Committee on the Status of Endangered Wildlife in Canada

Comité sur le statut des espèces menacées de disparition au Canada

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STATUS REPORT ON THE BELUGA WHALE (WESTERN HUDSON BAY POPULATION) DELPHINAPTERUS LEUCAS IN CANADA

BY

P.R. RICHARD

STATUS ASSIGNED IN 1993
NO DESIGNATION REQUIRED

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Status Of The Beluga, *Delphinapterus leucas*, In Western And Southern Hudson Bay.

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Richard, P.R. 1993. Status of the Beluga, *Delphinapterus leucas*, in western and southern Hudson Bay. Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Canadian Wildlife Service, Ottawa, Ontario.

In mid-July, the western Hudson Bay Beluga stock ranges in coastal waters from Eskimo Point to the Ontario border with concentrations at the estuaries of the Seal, Churchill and Nelson rivers. At the same time, another population of Belugas occupies southern Hudson Bay coastal waters with concentrations at the estuaries of the Severn and Winisk rivers. The relationships between the western Hudson Bay stock and other Hudson Bay summer populations are unclear. It is not known how many separate genetic stocks there are. Current annual removals from hunting and live-captures can be sustained by the western Hudson Bay stock; it is thought to be stable. The effect of hydro-electric development on the estuarine habitat of the stock is unknown. It is recommended that the western Hudson Bay Beluga not be placed in any COSEWIC category.

Durant la mi-juillet, la population de Bélugas de l'ouest de la baie d'Hudson occupe les eaux côtières situées entre Eskimo Point et la frontière de l'Ontario, formant des concentrations aux estuaires des rivières Seal, Churchill et Nelson. En même temps, une autre population de bélugas occupe les eaux côtières du sud de la baie d'Hudson, formant des concentrations aux estuaires des rivières Severn

et Winisk. Les liens entre le stock de l'ouest de la baie d'Hudson et les autres populations estivales de la baie d'Hudson ne sont pas clairs. Nous ne savons pas combien il y a de stocks génétiques distincts. Le stock de l'ouest de la baie d'Hudson peut soutenir les retraits annuels causés par la chasse et les captures. On en déduit que la population est stable. On ne connaît pas les effets qu'on pu avoir le développement hydro-électrique sur l'habitat estuarien de ce stock. On recommande que la population de Bélugas de l'ouest de la baie d'Hudson ne soit pas placée dans une catégorie du CSEMDC.

Key Words: Beluga, Belukha, White whale, *Delphinapterus leucas,* stock size and trend, western and southern Hudson Bay

The white whale, Beluga or Belukha, *Delphinapterus leucas* (Pallas, 1776) is an odontocete cetacean of the family Monodontidae. It has a blunt head, a slight beak, a fat stocky body (Figure 1) and lacks a dorsal fin. Young are slate or brown colored and become progressively lighter colored as they mature. Adults are generally pure white but their skin may appear a light shade of yellow in spring or early summer during the molt. Lack of a dorsal fin and presence of thick skin are characteristics of ice-adapted cetaceans shared by the Beluga.

There are differences in size and weight among Belugas of different geographical locations. Western Hudson Bay Belugas are small in comparison to other Canadian populations (Sergeant and Brodie 1969); female and male adults of age 10 years or more reach mean lengths of about 310 cm and 350 cm respectively and weight about 280-320 kg. Newborn calves average 150 cm and 60 kg.

Comparisons of length and girth at age indicate that western Hudson Bay Belugas are smaller than Belugas from Cumberland Sound and the high Arctic but not different from eastern Hudson Bay or Ungava Bay stocks (Sergeant and Brodie 1969; Finley et al. 1982;, Doidge 1990; Stewart 1994). The morphometric differences suggest that western Hudson Bay Belugas are a different genetic stock

than Cumberland Sound Belugas. There is no significant difference with the neighbouring stock of eastern Hudson Bay and no morphometric data from northern and southern Hudson Bay Belugas.

Several authors have argued that there is sufficient evidence and compelling conservation reasons to class populations of Belugas occupying different geographical locations in summer as separate management stocks (Finley et al. 1982; Reeves and Mitchell 1989a). The underlying assumption is that each stock is a discrete population of Belugas with little or no exchange of animals with other stocks. In this report, I will refer to geographically defined summer populations as stocks. The reader should bear in mind that the issue of stock discreteness of Hudson Bay and neighbouring populations is not clearly resolved, as discussed above and in later sections (see below Distribution, Behavior and Adaptation).

Distribution

Western Hudson Bay Belugas concentrate at the estuaries of the Seal, Churchill and Nelson rivers in July and August (Doan and Douglas 1953; Sergeant 1973). During July and August 1981, reconnaissance surveys along the coast of western Hudson Bay, Richard et al. (1990) found Belugas to be widely distributed between these estuaries. They were more abundant in July than in August. In July 1987, Belugas were observed throughout all survey transects from Eskimo Point to the Ontario border, and during one survey of the Nelson concentration, which extended as far as 110 km from the coast and 140 km from Port Nelson, Belugas were found throughout the surveyed area (Richard et al. 1990).

During similar reconnaissance surveys, also in July 1981 and 1987, Richard et al. (1990) found that Belugas occupied coastal areas of southern Hudson Bay. In July 1987, they counted a total of 1269 Belugas during a first transect flown approximately three km from shore. Most Belugas were concentrated near the estuaries of the Severn and Winisk rivers, but dispersed groups were seen all along the transect. Richard et al. (1990) saw a total of 30 Belugas on a transect 28 km offshore and parallel to the coast.

Belugas are regular summer occupants of southern Hudson Bay. Sergeant (1968) mentions "herds (of Belugas) extending at least to Winisk". Johnston (1961) mentions that "during summer months, the schools of Belugas move randomly along the coastline, with large concentrations centered along the bigger river mouths". He reports sightings of 100 Belugas at both the Severn and Winisk estuaries in July 1961. Belugas have been reported by local Indians before spring breakup at both the Severn and Winisk estuaries (Johnston 1961). Herds of 100 to 150 Belugas have been seen near the mouth of the Winisk River on 1 July 1979 and 25 June 1982 (K. F. Abraham, Ontario Ministry of Natural Resources [OMNR], Moosonee, Ontario; personal communication). The Cree report the occurrence of Belugas "in summer" at the mouth of the Severn River (Abraham, personal communication).

Other than western and southern Hudson Bay, Belugas are found throughout James Bay and are widespread from the Nastapoka coast in Northern Quebec to the Belcher Islands (Smith and Hammill 1986). The combination of the above Beluga observations in western, southern, and eastern Hudson Bay and James Bay is an unbroken distribution from west to east along the coasts of Hudson Bay and James Bay (Figure 2). A fourth summer stock occurs around Southampton Island, northern Hudson Bay, in July (Richard et al. 1990).

Winter survey results (Figure 3) indicate that Hudson Bay Belugas winter in Hudson Strait (Finley et al. 1982). Surveys in March 1981 (Finley et al. 1982) and 1983 (Richard et al. 1990) failed to find a large concentration in northern Hudson Bay, a hypothesized wintering area for the western Hudson Bay stock (Sergeant 1973). On the other hand, March 1981 surveys resulted in a very large number of sightings throughout the Hudson Strait pack ice, suggesting a winter population of the same magnitude as the western Hudson Bay summer stock (Finley et al. 1982).

Few Belugas winter in Hudson Bay (Figure 3). Local sources have reported occasional winter sightings at the floe edge of Daly Bay (G. Pryznick, Department of Fisheries and Oceans [DFO], Yellowknife, Northwest Territories; personal communication), Chesterfield Inlet (Sergeant 1973), Eskimo Point (Sergeant

1973), in Lyon Inlet and off Cape Bylot (65°20'N, 84°10'W), and northern Southampton Island (Richard, unpublished data). Belugas have also been seen in James Bay during winter months (Jonkel 1969), in Hudson Bay near the Belcher Islands (Breton et al. 1984) and in Roes Welcome Sound (Finley et al. 1982). The numbers reported are relatively small and suggest that only a small proportion of the Belugas that summer in Hudson Bay or James Bay also winter there.

The above observations show that mixing between neighbouring stocks is possible during summer and winter months. On the other hand, there is evidence from mitochondrial DNA analysis of skin tissue that most Belugas sampled at Eskimo Point and Churchill in western Hudson Bay belong to different maternal lineages than those of Belugas sampled at the Nastapoka River of eastern Hudson Bay (Helbig et al. 1989; Brennin 1992). These sampling locations are at the western and eastern extremes of the continuous summer range of Belugas described above (Figure 2). No genetic sampling has been done in other more central locations, such as the Nelson, Severn and Winisk estuaries. Sampling of these locations is needed to determine if the genetic types found at the extremes mix there or if they form other genetic types.

The potential for exchange is greatest in winter when most sub-arctic Belugas occupy a relatively small geographical area from northern Hudson Bay to southeast Davis Strait and the Labrador Sea. More importantly, mating is thought to occur in April or May (Brodie 1971; Sergeant 1973) while many Belugas are still in the winter range, which means that genetic mixing through cross-breeding could also take place.

Protection

International

Regulation of international trade between members of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and between non-members and Convention members, has been established by listing the Beluga (see Cetacea) under Appendix II of the Convention. The Convention came in effect in Canada in 1975. Between 1975 and 1993, a total of 53 live-captured

belugas, or an average 2.94 belugas per year, have been traded to other countries under a CITES permit.

National

Beluga management in Canada is conducted by the Department of Fisheries and Oceans (DFO) under the authority of the Fisheries Act of 1867 and the Marine Mammal Regulations of 1993 which provide for the protection of habitat, management of the species and control of the harvest.

The Marine Mammal Regulations limit Beluga hunting without a licence to the Indian and Inuit natives of Canada. A native resident of the Northwest Territories, Yukon, Quebec or Newfoundland may without a licence take Belugas for food, social or ceremonial purposes, and may buy, sell, trade or barter Belugas within these areas with other native residents. Exceptions are made for beneficiaries of native land claim agreements if the agreements contain specific terms limiting buying, selling, trading or bartering.

Non-native hunting is controlled by licences which can be issued to a person who wishes to obtain beluga for food. They may not buy, sell, trade or barter Beluga parts. Only two to five Belugas have been hunted annually by non-native residents of Churchill, Manitoba between 1973 and 1993.

The Marine Mammal Regulations also establish conditions that are to be met by all Beluga hunters. They state that no person shall hunt without the necessary equipment to retrieve any animal killed or wounded during a hunt and without making a reasonable effort to do so. They prohibit wastage of any parts suitable for food. Hunting of calves and females accompanied by calves is prohibited. Hunters are prohibited from hunting Belugas with rifles or shotguns with a muzzle energy less than 1,500 foot pounds and with rifled slugs or bullets that are not full-jacketed.

Finally, with the exception of hunting activities, there is a general prohibition on disturbance of Belugas. DFO has guidelines for non-hunting activities which may otherwise cause disturbance to Belugas. Moving, tagging or marking of Belugas for experimental, scientific, educational, or public display

purposes is regulated by licences. Applicants for live-capture licences must comply with conditions set by the Beluga live-capture guidelines of the Department of Fisheries and Oceans. These conditions pertain to the methods of capture, transport, care and husbandry of Belugas. Licences are approved by the Minister of Fisheries and Oceans. Between 1967 and 1993, a total of 68 or 2.6 Belugas per year have been live-captured in Churchill.

Population Size and Trends

In July 1987, Richard et al. (1990) flew broad coverage surveys of the Nelson and the Churchill and Seal estuaries and surrounding Hudson Bay waters. Two separate surveys resulted in total estimates for the western Hudson Bay stock of 23 000 Belugas (95% c.i.: 10 300 - 58 300) and of 25 100 (95% c.i.: 18 300 - 32 800) respectively. Their results are uncorrected for submerged animals and are therefore negatively-biased estimates of true population size. In addition, they counted 1300 Belugas during reconnaissance surveys flown along the coast of southern Hudson Bay in the days that followed.

These numbers far exceed the 1965 estimates of 8 000 to 10 000 for the western Hudson Bay stock (Sergeant 1973, 1981). The difference is understandable when one considers that previous estimates were derived from surveys limited to waters 10 or 40 km inshore, depending on the area (Sergeant 1973). Richard et al.'s (1990) coverage of western Hudson Bay extended between 40 and 110 km offshore. In the area of the Nelson estuary which had the largest Beluga concentration, our surveys covered an area of 15,000 km^2, more than ten times the area of previous surveys. Previous estimates relied on rough extrapolations for submerged animals (Sergeant 1973, 1981). In their estimates, Richard et al. (1990) did not correct for submerged animals because adequate methods are not available for such corrections (Smith and Hammill 1986; Richard et al. 1990). Despite the lack of correction for submerged animals, their results were substantially higher. These differences in methods of estimation and coverage preclude any statement on population trend between 1965 and 1987.

Habitat

Western and southern Hudson Bay Belugas concentrate at the mouths of the Nelson, Churchill, Seal, Severn and Winisk rivers in summer (*see above*, Distribution). It has been postulated that Beluga neonates in particular can reduce their energy expenditures while occupying warm estuarine waters (Sergeant and Brodie 1969). Thyroid hormone production increases during estuarine occupation, suggesting that growth in animals of all ages is enhanced during summer. (St-Aubin and Geraci 1989). Warm estuaries could provide a less energetically demanding environment at a time when fat reserves are mobilized for growth (St-Aubin and Geraci 1989). Belugas also molt their skin in summer and have been observed rubbing themselves on the bottom (Finley et al. 1982). Belugas occupying rivers occasionally feed on various prey species (*see below*, Feeding).

The Churchill-Nelson river diversion for hydro-electric power created in the early seventies has greatly reduced the freshwater flow to the Churchill estuary and increased the flow to the Nelson estuary. These habitat modifications may have caused the distribution pattern of Belugas and their prey to change. Information on their past and present distribution is insufficient to reach any conclusion on the impact this diversion has had on the Belugas. Continued development on the Nelson and proposed developments on the Seal River are specific concerns. Also of concern is the release of pollutants such as mercury into the Nelson River as a result of the reservoirs created by the hydro-electric project.

The winter habitat of western Hudson Bay Belugas is thought to include the whole of Hudson Strait (*see above*, Distribution). In Hudson Strait, Belugas were found in higher numbers in loose pack ice (26% to 75% cover) than in heavy pack ice (>75% cover) while no Beluga was seen in ice-free waters east of the pack (McLaren and Davis 1982). There is no information on trends in quality and quantity of winter habitat.

General Biology

Reproductive Biology and Mortality

Estimates of life history parameters for western Hudson Bay Belugas were obtained by sampling animals caught at Churchill and Whale Cove (Sergeant 1973). Animals were aged by counting dentinal growth layers on longitudinal thin sections of teeth. There has been some controversy over whether one or two growth layers are deposited every year (Brodie 1969; Sergeant 1973; Braham 1984), but evidence from a few captive animals lends support to the two-growth-layer-per-annum hypothesis (Brodie 1982, Goren et al. 1987).

Age is therefore estimated as half the number of growth layers. Tooth wear complicates the aging of older animals by removing the layers deposited at the apex of the teeth (Sergeant 1973). Consequently, maximum life span cannot be ascertained precisely. The maximum number measured for Churchill and Whale Cove animals is 50 dentinal layers (or 25 years), but studies of tooth and mandibular layers suggest that Belugas can probably reach 30 years (Brodie 1969).

Western Hudson Bay Beluga females reach sexual maturity at a mean age of five years and give birth to a single calf after a gestation of about 14.5 months (Sergeant 1973). Calves are suckled for about two years, and the calving interval is estimated to be three years for most females. About 25% of females sampled apparently started a new pregnancy while still lactating (Sergeant 1973). Breeding has never been observed but is thought to peak in April or May. Calving takes place from June to early September the following year, with a peak somewhere between late June and late July (Sergeant 1973).

The annual sustainable yield of the western Hudson Bay stock is not known because age-specific mortality rates cannot be estimated from existing data. It was suggested that 5% is a permissible rate of harvest for western Hudson Bay Belugas (Sergeant 1981), but the data used to support this argument is tenuous (Richard and Orr 1986; Reeves and Mitchell 1989b).

Attempts have been made to model the rate of increase of delphinids and monodontids, including Belugas, from published fecundity rates and a range of adult and juvenile mortality rates (Reilly and Barlow 1986; Kingsley 1989; Béland

et al. 1988). There are few estimates of rate of increase for cetaceans; those that are available for odontocetes, Killer Whales *(Orcinus orca)* and Striped Dolphins *(Stenella coeruleoalba)* range from 1.7% to 3.2% (Perrin and Reilly 1984). These models and estimates suggest that the intrinsic rate of increase of Belugas is about 2 to 3% per year. Annual rates of population increase of 2 to 3% would allow an annual sustainable harvest rate of roughly 2 to 3% from the Western Hudson Bay's stock.

Feeding

Inspection of stomach contents from Belugas caught in the Churchill River in summer indicate that Belugas feed mainly on Capelin, *Mallotus villosus* (Doan and Douglas 1953; Sergeant 1973; Watts and Draper 1986). The remains of "estuarine fishes", including Pike, *Esox lucius*, and Cisco, *Coregonus* sp, as well as squid beaks, Annelid Worms, *Nereis* sp, and Shrimp, *Sclerocrangon* sp, were found in a few stomachs.

No quantitative analysis was made of the stomach contents but it was suggested that Belugas did not feed extensively during their stay at Churchill since a large proportion of stomachs were empty (Sergeant 1973). However, digestion in odontocete whales is rapid and little soft tissue may remain in their stomachs a few hours after ingestion (Finley and Gibb 1982). Consequently, absence of food in the stomach of Belugas could be a consequence of the delay between feeding and sampling, rather than a lack of feeding.

Inspection of stomachs of four Belugas caught in August at the Nelson estuary also indicated that Capelin were consumed in that area, along with whitefish and a few other species (Comeau 1915). Belugas caught at Whale Cove in August (Sergeant 1973) had a predominance of Shrimp (*Pandalus montagui, Eualus* sp, and other species) in their stomachs. Fishes noted in a few stomachs included Sand Lance *(Ammonodytes americanus)*, Greenland Cod *(Gadus ogac)*, and Arctic Charr *(Salvelinus alpinus)*. Capelin apparently do not occur at Whale Cove (Sergeant 1973). The winter diet of Belugas in Hudson Strait is not known.

Species Movement

It is unclear what route is taken by Belugas to reach the western Hudson Bay and Ontario summering areas. On the Keewatin coast, Belugas are rarely seen or hunted in spring and early summer (Richard et al. 1990). A population of 23 000 Belugas migrating near the Keewatin coast in May and June would not go unnoticed. On the east side of Hudson Bay, reports of a spring southward migration of Belugas are well documented (Finley et al. 1982; Breton et al. 1984).

In the fall, a return northward migration occurs along both the east and west coasts of Hudson Bay (Sergeant 1973; Finley et al. 1982). This northward migration is apparent from catch records and local informants (Breton et al. 1984; Gamble 1984, 1987a,b, 1988) and was demonstrated at least for the western Hudson Bay by recoveries at Whale Cove and Repulse Bay of Belugas tagged at the Seal River (Sergeant 1973). Our 1981 reconnaissance surveys show a reduction in density on the Manitoba coast in August and an extension of the range of Belugas northward along the Keewatin coast (Richard et al. 1990).

Behavior and Adaptability

Beluga in the Churchill River appear to have adapted to local traffic which consists mostly of whale watching tour boats. Continued harassment by hunters can cause Belugas to temporarily vacate an estuary, but they usually return within a few hours, or sometimes after a few days of absence (Caron and Smith 1990; J. Orr, DFO, Winnipeg, Manitoba; personal communication). It is unclear how Belugas react to changes in freshwater flow into the estuaries that they occupy.

Several authors have speculated that the same Belugas tend to occupy the same estuaries every summer (Brodie et al. 1981; Finley *et al.* 1982). The only evidence of philopatry (site fidelity) and site tenacity comes from a study by Caron and Smith (1990) of individually recognizable Belugas at the Nastapoka estuary of eastern Hudson Bay. Their work also suggests that the Nastapoka estuary had a preponderance of calves and females. If so, other age and sex

classes were under-represented in the estuary and could, at least in a given year, be less site tenacious than the river occupants.

Limiting Factors

Potential limiting factors include ice entrapment (Mitchell and Reeves 1981; Brodie 1982), and predation by polar bears and killer whales (Smith 1985; Lowry et al. 1987a,b). The contribution of each of these factors to overall natural mortality is difficult to quantify and has not been estimated. There is insufficient evidence to determine whether western or southern Hudson Bay Beluga have been affected by habitat loss, or if they have suffered from direct or indirect environmental contamination.

Human predation is probably one of the most, if not the most, important limiting factors of the western Hudson Bay stock (Table 1). No hunting for Beluga takes place in southern Hudson Bay (Abraham, personal communication). The mean annual landed catch of Belugas (including live-captures) along the western Hudson Bay coast (Churchill to Rankin Inlet) between 1981 and 1991 was 125 Belugas while northern Hudson Bay communities (Chesterfield Inlet, Coral Harbour and Repulse Bay) took an average of 104 Belugas. The catch from the latter communities probably also came in part from the small stock of 1000 or more which summers in northern Hudson Bay.

In addition, the western and southern Hudson Bay stocks are probably hunted in spring and fall by Hudson Strait and Ungava Bay communities. The mean annual catch from northern Hudson Strait communities was 35 Belugas, while Hudson Strait and Ungava Bay communities of northern Quebec took an average of 176 Belugas per year (Table 1).

Belugas caught by Hudson Strait communities probably belong in part to the western and southern Hudson Bay stocks and in part to the northern, eastern Hudson Bay, Ungava Bay and South East Baffin stocks, which also are thought to migrate to Hudson Strait for the winter (Finley et al. 1982; Richard and Orr 1986). The contribution of each stock to the Hudson Strait catch is unknown. Assuming the worst case scenario that the entire catch of these communities came

solely from the western Hudson Bay stock, the total average annual catch would be 440 Belugas (Table 1). Hunting losses during Beluga hunts have been estimated at about 10 to 20% (Richard and Orr 1986; T. Strong, DFO, Winnipeg, Manitoba; personal communication), therefore removals of 1.1 to 1.25 times the landed catch (440), or 484 to 550 Belugas, are to be expected from these hunts. That level of annual removal represents 2.1% to 2.4% of our western Hudson Bay population estimate of 23 000 (*see above*, Population Size and Trend).

It is more than likely that a portion of the total annual catch (484 to 550) comes from a mixture of eastern, southern and northern Hudson Bay Belugas because all three stocks also spend winter and part of spring and fall in Hudson Strait and are therefore susceptible to being hunted by local hunters. Also, the size of the western Hudson Bay stock used in the above calculations is uncorrected for submerged animals and therefore probably an underestimate (*see above*, Population Size and Trend). Consequently, the actual removal from the western Hudson Bay stock is probably smaller than 484 to 550, and certainly within sustainable harvest limits of 2 to 3% (*see above*, Reproductive Biology and Mortality).

The effect of present harvesting levels on the southern Hudson Bay stock cannot be fully assessed until its relationship with other stocks is determined and more information can be obtained on the proportion of the catch which belongs to each stock.

Special Significance of the Species

The Beluga is one of the few truly arctic whale species, living year-round in ice-covered waters and exhibiting several adaptations for its arctic environment. It is an important resource for the Inuit. The skin or *muktuk* is a favoured food which is rich in nutritive value and often in short supply in many communities. Consequently, there is a great demand for trade in *muktuk* from communities which have fewer opportunities to hunt Beluga. The hunting of Beluga in western Hudson Bay has long been an important cultural and subsistence activity for a people to whom hunting and culture are synonymous and where diet

is composed largely of wild foods.

The pure white color of the Beluga, its gregariousness and concentration in the Churchill estuary, an area easily accessible have made it a popular tourist attraction. Beluga captured in Churchill are kept in several north American aquaria where their docility and playfulness have captured the public's imagination around the world.

Evaluation

Although there are no data to determine a trend in abundance, the western Hudson Bay stock appears to be large, despite a substantial harvest and habitat modifications. Therefore, it is recommended that the western Hudson Bay Beluga stock not be placed in any of the COSEWIC categories (Cook and Muir 1984). The status of the southern Hudson Bay stock should be reviewed as information on its size, relationship to other stocks and harvest levels become available.
A more precise delineation of the Hudson Bay stocks is needed to determine if there are one, two or several stocks and how they contribute to the catch of different hunting communities bordering Hudson Bay and Hudson Strait. Research should also focus on determining more precisely what constitutes critical habitat for Belugas, particularly the importance of estuaries and the effects of hydro-electric developments.

Literature Cited

Béland P., A. Vézina, and D. Martineau. 1988. Potential for growth of the St. Lawrence (Québec, Canada) Beluga whale *(Delphinapterus leucas)* population based on modelling. Journal de Conseil International pour L'exploration de la Mer 45: 22-32.

Braham H.W. 1984. Review of reproduction in the white whale *Delphinapterus leucas*, narwhal, *Monodon monoceros*, and Irrawaddy dolphin, *Orcaella brevirostris*, with comments on stock assessment. Report of the International Whaling Commission, Special Issue 6: 81-89.

Brennin, R. 1992. Population genetic structure of beluga whales, *Delphinapterus leucas*, mitochondrial DNA sequence variation within and among North American populations. MSc thesis (Biology) McMaster University, Hamilton, Ont., Canada. 70 p.

Breton, M., T.G. Smith, and B. Kemp. 1984. The views of scientists and Inuit on biology and behaviour of Arctic seals and whales: harvesting sea mammals; management and conservation for the future. Department of Fisheries and Oceans, Quebec, Quebec. 50 p.

Brodie, P.F. 1969. Mandibular layering in *Delphinapterus leucas* and age determination. Nature (London) 221: 956-958.

Brodie, P.F. 1971. A reconsideration of aspects of growth, reproduction and behavior of the white whale *Delphinapterus leucas* with special reference to the Cumberland Sound, Baffin Island population. Journal of the Fisheries Research Board of Canada 28: 1309-1318.

Brodie. P.F. 1982. The Beluga *(Delphinapterus leucas):* growth at age based on a captive specimen and a discussion of factors affecting natural mortality estimates. Report of the International Whaling Commission 32: 445-447.

Brodie, P.F., J.L., Parsons, and D.E. Sergeant. 1981. Present Status of the White Whale *(Delphinapterus leucas)* in Cumberland Sound, Baffin Island. Report of the International Whaling Commission 31: 579-582.

Caron, L.M.J., and T.G. Smith. 1990. Philopatry and site tenacity of belugas,

Delphinapterus leucas, hunted by the Inuit at the Nastapoka estuary, eastern Hudson Bay. Pages 69-79 *in* Advances in research on the Beluga whale *Delphinapterus leucas*. *Edited by* T.G. Smith, D.J. St-Aubin, and J.R. Geraci. Canadian Bulletin of Fisheries and Aquatic Sciences 224: 69-79.

Comeau, N.A. 1915. Report on the fisheries expedition to Hudson Bay in the auxiliary schooner *Burleigh* 1914. Pages 69-85 *in* Reports on Fisheries Investigations in Hudson and James bays and tributary waters in 1914 by C.D. Melvill, Ar. M, Lower, and Napier A. Comeau. Sessional Paper 39a, Department of Naval Service, Appendix to Annual Report Department of Naval Service, Fiscal Year ending March 31, 1914, Ottawa, Ontario.

Cook, F.R., and D. Muir. 1984. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC): history and progress. Canadian Field-Naturalist 98: 63-70.

Doan, K.H., and C.W. Douglas. 1953. Belugas of the Churchill region of Hudson Bay. Fisheries Research Board of Canada Bulletin 98: 27 p.

Doidge, D.W. 1990. Age-length-weight comparisons in the beluga, *Delphinapterus leucas*. Pages 59-68 *in* Advances in research on the Beluga Whale, *Delphinapterus leucas*. *Edited by* T.G. Smith, D.J. St-Aubin, and J.R. Geraci. Canadian Bulletin of Fisheries and . Aquatic Sciences 224: 59-68.

Finley, K.J., and E.J. Gibb. 1982. Summer diet of the narwhal *(Monodon monoceros)* in Pond Inlet, northern Baffin Island. Canadian Journal of Zoology 60: 3353-3363.

Finley, K.J., G.W. Miller, M. Allard, R.A. Davis, and C.R. Evans. 1982. The Belugas *(Delphinapterus leucas)* of Northern Quebec: distribution, abundance, stock identity, catch history and management. Canadian Technical Reports Fisheries and Aquatic Sciences 1123: 63 + vii.

Gamble, R.L. 1984. A preliminary study of the native harvest of wildlife in the Keewatin region, Northwest Territories, Canada. Canadian Technical Report Fisheries and Aquatic Sciences 1282: iv + 48.

Gamble, R.L. 1987a. Native harvest of wildlife in the Keewatin region,

Northwest Territories for the period October 1983 to September 1984. Canadian Technical Report Fisheries and Aquatic Sciences 1543: v + 85.

Gamble, R.L. 1987b. Native harvest of wildlife in the Keewatin region, Northwest Territories for the period October 1984 to September 1984. Canadian Technical Report Fisheries and Aquatic Sciences 1549: v + 82.

Gamble, R.L. 1988. Native harvest of wildlife in the Keewatin region, Northwest Territories for the period October 1985 to March 1986 and a summary for the entire period of the harvest study from October 1981 to March 1986. Canadian Data Reports Fisheries and Aquatic Sciences 688: v + 85.

Goren, A.D., P.F. Brodie, S. Spotte, G. Carleton Ray, H.W. Kaufman, A.J. Gwinnett, J.J. Sciubba, and J.D. Buck. 1987. Growth layers groups (GLGs) in the teeth of an adult belukha whale *(Delphinapterus leucas)* of known age: evidence for two annual layers. Marine Mammal Science 3: 14-21.

Helbig, R., P.T. Boag, and B.N. White. 1989. Stock identification of beluga whales *(Delphinapterus leucas)* using mitochondrial DNA markers: preliminary results. Musk-ox 37: 122-127.

Johnston, D.H. 1961. *Manuscript*. Marine Mammal surveys Hudson Bay 1961. Ontario Department of Lands and Forests, Toronto, Ontario. 32 p. [author's collection]

Jonkel, C.J. 1969. White whales wintering in James Bay. Journal of the Fisheries Research Board of Canada 26: 2205-2207.

Kingsley, M. 1989. Population dynamics of the narwhal, *Monodon monoceros:* an initial assessment (Odontoceti: Monodontidae). Journal Zoology (London) 219: 201-208.

Lowry, L.F., J.J. Burns, and R.R. Nelson. 1987a. Polar bear, *Ursus maritimus*, predation on Belugas, *Delphinapterus leucas*, in the Bering and Chukchi seas. Canadian Field-Naturalist 101: 141-146.

Lowry, L.F., R.R. Nelson, and K.J. Frost. 1987b. Observations of killer whales, *Orcina orca*, in eastern Alaska: sightings, strandings, and predation on other marine mammals. Canadian Field-Naturalist 101: 6-12.

MacLaren, P.L., and R.A. Davis. 1982. Winter distribution of Arctic marine

mammals in ice-covered waters of eastern North America. LGL Offshore Labrador Biological Studies (OLABS) Report. Petro-Canada Exploration Inc., Calgary, Alberta: xiii+151.

Mitchell, E., and R. R. Reeves. 1981. Catch history and cumulative estimates of initial population size of cetaceans in the eastern Canadian Arctic. Report of the International Whaling Commission 31: 645-682.

Perrin, W.F., and S.B. Reilly. 1984. Reproductive parameters of Dolphins and small whales of the family Delphinidae. Pages 97-133 *in* Reproduction in whales, dolphins and porpoises. *Edited by* Perrin, W.F., R.L. Brownell, Jr., and D.P. DeMaster. Repoft of the International Whaling Commission, Special Issue 6.

Reeves, R.R., and E. Mitchell. 1989a. Status of white whales in Ungava Bay and eastern Hudson Bay. Canadian Field-Naturalist 103: 220-239.

Reeves, R.R., and E. Mitchell. 1989b. History of exploitation, distribution and stock identity of white whales in western Hudson Bay and Foxe Basin. Report to the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Canadian Wildlife Service, Ottawa, Ontario. 290 p.

Reilly, S. B., and J. Barlow. 1986. Rates of increase in dolphin population size. Fishery Bulletin. 84: 527-533

Richard, P.R., and J.R. Orr. 1986. A review of the status and harvest of white whales (Delphinapterus leucas) in the Cumberland Sound area, Baffin Island. Canadian Technical Report Fisheries and Aquatic Sciences 1447: iv+25.

Richard, P.R., J.R. Orr, and D. G. Barber. 1990. The distribution and abundance of Belugas, Delphinapterus leucas, in eastern Canadian subarctic waters: a review and update. Pages 23-38 *in* Advances in research on the Beluga Whale *Delphinapterus leucas*. *Edited by* : T.G. Smith, D.J. St-Aubin, and J.R. Geraci. Canadian Bulletin of Fisheries and Aquatic Sciences 224.

Sergeant, D. E. 1968. Whales. Pages 388-396 *in* Science, history and Hudson Bay. *Edited by* C.S., and D.A. Shenstone. Volume 1. Department of Energy, Mines and Resources, Ottawa, Ontario. 502 p.

Sergeant, D.E. 1973. Biology of the white whales *(Delphinapterus leucas)* in western Hudson Bay. Journal of the Fisheries Research Board of Canada 30: 1065-1090.

Sergeant, D.E. 1981. On Permissible exploitation rates of Monodontidae. Report of the International Whaling Commission 31: 583-588.

Sergeant, D.E., and P.F. Brodie. 1969. Body Size in White Whales, *Delphinapterus leucas*. Journal of the Fisheries Research Board of Canada 26: 2561-2580.

Smith, T.G. 1985. Polar Bears, *Ursus maritimus*, as predators of Belugas, *Delphinapterus leucas*. Canadian Field-Naturalist 99: 71-75.

Smith, T.G., and M.O. Hammill. 1986. Population estimates of white whale, *Delphinapterus leucas*, in James Bay, eastern Hudson Bay, and Ungava Bay. Canadian Journal of Fisheries and Aquatic sciences 43: 1982-1987.

St-Aubin, D., and J. Geraci. 1989. Seasonal variation in thyroid morphology and secretion in the white whale *(Delphinapterus leucas)*. Canadian Journal of Zoology 67: 263-267.

Stewart, R.E.A. 1994. Size-at-age relationships as discriminators of white whale *(Delphinapterus leucas* Pallas 1776) stocks in the eastern Canadian Arctic. *In* Studies on White whales *(Delphinapterus leucas)* and Narwhals *(Monodon monoceros)* in the NW and NE Atlantic Arctic. *Edited by* E. Born, R. Dietz, and R. Reeves. Meddelelser om Grønland, Bioscience, Special Issue. In Press.

Strong, J.T., 1989. Reported harvests of narwhal, Beluga and walrus in the Northwest Territories, 1948-1987. Canadian Data Report Fisheries and Aquatic Sciences 734: iv + 14.

Watts, P.D., and B.A. Draper. 1986. Note of the behaviour of Beluga Whales feeding on Capelin. Arctic and Alpine Research 18: 439.

Table 1: Reported harvest from Western and Northern Hudson Bay, and Hudson Strait. Sources are Strong (1989) for NWT communities and M. Breton (DFO, Quebec, Quebec; personal communication) for Northern Quebec.

	Year											
Location	81	82	83	84	85	86	87	88	89	90	91	Annual Average (to nearest integer)
Churchill	1		7	13	16	5	15	11	4	2	4	7 (includes live-captures)
Arviat	52	45	61	60	85	75	70	45	70	70	25	59
Whale Cove	22	6	8	24	19	35	30	16	27	27	25	21
Rankin Inlet	61	37	33	69	36	30	30	27	40	40	20	38
				Western Hudson Bay								**125**
Chesterfield Inlet	11	3	5	12	28	23	34	15	20	20	20	17
Repulse Bay	56	34	18	30	3	20	30	47	20	20	13	26
Coral Harbour	8	33	64	116	76	50	29	38	67	67	125	61
				Northern Hudson Bay								**104**
Cape Dorset	1	3	46		21	2	9	10	18	39	37	18
Lake Harbour	16	4		9	9	19	34	9	28	21	28	17
				Northern Hudson Strait								**35**
Ivujivik	58	126	69	69	42	5	24	19	118		31	56
Salluit	57	41	53	29	10	24	20	16	53	17	28	31
Kangirsujuaq	14	21	22	26	64	22	28	28	28	24	39	28
Qartaq	28	25	38	46	29	21	21	15	35	18	29	27
Kanqirsuk	14	9	12	3	7	9	8	7	11	10	12	9
Aupaluk	4	2	3	2	3	3	1	2	3	5	9	3
Tasiujaq	5	6	13	4	9	14	4	11	9	3	2	7
Kuujjuaq	30	29	12	5	2	10	5	2	8	3	3	9
Kangirsualujjuaq	26	12	3	5	3	5	2	1	0	0	7	5
Killiniq/Tarpangajuq	0	0	0	0	8	1	0	8	0	0	0	1
				Southern Hudson Strait - Ungava Bay								**176**
Overall Annual Average												**440**

FIGURE CAPTIONS

Figure 1. Adult Beluga, Belukha or white whale, *Delphinapterus leucas*. and newborn calf.

Figure 2. Range of western, southern and other Hudson Bay Beluga populations in summer.

Figure 3. Range of Hudson Bay Beluga populations in winter, including occasional sightings (solid circles).

Fig. 1

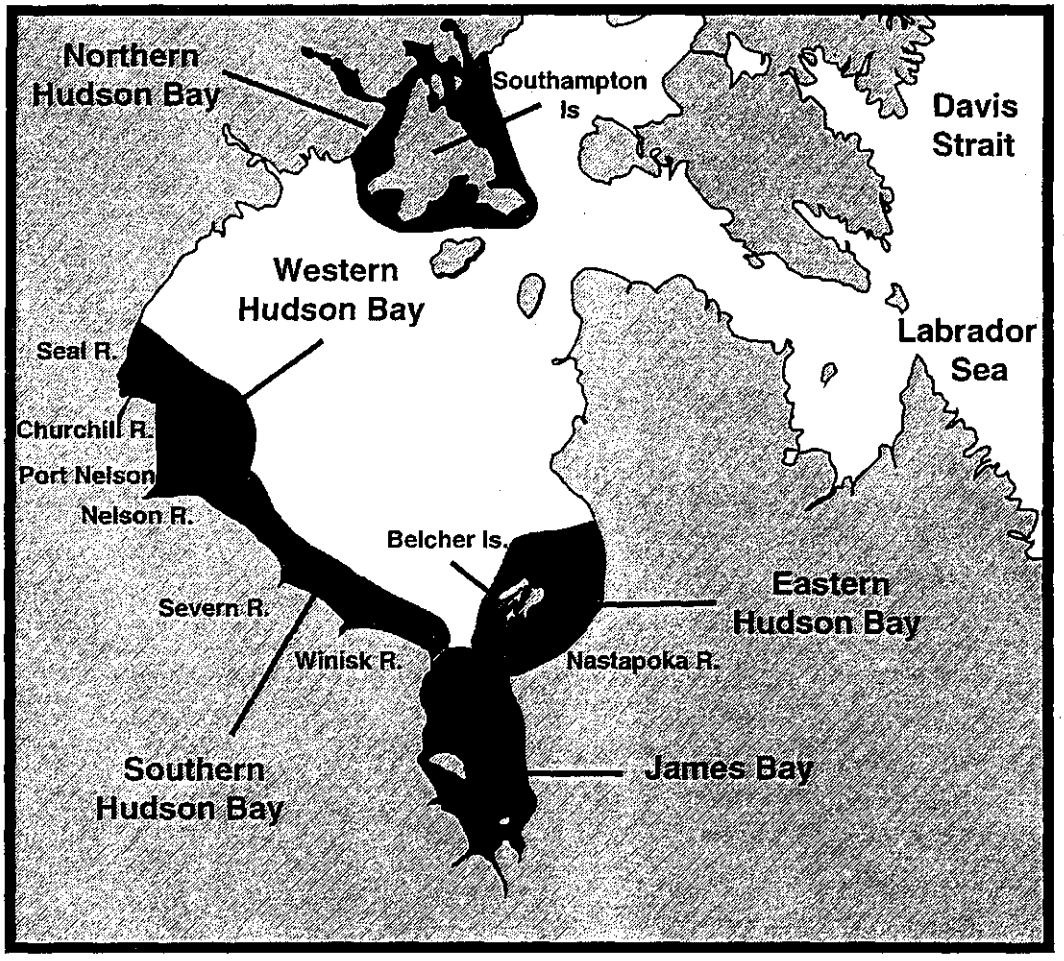
Northern
Hudson Bay
Southampton
Is
Davis
Strait
Western
Hudson Bay
Labrador
Sea
Seal R.
Churchill R.
Port Nelson
Nelson R.
Belcher Is.
Eastern
Hudson Bay
Severn R.
Winisk R.
Nastapoka R.
Southern
Hudson Bay
James Bay

Fig 2

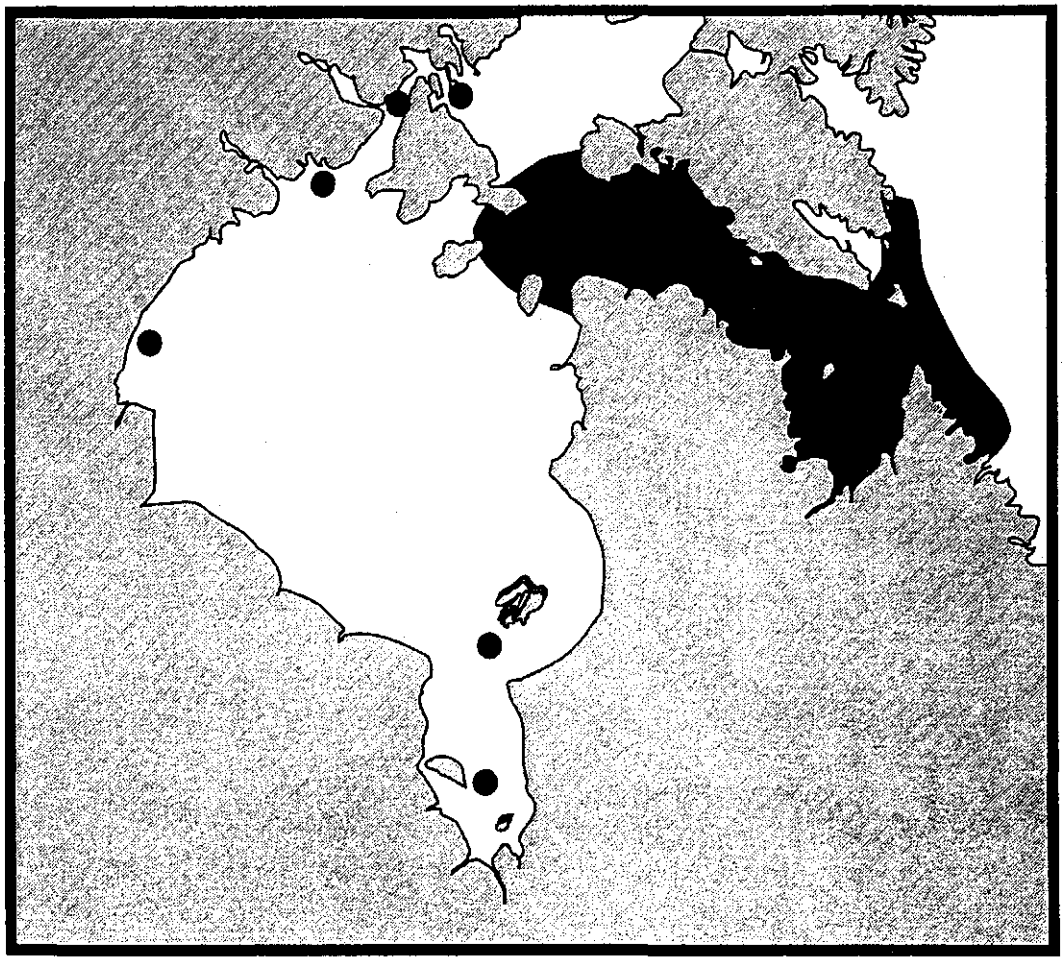

Fig 3