIFICANCE OF THE SPECIES

The beluga is the only species in the genus *Delphinapterus.* In southern Canada the population living in the St. Lawrence Estuary is a relict Arctic species, originating (together with the Eastern Hudson Bay population) from an eastern refugium that persisted during the Wisconsin Ice Age. Recently, with the reduction in the St. Lawrence Estuary population by hunting and the threat to the remaining population from industrialization, the beluga has become a symbol of marine conservation efforts in Canada.

For the Inuit in some communities, belugas are a preferred food item; they are extremely nutritious, and much-sought-after as a subsistence resource throughout the Arctic (McGhee 1974, Reeves and Mitchell 1987, Byers and Roberts 1995).

The beluga was one of the first cetaceans to be kept in aquaria, where it adapts readily and survives well under present modern husbandry. It has long been in the eye of the public. A number of aquaria throughout the world have successfully bred belugas and maintain breeding stocks.

Both captive and free-ranging belugas, because they are easy to handle, have helped further our scientific knowledge of cetaceans in many fields. These include marine mammal medicine (Ridgway 1973, St. Aubin *et al.* 2001), behaviour (Au *et al.* 1985, Sjare and Smith 1986, Caron and Smith 1990, Smith *et al.* 1994), and ecology (Reeves and St. Aubin 2001).

EXISTING PROTECTION OR OTHER STATUS

In Canada, belugas have been managed under the Fisheries Act since 1949. The history of legislation and amendments are reviewed in Reeves and Mitchell (1989). The Beluga Protection Regulations of 1979 (absorbed into the Marine Mammal Regulations of the Fisheries Act in 1993) limited beluga hunting without a permit to Indians and Inuit of Canada.

In the Arctic waters, where the belugas are subject to subsistence hunting, a number of populations are the subject of co-management by Inuit groups, Hunters and Trappers Associations, the Nunavut Wildlife Management Board, and Fisheries and Oceans Canada. In the northern Quebec territories of Nunavik, which comprises many beluga hunting communities (Lesage et al. 2001), a Beluga Management Plan (Anon. 2001a) specifies annual allowable catches, which are implemented by a system of community quotas. Under the current management plan, Ungava Bay and that part of the habitat of the Eastern Hudson Bay population encompassing the Hudson Bay arc are closed to hunting. Current hunting by Nunavik Inuit is limited to Hudson Strait and James Bay.

The Cumberland Sound population has been the subject of co-management action since

the 1980s (Richard and Pike 1993). A recovery strategy for this population is being developed by Fisheries and Oceans Canada in collaboration with the Pangnirtung HTA, Qikiqtaaluk Wildlife Board, Nunavut Wildlife Management Board and Nunavut Tunngavik Inc. (S. Cosens, DFO, Winnipeg, *pers. com.*). Presently the annual allowable catch is set at 41 landed belugas.

The Eastern High Arctic – Baffin Bay population is the subject of scrutiny and continuing research in view of the likely overexploitation in West Greenland (Innes and Stewart 2002). The West Greenland group might well be a separate population (de March et al. 2002, Heide-Jørgensen et al. 2003). The Canada - Greenland Joint Commission on Conservation and Management of Narwhal and Beluga was established in 1991 in order to develop and integrate research and manage the populations of Arctic monodontids whose total range is shared by both countries. This commission has paid close attention to the population of belugas hunted in western Greenland.

SUMMARY OF STATUS REPORT

Current data suggest that the belugas in Canada be divided into seven designatable units, based principally on summer ranges and gene distributions.

Some evidence suggests that the Eastern High Arctic - Baffin Bay population should be split. One part is of a considerable size and appears to remain in Canadian or offshore waters during the winter where it is only harvested at low levels. Another part of the Eastern High Arctic - Baffin Bay population spends the winter in western Greenland waters where it is heavily exploited. It appears to have significantly decreased in numbers over the last decade.

The Cumberland Sound population containing about 1,500 animals is managed under an allowable catch of 41 belugas. It has increased in numbers since 1980 and is now either stable or slightly growing. It appears to have a limited distribution in the Cumberland Sound area throughout the year.

TECHNICAL SUMMARY: EASTERN HIGH ARCTIC – BAFFIN BAY POPULATION

Extent and Area Information	
• *Extent of occurrence (EO)(km²)*	250,000 km² (approx.)
• *Specify trend in EO*	Stable
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²)*	49,000 km²
• *Specify trend in AO*	Stable
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	Not applicable
• *Specify trend in #*	Not applicable
• *Are there extreme fluctuations in number of locations?*	No
• *Specify trend in area, extent or quality of habitat*	Stable
Population Information	
• *Generation time (average age of parents in the population)*	14 years
• *Number of mature individuals*	12,729 (60%x21,213)
• *Total population trend:*	Decline?
• *% decline over the last/next 10 years or 3 generations.*	Unknown
• *Are there extreme fluctuations in number of mature individuals?*	No
• *Is the total population severely fragmented?*	No
• *Specify trend in number of populations*	Not applicable
• *Are there extreme fluctuations in number of populations?*	Not applicable
Threats (actual or imminent threats to populations or habitats)	
Overharvesting off West Greenland	
Rescue Effect (immigration from an outside source)	
Status of outside population(s)? Not at Risk to Endangered	
• *Is immigration known or possible?*	Yes
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	Yes
• *Is rescue from outside populations likely?*	Not very
Quantitative Analysis	Not applicable
Other Status **COSEWIC: Special Concern, April 1992**	

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

Reasons for Designation:
The population overwinters in Baffin Bay and west Greenland and may consist of two distinct populations. It is heavily hunted in west Greenland. However, most of the population winters in Baffin Bay and the High Arctic where it is not hunted. Hunting pressure in Canadian waters is low in summer.

Applicability of Criteria

Criterion A (Declining Total Population): might qualify for Threatened A2d or A3d as inferred from recent estimate of High Arctic summering population (21,213 animals), and catches, mainly off west Greenland (650-941 per year) in winter. The part of the population off West Greenland declined about 50% between 1981-1994, roughly one generation, suggesting an approximate 7/8 decline over three generations; as the West Greenland wintering animals number about 15% of the current population, this suggests a decline of [1-1/(0.85 +8x0.15)]x100=51% decline over three generations. Alternatively, the catch (roughly 795.5 off west Greenland and <100 in Canada, plus struck and lost animals) constitutes about 4.2% of the population per year (895.5/21,213), an excess of 1.2% over the median postulated maximum potential rate of increase (3% per year). A decline of 1.2%/year over 42 years (3 generations) is 40%. Both of these calculations make questionable assumptions (about the effects of past and future catches respectively).

Criterion B (Small Distribution, and Decline or Fluctuation): no

Criterion C (Small Total Population Size and Decline): no

Criterion D (Very Small Population or Restricted Distribution): no

Criterion E (Quantitative Analysis): no

TECHNICAL SUMMARY: CUMBERLAND SOUND POPULATION

Extent and Area Information	
• *Extent of occurrence (EO)(km²)*	27,000 km² (approx.)
• *Specify trend in EO*	Stable
• *Are there extreme fluctuations in EO?*	No
• *Area of occupancy (AO) (km²)*	9,000 km²
• *Specify trend in AO*	Stable
• *Are there extreme fluctuations in AO?*	No
• *Number of known or inferred current locations*	Not applicable
• *Specify trend in #*	Not applicable
• *Are there extreme fluctuations in number of locations?*	No
• *Specify trend in area, extent or quality of habitat*	Stable
Population Information	
• *Generation time (average age of parents in the population)*	14 years
• *Number of mature individuals*	928 (60%x1,547)
• *Total population trend:*	Stable
• *% decline over the last/next 10 years or 3 generations.*	
• *Are there extreme fluctuations in number of mature individuals?*	No
• *Is the total population severely fragmented?*	No
• *Specify trend in number of populations*	Not applicable
• *Are there extreme fluctuations in number of populations?*	Not applicable
Threats (actual or imminent threats to populations or habitats)	
Overexploitation, noise disturbance	
Rescue Effect (immigration from an outside source)	
Status of outside population(s)? Not at Risk to Endangered	
• *Is immigration known or possible?*	Yes
• *Would immigrants be adapted to survive in Canada?*	Yes
• *Is there sufficient habitat for immigrants in Canada?*	Yes
• *Is rescue from outside populations likely?*	Not very
Quantitative Analysis	Model exists but does not predict extinction at current
Other Status **COSEWIC: Endangered, April 1990.**	

Status and Reasons for Designation

Status: Threatened **Alpha-numeric code:** D1

Reasons for Designation:
Numbers of belugas using Cumberland Sound have declined by about 1500 individuals between the 1920s and present. The population decline is believed to have been caused by hunting by the Hudson Bay Company into the 1940s and by the Inuit until 1979. Hunting has been regulated since the 1980s. Current quotas (41 in 2003) appear to be sustainable. Concerns have been raised about increased small vessel traffic and the associated noise of outboard motors, as well as fishery removals of Greenland halibut, a food of belugas.

Applicability of Criteria

Criterion A (Declining Total Population): no decline since 1960.

Criterion B (Small Distribution, and Decline or Fluctuation): no.

Criterion C (Small Total Population Size and Decline): no.

Criterion D (Very Small Population or Restricted Distribution): Threatened under D!, less than 1,000 mature individuals.

Criterion E (Quantitative Analysis): Model exists but does not predict extinction at current harvest levels.

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