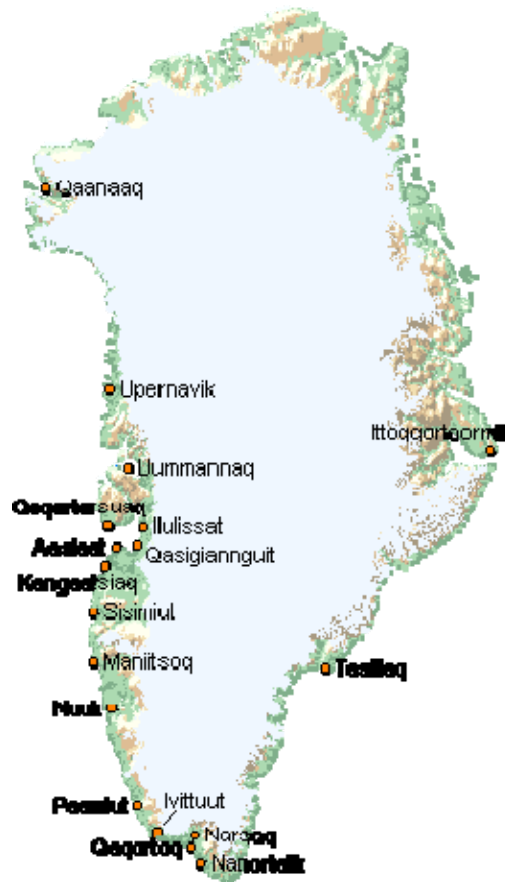


White Paper on Hunting of Large Whales in Greenland



Prepared by Fernando Ugarte

Prepared for the Greenland Home Rule Government

Ministry of Fisheries, Hunting & Agriculture

May 2007

White paper on hunting of large whales in Greenland

CONTENTS

Summary

Introduction

Historical overview

- Hunting of large whales by early Greenlanders

- Pelagic whalers (1922 – 1958)

- Coastal whaling after 1948

- Modernisation of the whaling fleet

Status of large Whales around Greenland

- Recent surveys

- Minke whale

- Fin whale

- Humpback whale

- Sei whale

- Bowhead whale

Regulations and Monitoring

- The executive order on hunting of large whales

- Quotas

- Monitoring and data collection

Animal welfare: hunting methods, times to death and struck and lost rates

- Fin whales with harpoon

- Minke whales with harpoon

- Collective minke whale hunt

- Time to death and loss rates

- Measures to reduce animal suffering

The future of whaling in Greenland

- Greenland's need of whale meat

- Environmental and health reasons for consuming whale meat in Greenland

- Catch of species other than fin and minke whale.

Concluding remarks

References

Appendix I: Summary of the points relevant to limitations of catch, monitoring of quota and human killing methods, from the "Greenland Home Rule's executive order nr. 10 of the 13th of April 2005 on the hunt of large whales"

Appendix II: The importance of whale meat and blubber to the diet of Greenlanders

Appendix III: Documentation on Greenland whaling provided to the IWC

Introduction

The term Aboriginal Subsistence Whaling carries out an image of timelessness, of people trapped in the past, living in poverty and risking their lives in order to survive by hunting whales with primitive tools. The truth is that we have moved a long way since whaling by aborigines was first given a special status in 1931 by the whaling convention that preceded the IWC. The aim of this document is to give an overview of the hunting for large whales in Greenland as it is done today.

The document includes:

- A brief review of our long whaling history
- An update of the current status of the stocks of large whales found around Greenland
- A summary of our legislation and monitoring system regarding hunting of large whales
- An explanation of our work aimed at improving the welfare aspects of the hunt, with updated statistics
- A discussion of our current need of whale meat and our motivation for whaling
- A mention to our future plans regarding hunting of large whales.

Since the last half of the 20th century, Greenland has gone through enormous changes. We have become a relatively modern nation that depends to a large degree on fishing and hunting. We have always regarded whales as a natural resource, and sustainable whaling is vital for our culture and for our economy. We make efforts to keep up with technology and to train our hunters in order to ensure that large whales are killed as humanely as possible, while at the same time taking into consideration the safety of our crews.

Currently, West Greenland has an aboriginal subsistence quota of 175 minke whales and 19 fin whales per year. This quota brings approximately 450 tons of whale meat to our people. However, the IWC has estimated that the amount of meat from large whales needed to satisfy West Greenland's need is 670 tons/year. Thus, we are operating with 220 tons of meat less of what we need in order to satisfy our yearly need. We would like to find a solution to this problem in the form of increased catches of fin and minke whales or quotas for other species.

I hope that this paper will give the reader a better understanding of the hunting of large whales in modern Greenland. We need this understanding in order to obtain international approval for the continuation of sustainable catches of large whales in future years.

Qujanaq,

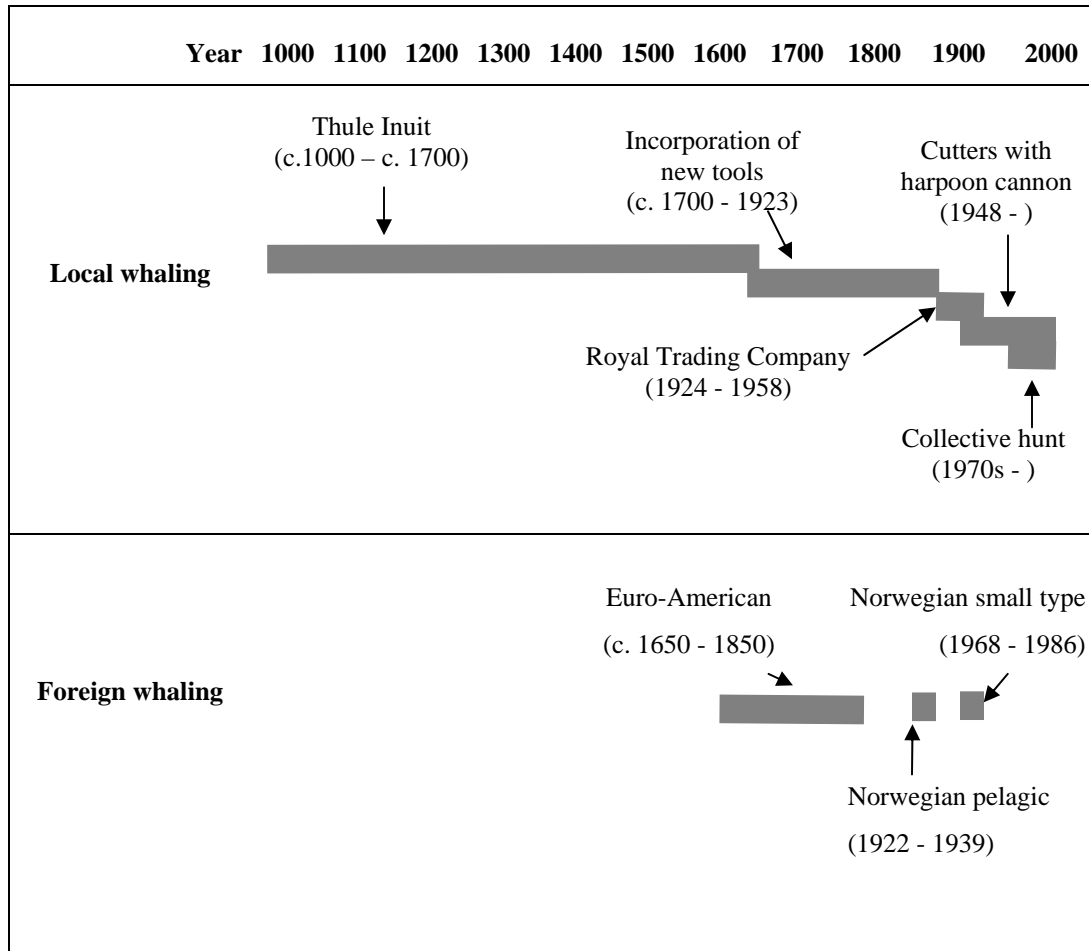
Finn Karlsen
Minister of Fisheries, Hunting and Agriculture
Greenland Home Rule Government



Historical overview

The following section gives a short overview of the history of hunting of large whales in Greenland from the time when the Thule Inuit, the ancestors of the present Greenlanders emigrated from Arctic Canada until today. Timelines for the different categories of whaling described in the text are schematised in table 1.

Table 1. Schematic representation of different periods in the history of whaling in Greenland. Local whaling: whaling by Greenlanders or Danish for the benefit of Greenlanders. Foreign whaling: whaling off Greenland by Europeans or North Americans for the purpose of trading with oil and other whale products.



Hunting of large whales by early Greenlanders: The ancestors of the modern Greenlanders that migrated from Arctic Canada at the turn of the first millennium were skilled hunters of bowhead and humpback whales. These Thule Inuit brought with them specialized tools used in whaling, which included the *umiaq* skin boat, distinctive whaling harpoons made of whalebone, floats, hunting lines and the *atallaaq*. The *atallaaq* was a dry suit made of waterproof seal skin that allowed the hunters to crawl upon the back of the whale in order to deliver the final strike and to aid in flensing. The

atallaaq was still used in some areas during the 19th century (Birketh-smith 1924, Caulfield 1997).

Other Eskimo cultures immigrated to Greenland and became extinct before the arrival of the Thule Inuit. The whaling of these cultures is not discussed here. Likewise, we do not discuss the whale hunting of the Scandinavian Norboere, who came via Iceland and settled in Greenland from the year 985-6 to the 15th century (Kellog 1997, Gulløv 2004).

Contact of the Thule Inuit with European and North American whalers in the 18th century resulted in changes of equipment, such as shifting to metal harpoons, more efficient flensing tools and wooden boats (Caulfield 1997).

The hunting of humpback whales continued with few modifications until 1923, when modern whaling was introduced by the Danish authorities (Kapel and Petersen 1982).

Bowhead whales became scarce due to overexploitation by foreign whalers during the 17th, 18th and beginning of the 19th century. As a result of this, hunting of bowhead whales by Greenlanders in a regular basis stopped in the 19th century. Only a couple of bowhead whales were taken during the 20th century (Kapel and Petersen 1982).

Minke whales were taken in Disko Bay during the 19th century, and perhaps also in earlier times (Caulfield 1997).

Pelagic whalers (1922 – 1958): Norwegian pelagic whalers caught considerable numbers of large whales during 8 cruises off West Greenland carried out between 1922 and 1939. This catches included 705 fin whales, or an average of 88 fin whales per cruise. During the first three years of the operation, the Norwegian whalers took 327 humpback whales. Thereafter the catches of humpback whales were much smaller (Kapel and Petersen 1982, Simon *et al.* 2007b, Witting 2007).

From 1924 to 1939, and again from 1946 to 1958, the Royal Greenland Trade Company, from Denmark, used a large steel catcher to provide whale meat for the Greenlanders and bring oil back to Denmark. On average, this operation caught 21 fin whales per year, and a smaller number of humpback, blue, sei, sperm and bottlenose whales. The operation ended because it was financially unprofitable (Kapel and Petersen 1982, Freeman *et al.* 1998, Simon *et al.* 2007b).

Coastal whaling in the 20th century: In 1948, in Disko Bay, West Greenland, a fishermen and hunter mounted a harpoon cannon on the bow of his 36 ft. cutter, revitalizing the community based hunting of large whales. Other cutters from West Greenland followed this example in the late 1950s and began taking minke, fin and humpback whales. A few blue whales were taken during the first years of this fishery (Caulfield 1997, Freeman *et al.* 1998).

In 1955, the IWC limited the taking of humpback whales in West Greenland to 10 animals per year. Quotas were reduced to 9 humpback whales per year in 1984 and to 8 in 1985. The IWC prohibited the catching of humpback whales off Greenland in 1986, due to uncertainties about the size of the stock (figure 1, Kapel and Petersen 1982, Lemche 1990, Caulfield 1997).

During the 1960s and 1970s, Greenlanders caught 0-13 fin whales per year. Catches have been regulated by IWC aboriginal subsistence quotas since 1977 and the average catch has been 12 fin whales per year. The quotas have ranged from 6 to 23 whales per year, and since 1995 have remained stable at 19. Surveys carried out in 2004 in order to update abundance estimates of large whales were unsuccessful and, due to the uncertain status of the stock the Greenland Home Rule voluntarily reduced the quotas for 2006 and 2007 to 10 fin whales per year (figure 2; Kapel and Petersen 1982, Caulfield 1997, Simon *et al.* 2007b).

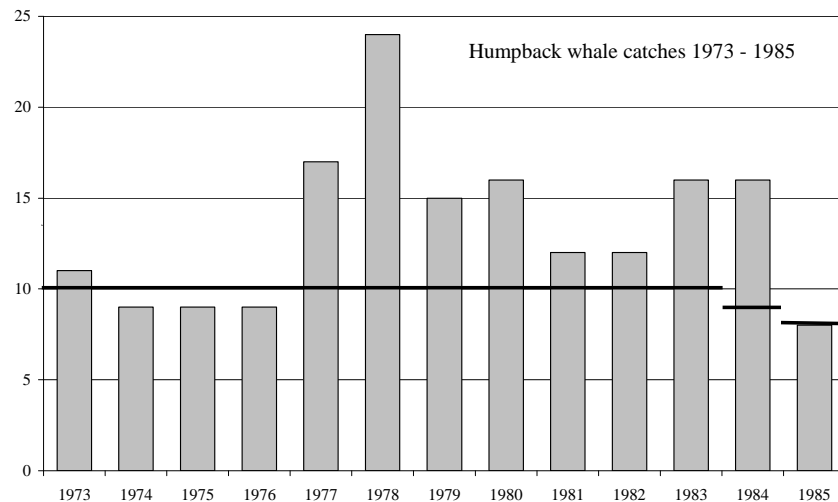


Figure 1. Catches of humpback whales by Greenlandic whalers off West Greenland from 1973 to 1985. Black lines show the quotas. Previous to 1973 Greenlandic whalers caught less than 5 humpback whales per year. Source: Witting 2007. Note: comparison with catches of fin whales (fig. 2) and minke whales (fig. 3) show that the regulation system and the subsequent adherence to quotas improved substantially during the 1990s.

The catches of minke whales remained low during the 1950s, but several boats acquired harpoon cannons during the 1960s and the catches off West Greenland increased to more than 200 whales per year. In 1968, small type whaling boats from Norway expanded their operation to include waters of East and West Greenland. During the early and mid 1970s, Norwegian catches off West Greenland averaged 175 minke whales per year. At that time, Greenlanders caught an average of 225 minke whales per year. After 1977, following recommendations by the IWC, the Norwegian catches were reduced to 75 minke whales per year (Kapel and Petersen 1982). The Norwegian boats stopped catching minke whales in Greenland in 1986.

A proliferation of outboard engines in the 1970s allowed hunters to take minke whales with rifles and hand held harpoons by cooperatively working from several skiffs (Kapel 1978). This type of whaling is called the “collective hunt”, and is the only type of whaling carried out in East Greenland today.

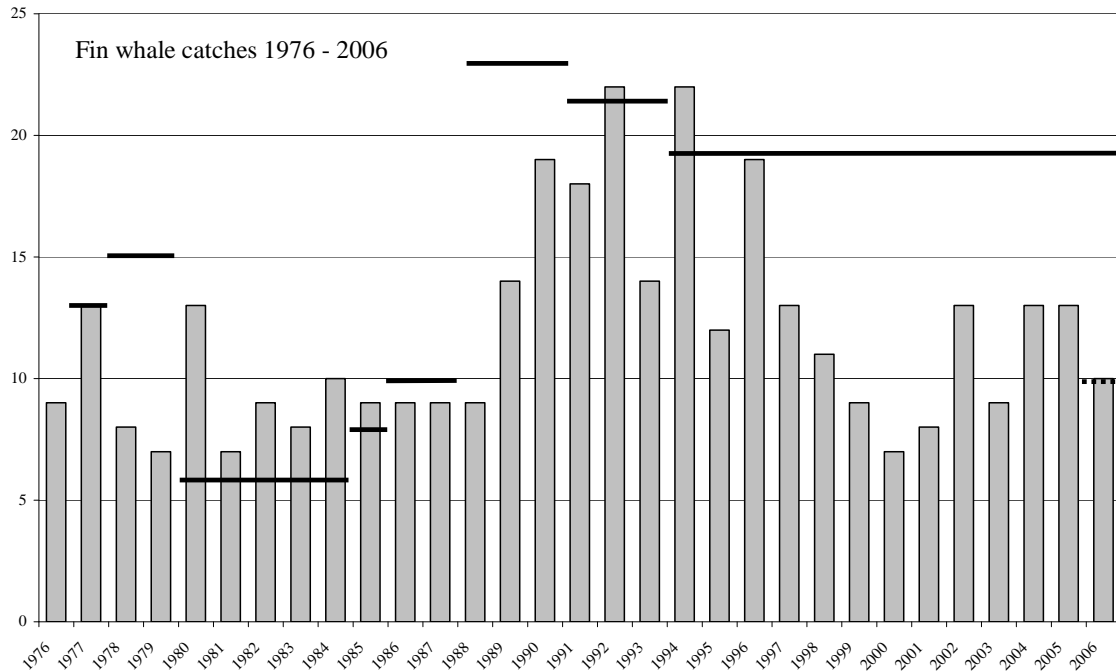


Figure 2. Catches of fin whales by Greenlandic whalers off West Greenland from 1976 to 2006. Black lines show the quotas. The Home Rule Government voluntarily reduced the quota for 2006 and 2007 from 19 to 10 fin whales. Previous to 1976 Greenlandic whalers caught less than 5 fin whales per year. Source: Ministry of Fisheries and Hunting / Greenland Institute of Natural Resources.

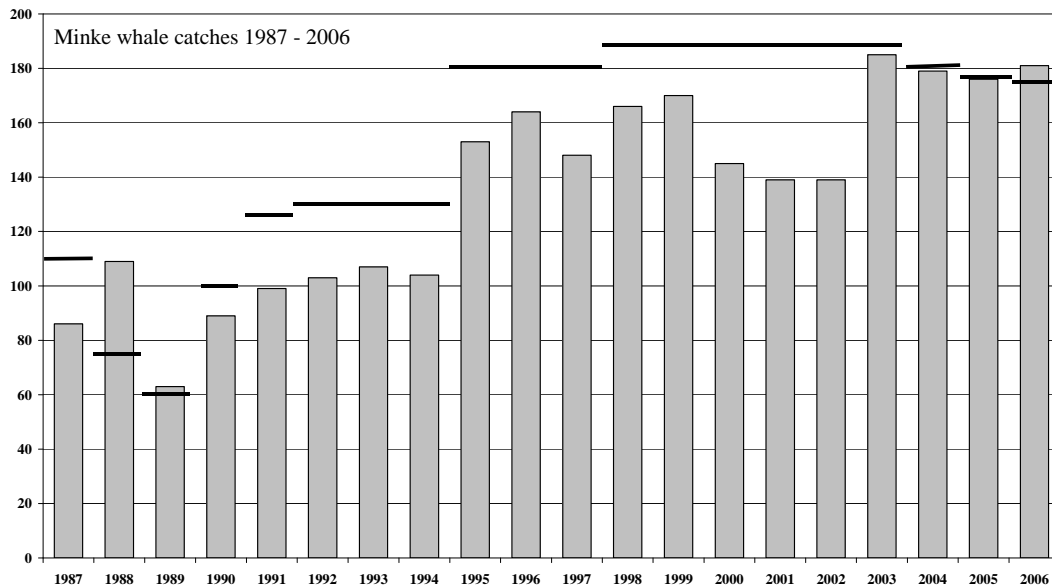


Figure 3. Catches of minke whales by Greenlandic whalers off West Greenland from 1987 to 2006. Black lines show the quotas. The overrun from 2006 has been withdrawn from the 2007 quota. Previous to 1987, minke whales were caught both by Norwegian small type whalers and by Greenlanders. Source: Ministry of Fisheries and Hunting / Greenland Institute of Natural Resources.

Since 1975, catches of minke whales by Greenlanders are regulated by IWC aboriginal subsistence quotas. Until 1985, the quotas were higher than the average catches. Since 1986, the quotas for West Greenland have ranged from 60 to 175 minke whales per year, and remained stable at 175 whales per year since 1998, with the possibility of carrying over up to 15 whales from one year to the next (figure 3). The quota for East Greenland is 12 minke whales per year, with the possibility of carrying over up to 3 whales from one year to the next.

Modernisation of the whaling fleet: In 1987, inspired by increasing concerns in the IWC regarding whale killing methods, the Greenland Home Rule Government sought for the assistance of Norwegian experts to perform experimental trials with detonating grenade harpoons. Further trials were carried out in 1988 and 1989. At that time, there were several 50mm harpoon cannons spread throughout West Greenland. Due to the poverty of the country, many of these harpoon cannons had been poorly maintained. In 1990, the Home Rule Government launched a program to renovate these harpoon cannons and introduce the use of the detonating penthrite grenade as a standard practice. The program finished in 1998. During this time, about 70 harpoon cannons were renovated and safely mounted on the bow of cutters. These boats were combined fishing and hunting boats, used in all open water seasons to harvest a variety of fish, crustaceans, mammals and birds. Because of the flexibility of the hunting and fishing activities, and the opportunistic nature of the hunt, not all the boats equipped with harpoon cannon take part on the hunting of large whales each year. In 1991, at the end of the harpoon-cannon renovating program, 50 boats equipped with harpoon cannon participated in the hunt of large whales. After that, the number of boats that catch large whales has remained stable, oscillating between 30 and 43, with a median of 40 boats (figure 4)

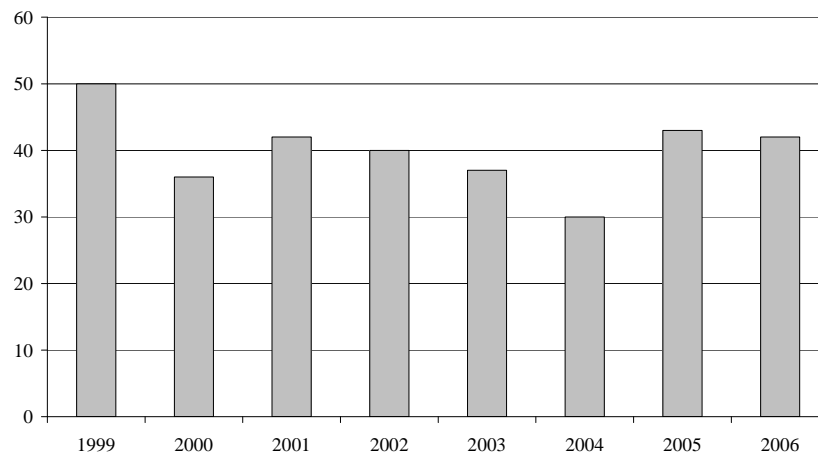


Figure 4. The number of boats actively hunting large whales from 1999 to 2006. The harpoon-cannon renovating program ended in 1998. Source: Ministry of Fisheries and Hunting.

Status of large Whales around Greenland

There are five species of the family balenopteridae, or rorquals, that can be regularly found in Greenland waters: minke, fin, humpback, sei and blue whale. All five species migrate to southern breeding grounds during the winter and return to feed in the ice-free waters of Greenland during summer. The first whales are usually seen in March or April, and the last ones in December or January. A few individuals may remain in Greenland waters throughout the winter. Except for the blue whale, all the species of this family are regularly seen off West Greenland. All five species are seen regularly off East Greenland.

Two species from the family balaenidae, or right whales, can be seen in Greenland waters: the North Atlantic right whale and the bowhead whale. The North Atlantic right whale is highly endangered. The only known population feeds during the summer in waters of northern US and southern Canada. Whales of this population are some times seen during summer in East Greenland and West Iceland. The bowhead whale can be found in Disko Bay and adjacent waters from around February until the break-up of the ice in April or May. Bowhead whales are sometimes seen in Northeast Greenland.

The last species of large whale found in Greenland waters is the sperm whale, from the physeteridae family. Sperm whales are relatively abundant in deep waters of both West and East Greenland.

Recent surveys: In order to estimate the abundance of large whales, the Greenland Institute of Natural Resources carried out two summer surveys in September 2005 and one winter survey in March and April 2006. One of the summer surveys was ship-based and departed from Iceland, surveyed the central and southern parts of East Greenland and thereafter sailed off West Greenland as far north as Upernavik. The second summer survey was done from an airplane and covered the waters off West Greenland. The winter survey was also aerial and targeted bowhead whales (Heide-Jørgensen *et al.* 2007a, 2007b, *in press*).

In 2006, the IWC Scientific Committee reviewed the results of both summer surveys from 2005 and decided that the methodology of the aerial survey was more suitable for obtaining the abundance estimates needed for providing management advice. The estimates for fin and minke whale were discussed and approved, and the Scientific Committee recommended a few adjustments to the analysis. A re-analysis taking these adjustments into consideration was reviewed again in 2007. The survey provided also with estimates of humpback and sei whales, but the IWC scientific committee did not discuss these in 2006 (IWC 2006).

The ship survey of 2005 yielded abundance estimates that supported the results of the aerial survey in West Greenland. In addition, the ship survey provided estimates of minke, fin, humpback and sei whales for East Greenland. Blue and right whales were observed in East Greenland, but the sample size was not large enough to derive abundance estimates. Both summer surveys of 2005 focused on continental shelf waters, and therefore did not provide with information about sperm whales. However, sperm whales were observed from the ship while on transit over deep waters between Iceland and East Greenland (Heide-Jørgensen *et al. in press*).

The IWC Scientific Committee has recently reviewed the results from the winter survey.

Earlier abundance estimates of large whales in Greenland waters include a series of aerial surveys carried out between 1983 and 1993, photo-identification surveys of humpback whales from 1988 to 1993 and aerial photographic surveys from 2002 and 2004 (Hiby 1985, Hiby *et al.* 1989, Larsen *et al.* 1989, Larsen 1995, Larsen and Hammond 2004, Witting and Kingsley 2005).

Minke whale: After re-analysing the data according to the suggestions from the Scientific Committee, the aerial survey from 2005 yielded a minimum estimate of 4,856 (95% CI 1,910 – 12,348) minke whales for West Greenland. This estimate was uncorrected for animals missed by the observer. Because two observers looking from the same side of the plane independently of each other reported a number of sightings that could be attributed to the same animal, it was possible to estimate the proportion of minke whales close to the track-line that were missed by the observers. After correction for this bias, the minke whale abundance was estimated to be 10,792 whales (95% CI 3,594 – 32,407; Heide-Jørgensen *et al.* 2007a).

Earlier abundance estimates of minke whales off West Greenland include 3,266 whales in 1987-88 (95% CI 1,700-5,710) and 8,371 minke whales in 1993 (95% CI 2,414-16,929; IWC 1990, Larsen 1995).

In 2006, the IWC Scientific Committee concluded that "...the new abundance estimate is not significantly different to the 1993 estimate accepted by the Committee although the power to detect trends is low" (IWC 2006).

The boat survey from 2005 indicated that minke whales were more abundant in East Greenland than in West Greenland (Heide-Jørgensen *et al. in press*).

The numbers mentioned above correspond to the abundance of minke whales in the areas surveyed. The actual size of the West Greenland stock is probably larger for two reasons: 1) the survey did not cover all the areas of West Greenland where minke whales are abundant and 2) the stock extends well beyond the territorial waters of Greenland.

Evidence that the stock of minke whales of West Greenland extends beyond the areas where the whales are caught is given by the fact that the majority of the animals harvested are females, even though the minke whales give birth to approximately the same number of male and female calves (figure 4, Simon *etal* 2007a). The sex bias of the catch can only be explained if a significant part of the population, including a majority of males is out of reach for the Greenlandic hunters. Furthermore, if catches were to have a measurable effect in the size of the population, they would affect the sex ratio because there are more females than males being caught. Such an effect will in turn be reflected in the sex ratio of future catches. Therefore, close monitoring of catch data with information about the sex of the caught animals can be used to make inferences about the sustainability of the hunt. The Greenland Institute of Natural Resources, in cooperation with the University of Oslo and the IWC Scientific Committee has developed mathematical models for stock assessment based on the sex ratio of the catch. The results of these models, discussed by the IWC Scientific Committee in 2007 suggest that sustainable catches for West Greenland are within the range of 170 - 270 whales per year (Witting and Schweder 2007).

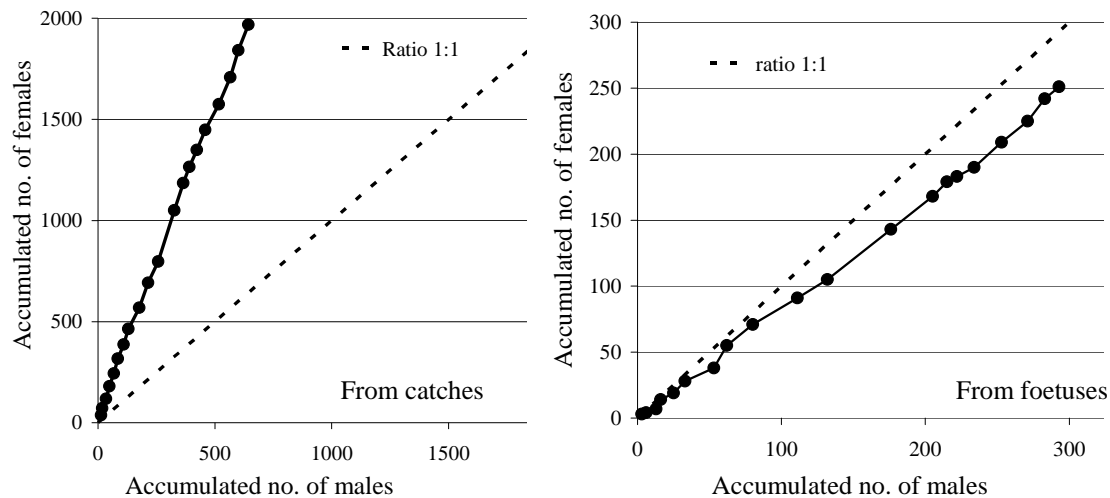


Figure 4. Cumulative number of males and females in the catches (left) and in the foetuses from pregnant females (right). Each data point corresponds to the number of males (x-axis) and females (y-axis) counted at the end of one season. Dotted lines indicate how the plot would look like if there were the same numbers of males as of females. Data obtained from catch reports filled by the hunters from 1987 to 2006. Source: Ministry of Fisheries and Hunting / Greenland Institute of Natural Resources.

Fin whale: Fin whales were observed in all the areas covered by the aerial survey from 2005 and the uncorrected estimate was 1,652 ($cv=0.37$). When corrected for proportion of animals missed by the observers, the estimates increased to 3,218 fin whales (95% CI 1,431-7,240). These results are underestimations because they were not corrected for the proportion of animals that were diving and therefore unavailable to be counted by the observers. Furthermore, the real numbers of fin whales off West Greenland must be considerably larger because, due to unfavourable weather conditions, the survey had low coverage in the northern area of West Greenland, where fin whales are particularly abundant (Heide-Jørgensen et al. 2007a).

The only earlier estimate of fin whale abundance off West Greenland accepted by the IWC Scientific Committee dates from 1987-88, and is 1,100 (95% CI 520-2,100; IWC 1992). About 3 times as many whales were seen per unit effort in the 2005 survey than in the 1987-88 survey.

In 2006, as in the case of the minke whales, when comparing the abundance estimates of fin whales off West Greenland obtained in 2005 with previous estimates, the Scientific Committee concluded that "...the present abundance estimate is not significantly different from that accepted for 1987/88, although the power to detect trends is low". The Scientific Committee endorsed the conclusion that the newest estimate was an underestimation of the real stock size (IWC 2006).

The Greenland Institute of Natural Resources has analysed the possible outcomes of sustainable catches ranging from 2 to 20 fin whales per year, and evaluated the population dynamics of this species in West Greenland. The data suggest that the West

Greenland stock of fin whales has nearly recovered from the large catches experienced early in the 20th century. Recommended sustainable catches range 14 - 26 fin whales per year. This study was done with basis on catch data and abundance estimates, and following advice from the IWC Scientific Committee (Witting 2007a).

As in the case of minke whales, the boat survey from 2005 indicated that fin whales were more abundant in East Greenland than in West Greenland (Heide-Jørgensen *et al. in press*).

Humpback whale: The estimate of humpback whales off West Greenland from the aerial survey of 2005, uncorrected for diving animals and for animals missed by the observers was 1,218 (95% CI 423 – 3,508). The estimate from the ship survey was 1,306 (95% CI 570-2,989). Humpback whales were seen both in offshore and coastal areas of West Greenland (Heide-Jørgensen *et al. 2007a, in press*).

In order to take into account the number of whales missed because they were underwater, the estimates will need to be multiplied by a factor that takes into account the time the whales are above a certain depth and therefore visible to the observers. This will in any case lead to a substantially larger abundance estimate of humpback whales in West Greenland, which spend more than 30% of their time at depths larger than 4 meters. In addition, the numbers mentioned above are likely to be underestimates because of the incomplete coverage of the area and lack of correction for whales missed by the observers.

Humpback whales are able to move over very large distances, including ocean basins. Photographic studies in the Northwest Atlantic concluded that considerable movement occurs between feeding areas at the scales of hundreds of kilometers, and there is a high exchange rate between neighboring feeding grounds, such as Eastern Canada and West Greenland. Satellite telemetry indicates that the individual humpback whales make round trips from West Greenland to the coast of North America within one season. The fact that humpback whales move over very large distances in general, and between Greenland and the coast of North America in particular, indicates that the population of humpback whales in West Greenland is substantially larger than what has been counted in the surveys (Pomilla and Rosenbaum 2005, Stevick *et al. 2006*, Heide-Jørgensen and Laidre, *in subm.*).

Earlier abundance estimates of humpback whales off West Greenland include 360 for 1998-1993 (95% CI 314-413), 599 for 1993 (95% CI 237-1,512) and 400 in 2002 and 2004 (cv=0.64; Kingsley and Witting 2001, Larsen and Hammond 2004, Witting and Kingsley 2005).

The surveys from 2005 suggest that the current abundance of humpback whales in West Greenland is substantially larger than in previous years. This may be due to underestimation of abundance in previous surveys, growth in population size and/or increased number of whales migrating in the summer to the West Greenland feeding ground.

Humpback whales were less abundant in East Greenland than in West Greenland (Heide-Jørgensen *et al. in press*).

The Scientific Committee of the North Atlantic Marine Mammal Commission (NAMMCO) reviewed the status of humpback whales in West Greenland and estimated that a yearly catch of 10 whales, including bycatch and animals struck but lost would have no deleterious effect in the population (NAMMCO 2006).

The Greenland Institute of Natural Resources has submitted an assessment of the population dynamics of humpback whales in West Greenland to the IWC Scientific Committee. This work calculates that yearly catches of less than 30 humpback whales would be sustainable (Witting 2007b).

Sei whale: Numbers of sei whales have only been calculated for the ship survey of 2005. The uncorrected estimates were 1,529 in West Greenland (95% CI 660-3540) and 729 in East Greenland (95% CI 226-2358; Heide-Jørgensen *et al.* in press).

The IWC Scientific Committee has not reviewed this estimate yet, and at the moment there are no suggested sustainable catch levels for this species. However, given that the uncorrected estimate of sei whales is not very different from the uncorrected estimates of fin and humpback whales, it is not unreasonable to suppose that, as the other two species, fin whales could sustain a catch of a couple of tens of animals per year.

According to local hunters, the number of sei whales in Uummannaq fjord, in Northwest Greenland has increased substantially during the last years.

Bowhead whale: Since 1981, the Greenland Institute of Natural Resources has carried out a series of surveys to estimate the numbers of narwhals and belugas in West Greenland. Bowhead whales are a secondary target of these surveys. The survey carried out in March and April 2006 yielded the largest number of observations of bowhead whales to date. It was estimated that there were 1,299 bowhead whales (95% CI 495-2,939) in the Disko Bay and adjacent waters at this time of the year (Heide-Jørgensen *etal.* 2007b).

Satellite tracking and genetic analyses indicate that bowhead whales from the Eastern Canadian Arctic and Western Greenland form a single population, where whales move extensively and share common ranges in summer as well as in winter (Dueck *etal* 2006, Postma *etal* 2006, Heide-Jørgensen and Laidre 2006, 2007).

In 2006, Canada submitted estimates of abundance of bowhead whales in the summer grounds of Eastern Arctic Canada to the IWC Scientific Committee. The Canadian scientists estimated a minimum of 7,310 bowhead whales in the area (95% CI: 3.160-16.900). The Scientific Committee did not accept these estimates and commented several aspects of the analysis (IWC 2006).

Inuit people from Nunavut, Canada, harvest this population moderately. Current quotas are one whale every other year in Fox Basin and one every 13 years in Baffin Bay. The recent abundance estimates are likely to lead to higher quotas in the near future.

The number of observations of bowhead whales in East Greenland has increased since the 1980s (Gilg and Born 2005)

Regulations and Monitoring

The Greenland Home Rule Government has issued one Act, with several amendments that affects hunting of all animals, including whales. Other Acts that indirectly affect whaling include an act on animal welfare from 2003 and an act of nature protection from the same year (table 2).

In addition, there are 3 executive orders that directly affect the taking of large whales: one on maintenance and approval of harpoon cannons, one on the reporting of the hunt and one on the hunt itself. Furthermore, whaling is indirectly affected by an executive order that regulates the issuing of hunting certificates (table 2).

Table 2. Legislation used to regulate hunting of large whales in Greenland.

Type of legislation	Name of legislation
Greenland Home Rule Act	No. 12 of 29 October 1999 on Hunting No. 11 of 12 November 2001 on Revisions to Greenland Home Rule Act no. 12 of 29 October 1999 on Hunting No. 9 of 15 April 2003 on Revisions to Greenland Home Rule Act no. 12 of 29 October 1999 on Hunting No. 29 of 18 December 2003 on Nature Protection No. 25 of 18 December 2003 on Animal Welfare
Executive Order	No. 26 of 24 October 1997 on Extraordinary Check and Approval of Harpoon Cannons No. 13 of 3 April 1998 on Reporting of Hunting and Strike of Large Whales No. 28 of 30 October 2003 on the Tasks and Authority of Fisheries and Hunting Inspectors No. 20 of 27 November 2003 on Hunting Licenses for Full Time Hunters No. 10 of 13 April 2005 on Hunting of Large Whales

The Home Rule Act on Hunting and its revisions have the goal to ensure a responsible and sustainable harvest of wild mammals and birds. Among other things, it specifies that the hunters' opinion should be taken into consideration when managing wildlife resources. It also mentions that only persons with a hunting certificate can hunt, specifies the types of weapons that can be used for hunting and describes the mechanisms to choose leadership in the case of collective hunts. The Home Rule Act on Hunting gives authority to the Cabinet for regulating the hunting and protecting the wildlife under a specific framework.

The Home Rule Act on Nature Protection is aimed at ensuring the preservation of animals and plants by protecting Greenland's nature in an ecologically sustainable basis, in accordance with the cautionary principle and with respect for the living conditions of the people.

The Home Rule Act on Animal Welfare aims at ensuring that all animals are handled in a responsible way and, as much as possible, are spared from unnecessary pain, suffering, fear, injuries and disadvantages.

The Executive Order No. 26 of 24 October 1997 on extraordinary check and approval of harpoon cannons establishes the requisites for installing and maintaining harpoon cannons in combined fishing and whaling boats. The goals of this executive order are to ensure that harpoon cannons mounted in whaling boats are safely installed, and adequate for using the Norwegian Penthrite grenade, which is the most efficient available weapon for killing whales.

The Executive Order No. 13 of 3 April 1998 on Reporting of Hunting and Strike of Large Whales sets the guidelines for reporting both catches and struck and lost animals. The reporting system is described below in the section about monitoring and data collection.

The Executive Order No. 28 of 30 October 2003 on the Tasks and Authority of Fisheries and Hunting Inspectors equips the inspectors with the authority to monitor the hunts. It also gives them the task of coordinating the mercy killing of wounded, entangled or sick animals.

The Executive Order No. 20 of 27 November 2003 on Hunting Licenses for Full Time Hunters defines who can be accredited as a fulltime hunter. This is relevant because only fulltime hunters can apply for licences to hunt large whales. Among other regulations, this executive order requires that fulltime hunters have to earn over 50% of their annual income from hunting and fishing.

The executive order on hunting of large whales: The core legislation dealing with hunting of large whales in Greenland at the moment is the Executive order No. 10 of 13 April 2005 on Hunting of Large Whales¹ (appendix 1). This Executive order declares that all baleen whales and sperm whales are protected, with the exemption of minke whales and fin whales, which can be taken following the rules specified in the executive order.

This executive order allows only for the hunt of adult whales that are not accompanied by immature animals. It also sets hunting seasons and defines rules for the merciful killing of whales that are injured, entangled in fishing gear or captured in ice entrapments.

The executive order places restrictions on the size and the type of boats that can be used for the taking of large whales. It also regulates the type of harpoon cannons allowed, specifies who should mount, examine and approve these cannons and demands that harpoon cannons should be examined and approved every other year.

¹ This executive order replaces an earlier executive order from 1998, which in turn replaced one from 1995.

The executive order specifies that only persons with licence or special permit can hunt large whales. Only full-time hunters that have taken a special course on handling and use of harpoon grenades, and whose boat and equipment have been approved can apply for licences. The executive order outlines a control system that limits sales of harpoon grenade to hunters that have taken the harpoon grenade course, and have a licence valid for the running year.

Special permits for collective hunt of minke whales can be given in places where the local boats equipped with harpoon cannon cannot satisfy the demand of fresh meat. Only full-time hunters that own skiffs and do not have access to boats with harpoon cannon can apply for permits for collective hunt. There are further regulations concerning the equipment necessary onboard the skiffs and the minimum amount of skiffs that can participate in a collective hunt.

Failure to comply with the executive order can result in a fine and in confiscation of the hunt and of the hunting equipment.

Quotas: The overall quotas for Greenland are set by the IWC. Thereafter, according to the executive order on hunting of large whales, the Ministry of Fisheries and Hunting decides the maximum number of large whales that can be taken from each municipality. This decision is taken every year after consulting with the municipalities and with the hunter's organisation. The municipal authorities provide numbered licences that allow the owner to hunt whales with a specified boat during the running year.

Since 1994, the fin whale quotas have been set free, meaning that quotas are not allocated to specific municipalities. Hunters who have obtained a licence for taking fin whales can hunt freely and the Ministry of Fisheries and Hunting stops the hunt when the catches approach the quota. This system has worked satisfactorily.

As a rule, the quotas for minke whales taken with harpoon cannon are also set free in April, at the beginning of the season and redistributed during August or September, depending on the progress of the hunt. In some years however, a proportion of the Greenland quota is distributed through fixed quotas among the municipalities at the beginning of the season, and the remaining Greenland quota is distributed later during the season.

At the beginning of the season, about 23% of the quota for minke whales for West Greenland is distributed among the municipalities to be used in the collective hunt. The municipality has the responsibility to allocate this quota among the settlements where there are not enough boats with harpoon cannon.

The Department for Fisheries and Hunting stops the hunt of minke whales when the catches approach the quota. This is usually between September and December. The Ministry of Fisheries and Hunting can reduce the quota for the running year, or for the following year, if the quotas have been exceeded. Other factors that may lead to redistribution of quotas, or the moving or cancelling of licences include quota overruns, incorrect reporting and the taking of whales of protected species.

As a rule, the current system works satisfactorily. An exemption was 2006, when a number of catch reports were delayed and arrived to the Ministry of Fisheries and Hunting after the quota had been stopped, resulting in a quota overrun of 6 minke whales.

This overrun was subsequently subtracted from the quota for 2007. As a result of this reduction, the block quotas for the period 2002 – 2007 should not be exceeded.

Because whalers are a combination of hunters of large whales, hunters of other species and fishermen, they have to evaluate a complex number of factors before setting out to catch large whales. These factors include weather conditions, seasonal variations in the availability of whales and time available for other activities such as fishing for snow crab and a number of fish species that are regulated by quotas, fishing seasons and market forces. This explains why some years the quotas for large whale are not all taken (figs. 2 and 3).

Monitoring and data collection: The hunt is monitored by the local authorities and by fisheries and hunting inspectors. Furthermore, it is possible to control the fate of all harpoon grenades, which are marked with unique serial numbers and distributed under a tightly regulated system. The Ministry of Fisheries and Hunting gathers information and follows the development of the hunt through a self-reporting system (fig. 5).

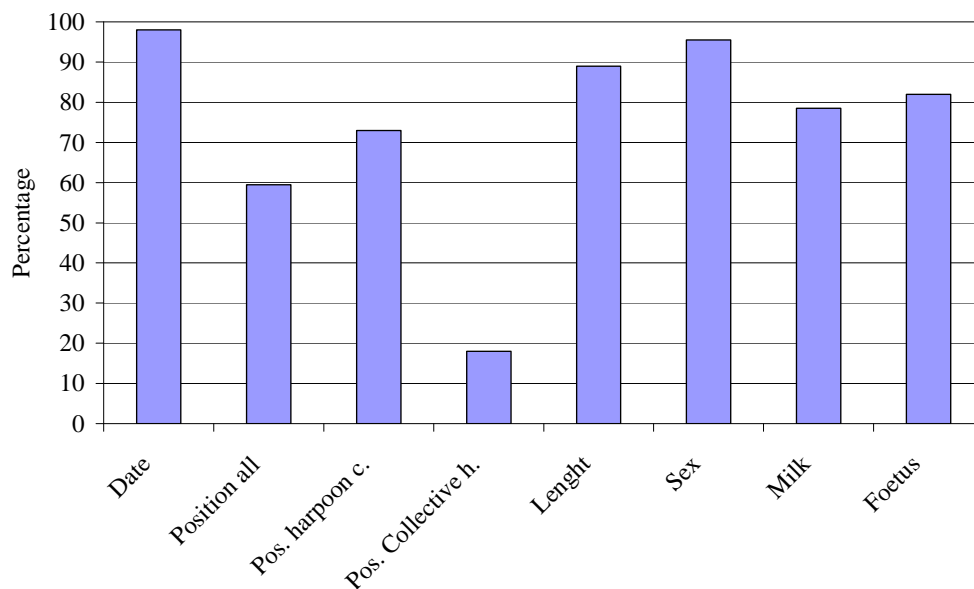


Figure 5. Proportion of the minke whales caught in 2005 and 2006 for which information about the following items was clearly reported: Date when whales were caught; position where whales were caught for all catches pooled; position where whales were caught by boats with harpoon cannon; position where whales were caught in the collective hunt; length of the whales; sex of the whales; females for which data on lactation state was given; females for which information on presence/absence of foetus was given. N = 357 minke whales. Note: This figure shows only a selection of biological parameters, catch reports contain more information than what is outlined here. Source: Ministry of Fisheries and Hunting

At the first high tide after a hunt, whale carcasses are dragged into shallow waters, where they are flensed during low tide. Thereafter, part of the meat is distributed among those who participated in the hunt and the rest is sold. Most hunters sell their catch in the open

market, but sometimes the meat is sold directly to institutions, such as hospitals or nursery homes, or to the government owned company that distributes products throughout the country.

As mentioned above, licences or special permits are required for the killing of large whales. The product of a catch cannot be sold before the municipal authorities have registered the hunt and stamped the licence. In order to obtain a stamp, whalers must show the receipt for the purchase of the harpoon grenade, as well as the used grenade with serial number.

In the small communities of Greenland, it would be difficult to kill, flense and distribute a large whale without the local authorities noticing and asking for the relevant licence or permit. In addition, fisheries and hunting inspectors monitor the hunt by making random checks in the field and in the open markets where the hunters sell their products. The fisheries and hunting inspectors operate 8 vessels in West Greenland.

After a whale has been caught, the hunter has the obligation to deliver a catch report to the municipal authorities. This catch report was designed to collect the information described in section IV of the Schedule of the International Convention for the Regulation of Whaling, 1946 (IWC 2006b). It includes operational information about the hunter, his license, boat, etc., as well as data about biologically relevant items such as the place where the animal was caught, the approximate size of the animal, sex, reproductive state of females, stomach contents, weight of meat products etc. The report also includes information about the hunting method, including descriptions of the weapon used to kill the animal, serial number of the harpoon grenade and estimated time to death.

Although it is obligatory to present a catch report, this is a self-reporting system, since there is no external control over the accuracy of the data provided by the hunters. Not all hunters are able to provide information on all items included in the catch report (fig. 5). For instance, only hunters who own a GPS (Global Positioning System) provide with latitude and longitude. Hunters without access to a GPS write the local name of the place where the whale was hunted. This explains the low reporting of geographical data from the collective hunt (fig. 5)

Hunters deliver their catch reports to the municipal authorities, together with tissue samples stored in a saturated saline solution. This information is forwarded to the Ministry of Fisheries and Hunting, where it is stored as a hard copy and entered into an electronic database. The tissue samples, together with copies of their associated catch reports are sent to the Greenland Institute of Natural Resources. The Greenland Institute of Natural Resources and the Ministry of Fisheries and Hunting share information and cooperate in the validation of the electronic database. The Greenland Institute of Natural Resources uses the data for biological studies (e.g. Simon et al 2007a, 2007b; Witting 2007a, Witting and Schweder 2007). The Ministry of Fisheries and Hunting uses the catch reports to monitor the hunt and to provide information requested by the IWC (e.g. Greenland Home Rule 2006a, 2006b, 2006c, this report).

International observers that report to the NAMMCO Inspection and Observation Committee have monitored the hunt of large whales in Greenland a number of times, most recently in 2006.

Animal welfare: hunting methods, time to death and loss rates

Humans should make every effort to avoid causing unnecessary distress to living animals. This principle is brought into the legislation in Greenland by the Home Rule Act on Animal Welfare (table 2).

In the case of whaling, the main goal from an animal welfare point of view is to cause death as quickly as possible. An ideal situation is when the whale is killed instantaneously. However, when hunting a large mammal in the wild, this goal may be difficult to attain.

Another important goal of whaling is to ensure that as many of the wounded animals are killed and landed. The proportions of animals that are struck but lost (S/L) are also known as “loss rates”.

In order to monitor the welfare aspects hunting large whales, Greenlandic whalers report the time passed between the first wounding and the moment when the whale was considered to be dead or unconscious. This period of time is technically known as Time to Death, or TTD. In addition, hunters are required to report all incidences of large whales that were struck but lost.

Time to death and loss rates depend on the species being hunted and on the method used to hunt the animal. There are three types of hunting of large whales in Greenland: hunting of fin whales with harpoon cannon, hunting of minke whales with harpoon cannon and collective hunt for minke whales.

Fin whales with harpoon cannon: Fin whales are caught in West Greenland, south from Uummanaq. They are caught either by two boats of a minimum length of 30 ft working together, or by one boat of a minimum length of 36 ft. Each boat should be equipped with one certified harpoon cannon, which is checked every other year.

The primary weapon is a harpoon with the Norwegian penthrite grenade “Whale Grenade 99”. This grenade was originally produced for hunting minke whales, and it has been modified for the hunt of fin whales by extending the length of the triggering cord.

The triggering cord is a string with one end attached to the detonator and the other end attached to a small hook. This hook anchors itself to the skin of the whale and, as the harpoon penetrates the body of the whale, the triggering cord unfolds until it tenses and initiates the detonation of the grenade. This way, the grenade explodes deep inside the body of the whale.

The harpoon is fired with a 50mm Kongsberg cannon. The harpoon is attached to a forerunner, which is in turn attached to a winch in the boat.

The secondary weapon is the same as the primary weapon.

Gunners shoot in the heart and lungs region by aiming at an area in front of the pectoral fins.

Minke whales with harpoon cannon: The majority of the minke whales are taken by this method (fig. 8). Minke whales are caught with harpoon cannon in West Greenland, south from Uummannaq. The minimum boat length is 30 ft. As with the fin whale hunt, the harpoon cannons used to hunt minke whales should be certified and checked every other year.

The primary weapon is a harpoon with a “Whale Grenade 99”. The length of the triggering cord is 50 cm. As with fin whales, gunners aim at the region in front of the pectoral flippers, in order to damage the heart and surrounding areas.

The secondary weapon is either a harpoon with the “Whale grenade 99”, or rifles of a minimum calibre of 7.62 mm (30.06) and full mantled bullets. Some hunters use round-nosed bullets together with rifles with higher calibre (.375), due to their better penetration. Rifle shots are aimed at the head, in front of the animal’s neck.

Collective minke whale hunt: The collective minke whale hunt takes place in settlements where there are no boats with harpoon cannons. The collective minke whale hunt is the only hunt of large whales in areas with little infrastructure, such as East Greenland and West Greenland north of Disko Bay.

A minimum of 5 skiffs have to participate in the hunt. Boats of larger size without harpoon cannon can also take part. These are usually small fishing boats. Each boat has to be equipped with at least one hand harpoon with line and buoys. This harpoon is attached to the whale at the first opportunity, to prevent the animal from sinking.

During the course of the hunt, hunters attempt to herd the whale towards shallow and inshore waters.

The weapons of the collective minke whale hunt are rifles of a calibre of 7.62 mm. (30.06) or larger and full mantled bullets. As a rule, the whales are first wounded and then secured with the hand harpoons. When possible, the hand harpoon is used before wounding the animal. Once a whale has been secured, it is killed by shoots aimed at the head. Round-nosed bullets together with rifles with higher calibre, such as .375, are often used to kill the whale.

Time to death, instantaneous death and loss rates: A whale is considered dead when it stops swimming, it does not move and its flippers are still. In practice, it can be difficult to estimate the exact moment of death or unconsciousness because fin and minke whales tend to sink as soon as they are dead. Often, the whale is considered dead or unconscious when it has sunk and the harpoon lines attached to the whale show no signs of movement.

In the case of hunts with harpoon cannon, reasons for longer than average times to death include malfunction of equipment (penthrite grenades failing to explode, ropes breaking, etc.) and inaccurate shots. Deterioration of weather conditions often lead to unsuccessful or difficult catches.

For collective hunts, unusual long times to death are caused by factors such as whales swimming offshore and weather deteriorating.

For all hunts, long times to death increase the risk of wounded animals escaping before being secured. Both fin and minke whales tend to sink when dead, and therefore a relatively common cause for losing the animals is when dead whales sink before they have been secured properly. In recent years, median times to death have ranged between 5 - 20 minutes for the fin whale hunt, 3 - 5 minutes for the minke whale hunt with harpoon cannon and 20 - 25 minutes for the collective hunt (figure 6 and table 3).

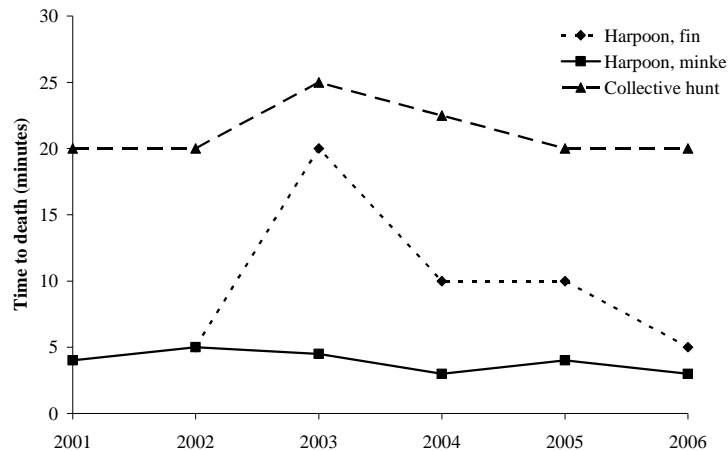


Figure 6. Time to death for fin whales (diamonds), minke whales taken with harpoon cannon (squares) and mink whales taken in the collective hunt (triangles) from 2001 to 2006. N = 947 catch reports. Source: Ministry of Fisheries and Hunting

In recent years, loss rates have ranged between 0 – 21 % for the fin whale hunt, 0 – 2 % for the minke whale hunt with harpoon cannon and 4 – 10 % for the collective hunt (figure 7 and table 3).

From 2001 to 2006, instantaneous death rates, defined as the proportion of whales dying or losing consciousness within one minute after being wounded, were 20 % for the fin whale hunt, 31 % for the minke whale hunt with harpoon cannon and 2 % for the collective hunt (table 3).

Because instantaneous death is difficult to achieve when hunting wild animals, it may be relevant to consider also the proportion of animals that die within five minutes after being wounded for the first time. From 2001 to 2006, this proportion has been 45 % for the fin whale hunt, 67 % for the minke whale hunt with harpoon cannon and 10 % for the collective hunt (table 3).

The vast majority of large whales hunted in Greenland are minke whales taken with harpoon cannon (figure 8). As we can see from table 3 and figures 6 and 7, this type of hunt is characterised by a relatively low TTD and a very low loss rate (1 %). Improving hunter's skill through training with harpoon cannon may be a way to keep the instantaneous death rates of minke whales taken with harpoon cannon at the current levels or lower. Training with rifle as secondary weapon, and experiments with different

type of ammunition may help to reduce the killing time of minke whales that do not die instantly.

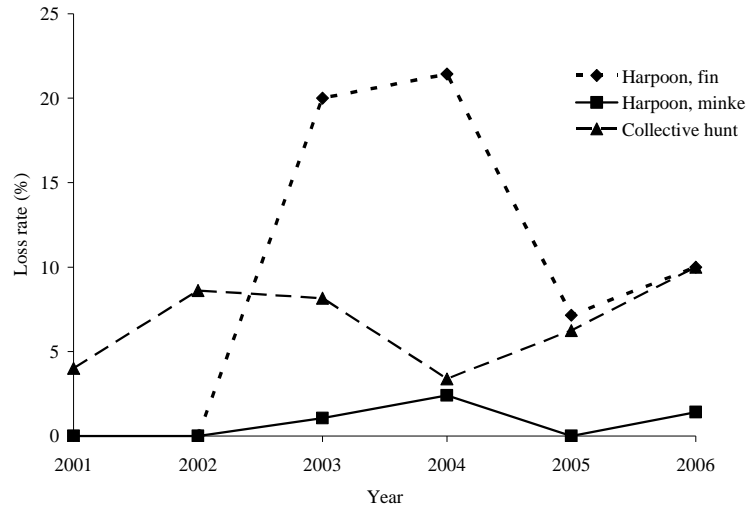


Figure 7. Loss rates for fin whales (diamonds), minke whales taken with harpoon cannon (squares) and minke whales taken in the collective hunt (triangles) from 2001 to 2006. N = 1,364 catch reports. Source: Ministry of Fisheries and Hunting

Table 3. Time to death, instantaneous death and loss rates for each type of hunt, from data reported by hunters in 2001-2006 (N = x reports). The maximum times to death for the hunts with harpoon cannon correspond to situations when the forerunners broke, the wounded animals escaped and it took a long time to recapture them. Source: Ministry of Fisheries and Hunting

	Harpoon cannon fin whale	Harpoon cannon minke whale	Collective minke whale hunt
Number of reports TTD - S&L	44 - 56	623 - 679	280 - 329
Average TTD	34 minutes	7 minutes	28 minutes
Median TTD	10 minutes	4 minutes	20 minutes
Maximum TTD	720 minutes	120 minutes	360 minutes
Percentage of whales killed within 1 minute	20 %	31 %	2 %
Percentage of whales killed within 5 minutes	45 %	67 %	10 %
Loss rate (% of struck animals that are lost)	11 %	1 %	6 %

Fin whales are particularly difficult to hunt because of their large size and fast swimming speed. On November 2006, the North Atlantic Marine Mammal Commission organised a workshop to Address Problems of “Struck and Lost” in hunts of marine mammals (table 5). One of the conclusions of this workshop was that the hunting of fin whales could be improved by modifying the Norwegian penthrite grenade to include added explosive power.

Of the three methods used to catch large whales in Greenland, the collective hunt has the longest TTD and the next highest rates of struck and lost animals. TTD could be improved by changing the type of ammunition or increasing the calibre of the rifles. However, more effective weapons may lead to animals dying and sinking before they can be secured with hand-harpoons attached to lines and floats; a reduced TTD may lead to an increased struck and lost rate!

The collective hunt is vital for the survival of several hunters and their families, and is especially important in the more remote settlements of Greenland, where there are no boats that can hunt large whales with harpoon cannon. Therefore, any measures to improve the killing methods used in the collective hunt should take the hunters into consideration and should be economically viable.

Probably as a result of the government efforts to encourage the hunt of minke whales with harpoon cannon, the proportion of minke whales taken by the collective hunt has decreased during the present century (fig. 8).

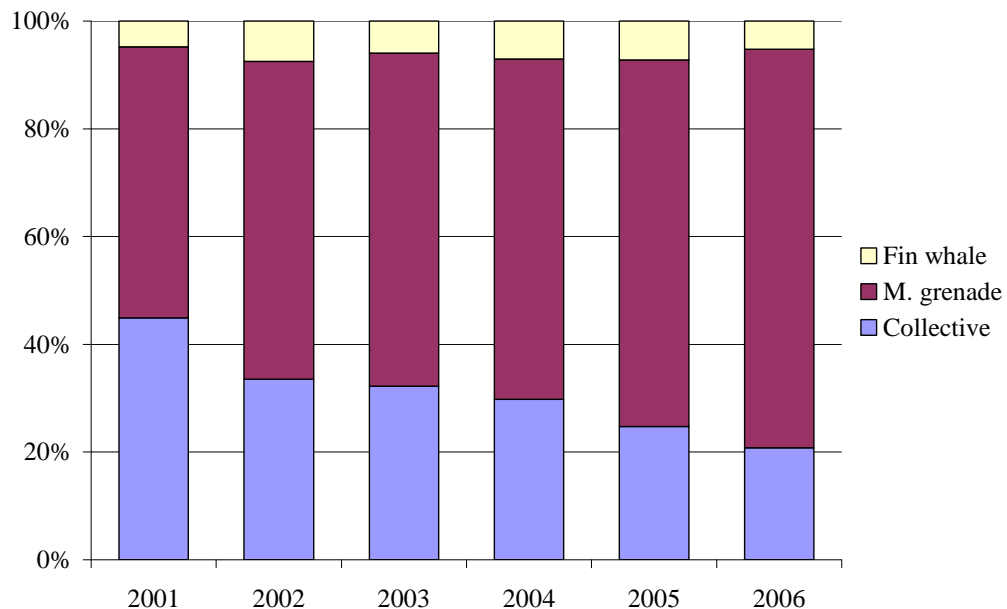


Figure 8. Percentage of whales taken by the different types of hunt from 2001 to 2006. Top: fin whales with harpoon cannon. Middle: minke whales with harpoon cannon. Bottom: minke whales in the collective hunt. There has been a gradual reduction of the number of whales taken by the collective hunt (N = 1,075 whales). Source: Ministry of Fisheries and Hunting

Measures to reduce animal suffering: In 1997, the IWC adopted the resolution 1997-1 on improving the humaneness of aboriginal subsistence whaling (IWC 1997). In response, the Greenland Home Rule Government has taken a number of initiatives, including improved legislation (table 2) and organization of conferences and workshops (table 5).

In addition, the Greenland Home Rule Government works towards improving the animal welfare aspects of hunting large whales by promoting the use of detonating harpoon grenades. As mentioned earlier, this work was boosted by a harpoon-cannon renovating program that finished in 1998.

The use of penthrite grenades became mandatory for all the boats equipped with harpoon cannons in 1991. Currently, it is obligatory to use the Norwegian penthrite grenade “Whale Grenade 99”, which is the best available weapon for killing large whales. This grenade is relatively expensive and the Home Rule Government promotes its use by subsidising part of its cost.

In order to secure the safety of the hunters, and ensure that the harpoon grenade is optimally used, a special course is obligatory in order to buy, handle and use harpoon grenades. Harpoon grenades can only be purchased after showing the certificate of this course, together with the licence for whaling. Licences for taking whales with harpoon are given only to boat owners who have taken the course, or have at least one member of their crew who has taken the course.

The current harpoon grenade courses are organised by the Organisation of Fishermen and Hunters (KNAPK) in cooperation with the Ministry of Fisheries, Hunting and Agriculture and take place one or more times per year, depending on demand (table 4). The programme of the course includes the mechanics of the “Whale grenade 99”, security aspects, mounting of harpoon, storage and handling of the grenade, as well as operation of the harpoon cannon.

Table 4. Courses on the handling and use of the Norwegian penthrite grenade “Whale Grenade 99”, as well as number of hunters, fisheries and hunting inspectors and distributors of the grenade that participated. Skippers or crew members representing all boats equipped with harpoon cannon were taught in the courses from the year 2000. Courses on the use of a previous model of the penthrite grenade were already held since 1991.

Year	2000	2003	2004	2006	2007
No. of courses	Several	9	2	1	3
No. of people trained	150	75	30	20	30

Table 5. Conferences and workshops relevant for improving the humaneness of whaling, which have been organised or co-organised by the Greenland Home Rule Government after the IWC adopted the resolution 1997-1 on improving the humaneness of aboriginal subsistence whaling (IWC 1997).

Date	Place	Event
Seminar on renewable resources		
9 - 11 October 1998.	Nuuk, Greenland.	Topics: future ways for sustainable harvest, the situation of the living natural resources, hunting ethics, sharing the resources, etc. Participants: hunters, resource managers, scientists and politicians
NAMMCO Workshop on Methods Used for Hunting Marine Mammals		
9 - 11 February 1999	Nuuk, Greenland	Topics: review of existing marine mammal hunting methods and examination of possibilities for technical innovation. Participants: hunters, resource managers and scientists.
NAMMCO Workshop on Marine mammals: Weapons, Ammunition and Ballistics		
12-15 November 2001	Sandefjord, Norway	Topics: review of existing marine mammal hunting methods and examination of possibilities for technical innovation. Participants: hunters, resource managers and scientists.
NAMMCO Conference on User Knowledge and Scientific Knowledge in Management Decision-Making		
4 - 7 January 2003	Reykjavík, Iceland	Topics: ways of incorporating user's knowledge and scientific knowledge into management decisions. Participants: hunters, fishermen, scientists, and resource managers.
NAMMCO Workshop to Address Problems of "Struck and Lost" in Seal, Walrus and Whale Hunting		
14 - 16 November 2006	Copenhagen, Denmark	Topics: hunting methods with respect to the problem of "struck and lost" (S&L), reasons why some hunts have a high or low S&L rate, recommendations on how to reduce S&L. Participants: hunters, resource managers, scientists and NGOs
Hunter's seminar		
Planned for February 2008	Nuuk, Greenland	Topics: status of natural resources, legislation, user's knowledge, hunting methods Target audience: hunters, resource managers, scientists and politicians

The first courses on the use and handling of the harpoon grenade were arranged in 1991, in cooperation with Dr. Egil Ole Øen, from the Norwegian School of Veterinary Science and the Norwegian “Kongsberg” company. At that time, the courses were taken by skippers and crew members from all the boats equipped with harpoon cannons (table 4).

The harpoon cannons are checked every other year by persons who have taken a course on mounting and renovation of harpoon cannons. These courses are also organised by the Organisation of Fishermen and Hunters (KNAPK) in cooperation with the Ministry of Fisheries, Hunting and Agriculture. Their frequency depends on the demand. The most recent course was held in November 2006, and personal from all that shipyards in West Greenland attended.

The course on mounting and renovation of harpoon cannons can be taken by persons who have completed a technical education on welding and working with metal, and are employed in a shipyard approved for the mounting and checking of harpoon cannons. In order to be approved, the shipyard needs to have specific machines and tools, as well as reserve parts needed for mounting and renovation of harpoon cannons.

The future of whaling in Greenland

The reasons why whaling is important for Greenlanders include:

- Whales and whaling are fundamental part of the culture and the history
- Large whales are a substantial source of food for the majority of the population
- The selling and distribution of whale meat provide a necessary source of income for many people
- There are well documented health reasons to promote the consumption of whale products
- In a country surrounded by highly productive seas, where the climate seriously restricts farming and agriculture, whaling provides with large amounts of food at very low costs for the environment.

For these reasons, the Greenland Home Rule Government is committed to continue harvesting large whales in a sustainable way in the foreseeable future.

Greenland's need of whale meat: Within the IWC context, Greenland's hunt of large whales falls in the category of Aboriginal Subsistence Whaling (ASW). Commercial whaling aims at maximizing profits, while ASW aims at satisfying the local need of whale meat and to secure the continuation of cultural practices. Therefore, one of the differences between commercial whaling and ASW is that commercial quotas would be limited only by the sustainability of catches, while aboriginal quotas are limited by the sustainability of the catches and by the needs of local subsistence. As a result, the IWC requires an evaluation of the local need of whale meat before allocating ASW quotas (Donovan, pers. Comm.)

West Greenland's need of meat from large whales was evaluated by the IWC in 1990 and 1991, with basis on the catches previous to 1986. The rationale behind this evaluation was that catches of large whales off West Greenland were severely reduced by quotas in 1985, when the humpback whale quota was eliminated and the quota for minke whales was reduced from 300 to 130 whales. Thus, catches previous to 1986 were limited by the demand of whale meat and by the logistic limitations for catching whales, rather than by restrictive quotas (IWC 1991).

According to the estimates accepted by the IWC, the average yearly catches in West Greenland before 1986 were 14 humpback whales, 10 fin whales and 240 minke whales. Using different sources of information, the IWC Aboriginal Subsistence Whaling Subcommittee agreed that the best available estimates for conversion of number of whales to weight of whale meat in this area were 8 metric tonnes for humpback whales, 10 tons for fin whales and 2 tons for minke whales (tale 6; IWC 1991).

Table 6. The documented yearly need of meat from large whales for West Greenland Based on the catches previous to 1986. The numbers in brackets show the values corresponding to the quotas for 2003-2007. The quotas from 2003-2007 yield 230 tons of whale meat less that the documented need for West Greenland.

<i>Species</i>	<i>Tons of meat per whale</i>	<i>Average yearly catches before 1986 (yearly quotas 2003-2007)</i>	<i>Meat form large whales consumed yearly in West Greenland previous to 1986 (meat available per year from 2003-2007 quotas)</i>
Humpback whale	8 tons	14 (0)	112 tons (0)
Fin whale	10 tons	9 (19)	90 tons (190 tons)
Minke whale	2 tons	232 (175)	464 tons (350 tons)
Total			670 tons (540 tons)

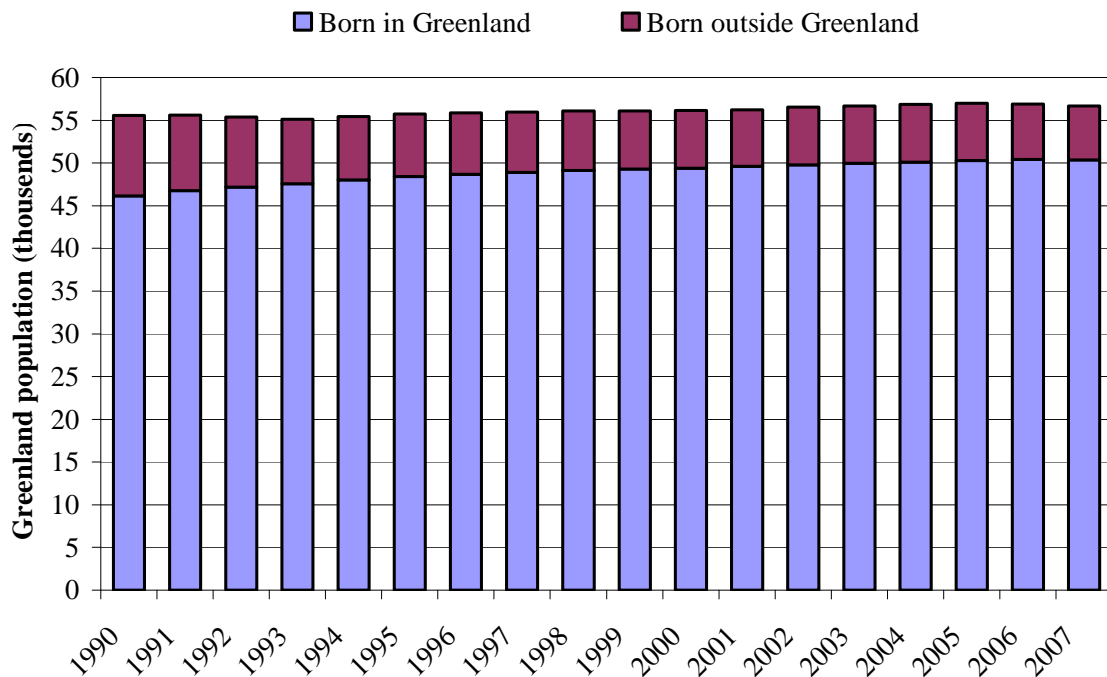


Figure 9. The number of people residing in Greenland from January 1990 to January 2007. Bottom: people born in Greenland. Top: people born outside Greenland. Source: Greenland Statistic.

Using this conversion factor, the yearly catches of West Greenland, before 1986, yielded 112 tons of humpback whale meat, 90 tons of fin whale meat and 464 tons of minke whale meat. This means that previous to 1986, approximately 670 tons of meat of large whales were consumed yearly in West Greenland (table 6).



Figure 10. People lining up to buy fresh minke whale meat at the open market in Nuuk, May 2007. Photo: Benny Koksholm

Applying the same principle to the potential catches given by the current quotas of 175 minke whales and 19 fin whales for the period 2003 – 2007, we obtain 350 tons of minke whale meat and 190 tons of fin whale meat. Or a total of 540 tons of large whale meat.

This means that West Greenland still needs 130 tons of meat from large whales in order to satisfy its documented needs (table 6).

The need of meat from large whales for West Greenland has probably increased since 1990, because Greenland's ability to locally produce alternative sources of meat has remained stable, and there has been a slight increase in the population size. The increase of population size is more substantial when considering the number of people born in Greenland (fig. 9). The people born in Greenland are the ones that are primary consumers of marine mammal products, including meat from large whales.

There is a high demand of meat from large whales in modern Greenland. When fresh meat from a minke whale or a fin whale is brought to the open market, the news spreads through the "kamikpost", a communication network that includes phone calls and text messages from mobile phones and, in the larger cities chain emails across working places. As a result, people often line up to buy the meat and hunters have no problem selling the share of the catch that is meant to be sold (figure 10).

Environmental and health reasons for consuming whale meat in Greenland: It is clear that hunting and consuming large whales have a cultural importance in Greenland. It is also clear that whale meat and other whale products, such as mattak are a vital source of proteins and a very welcome source of income, either as cash from sales, or as savings for those who acquired whale meat through non-commercial transactions. What is not so obvious for everyone is that consuming whale meat in Greenland has huge advantages for the protection of the environment and for the health of Greenlanders.

Harvesting large whales from local waters has a relatively low cost for the environment. In contrast, the amount of gas emissions, production of waste and use of land needed to farm western meat, and to transport this meat to Greenland is enormous. As mentioned above, the current IWC quotas are short of fulfilling the need of meat from large whales in West Greenland. A likely consequence of this shortage of meat is an increased import of western meat from overseas.

In a country like Greenland, surrounded by highly productive seas and with a climate unsuitable for large scale agriculture and farming, it would be environmentally irresponsible not to satisfy the demand of meat by hunting large whales, as long as such hunts are sustainable.

For Greenlanders, consuming whale meat has further advantages in terms of health. Several studies have confirmed the nutritional value of marine mammal products compared to imported and westernised food such as chicken, beef and pork. Whale mattak contains rich sources of vitamin A and C, thiamine, riboflavin and niacin. These are known to provide excellent protection against scurvy. Whale meat and blubber are considered beneficial due to their high concentration of selenium. In addition, marine mammal lipids are low in saturated fats and high in the omega-3 polyunsaturated fatty acids that give protection from the cardiovascular diseases common in North America and Europe (e.g. appendix II).

There is evidence that Inuit traditional diet protects against several diseases, including some types of cancer, thrombosis and atherosclerosis. There is also evidence that

Greenlanders depend on traditional food to obtain vitamin D. The Board of Nutrition in Greenland recommends Greenlanders not to stop eating traditional food because the effects of stopping these are not known. It is believed that a reduction of traditional diet would lead to an increase in the number of western diseases (appendix II).

Catch of species other than fin and minke whale.

It is important that the IWC quotas can satisfy the documented need of meat from large whales of 670 tons for West Greenland. This could be achieved either by increasing the current quota of minke whales and fin whales and/or by allocating quotas to other species as well.

During the last 20 years, the knowledge about the status of the stocks of large whales was insufficient to grant optimal allocation of quotas. Fortunately, surveys for large whales have been successful during 2005 and 2006, and the IWC is now in a better position to approve new quotas. The prospect of allocating quotas to species other than fin and minke whales is especially positive this year.

Humpback, sei and bowhead whales have become numerous enough to allow for well regulated sustainable catches. The IWC Scientific Committee has evaluated assessments of humpback and bowhead whales in 2007.

Humpback whales are abundant throughout the whole west coast and were hunted until 1986. Therefore many Greenlanders grew up with humpback whale meat and would very much appreciate if Greenland could obtain a quota for these species.

Bowhead whales are confined to Disko Bay and adjacent waters and, although they have not been hunted systematically in the recent past, a quota for this species will greatly alleviate the need of whale products in this area.

During the 1970s, there were difficulties regulating the catches of fin and humpback whales. Improved legislation and a well functioning monitoring system should ensure that the regulation of the hunt works satisfactorily, as it has worked during since the 1990s.

Concluding remarks

Greenlandic whaling is the continuation of a very old tradition performed according to needs in a contemporary society. Hunting in general and hunting of large whales in particular are integral parts of the culture and the economy of the country. A Greenland without hunting is therefore unimaginable. For this reason, Greenland has the intention to hunt large whales both in the near-term and in the long-term future.

The prospects of obtaining approval from IWC for quotas for 2008 – 2012 are particularly good for a number of reasons:

- IWC scientific committee has recently approved estimates of abundance for the relevant stocks
- The control and monitoring systems are functioning well and the block quotas for the period 2003 – 2007 have not been exceeded.
- With the current quotas, Greenland is 220 tons short of the documented need of 670 tons of meat from large whales that was approved by the IWC in 1991.

With a robust advice from the Scientific Committee, the IWC should be able to approve quotas for Greenland that are equal to or larger than the ones for the period 2003-2007. These quotas would be sustainable and the hunt would be well regulated. Furthermore, Greenland will continue working actively on improving the welfare aspects of whale hunting.

The Greenland Home Rule Government hopes that the IWC will be able to take management decisions based on the best available scientific knowledge and respect for the cultural, nutritional and economical needs of Greenlanders. Allowing Greenland to obtain sufficient whale meat to fulfil the documented need will be a way to protect the environment by rationally utilising the natural resources at hand.

References

- Birket-Smith, K. 1924. Ethnography of the Egedesminde District. Meddelelser om Grønland. 66: pp. 189
- Caulfield, R.A. 1997. Greenlanders, whales and whaling: sustainability and self-determination in the Arctic. University Press of New England, Dartmouth, NH
- Dueck, L.P., Hiede-Jørgensen, M.P., Villum-Jensen, M. and Postma, L.D. 2006. Update on investigations of bowhead whale (*Balaena mysticetus*) movements in the eastern Arctic, 2003-2005, based on satellite-linked telemetry. Canadian Science Advisory Secretariat. Research Document 2006/050. Pp 22
- Freeman, M.M.R., Bogoslovskaya, L., Caulfield, R.A., Egede, I., Krupnik, I.I. and Stevenson, M.G. 1998. Inuit, whaling, and sustainability. Altamira Press.
- Gilg, O. and Born E.W. 2005. Recent sightings of the bowhead whale (*Balaena mysticetus*) in Northeast Greenland and the Greenland Sea. *Polar Biol* (2005) 28: 796–801
- Greenland Home Rule 2006a. A note regarding information encouraged in IWC-resolution 1999, for the Greenland catch of 2005. IWC/58/WKM & AWI3.
- Greenland Home Rule 2006b. Summary of activities related to the Action Plan on Whale Killing Methods. IWC/58/WKM & AWI6.
- Greenland Home Rule Government 2006c. Whale killing methods and associated welfare issues in Greenland. IWC/58/WKM & AWI7.
- Gulløv, H.C. (ed) 2004. Grønlands Forhistorie. Gyldendal. Pp 434
- Heide-Jørgensen, M.P. and Laidre, K.L., 2006. Greenland's winter whales. Iinnisiorfik. ISBN-10:87-7975-309-4. 128 p.
- Heide-Jørgensen, M.P. and Laidre, K.L., 2007. Further evidence for a single stock of bowhead whales between Canada and Greenland. IWC/59/BRG36
- Heide-Jørgensen, M.P. and Laidre, K.L., *in subm.* Autumn space-use patterns of humpback whales (*Megaptera novaeangliae*) in West Greenland. Submitted to JCRM.
- Heide-Jørgensen, M.P., Borchers, D.L., Witting, L.M., Simon, M.J., Laidre, K.L., Rosing-Asvid, A., and Pike, D. G. 2007a. Final estimates of large whale abundance in West Greenland waters from an aerial survey in 2005. IWC/SC/59/AWMP7
- Heide-Jørgensen, M.P., Laidre, K.L., Borchers, D.L. and Samarra, F. 2007b. Surprising recovery of bowhead whales. IWC/SC/59/BRG93
- Heide-Jørgensen, M.P., Simon, M.J., Laidre, K.L. *in press.* Estimates of large whale abundance in Greenland waters from a ship-based survey in 2005. Submitted to *Journal of Cetacean Research and Management* December 2005.
- Hiby, A.R. 1985. An approach to estimating population densities of great whales from sighting surveys. *IMA Journal of mathematics Applied to Medicine and Biology* 2: 201-220
- Hiby, L., Ward, A. and Lovell, P. 1989. Analysis of the North Atlantic sightings survey 1987: aerial survey results. *Report of the International Whaling Commission* 39: 447-455.
- IWC 1991. Chairman's report of the forty-second annual meeting. Rep. int. Whal. Commn. 41:31-32.
- IWC 1992. Comprehensive assessment special meeting on North Atlantic fin whales, Reykjavik, Iceland, 25 February-1 March 1991. Rep. int. Whal. Commn. 42: 595-644.
- IWC 1997. Annual Report of the International Whaling Commission 2005. Cambridge.
- IWC 2006. Report of the Scientific Committee. IWC/58/Rep1
- IWC 2006b. International Convention for the Regulation of Whaling, 1946; Schedule. In: Annual Report of the International Whaling Commission 2005. Cambridge. Pp:157-168

- Kapel, F. O. 1978. Catch of minke whales by fishing vessels in West Greenland. *Rep. Int. Whal. Commn.* 28: 217-226
- Kapel, F. O. and Petersen, R. 1982. Subsistence hunting: the Greenland case. In: *Aboriginal / subsistence whaling (with special reference to the Alaska and Greenland fisheries)*. *Rep. Int. Whal. Commn.* (special issue 4): 51-74
- Kellogg, R. 1997. Introduction. In: *The Sagas of Icelanders*. Ed: Ö. Thorsson. Allen Lane, the Penguin Press. Pp. 782
- Kingsley, M. C. S., and L. Witting 2001. A preliminary analysis of aerial survey observations of humpback whales in Greenland waters. IWC/SC/53/NAH23.
- Larsen, F. 1995. Abundance of minke and fin whales off West Greenland, 1993. *Rep. int. Whal. Commn* 45: 365-370.
- Larsen, F., Martin, A.R. and Nielsen, P.B. 1989. North Atlantic sightings survey 1987: Report of the West Greenland aerial survey. *Rep. int. Whal. Commn* 39: 443-446.
- Larsen, F. and Hammond, P.S. 2004. Distribution and abundance of West Greenland humpback whales (*Megaptera novaeangliae*). *Journal of Zoology* 263: 343-358.
- Lemche, E. 1990. Management of stocks. In: *North Atlantic studies: whaling communities*. Ed: Vestergaard, E. Vol. 2. No 1+2: Pp:87-89. Aarhus University Press.
- Pomilla, C. and Rosebaum, H. C. 2005 Against the current: an inter-oceanic whale migration event. *Biol. Lett.* (2005) 1, 476-479
- Postma, L.D., Dueck L.P., Heide-Jørgensen, M.P. and Cosens S.E.. 2006. Molecular genetic support of a single population of bowhead whales (*Balaena mysticetus*) in Eastern Canadian Arctic and Western Greenland waters. Canadian Science Advisory Secretariat. Research Document 2006/051
- Simon, M., Kingsley, M. and Witting, L. 2007a. Biological parameters and the seasonal and spatial distribution of minke whale catch off west Greenland, 1987-2006. IWC/SC/59/AWMP3
- Simon, M., Kingsley, M. and Witting, L. 2007b. Seasonal and spatial distribution and sex ratio of fin whale catches off West Greenland, 1987-2006. IWC/SC/59/AWMP2
- Stevick, P.T., Allen, J., Clapham, P. J., Katona, S. K., Larsen, F., Lien, J., Mattila, D. K., Palsbøll, P. J., Sears, R., Sigurjonsson, J. T., Smith, D., Vikingsson, G., Øien, N. and Hammond, P. S. 2006. Population spatial structuring on the feeding grounds in North Atlantic humpback whales (*Megaptera novaeangliae*). *Journal of Zoology* **270** (2006) 244-255
- Witting, L. 2007a. Population dynamics of fin whales off West Greenland. IWC/SC/59/AWMP
- Witting, L. 2007b. Population dynamics of humpback whales off West Greenland. IWC/SC/59/AWMP5
- Witting, L., and Kingsley, M. 2005. Abundance of marine mammals off West Greenland, 2002-2004. IWC/SC/57/AWMP3.
- Witting, L. and Schweder, T. 2007. Sex ratio based assessment for minke whales off West Greenland. IWC/SC/59/AWMP6

Appendix I

Summary of the points relevant to limitations of catch, monitoring of quota and human killing methods, from the “Greenland Home Rule’s executive order nr. 10 of the 13th of April 2005 on the hunt of large whales”

Species:

- All baleen whales and sperm whales are protected, with the exemption of minke whales and fin whales, which can be taken following the rules specified in the executive order.
- Only adult fin whales that are not accompanied by immature animals can be taken.
- Minke whales can only be taken from April 1 to December 31. Mother/calf pairs of minke whales are protected year round.
- It is possible to apply for a special permit for the merciful killing of whales that are injured, entangled in fishing gear or captured in ice entrapments.
- Fin and minke whales that were caught legally, but that were sick and unsuitable for human consumption are considered as mercifully killed and are not counted as part of the quotas.
- The Ministry of Fisheries and Hunting decides how to use products derived from whales mercifully killed. It has been the custom that the meat of whales entangled in fishing gear is distributed freely among national institutions, such as hospitals or schools, and among the people from the community.

Requirements:

- Only Greenlandic boats registered in the Danish Maritime Authority can be used for whaling. Furthermore, there are restrictions related to the size of the boat and the equipment on board. These restrictions include the type of harpoon cannon.
- Harpoon cannons should be mounted and approved by authorised personnel. All harpoon cannons have to be examined and approved every other year by authorised personnel.
- Only persons that have taken a special course on the handling and use of penthrite grenade can buy or handle harpoon grenades. A certificate of the harpoon grenade course, as well as a licence, valid for the running year have to be shown in order to buy a harpoon grenade. Registers of all the purchases of harpoon grenades are kept at the Ministry of fisheries and Hunting.
- The boat and the equipment that will be used for whaling have to be approved before a hunter can obtain a licence. Only full-time hunters that have taken the course on handling and use of harpoon grenades can apply for licences for minke or fin whales (an exemption for this rule are the special permits for collective hunt described below). Only persons with licence or special permit can hunt large whales.
- Special permits for collective hunt of minke whales can be given in places where the local boats equipped with harpoon cannon cannot satisfy the demand of fresh meat. Only full-time hunters that own skiffs and do not have access to boats with harpoon can apply for permits for collective hunt. There are further regulations concerning the equipment necessary on board the skiffs and the minimum amount of skiffs that can participate in a collective hunt.

Quotas and licences:

- After consulting with the municipalities and with the hunter’s organisation, the Ministry of Fisheries and Hunting decides every year the maximum number of fin whales and minke whales

that can be taken from each municipality.

- The municipal authorities provide numbered licences that allow the owner to hunt whales with a specified boat during the running year. Licences for minke whales are restricted to one minke whale per licence.
- Licences for hunting of minke whales are given in numbered forms that are printed by the Ministry of Fisheries and Hunting and distributed to the municipal authorities. The municipal authorities issue licences for fin whales.
- Once the amount of licences allowed by the allocated quotas has been issued, the municipal authorities send information about the hunters, licences and boats to the Ministry of Fisheries and Hunting. This information is kept as hard copies and entered into an electronic database.
- A licence for the hunt of one minke whale in West Greenland is used up when the animal is captured or shot. A licence for the hunt of one minke whale in East Greenland is used up when the animal is captured.

Redistribution and reduction of quotas:

- The Ministry of Fisheries and Hunting can reduce the quota for the running year, or for the following year, if the quotas have been exceeded. Quotas can also be reduced if whales, including whales of protected species, have been shot or captured without permit.
- The municipal authorities and the Ministry of Fisheries and Hunting have the authority to move or cancel licences. Incorrect reporting of taken or wounded whales may lead to lose of licences.
- The quotas are redistributed in early fall. Unused licences cannot be used after the redistribution of quotas.

Sale of catch, biological samples and catch data

- The product of a catch cannot be sold before the municipal authorities have registered the hunt and stamped the licence. In order to obtain a stamp, whalers must show the receipt for the purchase of the harpoon grenade, as well as the used grenade with serial number (hunters from the collective hunt do not buy harpoon grenades and are exempted from showing receipts or used grenades).
- It is forbidden to export meat of large whales with commercial purposes.
- Any one who kills a large whale has the obligation to deliver a fresh tissue sample to the municipal authorities. The sample should be stored in containers with chemical solution provided by the Greenland Institute of Natural Resources, and sent to this institute as soon as possible. The sample should be accompanied by information about species, date, location, etc.
- Failure to compile with the regulations of this executive order can lead to fines

Appendix II

The importance of whale meat and blubber to the diet of Greenlanders

Paper 1.

Title: The Inuit diet. Fatty acids and antioxidants, their role in ischemic heart disease, and exposure to organochlorines and heavy metals. An international study.

Authors: Mulvad G, Pedersen HS, Hansen JC, Dewailly E, Jul E, Pedersen M, Deguchi Y, Newman WP, Malcom GT, Tracy RE, Middaugh JP, Bjerregaard P.

Affiliation: Center of Primary Health Care, Nuuk, Greenland.

Journal: Arctic Med Res. 1996; 55 Suppl 1:20-4.

Abstract: Traditional food is culturally, economically and nutritionally important for the Greenlandic Inuit people. In the 1970s the preventive effect of marine fat on cardiovascular disease, thrombosis and atherosclerosis was described. The low incidence of ischemic heart disease among Greenlanders has been related to the high intake of marine food. Since 1990 routine autopsies have taken place in two towns in Greenland, Nuuk and Ilulissat. The autopsies represent 26% of the total number of deaths in these two towns. Samples have been collected from 104 autopsies. International cooperative studies have analysed specimens in relation to ischemic heart disease as a benefit related to diet, as well as the level of heavy metals and organochlorine in organs as a risk related to diet. High amounts of mono-unsaturated and Omega-3 poly-unsaturated fatty acid were found in adipose tissue. Liver analyses of selenium have confirmed the expected high intake among Greenlanders. Reduced atherosclerotic lesions were found in the coronary arteries. Blood pressure levels calculated from renovasculopathy of hypertension indicate prevailing levels similar to those in industrialized countries. Some factors in Greenland may be protecting the coronary arteries, thereby of setting the expected effect of hypertension. The level of methyl mercury in organs is generally high. PCB concentrations found in organs of Greenlanders are higher than among other populations. **Health and risk effects of the traditional foods need further investigation.**

Paper 2.

Title: Vitamin D insufficiency in Greenlanders on a westernized fare: ethnic differences in calcitropic hormones between Greenlanders and Danes.

Authors: Rejnmark L, Jorgensen ME, Pedersen MB, Hansen JC, Heickendorff L, Lauridsen AL, Mulvad G, Siggaard C, Skjoldborg H, Sorensen TB, Pedersen EB, Mosekilde L.

Affiliation: Department of Endocrinology and Metabolism C, Aarhus Amtssygehus, Aarhus University Hospital, Aarhus, Denmark. rejnmark@post6.tele.dk

Journal: J Trace Elem Med Biol. 2004

Abstract: We studied the influence of age, gender, latitude, season, diet and ethnicity on plasma 25-hydroxyvitamin D 25 OHD, PTH, 1,25-dihydroxyvitamin D, vitamin D-binding protein, bone-specific alkaline phosphatase, and osteocalcin levels in 46 Greenlanders living in Nuuk (64 degrees N) on a traditional fare (group A), 45 Greenlanders living in Nuuk on a westernized fare (group B), 54 Greenlanders (group C), and 43 Danes (Group D) living in Denmark (55 degrees N) on a westernized fare. Blood specimens were drawn both summer and winter. Vitamin D insufficiency (plasma 25 OHD <40 nmol/l) was common in all four study groups during summer (23-74%) and winter (42-81%). Compared to groups A and D, vitamin D insufficiency was significantly more frequent in groups B and C. In all groups, summer levels of 25 OHD were above winter levels. Multiple regression analysis revealed a significant effect of ethnicity. Compared to Danes, Greenlanders had higher 1,25-dihydroxyvitamin D levels, but lower 25 OHD and PTH levels despite relatively low plasma calcium concentrations. In addition to ethnicity, 25(OH)D levels were influenced by age, season (summer > winter), and diet (a traditional Inuit diet>westernized diet). Ethnic differences exist between Greenlanders and Danes. Our results suggest that Greenlanders may have an inherent lower "set-point" for calcium-regulated PTH release or an enhanced

renal 1,25(OH)(2)D production. **In addition to ethnicity, age, season, and diet were important determinants of vitamin D status. Changes from a traditional to a westernized fare are associated with a reduced vitamin D status in Greenlanders. Vitamin D supplementation should be considered."**

Paper 3.

Title: Inuit are protected against prostate cancer.

Authors: Dewailly E, Mulvad G, Sloth Pedersen H, Hansen JC, Behrendt N, Hart Hansen JP.

Affiliations: Public Health Research Unit, CHUQ-Laval University, Sainte-Foy, Quebec, G1V 5B3 Canada. eric.dewailly@crchul.ulaval.ca

Journal: J Trace Elem Med Biol. 2004

Abstract: Incidence and mortality rates for prostate cancer are reported to be low among Inuit, but this finding must be additionally supported given the difficulty of obtaining a precise medical diagnosis in the Arctic. We conducted an autopsy study in 1990-1994 among 61 deceased males representative of all deaths occurring in Greenland and found only one invasive prostate cancer. Histological data were available for 27 autopsies and revealed no latent carcinoma. **Our results suggest that in situ carcinoma is rare among Inuit and that their traditional diet, which is rich in omega-3 polyunsaturated fatty acids and selenium, may be an important protective factor."**

Paper 4.

Title: Elements in autopsy liver tissue samples from Greenlandic Inuit and Danes. V. Selenium measured by X-ray fluorescence spectrometry.

Authors: Milman N, Laursen J, Byg KE, Pedersen HS, Mulvad G, Hansen JC.

Affiliation: Department of Medicine B, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark. milman@rh.dk

Journal: J Trace Elem Med Biol. 2004;17(4):301-6.

Abstract: The content of selenium in normal liver tissue samples from Greenlandic Inuit was measured and the results compared with those obtained in normal liver tissue samples from Danes. Normal liver tissue samples were obtained at autopsy from 50 Greenlandic Inuit (27 men, 23 women) with a median age of 61 years (range 23-83) and from 74 Danes (44 men, 30 women) with a median age of 60 years (range 15-87). Total liver selenium content was measured by X-ray fluorescence spectrometry. The content of selenium (median) was in Inuit 26.6 micromol/kg dry liver (5-95 percentile: 15.2-49.4) and in Danes 17.7 micromol/kg dry liver (5-95 percentile: < 3.8-36.5) ($p < 0.0001$). Liver selenium content displayed no significant gender difference, either in Inuit or Danes. In Inuit men, there was a negative correlation between liver selenium content and age ($rs = -0.39$, $p < 0.05$), whereas Danish men displayed a positive correlation between liver selenium content and age ($rs = 0.37$, $p = 0.02$). There was no correlation in Inuit or Danish women. In Inuit, the median hepatic selenium index (liver selenium content divided by age) was 0.48 and in Danes 0.33 ($p = 0.001$). There was an inverse correlation between hepatic selenium index and age both in Inuit ($rs = -0.77$, $p < 0.0001$) and in Danes ($rs = -0.47$, $p < 0.0001$). **In conclusion, Inuit had a higher liver content of selenium and a higher hepatic selenium index compared with Danes. The more favourable selenium status is due to a higher nutritional selenium intake with fish and meat from sea mammals.**

Appendix III

Documentation on Greenland Whaling Submitted by the Greenland Home Rule Government to the IWC, 1979 – 2006²

1979

Ab. Subs. Panel of Experts. Seattle. Kapel, F.O and Petersen, R. Subsistence Hunting – the Greenland Case.

1981

TC/33/WG/S 3 Subsistence Whaling in Greenland.³

1983

TC/AB 1. Subsistence and Cultural Needs relating to Aboriginal Subsistence Whaling among the Inuit in Greenland.

TC/AB 2. Nutritional Needs relating to Aboriginal Subsistence Whaling among the Inuit in Greenland.

1984

TC/36/AS 2. The Greenland Aboriginal Whale Hunt: Report to the standing Sub-Committee on Aboriginal /Subsistence Whaling of the International Whaling Commission, June 1984. 2

1986

TC/38/AS 3. Documentation on the catch taken by aboriginal people from the Central Stock of Minke Whales.

TC/38/HK 2 B. The Greenland Aboriginal Whale Hunt.

1987

TC/39/AS 1. The Legal and Administrative Aspects of Whaling Operations in Greenland.

TC/39/AS 2. Hunting Methods including the "Cold/Warm Harpoon Question".

TC/39/AS 3. Larsen, F.B. - Scoresbysund - A Hunting Community in East Greenland. 2

TC/39/AS 4. Petersen, R. - Communal Aspects of Preparation for Whaling, of the Hunt Itself and of the Ensuing Products. 2

1988

IWC/TC/40/AS doc.1. Submission by the Delegation of Denmark. 2

TC/40/AS 3. Danish Statement.

² Scientific Committee Papers not included

³ An edition of these papers is found in "The Anthropology of Community-Based Whaling in Greenland", Studies in Whaling No. 4, Occasional Publication No. 42, Canadian Circumpolar Institute, University of Alaska, ISBN 1-896445-05-5. This book was given to all IWC-delegations at the Annual Meeting in 1997.

TC/40/HK 3. Denmark's Answers to the Remaining Questions stated in Document IWC/39/19 "Report of the Humane Killing Working Group", Annex 4.

TC/40/HK 4. Implementation of the Detonating Grenade Harpoon in Greenland's Whaling on a Experimental Basis.

1989

IWC/41/22. Greenland Subsistence Hunting.¹

TC/41/HK 2. Introduction of the Detonating Grenade Harpoon in Greenland Whaling on a Experimental Basis.

TC/41/Inf. 4. National Inspection in Greenland.

1990

TC/42/SEST 4. Larsen, S.E. and Hansen, K.G. - Inuit and Whales at Sarfaq (Greenland): Case Study.¹

TC/42/SEST 5. Josefsen, E. - Cutter Hunting of Minke Whale in Qaqortoq (Greenland): Case Study.¹

TC/42/HK 1. Greenland Home Rule Government. - Introduction of the Detonating Grenade Harpoon in Greenland on an Experimental Basis.

TC/42/HK 2. Greenland Home Rule Government. - Greenland Licences for Hunting Minke Whales with Rifles.

TC/42/Inf. 1. Greenland Home Rule Government. - Quota monitoring in Greenland.

1991

TC/43/AS 1. Greenland Home Rule Government. - Designation of Types of Rifles in Greenland.

TC/43/AS 3 Add. Conversion Factors for Minke Whale Meat (Denmark).

TC/43/AS 4. Caulfield, R.A. - Qeqertarsuarmi arfanniarneq: Greenlandic Inuit Whaling in Qeqertarsuaq Kommune, West Greenland.⁴

TC/43/HK 2. Greenland Home Rule Government. - Introduction of the Detonating Grenade Harpoon in Greenland, 1991.

TC/43/Inf. 1. Greenland Home Rule Government. - Quota monitoring in Greenland, 1990.

1992

IWC/44/HK 1. Greenland Home Rule Government. - Introduction of the detonating grenade harpoon in Greenland, 1992.

IWC/44/Inf. 1. Greenland Home Rule Government. - Quota monitoring in Greenland, 1991.

IWC/44/12. International Register of Whaling Vessels, June 1992 (contribution concerning Greenlandic vessels).

1993

⁴ An edition of these papers is found in "The Anthropology of Community-Based Whaling in Greenland", Studies in Whaling No. 4, Occasional Publication No. 42, Canadian Circumpolar Institute, University of Alaska, ISBN 1-896445-05-5. This book was given to all IWC-delegations at the Annual Meeting in 1997.

IWC/45/HK 3. Greenland Home Rule Government. - Greenland Action Plan on Whale Hunting Methods, 1992.

IWC/45/Inf. 1. Greenland Home Rule Government. - Quota monitoring in Greenland, 1992.

1994

IWC/46/AS 1. Caulfield, R.A. - Whaling and Sustainability in Greenland.⁵

IWC/46/AS 2. Greenland Home Rule Government. - Quota monitoring in Greenland, 1993.

IWC/46/AS 3. Greenland Home Rule Government. - Greenland Action Plan on Whale Hunting Methods, 1993.

1995

IWC 47/24. Greenland Home Rule Government. - Greenland Action Plan on Whale Hunting Methods, 1995.

IWC/47/Inf. 2. Greenland Home Rule Government. - Quota monitoring in Greenland, 1994.

1996

IWC/48/Inf. 1. Greenland Home Rule Government. - Quota monitoring in Greenland, 1995.

1997

IWC/49/AS 3. Caulfield, R.A. - New Technologies, New Traditions: Recent Developments in Greenlandic Whaling.

IWC/49/Inf. 1. Greenland Home Rule Government. - Quota monitoring in Greenland, 1996.

1998

IWC/50/Inf.1. Greenland Home Rule Government - Quota monitoring in Greenland, 1997.

1999

IWC/51/inf.3. Greenland Home Rule Government. - Quota monitoring in Greenland, 1998.

IWC/51/WK6. Greenland. Status for Greenland Action Plan on Whale Killing Methods, 1999

IWC/51/WK7. Greenland. Report on improvings in ASW in Greenland.

IWC/51/WK8. Greenland. Efficiency in the Greenlandic Hunt of Minke and Fin whales, 1990-1998.

IWC/51/22. A note regarding information requested in IWC-resolution 1998-11.

2000

IWC/52/AS1. A note regarding information requested in IWC-resolution 1998-11.

IWC/52/AS2. Traditional food – Environmental and Health Concerns

5 An edition of these papers is found in "The Anthropology of Community-Based Whaling in Greenland", Studies in Whaling No. 4, Occasional Publication No. 42, Canadian Circumpolar Institute, University of Alaska, ISBN 1-896445-05-5. This book was given to all IWC-delegations at the Annual Meeting in 1997.

Agenda items: ASW 4, 6.3 & 6.4; INF 4; WKM&AWI 3 & 4

IWC/52WKM&AWI 2. A note regarding information encouraged in IWC-resolution 51/44

IWC/52WKM&AWI 3. Status for Greenland Action Plan on Whale Hunting Methods, 2000

IWC/52WKM&AWI 4. Report on improvements in ASW in Greenland

IWC/52/INF3. Quota monitoring on Minke whale and Fin whale hunting in Greenland, 1999.

2001

IWC/53/WKM&AWI 1. A note regarding information encouraged in IWC-resolution 51/44 + Appendix 1: 2000 Quota allocation to individual municipalities

IWC/53/WKM&AWI 2. Status for Greenland Action Plan on Whale Hunting Methods, 2001 + Efficiency in the Greenlandic hunt of Minke and Fin Whales 1990 – 2000

IWC/53/WKM&AWI 3. Report on improvements in ASW in Greenland

IWC/53/WKM&AWI 4. Quota monitoring on minke whale and fin whale hunting in Greenland, 2000.

IWC/53/INF1. Quota monitoring on minke whale and fin whale hunting in Greenland, 2000.

2002

IWC/54/AS4. Caulfield, R.A. - Whaling and Sustainability in Greenland.

IWC/54/WKM&AWI 1. Efficiency in the Greenlandic hunt of Minke and Fin Whales 1990 – 2001

IWC/54/WKM&AWI 2. A note regarding information encouraged in IWC-resolution 1999-1 + Appendix 1: 2001 Quota allocation to individual municipalities

IWC/54/WKM&AWI 3. Report on improvements in ASW in Greenland

IWC/54/WKM&AWI 4. Quota monitoring on minke whale and fin whale hunting in Greenland, 2001 (submitted to the Working Group on Whale Killing Methods and Associated Welfare Issues and the Infractions Sub-Committees)

IWC/54/WKM&AWI 5. Status for Greenland Action Plan on Whale Hunting Methods, 2001

IWC/54/28. Explanation by Denmark on the transfer of traditional food, including minke whale meat, blubber and mattak to Kalaallit living in Denmark

2003

IWC/55/WK 8. Efficiency in the Greenlandic hunt of Minke and Fin Whales 1991 – 2002

IWC/55/WK 9. A note regarding information encouraged in IWC-resolution 1999-1 + Appendix 1: 2002 Quota allocation to individual municipalities

IWC/55/WK 10. Report on improvements in ASW in Greenland

IWC/55/WKM 11. Status for Greenland Action Plan on Whale Hunting Methods, 2002

IWC/55/WKM 12 Rev. Times to death in the Greenlandic minke and fin whale hunt in 2002

IWC/55/INF 5 Rev. Quota monitoring on minke whale and fin whale hunting in Greenland, 2002

IWC/55/INF 6. Entanglements in fishing gear 2002

2004

IWC/56/5. Summary of Activities Related to the Action Plan on Whale Killing Methods (based on Resolution 1999-1)

IWC/56/6. Report on improvements in ASW in Greenland

IWC/56/7. A note regarding information encouraged in IWC-resolution 1999-1 + Appendix 1: 2003 Quota allocation to individual municipalities

IWC/56/8. Status for Greenland Action Plan on Whale Hunting Methods, 2003

IWC/56/INF5. Quota monitoring on minke whale and fin whale hunting in Greenland, 2003

2005

IWC/57/AS4. Documentation to IWC on Greenland Whaling, 1979 – 2004

IWC/57/INF5. Quota monitoring on minke whale and Fin whale hunting in Greenland, 2004

IWC/57/WKM&AWI/7. Report on improvements in ASW in Greenland

IWC/57/WKM&AWI/6. A note regarding information encouraged in IWC-resolution 1999-1 + Appendix 1: 2003 Quota allocation to individual municipalities

IWC/57/WKM&AWI/8. Status for Greenland Action Plan on Whale Hunting Methods, 2004

2006

IWC/58/WKM & AWI3. A note regarding information encouraged in IWC-resolution 1999, for the Greenland catch of 2005.

IWC/58/WKM & AWI4. Report on improvements in ASW in Greenland.

IWC/58/ WKM & AWI5. Status for Greenland Action Plan on Whale Hunting Methods.

IWC/58/WKM & AWI6. Summary of activities related to the Action Plan on Whale Killing Methods.

IWC/58/WKM & AWI7. Whale killing methods and associated welfare issues in Greenland.