



# Northern Quebec (Nunavik) Beluga (*Delphinapterus leucas*)

## Background

*Beluga* whales are found in summer along the Hudson Bay coast, in James Bay and in Ungava Bay. The majority of the animals from all areas are thought to overwinter together in Hudson Strait. At least three separate stocks of beluga have been identified (Ungava Bay Beluga, Eastern Hudson Bay Beluga and Western Hudson Bay Beluga); each stock recognised by the tendency of beluga to home in summer at a particular estuary or group of estuaries. COSEWIC accepted this separation of stocks. In 1988, the Ungava Bay stock of Beluga were classified as endangered, while the eastern Hudson Bay stock was identified as threatened (Reeves and Mitchell 1989).

*In addition to the traditional subsistence hunt commercial hunts operated in Ungava Bay from the 1860's until the early 1900's and removed at least 1,340 animals. The numbers of beluga killed appear to have declined owing to depletion of the stock. Commercial hunting at the Little Whale and Great Whale Rivers, in eastern Hudson Bay removed an estimated 8,294 animals between 1854 and 1868. Commercial hunting continued at Great Whale River until at least 1877, but apparently ended owing to depletion of the stock.*

*The beluga hunt in northern Quebec has been regulated by a five-year management plan, which regulates harvests through a combination of area closures, controlled seasons and village quotas. The current plan ends in March 2001. The intention of this report is to provide scientific advice on northern Quebec beluga for the new management plan to be implemented in 2001.*

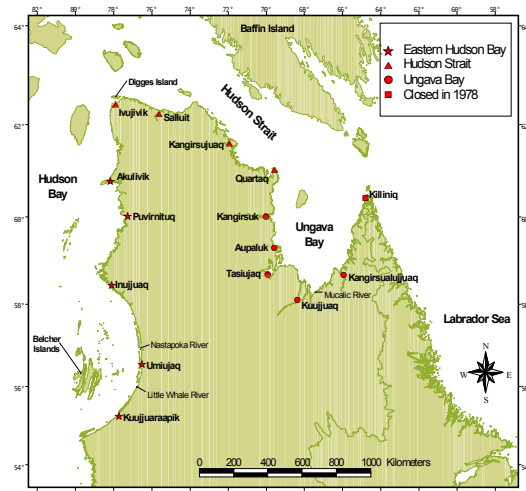


Figure 1. Map of communities in northern Quebec (Nunavik)

## Summary

- Aerial surveys flown in 1993 provided a visible abundance estimate (uncorrected for diving) of 1,000 (SE=400) in eastern Hudson Bay (EHB), and 3,100 (SE=800) whales in James Bay. Too few whales were seen in Ungava Bay to provide a survey estimate, but numbers are likely less than 200 animals. Beluga whales in western Hudson Bay have not been surveyed since the 1980s. These surveys provided a visible abundance estimate of 23,000 animals. Beluga whales were also seen in northern Hudson Bay (N=700), and along the Ontario coast of Hudson Bay (N=1,300). The stock relationships of beluga in the Hudson Bay-James Bay-Ungava Bay complex are poorly understood.
- A 5-year management plan limited harvesting of beluga whales to a total of 240 whales per year. However, reported harvests consistently exceeded this total ranging between 267 and 302 belugas per year.

- There is considerable uncertainty associated with current abundance, the rate of increase of the population, factors associated with correcting survey estimates to account for animals below the surface, and the fraction of the harvest in the different communities made up of animals that belong to the different beluga stocks.
- In spite of these uncertainties, the EHB beluga population has likely declined from 2,200 (95% C.I. 1,900-2,600) whales in 1985 to 1,400 (95% C.I. 500-2,300) in 2000. Current levels of harvesting of the eastern Hudson Bay population are likely not sustainable.
- Harvesting of eastern Hudson Bay animals, particularly at the estuaries should be reduced substantially.
- New abundance estimates are needed along with information on the stock composition of the harvest, the relationship of beluga in James Bay to the other beluga stocks in Hudson Bay-Hudson Strait-Ungava Bay complex

### ***Species biology***

Beluga whales have a circumpolar distribution. They are a medium-sized toothed whale with an adult length of 350 cm. The calves are born after a 14 month gestation and lactation lasts for roughly 18 months. The calving interval is one calf every 3 years. At birth, the calves have been described by different authors as being brown or dark bluish in colour. As they mature the skin becomes lighter in colour gradually turning to grey then to white. Beluga are sexually mature between 4 and 7 years of age. At this time some animals may still be grey in colour. In the EHB population 57% of the light grey animals may be sexually mature.

Beluga lack a dorsal fin, which is believed to be an adaptation to inhabiting ice covered

waters. They are often associated with estuaries, which has led to the view that they are a shallow water species. However, aerial surveys and satellite telemetry indicate substantial movements offshore and diving to depths of over 600 m.

### ***The Hunt***

Harvest statistics are available since 1974. These statistics represent minimum estimates only, since not all villages provided catch data in all years and information on the number of animals struck and lost is incomplete. During the 12 year period 1974-1985, a total of 4,808 whales (average=401 whales/yr) was reported to have been taken. Catches declined beginning in 1978 in Ungava Bay, Hudson Strait and Hudson Bay villages. A management plan to reduce harvesting was introduced in 1986, and reported catches declined to a total of 2,255 (average =225/yr) during the period 1986-95. In 1996, a 5 year management plan was introduced. This plan limited harvesting to 240 animals per year for the Nunavik region. A quota of 90 animals was allocated to villages along the eastern Hudson Bay coast (18 per village), 100 animals to the four villages in Hudson Strait and 50 animals to communities in Ungava Bay. Hunters were to direct harvesting away from young animals or females with calves and towards large males. Hunters in Ungava Bay were encouraged to take animals outside of the bay. Total harvests during the current plan have been 1,424 animals for an average of 285 whales per year. (Table 1). Prior to 1996, hunters in eastern Hudson Bay took most of their animals near their community or from the Nastapoka, and Little Whale Rivers and Richmond Gulf. Under the current management plan, the communities of Akulivik and Puvirnituk have shifted their hunting effort to the Hudson Strait area near Ivujivik. Depending on the region, grey beluga (<7 years old)

represented 46 to 51% of harvests, and females, 47 to 60% of

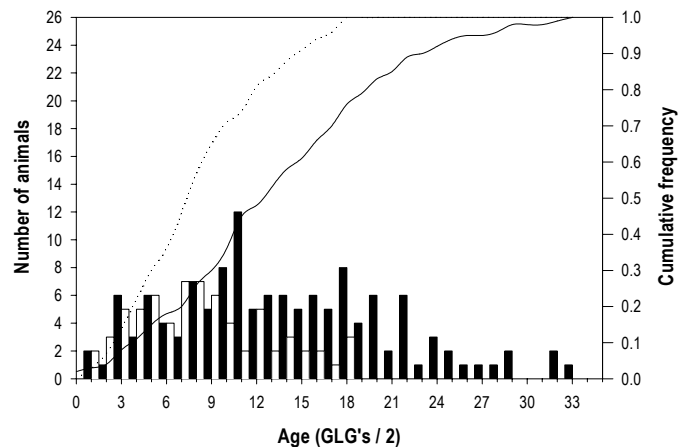
**Table 1.** Beluga harvest statistics for Nunavik villages from 1984-2000 (Lesage et al. 2001).

YEAR	96	97	98	99	2000
Kuujuarapik	15	11	14	14	8
Umiujaq	19	19	18	24	19*
Inukjuak	22	21	18	19	35
Puvirnituk	38	33	36	27	29
Akulivik	15	24	17	22	12
Eastern Hudson Bay total	109	108	103	106	103
Ivujivik	34	22	44	37	36
Salluit	32	46	54	33	28
Kangiksujuaq	25	25	22	27	26
Quaqtaq	23	31	32	24	26
Hudson Strait total	114	124	152	121	116
Kangirsuk	16	16	13	19	12
Aupaluk	8	8	4	13	8
Tasiujaq	6	14	17	21	13
Kuujuak	5	13	10	8	7
Kangiksualujjuaq	9	7	3	7	11
Ungava Bay total	44	58	47	68	51
Nunavik total	267	290	302	295	258

catches during 1993–2000. The proportion of white males (23–30%) in harvests was near the percentage expected if animals were taken at random (*i.e.* 25%) during 1995–2000. A comparison between the 1980s and the 1990s of the age frequency distributions of beluga harvested in eastern Hudson Bay, indicates a statistically significant change in the age composition of the harvest. During 1980–1987, the median age of beluga taken by the Nunavik villages in eastern Hudson Bay was 13.0 (N=132),

which is much older than the median age of 8.0 (N=69) for animals harvested during the 1990s (Fig. 2). A characteristic of beluga is an increase in wear of the teeth as the animals become older. This leads to an underestimate of the true age among older animals. During the 1980s, 48% of the teeth from harvested animals were worn. This proportion declined to 28% of the teeth from animals harvested during the 1990s.

**Figure 2.** Age of beluga harvested in Eastern Hudson Bay during 1980, 1983–1987 (black bars and plain curve and 1993–1999 (clear bars and dotted curve), presented as age frequencies (bars) and cumulative frequencies (curves).



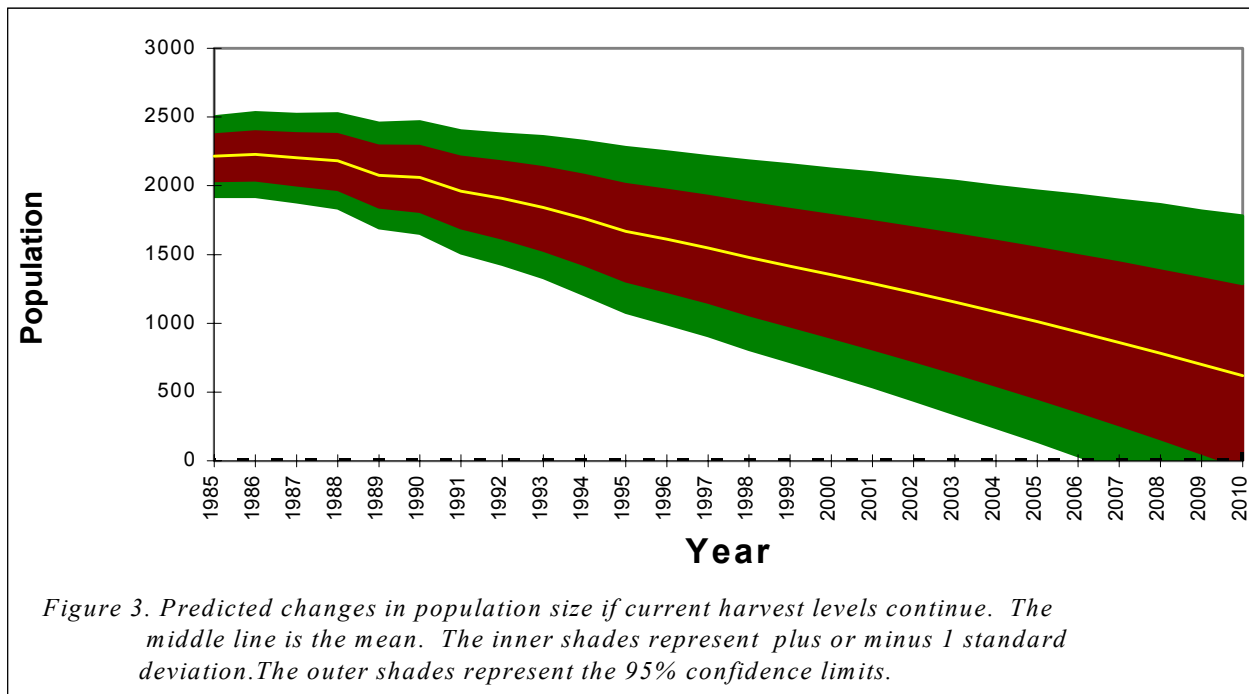
**Resource User Perspective**

Beluga are considered as an important food resource by Inuit in northern Quebec. There is community concern regarding contaminants and disease agents that could affect the health of belugas or their human consumers. Other global issues of concern, include climate change and the resultant changes in sea ice, which might affect whale movements, their foods and hunter access to whales. During community consultations concerns were also expressed about the increase in vessel traffic, from both small boats and large ships, the resulting noise pollution and how this noise might disturb beluga, particularly in nearshore areas.

Concerning beluga whale abundance, there were a wide range of opinions. Some people indicated that there has been no change in numbers of animals, or that more animals are seen now than before. Several people expressed concern that fewer animals were seen now than many years ago. However, it is not clear whether changes in sightings are a result of a reduction in beluga abundance or animals have moved elsewhere due to noise pollution.

Beluga in northern Quebec have been managed under a five year management plan. This plan was considered by resource users to be too long and unwieldy. In response, a multi-year plan outlining management and science objectives has been proposed, with quotas to be established annually.

maternally inherited “haplotypes” and also with 15 nuclear microsatellite loci in which alleles at each locus are inherited from both parents. The molecular genetics of 100 belugas from Sanikiluaq, a community located in the Belcher Islands (Fig. 1), 126 from villages in EHB, 137 from northern Quebec and Hudson Strait, and hundreds from other locations in the Arctic have been examined. Results support the hypothesis that most belugas hunted in EHB and Sanikiluaq are from different stocks. Belugas from the Nastapoka River (1984-1985) and from the EHB arc (1990s) are characterized by high proportions of two haplotypes which are uncommon in other areas. Belugas hunted near Sanikiluaq (1993-1997) are different from EHB beluga and may represent a different stock which also differs from other western Hudson Bay populations that have been examined.



**Resource Status**

Two genetic techniques have been used for stock delineation. Individuals and populations were characterized with a mitochondrial DNA (mtDNA) d-loop sequence of 324 base pairs which described

Genetic results from both EHB and Sanikiluaq (Belcher Islands) were consistent over the years that they were sampled. Approximately 10% of belugas hunted from Sanikiluaq have EHB genotypes, and 16% of belugas hunted in the EHB arc have genotypes that resemble western

populations. Belugas hunted in Hudson Strait villages have a high genetic diversity, confirming that several stocks are hunted here. It is estimated that Hudson Strait villages hunt approximately 30% EHB belugas, but sample sizes are still quite low.

Visual strip transect surveys completed in 1985, were used to estimate a visible population rounded to the nearest 100, of 1,200 (SE=300) in James Bay, and 1,000 animals (SE=200) in eastern Hudson Bay. Numbers of animals seen in Ungava Bay were too few to provide an estimate for this area (Smith and Hammill 1986). A second series of aerial surveys flew the same transect lines in August 1993, but used line-transect techniques instead of strip-transect methods (Kingsley 2000). The estimated visible population was 3,300 belugas (SE=800) in James Bay, and 1,000 animals (SE=400) in eastern Hudson Bay. Again, too few animals were seen in Ungava Bay to estimate population size, but numbers were likely less than 200 animals. No recent estimates of abundance for beluga in western Hudson Bay are available, but surveys flown in the 1980's suggested that numbers were greater than 23,000 animals.

Correction factors are required to estimate total population size. These correction factors account for animals under the water, and consequently not visible, when the survey plane passes overhead. The survey platform, animal behaviour, water turbidity, and the ranges at which sightings occur will affect these factors. Correction factors derived from satellite telemetry vary between 1.42 in the High Arctic, and 5.0 for surveys conducted during the fall when animals spend less time at the surface. A factor of 1.66 (SE=0.12) has been suggested for Hudson Bay. In the St Lawrence estuary a study using aerial observations of anchored models and overflights of individual animals estimated a correction

factor of 2.09 (SE=0.16).

Information on abundance from the aerial surveys, factors to correct aerial survey estimates for animals under the water, harvest data and the proportion of EHB animals in the harvest were incorporated into a population model to describe changes in the population since 1985 (Fig. 3). Beluga in eastern Hudson Bay have likely declined from 2,200 (95% C.I. 1,900-2,600) animals in 1985 to 1,400 (95% C.I. 500-2,300) in 2000. If current levels of harvesting continue then this population could disappear in the next 10-15 years.

### *Sources of uncertainty*

There is a considerable amount of uncertainty associated with the available data. Abundance estimates for this stock are limited to two aerial surveys, flown eight years apart, which used the same transect lines, but applied different survey techniques. The most recent survey was flown in 1993.

The aerial surveys indicate that a considerable proportion of the surveyed beluga population are found offshore and that some animals are located near Sanikiluaq. However, most animals harvested in the Sanikiluaq area do not belong to the eastern Hudson Bay stock. This would indicate that the aerial survey estimates include animals from more than one beluga stock. If this is the case, then it suggests that the eastern Hudson Bay beluga stock is smaller than originally thought.

Data on the appropriate correction factor to apply to aerial survey estimates to account for animals not visible at the surface are limited and have not been thoroughly reviewed. In this analysis an estimate of 2.09 (SE=0.16), developed for beluga in the St Lawrence estuary was used.

Communities north of the Hudson Bay arc and in Hudson Strait are hunting beluga from both the small EHB stock and the large western Hudson Bay stock. A sensitivity analysis showed that changes in the percentage of EHB animals had a major impact on predictions of changes in the population trends. Initial estimates from genetic analyses indicate that about 30% of the beluga harvested by northeastern Hudson Bay and Hudson Strait communities may be from the EHB stock, but these are based on small sample sizes. More information on the stock composition of the harvest is needed from the Hudson Strait communities in order to assess the impact of hunting on the EHB population.

Owing to the lack of a time series of estimates of beluga abundance and the absence of information on rates of increase, values for  $r_{\max}$  from other toothed whale species were used during model simulations. These provided a range of possible rates of increase, but obviously contributed to uncertainty about how population size may have changed over time.

Harvest statistics are available since the 1970's. However, it is not possible to assess the degree of non-reporting of struck whales. Furthermore, although few animals harvested in estuaries may be lost due to a tradition of first harpooning animals, harvests from the Hudson Strait area occur in more open water, where animals are not always harpooned first. Struck and loss data for beluga are limited, but for narwhal in some areas, the number of animals struck and lost may approach 50%. There is no information on the number of belugas that are struck and loss in northern Quebec. This lack of information increases the uncertainty of total removals from the population.

### ***Outlook***

If current levels of harvesting continue then the EHB population could disappear in the next 10-15 years. To halt the apparent decline harvesting of EHB beluga should be reduced substantially. A reduction in total removals from this population to 40 animals per year is sustainable. However, a reduction in total removals to 20 animals per year would probably allow the population to increase and is recommended owing to uncertainties in model parameters. These recommendations are for total removals. The incorporation of a factor for struck and loss would result in a lower quotas being assigned to each village.

Northern Quebec beluga have been managed under a 5-year management plan. Beluga in Ungava Bay were classified as endangered. The low potential for growth of beluga populations means that it is unlikely that this population has increased. Therefore, current management requirements that hunting occur outside of the Bay should continue. A reduction in harvesting on the EHB population is needed if this stock is not to decline further. Reducing harvests at the Nastapoka and Little Whale Rivers, including the possibility of closure to hunting is recommended. However, if current overharvesting is to be reduced, the management plan will need the support of the harvesters along with appropriate enforcement.

### ***Other considerations***

There is an urgent need for information on the abundance, and stock structure of beluga along the Hudson Bay coast and in James Bay. A biological sampling program aimed at understanding the stock composition of the Nunavik harvest should be maintained. Efforts should be expanded to improve the documentation of harvesting in the Hudson Strait area.

Information on abundance of western Hudson Bay dates from the 1980s. If harvesting of this stock by Nunavik hunters is being encouraged, an update on WHB beluga population abundance is needed.

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