



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 in Hudson Strait. At least three separate populations of beluga have been identified (Ungava Bay Beluga, Eastern Hudson Bay Beluga and Western Hudson Bay Beluga); each population recognised by the tendency of beluga to home in summer at a particular estuary or group of estuaries. In 1988, the Ungava Bay population of Beluga were classified as endangered, while the eastern Hudson Bay (EHB) population was identified as threatened (Reeves and Mitchell 1989).

In addition to the traditional subsistence hunt commercial hunts in Ungava Bay removed at least 1,340 animals between the 1860's until the early 1900's. The numbers of beluga killed appear to have declined owing to depletion of the population. 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 population. Current subsistence hunting is directed towards both resident populations in summer and also migrating whales from a mixture of populations during spring and fall.

The beluga hunt in northern Quebec is regulated by a three-year management plan, which allows for annual adjustment of quotas upon availability of new scientific information. Harvesting is regulated through a combination of area closures, controlled seasons and village quotas. The intention of this report is to provide scientific advice on northern Quebec beluga for 2002.

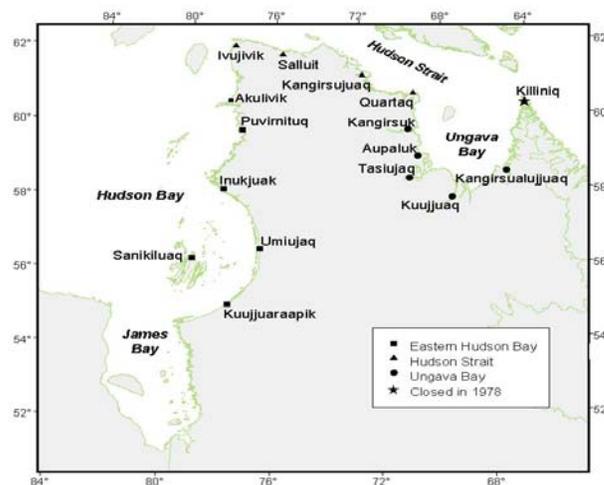


Figure 1. Map of communities in northern Quebec (Nunavik).

Summary

- Aerial surveys flown in 2001 provided a visible abundance estimate (uncorrected for diving) of 1,200 (SE=500) in Eastern Hudson Bay (EHB), and 7,900 (SE=1,700) in James Bay. This compares to 1,000 (SE=400) in EHB, and 3,100 (SE=800) whales in James Bay in 1993. Too few whales were seen in Ungava Bay during both surveys to provide a population estimate, but numbers are likely less than 200 animals. Another survey flew the same lines in 1985. In this survey, there were an estimated 1,000 (SE=200) whales in EHB, and 1,200 (SE=300) in James Bay. No estimate was possible for Ungava Bay because no animals were seen on transect. Beluga whales in western Hudson Bay (N=25,000) have not been surveyed since the 1980s.
- A 5-year (1996-2000) 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 beluga per year.
- A new management plan was implemented for the 2001 hunting season and recommended a total harvest of 370 beluga. In Eastern Hudson Bay the quota was 30 animals that could be harvested in EHB. An additional 30 animals could be harvested from James Bay and 65 animals could be taken in Hudson Strait. For the Hudson Strait communities, the quota was set at 30 animals per community. Communities in Ungava Bay were assigned a quota of 25 animals per village, but this was to be harvested outside of Ungava Bay. In 2001, the total reported harvest was 395 whales.
- In spite of the uncertainty associated with the interpretation of the available data, the EHB beluga population has likely declined from 4,000 (SE=300) whales in 1985 to 2,000 (SE=600) in 2001. If current levels of harvesting continue (>140 EHB beluga killed in 2001), then this population could disappear in the next 10-15 years.
- It is recommended that no harvesting of beluga occur in Ungava Bay. Harvesting of eastern Hudson Bay animals, particularly at the estuaries should be reduced substantially.
- More information is needed on the relationship of beluga in James Bay to the other beluga populations 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 and weigh up to 500-600 kg. Mating is thought to occur in March-April, with calving occurring in mid-summer. The calves are born after a 14 month gestation and lactation lasts for roughly 18 months. The calving interval is one calf every three years. At birth, the calves have been described by different authors as being

brown or dark bluish in color. As they mature, the skin becomes lighter in colour gradually turning to grey and then to white. Female beluga are sexually mature between 4 and 7 years of age assuming two growth layer groups (GLGs) in teeth per year. In the EHB population, 57% of the light grey animals may be sexually mature. Beluga have a lifespan of about 30 years but maximum lifespan is difficult to determine owing to wearing of the teeth.

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 5,402 whales (average=450 whales/yr) was reported to have been taken.

Reported 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 2,327 (average =233/yr) beluga 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 that period (1996-2000) were 1,424 animals for an average of 285 whales per year (Table 1). Prior to 1996, hunters in EHB took most of their animals near their community or from the Nastapoka, and Little Whale Rivers and Richmond Gulf.

Under the 2001 management plan, a global quota of 125 animals was allocated to the EHB communities, 120 beluga for the Hudson Strait communities, and 125 beluga for the Ungava Bay communities. In EHB, only 30 animals were to be harvested in that area, 30 animals were allowed to be taken from James Bay, and the remaining 65 animals were to be taken from Hudson Strait. The Ungava Bay communities were to harvest their animals outside of Ungava Bay.

During 2001, the quota was exceeded in all areas with a total harvest of 395 animals reported taken. This total included 140 animals harvested by EHB villages, 164 beluga by Hudson Strait communities and 91 whales reported taken by Ungava Bay communities. Some of the harvest by these communities occurred inside Ungava Bay. Taking into account that 22% of the Hudson Strait harvest and 31% of the Ungava Bay harvest consisted of EHB animals, an estimated 140 animals were removed from the EHB beluga population.

Table 1. Minimum beluga harvest statistics for Nunavik villages from 1996-2000.

YEAR	96	97	98	99	2000	2001
Kuujuarapik	15	11	14	14	8	15
Umiujaq	19	19	18	24	19*	17
Inukjuak	22	21	18	19	35	25
Puvirnituq	38	33	36	27	29	50
Akulivik	15	24	17	22	12	33
E. Hudson Bay total	109	108	103	106	103	140
Ivujivik	34	22	44	37	36	13
Salluit	32	46	54	33	28	57
Kangiksujuaq	25	25	22	27	26	34
Quaqtaq	23	31	32	24	26	60
Hudson Strait total	114	124	152	121	116	164
Kangirsuk	16	16	13	19	12	24
Aupaluk	8	8	4	13	8	7
Tasiujaq	6	14	17	21	13	23
Kuujjuak	5	13	10	8	7	20
Kangiksualujjuaq	9	7	3	7	11	17
Ungava Bay total	44	58	47	68	51	91
Nunavik total	267	290	302	295	270	395

Resource User Perspective

The Inuit in northern Quebec consider beluga an important food resource. There is concern regarding contaminants and disease agents that could affect the health of beluga 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. Community consultations raised concerns about the increase in numbers of both small boats and large ships, and how increasing noise might disturb beluga, particularly in nearshore areas.

A wide range of concerns have been expressed about beluga whale abundance. Some people have difficulty understanding and accepting survey estimates, since they have seen large numbers of whales in areas where only small numbers of whales have been seen during the survey period. Several people expressed concern that they were

seeing fewer animals than in the past. However, it is not clear whether changes in sightings are a result of a reduction in beluga abundance, or animals have moving elsewhere. Some hunters from communities in EHB have also indicated that there are fewer whales today than during previous years due to high harvest levels. However, other community representatives (particularly in Hudson Strait) feel very strongly that beluga are abundant.

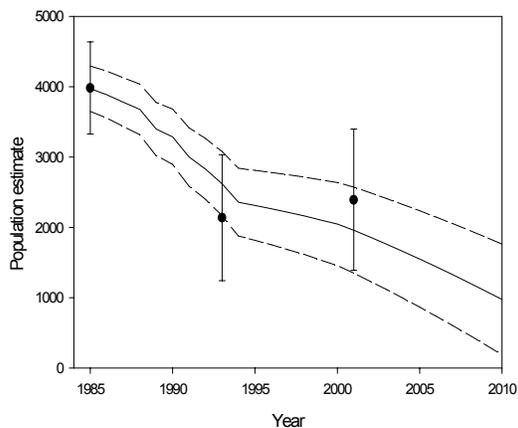


Figure 2. Aerial survey estimates (Mean \pm SE) conducted in 1985, 1993 and 2001, corrected for diving animals and modelled changes in abundance of EHB beluga from the population model assuming a harvest of 140 EHB beluga each year from 2002 onward.

Beluga in northern Quebec were 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 was agreed upon, with quotas to be established annually upon presentation of new scientific information.

Resource Status

Beluga in the waters adjoining northern Quebec were originally separated into different populations based on the summer distribution of animals. Beluga that summer in Ungava Bay, along the eastern Hudson Bay coast, and the western Hudson Bay

coast have been recognized as separate populations. Genetic analyses have supported the principal of eastern and western Hudson Bay beluga belonging to two separate stocks, while samples have yet to be obtained and analysed from beluga that summer in Ungava Bay and James Bay.

Two genetic techniques have been used to delineate beluga for populations. Individuals and populations were characterized with a mitochondrial DNA (mtDNA) d-loop sequence of 324 base pairs that described maternally inherited “haplotypes” and also with 15 nuclear microsatellite loci in which alleles at each locus are inherited from both parents.

The molecular genetics results support the hypothesis that most beluga hunted in EHB and Sanikiluaq are animals belonging to two different populations. Beluga from the Nastapoka River (1984-1985) and from the EHB arc (1990s) have high proportions of two haplotypes, which are uncommon in other areas. Beluga hunted near Sanikiluaq (1993-1997) are different from EHB beluga and may represent a different population, which also differs from other western Hudson Bay populations that have been examined. Genetic results from both EHB and Sanikiluaq (Belcher Islands) were consistent over the years that beluga were sampled.

Approximately 13% of beluga hunted from Sanikiluaq have EHB haplotypes, and 10% of beluga hunted in the EHB arc have genotypes that resemble western populations. Beluga hunted in Hudson Strait villages have a high genetic diversity, confirming that several populations are hunted here. It is estimated that 22% of the Hudson Strait villages harvest and 31% of the Ungava Bay harvest comprise EHB animals.

Visual systematic transect aerial surveys to evaluate beluga abundance in James Bay, EHB and Ungava Bay were completed in 1985, 1993 and 2001. All surveys have

been flown along the same transect lines to ease comparisons between years.

In James Bay, the 1985 survey produced an estimate of 1,200 (SE=300) animals (rounded to the nearest 100). When corrected to be comparable to the line-transect surveys flown in 1993 and 2001, the 1,200 estimate is revised upwards to 1,800 beluga. Higher estimates of 3,100 beluga (SE=800) and 7,900 beluga (SE=1,700) were obtained from the 1993 and 2001 surveys respectively. These changes observed in the estimated number of animals present in James Bay are too great to be accounted for by population growth alone. However, the movement of whales between James Bay and the Ontario coast of Hudson Bay could be sufficient to account for some of the observed changes.

In EHB, the 1985 aerial survey estimated a total visible population of 1,000 animals (SE=200). When corrected to be comparable to the line-transect surveys flown in 1993 and 2001, the estimate is revised upwards to 1,600 beluga in EHB. Adding in animals seen in estuaries, the total number of animals visible was estimated to be 2,100. In 1993, an estimated 1,000 (SE=400) beluga were visible during the offshore survey. Few animals were seen in the estuaries. Adding in these animals results in a total population estimate of 1,000 (SE=400). In 2001, an estimated 1,200 (SE=500) beluga were present in the offshore survey. Including estuary counts, results in a total visible population estimate of 1,200 (SE=500).

In Ungava Bay, visual transect surveys were flown in 1985, 1993 (two surveys) and in 2001. No beluga were seen along the transect lines in any of these surveys. Given the current survey design it is unlikely that any beluga would be detected along the lines if the visible population was 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 around 25,000 animals.

The number of beluga counted from the air must be adjusted to account for animals that were diving below the surface. This is done by multiplying the actual counts by a correction factor to determine the true population size. The survey platform, animal behaviour, water turbidity, and the ranges at which sightings occur will affect this correction factor. Satellite telemetry studies of eastern Hudson Bay animals indicate that 54-59% of individuals are near the surface. A third estimate of 48% was calculated from a helicopter hovering over diving animals in the St Lawrence Estuary. The primary analyses were completed using the third (48%) correction factor because this factor was specifically developed with aerial surveys in mind and water conditions (clarity) in the St. Lawrence are comparable to conditions encountered in the north. If the proportion of animals at the surface is actually greater than what we have used in our primary analysis, then the total population size would be smaller, and reported current harvest levels would cause the population to decline more quickly than predicted.

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 combined to predict changes in the population since 1985 (Fig. 2). Two mathematical approaches were used to fit changes in population size to the corrected aerial survey estimates for Eastern Hudson Bay. The first model optimized the value for the natural rate of increase and harvest levels to estimate population changes. The second incorporated age and sex specific reproductive rates, survival rates and age composition of numbers killed into the model structure. An age structured model is normally considered to be more powerful, but there is not enough information available at this time to develop this model further (only three abundance estimates, no

data on age structure of the population, limited data on age structure of the harvest). Therefore, the simple model was used to describe the population change and impacts of harvesting.

Fitting the model to the population survey data and taking into account reported harvests, beluga in eastern Hudson Bay have likely declined from an estimated population of 3,800 (SE=300) animals in 1985 to 2,100 (SE=600) in 2001.

There is some other evidence indicating that the EHB beluga population has declined. 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 years (N=132), which is much older than the median age of 8.75 years (N=108) for animals harvested during the 1990s (Fig. 3).

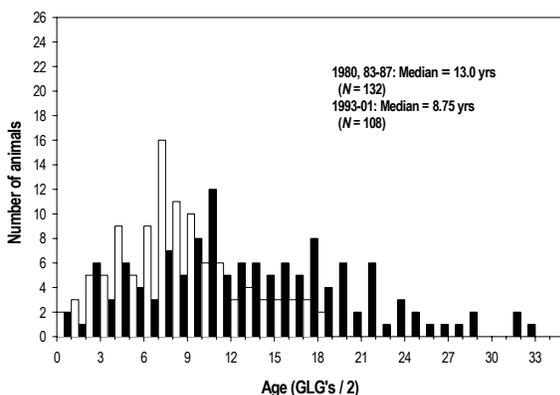


Figure 3. Age distribution of beluga harvested in Eastern Hudson Bay during the 1980s (solid bars) and since 1993 (open bar).

A characteristic of beluga is an increase in wear of the teeth as the animals become older. The proportion of worn teeth in the population provides another measure of the age structure. During the 1980s, 48% of the teeth from harvested animals were worn.

This proportion declined to 32% of the teeth from animals harvested during the 1990s.

Sources of uncertainty

Available data on exploitation and abundance of this stock is neither unbiased nor sufficiently comprehensive to yield precise estimates. There is a lack of data on vital rates, which limits opportunities to model the dynamics of this population. Abundance estimates for this population are limited to three aerial surveys, flown at eight year intervals (1985, 1993, and 2001). These surveys used the same transect lines, but different survey techniques. A correction factor was applied to the 1985 surveys to allow for comparison with the 1993 and 2001 data. Another correction factor was applied to the aerial survey data to correct for animals that were diving when the survey plane passed overhead. Estimates of total population size are very sensitive to the size and variability associated with this factor, but only limited work has been done to develop such correction factors. There is some evidence that the correction factor might be lower than what we have used. This results in a smaller population and would indicate that harvests are having a greater impact on the population than estimated.

Beluga harvested in the community of Sanikiluaq are of mixed origin. However, it is not possible using aerial survey techniques to determine the proportion of animals in the offshore regions that belong to the EHB population or the western Hudson Bay population.

Communities north of the Hudson Bay arc and in Hudson Strait are hunting beluga from both the small EHB population and the large western Hudson Bay population. Initial estimates from genetic analyses indicate that about 22% of the beluga harvested by northeastern Hudson Bay and Hudson Strait communities may be from the EHB population, but these are based on small sample sizes. More information on the population composition of the harvest is needed from the Hudson Strait communities

in order to assess the impact of these hunts on the EHB population.

The maximum rate of increase is not known for northern Quebec beluga. It may be between 2-4% based on studies of other species of small whales. Such uncertainty has a bearing on our predictions about future population trends.

Harvest statistics have been gathered since the 1970's. However, there is considerable uncertainty about non-reporting of harvests and on the number of animals that are struck and lost. Levels of non-reporting may have been particularly high between 1985 and 1995. Currently, 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%.

Outlook

The current information supports the 2001 findings that the EHB population has declined since the 1980's and that current harvests are not sustainable. In light of these findings, it is evident that harvest from 2001 were much too high.

If current levels of harvesting continue (>140 beluga killed from the EHB population in 2001), then this population could disappear in the next 10-15 years. A reduction in total removals from this population to 40 animals per year would be sustainable, but probably would not allow any growth of the population from current depleted levels. A harvest of ≤ 20 animals would allow the population to increase. This more conservative harvest is recommended owing to uncertainties about the status of this population. These recommendations are for total removals.

A reduction in harvesting on the EHB population is needed if this population is not to decline further. Reducing harvests at the Nastapoka and Little Whale Rivers, including the possibility of closure to hunting is recommended.

Beluga in Ungava Bay are classified as endangered. It is recommended that no harvesting of beluga occurs in Ungava Bay.

However, if current overharvesting is to be reduced, management measures will need the support of the harvesters along with appropriate enforcement.

Other considerations

There is an urgent need for additional information on the abundance, and population structure of beluga in Ungava Bay, along the Hudson Bay coast and in James Bay. A regular population monitoring program would reduce the need to rely on accurate harvest data to monitor changes in population abundance. A biological sampling program aimed at understanding the population composition of the Nunavik harvest should be maintained and it is recommended that seized animals in Ungava Bay be sampled whenever possible to determine stock composition of animals from this area. 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. Any redirection of harvesting effort from Northern Quebec populations to adjacent populations should only be considered after the current status of the adjacent populations is reviewed.

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