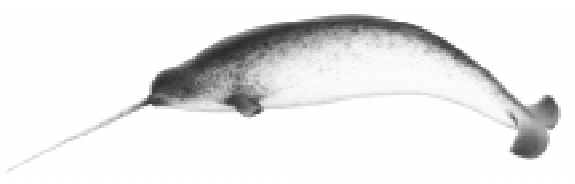


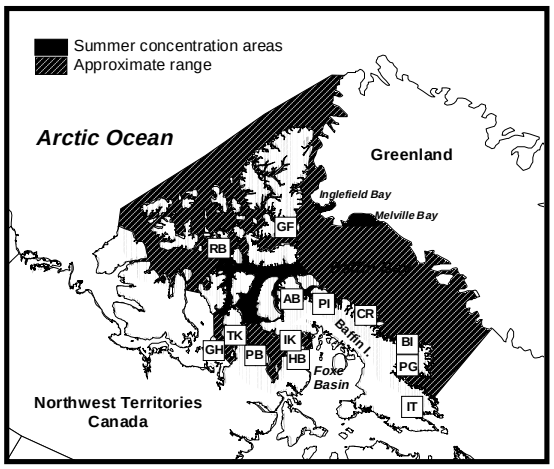
Baffin Bay Narwhal

Background

The summer range of Baffin Bay narwhals probably includes most of the waters of the Canadian Arctic Archipelago and northwestern Greenland. Main summering areas in Canada are Barrow Strait, Peel Sound, Prince Regent Inlet, Admiralty Inlet and the Eclipse Sound area (black zones on map; Richard et al. 1994). Main summering areas in West Greenland are Melville Bay and Inglefield Bay (Born 1986, Born et al. 1994, Heide-Jørgensen 1994). Narwhals from this stock may reach northern Foxe Basin by Fury and Hecla Strait (Stewart et al. 1995). Baffin Bay narwhals winter in Baffin Bay and Davis Strait.

Baffin Bay narwhals are hunted under a quota system in 13 communities. The skin, or maqtaq, is highly prized by the Inuit for food and is consumed locally or traded to other Inuit communities. The meat is also used as food. The tusk of males is a valuable economic commodity. The hunt itself and the sharing of its proceeds are of great social and cultural significance for many communities in the region.

The hunt is co-managed by the Nunavut Wildlife Management Board and the Canada Department of Fisheries and Oceans (DFO). Hunting regulations are implemented under the Fisheries Act and the Marine Mammal Regulations by DFO. Narwhal quotas were originally set through negotiation with communities based on their historic harvest levels (Strong 1988). For many years, the hunters in these communities have been requesting changes to the management system of narwhal. A review of the stock was undertaken to anticipate the consideration of new management options for this species.



Range map of Baffin Bay narwhals (boxed letters show the locations of communities named in the table below)

The Hunt

Community	(quota)	Catch 93-94	94-95	95-96	96-97	97-98
AB-Arctic Bay	(100)	85	99	46	99	66
BI-Broughton I.	(50)	52	50	50	21	50
CR-Clyde River	(50)	34	25	26	10	15
GF-Grise Fiord	(20)	9	12	9	1	1
HB-Hall Beach	(10)	0	6	0	1	2
IK-Igloolik	(25)	27	25	18	5	3
IT-Iqaluit	(10)	0	0	0	0	0
PG-Pangnirtung	(40)	24	33	6	19	2
PI-Pond Inlet	(100)	79	91	73	100	75
RS-Resolute	(32)	8	3	4	2	7
TK-Taloyoak	(10)	0	0	0	0	0
PB-Pelly Bay	(10)	0	0	5	7	15
GH-Gjoa Haven	(10)	0	0	0	0	0
Total	**(467)**	**318**	**344**	**237**	**265**	**236**

Narwhals in the Baffin and Kitikmeot regions of Nunavut and in the Avanersuaq (NW) region of Greenland are hunted mainly in summer and fall. In other regions of West Greenland, narwhals are generally caught in late fall or winter (Heide-Jørgensen 1994). Recent estimates of the total landed catch from this stock in Canadian waters are between 236 and 344 narwhals. In addition, West Greenland lands between 500 and 1000 narwhals annually (SWG 1995, 1997).

The landed catches are only part of the total number

killed by the narwhal hunts. In Pond Inlet and Arctic Bay, hunt losses have been found to vary depending on the type of hunt and year (Weaver and Walker 1988, Roberge and Dunn 1990). On average, there were about 7 narwhals landed and 3 lost for every 10 killed. However, an estimation of overall hunting losses by all communities throughout the stock's range in Nunavut and West Greenland cannot be extrapolated from these studies which collected data in only two North Baffin communities.

Resource Status

Stock Delineation

Preliminary results of a genetic study of mitochondrial DNA of narwhals caught in west Greenland suggest that the pattern of genetic differences in Baffin Bay narwhals may be complex (Palsbøll *et al.* 1995). Narwhals tagged with satellite-linked radio tags in Melville Bay, Greenland and in the Pond Inlet, N.T. during August and September did not move to other summer narwhal aggregation areas (Dietz and Heide-Jørgensen 1995, Heide-Jørgensen, Dietz and Richard, unpubl.). Tagged males from both areas moved to the same wintering area in northern Davis Strait.

Many hunters reported that they observe different types of narwhals (Remnant and Thomas 1992, Thomsen 1993, Stewart *et al.* 1995). One type is described as large and dark with a long tusk and the other type as smaller and lighter-coloured with a smaller and more twisted tusk. Hunters from different communities also reported notable differences in narwhal behaviour, particularly in their responses to hunting activity. Some narwhals are unusually easy to approach compared to the narwhals normally found in their area. Hunters also observed that some narwhals are easily herded into shallow water in contrast to the usual avoidance reaction. These differences combined with the genetic and tracking work mentioned above indicate the possible existence of different stocks within the Baffin Bay region. More studies will be required to delineate how many stocks there are and what their respective ranges are. At present, we consider the narwhals in the Baffin Bay region as belonging to a single stock.

Stock Size

Estimates of stock size have been limited to methods which only estimate a portion of the population. They are aerial surveys of the water surface in areas of aggregation. They do not account for narwhals that were submerged beyond view at the time of the survey or those outside of the survey area. Furthermore, they do not account for animals missed by the observers because of ice or reduced visibility.

Dive data from tagged narwhals in the Canadian High Arctic, Melville Bay and Baffin Bay suggest that there are likely at least twice as many narwhals than are seen at the surface during a survey (Martin *et al.* 1994, Heide-Jørgensen and Dietz 1995). This is confirmed by land-based observations of migrating narwhals (Born *et al.* 1994). Dive patterns may differ between males, females and young ones and between areas but more data are needed before survey estimates can be accurately corrected for diving animals.

An aerial survey of the pack ice of western Baffin Bay during May 1979 estimated 34,700 narwhals at the surface (Koski and Davis 1994; 95% CI: 21,600-54,600, Reeves *et al.* 1994). This survey covered about 2/3 of Baffin Bay. It did not cover much of the West Greenland waters or Smith Sound where narwhals are also known to occur at that time of year.

An aerial photographic survey of Eclipse Sound, Admiralty Inlet, Prince Regent Inlet and Peel Sound during August 1984 estimated 18,000 narwhals at the surface (90% CI: 15,000-21,000, Richard *et al.* 1994). The areas surveyed represent a significant portion but not the entire known summer range of Baffin Bay narwhals in Canadian waters. Narwhals are known to range throughout the Arctic archipelago (Richard *et al.* 1994; see above figure).

Other surveys have covered smaller portions of the summer aggregation areas (Fallis *et al.* 1983, Smith *et al.* 1985, SWG 1997) and are therefore not useful for estimating stock size or for determining stock trends.

Four thousand narwhals were seen in Inglefield Bay, NW Greenland (Born 1986) concurrently to the 1984 survey. There have been no estimates of numbers in other aggregation areas in Greenland, such as Melville Bay.

Stock Trend

Based on past estimates of numbers in summer or winter aggregation areas, there is no evidence of a decline of the Canadian portion of the Baffin Bay

stock (Strong 1988) and the entire stock is thought to be protected from over-exploitation by its widespread distribution (SWG 1995).

During hunter knowledge studies, few hunters indicated having observed a decline in narwhal numbers in their area (Remnant and Thomas 1992, Thomsen 1993, Stewart *et al.* 1995). Most Baffin region hunters indicated either that numbers had remained the same or that they had increased over the last few decades (Remnant and Thomas 1992, Stewart *et al.* 1995).

A long series of surveys covering the entire range of narwhals would be needed to more accurately study changes in the number of Baffin Bay narwhals. Such data are not available.

Sustainable Hunting Rate

Studies of the reproductive biology of narwhals have concluded that mature female narwhal first calve at 5 to 12 years of age and every 3 years on average after that (Hay 1984, Kingsley 1989, Neve 1995). Based on those studies and reasonable assumptions on natural mortality (i.e. mortality due to injury, sickness, starvation, or predation by killer whale or other non-human predators), the maximum population growth and consequently sustainable hunting rate have been estimated at no more than 3-4% of the population per year (Kingsley 1989). This is based on the assumption that an equal proportion of males and females are taken. A larger catch of females would probably reduce this sustainable hunting rate while a greater catch of males would increase it. A more precautionary hunting rate would be 2% given the uncertainties and the fact that the population growth rate may be reduced by density dependent effects in all but small populations (Fowler 1981, Taylor and DeMaster 1993, Wade 1998). Data from hunt monitoring studies (Weaver and Walker 1988, Roberge and Dunn 1990) show that hunts in the 1980s by the two largest narwhal hunting communities, Pond Inlet and Arctic Bay, were biased towards males (2:1 and 3:1 respectively). Consequently, both the maximum sustainable hunting rate and the precautionary hunting rate would be higher in this case than those mentioned above, which assume an equal ratio of both sexes in the catch. There is at present no published information on the sex composition of hunts in recent years.

In hunter knowledge studies, most hunters thought that narwhals gave birth more frequently: every one or two years (Remnant and Thomas 1992, Thomsen 1993, Stewart *et al.* 1995). Hunters say that they often see females with a small and a large calf. There is therefore disagreement as to the exact gross sustainable hunting rate.

Other Considerations

There are no data to indicate that the following factors are presently negatively affecting narwhal populations but they are listed here as potential impacts. Commercial fisheries, such as the turbot fishery, could compete with narwhals for their food species causing the narwhal population to decline. Entanglement in lost fishing gear could cause some narwhals to drown. Oil or mining exploration and extraction could expose narwhals to contaminants (Muir *et al.* 1992, Wagemann *et al.* 1983) and, along with fishing, to disruptive noise (Cosens and Dueck 1988, Remnant and Thomas 1992, Thomsen 1993). Narwhals respond to ship noise (Cosens 1995) but it is difficult to determine whether there are long-term, population effects. Noise may be more disruptive to narwhals in hunting areas than in non-hunting areas.

Outlook

No status can be assigned to the Baffin Bay narwhal stock due to uncertainties in stock identity, abundance, reproduction and hunting mortality. However, the size of the Baffin Bay narwhal population is large in comparison to catches. It also has a wide geographic range and several of its aggregation areas are outside of normal hunting areas. These facts suggest that the Baffin Bay narwhal stock is not currently at risk of overexploitation and, therefore, of decline.

Management Considerations

The uncertainties in stock delineation, stock size, growth rate and hunt losses are reasons for caution in introducing management changes. It is advisable to maintain catches close to present levels unless it can be shown that the stock can sustain a higher catch. Every effort to reduce hunting losses should be exercised.

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ISSN 1480-4913(for English series)
ISSN 1480-4921(for French series)

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