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2003

North Atlantic Marine Mammal Commission

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MEETINGS & OFFICE BEARERS 2003

Members of the Commission		**Councillors**
Faroe Islands	(F)	Mr Kaj P. Mortensen
Greenland	(G)	Mr Einar Lemche
Iceland	(I)	Mr Stefan Asmundsson
Norway	(N)	Mr Halvard P. Johansen

Council

Chairs –	*1992-95*	Mr Kjartan Høydal (F)
	1995-97	Mr Halvard P. Johansen (N)
	1997-99	Mr Arnór Halldórsson (I)
	1999-2004	Ms Amalie Jessen (G)
	2004…	Ms Kate Sanderson(F)

Thirteenth Meeting of the Council, 2 - 4 March 2004, Tórshavn, Faroe Islands

Committee on Hunting Methods

Chairs –	*1994-98*	Ms Amalie Jessen (G)
	1998…	Mr Jústines Olsen (F)

Management Committee

Chairs –	*1993-94*	Mr Kjartan Høydal (F) interim
	1994-98	Mr Einar Lemche (G)
	1998-2004	Mr Kaj P. Mortensen (F)
	2004…	Mr Halvard P. Johansen(N)

Twelfth Meeting of the Management Committee, 3 March 2004, Tórshavn, Faroe Islands

Management Committee Sub-Committee on Inspection and Observation

Chairs –	*1993-95*	Mr Einar Lemche (G)
	1995…	Dr Egil Ole Øen (N)

Management Committee Working Group on By-catch

Chairs –	*1998-99*	Mr Gísli A. Víkingsson (I)
	1999-2003	Dr Arne Bjørge (N)
	2003-2004	Mr Kim Mathiasen (G)
	2004…	Ms Droplaug Ólafsdóttir (I)

Scientific Committee

Chairs –	*1993-95*	Mr Jóhann Sigurjónsson (I)
	1995-97	Prof. Tore Haug (N)
	1997-2000	Dr Mads Peter Heide-Jørgensen (G)
	2000-2004	Mr Gísli A. Víkingsson (I)
	2004…	Prof. Lars Walløe (N)

Eleventh Meeting of the Scientific Committee, 17 -19 November 2003, Nuuk, Greenland

Scientific Committee Working Group on Management Procedures

Chair –	*1993…*	Dr Nils Øien (N)

Scientific Committee Working Group on Abundance Estimates

Chair –	*1996…*	Dr Nils Øien (N)

Scientific Committee Working Group on the Economic Aspects of Marine Mammal – Fisheries Interactions

Chairs –	*1998-99*	Dr Gunnar Stefánsson (I)
	1999-2000	Mr Aqqalu Rosing-Asvid (G)
	2000 …	Prof. Lars Walløe (N)

Scientific Committee Working Group on the Population Status of Narwhal and Beluga

Chair –	*1999…*	Prof. Øystein Wiig (N)

Scientific Committee Working Group on the North Atlantic Fin Whales

Chair –	*1999…*	Mr Gísli A. Víkingsson (I)

Finance and Administration Committee

Chairs –	*1999-2000*	Mr Øyvind Rasmussen (N)
	2000 …	Mr Einar Lemche (G)

The NAMMCO Fund

Chairs –	*1998-2000*	Ms Ulla S. Wang (F)
	2000-2001	Ms Kate Sanderson (F)
	2001…	Ms Ulla S. Wang (F)

Secretariat

General Secretary	Dr Grete Hovelsrud-Broda
Scientific Secretary	Mr Daniel Gordon Pike
Administrative Co-ordinator	Ms Charlotte Winsnes

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1.1
REPORT OF THE THIRTEENTH MEETING OF THE COUNCIL

Tórshavn Faroe Islands 2 – 4 March 2004

The NAMMCO Council held its 13th Meeting at the Hotel Føroyar in Tórshavn, the Faroe Islands 2 - 4 March 2004. The meeting was attended by delegations from all Contracting Parties, the Faroe Islands, Greenland, Iceland and Norway, as well as observers from the Governments of Canada, Denmark and Japan. A number of intergovernmental and non-governmental organisations were also represented at the meeting, including for the first time the Association of Traditional Marine Mammal Hunters of Chukotka (ATMMHC). See Section 5.1 for the List of Participants.

The Chair of the Council, Amalie Jessen convened the meeting.

1. OPENING PROCEDURES

1.1 Welcome Address

The Chair introduced the Faroese Minister of Fisheries Bjørn Kalsø, who welcomed the participants to Tórshavn and to the Faroe Islands. The full text of the address is contained in Appendix 3.

Dr Bogi Hansen (Faroe Islands) gave a presentation to the meeting on Climate Change in the Nordic Seas. In his address Dr Hansen discussed the consequences of warming temperatures over the past century and the future trends, in particular for the Nordic Seas. Dr Hansen explained the conveyer belt theory of the North Atlantic Ocean circulation cycle and noted that warming in the northern regions could lead to regional cooling, because the current cycle would be disrupted.

1.2 Opening Statements

The heads of the delegations of Greenland, Iceland and Norway made opening statements to the meeting. In addition, the observer from the Government of Japan, Mr Morimoto, and a representative from the ATMMHC presented opening statements. These statements are contained in Appendix 3.

1.3 Admission of Observers

On behalf of the Council, the Chair welcomed the observers from governments, intergovernmental and non-governmental organisations.

Invitations had also been sent to the Russian Federation, St. Lucia, the National Marine Fisheries Service, United States of America, Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), the Bonn Convention (UNEP/CMS), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Eastern Caribbean Cetacean Commission (ECCO) the International Council for the Exploration of the Sea (ICES), the Food and Agriculture Organisations of the UN (FAO), North Atlantic Salmon Conservation Organisation (NASCO), the Northwest Atlantic Fisheries Organisation (NAFO), Nordic Atlantic Co-operation (NORA), OSPAR Commission, the Arctic Council, Inuvialuit Game Council, World Conservation Union (IUCN), International Working Group for Indigenous Affairs (IWGIA), World Council of Whalers (WCW), and KANUKOKA (Greenland).

1.4 Adoption of Agenda
The agenda as contained in Appendix 1 was adopted.

1.3 Meeting Arrangements
The Secretary outlined the practical and social arrangements for the meeting. The Faroese Ministry of Fisheries hosted a dinner for the meeting participants. The participants were also invited to a dinner hosted jointly by NAMMCO and the High North Alliance.

The list of documents presented to the meeting is contained in Appendix 2.

2. FINANCE AND ADMINISTRATION

2.1 Report of the Finance and Administration Committee
The Chair of the Finance and Administration Committee, Einar Lemche (Greenland) presented the report to the Council.

The Finance and Administration Committee had held two meetings since NAMMCO/12 in March 2003. The tasks of the Committee had been to review the audited accounts for 2003, to develop a draft budget for 2004 and a forecast budget for 2005 (see under item 2.2). In line with the practice established at NAMMCO/12 in March 2003 (see NAMMCO Annual Report 2002: 12), the Committee had received a preliminary spending authorisation from the Council for 2004, awaiting the Council's approval of the draft budget for 2004 at the current meeting (see under item 2.2). The reports of the Committee were available to the meeting as NAMMCO/13/4. Mr Lemche noted that the Committee had mainly dealt with budget items this past year because the other tasks of the Committee had been completed.

2.1.1 Other Matters
The Council thanked the Finance and Administration Committee for their report (see also under items 2.2 and 2.3).

2.2 Final Accounts 2003, Commission Budget 2004, Forecast Budget 2005
2.2.1 Final Accounts 2003
The Council noted that the Finance and Administration Committee in two telephone meetings (September 2003 and January 2004) had reviewed the final accounts of the Commission for 2003. The Council formally approved the audited accounts for 2003 (see Appendix 4).

2.2.2 Commission Budget 2004
The Council agreed to put the NAMMCO Fund on hold and to transfer the budgeted amount of 100 000 NOK to Item 7, Information (see also Item 6, the NAMMCO Fund, page 31 in this report).

The Council adopted the budget for 2004, as contained in NAMMCO/13/4 - Annex 1.

2.2.3 Forecast Budget for 2005
The Council adopted on a preliminary basis the forecast budget for 2005, as contained

in NAMMCO/13/4 – Annex 1.

2.3 Other Business

There was no other business.

3. SCIENTIFIC COMMITTEE

3.1 Report of the Scientific Committee

Gísli A. Víkingsson, Chair of the Scientific Committee, presented the Report of the 11th Meeting, which was held 25-27 November at the Greenland Institute of Natural Resources in Nuuk, Greenland. The full report is included in section 3 of this volume.

3.1.1 Incorporation of users knowledge in the deliberations of the Scientific Committee

Noting that a Working Group had been formed under the Management Committee to improve the process of incorporating users knowledge in management decision making, the Scientific Committee considered this was now being treated as a process parallel to the use of scientific advice by the Council. The Scientific Committee will therefore await the conclusions of the new Working Group about what role, if any, the Committee can play in this process.

3.1.2 Harp and hooded seals

The Scientific Committee used the report of the ICES/NAFO Working Group on Harp and Hooded Seals (WGHARP) as a basis for advice on these species. When WGHARP met in Arkhangelsk in September 2003, the stocks of Greenland Sea harp seals, White Sea/Barents Sea harp seals and Greenland Sea hooded seals were assessed. Management agencies had requested advice on "sustainable" yields for the stocks. "Sustainable catch" as used in the yield estimates for seals means the catch that is risk neutral with regard to maintaining the population at its current size within the next 10 year period. Sustainable catch options were provided for Barents/White Sea and Greenland Sea harp seals, and for Greenland Sea hooded seals. For the harp seal stocks, projections were also provided for catches at twice the sustainable levels (see section 3, item 9.1 & 9.2).

<u>Discussion by the Council</u>

The Council noted the continuing reliance by the Scientific Committee on the ICES/NAFO Working Group for advice on these species. Such advice is always provided as catch levels that will maintain the populations at their current size. The Council considered that, given the historically high levels of harp seal populations in particular and the possibility of significant fishery interactions with these stocks, this advice should be extended to provide catch levels that would reduce the populations to pre-defined levels within a given time period.

3.1.3 Narwhal and beluga

The Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic met February 3-6, 2004 in Montreal, Canada. The meeting was held jointly with the Scientific Working Group of the Joint Commission on the Conservation and Management of Narwhal and Beluga (JCNB). The Scientific Committee considered the report of the Joint Working Group (JWG) by correspondence (see section 3.2).

Narwhal

Narwhal stock structure was investigated using genetic analyses and contaminant levels in samples from diverse areas. Generally it was found that these tools provided rather weak evidence of stock differences between areas. However, satellite tag applications have demonstrated that narwhal do form discrete summering stocks that do not mix on the summering grounds, and that these stocks winter in separate areas of Baffin Bay.

A model of the population structure of narwhals in Baffin Bay and adjacent waters was developed, integrating all available information. The model allocates the catches by the eighteen major hunting grounds in Canada and Greenland to one or more coastal summering aggregation. Several stocks appear to be hunted by more than one community, and some communities hunt more than one stock. Evidence suggests that whales from Canadian stocks have a low risk of being harvested in West Greenland, and that whales from Greenlandic stocks have a low risk of being harvested in Canada.

Canada has conducted visual surveys of narwhal in Eclipse Sound, Prince Regent Inlet, the Gulf of Boothia, Admiralty Inlet and in inlets along the eastern coast of Baffin island during the summers of 2002 and 2003. However, the analysis is at a preliminary stage and final estimates will be available in 2005.

Greenland has conducted aerial digital photo surveys of narwhal in Inglefield Bredning and adjacent fjords in Northwest Greenland in August 2001 and 2002. When the uncorrected estimates were compared to the results of visual line-transect surveys conducted in 1985 and 1986 it showed an annual decline of 10% in the abundance of whales visible at the surface. Total estimated abundance in 2002 was about 15% of the total estimated abundance in 1986. A photo survey was also performed in Melville Bay in August 2002. Here no narwhal were sighted on 990 km of trackline flown, and Melville Bay is therefore considered to contain low numbers of narwhals. A third photo survey in Uummannaq in November 2002 was unsuccessful because of the short days and poor weather conditions at that time of year.

Assessments were made of the stocks of narwhals in West Greenland to estimate their current status and the sustainable levels of harvest. Although no explicit management goals have been identified for West Greenland narwhal, the JWG considered that, given the rapid decline in numbers suggested by the assessments, the main goal must be to halt the decline in the short term. Therefore the JWG worked under the assumption of an immediate goal of halting the decline of narwhal in West Greenland.

Although a likely model for the population structure of narwhals in Canada and Greenland had been agreed upon as a working concept, the population structure of narwhals in West Greenland remains uncertain. To cope with this problem a total of seven different population structure hypotheses were investigated to combine the harvest from four sub areas [Inglefield Bredning (including Qaanaaq), Melville Bay (including Upernavik and Savissivik), Uummannaq, and Disko Bay and the area south thereof] with estimates of the summer abundance in Inglefield Bredning and the winter abundance in Disko Bay.

Another important issue is whether the abundance estimates from especially Inglefield Bredning are partial or complete estimates of the stock that is harvested. It is likely that the estimate of abundance in Inglefield Bredning supplies the hunt for that area. However, it may not be the only component that supplies the hunt in other areas.

The results of the assessments show that West Greenland narwhals are depleted to approximately one quarter of their pre-harvested abundance (estimates between 0.13 and 0.35 dependent upon the mode), and that a future harvest at the present level may result in the extinction of West Greenland narwhals in the near future.

For the Inglefield Bredning, Uummannaq, and Disko Bay areas most stock scenarios examined indicate that an annual removal of 135 narwhals for the entire area should result in a probability of 0.7 for some increase within ten years (survey estimates are scaled by the model to an abundance in 2005 between 5,500 and 7,800 narwhal depending upon the model). Another scenario, where the entire West Greenland catch (other than Melville Bay) is supplied by the Inglefield Bredning summer aggregation, suggests that annual removals would have to be reduced to about 20 animals to achieve the same result (based on a survey estimate of 1,500 narwhal in 2002). There was not general agreement within the JWG on what model scenarios should be used in a final assessment. However, there was general agreement to recommend that the total removals should be reduced to no more than 135 individuals.

Delay in implementing catch reductions will result in delay in stock recovery and probably in lower available catches in the medium term. The JWG emphasised that this is an interim recommendation only. More work must be done on the assessments and this advice may change once this is done. It was also emphasised that this recommendation is given in terms of total annual removal rather than a landed catch.

Satellite tagging studies have suggested that whales from the Melville Bay area do not winter in Disko Bay and are not available for harvest once they leave Melville Bay in the fall. A survey conducted in Melville Bay in 2003 was unable to detect any narwhal despite a considerable amount of effort. The JWG was informed that local hunters have noted a decline in narwhal numbers in the area. This indicates that numbers are very low and it was considered highly unlikely that present harvests in the area could be sustainable. The JWG therefore recommended a cessation of narwhal hunting in the Melville Bay area. It was emphasized that this advice was based on the assumption of a discrete summer stock in Melville Bay. If future work reveals that Melville Bay receives influxes of narwhal from other areas, this advice could be revised.

Beluga

Given the focus on narwhal relatively little new information was presented for beluga, and an update of the assessment for beluga in West Greenland, as requested by the NAMMCO Council in 2003, was postponed to the next meeting in order to incorporate a planned abundance estimate for 2004. Belugas occurring on the Greenland West Coast can be separated into two stocks for management purposes: One stock wintering in the North Water and summering in Canadian High Arctic, and another stock that winters in West Greenland south of Melville Bay and summers in the Canadian High Arctic. Some satellite-tracked belugas have been shown to move from the Canadian High Arctic toward the southerly wintering areas in West Greenland before or near 1 October. Of a total number of 26 belugas that had been satellite-tracked in Canada beyond 1 October, 15% (95% CI:6%-35%) moved to the southerly wintering grounds in West Greenland. The remaining 85% apparently stayed in the North Water during the winter.

The timing of this migration and evidence from satellite tracking strongly suggest that these are the same animals that pass by Upernavik later in the fall. Therefore, animals taken in September and October at Qaanaaq should be considered part of the West Greenland wintering stock. Beluga taken later in the fall and in the winter are likely to be animals wintering in the North Water. Beluga are rarely taken in the summer in this area, and these may be stragglers from other areas or perhaps part of a small summering stock. Given the relative rarity of belugas in the summer in this area, it was suggested that they should be protected during this period.

3.1.4 Fin Whales

The Scientific Committee has carried out fin whale assessments on 2 previous occasions. In 1999, the Committee dealt with the East Greenland-Iceland (EGI) stock. In 2000, the Committee considered fin whales around the Faroe Islands, subjected to projected annual catch levels of 5, 10 and 20 whales. Given that new information has become available from abundance surveys, satellite tracking programs and reconsideration of historical catch series, in 2002 the NAMMCO Council requested that the Scientific Committee continue with its assessments of fin whale stocks in the areas of interest to NAMMCO countries.

No new genetic information on fin whale stock structure has become available since the last review was conducted in 1998. Stock delineation remains the greatest barrier to the reliable assessment of North Atlantic fin whales, especially at a finer scale. One of 2 fin whales satellite tagged in the Faroes in August 2001 migrated southward as far as 46° N, at the latitude of the Bay of Biscay. This may indicate a stock connection between whales around the Faroes and off the Iberian Peninsula, but it would be premature to draw conclusions from the movements of 1 animal.

New estimates of abundance for the EGI and Faroese areas were available from the NASS-2001. In addition a new estimate was available from the Norwegian 1995 shipboard sightings survey, covering the Northeastern Atlantic including the North Sea, the Norwegian Sea, the Greenland Sea and the Barents Sea

Assessment of the EGI fin whales utilised recent estimates of abundance from sighting surveys, and CPUE series for the 1901-1915 and 1962-1987 periods. Approaches which treat the stock as homogeneous throughout the Central North Atlantic area fail because the population models applied cannot be reconciled with all 3 sources of data (the absolute abundance estimates and the 2 sets of CPUE data). In particular, such models have great difficulty in reflecting the large decline in CPUE observed in the 1901-1915 period.

To address this, two alternative assessment models used a 2 or more substock model approach, where historic catches have been taken from an “inshore” substock only, and there is diffusive mixing between this “inshore” and the “offshore” substock (in the 2-substock model). Under such analyses, the resource as a whole is estimated to be close to its pre-exploitation abundance. Projections under constant catch levels suggest that the inshore substock will maintain its present abundance (which is above MSY level) under an annual catch of about 150 whales. It is important to note that this result is based upon the assumption that catches are confined to the "inshore" substock, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that the "offshore" substock was also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales.

For fin whales around the Faroes, the new information on abundance from NASS-2001 and the updated catch history available for the Faroes did not greatly change the conclusion reached in 2000 (NAMMCO 2001), that the fin whale stock around the Faroes was likely to be heavily depleted under most stock scenarios considered plausible. Under some of these stock scenarios even catches as low as 5 animals per year slow or halt the recovery of the stock, and higher catches result in further depletion in nearly all cases. The uncertainties about stock identity are so great as to preclude carrying out a reliable assessment of the status of fin whales in Faroese waters. It may also be necessary to obtain clearer guidance on the management objectives for harvesting from what is likely to be a recovering stock before specific advice can be given.

In order to get better information on stock delineation in this area, biopsy sampling for genetic analysis from the Faroes and adjacent areas should be continued. Existing biopsy samples should be analysed as soon as possible. In addition satellite tracking should continue. The revision of catch statistics for Faroese and adjacent whaling operations should be completed, and the feasibility of preparing a CPUE index from Faroese and adjacent whaling operations should be investigated;

The availability of abundance estimates from NASS-1995 and the development of abundance estimates from more recent Norwegian surveys for fin whales in the Northeast Atlantic will make the assessment of fin whales in this area feasible. The Scientific Committee considered that the scheduling of future assessment meetings should be dependent on the completion of additional research and necessary preparatory work. The next meeting will concentrate on assessment in the Northeast Atlantic (North and West Norway stocks), and on further development of assessments for the EGI and Faroes areas.

<u>Discussion by the Council</u>
The Council concurred with the conclusion of the Scientific Committee that a better resolution of stock identity around the Faroes is the key to completing a successful assessment for that area. Although the results from one satellite tag application open the possibility of a connection between fin whales in the Faroes and off Spain, more research is needed to confirm this. The Council therefore supported the research recommendations put forth by the Scientific Committee to improve knowledge of stock delineation in this and other areas.

3.1.5 Minke whales
The Scientific Committee carried out an assessment of the Central North Atlantic stock of minke whales in 1998 (NAMMCO 1999). The Committee concluded then

that the stock was close to its carrying capacity, and that present removals would not adversely affect the stock. Since that time, more information has become available on the stock delineation of minke whales in the North Atlantic. New abundance estimates are available for the Central Stock area from NASS-2001, and for the Northeast Atlantic from Norwegian surveys conducted from 1996-2001. Therefore in 2002, the Council of NAMMCO requested that the Scientific Committee complete a new assessment of Central North Atlantic minke whales.

Recent genetic analyses have indicated that animals from the CM Small Area are different from those from the Eastern Medium Area. However there may be sub-structure within this area. While there is no data to support the existence of a separate stock in the CIC Small Area, most catching by Iceland has historically occurred here so it made sense to consider this as a separate area for precautionary sensitivity tests.

The catch series used in assessments were the same as that used in the 1998 assessment, with the addition of more recent catches by Norway in the CM Small Area and by East Greenland. A "High Catch" case was also developed which included assumed maximum annual levels of both bycatch (5) and unreported catch (10 per annum from 1986-2002) in Icelandic waters.

New abundance estimates available to the Working Group included those from the NASS-2001 and NASS-1987 aerial surveys covering coastal Iceland (CIC small area). A new estimate was also available from the NASS-2001 shipboard survey, considered to be negatively biased because of animals missed on the trackline and diving animals.

The results from two independent analytical approaches indicated that the Central Stock of minke whales has not been appreciably impacted by past whaling, having a current abundance of mature females that is at least 85% of the corresponding pre-exploitation level. This result holds regardless of whether the CIC area is treated as an isolated stock, and across a wide range of assumptions concerning past catches, stock boundaries, MSYR values and abundance estimates. Projections over the next 20 years indicate that, under all scenarios considered, a catch of 200 minke whales per year would maintain the mature component of the population above 80% of its pre-exploitation level over that period. Similarly, a catch of 400 per year would maintain the population above 70% of this level. This constitutes precautionary advice, as these results hold even for the most pessimistic combination of the lowest MSYR and current abundance, and the highest extent of past catches considered plausible. The advice applies to either the CIC Small Area (coastal Iceland), or to the Central Stock as a whole.

Questions remain about the stock delineation of minke whales in the Central Area, and further genetic sampling, particularly from Icelandic waters, East and West Greenland, and the Faroes is recommended. In addition further satellite tracking to investigate spatial and temporal distribution in all areas is recommended. The development of valid ageing methods for North Atlantic minkes, using amino acid racemisation in the eye lens or other techniques, is required for the reliable estimation of biological parameters.

3.1.6 White-beaked, white-sided and bottlenose dolphins
The Council has asked the Scientific Committee to carry out assessments of these species, but to date insufficient information has been available on stock delineation, distribution, abundance and biological parameters to initiate the work. This year a series of working papers from the Faroes reported on research in progress on white sided dolphins, providing information on catches, biological parameters, feeding and genetics. Little progress has been made in analysing samples from white beaked dolphins collected from bycatch in Iceland. A report on the distribution and abundance of dolphins from the 4 aerial surveys carried out around Iceland between 1986 and 2001 is nearly complete, and further information on distribution is available from the NASS ship surveys. As yet no reliable information is available on bycatch of these species in Iceland. Norway will begin a sampling program focussing on white beaked dolphins in 2004, involving biopsy sampling for genetic and fatty acid analyses, and satellite tracking.

The Committee noted that considerable progress has been made in the Faroes in describing the ecology and life history of white sided dolphins, but that some analytical work remains to be completed and sampling will continue. The Committee was informed that satellite tracking will be attempted in the coming years in the Faroes, and that information on white beaked dolphins should be available from Iceland and Norway in about 2 years time. Abundance estimates are lacking in all areas except Icelandic coastal waters, and no information on stock delineation or pod structure is yet available. The SCANS survey planned for 2005/6 and coastal surveys planned for Norway (see below) should provide information on distribution and abundance in some areas. At this point the Scientific Committee considered that there was still insufficient information on abundance, stock relationships, life history and feeding ecology to go forward with the requested assessments for these species. This may become feasible once the above-mentioned studies have been completed, probably by 2007.

3.1.7 Grey seals
In 2001 the Scientific Committee noted that the abundance of grey seals around Iceland had decreased from an estimated 12,000 in 1992 to 6,000 in 1998, and that the annual catch of around 500 seals may not be sustainable. In contrast there have been apparent increases in the abundance of grey seals in other areas, including Southwest Norway, the United Kingdom and Canada. Grey seals are harvested or taken incidentally by fisheries and aquaculture operations in the Faroe Islands, Iceland and Norway. Subsequently the Scientific Committee was asked to provide a new assessment of grey seal stocks throughout the North Atlantic.

The Scientific Committee investigated the status of grey seals in Iceland, the Faroes, Norway, the Baltic, the United Kingdom, Canada and the USA.

The Icelandic grey seal population appeared stable between 1982 and 1990, but since then, the pup-production has been declining by about 6% (95% CI 3% to 9%) annually. The abundance of the grey seals around Iceland in the year 2002 was about 5,000 animals. Recently following the decrease in population size, its distribution has contracted and it is now not found off the northeast coast, where some breeding occurred about 10 years ago. The Committee noted that it was obvious that harvests had been above sustainable levels for more than 10 years, and that the resulting decline in the population was well documented. While no management objectives have been identified explicitly, it is apparent that the implicit objective has been to reduce the stock to some undeclared level. There is an urgent need to identify clear and explicit limits for the stock and to regulate the level of harvest accordingly. If exploitation is continued at its present rate, it is likely that the population will be reduced to very low levels, and likely extirpated in many areas, within the next 10 years.

Grey seals in the Faroes mainly breed in caves, which is exceptional for the species. Today, the only take occurs in defence of fish farms. Catch statistics are not available, but from direct contact with fish farmers, the catch in 2001 was estimated to be in the order of 250 to 500 seals, which seems surprisingly high for the population. Present population size is unknown. The Committee expressed concern that the Faroese grey seal population is subject to an apparently high but unknown level of exploitation, and that this exploitation has developed rather recently since the advent of fish farming activities. The Committee therefore strongly recommended immediate efforts to obtain better information on the population of Faroese grey seals, and on the nature and impact of the take in the Faroes.

Ship based surveys along the Norwegian coast in 2000-2002, combined with aerial surveys conducted in 1998 in northern parts of Nordland and Troms, show the number of pups born in Norwegian waters is about 1,030, which corresponds to about 4,400-5,500 seals (1+). Total annual catches of grey seals in Norwegian waters ranged from 34-176 animals in 1997-2002, which corresponds to 13%-49% of the scientifically based recommended quotas(which are 5% of the estimated population size), and 11%-35% of the given quotas. There are no catch statistics available prior to 1997. A change in management occurred in 2003 when quotas were at 25% of current population estimate. Also, a bounty of NOK 500 is to be awarded for each grey seal documented killed. The Scientific Committee noted that the new quota levels of 25% of the estimated population size would, if taken, certainly result in population reduction. Clear management objectives should be developed for this stock.

A 40 year time series of pup production estimates for the majority of the British grey seal colonies is available. The average annual rate of increase between 1984 and 1999 was 6.3% ±0.26%, but this varied locally and regionally. The estimate for the total number of females alive just before the 1999 breeding season is 63,000 (95% CI 54,000 to 73,000). The point estimate for females and males is 109,000. The reasons for the rapid population expansion in many areas of Scotland since 1960 are uncertain. There has been little harvest of this population since early in the 20th century. Some culling was carried out in the 1970's and 1980's, and this may have had the unintended effect of forcing females to found new pupping colonies, thus expanding the breeding habitat of the population. In addition, the human occupation of the isolated outer islands has decreased over the past 50 years, allowing the development of breeding colonies on these islands.

The Baltic population is severely depleted relative to historical levels, but is recovering after a century of bounty hunting and 3 decades of low fertility rates caused by environmental pollution. The growing population has led to increased interactions with the fishery, and demands have increased for the re-introduction of hunting.

Grey seals on the Murman coast have been protected since 1958. Investigations in the early 1960s suggested that about 600 seals inhabited the area at that time. Subsequent studies carried out in 1986 and 1991/92 have indicated that *ca* 850 pups are born in the area, suggesting a population of about 3,500 animals.

Northwest Atlantic grey seals form a single stock, but are often considered as two groups, named for the location of the main pupping locales for management purposes. The largest group whelps on Sable Island. The second group, referred to as non-Sable Island or Gulf animals, whelps on the pack ice in the southern Gulf of St. Lawrence, with other smaller groups pupping on small islands in the southern Gulf of St. Lawrence and along the Nova Scotia Eastern Shore. The grey seal population has increased from slightly less than 30,000 animals in 1970 to over 260,000 animals in 2000. Currently, there is no commercial harvest for grey seals in Canada.

Grey seals were historically distributed along the U.S. east coast (from Maine to Connecticut). Native and bounty hunting extirpated the population and they were rarely sighted for most of the 20th century. Seals tagged on Sable Island as pups were observed in New England during the 1980’s and 1990’s. The grey seals currently found in New England are probably a mixture of Canadian migrants and animals born locally.

<u>Discussion by the Council</u>
The Council noted that only Norway presently had regulations, including quotas, governing the grey seal hunt. Greys seals do not occur regularly in Greenland, and are taken only in defence of fish farms in the Faroes. Ásmundsson (Iceland) noted that while Iceland presently had no harvest controls for this species, the matter is receiving increased attention both in terms of research and harvest control.

3.1.8 Humpback whales
The Scientific Committee has previously noted that there is evidence of a rapidly increasing abundance of humpback whales around Iceland, and the Council has recommended that the Scientific Committee complete abundance estimates for this species as a high priority. The Scientific Committee was also asked to consider the results of the "Years of the North Atlantic Humpback" (YoNAH) project as it pertains to member countries in providing advice for this species.

The total abundance of humpbacks in the North Atlantic has been estimated at 10,752 (cv 0.068) for the West Indies breeding population only, and 11,570 (95% CI 10,290-13.390) for the entire North Atlantic (Stevick *et al.* 2003). These estimates, which apply to 1992-93, are derived from the YoNAH project, which used mark recapture analysis of photo-id and biopsy data. The estimates from the NASS in 1995 and 2001 are higher, but these apply only to the survey area around Iceland and the Faroes (and Norway in 1995). Because of the low precision of the NASS estimates, there is no significant difference between YoNAH and NASS estimates. However, the YoNAH estimate is said to apply to the entire North Atlantic whereas the NASS estimates apply only to the area around Iceland and the Faroes (and Norway in 1995). The YoNAH estimate should therefore be considerably larger than the NASS estimates, which apply only to 1 or 2 of potentially 5 feeding areas in the North Atlantic.

The Scientific Committee concluded that the discrepancy between the NASS and YoNAH estimates suggests that the North Atlantic population of humpback whales is likely considerably larger than estimated in the YoNAH study.

3.1.9 North Atlantic Sightings Surveys

The Working Group on Abundance Estimates met in St Andrews, UK in March 2003. The Working Group was tasked with continuing the evaluation of abundance estimates for target and non-target species, determining if additional analyses are required and recommending estimates for acceptance by the Scientific Committee. New, fully corrected abundance estimates for minke whales from the 1987 and 2001 Icelandic aerial surveys were reviewed and accepted. Other new estimates for minke whales (ship, 2001), humpback whales (1995 and 2001), pilot whales (2001), northern bottlenose whales (1995 and 2001) and blue whales (1995 and 2001) were also reviewed by the Working Group.

The Scientific Committee also considered the future of the North Atlantic Sightings Surveys. The NASS have been highly successful in providing important information on the distribution and abundance of cetaceans over a broad area of the North Atlantic. This information becomes more valuable every time a survey is completed, as it provides an indication of trends in abundance over meaningful time periods. The Scientific Committee emphasised the importance of these surveys and recommended that they be continued in some form at regular intervals.

Several countries are planning surveys, which may offer opportunity for integration into a large-scale survey, probably in 2006. The Scientific Committee recommended that Iceland, the Faroes, Greenland and Norway make every effort to co-ordinate their survey activities with other countries into an integrated NASS in 2006. Such co-ordination can occur through this Committee, as has been done in 1995 and 2001.

<u>Discussion by the Council</u>

The Council that the continuation of the NASS series was important for the management of cetaceans in the North Atlantic. The Management Committee was asked to recommend what role the Scientific Committee should play in the planning and co-ordination of future surveys.

3.1.10 Publications

Five volumes of NAMMCO Scientific Publications have now been published: Vol. 1 *Ringed seals in the North Atlantic*, Vol 2 *Minke whales, harp and hooded seals: Major predators in the North Atlantic ecosystem,* and Vol. 3 *Sealworms in the North Atlantic: Ecology and population dynamics*, Vol. 4 *Belugas in the North Atlantic and the Russian Arctic,* and Vol. 5 *Harbour porpoises in the North Atlantic.* The latter was published late in 2003. The following volumes are planned:

- Vol. 6: North Atlantic Sightings Surveys, eds. Nils Øien and Daniel Pike. To be published early in 2005.
- Vol. 7: Grey Seals in the North Atlantic, eds. Tore Haug and Droplaug Ólafsdóttir. To be published in 2005.
- Vol. 8: Narwhal, eds. Mads Peter Heide-Jørgensen and Øystein Wiig. Planning is tentative, but may be published in 2006 if it goes forward.

3.1.11 Election of officers
Lars Walløe was elected as Chairman, and Dorete Bloch as Vice Chairman, of the Scientific Committee. The Council expressed its thanks to Gísli Víkingsson for his able chairmanship over the past 3 years.

4. MANAGEMENT COMMITTEE

4.1 Report of the Management Committee
The Chair of the Management Committee, Kaj P. Mortensen (Faroe Islands) reported to the Council on the meeting of the Management Committee, which was held in Tórshavn 3 March 2004. A preliminary report was distributed as NAMMCO/13/6-Draft, containing the substantive issues agreed to by the Management Committee. (The final edited version of the report was adopted by correspondence after the meeting. See section 2.1).

4.1.1 National Progress Reports
The Council noted the Management Committee's appreciation to the member countries for the National Progress Reports for 2002. In addition the Council noted with appreciation that a Progress report was provided by Canada to the NAMMCO Scientific Committee and brought to the Management Committee as an information item. The Council further noted that Canada and the Russian Federation were invited to present similar reports in the future.

4.1.2 Proposals for Conservation and Management
<u>Status of past proposals</u>
Atlantic Walrus
The Council noted that a regulatory initiative that will restrict walrus hunting to those holding valid hunting licences, and that the introduction of quotas and other hunting regulations would be approved by the Greenlandic government this year.

Harp seals
Northwest Atlantic
The Council noted the reference to the 2003 Canadian multi-year management plan for the Atlantic harp seal hunt. It was further noted that if the full quota (975 000 over a 3 year period), and the Greenlandic harvests were as forecast, the total take should result in a slight population reduction over the period, while still maintaining the population well above the conservation reference point adopted. The Council noted that bilateral discussions had been held between Greenland and Canada this past year.

White/Barents Sea and Greenland Sea
The Council noted the considerations by Norway to improve the efficiency of the seal harvest in these areas. The long-term goal will be to reduce the need for subsidies and increase the take of seals from these stocks.

Hooded seals
Greenland Sea
The Council noted the information provided by Norway that quotas for this area have been reduced on the advice of the ICES/NAFO Working Group on Harp and hooded Seals, mainly because there is no recent abundance estimate for the stock.

Beluga West Greenland
The Council noted the Management Committee reference to the previous conclusions by the Scientific Committee that the beluga off West Greenland have been depleted by overexploitation and that substantial reductions in the catch are required to arrest this decline. The Council further noted that a regulatory framework allowing the government to set quotas has now been passed, and that the quotas will likely be introduced by July 2004.

Narwhal West Greenland
The Council noted that the new regulations for West Greenland beluga will also apply to narwhal, and that quotas will be introduced in July 2004.

Status of Past Requests
The Council noted the updated summary of requests for advice by the NAMMCO Council to the Scientific Committee (see section 2.1, appendix 4), and responses by the Scientific Committee since 1992. The Council agreed that this information is valuable and urged the Secretariat to continue to update the information.

4.1.3 Report of the Working Group on Bycatch

The Council noted the Management Committee's endorsement of the recommendation reiterated from last year that the member countries are encouraged to report their bycatch to NAMMCO through the modified National Progress Reports. The Council further noted the endorsement of the recommendations that member countries increase their efforts in implementing monitoring programs for marine mammal bycatch, prepare working documents outlining the existing knowledge about bycatch in their jurisdiction, and that the Scientific Committee is requested to carry out an evaluation of the data collection and estimation procedure used in the Icelandic monitoring programme (see section 2.1, item 8, page 81).

4.1.4 Report of the Working Group on User Knowledge in Management Decisions

Upon considering the results and conclusions from the NAMMCO Conference on User Knowledge and Scientific Knowledge in Management Decision-Making the NAMMCO Council at NAMMCO/12 agreed to establish a Working Group under the Management Committee (Annual Report 2002: 36, 73).

The Council noted the decision by the Management Committee to keep the Terms of Reference for the Working Group on User Knowledge in Management Decisions open until the next meeting of the Management Committee (see section 2.1, item 11, page 84). The Council also noted that the Management Committee endorsed the work plan for the Working Group and expected further information and advice to be available at the next meeting. The Council noted that the work plan included a collection of methods/procedures for how users are involved in the decision-making process, used by managers in each member country.

The Council noted that the publication of the proceedings from the Conference was in progress and expected to be completed by January 2005.

4.1.5 Report of the ad hoc Working Group on Enhancing Ecosystem-based Management

The Council noted that the Management Committee endorsed the draft Terms of Reference for the Working Group on Enhancing Ecosystem-based Management (see section 2.1, item 12, page 85).

The Council noted that the Management Committee endorsed the draft definition of an Ecosystem Approach to Management with the understanding that the Working Group would develop the definition further. Draft definition of an Ecosystem Approach to Management:

> *The utilisation of living marine resources is essential for the development and social and economic well being of countries and coastal communities in the North Atlantic. Effective management is necessary to ensure sustainability of the use and thereby the long term benefits from these resources. NAMMCO is concerned with the study, conservation and management of marine mammals, and recognises that these resources are part of complex ecosystems. To ensure effective management it is therefore necessary to consider the role of marine mammals both in terms of how they affect and are affected by it. This includes inter alia species interactions, and natural and human induced factors such as climate and pollution.*

The Council noted that the Management Committee agreed that it was useful for NAMMCO to develop such a definition and that NAMMCO would aim to improve what is already in place by taking a holistic view.

The Council noted that the Management Committee endorsed the recommendations of the Working Group including that NAMMCO continues to exchange observers with relevant organisations, that NAMMCO prepares fact sheets informing other organisations about the ongoing work in NAMMCO, and that the Group remains *ad hoc* and is called upon by the Management Committee (page 86).

The Council noted that the Management Committee considered a preliminary case study with the working title *A case study on harp seals in the North Atlantic from an ecosystem perspective,* and agreed that the Working Group in co-operation with the Secretariat would develop the study further. The Council noted that the Management Committee agreed to consider the developed case study intersessionally, and that users and scientists from participant countries would be invited to Working Group meetings (see section 2.1, item 12.1, page 86).

4.2 Recommendations for Requests for Advice

Economic Aspects of marine mammal – fisheries interactions

The Council **agreed** to the Management Committee's endorsement of the Scientific Committee’s plan to hold a meeting of the Working Group on Marine Mammal - Fisheries Interactions in the autumn of 2004 (see section 2.1, item 7.1, page 77).

Harp and Hooded Seals

<u>New Request for Advice</u>

The Council endorsed the Management Committees request that the Scientific Committee annually discusses the scientific information available on harp and hooded seals and advice on catch quotas for these species given by the ICES/NAFO Working

Group on Harp and Hooded Seals. The Council noted that the advice by the Scientific Committee should not only be given as advice on replacement yields, but also levels of harvest as part of an ecosystem approach to management.

For the Barents/White Sea and Greenland Sea stocks, the Council noted the Management Committees request that in addition to advice on replacement yields, advice should be provided on levels of harvest that would result in varying degree of stock reduction over a 10 year period.

The Council noted the Management Committees request, in connection with Canada's multi-year management plan, that the Scientific Committee provides advice on likely impact in stock size, age composition, and catches in West Greenland and Canada under the conditions of this plan (see section 2.1, item 7.2.2, page 77).

Harbour porpoise

The Council endorsed the Management Committee recommendation that the member countries co-operate to the extent possible, to maximise the coverage and effectiveness of the SCANS surveys planned for 2005 and 2006 (see section 2.1, item 7.3.1, page 78).

Beluga West Greenland

New request for advice

The Council noted the Management Committee's endorsement of the Scientific Committee plan to update the stock assessment based on the March 2004 survey of over-wintering area of this stock.

Narwhal – West Greenland

Proposals for Conservation and Management

The Council noted the Management Committee's grave concern over the depleted status of the West Greenland narwhal, and that the preliminary scientific conclusions recommend a substantial reduction in harvest levels. It further noted that the JCNB, which provides management advice for stock, would be considering this information in the near future.

Recommendations for Scientific Research

The Council noted that the Management Committee endorsed the Scientific Committee plan, to update and finalise the assessment of West Greenland narwhal in 2005 in co-operation with the Scientific Working Group of the JCNB (see section 2.1, item 7.5.2, page 78).

Fin whales

Proposals for Conservation and Management

East Greenland-Iceland Stock

The Council noted the Management Committee's considerations of the Scientific Committee conclusion that projections under constant catch levels suggest that the "inshore" substock would maintain its present abundance under an annual catch of about 150 whales. If the "offshore" substock was also harvested the level of overall sustainable annual catch possible would be higher than 150 whales.

Faroe Islands
The Council noted the Management Committee's considerations of the Scientific Committee's conclusions that these had not changed since the previous assessment. The continued uncertainties about stock identity preclude carrying out reliable assessment of the status of fin whales in Faroese waters, and the Scientific Committee is not in a position to provide advice on the effects of various catches. The Council further noted that the Scientific Committee asked the Management Committee to provide clearer guidance on the management objectives for harvesting from what is likely to be a recovering stock before specific advice can be given (see section 2.1, item 7.6.1, page 79).

New Request for Advice
The Council noted the Management Committee's endorsement of the Scientific Committee's plan to complete an assessment, likely in 2005, for the North Atlantic stocks and update assessments for other areas.

Recommendations for Scientific Research
The Council noted the Management Committee's endorsement of the Scientific Committee's recommendations for research for all stocks (see section 3.1, item 9.6.1, page 166). The Council further noted the Management Committee's emphasis to give the question of stock identity and relationship to other stocks for the fin whales around Faroe Islands highest priority, and endorsed the encouragement to member countries to undertake research in the area.

White-beaked, white-sided and bottlenose dolphins
New Request for Advice
The Council noted the Management Committee endorsement of the Scientific Committee plan to proceed with the assessments once information on distribution and abundance becomes available from the SCANS planned for 2005/6 and the Norwegian coastal surveys. The Council noted that considerable progress has been made in the Faroes in describing the ecology and life history of white-sided dolphins. Information on white-beaked dolphins should be available from Iceland and Norway in two years time (see section 2.1, item 7.7.1, page 79).

Recommendations for Scientific Research
The Council **endorsed** the Management Committee's recommendation to complete the research noted under Item 7.7.2 in the Scientific Committee Report (Section 3.1) within the indicated timelines (see section 2.1, item 7.7.2, page 80).

North Atlantic Sightings Surveys
New Request for Advice
The Council also welcomed the new abundance estimates for particularly minke and humpback whales in the Central North Atlantic. The Council noted that the NASS have been highly successful in providing important information on the distribution and abundance of cetaceans over a broad area of the North Atlantic.

The Council endorsed the Management Committee request that the Scientific Committee co-ordinate the efforts of member countries and non-members with other jurisdictions in planning and conducting a large-scale survey in 2006 (see section 2.1, item 7.8.1, page 80).

Others

Minke Whales

Proposal for conservation and management

The Council noted the Management Committee's considerations of the Scientific Committee conclusions that for the Central North Atlantic Stock, a catch of 200 minke whales per year would, under all scenarios considered, maintain a mature component of the population above 80% of its pre-exploitation level. Similarly, a catch of 400 per year would maintain the population above 70% of this level (see section 2.1, item 7.9.1.1, page 80).

Recommendations for scientific research

The Council noted the Management Committee's endorsement of the recommendations for research identified by the Scientific Committee (see section 2.1, item 7.9.1.2, page 80).

Grey Seals

Proposal for conservation and management

The Council noted the Management Committee's considerations of the concern expressed by the Scientific Committee with the observed decline of the grey seal stock around Iceland, and the conclusion that the new quota levels implemented for Norwegian grey seals would, if filled, almost certainly lead to a rapid reduction in the population in the area. The Council endorsed the Management Committee's recommendation that Iceland and Norway should define clear management objectives for this stock.

Recommendations for scientific research

The Council noted the Management Committee's endorsement of the recommendations for research identified by the Scientific Committee (see section 2.1, item 7.9.2.1, page 80).

Humpback Whales

New Request for Advice

The Council noted the considerations of the Management Committee of the conclusions by the Scientific Committee that there is evidence from the NASS of a rapidly increasing abundance of humpback whales in the Central North Atlantic. The Council noted the request to the Scientific Committee to assess the sustainable yield levels for humpback whales, particularly those feeding in West Greenland waters. The Council took note of the management objective to maintain the stock at a stable level (see section 2.1, item 7.9.3.1, page 81).

Killer whales

New Request for Advice

The Council noted the Management Committee request to the Scientific Committee to review the knowledge on the abundance, stock structure, migration and feeding ecology of killer whales in the North Atlantic, particularly in the West Greenland – Eastern Canada area, and to provide advice on research needs to improve this knowledge.

Walrus

The Council noted the Management Committee request to the Scientific Committee to provide an updated assessment of walrus, including stock delineation, abundance, harvest, stock status and priorities for research (see section 2.1, item 7.9.5.1, page 81). The Council noted that the last assessment by the Scientific Committee was from 1994.

4.3 International Observation Scheme

The Council noted the Management Committee review of the implementation of the Observation Scheme for 2003 under the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals and for the planned observation activities for 2004 (see section 2.1, item 10, page 83).

The Council noted that the Management Committee had urged member countries to adhere to deadlines for implementing the Scheme and that they provide the Secretariat with names of contacts for the observers.

The Council further noted that the 2003 observations focussed on whaling activities in Norway, and that no violations were reported. The Council agreed to the Management Committee considerations that observations on board whaling ships are an important development of the observation scheme. The Council noted the description, by Norway, of the development and testing of an automated system for recording observations on whaling vessels. The system will be installed on all vessels by 2005, at which point the national inspectors will be optional.

4.3.1 Report of the Sub-Committee on Inspection and Observation

The Council noted the Management Committee's endorsement of the recommendation by the sub-Committee that the Secretariat reviews and recommends improvements to the implementation of the Scheme. The Council noted that the evaluation should only consider the implementation process and not the actual Provisions and Guidelines texts.

The report from the Committee is contained in section 2.3 .

4.4 Other Business

The Council noted that Mr Halvard P. Johansen (Norway) was elected as Chair for the Management Committee, and that Mr Stefán Ásmundsson (Iceland) was elected as vice-Chair. The Council also expressed their appreciation to the outgoing Chair Mr Kaj P. Mortensen (Faroe Islands) for his able chairmanship since 1998.

5. HUNTING METHODS

5.1 Report of the Committee on Hunting Methods

The Chair of the Committee on Hunting Methods, Jústines Olsen (Faroe Islands) presented the report of the Committee to the Council. The Committee met in Copenhagen on 13 January 2004. The report is contained in Section 1.2.

The Council noted the updated information on hunting methods developments in the Faroe Islands, Greenland, Iceland and Norway, presented to the Committee at the January meeting.

The Committee Chair presented the updated lists of regulations and references on hunting methods in the member countries (see section 1.2, appendices 1 and 2).

The Council noted that most of the recommendations from the NAMMCO Workshop on Hunting Methods (Greenland, February 1999), adopted by the Council at its 9th Annual Meeting in Iceland in 1999 had been fulfilled, while the two remaining are currently in progress (see section 1.2, item 5 , page 57). See also NAMMCO Annual Report 1999, section 1.3, item 7, page 71. Follow-up to the recommendations were also reported to the NAMMCO Council at the 10th Annual Meeting in Norway 2000 (see NAMMCO Annual Report 2000, section 1.2, item 4, page 61), and at the 11th Annual Meeting in Greenland 2002 (NAMMCO Annual Report 2002, Section 1.2, item 3, page 62).

The Chair presented an update of the recommendations resulting from the NAMMCO Workshop on Marine Mammals: Weapons, Ammunition and Ballistics in Sandefjord, Norway in 2001 (see NAMMCO Annual Report 2001, Section 1.3, item 4, page 71). These recommendations were endorsed by the NAMMCO Council at their 11th meeting in Greenland in 2002 (NAMMCO Annual Report 2001, Item 5.1.1 page 27).

The Council noted that progress was being made on these recommendations, and that they were likely to be completed by the next Council meeting in 2005 (see also item 5.2 below).

5.2 Update on preparations for Workshop on Hunting Methods for Seals and Walrus, September 2004

The Chair presented an update of plans for the Workshop on Hunting Methods for Seals and Walrus and informed the Council that it would be held in Copenhagen 7 – 9 September 2004 (see NAMMCO Annual Report 2002, Section 1.2, item 5.1, page 33). The Committee had held three meetings in 2003 for planning purposes (see section 1.2, appendix 3).

The Council noted that the Workshop would include scientific presentations, presentations on seal and walrus hunting methods and on weapons and gear, and that the Workshop was expected to result in recommendations on weapons and technical innovations. The Council further noted that the Nordic countries, Canada, the Russian Federation and Alaska, USA had indicated positive interest.

The Council expressed its gratitude to the Nordic Council of Ministers for committing NOK 150,000 in financial support of the Workshop. The Council noted the Workshop plans and thanked the Committee for its efforts.

Norway congratulated the Committee on the successful follow-up of the recommendations from the Workshops, and noted that this work helps to demonstrate that NAMMCO is taking animal welfare issues seriously.

The Council noted the future work of the Committee including the Workshop and the follow-up of the remaining recommendations. The Council also noted the possibility that a publication would result from the series of Workshops on killing methods. The Council expressed its appreciation for the Committee’s work.

5.3 Other business

Presentation by the Association of Traditional Marine Mammal Hunters of Chukotka (ATMMHC)

Mr Gennady Innankeuyas, Chairman of the ATMMHC and the Whaling Commission gave a presentation of the ATMMHC and Chukotka aboriginal hunting. The ATMMHC was established in 1997 to preserve the aboriginal habitat and traditional subsistence of Chukotka Native peoples. The Chukotka region is home to about 75,000 people covering an area twice the size of Japan. The ATMMHC represents a total of 800 hunters and 10,000 traditional consumers of marine mammal products living in 25 native villages. The goals and objectives of the Association includes the protection of marine mammal hunters' interests, preservation of habitat and biological resources of vital importance to native peoples, conservation of traditional subsistence uses, information support and educational programs in marine mammal issues, scientific support of marine mammal hunting, and management and co-management of marine mammal resources. In 2003 the Native people of Chukotka, for the first time in history, started to manage their own aboriginal whaling quota, through the ATMMHC. The management system of the aboriginal gray and bowhead whales quotas include:

- collection and processing of quota applications from Native peoples' organisations by the ATMMHC whaling commission
- consultations with biologists and ethnographers
- preliminary quota distribution in accordance with the traditions of harvest and use of whales and scientific recommendations
- approval of the quota distribution plans at the ATMMHC board meetings
- collection of information of the whale hunt
- redistribution of quotas depending on weather and ice conditions, and
- analysis and drafting of the harvest report for the Russian Ministry of Natural Resources.

Mr Innankeuyas illustrated his presentation of the hunting methods with a series of photographs.

6. THE NAMMCO FUND

6.1 Report of the NAMMCO Fund

The Chair of the Board of the NAMMCO Fund, Ulla Wang (Faroe Islands), presented the report of the Board to the Council. The Board had two telephone meetings in 2003 to discuss the Fund Announcement for 2003 and 2004 and to review the 2003 applications for funding from the NAMMCO Fund. The report was contained in document NAMMCO/13/8. The Council noted that for 2003 the Board was particularly interested in considering projects that would produce an information book-let on marine mammals in the North Atlantic that would give scientifically accurate species information including current and historical utilisation of marine mammals.

The Council noted that the total available funds for 2003 were NOK 187,000 (NOK 82,000 transferred from 2002, NOK 20,000 allocated from the Council budget for 2003 and NOK 85,000 released after the withdrawal of a previously approved project). The Council also noted the reiteration from last year that the quality of the applications in any given year determines whether all the funds are allocated.

6.1.1 Applications
The Council noted that the Secretariat had received five applications for funding for 2003, two of which had been rejected by the Secretariat because they did not meet the application criteria. The Board of the Fund decided to fund one of these proposals.

The successful application was:
<u>An Ethical Platform in Defence of Marine Mammal Hunting</u> – A report for a general audience that aims to develop an ethical argumentation in support of marine mammal hunting. The background for the project is based on the observation that the principle of sustainable use, and references to social and economic consequences do not appear to have had an effect on the international opinion against marine mammal utilisation, and that new ways of thinking are necessary to persuade a critical audience that marine mammal utilisation is acceptable. The project is aimed at an international audience. It will also develop a manual of ethical argumentation for use by hunters and representatives of the whaling industry.

6.2 Funded projects overview
The Chair presented the overview of the funded projects as contained in document NAMMCO/13/8-Annex 1. The Council noted that there are currently 10 projects running, only a few of which are in the final stages.

6.3 Other business
The Council **agreed** that no new projects would be solicited for 2004. The Council asked the NAMMCO Fund Board to suggest alternative approaches for the Fund to be presented to the Council at their next meeting in 2005. The Council further **agreed** that the current funds of approximately NOK 100,000 would be kept in reserve until the proposal from the Board had been considered.

7. ENVIRONMENTAL QUESTIONS

The Council noted the reply from the British Secretary of State the Rt Hon Margaret Beckett in response to the letter from NAMMCO on the Sellafield issue (see NAMMCO Annual report 2002: 35). The Council further noted that NAMMCO's newly acquired observer status to OSPAR would provide an opportunity for active exchange of information on environmental issues outside of the NAMMCO countries. The Council recognised that NAMMCO does not have the competence to deal with the issue of contaminants and other environmental questions, but that the NAMMCO members have stakes and interests in a clean environment, and therefore an interest in keeping abreast of developments and discussions on such topics. It was also recognised that environmental issues are intrinsic to an ecosystem approach to management, a highly relevant issue for NAMMCO. The Council **agreed** that it was important to keep this item on the agenda as a means of exchanging ideas and information on this topic between the member countries. The Council encouraged member countries to consider these issues and to provide information at future meetings.

8. EXTERNAL RELATIONS

Under this item the Secretary informed the Council of the meetings officially attended by NAMMCO and reviewed relations with those organisations with which NAMMCO exchanges observers.

8.1 Co-operation with other international organisations

The Secretary drew the attention of the meeting to document NAMMCO/13/9.

IWC International Whaling Commission

The Council noted that the Secretary and the Administrative Co-ordinator had represented NAMMCO as observer at the 55th Annual Meeting of the IWC, which was held in Germany in June 2003. The Scientific Secretary represented NAMMCO at the IWC Scientific Committee meeting. Items of relevance or interest to the NAMMCO Scientific Committee were available to the meeting as document NAMMCO/13/9-1.

In following previous practice NAMMCO submitted an opening statement to the IWC, providing updated information on recent activities of the organisation. The statement was available to the Council meeting as document NAMMCO/13/9-2 part 1.

The Secretary reported that NAMMCO was given an opportunity to make an intervention under the IWC agenda item dealing with the Revised Management Scheme. The statement was contained in NAMMCO/13/9-2, part 2.

Arctic Council – Senior Officials Meetings

The Secretary informed the Council that she had attended two meetings of the Senior Arctic Officials in Iceland in 2003. Reviews of the meetings were presented in document NAMMCO/13/9-3. See Item 8.1.2 below for a discussion on NAMMCO's current involvement in the Arctic Council and alternatives for future co-operation between the two organisations.

NEAFC – North East Atlantic Fisheries Commission

Silje Wangen (Norway) represented NAMMCO at the 22nd Annual Meeting of NEAFC, held in London 10-14 November 2003. The Commission had reviewed scientific information from the International Council for the Exploration of the Sea (ICES) concerning the status of fish stocks in the North East Atlantic. Specific attention was given to reports on oceanic redfish, blue whiting, and Norwegian spring spawning herring, mackerel, Rockall haddock and deep-sea species. Other issues considered at the meeting included extended measures to reduce fishing efforts in deep waters, agreement on management measures to control exploitation of major fish stocks in international waters, adoption of a new non-Contracting Party Scheme for preventing illegal, unreported and unregulated fishing in the NEAFC area, and review of recent trends in international management of marine resources, including the ecosystem approach. The report from the NAMMCO observer was available to the meeting as NAMMCO/13/9- 4.

NAFO – Northwest Atlantic Fisheries Organisation
Iceland represented NAMMCO at the 25th Annual Meeting of NAFO, held in Dartmouth, Canada, 15 – 19 September 2003.

NASCO – North Atlantic Salmon Conservation Organization
The Faroe Islands represented NAMMCO at the 21st Annual Meeting of NASCO, held in Edinburgh, Scotland 2 – 6 June 2003.

OSPAR Convention
The Secretary reported that NAMMCO was granted observer status to the OSPAR Commission, under article 11 of the OSPAR Convention, at its meeting in Bremen 23 – 27 June, 2003. The Commission agreed unanimously to grant observer status to NAMMCO. The Secretary informed the Council that the Secretariat receives information and documents for all meetings within OSPAR. The Council noted that the Secretariat is currently working on identifying the meetings that are most relevant for NAMMCO. Norway represented NAMMCO at the meeting of the OSPAR Biodiversity Committee held in Belgium 16 – 20 February 2004.

The North Atlantic Regional Fisheries Management Organisations (NARFMO)
The Secretary reported that the North Atlantic Regional Fisheries Management Organisations held their 2nd meeting in Rome, Italy 4 – 5 March 2003. The Secretary was unable to attend due the scheduling conflict with NAMMCO/12. The meeting addressed a number of topics, including: management of marine ecosystems and the need for the North Atlantic RFMOs to feed into the process, developments of Memorandum of Understanding with ICES, issues of transparency at meetings, issues of conservation, pollution prevention and utilisation of marine resources and ways that the North Atlantic RFMO can avoid potential duplication by keeping each other informed of contacts with regional seas organisations. A report from the meeting was available as document NAMMCO/13/9-8.

8.1.1 Other meetings and relations
<u>ICES – International Council for the Exploration of the Sea</u>
The Secretary informed the Council that the General Secretaries to NAMMCO and ICES had agreed to draft a Memorandum of Understanding (MoU) for approval by the NAMMCO Council intersessionally and by the ICES Bureau Meeting in June 2004. The Council noted that the MoU would be modelled upon the existing MoU between ICES and the Food and Agriculture Organisations of the UN (FAO). The Council recognised that this discussion is a part of a long process and endorsed the Secretary's recommendation that the Council give the Secretariat mandate to negotiate such a MoU.

<u>North Atlantic Conference 2003</u>
The Secretary attended the second North Atlantic Conference (NAC) 2003, held in Lerwick, Shetland 1 – 2 October 2003. The Conference is now an established forum, first held in Tórshavn in 2001. The Conference provides a political forum to review and discuss recent developments on international, national and community levels to enhance sustainable use of the ocean and its living resources, with a focus on the integration of environmental, economic and social considerations, all of which are fundamental to ensuring sustainable development. The issues considered at the Shetland Conference included: a greater focus on the implementation of ecosystem

approaches, co-ordinated assessment of the marine environment, enhancing business and educational partnerships and exchanges in the region. The Conference resulted in the signing of the Conference Declaration *Living off the Sea in the North Atlantic.* The Conference Declaration was available to the meeting as document NAMMCO/13/9-6. Norway offered to host the third NAC in 2005 and the Faroe Islands will provide interim support for the Conference process.

<u>Norwegian Small Whalers Union</u>
The Council noted that the Secretary and the Administrative Co-ordinator Winsnes, had attended the annual meeting of the Norwegian Small Whalers Association 26- 27 September 2003 in Svolvær, Norway). The meeting considered a variety of aspects around three main topics: political marine mammal management – ecological neglect, a summary of the 2003 whaling season, and an update of the results from the whale killing project. Ms Winsnes presented the International Inspection and Observation Scheme from the 2003 season, where the focus had been Norwegian whaling.

<u>Symposium on Sustainable Use of Living Marine Resources</u>
The Council noted that the Secretary had attended the symposium held in Tokyo, Japan 30 October – 1 November 2003. The meeting was hosted by Japan and its purpose was to discuss a follow-up strategy from IWC 55, the MoU between CITES and FAO and other CITES matters, and Japan's whale research programme.

8.1.2 The Arctic Council
At its meeting in 2003, NAMMCO/12 the Council instructed the Secretary to prepare a short report on the work of the Arctic Council and to suggest a best effort strategy for co-operation between NAMMCO and the Arctic Council (NAMMCO Annual report 2002: 38). The Secretary's briefing note was available to the meeting as document NAMMCO/13/10.

The Secretary reviewed NAMMCO's current involvement in the Arctic Council. The Council noted that the Secretary to date has attended the ministerial meetings, the biannual meetings of the Senior Arctic Officials and the some of the meetings of the Working Group on Sustainable Development. Currently four of the five Arctic Council Working Groups are relevant to NAMMCO. The Sustainable Development Working Group (SDWG) currently with two relevant initiatives, the Arctic Human Development Report (AHDR) in which the Secretary is a member of the Steering Committee and a contributing author to one of the chapters, and the development of a Sustainable Development Action Plan. The Arctic Monitoring and Assessment Programme (AMAP) which provides *inter alia* useful information on the pollution load in marine mammal species and on pollution and health. Other programmes include the Working Group on Conservation of Arctic Flora and Fauna (CAFF), and the Protection of the Arctic Marine Environment (PAME), which is co-ordinating the development of an Arctic Marine Strategic Plan. The AMSP is highly relevant to NAMMCO in its efforts to better co-ordinate and integrate strategic approaches to management of the Arctic coastal and marine environment. In addition, NAMMCO is involved in one of the special initiatives of the Arctic Council, the Arctic Climate Impact Assessment (ACIA) in which the Secretary is a contributing author to Chapter 16 of the report.

The Council noted the four co-operative alternatives suggested by the Secretary each with an increasing involvement on the part of NAMMCO. The Council further noted that the observer status is open to inter-governmental organisations the Arctic Council determines can contribute to its work. Co-operation between that the two organisations should therefore aim at being mutually beneficial. The member countries of NAMMCO are also members of the Arctic Council. Therefore an opportunity exists for better co-ordination between the NAMMCO members within the Arctic Council in addressing issues of interest to NAMMCO as an organisation.

The Council **agreed** that it is important to follow the developments in the Working Groups, while also aim to increase co-operation between NAMMCO and the Arctic Council. The Council therefore **agreed** that the level of involvement would be dependent on the relevance of the topics considered at the Arctic Council. In addition the Council noted the value of a co-operative effort in which NAMMCO would have an active role in developing and executing projects of common interest to NAMMCO and to the Arctic Council. The Council suggested that the Secretariat continue to monitor the Arctic Council activities closely and circulate the relevant agenda items to the Council in order for the Council members to better co-ordinate their own efforts. The Council also noted the importance of being active in relations with other organisations involved with the Arctic Council which may provide opportunities to contribute to projects initiated by Arctic Council Working Groups.

The Council noted that although the Arctic Council has not yet generated a specific focus on issues related to marine mammal utilisation, this is obviously an area of direct relevance in the development of strategies for sustainable development in the entire circumpolar region.

8.2 Other business

Japan noted that the establishment of the Conservation Committee by the IWC is one reason that withdrawal from that organisation remains an option and that in this regard, Japan would like to discuss with NAMMCO members the issue of advice for the management of large whales.

9. INFORMATION

The Secretary informed the Council of the work and plans regarding information on NAMMCO that is aimed at the general public and of work that had been presented by the Secretariat members in different fora.

The Council noted with satisfaction that the basic texts on NAMMCO had been compiled in a handbook “NAMMCO Basic Documents”. The handbook was circulated to the meeting as document NAMMCO/13/11-1.

The Secretary informed the Council that the information brochure on NAMMCO had been updated and printed in 2000 copies. The updated brochure was available to the meeting as document NAMMCO/13/11-2.

The Council noted that the Secretariat had initiated a “NAMMCO Seminar Series on Marine Mammals” in Tromsø. It was further noted that the main objective of the seminar series is to bring the many researchers that are scattered among several institutions in Tromsø together on a regular basis to increase the awareness on marine mammal- related research, and to stimulated discussion and co-operation. The Council noted that the series so far has been successful. The list of seminars was presented to the Council in document NAMMCO/13/11-3.

The Council noted that the members of the Secretariat had prepared and presented a number of papers and lectures on a variety of topics related to NAMMCO and marine mammals as listed in document NAMMCO/13/11-4.

The Secretary drew attention to document NAMMCO/13/11-5 listing the volumes in the NAMMCO Scientific Committee Publications Series, Series Editor Daniel G. Pike. The latest volume to be published was Volume 5. Harbour Porpoise in the North Atlantic, in 2003. The Council noted two published reviews of volumes 2 and 3 contained in document NAMMCO/13/11-6 part 1 and 2.

The Council noted that the Secretary had published a chapter entitled NAMMCO – Regional Co-operation, Sustainable Use, Sustainable Communities in the 2003 book *The Future of Cetaceans in a Changing World*, edited by William Burns and Alexander Gillespie, and an article on recent activities of NAMMCO in the Japanese journal *ISANA* in 2003 (NAMMCO/13/11-7).

The observer from EBCD, Ms Despina Symons informed the meeting of various developments in the European Union and the European Parliament with regard to issues on marine mammals, fisheries and ecosystem approaches to resource management.

The Council thanked the Secretary for the report and noted the usefulness of the handbook "NAMMCO Basic Documents".

10. ELECTION OF OFFICERS

10.1 Election of Chair 2004/2005

The Council elected Kate Sanderson (Faroe Islands) as its Chair for the next two years (2004/2005). The outgoing Chair Amalie Jessen (Greenland) had held the position for two periods. The Council thanked the Chair for her able chairmanship and wished her well in the future. The Faroe Islands presented the outgoing chair with a gift in appreciation of her efforts.

10.2 Election of Vice- Chair 2004/2005

The Council elected Halvard P. Johansen (Norway) as Vice- Chair for the next two years (2004/2005).

11. ANY OTHER BUSINESS

Ms Jessen closed the meeting with some personal reflections over her long period as Chair of the NAMMCO Council. Ms Jessen noted that she had actually been a part of NAMMCO since before it was officially established and found that NAMMCO has become a mature, serious, productive and constructive management body. Her expectations and hopes are that NAMMCO can continue to grow, not only in its work and goals but also in its membership. She noted that it is appropriate and relevant for NAMMCO to work towards an ecosystem based approach to management. This is the right direction for NAMMCO and for sustainable use of marine mammals. She concluded her remarks by thanking the Secretariat, the participants and the interpreters for a successful meeting, and congratulated the new Chair with her position.

12. CLOSING ARRANGEMENTS

12.1 Next Meeting

The next meeting to be hosted by Norway and will be held in Tromsø, Norway 1 – 4 March 2005.

12.2 Adoption of Press Release

A drafting group finalised the press release after the conclusions of the meeting.

Appendix 1

AGENDA

1. Opening procedures
   - 1.1 Welcome address: Minister for Fisheries and Maritime Affairs, Mr Bjørn Kalsø, Faroes Islands
     Key Note Speaker: Dr Bogi Hansen, Faroese Fisheries Laboratory
   - 1.2 Opening statements
   - 1.3 Observers
   - 1.4 Adoption of agenda
   - 1.5 Meeting arrangements
2. Finance and Administration
   - 2.1 Report of the Finance and Administration Committee
   - 2.2 Commission Budget 2004 & Forecast Budget 2005
     Approved Final Accounts 2002, Final Accounts 2003
   - 2.3 Other business
3. Scientific Committee
   - 3.1 Report of the Scientific Committee
   - 3.2. Report Working Group on Narwhal - Beluga
   - 3.3 Other business
4. Management Committee
   - 4.1 Report of the Management Committee
   - 4.2 Recommendations for Requests for advice
   - 4.3 International Observation Scheme
   - 4.4 Other business
5. Hunting Methods
   - 5.1 Report of the Committee on Hunting Methods
   - 5.2 Update on Preparations for Workshop on Hunting Methods for Seals and Walrus, September 2004
   - 5.3 Other business
6. NAMMCO Fund
   - 6.1 Report of the NAMMCO Fund
   - 6.2 Funded projects overview
   - 6.3 Other business
7. Environmental questions
8. External relations
   - 8.1 Co-operation with other international organisations
     - 8.1.1 Other meetings and relations
     - 8.1.2 Arctic Council
   - 8.2 Other business
9. Information
10. Election of Officers
    - 10.1 Election of Chair 2004/2005
    - 10.2 Election of Vice-Chair 2004/2005
11. Any other business
12. Closing arrangements
    - 12.1 Next meeting
    - 12.2 Adoption of press release

Appendix 2

LIST OF DOCUMENTS

NAMMCO/13/1	List of Participants
NAMMCO/13/2	Agenda
NAMMCO/13/3	List of Documents
NAMMCO/13/4	Report of the Finance and Administration Committee
NAMMCO/13/4 – Annex 1	Approved Final Accounts for 2002, Final Accounts 2003, Draft Budget 2004 and Forecast Budget 2005
NAMMCO/13/5	Report of the Scientific Committee, 25-27 November 2003
NAMMCO/13/6	Report of the Management Committee, - March 2004
NAMMCO/13/7	Report of the Committee on Hunting Methods
NAMMCO/13/8	Report of the NAMMCO Fund
NAMMCO/13/8- Annex 1	List of Funded Projects
NAMMCO/13/9	External Relations
NAMMCO/13/10	Co-operation between NAMMCO and the Arctic Council
NAMMCO/13/11	Information
NAMMCO/13/12	Report of the Joint Meeting of the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga Scientific Working Group and the NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic
NAMMCO/13/13	Response regarding Sellafield
NAMMCO/13/OS	Welcome address and opening statements from member countries, Japan and Association of Traditional Marine Mammal Hunters of Chukotka (ATMMHC)

Appendix 3

ADDRESS AND OPENING STATEMENTS TO THE COUNCIL BY MEMBER DELEGATIONS AND OBSERVER GOVERNMENTS

THE FAROE ISLANDS - WELCOME ADDRESS

Minister for Fisheries and Maritime Affairs, Mr Bjørn Kalsø

Madam Chair, distinguished delegates and observers, ladies and gentlemen,

It is a great pleasure to welcome you here to the Faroes to the thirteenth Annual Meeting of NAMMCO. It is only one week since I was appointed minister of fisheries. So it is a special honour, as one of my very first official tasks, to welcome such an important group of delegates and observers from so many countries and organisations. I welcome all delegates from our fellow member countries in NAMMCO, including my colleague from Greenland, fisheries minister Mr Simon Olsen. I am also pleased to welcome observers from Canada, Japan and Denmark, as well as from a number of other international organisations and interest groups. I would in particular like to welcome parliament members from Iceland and Greenland who are here representing the Nordic Council, as well as members of the Association of Traditional Marine Mammal Hunters, all the way from Chukotka in the far east of the Russian Federation.

I am a whaler myself, like many of my fellow countrymen. Whenever I have the chance I take part in whale drives in the northern islands of the Faroes, where I come from. I also take my children with me. I want them to learn how whaling is done so they can keep alive this practical knowledge and respect for where our food comes from. It is vitally important for our future that our children also understand how valuable the resources of the sea are for us, and why we must take good care of them.

So even though I am new as minister, the important work and cooperation we have in NAMMCO is not new to me. Since NAMMCO was established in April 1992 and held its very first meeting here in Tórshavn in September the same year, we have seen the organisation establish a firm place in the North Atlantic as an international body for cooperation on the conservation, management and study of marine mammals. And we in the Faroes value this cooperation very much indeed. We also see potential for it to be strengthened in the future if Canada and the Russian Federation decide to join as full members.

Ensuring that our use of marine resources is sustainable must always be the basis of our management and our cooperation as fisheries nations. This is a principle that applies to all resources - including whales and seals. A stronger focus on managing fisheries in the ecosystem is the way forward. We cannot manage our whaling and sealing in isolation. We must also take fisheries into account, and improve our understanding of how fish, whales and seals function together in the seas they share. We are pleased to see that NAMMCO is taking a leading role in putting these questions very clearly on the agenda.

Once again I welcome you all, and wish you all the best for a productive meeting and an enjoyable stay in the Faroes.

GREENLAND – OPENING STATEMENT

Madam Chair, Delegates, Observers, Ladies and Gentlemen

On behalf of the Greenlandic Delegation I would like to express our appreciation to be here in The Faroe Islands for the thirteenth meeting of the Council. As you all know, the utilisation of marine mammals is of great importance to Greenland, and we are gathered here because we believe that NAMMCO is a very important regional and international organisation for co-operation on sustainable utilization, conservation and study of marine mammals in the North Atlantic.

The eco-system approach to management of living marine resources was set out as a desired objective in our NAMMCO Agreement. Many different definitions are available with respect to ecosystem management. For the first time we have looked into this matter from a NAMMCO point of view, and we will in this meeting discuss the recommendations of the working group.

Greenland wants that the possible impacts of the climate change on the marine mammals, and the impact on users of these mammals, our hunters, also will be taken into consideration. There are settlements were the ice, the mammals and the people are so interconnected, that changes in the ice and driftice may be followed by changes in ways of life and hunting methods.

With respect to marine mammals – fisheries interaction we should encourage the work by the Scientific Committee and try to focus on issuses which may be utilised in a future eco-system management.

The NAMMCO conference on the difficult task of incorporation, on a equal footing, user knowledge and scientific knowlegde in management decision-making was indeed very successful. Greenland is pleased to inform that the Greenland Institute of Natural Resources and the Organisation of Fishermen and Hunters in Greenland has signed an agreement on committing into a formal co-operation between the two parties. With respect to scientific schools Greenland strongly support the work that is initiated in the Working Group of User Knowlegede in the Management Decision-Making and are looking forward to the recommendations. Greenland intends to set up a committee to discuss the principles for user knowledge in management decision-making.

Greenland is very engaged in the work regarding hunting equipment and hunting methods within the NAMMCO countries, and Greenland finds it useful and important to collect and exhange knowledge on this issue with the other member countries. Consequently, Greenland is looking forward to participate in the workshop on Hunting Methods for Seals and Walrus in September this year.

Greenland also very strongly supports the NAMMCO Inspection and Observation Scheme. The seven years of experience with the scheme has demonstrated that it is possible to establish and implement a well-functioning international Inspection and

Observations Scheme on whaling and sealing. Greenland therefore recommends that this scheme be further developed.

Greenland is happy to inform that after many years of work the Greenland Home Rule Government has signed a departmental order on protection and hunting on beluga and narwhale. The Government will according to international agreements, scientific advise, also from NAMMCO's scientific committee from this meeting, user knowledge and after hearing /consulting the Council of Hunting determine the quota on beluga and narwhale during this spring.

Thank you Madam Chair.

ICELAND - OPENING STATEMENT

Madame Chair, Honourable Minister, Delegates, Observers, Ladies and Gentlemen.

Let me start by saying what a pleasure it is to have this year's NAMMCO meeting in these beautiful surroundings in Tórshavn. I hope we will find the strength to do our work regardless of the fantastic view we have when we look out the window here on the top of the hill overlooking Tórshavn and the surrounding area. Of course, we are not gathered here only to enjoy the beauty of the Faroe Islands. We are gathered here because the issue of marine mammals is of importance to us.

Sustainable utilisation of marine mammals is important for all the countries that are parties to NAMMCO. We base our livelihoods largely on utilising the living resources of the sea, and see no reason why marine mammals should be treated any different than other living marine resources. The important issue is the sustainability of the utilisation. Unsustainable utilisation hurts both the environment and the communities that rely on living marine resources. In a way, this inseverable link forces us all to be environmentalists. We place great importance on conservation and sustainability because we have no other choice. Our long-term well being depends on us ensuring the sustainability of all utilisation of living marine resources.

That is why international co-operation in this field is important. The living marine resources do not respect the borderlines that we have drawn between different national jurisdictions. We need to work together for the conservation, rational utilisation and study of these resources, and for that work NAMMCO is very important.

In international co-operation regarding marine mammals, one often finds oneself in a situation where the discussion does not revolve around issues such as scientific findings and sustainability, but around more subjective issues that we find less relevant. It is clear that such discussions create a barrier to fruitful work. The objective, and science-based, approach that we use in NAMMCO is therefore a key element in NAMMCO's continued importance. I would like to stress this point particularly now to prevent people from concluding that since Iceland decided to start implementing a research program, that includes the taking of minke whales, within the framework of another international organisation, Iceland is now placing less emphasis on NAMMCO. The fact of the matter is that NAMMCO has been an important organisation for Iceland and will continue to be exactly that. Actually, NAMMCO's importance to Iceland is growing as a result of an increased focus on the eco-system approach.

Around the world, there is a growing tendency to increasingly look at the marine eco-system as a whole rather than focus on individual stocks in isolation. One obstacle to using the eco-system approach when it comes to international co-operation is built into the very framework for co-operation regarding living marine resources. There tend to be separate regional organisations that have competence regarding specific aspects of the marine eco-system, rather than one organisation that concerns itself with the eco-system as a whole. This situation results in increased co-operation between several organisations being necessary for the successful international implementation of an eco-system approach. The nature of this sort of co-operation is such that it will remain regional rather than global. Increasing emphasis on the eco-system approach therefore serves to further increase NAMMCO's importance, as it will play an important role in implementing the eco-system approach in the North Atlantic.

NORWAY - OPENING STATEMENT

Madam Chair, Ministers, Delegates, Observers and Guests,
Dear Friends,

On behalf of the Norwegian delegation I would like to extend our appreciation to the Faroe Islands for hosting the Thirteenth Meeting of the NAMMCO Council here in Tórshavn, and we would like to thank the Faeroes Government for their well-known hospitality.

For me personally, it is a great pleasure to be back in this forum with so many friends, old and new ones, after a break of several years. I am particularly pleased to see so many observers from non-member countries taking an interest in the deliberations of the NAMMCO Council. I now look forward to work with all of you and contribute to the further development of NAMMCO as an organization for sustainable use of marine mammals.

As we have said several times before, NAMMCO is of great importance to the coastal populations around the North Atlantic. Also in Norway these people depend on the sustainable use of all living marine resources for their livelihood and welfare. It is therefore of the utmost importance, that we fulfil both the conservation part as well as the management part of the task given to us in the NAMMCO Agreement. It is only if we can prove to the surrounding world that we are taking management decisions in accordance with the principles we adhere to that we can obtain respect and credibility. As there is a lot of scepticism to the use of marine mammals, it is imperative that we base our decisions on sound scientific advice. We will have this in mind when we review earlier conservation decisions, and also when we shall take new actions based on the findings of the Scientific Committee during this meeting.

This month the Government of Norway will present a White Paper to the Parliament (Stortinget) on marine mammal policy. I am not in a position to disclose the content of this White Paper apart from the basic fact that Norway wants to base its future marine mammal policy on the ecosystem approach.

NAMMCO established during its previous meeting an ad hoc Working Group on Enhancing Ecosystem-based Management. The group met in Copenhagen last December and discussed the role of NAMMCO in the ongoing international work on ecosystem-based management. The term ecosystem-based approach to management is currently a catchword in many global and regional organizations. But the content of the term still has to be defined properly in order to be useful.
In the report of the group, which will be discussed in the Management Committee, we have proposed a possible NAMMCO definition. This definition may have to be developed further during this meeting.

If the NAMMCO member countries can agree on what we understand by the term ecosystem-based management, we could have considerable influence on the meaning of this term also when it is used in other forums. Our chances to succeed will increase if we also are able to give our definition a definite content and state how we will use it in our struggle to achieve a better and comprehensive management tool.

At this stage I would only like to say that Norway attaches great importance to the work on this issue within NAMMCO. In our view there is no other international organization that will actively consider the use of the marine mammal resources and associated socio-economic aspects in the context of marine resource management. The further work of NAMMCO on the ecosystem-based approach to resource management could thus be a path breaking contribution to the management of living marine resources.

We look forward to the presentation of the report from the Scientific Committee and the updates on stock assessments. On the problem of bycatch, which is mentioned in the report, I can inform you that the logbook of the Norwegian fishing vessels has been updated to include information on by-catch of marine mammals. However, all vessels are not required to use logbooks. Consequently, we still have a challenge in order to make sure that we get better knowledge of the size of by-catch of marine mammals in our fisheries.

NAMMCO has now had an inspection and observation scheme in operation for 6 years. We realize that we need to evaluate the results and take note of what we have learned so far. We should also look into new techniques for supervision and control. Following such an evaluation, we should take action to improve our scheme if need be.

We look forward to the NAMMCO Workshop on Hunting Methods for Seals and Walrus that is scheduled for September this year. It is important for NAMMCO always to be ahead of the development in this area, and we are pleased to see the progress all the time.

Finally, I would like to congratulate you, Madam Chair, for the way in which you have lead the NAMMCO Council for four consecutive years now. Also, I would like to extend my appreciation to the Secretariat for the solid preparations of this meeting.

JAPAN – OPENING STATEMENT

Madam Chair, Honourable Ministers, Delegations, Observers, Ladies and Gentlemen, my name is Minoru Morimoto, the Commissioner for Japan to the IWC.

On behalf of the Government of Japan I would like to expresses our sincere appreciation for having been invited to participate as an observer at this Thirteenth Meeting of the NAMMCO Council. As we have noted in the past, NAMMCO has established itself as a credible intergovernmental organization with a record of significant achievements concerning the science and management of marine mammals.

Japan shares a common understanding with NAMMCO members that scientific findings must be the basis of management regimes for the sustainable use of all living marine resources. We also believe that coordination of our efforts in international fora such as the IWC and CITES is important to counter the position of those who would give protected status to marine mammals irrespective of their abundance and contrary to the widely accepted principle of sustainable use. It is unreasonable that those who view whales as other than food resources continue to try to impose their views on those who view whales as a valuable food resource with important cultural significance.

Japan has become increasingly dissatisfied with the IWC given the lack of progress in implementing the Revised Management Scheme, the continuing inequitable treatment of whaling which permits whaling by aboriginal peoples and denies whaling by other coastal peoples and most recently, the establishment of the Conservation Committee at the last meeting of the IWC. We have been patient but there is a limit. We therefore believe that our cooperative efforts must be further enhanced.

I am sure some of you are aware that prior to the last meeting of the IWC, Japan's Liberal Democratic Party's Parliamentary League for Preservation of Whaling adopted a resolution which among other things required the Government of Japan to consider options such as not paying contributions to the IWC and/or withdrawing from the IWC if the Conservation Committee was established. Following the meeting of the IWC and after careful consideration of this matter Japan has informed the Chairman of the IWC that we have reached the conclusion that the establishment of Conservation Committee will detract from the work of the Commission in support of the objective of the ICRW and that it will further aggravate the polarized situation in the IWC. We further informed the Chairman that Japan has therefore decided that, for this year, we will remit our contribution with a declaration that we do not want any portion of our contribution to be used to support the work of the Conservation Committee.

I can also inform you that the Parliamentary League for the Preservation of Whaling is continuing to examine all options including unilateral resumption of commercial whaling and withdrawal from the IWC. For this purpose, the ruling Liberal Democratic Party (LDP) established a Project Team last year and the Team has just issued its interim report reflecting their intensive discussions on the IWC issues. The report recommended, among others, that both options of the withdrawal from the IWC and the resumption of whaling while staying in the IWC should be sought and that Japan should strengthen its participation to the activities of NAMMCO. This is one of the reasons that I earlier stressed our view that it is important to enhance the cooperation between Japan and members of NAMMCO. For the same reason we are also keenly interested in the substance of “white paper” that the Government of Norway will shortly present to its Parliament and will closely follow further developments.

Research on interactions between whales and fisheries and ecosystem modeling is another subject of shared interest between Japan and the members of NAMMCO. We are therefore fully supportive of Iceland’s newly implemented research program and welcome the ongoing efforts by Norway and Iceland to develop ecosystem models that take account of the consumption of fish by marine mammals. We believe that Japan’s whale research programs complement these efforts and that collectively they will provide the basis for improved management of all marine resources. Japan therefore appreciates the continuing expressions of support for our research programs from NAMMCO members.
Japan looks forward to continuing cooperation with NAMMCO members on all of these important matters.

Thank you.

ASSOCIATION OF TRADITIONAL MARINE MAMMAL HUNTERS OF CHUKOTKA – OPENING STATEMENT

Members of NAMMCO, organizers and guests, the delegation of Chukotka would like to give its heartfelt thanks for the opportunity to participate in your meeting and wish you success in your work. We have traveled a long way from the shores of the Pacific Ocean to participate in this NAMMCO meeting.

We specially requested that we become observers because we understand the important role that NAMMCO plays. Indeed, we share the view that natural resources should be used rationally, inexhaustibly, or, using the phrase currently favored by many, we support “the sustainable development of natural resources”. One can say that the most sustainable form of resource use is traditional resource use. Some scientists refuse to recognize this and go to lengths to invent their own terms such as “sustainable development”. In actuality, traditional development is comprehensive in nature so it is now said that traditional resource use is a process that utilizes an ecosystem approach for the use of natural resources. Traditional use of natural resources always demonstrated wise limits of use and conservation, wisely, went hand-in-hand with use of natural resources. So, when our traditional knowledge of our Native people is linked together with the scientific knowledge of our scientists it clearly produces very good results. We very much like that NAMMCO uses this kind of approach for resource use and that is why we are here with you.

We are also participants in the International Whaling Commission. We have a quota for 135 gray whales and 5 bowhead whales. We also do not like that the last several years the IWC process has drifted outside of the legal framework of the Convention under which it operates. We also do not like that it has moved from being a “whaling commission” to what might be called, for lack of a better term, a “protectionist commission”. At the same time, we consider that the International Whaling

Commission has not exhausted all of its possibility and potential. We also believe that aboriginal whaling, scientific whaling and commercial whaling should not be intermixed within the process of the IWC. Rather, these three activities must be considered in absolutely separate arenas. What we are saying is that the IWC needs to once again operate within the legal framework of the Convention within which it was originally created.

NAMMCO is also extremely important and useful to us as an example for a proposal we are considering – should we create an analogous organization in the North Pacific – a "PAMMCO"? Your expertise and work would be very helpful for us in the future, should we decide to create such an organization on the shores of the North Pacific.

We respect the nutritional and cultural needs of all the people around the globe and their rights regarding natural resources. So, we think the more regional organizations there are, such as NAMMCO, the greater the benefits for the natural environment and humanity.

I would like to thank Chairperson Amalie Jessen and her staff for the wonderful work they do. Thank you very much.

Appendix 4

AUDITED ACCOUNTS FOR 2003

All figures in Norwegian kroner NOK

1. PROFIT AND LOSS ACCOUNT

	2003	*2002*
Income		
Contributions	3,028,200	*2,940,000*
Interest received (netto)	51,100	*76,857*
Book Sale	19,035	*12,346*
Employees Tax	75,397	*72,222*
Total Income	**3,572,701**	***3,479,055***
Expenditure		
Secretariat costs	3,141,517	*2,761,214*
Meetings	74,652	*125,475*
Scientific Committee	295,422	*324,876*
Projects, NAMMCO Fund	20,000	*200,000*
Conference	-103,990	*101,564*
Total operating expenses	**3,427,601**	***3,513,129***
Operating result	**145,100**	***-34,074***

2. BALANCE SHEET

Current assets		
Bank deposits (restricted 200,000)	860,829	*808,901*
Outstanding claims	314,829	*121,244*
Total assets	**1,175,048**	***930,145***
Current liabilities		
Employers tax deduction & tax	10,605	*0*
Creditors	229,829	*25,898*
NAMMCO Fund*	203,355	*266,695*
Other	239,515	*290,908*
Total current liabilities	**683,304**	***583,501***
Equity		
Restricted equity (Relocation fund)	200,000	*200,000*
Distributable equity (General reserve)	291,744	*146,644*
Total equity	**491,744**	***346,644***
Total liabilities and equity	**1,175,048**	***930,145***

* The NAMMCO Fund account is audited separately.

Appendix 5

FINAL PRESS RELEASE

The North Atlantic Marine Mammal Commission (NAMMCO) held its 13th meeting 2 - 4 March 2004 in Tórshavn, Faroe Islands. The meeting was attended by delegations from the member countries, the Faroe Islands, Greenland, Iceland and Norway. In addition to the Governments of Canada, Denmark, Japan and the Russian Federation who have observer status to NAMMCO, a number of international governmental and non-governmental organisations follow the work of NAMMCO closely by attending annual meetings. Attending this year were representatives from the International Whaling Commission and the Nordic Council, as well as the Inuit Circumpolar Conference, the Nunavut Tunngavik Inc. from Nunavut in Canada and other interest groups. In statements to the meeting, the observers from the Government of Japan and the Association of Traditional Marine Mammal Hunters of Chukotka in the Russian Federation expressed their strong support for NAMMCO as a model for international cooperation in other regions on the conservation, management and study of whales and seals.

- **Ecosystem approach**

Implementing an ecosystem approach to the management of marine mammals is the focus of new work under development in NAMMCO, with the active participation of Canada. Plans are underway to develop a case study on harp seals in the North Atlantic – examining the range of issues related to a broad management approach, including the ecological role of harp seals, as well as social and economic factors which influence conservation and management decisions in sealing activities in the region. The Scientific Committee will also be providing advice on different levels of harvest of harp and hooded seals in the North Atlantic in the light of an ecosystem approach to the management of these abundant and increasing stocks.

- **Narwhal and Beluga**

Grave concern was expressed over the preliminary conclusions on the status of the West Greenland narwhal, where substantial reductions in harvesting will be required to reduce the decline of this stock. Greenland has recently taken regulatory measures to protect both narwhal and beluga off West Greenland.

- **Grey seals**

There has been a decline in the stock of grey seals around Iceland over the past 10 years, and it was recommended that Iceland should define clear management objectives for this stock. Similarly, present quotas (although not harvests) in Norway may be above sustainable levels, and again it was recommended that clear management objectives be defined.

- **Minke and fin whales**

Minke and fin whales around Iceland are probably at or near pre-exploitation levels. Advice from the Scientific Committee indicated that annual harvests of up to 200 minke whales and 150 fin whales would be sustainable. Because of the great uncertainty in the stock identity of fin whales around the Faroes, no advice on sustainable harvest levels could be provided for this area.

- **North Atlantic Sighting Surveys (NASS)**

New abundance estimates for minke, humpback and several other species were provided from the 2001 and earlier surveys. The NASS have been highly successful in providing important information on the distribution and abundance of cetaceans over a broad area of the North Atlantic. This information becomes more valuable every time a survey is completed, as it provides an indication of trends in abundance over meaningful time periods. The Scientific Committee will therefore co-ordinate the efforts of member countries in planning and conducting a large-scale sightings survey in 2006, in co-operation with other jurisdictions.

- **New requests for scientific advice**

In 2004 the Scientific Committee will provide advice on the population status of humpback whales, killer whales, harp and hooded seals and walrus. In addition the Committee will continue its evaluation and modelling of the interactions between marine mammals and fisheries.

- **Importance of research**

The NAMMCO member countries place great importance on marine mammal research. This scientific research is vital to enhance knowledge and understanding of marine mammals as a basis for management. The member countries support scientific research that includes the taking of whales, as a part of the important work that is done on marine mammals and their role in the marine ecosystem.

- **User knowledge**

Through a newly established working group, NAMMCO continues to work towards better incorporating user knowledge in the management decision-making process.

- **New Chair**

Kate Sanderson of the Faroe Islands was elected as Chair of the NAMMCO Council for the next two years. The next meeting of NAMMCO will be held in March 2005 in Norway.

1.2
REPORT OF THE COMMITTEE ON HUNTING METHODS

The Committee on Hunting Methods met on 13 January 2004 from 9:00 to 17:00 in the Home Office of the Faroe Islands in Copenhagen. Present were Jústines Olsen, Chairman, (Faroe Islands), Ole Heinrich and Mads Brinck Lillelund (Greenland), Kristjan Loftsson (Iceland), Egil Ole Øen (Norway), and Grete Hovelsrud-Broda and Charlotte Winsnes from the Secretariat.

1. – 3. INTRODUCTORY REMARKS, ADOPTION OF AGENDA AND APPOINTMENT OF RAPPORTEUR

The Chairman of the Committee, Jústines Olsen, welcomed the Committee members to the meeting. In particular he welcomed the two new members from Greenland, Mr Heinrich and Mr Lillelund. The draft agenda was adopted and members of the Secretariat were appointed as rapporteurs.

4. UPDATES ON HUNTING METHODS IN MEMBER COUNTRIES

The Chairman noted that the lists of laws and regulations in member countries (NAMMCO/HM/2004-3), and of references on hunting methods (NAMMCO/HM/2004-4), had been updated (see Appendices 1 and 2 of this report).

Faroe Islands

Olsen (Faroe Islands) reported that there had been no changes in the regulation on pilot whale hunting in the Faroe Islands this past year. Olsen informed the Committee of a project in which the pilot whale hunting method with the new knife had been video taped and will be shown to the Faroese hunters to illustrate how to use the new knife.

Greenland

Lillelund (Greenland) reported that the cost of hunting licenses have been increased from 30 to 50 DKR, for both categories of hunters. Small changes have also been made to the regulations on trophy hunting. The Nature Protection Act was implemented on 1 January 2004. One of the main goals of the Act is to ensure ecological sustainability. It is explicitly stated that the Act follows the precautionary principle. The Parliament is given the power to protect all wild fauna and flora (Article 3 paragraph 1 and 3). Fish, shellfish and invertebrate are indirectly included in the Act by being the prey of mammals and birds and as such can be protected through the Act (Article 5 paragraph 1, No. 6). The government can decide to protect animals not mentioned directly in the Act. Furthermore the Act gives the Parliament the right to regulate hunting methods (Article 7). The Act represents one of the ways by which the government responds to Greenland’s international responsibilities.

Lillelund further reported that the Animal Protection Act would be implemented on 1 July 2004. The Act covers all animals, and states that animals should be to the fullest extent possible protected against pain, suffering, permanent damage and significant distress (Article 1 and 2). The Act further stipulates that animals shall be killed as painlessly and quickly as possible, and death by drowning is only allowed for marine mammals (Article 13). It is the duty of the veterinarian to file a report to the police in cases when the Act is violated (Article 22).

Lillelund noted that two Executive Orders had been issued on small and large whales. One addresses the issue of the power block requirement on board whaling vessels, in response to a previous observation by a NAMMCO Observer that the winch onboard the observed whaling vessels were undersized.

The Executive Order on beluga and narwhal has gone through a full hearing process and is currently undergoing small adjustments. It will be discussed in the government early this year. The Executive Order on walrus, polar bears, seals and small cetaceans are expected to be completed in 2004. Quotas will be introduced on walrus, polar bears, beluga and narwhal.

In 2003, 131 whale grenades were sold in Greenland, and nine courses on how to handle the grenades and the harpoons were held for hunters. Lillelund noted that only the unused minke whale quotas for the rifle hunts are transferred to both the rifle and the harpoon hunt in 2003.

Iceland

Loftsson (Iceland) informed the Committee that scientific whaling of minke whales had taken place in 2003. The scientific whaling programme called for 100 minke whales to be caught. The Department of Fisheries decided that the scientific whaling programme should start on 15th August and last until the end of September. The quota was set at 38 minke whales, which corresponds to the number that was to be taken during August and September in the scientific whaling programme. The three whaling vessels involved caught 36 whales in that period. The method used is the same as in Norway, and because no whales have been hunted since 1985, Dr Øen was called in to hold a course in how to use the Norwegian grenade (Whale Grenade '99). The rifles used as secondary weapons or backup were the same calibre as in Norway (.375 and 4.58).

Norway

Øen (Norway) reported that a number of new adjustments had been made to the existing regulations on seal and whale hunting in the past year. He noted that regulation updates had been forwarded to the Secretariat. He reported that with the increasing interest in sports hunting of coastal seals, the Norwegian Hunting and Fishing Association (*Norges Jeger og Fiskerforbund*) in consultation with himself had jointly developed a poster recommending where on the seals the hunters should aim and shoot. Seal sports hunting is again increasing but hunters are no longer as familiar with seal hunting as they once were. Currently sport seal hunters must pass a shooting test designed for large terrestrial mammals.

Øen reported that only small adjustments had been made to the regulations of whaling. He informed the Committee that the new results for time to death shows that 8 of 10 animals are dead immediately and the remaining 20 percent die within a few minutes.

5. UPDATE ON THE RECOMMENDATIONS FROM THE WORKSHOP ON HUNTING METHODS, 9-11 FEBRUARY 1999

The Chairman asked the members to present the status of each country's follow-up to the recommendations from the 1999 Nuuk workshop that were not reported at the last meeting.

Recommendation 3a: This pertains to Greenland, but the completion of this recommendation is awaiting guidelines on shooting tests on dead animals. The guidelines for standardising methods on how to perform the shootings tests must be completed before the tests can take place (see also Item 6 in this report.).

Recommendation 3b: Lillelund (Greenland) noted that the development of objective descriptions of hunting methods is also a question of resources. The staff working on these issues in the Greenland Home Rule Government has increased and it is therefore more likely that these descriptions would be completed. At last year's meeting the Committee noted the following:

- Such descriptions, to be all inclusive of the various hunting methods and regional variations in Greenland would be a major effort to produce. The descriptions would have to be created in co-operation with the hunters in the different regions of Greenland, and must be adapted to the different hunting methods. Jessen suggested that Greenland could start with a set of main points that would cover the different methods and the different regions. The Committee agreed to this idea and noted that such descriptions would also be an important contribution to the cultural history of Greenland (NAMMCO Annual Report 2002: 64).

Recommendations under 4, Baleen whale hunting, pertaining to Greenland:
Øen (Norway) informed the Committee that the producers would substantially reduce the price on the penthrite grenades next year. The price cut reflects the fact that the development costs have been paid off.

Recommendation 5: Lillelund (Greenland) informed the Committee that the new law on animal protection in Greenland would be implemented 1 July 2004.

6. UPDATE ON THE RECOMMENDATIONS FROM THE WORKSHOP ON BALLISTICS SANDEFJORD 13 -15 NOVEMBER 2001

At its 11th meeting in Ilulissat, Greenland in February 2002, the Council agreed to the Committee's recommendations:

- To develop guidelines for methods used to undertake more controlled and standardised studies of the effect of different weapons and ammunition on different species.
- To harmonise weapons and ammunition types for different species with due considerations to variation in hunting conditions in the different countries.
- To focus on seals and seal hunting.

Olsen (Faroe Islands) noted that with respect to the first recommendation, Dr Øen and himself would prepare a draft set of guidelines to be presented to the Council at its Annual Meeting in March 2004 (NAMMCO/13).

With respect to the second recommendation the Committee reiterated its decision from last year that the harmonisation of weapons and ammunition would start with seals. It was emphasised that seal-hunting methods is a central topic at the upcoming Workshop on Hunting Methods of Seals and Walrus (see next recommendation).
With respect to the third recommendation see agenda item 7.

7. WORKSHOP ON HUNTING METHODS FOR SEALS AND WALRUS, 7-9 SEPTEMBER 2004

At its 12th Meeting, in March 2003 the Council endorsed the recommendation from the Committee to hold a NAMMCO Workshop on Hunting Methods for Seals and Walrus.

The Terms of reference for the Workshop:

- To review existing seal and walrus hunting methods known.
- To evaluate methods used in seal and walrus hunting in relation to killing efficiency and struck and lost rates
- To examine possibilities for technical innovation and further enhancement of efficiency and safety of hunting methods, with a view to providing recommendations for improvement, where relevant, and
- If possible, determine minimum requirements for safe and efficient killing of walrus and different seal species, considering variations in hunting methods.

The Committee held 3 telephone meetings for workshop planning purposes in 2003. The reports from these meetings are available in Appendix 3 of this report.

Charlotte Winsnes (NAMMCO Secretariat) presented an update of the preparations for the Workshop. The preliminary programme had been distributed in mid October, and she noted that there has been a very positive response to the Workshop. The programme has been translated into Greenlandic and the Home Rule Government is responsible for the distribution in Greenland. Furthermore, Nordic Council of Ministers has agreed to financially support the Workshop with DKK 150 000.

The Committee discussed various aspects of the Workshop including:

In regard to possible financial support for the Workshop, it was decided that the Secretariat would follow up on contacts previously made with NORA (Nordic Atlantic Co-operation) and NTI (Nunavut Tunngavik Inc.).

It was decided that NAMMCO should only sponsor the invited speakers who are not able to secure travel and accommodations from their own organisation, or who do not belong to any organisation.

It was agreed that the programme should be flexible and allow for interested participants to give a presentation without having been invited in advance.

It was decided to ask each presenter to bring a written version of his/her presentation. At a minimum this would be a summary or abstract of the presentation.

It was decided to instruct the presenters to briefly mention the hunting regulations and requirements they have to contend with as hunters.

It was decided to set aside sufficient time in the programme for clarifying questions and comments after each region and species.

It was decided to prepare a letter of invitation to relevant groups and organisations, which would include an invitation to suggest speakers.

The committee decided that the Secretariat would prepare a booklet containing the regulations and requirements from each country that would be made available to all participants.

The Committee concluded that the meeting should be open to anyone who was willing to pay, including the media.

The Committee would further discuss participants from Scotland, Namibia, and other countries.

The Committee further developed the draft programme for the Workshop.

8. FUTURE WORK OF THE COMMITTEE

The Committee agreed to hold a telephone meeting prior to NAMMCO/13, 2 - 4 March if needed.

The Committee also reiterated the invitation to the Management Committee on By-catch to forward questions or issues regarding killing methods of by-caught marine mammals.

The committee discussed the possibility of publishing proceedings from the three hunting method Workshops held by NAMMCO, and decided to return to this question after the completion of the current Workshop. The Committee agreed that these Workshops represent a significant amount of relevant and useful information, and that such proceedings would build upon the results from all three Workshops organised by Committee.

9. IWC WORKSHOP ON KILLING METHODS

Egil Ole Øen (Norway) reported from the IWC Workshop on Killing Methods held 7-9 June 2003, in conjunction with IWC 55 in Berlin, Germany, where 25 papers from 9 member countries were presented. The Workshop Chair Dr Geraci was assisted by a small working group that laid out the strategy for the meeting beforehand and also met several times during the workshop, allowing the Chair to run a structured meeting. Dr Øen noted that this could be a useful strategy for the upcoming hunting methods workshop.

Dr Øen circulated the Chair's Summary from the Workshop to the Committee, which was an effort to move the issues forward at future meetings. Such a Chairs Summary would be useful for the NAMMCO Workshop as well. Øen noted that if Knud

Nielsen is willing to Chair the NAMMCO Workshop, he could prepare a similar Executive Summary drawing on his experiences from chairing the previous two NAMMCO Workshops.

Dr Øen reviewed the papers presented at the IWC Workshop and noted that he and Siri Knudsen had presented 6 papers.

10. ANY OTHER BUSINESS

There was no other business.

11. APPROVAL OF THE REPORT

The report was approved through correspondence on 8 February 2004.

Appendix 1

LIST OF LAWS AND REGULATIONS IN NAMMCO MEMBER COUNTRIES

(Updated February 2004)

FAROE ISLANDS

Parliamentary Act	No. 57 of 5 June 1984 on whale hunting
	No. 54 of 20 May 1996 amending Parliamentary Act on whale hunting
	No. 9 of 14 March 1985 on the protection of animals, as last amended by Parliamentary Act no. 60 of 30 May 1990
	No. 43 of 22 May 1969 on weapons etc. as amended by Parliamentary Act No. 54 of 12 May 1980
	No. 128 of 25 October 1988 on hare hunting
Executive order	No. 57 of 12 September 1969 on weapons etc.
	No. 19 of 1 March 1996 on exemption from protection of whales
	No. 126 of 23 June 1997 on protection of whales
	No. 46 of 8 April 1998 on pilot whaling
	No. 107 of 21 November 1989 on authorisation of whaling bays, as amended by executive order no. 64 of 11 May 1992, executive order No. 127 of 27 August 1992, executive order no. 141 of 23 June 1993, executive order no. 34 of 24 March 1994 and executive order no. 94 of 31 May 2001
	No. 166 of 27 August 1993 on provisional authorisation of whaling bays
	No. 118 of 23 October1996 on provisional authorisation of whaling bays
	No. 72 of 17 May 2000 on provisional authorisation of whaling bays

GREENLAND

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
Executive Order	No. 20 of 11 May 1994 on polar bear hunting in Greenland
	No. 30 of 11 October 1995 on beluga and narwhal hunting
	No. 6 of 29 February 1996 on revisions to Executive Order No. 30 of 11 October 1995 on beluga and narwhal hunting

	No. 26 of 24 October 1997 on extraordinary check and approval of harpoon canons
	No. 7 of 26 February 1998 on protection and hunting of walrus
	No. 13 of 3 April 1998 on reporting from hunting and strike of large whales
	No. 12 of 3 April 1998 on hunting of large whales
	No. 22 of 19 August 2002 on trophy-hunting and fishing
	No. 20 of 27 November 2003 on hunting licenses for full time hunters
	No. 21 of 28 November 2003 on hunting licenses for part-time and/or sport hunters

Catch registration form (1993)
Greenland Parliament Regulations of 31 August 1959, ratified on 12 February 1960 on the protection of harbour seals (*Phoca vitulina)*

ISLAND

Whaling Act	No. 26,May 3, 1949
Regulation	No. 163, May 30, 1973 on whaling
	No. 304, May 9, 1983 on amendments to Regulation No. 163 of May 30, 1973 on whaling
	No. 239, May 10, 1984 on amendments to Regulation no. 163 of May 30, 1973 on whaling (cf. Regulation no. 304/1983)
	Agreement No. 9 of 26. June 1991 between Iceland and Spain on an international observer scheme for land-based whaling stations in the North Atlantic area.

NORWAY
Act of 20 December 1974 no. 73 concerning the welfare of animals
Act of 29 May 1981 relating to wildlife and wildlife habitats (the Wildlife act)
Act of 3 June 1983 no. 40 relating to seawater fisheries, etc.
Act of 27 March 1999 No 15 relating to the right to participate in fisheries and hunting (Participants act)

Executive Order from the Director of Fisheries:

J-45-1989, 14.3.1989	Regulation on control of the practice of seal hunting
J-34-2003, 11.2.2003	Regulation on the practice of seal hunting in the West and East Ice
J-35-2003, 11.2.2003	Regulation on the permission to hunt seals in the West and East Ice
J-74-2003, 14.3.2003	Regulation on control and permission of hunting minke whales in 2003.
J-74-2000, 31.3.2000	Regulation on the practice of hunting minke whales in 2000.
J-85-2003, 03.4.2003	Regulation on maximum quotas for hunting minke whales in 2003.

J-112-2003, 22.5.2003	Amendment to regulation on maximum quotas for hunting minke whales in 2003

Instructions for inspectors during the minke whale hunt in 2003.

Appendix 2

LIST OF REFERENCES ON HUNTING METHODS

(Updated February 2004)

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World Council of Whalers - 1998 General Assembly Report: Whaling and Whale Use Around the World - Greenland page 21
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Appendix 3

WORKSHOP ON HUNTING METHODS FOR SEALS AND WALRUS

The following appendix contains the reports from the meetings held in connection with the planning of the Workshop.

TELEPHONE MEETING 6 MAY 2003

The Committee on Hunting Methods held a telephone meeting on 6 May 2003 from 14:00 to 16:00. Online were Jústines Olsen, Chairman, (Faroe Islands), Amalie Jessen (part of the meeting (Greenland)), Kristjan Loftsson (Iceland) Egil Ole Øen (Norway), and Charlotte Winsnes from the Secretariat.

1. INTRODUCTORY REMARKS AND ADOPTION OF AGENDA

The Chairman of the Committee, Jústines Olsen, welcomed the Committee members to the meeting. The draft agenda was adopted and Charlotte Winsnes was appointed as rapporteur.

2. TERMS OF REFERENCE FOR THE WORKSHOP

The Committee noted that the Committee's suggestion for Terms of Reference had been adopted by the Council at its 12th meeting in March 2003. The Terms of Reference is as follows:

- To review existing seal hunting methods known.
- To evaluate methods used in seal hunting in relation to killing efficiency and struck and loss rates
- To examine possibilities for technical innovation and further enhancement of efficiency and safety of hunting methods, with a view to providing recommendations for improvement, where relevant, and
- If possible, determine minimum requirements for safe and efficient killing of different seal species, considering variations in hunting methods.

3. DATE AND PLACE FOR THE WORKSHOP

In the proposal adopted by, the Council, Tromsø was chosen as the venue for the workshop. Copenhagen was later suggested, due to the new facilities "Den nordatlantiske brygge" that opens in November 2003 and will house the headquarters of the Faroese, Greenlandic and Icelandic administrations in Copenhagen. From the point of view of the participants, Copenhagen will likely be less expensive both in time and money compared to Tromsø. However, given the focus of the Workshop, Tromsø is an appropriate place, and is also situated in a NAMMCO member county. The weeks of 36 and 37 were chosen as suitable dates, and the workshop will have duration of three days.

The final decision on where and when to hold the workshop was postponed until the next meeting, subject to the availability of hotel- and meeting-room facilities. Jústines Olsen volunteered to follow up with respect to Copenhagen and the Secretariat was asked to look into the possibilities in Tromsø.

4. DRAFT PROGRAMME

Egil Øen had prepared a first draft programme based on the Terms of Reference and the report from the last meeting. The Committee welcomed the proposal and endorsed the idea to include walrus in the Workshop. The suggested tittle for the Workshop: "NAMMCO Workshop on Hunting Methods for Seals and Walrus", was adopted.
The Committee discussed the programme and agreed to the proposal with minor adjustments (see appendix 1). The workshop will have four main parts: Part I - Welcome and Introduction, Part II - Factual background: Anatomical and physiological features. Ballistics, Part III: Descriptive: Methods of Hunting in different regions. Weapons and ammunition. Efficiency incl. struck and lost rates, Part IV: Evaluation of methods and Part V: Recommendations from the workshop. It was generally agreed that the different laws and regulations associated with the various forms of hunting in the different regions should not be a topic for the workshop.

<u>Speakers</u>
Part I: To be decided
Part II: Scientists
Part III: Representatives from the different regions. The Committee suggested that the different regional authorities and /or organisations will be invited to nominate a representative to give a presentation.
Part IV: Not discussed
Part V: Not discussed

The Workshop language will be English with simultaneous interpretation to Greenlandic, Russian and a Nordic language(s).

The Committee decided that Jústines Olsen would ask Knud Nilsen to chair the Workshop. Nilsen successfully chaired the two earlier NAMMCO Workshops in Nuuk in 1999 and Sandefjord in 2001, and is familiar with NAMMCO and the Committee's work.. Jústines Olsen will serve as co-chair.

Programme Announcement: Jústines Olsen and the Secretariat will develop a proposal for the first programme announcement to be discussed at the next meeting.

5. PARTICIPANTS TO THE WORKSHOP

The workshop will be open to all interested parties.

6. BUDGET

The Secretariat had developed a tentative budget with total expenditure of NOK 500 000. The Committee did not discuss the specific budget items, but noted that as a minimum financial support in the range of NOK 300 000 must be found in order to go ahead with the Workshop. Possible sources include: the Nordic Council of Ministers, NORA, Northern Periphery and Barentssamarbeidet.

Amalie Jessen informed the Committee that Greenland would most probably be able to cover travel and accommodation for the participants from Greenland and also costs connected to an interpreter from Greenland.

7. NEXT MEETING

The next meeting will be held as a telephone meeting Tuesday 27 May at 14:00 Norwegian time.

8. ANY OTHER BUSINESS

No other business was discussed.

TELEPHONE MEETING 27 MAY 2003

The Committee on Hunting Methods held a telephone meeting on 27 May 2003 from 14:00 to 15:15. Online were Jústines Olsen, Chairman, (Faroe Islands), Amalie Jessen (Greenland), Kristjan Loftsson (Iceland) Egil Ole Øen (Norway), and Grete Hovelsrud-Broda and Charlotte Winsnes from the Secretariat.

1. OPENING PROCEDURES: APPOINTMENT OF RAPPORTEUR; ADOPTION OF AGENDA

The Chairman, Jústines Olsen, welcomed the Committee members to the meeting. The Secretariat was appointed as rapporteur.

2. DATE AND PLACE FOR THE WORKSHOP

The agenda was adopted as revised. The Committee decided to hold the Workshop at *Den Nordatlantiske Brygge* in Copenhagen, 7 – 9 September 2004, but is awaiting final confirmation from the administrators of the facilities. The Secretariat will be responsible for the practical arrangements with the *Brygge*.

3. ELECTION OF CHAIRMAN FOR THE WORKSHOP

Olsen had approached Knud Nielsen who had expressed a keen interest in chairing the Workshop. He will make his final decision when he has seen the programme and first announcement to be forwarded by the Secretariat.

4. FIRST ANNOUNCEMENT

Content
The Secretariat will finalise the First Announcement according to revisions suggested by the Committee.

Distribution
The Secretariat will compile a list of potential participants based on contact

information from the previous hunting methods Workshops, the NAMMCO Conference in Reykjavik 2003 and others. This master list will be circulated to the Committee members for review and further contact suggestions.

Finances and budget

The Secretariat will start the process of applying for funds as soon as the First Announcement has been finalised. The Committee decided to postpone the decision of whether or not to ask for a registration fee from the participants until the budget has been developed further and presented to the Committee at the next meeting. The budget will be presented for approval to the Finance and Administration Committee in early September.

5. NEXT MEETING

The next telephone meeting will be held 2 September 2003 at 14:00 Norwegian time.

6. ANY OTHER BUSINESS

Egil Ole Øen informed the Committee that the report from the NAMMCO Workshop Marine Mammals: Weapons, Ammunition and Ballistics in Sandefjord 2001 would be included as a meeting document at the upcoming IWC Workshop on Whale Killing Methods and Related Animal Welfare Issues. The Committee expressed its satisfaction at this opportunity to illustrate, to a wider audience, the serious approach taken by NAMMCO on this topic, and thanked Dr Øen for his efforts.

TELEPHONE MEETING 2 SEPTEMBER 2003

The Committee on Hunting Methods held a telephone meeting on 2 September 2003 from 14:00 to 15:15. Online was Jústines Olsen, Chairman, (Faroe Islands), Kim Mathiasen (Greenland), Kristjan Loftsson (Iceland) Egil Ole Øen (Norway), and Grete Hovelsrud-Broda and Charlotte Winsnes from the Secretariat.

1. OPENING PROCEDURES: APPOINTMENT OF RAPPORTEUR; ADOPTION OF AGENDA

The Chairman, Jústines Olsen, welcomed the Committee members to the meeting. The Secretariat was appointed as rapporteur.

2. WORKSHOP BUDGET

The Committee agreed to charge a registration fee for the Workshop; 500 NOK for individuals and 1,500 NOK for institutions. The current draft budget does not contain honoraria for the speakers, and the Committee agreed that it would not be financially possible to pay the speakers for their time.

The Secretariat informed that the Nordic Council of Ministers and NORA would be contacted as sponsors. The Secretariat had been in contact with the Northern Periphery programme, and informed the Committee that the programme does not fund

Workshops that are not part of larger projects. The Committee agreed that it would be useful to contact weapon producers and companies producing and selling sealskin products for financial support.

The Secretariat informed the Committee that prices from the Nordatlantiske Brygge would be forthcoming later this autumn.

The Committee agreed that the Secretariat would informally contact the Swedish and Finish hunting associations to discuss their potential sponsorship and participation in the Workshop.

3. FIRST ANNOUNCEMENT

The content was accepted with the changes as suggested by Dr Øen.

The Secretariat will circulate a list over possible participants to the Committee members for review and suggestions for additional names. The recipients should include contacts in Scotland and Sweden. The aim is to circulate the First Announcement within one month. The First Announcement will not contain a detailed programme (see next agenda item).

4. PROGRAMME

The Committee agreed that the First Announcement circulated to relevant organisations, associations and institutions would include a letter of invitation to suggest speakers at the Workshop. In addition the Committee members would suggest speakers from their respective member countries. The goal would be to create a pool of speakers from which the Committee could choose, based on the three main topics from the Preliminary Programme. Dr Øen would contact the North Slope Burrow in Alaska regarding participation and sponsorship. The Committee agreed that discussions of the timetable would have to be postponed until the list of speakers had been drafted.

5. NEXT MEETING

The Committee agreed to hold a meeting in Copenhagen 13 – 14 January 2004 at the Nordatlantiske Brygge. If it were necessary the Secretariat would organise a telephone meeting prior to the January meeting.

6. ANY OTHER BUSINESS

The Committee considered a letter from the High North Alliance (HNA) offering their services to help organise the Workshop. The Committee agreed that the Secretariat would write a letter in which interest in co-operation with HNA is expressed in particular in relation to contact with the media. The HNA would be asked to provide a cost estimate and the Committee would decide on the extent of the co-operation on budgetary grounds.

SECTION 2 - MANAGEMENT COMMITTEE

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2.1
REPORT OF THE MANAGEMENT COMMITTEE
Tórshavn, Faroe Islands, 2 March 2004

1. - 3. OPENING PROCEDURES

The Chair of the Management Committee, Kaj P. Mortensen, welcomed delegations and observers to the meeting. Participants to the meeting are listed in Appendix 1 of the Report of the Council. The agenda, as contained in Appendix 1, was adopted. Documents available to the meeting are listed in Appendix 2. Daniel Pike was appointed as rapporteur for the meeting.

4. NATIONAL PROGRESS REPORTS

National Progress Reports for the year 2002 were available from the Faroe Islands, Greenland, Iceland and Norway. In addition a Progress Report was provided by Canada to the NAMMCO Scientific Committee and brought to the Management Committee as an information item. The Management Committee expressed its appreciation to Canada for providing the report, and invited Canada to continue to do so in the future.

5. STATUS OF PAST PROPOSALS FOR CONSERVATION AND MANAGEMENT

The Committee considered document NAMMCO/13/MC/3 (Appendix 3) which was a record of past proposals for conservation and management put forward by the Management Committee. The Chair asked the Committee to comment on any regulatory or other measures that had been taken in response to these proposals.

5.1 Atlantic walrus
In 1995 the Management Committee recommended that Greenland take appropriate steps to arrest the decline of walrus along its west coast, and encouraged Canada to consider working co-operatively with Greenland to assist in achieving this objective. Greenland informed the Committee that a regulatory initiative that will restrict walrus hunting to those holding valid hunting licences, and allow the introduction quotas and other hunting regulations for this species was now in progress, and that public hearings were being conducted. The regulation will go to the Greenlandic government for approval this year.

5.2 Ringed seal
There was no discussion under this item.

5.3 Harp seal
5.3.1 Northwest Atlantic
Greenland reminded the Management Committee of the new multi-year management plan for the Atlantic seal hunt, which was introduced by Canada in 2003. For harp seals total allowable catch is set at 975,000 over a 3-year period. If the full quota were taken and Greenlandic harvests were as forecast, the total take should result in a slight population reduction over the period, while still maintaining the population well

above the conservation reference points adopted. As noted last year, this Management Plan was introduced without consultation with Greenland. However, Greenland informed the Management Committee that bilateral discussions on this issue had taken place over the past year.

5.3.2 White/Barents Sea
Norway informed the Committee that measures were being considered to improve the efficiency of the seal harvest in this area. Recent catches have been well below quota levels and there is evidence that the stock is increasing in size. The Norwegian hunt involves large vessels and is heavily subsidised. The possibility of introducing smaller vessels into the seal hunt is being pursued. This type of hunting is carried out in Canada and was done historically by Norway and Russia in this area. The long-term goal will be to reduce the need for subsidising the hunt and increase the take of seals from this stock.

5.3.3 Greenland Sea
Norway informed the Committee that, similar to the situation for the White/Barents Sea stock, efforts are being made to improve the efficiency of harvesting, which is heavily subsidised at present. Recent harvests have been a small fraction of available quotas. Again the long-term goal will be to reduce the need for subsidising the hunt and increase the take of seals from this stock.

5.4 Hooded seal
5.4.1 Northwest Atlantic
There was no discussion under this item.

5.4.2 Greenland Sea
Norway informed the Committee that quotas in this area have been reduced on the advice of the ICES/NAFO Working Group on Harp and Hooded Seals, mainly because there is no recent abundance estimate for the stock. Consequently it is expected that the quota may be fully utilised this year.

5.5 Northern bottlenose whales
There was no discussion under this item.

5.6 Long-finned pilot whales
There was no discussion under this item.

5.7 Minke whales – Central North Atlantic
There was no discussion under this item.

5.8 Beluga - West Greenland
The Management Committee has on previous occasions noted the conclusions of the Scientific Committee that the beluga wintering off West Greenland have been depleted by overexploitation and that substantial reductions in catch are required to arrest this decline. NAMMCO has accepted that it is the Canada/Greenland Joint Commission on the Conservation and Management of Narwhal and Beluga that provides management advice for this stock, which is shared with Canada.

Greenland informed the Committee that a regulatory framework allowing the government to set quotas and other limitations on hunting has now been passed. The new regulations provide protection for calves and females with calves and limit the size of vessels that are involved in beluga and narwhal hunting as well as hunting methods. The Municipalities will have the power to limit or prohibit the use of nets for narwhal/beluga harvesting. It is expected that quotas will be introduced for beluga and narwhal by July 2004. The municipalities will be involved in the allocation of the quotas.

The Management Committee welcomed this information and commended Greenland for taking action to halt the decline of beluga in this area.

5.9 Narwhal - West Greenland

Greenland informed the Committee that the new regulations mentioned under 5.8 for beluga will also apply to narwhal, and that quotas will be introduced in July 2004. The Management Committee welcomed this information and commended Greenland for taking action to halt the decline of narwhal in this area (see 7.5).

5.10 Fin whales - East Greenland – Iceland stock area

There was no discussion under this item.

5.11 Incorporation of users' knowledge in the deliberations of the Scientific Committee

See under item 11.

6. STATUS OF PAST REQUESTS TO THE SCIENTIFIC COMMITTEE

The Chair drew the attention of the Committee to the updated summary of requests by the NAMMCO Council to the Scientific Committee, and responses by the Scientific Committee (Appendix 4).

The Management Committee expressed its appreciation of the usefulness of both this summary of requests, and the record of past proposals by the Committee and the response of member countries to this advice (Appendix 3), and directed the Secretariat to continue to update these documents on a regular basis.

7. NEW PROPOSALS FOR CONSERVATION AND MANAGEMENT, REQUESTS FOR ADVICE FROM THE SCIENTIFIC COMMITTEE AND RECOMMENDATIONS FOR SCIENTIFIC RESEARCH.

7.1 Economic aspects of marine mammal – fisheries interactions

The Management Committee endorsed the plan of the Scientific Committee to hold a meeting of the Working Group on Marine Mammal – Fisheries Interactions in the autumn of 2004, both to discuss progress in the modelling and to review and discuss the new empirical data on diet and consumption by marine mammals.

7.2 Harp and hooded seals

7.2.2 New request for advice

The Management Committee requests that the Scientific Committee annually discusses the scientific information available on harp and hooded seals and advice on catch quotas for these species given by the ICES/NAFO Working Group on Harp and

Hooded Seals. The advice by the Scientific Committee on catch quotas should not only be given as advice on replacement yields, but also levels of harvest that would be helpful in light of ecosystem management requirements

For the Barents/White Sea and Greenland Sea stocks, in addition to the advice on replacement yields, advice should be provided on the levels of harvest that would result in varying degrees of stock reduction over a 10 year period.

Noting that Canada has instituted a multi-year management plan with a 3- year allowable catch of harp seals totalling 975,000 (not including the catch by Greenland), the Management Committee requested the Scientific Committee to provide advice on the likely impact on stock size, age composition, and catches in West Greenland and Canada under the conditions of this plan.

7.3 Harbour porpoise

7.3.1 Recommendation for scientific research

The Management Committee noted that a second SCANS is tentatively planned for 2005 and 2006. The Faroes is planning to participate in this survey, and other surveys (NASS and Norwegian surveys) may also be planned to coincide (see 7.8). Given that there are presently no abundance estimates for this species for NAMMCO member countries, and that bycatch for this species is unknown but may be significant in some areas, the Management Committee recommended that member countries co-operate to the extent possible to maximise the coverage and effectiveness of these surveys.

7.4 Beluga - West Greenland

7.4.1 New request for advice

The Committee noted that a new survey would be carried out in the over-wintering area of the West Greenland beluga in March 2004. If the survey is successful, it will provide an abundance estimate with which to update the assessment of this stock. The Management Committee therefore endorsed the plan of the Scientific Committee to update this assessment in 2005, jointly with the Scientific Working Group of the JCNB.

7.5 Narwhal – West Greenland

7.5.1 Proposals for conservation and management

The Management Committee noted the conclusions of the Scientific Committee, that the West Greenland narwhal have been depleted, and that a substantial reduction in harvest levels will be required to reverse the declining trend. These are preliminary conclusions, and more research and assessment work will be required. Nevertheless the Management Committee expressed its grave concern over the status of the West Greenland narwhal, and noted that the JCNB, which provides management advice for this stock, would be considering this information in the near future. The Management Committee also noted that it will be important for NAMMCO to monitor the situation closely and update the assessment as soon as more information is available.

7.5.2 New requests for advice

The Management Committee endorsed the plan of the Scientific Committee to update and finalise the assessment of West Greenland narwhal in 2005, in cooperation with the Scientific Working Group of the JCNB.

7.5.3 Recommendations for scientific research
The Management Committee endorsed the recommendations for scientific research by the Scientific Committee (see section 3.2).

7.6 Fin whales
7.6.1 Proposals for conservation and management
East Greenland-Iceland Stock
The Management Committee noted the conclusion of the Scientific Committee that projections under constant catch levels suggest that the inshore substock will maintain its present abundance (which is above MSY level) under an annual catch of about 150 whales. It is important to note that this result is based upon the assumption that catches are confined to the "inshore" substock, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that the "offshore" substock was also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales.

Faroe Islands
The Management Committee noted that the conclusion of the Scientific Committee had not changed from the previous assessment, that the uncertainties about stock identity are so great as to preclude carrying out a reliable assessment of the status of fin whales in Faroese waters, and thus the Scientific Committee was not in a position to provide advice on the effects of various catches. It may also be necessary to obtain clearer guidance on the management objectives for harvesting from what is likely to be a recovering stock before specific advice can be given.

7.6.2 New requests for advice
The Management Committee noted that it had previously asked that the Scientific Committee continue with its assessments of fin whale stocks in the areas of interest to NAMMCO countries with existing and new information on abundance and stock delineation as it becomes available, and endorsed the plan of the Scientific Committee to complete an assessment for the Northeast Atlantic stocks and update assessments for other areas, probably in 2005.

7.6.3 Recommendations for scientific research
The Management Committee endorsed the recommendations for scientific research by the Scientific Committee for all stocks (see Scientific Committee Report Item 9.6).

With regard to the fin whales around the Faroe Islands, the Management Committee emphasised that the question of stock identity and relationships to other stocks is of highest priority, and encouraged member countries to undertake research in this area.

7.7 White-beaked, white-sided and bottlenose dolphins
7.7.1 New requests for advice
The Management Committee has asked the Scientific Committee to carry out assessments of these species, but to date insufficient information has been available on stock delineation, distribution, abundance and biological parameters to initiate the work. The Committee was pleased to note that considerable progress has been made in the Faroes in describing the ecology and life history of white sided dolphins and that information on white beaked dolphins should be available from Iceland and Norway in about 2 years time. Abundance estimates are lacking in all areas except

Icelandic coastal waters, and no information on stock delineation or pod structure is yet available. The SCANS survey planned for 2005/6 and coastal surveys planned for Norway (see 9.3) should provide information on distribution and abundance in some areas. The Committee endorsed the plan of the Scientific Committee to proceed with the assessments once the above-mentioned studies have been completed, probably by 2007.

7.7.2 Recommendations for scientific research
The Management Committee recommended that the research noted under 7.7.2 be completed within the indicated timelines.

7.8 North Atlantic Sightings Surveys
7.8.1 New requests for advice
The Management Committee welcomed the new abundance estimates for particularly minke and humpback whales in the Central North Atlantic.

The NASS have been highly successful in providing important information on the distribution and abundance of cetaceans over a broad area of the North Atlantic. This information becomes more valuable every time a survey is completed, as it provides an indication of trends in abundance over meaningful time periods.

The Management Committee therefore requested that the Scientific Committee co-ordinate the efforts of member countries in planning and conducting a large-scale sightings survey in 2006. In order to ensure as broad a coverage as possible, this should include co-ordination with planned surveys by non-member countries, and inviting other jurisdictions, particularly in the Western Atlantic, to participate in the surveys.

7.9 Others
7.9.1 Minke whales
7.9.1.1 Proposal for conservation and management

The Management Committee took note of the conclusions of the Scientific Committee with regard to the Central Atlantic Stock, that, under all scenarios considered, a catch of 200 minke whales per year would maintain the mature component of the population above 80% of its pre-exploitation level over that period. Similarly, a catch of 400 per year would maintain the population above 70% of this level. This constitutes precautionary advice, as these results hold even for the most pessimistic combination of the lowest MSYR and current abundance, and the highest extent of past catches considered plausible. The advice applies to either the CIC Small Area (coastal Iceland), or to the Central Stock as a whole.

7.9.1.2 Recommendations for scientific research

The Management Committee endorsed the recommendations for research by the Scientific Committee (see Scientific Committee Report Item 9.7).

7.9.2 ***Grey Seals***
7.9.2.1 Proposals for conservation and management

The Management Committee noted the concern expressed by the Scientific Committee with regard to the observed decline in the grey seal stock around Iceland, where harvesting has been above sustainable levels for more than 10 years, with the apparent objective of reducing the size of the stock. The Management Committee agreed to recommend that Iceland should define clear management objectives for this stock.

The Management Committee noted the conclusion of the Scientific Committee that the new quota levels implemented for Norwegian grey seals would, if filled, almost certainly lead to a rapid reduction in population in the area. The Management Committee agreed to recommend that Norway should define clear management objectives for this stock.

For the Faroe Islands, the Management Committee supported the recommendation of the Scientific Committee to obtain better information on the level of catch.

7.9.2.2 Recommendations for scientific research

The Management Committee endorsed the recommendations for further research identified by the Scientific Committee.

7.9.3 *Humpback whales*

7.9.3.1 New request for advice

The Management Committee noted the conclusion of the Scientific Committee that there is evidence from the NASS of a rapidly increasing abundance of humpback whales in the Central North Atlantic. The Scientific Committee was requested to assess the sustainable yield levels for humpback whales, particularly those feeding in West Greenlandic waters. The management objective in this case would be to maintain the stock at a stable level.

7.9.4 *Killer whales*

7.9.4.1 New request for advice

The Management Committee requested the Scientific Committee to review the knowledge on the abundance, stock structure, migration and feeding ecology of killer whales in the North Atlantic, and to provide advice on research needs to improve this knowledge. Priority should be given to killer whales in the West Greenland – Eastern Canada area.

7.9.5 *Walrus*

7.9.5.1 New request for advice

The Management Committee noted that the Scientific Committee had last provided an assessment of walrus in 1994. Noting that considerable new information has become available since then, the Management committee therefore requested the Scientific Committee to provide an updated assessment of walrus, to include stock delineation, abundance, harvest, stock status and priorities for research.

8. REPORT OF THE WORKING GROUP ON BY-CATCH

The Working Group held a teleconference on 19 February 2004, and the Report from the meeting is included in Section 2.2.

The Working Group was informed of new regulatory measures to take effect in the EU designed to reduce the bycatch of dolphins and porpoises in selected EU fisheries. The proposed Council regulation contains three specific technical measures, designed to address bycatch in EU waters and by EU vessels: 1) rrestrictions on Baltic Sea drift-net fisheries, with an eventual phase-out of the use of drift nets; 2) mandatory use of acoustic deterrent devices (pingers) in some fisheries; and 3) use of on board observers in 'high risk' fisheries.

The Working Group reviewed the progress of member countries in establishing systems to effectively monitor bycatch. No new initiatives have been taken in the Faroe Islands or Greenland. In Norway the reporting of marine mammal bycatch in fishery logbooks has been mandatory for 1 year on larger fishing vessels. In addition reporting of bycatch has been integrated into those fisheries covered by observers. There is presently no program in place to obtain data from small vessel (*Sjark*) fisheries. In Iceland an effort to improve reporting of bycatch through fishery logbooks was initiated in 2002 for gillnet fisheries, and in 2003 the reporting system was be expanded to include all Icelandic fisheries. However the proportion of vessels reporting remains low. The Working Group noted that, with the exception of Iceland, there had been little progress in developing and implementing procedures for monitoring bycatch in NAMMCO member countries.

The Working Group noted the continued lack of adequate reporting of bycatch through the National Progress Reports by some member countries and reiterated its recommendation from 2002 and 2003 for member countries to report their bycatch to NAMMCO through the new National Progress Report format.
The Management Committee endorsed the following recommendations by the Working Group:

i. Reporting of bycatch to NAMMCO was still not adequate. The Committee therefore reiterated its recommendation from 2002 and 2003, that NAMMCO member countries report their bycatch to NAMMCO through the new National Progress Report format.
ii. Noting the lack of progress in implementing monitoring programs for marine mammal bycatch in NAMMCO member countries, the Management Committee recommended that member countries increase their efforts in this area.
iii. Member countries should prepare working documents outlining the existing knowledge about marine mammal bycatch in their jurisdiction, for the consideration of the Working Group at the next meeting.
iv. The Scientific Committee is requested to carry out an evaluation of the data collection and estimation procedures used in the Icelandic monitoring program.

9. REPORT OF THE SUB-COMMITTEE ON INSPECTION AND OBSERVATION

The Chair of the Sub-committee on Inspection and Observation, Egil Ole Øen, presented the report from the meeting held 14 January 2004 (Section 2.3).

The Sub-committee in reviewing the experiences from the 2003 observation season noted that unpredictable events such as weather play a role in the success and efficiency of observations. The programme has proven to be time-consuming for the Secretariat, but the focus on one hunting activity (Norwegian whaling) this year was considered successful. The Committee recommended that the Secretariat review and evaluate the implementation of the Scheme after the 2004 season, to assess what has been learned so far and develop recommendations for improvement of the Scheme. The evaluation should only look at the implementation process and not the actual Provisions and Guidelines.

The Management Committee endorsed the recommendations from the Sub-Committee that the Secretariat reviews and recommends improvements to the implementation of the Scheme (see Section 2.3).

10. IMPLEMENTATION OF THE JOINT NAMMCO CONTROL SCHEME

10.1 NAMMCO International Observation Scheme 2003

The Chair referred to the Report of the NAMMCO International Observation Scheme under the Joint Control Scheme for the Hunting of Marine Mammals, prepared by the Secretariat. Charlotte Winsnes, the Administrative Co-ordinator presented the report to the Management Committee.

In 2003 observations were focused on activities on board Norwegian whaling vessels. Four observers were contracted over a 6 week period, of which 29 days were conducted on-board four different vessels. Prior to the observation period, the observers had participated in the course for the Norwegian national inspectors. The hunting areas included the North Sea, Spitsbergen, Vestfjorden and off the coast of Finnmark. No observations of the landing of catches were done. All the observers found that they could carry out their observations in accordance with the provisions of the Scheme. No violations were reported, and reports have been submitted to the Secretariat.

The whaling fleet in Norway consists largely of small vessels, and it is not always possible to find accommodations for the NAMMCO observer. Furthermore new security measures were introduced in 2003 and some vessels had not yet made the necessary adjustments. As a consequence the total number of persons allowed onboard had been reduced.

The Management Committee considered that the implementation of observations on board whaling ships was an important development for the observation scheme, and expressed its appreciation to the Secretariat for co-ordinating this work.

10.2 NAMMCO International Observation Scheme 2004

The Management Committee agreed that observations in 2004 would focus on whaling and sealing activities in Greenland.

10.3 Other matters

Norway described the development and testing of an automated system for recording observations on whaling vessels. Due to the small size of many of the whaling vessels, it is often problematic to accommodate an inspector on board. The automated system records key events during whale hunting, such as the location, heading and speed of the vessel, the times when the harpoon is fired, and when the carcass is hauled, flensed and disposed of. The data are stored on board and are not accessible to the crew. Whalers would still be required to keep logbooks, and the data from the system would be used to verify the contents of the logbooks. To date the system has undergone two years of development and one year of testing. It will be implemented on 14 vessels in 2004 and on all vessels in 2005 at which point the presence of inspectors on whaling vessels will be optional.

11. REPORT OF THE WORKING GROUP ON USER KNOWLEDGE IN MANAGEMENT DECISIONS

The Working Group on User Knowledge in Management Decisions held its first meeting by telephone on 12 February 2004. The Working Group emerged directly from the NAMMCO Conference on User Knowledge and Scientific Knowledge in Management Decision-Making held in January 2003. The NAMMCO Council at its Twelfth meeting agreed to establish the Working Group under the Management Committee to continue to move the work forward. The Working Group agreed on the following draft Terms of Reference, with the understanding that these may be further developed at future meetings:

i. Develop procedures on how to make the management decision-making process transparent;
ii. Develop recommendations on how to build capacity among users for involvement in the process;
iii. Develop recommendations based on the Secretariat review, in the upcoming Conference Proceedings, of existing resource management systems on how to incorporate user knowledge in the management decision-making process at national levels;
iv. Consider the Scientific Committee’s proposal for procedures on how to incorporate user knowledge into the Scientific Committee’s deliberations, in light of the results from the 2003 Conference.

The Management Committee agreed to keep the Terms of Reference open in order for the Working Group to develop these further and present a new version at the next Management Committee meeting.

The Working Group agreed that the first step would be to collect the methods/ procedures used by the managers in each member country to involve users in the decision-making process. The report from the 2003 Conference contains relevant information on this topic. Working Group members were also asked to collect material on this topic from their respective countries.

The Management Committee endorsed the work plan of the Working Group and expected further information and advice to be available at the next meeting.

11.1 Status of the 2003 User Knowledge Conference Proceedings

The General Secretary; Grete Hovelsrud-Broda; informed the Committee that the publication of the proceedings of the 2003 Conference on User Knowledge and Scientific Knowledge in Management Decision-Making was in progress. The Proceedings volume will contain about 18 papers together with a review of existing management systems that have involved user – or traditional knowledge Norway the management decision-making process. It is expected that the book will be published early in 2005.

12. REPORT OF THE *AD HOC* WORKING GROUP ON ENHANCING ECOSYSTEM BASED MANAGEMENT

The Chair of the *ad hoc* Working Group on Enhancing Ecosystem Based Management, Mr Halvard P. Johansen (Norway) presented the report from the first Working Group meeting held in Copenhagen 3-4 December 2003 (see section 2.4).

The Working Group had reviewed ecosystem-based management issues, triggering discussions on a range of topics, including whether it is possible to manage an ecosystem and how to determine a useful focus in an ecosystem approach to management.

The following draft Terms of Reference (ToR) for the Working Group were prepared by the Secretariat based on the conclusions by the Management Committee at NAMMCO/12 in March 2003 (*NAMMCO Annual Report 2002*, pages 124 and 32).

1. Identify the challenges faced in adapting marine management systems to ecosystem-based approaches,
2. Investigate the progress that has been done in other fora in implementing ecosystem-based management
3. Recommend what kind of principles and measures can be applied to the situation faced by NAMMCO members and neighbouring countries.

In considering ToR 1. the Working Group identified a number of challenges including lack of knowledge about complex interactions within an ecosystem, lack of co-ordination among regional management organisations on relevant topics, and lack of funds for the development of multispecies models. In reference to ToR 2. it was noted that Canada has been concerned with how to operationlise ecosystem based management in terms of science and socio-economic aspects. With regard to ToR 3. the Working Group agreed that in order to come up with such recommendations it was first necessary to define what an ecosystem based approach to management means in the context of NAMMCO. The Management Committee, with the understanding that the Working Group would develop the definition further, endorsed the draft definition:

An Ecosystem Approach to Management Draft Definition

The utilisation of living marine resources is essential for the development and social and economic well being of countries and coastal communities in the North Atlantic. Effective management is necessary to ensure sustainability of the use and thereby the long term benefits from these resources. NAMMCO is concerned with the study, conservation and management of marine mammals, and recognises that these resources are part of complex ecosystems[1]. To ensure effective management it is therefore necessary to consider the role of marine mammals both in terms of how they affect and are affected by it. This includes inter alia species interactions, and natural and human induced factors such as climate and pollution.

The Management Committee noted that the concept of ecosystem approach to management often appears vague in international fora and agreed that it was useful for NAMMCO to develop such a definition. The Committee agreed that this work

[1] From the preamble to the NAMMCO Agreement (1992)

would not entail a paradigm shift, but that it would improve what is already in place by taking a holistic view of management. NAMMCO would have a dual role in such work by adding new information to other organisations work and by breaking new ground. The Management Committee further noted that an ecosystem approach is not limited to the national jurisdictions of NAMMCO member countries and stressed the importance of co-operating with Canada and the Russian Federation in developing an ecosystem approach to management. In this regard, the Management Committee thanked Canada for their participation and interest in the *ad hoc* Working Group, and reiterated its open invitation to the Russian Federation to participate in the work.

The Management Committee endorsed the recommendations of the Working Group:
1) that NAMMCO continues to actively exchange observers with relevant organisations and that the NAMMCO Secretariat prepares statements (fact sheets) informing other organisations about the ongoing work in NAMMCO on issues relevant to an ecosystem approach to management, and 2) that NAMMCO identify concrete projects or case studies that take an ecosystem approach to management with the task of solving a specific problem or issue (see also Item 12.1). Such case studies would consider a number of relevant aspects such as ecological (i.e. pollution), economic (i.e. trade) and social (i.e. question of stakeholders).

The Management Committee endorsed the future work plan of the Working Group to develop a case study on harp seals focussing on *inter alia* management, biological and socio-economic aspects, and noted that the Secretariat had been tasked with the initial development of such a study (see Item 12.1).

The Management Committee endorsed the Working Group recommendation that it remains *ad hoc* and is called upon by the Management Committee when 1) the Committee requests the Working Group to come up with new ideas and 2) the Management Committee requests the Working Group to operationalise the decided-upon case studies.

12.1 Preliminary case study

The General Secretary, Grete Hovelsrud-Broda, presented the preliminary case study to the Management Committee. The initial focus of the case study was the harp seal in four countries, Canada, Greenland, Norway and the Russian Federation. The harp seal is utilised in all four countries under various management systems, trade, market and economic systems, under various climatic and ice conditions and levels of utilisation. The three harp seal stocks are shared in various ways between the four countries. Dr Hovelsrud-Broda outlined the type of data and knowledge needed in an ecosystem approach to management. It was emphasised that it would be necessary to collect data and knowledge from managers, users and scientists on factors ranging from environmental questions to hunting methods, markets, regulations and the identification of stakeholders.

The Management Committee recognised the complexity involved in undertaking such a case study and tasked the *ad hoc* Working Group with developing the study further. The Management Committee agreed to amend the study to encompass the North Atlantic in order to include member countries that are not directly involved in the harvest of harp seals but that are involved in the fisheries interacting with this species. The Management Committee agreed that the working title of the case study would be

A case study on harp seals in the North Atlantic from an ecosystem perspective. The Committee left it to the Working Group and the Secretariat to develop the title further in conjunction with developing the case study. The Management Committee agreed to consider the developed case study intersessionally if necessary. The Management Committee also agreed that users and scientists from the participant countries would be invited to the next Working Group meeting. The Secretariat would contact the Working Group members with a deadline for suggesting additional participants.

12.2 Other business

The observer from the EBCD (European Bureau of Conservation and Development) Ms Despina Symons informed the Management Committee on recent developments within the European Union under the Working Group on Ecosystem Approach to management of Human Activities (EAM). The Working Group is set up in the context of the European Marine Strategy, and will develop a common approach – a guideline – for an ecosystem approach to human activities, and proposals for implementation of the ecosystem approach to human activities affecting the marine environment. The Working Group is led by the European Commission Directorate General for the Environment. The inaugural meeting of the Working Group was held in December 2003.

13. ELECTION OF OFFICERS

13.1 Election of Chair

Halvard P. Johansen (Norway) was elected as Chair of the Management Committee. Kaj P. Mortensen was thanked for his able chairmanship since 1998.

13.2 Election of Vice-Chair

Stefán Ásmundsson (Iceland) was elected Vice-Chair of the Management Committee.

14. ANY OTHER BUSINESS

There was no other business.

15. ADOPTION OF REPORT

The Management Committee adopted a preliminary report on 4 March 2004. The full report was adopted by correspondence on 30 March 2004.

Appendix 1

AGENDA

1. Chairman's opening remarks
2. Adoption of agenda
2. Appointment of rapporteur
4. National Progress Reports
5. Status of past proposals for conservation and management
    - 5.1 Atlantic Walrus
    - 5.2 Ringed Seal
    - 5.3 Harp Seal
        - 5.3.1 Northwest Atlantic
        - 5.3.2 White/Barents Sea
        - 5.3.3 Greenland Sea
    - 5.4 Hooded Seal
        - 5.4.1 Northwest Atlantic
        - 5.4.2 Greenland Sea
    - 5.5 Northern Bottlenose Whales
    - 5.6 Long-Finned Pilot Whales
    - 5.7 Minke Whales – Central North Atlantic
    - 5.8 Beluga - West Greenland
    - 5.9 Narwhal - West Greenland
    - 5.10 Fin Whales - East Greenland – Iceland Stock Area
    - 5.11 Incorporation of Users' Knowledge in the deliberations of the Scientific Committee
6. Status of past requests to the Scientific Committee
7. New proposals for conservation and management, requests for advice from the Scientific Committee and recommendations for scientific research.
    - 7.1 Economic Aspects of Marine Mammal – Fisheries Interactions
        - 7.1.1 Proposals for conservation and management
        - 7.1.2 New requests for advice
        - 7.1.3 Recommendations for scientific research
    - 7.2 Harp and Hooded Seals
        - 7.2.1 Proposals for conservation and management
        - 7.2.2 New requests for advice
        - 7.2.3 Recommendations for scientific research
    - 7.3 Harbour Porpoise
        - 7.3.1 Proposals for conservation and management
        - 7.3.2 New requests for advice
        - 7.3.3 Recommendations for scientific research
    - 7.4 Beluga - West Greenland
        - 7.4.1 Proposals for conservation and management
        - 7.4.2 New requests for advice
        - 7.4.3 Recommendations for scientific research
    - 7.5 Narwhal – West Greenland
        - 7.5.1 Proposals for conservation and management
        - 7.5.2 New requests for advice
        - 7.5.3 Recommendations for scientific research

7.6 Fin Whales
 7.6.1 Proposals for conservation and management
 7.6.2 New requests for advice
 7.6.3 Recommendations for scientific research
7.7 White-Beaked, White-Sided and Bottlenose Dolphins
 7.7.1 Proposals for conservation and management
 7.7.2 New requests for advice
 7.7.3 Recommendations for scientific research
7.8 North Atlantic Sightings Surveys
 7.8.1 Proposals for conservation and management
 7.8.2 New requests for advice
 7.8.3 Recommendations for scientific research
7.9 Others

8. Report of the Working Group on By-Catch
9. Report of the Committee on Inspection and Observation
10. Implementation of the Joint NAMMCO Control Scheme
 10.1 NAMMCO International Observation Scheme 2003
 10.2 NAMMCO International Observation Scheme 2004
 10.3 Other matters
11. Report of the Working Group on User Knowledge in Management Decisions
 11.1 Status of the 2003 User Knowledge Conference proceedings
12. Report of the ad hoc Working Group on Enhancing Ecosystem Based Management
 12.1 Preliminary case study
 12.2 Other business
13. Election of officers
 13.1 Election of chair
 13.2 Election of vice-chair
14. Any other business
13. Adoption of report

Appendix 2

LIST OF DOCUMENTS

NAMMCO/13/MC/1	List of documents
NAMMCO/13/MC/2	Agenda
NAMMCO/13/MC/3	Status of proposals for conservation and management (up to and including NAMMCO/12)
NAMMCO/13/MC/4	Summary of requests by NAMMCO Council to the Scientific Committee, and responses by the Scientific Committee
NAMMCO/13/MC/5	Report of the Management Working Group on By-catch
NAMMCO/13/MC/6	Report of the Committee on Inspection and Observation
NAMMCO/13/MC/7	Report of the NAMMCO International Observation Scheme 2003
NAMMCO/13/MC/8	Report of the Working Group on User Knowledge in Management
NAMMCO/13/MC/9	Report of the *ad hoc* Working Group on Enhancing Ecosystem Approach to Management
NAMMCO/13/MC/9 Annex 1	Draft Preliminary Case Study

<u>National Progress Reports</u>

NAMMCO/13/MC/NPR-F	Faroe Islands - Progress Report on Marine Mammals in 2002
NAMMCO/13/MC/NPR-G	Greenland - Progress Report on Marine Mammals in 2002
NAMMCO/13/MC/NPR-I	Iceland - Progress Report on Marine Mammals in 2002
NAMMCO/13/MC/NPR-N	Norway - Progress Report on Marine Mammals in 2002
NAMMCO/13/MC/NPR-C	Canada – Progress Report on Marine Mammals in 2002

<u>Council Documents</u>

NAMMCO/13/5	Report of the Scientific Committee, 25 - 27 November 2003
NAMMCO/13/12	Report of the Joint Meeting of the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga Scientific Working Group and the NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic

Appendix 3

LIST OF PAST PROPOSALS FOR CONSERVATION AND MANAGEMENT

(Up to and including NAMMCO/13 - 2004)

PINNIPEDS

1. Atlantic walruses

Proposal for conservation and management:

The Management Committee examined the advice of the Scientific Committee on Atlantic Walrus and noted the apparent decline which the Scientific Committee identified in respect to "functional" stocks of walrus of Central West Greenland and Baffin Bay.

While recognising the over all priority of further work to clarify and confirm the delineation and abundance of walrus stocks in the North Atlantic area, the Management Committee recommends that Greenland take appropriate steps to arrest the decline of walrus along its west coast.

Taking into account the views of the Scientific Committee that the Baffin Bay walrus stock is jointly shared with Canada and that the West Greenland stock might be shared, the Management Committee encourages Canada to consider working co-operatively with Greenland to assist in the achievement of these objectives (*NAMMCO Annual Report 1995*: 49).

Management measures/response by member countries:

Greenland provided the Management Committee with information on further measures recently implemented through legislation by the Greenland authorities for the conservation of the West Greenland stock. These regulations include: the restriction of walrus hunting to people with valid professional hunting licences only; a year-round ban on walrus hunting south of 66° N; limitations on the means of transport used in connection with walrus hunting to dog sleds and vessels of 19.99 GRT/31.99 GT or less; and the sale of walrus products limited to direct sales at open markets or for personal use only. Municipal authorities now also have the possibility of implementing further restrictions if circumstances require. (*NAMMCO/8*)

Greenland noted that in addition to the regulatory measures that were taken in 1999, it had been decided to introduce quotas on walrus. A new regulatory proposal has been drafted and public hearings will be held in the near future. The final regulatory proposal will take these hearings into account. (*NAMMCO/11*)

Greenland informed the Committee that the regulatory initiative to introduce quotas and other hunting regulations for this species had been delayed, and comprehensive public hearings have been conducted. The draft regulations have now been submitted to the Council of Hunters. It is expected that a final decision on the initiative will be taken later in 2003 (*NAMMCO/12*).

2. Ringed seals

2.1 *Proposal for conservation and management*

The Management Committee noted the conclusions of the Scientific Committee on the assessment of ringed seals in the North Atlantic, which had been carried out through the Scientific Committee Working Group on Ringed Seals. In particular, the Management Committee noted that three geographical areas had been identified for assessing the status of ringed seals, and that abundance estimates were only available for Area 1 (defined by Baffin Bay, Davis Strait, eastern Hudson Strait, Labrador Sea, Lancaster, Jones and Smith sounds (*NAMMCO/6*).

Management measures/response by member countries:

None.

2.2 *Proposal for conservation and management*

While recognising the necessity for further monitoring of ringed seal removals in Area 1, the Management Committee endorsed the Scientific Committee's conclusions that present removals of ringed seals in Area 1 can be considered sustainable (*NAMMCO/6).*

Management measures/response by member countries:

The Greenland government is presently undertaking a regulatory initiative which will deal with hunting of all seals in Greenland, rather than just harbour seals as at present (*NAMMCO/11*).

3. Harp seals in the Northwest Atlantic

3.1 Northwest Atlantic

3.1.1 *Proposal for conservation and management*

The Management Committee noted that a new abundance estimate for Northwest Atlantic harps seals of 4.8 million was available, based on a pup production estimate for 1994 of 702,900. The Management Committee also noted the conclusion that the Northwest Atlantic population of harp seals has been growing at a rate of 5% per year since 1990, and that the 1996 population was estimated to be 5.1 million, with a Calculated replacement yield of 287,000.

The Management Committee concluded that catch levels of harp seals in Greenland and Canada from 1990 to 1995 were well below the calculated replacement yields in this period (*NAMMCO /6*).

Management measures/response by member countries:

None.

3.1.2 *Proposal for conservation and management*

The Management Committee noted that combined estimated catches of harp seals in Canada and Greenland are in the order of 300,000 and that these catches are near or at, the established replacement yields (*NAMMCO/8*).

Management measures/response by member countries:

Canada brought to the attention of the Committee the recently completed Report of the Eminent Panel on Seal Management, which contains a full review of research and

management of seals in Canada, with a primary focus on Northwest Atlantic harp and hooded seals. The Report is available at the following web site: http://www.dfo-mpo.gc.ca/seal-phoque/reports/index.htm. Canada also noted that an abundance survey of the Northwest Atlantic harp seals had been completed in 1999, and that published results were now available. (*NAMMCO/11*) Greenland commented that sustainable catches may be obtained at other catch levels than those that provide replacement yields. (*NAMMCO/11*) The Observer for Canada presented information on a multi-year management plan for the Atlantic seal hunt, which was announced in February 2003. For harp seals total allowable catch is set at 975,000 over a 3-year period. If the full quota were taken and Greenlandic harvests were as forecast, the total take should result in a slight population reduction over the period, while still maintaining the population well above the conservation reference points adopted. (*NAMMCO/12*)

3.2 White/Barents Sea

Proposal for conservation and management

The Management Committee noted the stock status and catch options presented by the Scientific Committee, and concluded that the catch level in 1998 was well below the calculated replacement yield. Catches at the same level in the future may result in population increase. From a resource management point of view, future quota levels approaching the replacement yield are advised. (*NAMMCO/9*)

Management measures/response by member countries:

None.

3.3 Greenland Sea

Proposal for conservation and management

The Management Committee noted the stock status and catch options presented by the Scientific Committee, and concluded that the catch level in 1998 was well below the calculated replacement yield. Catches at the same level in the future may result in population increase. From a resource management point of view, future quota levels approaching the replacement yield are advised. (*NAMMCO/6*)

Management measures/response by member countries:

None.

4. Hooded seals

4.1 *Northwest Atlantic*

4.1.1 *Proposal for conservation and management*

Noting the Scientific Committee's review of available analyses of hooded seal pup production, which recognised that calculations are dependent on the particular rate of pup mortality used, as well as the harvest regimes, the Management Committee concluded that present catches of hooded seals in the Northwest Atlantic (1990-1995) were below the estimated replacement yields of 22,900 calculated for a harvest of pups only, and 11,800 calculated for a harvest of 1-year and older animals only. (*NAMMCO/6*)

Management measures/response by member countries:

None.

4.1.2 *Proposal for conservation and management*

The Management Committee noted that the total catch of hooded seals in the Northwest Atlantic in 1996 slightly exceeded the replacement yield while in 1997 the total number of seals taken was much lower. (*NAMMCO/8*)

Management measures/response by member countries:

Greenland noted that this stock was shared with Canada and that the two countries hold regular bilateral discussions on management of this stock, including an exchange of information on harvest statistics, utilisation and stock assessment. (*NAMMCO/11*)

4.2 Greenland Sea

Proposal for conservation and management

The Management Committee noted the stock status and catch options presented by the Scientific Committee, and concluded that the catch level in 1998 was well below the calculated replacement yield. Catches at the same level in the future may result in population increase. From a resource management point of view, future quota levels approaching the replacement yield are advised. (*NAMMCO/9*)

Management measures/response by member countries:

While supporting the past conclusion of the Management Committee that catch levels for this stock are below replacement yield, Norway noted that the abundance estimate for this stock is dated and that it hoped that new information should soon be available from surveys planned for 2002. (*NAMMCO/11*)

CETACEANS

5 Northern bottlenose whales

Proposal for conservation and management

The Management Committee discussed the advice of the Scientific Committee on the status of the northern bottlenose whale and noted that this was the first conclusive analysis on which management of the northern bottlenose whale could be based. The Management Committee accepted that the population trajectories indicated that the traditional coastal drive hunt in the Faroe Islands did not have any noticeable effect on the stock and that removals of fewer than 300 whales a year were not likely to lead to a decline in the stock. (*NAMMCO/5*)

Management measures/response by member countries:

None.

6. Long-finned pilot whales

Proposal for conservation and management

The Management Committee noted the findings and conclusions of the Scientific Committee, through its review of the ICES Study Group Report and the analysis of data from NASS-95 with respect to the status of long-finned pilot whales in the North Atlantic (Section 3.1, item 3.1), which also confirmed that the best available

abundance estimate of pilot whales in the Central and Northeast Atlantic is 778,000. With respect to stock identity it was noted that there is more than one stock throughout the entire North Atlantic, while the two extreme hypotheses of i) a single stock across the entire North Atlantic stock, and ii) a discrete, localised stock restricted to Faroese waters, had been ruled out.

The Management Committee further noted the conclusions of the Scientific Committee that the effects of the drive hunt of pilot whales in the Faroe Islands have had a negligible effect on the population, and that an annual catch of 2,000 individuals in the eastern Atlantic corresponds to an exploitation rate of 0.26%.

Based on the comprehensive advice which had now been provided by the Scientific Committee to requests forwarded from the Council, the Management Committee concluded that the drive hunt of pilot whales in the Faroe Islands is sustainable. (*NAMMCO/7*)

Management measures/response by member countries:

In 1997 the Management Committee concluded that the Faroese drive hunt of pilot whales is sustainable. There have been no changes in annual take, new abundance estimates or other information that warrant any change in this conclusion. (*NAMMCO/11*)

7. Minke Whales - Central North Atlantic

Proposal for conservation and management

The Management Committee accepted that for the Central Stock Area the minke whales are close to their carrying capacity and that removals and catches of 292 animals per year (corresponding to a mean of the catches between 1980-1984) are sustainable. The Management Committee noted the conservative nature of the advice from the Scientific Committee. (*NAMMCO/8)*

Management measures/response by member countries:

None.

8. Beluga - West Greenland

8.1 *Proposal for conservation and management*

Maniitsoq – Disko

The Management Committee noted that a series of surveys conducted since 1981 indicate a decline of more than 60% in abundance in the area Maniitsoq to Disko. It further noted that with the present harvest levels (estimated at 400/yr) the aggregation of belugas in this area is likely declining due to overexploitation.

Avanersuaq – Upernavik

The present harvest in the area Avanersuaq - Upernavik is estimated to be more than 100/yr. The Management Committee noted that since this beluga occurrence must be considered part of those wintering in the area from Maniitsoq to Disko, it is considered to be declining due to overexploitation.

Finally the Management Committee noted the conclusion by the Scientific Committee that with the observed decline a reduction in harvesting in both areas seems necessary to halt or reverse the trend. *(NAMMCO/9)*

Management measures/response by member countries:

Greenland stated that this issue again will be thoroughly discussed with the hunters, and that the Greenland Government does share the concerns expressed. (*NAMMCO/10*)

Greenland informed the Committee that in November 2000 the government made a decision to introduce harvest quotas for beluga and narwhal. Public hearings on a draft regulatory proposal were held in spring 2001. The results of these hearings are being taken into account in the drafting of a revised regulatory proposal, and a final set of regulations is expected to be introduced sometime in 2002. (*NAMMCO/11*)

Greenland informed the Committee that the regulatory initiative to introduce quotas and other hunting regulations for this species had been delayed, and comprehensive public hearings have been conducted. The draft regulations have now been submitted to the Council of Hunters. It is expected that a final decision on the initiative will be taken later in 2003. (*NAMMCO/12*)

8.2 *Proposal for conservation and management*

It was accepted that the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB) would provide management advice for this stock, which is shared by Canada and Greenland. The Management Committee therefore recommended that closer links be developed between NAMMCO and the JCNB on this and other issues of mutual concern. Greenland stated that this issue again will be thoroughly discussed with the hunters, and that the Greenland Government does share the concerns expressed. *(NAMMCO/10)*

Management measures/response by member countries:

None

8.3 *Proposal for conservation and management*

In 2000 the Management Committee accepted that the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB) would provide management advice for this stock, which is shared by Canada and Greenland. The Management Committee noted with pleasure that a joint meeting of the NAMMCO Scientific Working Group on the Population Status of North Atlantic Narwhal and Beluga and the JCNB Scientific Working Group had been held in May 2001, and recommended that this co-operation at the scientific level should continue. The Management Committee also reiterated its recommendation that closer links be developed between NAMMCO and the JCNB on this and other issues of mutual concern. *(NAMMCO/10)*

Management measures/response by member countries:

None

9. Narwhal - West Greenland

9.1 *Proposal for conservation and management*

Avanersuaq

The Management Committee noted that the present exploitation level in Avanersuaq of 150/yr seems to be sustainable, assuming that the same whales are not harvested in other areas

Melville Bay – Upernavik
The Management Committee noted that the Scientific Committee could give no status for the Melville Bay – Upernavik summering stock.

Uummannaq
The Management Committee noted that the substantial catches (several hundreds) in some years do cause concern for the status of this aggregation. The Management Committee further noted that the abundance of narwhal in this area should be estimated.

Disko Bay
The Management Committee noted that present catches in this area are probably sustainable.

Catch Statistics
The Management Committee noted that for both narwhal and beluga it is mandatory for future management that more reliable catch statistics (including loss rates) are collected from Canada and Greenland. (*NAMMCO/9*)

Management measures/response by member countries:

As for beluga, harvest quotas will be introduced for West Greenland narwhal in the near future. (*NAMMCO/11*)

Greenland informed the Committee that the regulatory initiative to introduce quotas and other hunting regulations for this species had been delayed, and comprehensive public hearings have been conducted. The draft regulations have now been submitted to the Council of Hunters. It is expected that a final decision on the initiative will be taken later in 2003. *(NAMMCO/12*)

9.2 *Proposal for conservation and management*

The Management Committee accepted that the JCNB would provide management advice for this stock, which is shared by Canada and Greenland. The Management Committee therefore recommended that closer links be developed with the JCNB on this and other issues of mutual concern. *(NAMMCO/10)*

The Management Committee noted the conclusions of the Scientific Committee, that the West Greenland Narwhal have been depleted, and that a substantial reduction in harvest levels will be required to reverse the declining trend. These are preliminary conclusions, and more research and assessment work will be required. Nevertheless the Management Committee expressed its grave concern over the status of the West Greenland Narwhal, and noted that the JCNB, which provides management advice for this stock, would be considering this information in the near future. The Management Committee also noted that it will be important for NAMMCO to monitor the situation closely and update the assessment as soon as more information is available. *(NAMMCO 13)*

Management measures/response by member countries:

None

10. North Atlantic fin whales

Proposal for conservation and management

The Management Committee accepted that for fin whales in the East Greenland – Iceland (EGI) stock area, removals of 200 animals per year would be unlikely to bring the population down below 70% of its pre-exploitation level in the next 10 years, even under the least optimistic scenarios. However, catches at this level should be spread throughout the EGI stock area, roughly in proportion to the abundance of fin whales observed in the NASS surveys. Furthermore, the Management Committee stressed that the utilisation of this stock should be followed by regular monitoring of the trend in the stock size.

The Management Committee also noted the conservative nature of the advice from the Scientific Committee on which the conclusion of the Management Committee was *based. (NAMMCO/9)*

East Greenland-Iceland Stock

The Management Committee noted the conclusion of the Scientific Committee that projections under constant catch levels suggest that the inshore substock will maintain its present abundance (which is above MSY level) under an annual catch of about 150 whales. It is important to note that this result is based upon the assumption that catches are confined to the "inshore" substock, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that the "offshore" substock was also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales. *(NAMMCO 13)*

Faroe Islands

The Management Committee noted that the conclusion of the Scientific Committee had not changed from the previous assessment, that the uncertainties about stock identity are so great as to preclude carrying out a reliable assessment of the status of fin whales in Faroese waters, and thus the Scientific Committee was not in a position to provide advice on the effects of various catches. It may also be necessary to obtain clearer guidance on the management objectives for harvesting from what is likely to be a recovering stock before specific advice can be given. *(NAMMCO/13)*

Management measures/response by member countries:

None

11. Central Atlantic minke whales

11.1 *Proposal for conservation and management*

The Management Committee took note of the conclusions of the Scientific Committee with regard to the Central Atlantic Stock, that, under all scenarios considered, a catch of 200 minke whales per year would maintain the mature component of the population above 80% of its pre-exploitation level over that period. Similarly, a catch of 400 per year would maintain the population above 70% of this level. This constitutes precautionary advice, as these results hold even for the most pessimistic combination

of the lowest MSYR and current abundance, and the highest extent of past catches considered plausible. The advice applies to either the CIC Small Area (coastal Iceland), or to the Central Stock as a whole. *(NAMMCO/13)*

Management measures/response by member countries:

None.

1. Grey seals

***12.1** Proposal for conservation and management*

The Management Committee noted the concern expressed by the Scientific Committee with regard to the observed decline in the grey seal stock around Iceland, where harvesting has been above sustainable levels for more than 10 years, with the apparent objective of reducing the size of the stock. The Management Committee agreed to recommend that Iceland should define clear management objectives for this stock. The Management Committee noted the conclusion of the Scientific Committee that the new quota levels implemented Norwegian grey seals would, if filled, almost certainly lead to a rapid reduction in population in the area. The Management Committee agreed to recommend that Norway should define clear management objectives for this stock. For the Faroe Islands, the Management Committee supported the recommendation of the Scientific Committee to obtain better information on the level of catch. *(NAMMCO/13)*

Management measures/response by member countries:

None.

13. Incorporation of the users' knowledge in the deliberations of the Scientific Committee

***13.1** Proposal for conservation and management*

The Management Committee endorsed the proposals and viewpoints contained in section 6 in the Scientific Committee report, and suggested that the "Draft Minke Whale Stock Status Report" (*NAMMCO/9/7*) could usefully serve as a pilot project for co-operation with the hunters. (*NAMMCO/9*)

Management measures/response by member countries:

Status Reports under development.

***13.2** Proposal for conservation and management*

The Management Committee had previously asked the Secretariat to proceed with a proposal by the Scientific Committee to use stock status reports as a starting point for discussions with resource users to incorporate their knowledge in advice to Council, and to use the stock status report on minke whales as a pilot project. However, in 2000 the Management Committee recommended that a proposal for a conference on incorporating user knowledge and scientific knowledge into management advice should proceed, and asked the Conference Advisory Group to plan this conference to evaluate whether and how the previous proposal for incorporating user knowledge into the Scientific Committee's deliberations could be incorporated into the Conference.

(*NAMMCO/11*)

Management measures/response by member countries:

Greenland informed the Committee that a person had been hired at the Greenland Institute of Natural Resources to deal with these issues, and that this employee is also on the Advisory Board of the Conference. (*NAMMCO/11*)

List of References

NAMMCO/1
NAMMCO 1992. (MS) Report of the inaugural meeting of the Council of the North Atlantic Marine Mammal Commission. NAMMCO, University of Tromsø, Tromsø, 35 pp.

NAMMCO/2
NAMMCO. 1993. (MS) Report of the second meeting of the Council. NAMMCO, University of Tromsø, Tromsø, 65 pp.

NAMMCO/3
NAMMCO. 1993. (MS) Report of the third meeting of the Council. NAMMCO, University of Tromsø, Tromsø, 51 pp.

NAMMCO/4
NAMMCO. 1994. (MS) Fourth meeting of the Council. NAMMCO, University of Tromsø, Tromsø, 142 pp.

NAMMCO/5
NAMMCO. 1995. Fifth meeting of the Council. In: NAMMCO, *Annual Report 1995*. NAMMCO, Tromsø, 11-44.

NAMMCO/6
NAMMCO. 1997. Report of the sixth meeting of the Council. In: NAMMCO, *Annual Report 1996*. NAMMCO, Tromsø, 11-58.

NAMMCO/7
NAMMCO. 1998. Report of the seventh meeting of the Council. In: NAMMCO, *Annual Report 1997*. NAMMCO, Tromsø, 9-60.

NAMMCO/8
NAMMCO. 1999. Report of the eighth meeting of the Council. In: NAMMCO, *Annual Report 1998*. NAMMCO, Tromsø, 9-55.

NAMMCO/9
NAMMCO. 2000. Report of the ninth meeting of the Council. In: NAMMCO, *Annual Report 1999*. NAMMCO, Tromsø, 11-49.

NAMMCO/10
NAMMCO. 2001. Report of the tenth meeting of the Council. In: NAMMCO, *Annual Report 2000*. NAMMCO, Tromsø, , 11-69.

NAMMCO/11
NAMMCO. 2002. Report of the eleventh meeting of the Council. In: NAMMCO, *Annual Report 2001*. NAMMCO, Tromsø, 11-93.

NAMMCO/12
NAMMCO. 2003. Report of the twelfth meeting of the Council. In: NAMMCO, *Annual Report 2002*. NAMMCO, Tromsø, 11-112.

NAMMCO/13
NAMMCO. 2004. Report of the thirteenth meeting of the Council. In: NAMMCO, *Annual Report 2003*. NAMMCO, (this volume).

Appendix 4

SUMMARY OF REQUESTS BY NAMMCO COUNCIL TO THE SCIENTIFIC COMMITTEE, AND RESPONSES BY THE SCIENTIFIC COMMITTEE

The following provides a summary of all requests by NAMMCO Council to the Scientific Committee **(**including the 13th meeting), and notes the response of the Scientific Committee (SC) to these requests. Requests forwarded from NAC (North Atlantic Committee for Co-operation on Research on Marine Mammals) to ICES (International Council for the Exploration of the Sea) prior to NAMMCO's establishment, and which were carried over to NAMMCO in 1992, are included. This document will be continually updated to serve as a resource for both the Council and the Scientific Committee.

1. ROLE OF MARINE MAMMALS IN THE ECOSYSTEM

Marine mammal - fish interaction:

Code/Meeting: 1.1/ NAMMCO/1
Request:

To provide an overview of the current state of knowledge of the dependence of marine mammals on the fish and shrimp stocks and the interrelations between these compartments

Response of the Scientific Committee:

See 1.2, 1.4, 1.7, 1.9, 1.10.

Code/Meeting: 1.2/NAMMCO/1
Request:

In the multi-species context ... to address specific questions related to the Davis Strait ecosystem such as: - the apparent increase in harp seal stocks; - its influence on the economically important shrimp and cod stocks; - the impact of the fisheries on marine mammals, particularly harp seals; - the southward shift of minke whale distribution in recent years, and - observed changes in oceanographical conditions after the 1970s; - and to the East Greenland-Iceland-Jan Mayen area interactions between capelin stocks, fishery and marine mammals

Response of the Scientific Committee:

- Questions related to harp and hooded seals were forwarded to the ICES/NAFO Joint Working Group on Harp and Hooded Seals (SC/2) - Specific questions related to the Davis Strait ecosystem were not addressed. - See also 1.4, 1.7, 1.9, and 1.10.

Code/Meeting: 1.3/NAMMCO/2
Request:

To assess the impact of marine mammals on the marine ecosystem, with special emphasis on the availability of economically important fish species

Response of the Scientific Committee:

See 1.2, 1.4, 1.7, 1.9, 1.10

Code/Meeting: 1.4/ NAMMCO/6
Request:

The Scientific Committee was requested to focus its attention on the food consumption of three predators in the North Atlantic: the minke whale, the harp seal and the hooded seal, with a particular emphasis on the study of the potential implications for commercially important fish stocks.

Response of the Scientific Committee:

The Scientific Committee established a Working Group on the Role of Minke Whales, Harp Seals and Hooded Seals in the North Atlantic. The Scientific Committee used the report of this Working Group to provide advice to Council, and to recommend further research. (SC/5) Many of the papers presented will be published in Volume 2 of NAMMCO Scientific Publications. (SC/7)

Code/Meeting: 1.5/NAMMCO/7
Request:

The Council encourages scientific work that leads to a better understanding of interactions between marine mammals and commercially exploited marine resources, and requested the Scientific Committee to periodically review and update available knowledge in this field.

Response of the Scientific Committee:

See 1.9, 1.10

Multi-species approaches to management:

Code/Meeting: 1.6/NAMMCO/1
Request:

To consider whether multi-species models for management purposes can be established for the North Atlantic ecosystems and whether such models could include the marine mammals compartment. If such models and the required data are not available then identify the knowledge lacking for such an enterprise to be beneficial to proper scientific management and suggest scientific projects which would be required for obtaining this knowledge.

Response of the Scientific Committee:

See 1.4, 1.7, 1.9, 1.10

Code/Meeting: 1.7/NAMMCO/5
Request:

In relation to the importance of the further development of multi-species approaches to the management of marine resources, the Scientific Committee was requested to monitor stock levels and trends in stocks of all marine mammals in the North Atlantic.

Response of the Scientific Committee:

It was clarified that the purpose of this request was to ensure that data on marine mammals was available for input into multi-species models for management. The Committee agreed that updated information on abundance and indications of trends in abundance of stocks of marine mammals in the North Atlantic should be clearly described in a new document for the internal reference of the Council, to replace the

List of Priority Species. This document would be entitled Status of Marine Mammals in the North Atlantic and should include those cetacean and pinniped species already contained in the List of Priority Species, as well as other common cetacean species in the NAMMCO area for which distribution and abundance data is also available (fin, sei, humpback, blue, and sperm whales). (SC/5)

Sealworm infestation:

Code/Meeting: 1.8/NAMMCO/6
Request:

Aware that the population dynamics of the sealworm (*Pseudoterranova decipiens*) may be influenced by sea temperature, bathymetry, invertebrate and fish fauna, the Scientific Committee was requested to review the current state of knowledge with respect to sealworm infestation and to consider the need for comparative studies in the western, central and eastern North Atlantic coastal areas, taking into account the priority topics recommended by the Scientific Committee and its *ad hoc* Working Group on grey seals.

Response of the Scientific Committee:

The Scientific Committee established a Working Group on Sealworm Infection to address this question. The Scientific Committee used their report as the basis for providing advice to Council, and developing recommendations for further research. (SC/5) Many of the papers considered by the Working Group will are published in *NAMMCO Scientific Publications* Vol. 3 *Sealworms in the North Atlantic: Ecology and population dynamics* (SC/7)

Economic aspects of marine mammal-fisheries interactions:

Code/Meeting: 1.9/NAMMCO/7
Request:

The Council requested that special attention be paid to studies related to competition and the economic aspects of marine mammal-fisheries interactions

Response of the Scientific Committee:

The Scientific Committee established a Working Group on Economic Aspects of Marine Mammal-Fisheries Interactions. The Scientific Committee concluded that inclusion of economic considerations is a valuable addition to mullet-species models of interactions between marine mammals and fisheries. The work presented at the Working Group was considered the first step towards more complete analyses of these interactions and it was recommended, in light of the economic impacts, that more complete models should be developed and presented. The Scientific Committee showed a continued interest in the development of the models and it was decided to maintain the Working Group and seek further guidance from the Council on matters of particular interest. (SC/6)

Code/Meeting: 1.10/NAMMCO/8
Request:

The Scientific Committee is requested to investigate the following economic aspects of marine mammal – fisheries interactions:

- to identify the most important sources of uncertainty and gaps in knowledge with respect to the economic evaluation of harvesting marine mammals in the different areas;

- to advise on research required to fill such gaps both in terms of refinement of ecological and economical models and collection of basic biological and economical data required as input parameters for the models;
- to discuss specific cases where the state of knowledge may allow quantification of the economic aspects of marine mammal – fisheries interactions:

  a) what could be the economic consequences of a total stop in harp seal exploitation versus different levels of continued sustainable harvest?

  b) what could be the economic consequences of different levels of sustainable harvest vs. no exploitation of minke whales?

Response of the Scientific Committee:

The Working Group On The Economic Aspects Of Marine Mammal - Fisheries Interactions was reactivated to meet this request. It was agreed to separate the request into two sections. At the first Working Group meeting the first two items in the request were addressed. The Working Group used available information to derive estimates of consumption of cod, herring, capelin and shrimp by harp seals, minke whales and *Lagenorhynchus* spp. and bottlenose dolphins in some areas. Multi-species models presently in use or under development in Norway and Iceland offer a means of assessing the impact of marine mammal predation on fish stocks The Scientific Committee therefore recommended that the next logical step in addressing the request should be for NAMMCO to lead or assist in the development of a multi-species-economic model for a candidate area. However, the Scientific Committee reiterated that the estimation and model uncertainties are such that definitive quantification of the economic aspects of marine mammal-fisheries interactions in candidate areas cannot be expected in the near term. (SC/8)

Code/Meeting: 1.11/NAMMCO/10
Request:

Noting the requests for advice from the Council at its Eighth meeting in Oslo 1998 (see Annual Report 1998 page 23), the Management Committee recommended that the Scientific Committee continue the assessment of the economic aspects of fishery - marine mammal interactions in the two areas (Barents Sea and Iceland) and with the two species (minke whales and harp seals) that have been identified as feasible for this assessment.

Response of the Scientific Committee:

The Scientific Committee convened a workshop under the theme "Marine Mammals: From feeding behaviour or stomach contents to annual aonsumption - what are the main uncertainties ", to further investigate the methodological and analytical problems in estimating consumption by marine mammals. (SC/9)

Code/Meeting: 1.12/NAMMCO/11
Request:

The Management Committee noted the conclusion of the Scientific Committee that the estimation and model uncertainties are such that the economic aspects of marine mammal-fishery interactions in candidate areas cannot be quantified without further work. The Management Committee therefore recommended that the Scientific Committee should hold a workshop on ecosystem models aiming for a better understanding of the ecological role of minke whales and harp and hooded seals in the North Atlantic, as proposed in the Scientific Committee report.

Response of the Scientific Committee:

The Scientific Committee convened a workshop, under the theme "Modelling Marine Mammal – Fisheries Interactions in the North Atlantic", to investigate how presently available ecosystem models can be adapted for quantifying marine mammal - fishery interactions. (SC/10)

Code/Meeting: 1.13/NAMMCO/12
Request:

The Management Committee agreed that the Scientific Committee should monitor progress made in multispecies modelling and in the collection of input data and decide when enough progress has been made to warrant further efforts in this area. Future meetings should focus on assessing modelling results from the Scenario Barents Sea model and possibly the GADGET-based template models for other areas, if they are developed. The Scientific Committee should also consider the feasibility of connecting the multi-species models with simple economic models at that time.

Response of the Scientific Committee:

In progress.

2. ENVIRONMENTAL ISSUES

Code/Meeting: 2.1/NAMMCO/1
Request:

To describe the possible pathways of radioactive material from blowouts and leakage in existing nuclear power plants, leakage from dumped material and possible accidents in planned recycling plants in the northern part of Scotland into the food web of the North Atlantic and hence into the top predators like marine mammals.

Response of the Scientific Committee:

No response.

Code/Meeting: 2.2/NAMMCO/1
Request:

To review the contaminant burdens (especially organochlorines) in marine mammals in the North Atlantic and evaluate the possible sources of these contaminants.

Response of the Scientific Committee:

No response from the Scientific Committee. In 1995, NAMMCO hosted the International Conference on Marine Mammals and the Marine Environment. The Conference covered the following themes: Marine mammals and the marine environment-impacts and management approaches; Contaminants in marine mammals – sources, levels and effects; Coastal communities and marine pollution – social, economic and health considerations; Addressing the questions – problems and future needs. The proceedings were published as a special issue of *The Science of the Total Environment* (186, 1,2).

3. MANAGEMENT PROCEDURES

Code/Meeting: 3.1/NAMMCO
Request:

To review the basis for, and develop assessments necessary to provide the scientific foundation for conservation and management of the stocks relevant for management

under NAMMCO.

Response of the Scientific Committee:

A Working Group on Management Procedures was established to consider this matter. (SC/2). The Scientific Committee noted that there were many different management needs requiring different management procedures. It was agreed that there was need for more guidance on management objectives before any concrete work can be started on developing appropriate management procedures, and in turn this was likely to be case- (species and/or area) specific. Related to this it was also noted that NAMMCO may prefer to assume an advisory and evaluative role in developing its management. (SC/2)

Code/Meeting: 3.2/NAMMCO/4
Request:

Further development of RMP-like procedures.

Response of the Scientific Committee:

The Scientific Committee decided to develop management procedures on a case-by-case basis: "a more pragmatic approach on an area and species/case-specific basis would be desirable for the development of specific management procedures. It was therefore decided to suggest that requests for advice from the Council be accompanied by specific objectives defined for the case in question". (SC/3)

4. STOCKS/SPECIES

Monitoring marine mammal stock levels and trends in stocks /North Atlantic Sightings Surveys (NASS):

Code/Meeting: 4.1/NAMMCO/3
Request:

To plan joint cetacean sighting surveys in the North Atlantic by co-ordinating national research programmes.

Response of the Scientific Committee:

The Scientific Committee agreed to establish a Working Group to plan the sighting survey for the summer of 1995. (SC/2) The Scientific Committee was pleased to note the good progress that had been made in planning this important joint research, in which the Faroes (1 vessel), Iceland (3 vessels and 1 aircraft) and Norway (11 vessels) had decided to participate. It was noted that Greenland had decided not to conduct surveys as part of these joint efforts. (SC/3) The Scientific Committee agreed to recommend that a special fund of NOK 800,000 be established from the NAMMCO budget for use in financing various aspects of NASS-95, where required. (SC/3)

Code/Meeting: 4.2/NAMMCO/5
Request:

The 1995 North Atlantic Sightings Survey (NASS-95) would provide updated abundance estimates for a number of whale species in the North Atlantic, and the Scientific Committee was requested to review results in the light of recent assessments of North Atlantic whale stocks.

Response of the Scientific Committee:

The Scientific Committee agreed to establish a Working Group on Abundance Estimates. The task of the Working Group on Abundance Estimates would be to review analyses and where relevant also analyse data from NASS-95 to ensure its compatibility, both between NASS-95 survey areas, as well as with data from other sightings surveys, in order to provide a basis for calculating abundance estimates for the relevant cetacean stocks in the North Atlantic. (SC/4)

Code/Meeting: 4.3/NAMMCO/6

Request:

The Management Committee noted the successful completion of the North Atlantic Sightings Survey in 1995, and commended the process initiated by the Scientific Committee to conclude the analysis of NASS-95 data. It was expected that the results on abundance will be dealt with by the newly established Scientific Committee Working Group on Abundance Estimates and will be presented at the next annual meeting. It was noted that the Working Group would at least to some extent address last year's request from the Council regarding monitoring of stock levels and trends in stocks. However, it was also noted that one outstanding matter from last year is the request to the Scientific Committee to review results of NASS-95 in the light of recent assessments of North Atlantic whale stocks.

The Council agreed to the suggestion from the Management Committee that this be drawn to the attention of the Scientific Committee to secure a follow-up to last year's request.

Response of the Scientific Committee:

To address this request, a Working Group on Abundance Estimates had been established with the task of reviewing the analyses, and where relevant, also to analyse data from NASS-95 to provide a basis for calculating abundance estimates for the relevant cetacean stocks in the North Atlantic. The Working Group had focused on describing synoptic distributions of the cetacean species encountered during NASS-95, and abundance estimates for minke, fin, sei and pilot whales, which were the target species of the survey. The Scientific Committee concluded that the updated abundance estimates for the target species as reviewed by the Working Group on Abundance Estimates represented the best available estimates for the stocks concerned, and used them as a basis to provide advice to Council. The Scientific Committee also recommended that the results of NASS-95 be compiled to a future volume of *NAMMCO Scientific Publications*. (SC/5)

Code/Meeting: 4.4/NAMMCO/7

Request:

The Scientific Committee was requested to continue its work to monitor stock levels and trends in all stocks of marine mammals in the North Atlantic in accordance with previous recommendations (see *NAMMCO Annual Report 1996*:131-132). In this context the Scientific Committee was encouraged to prioritise calculation of the abundance of species covered by NASS-95, in particular those species presently harvested and species considered to be important with respect to interactions with fisheries.

Response of the Scientific Committee:

See 4.3.

Code/Meeting: 4.5/NAMMCO/9

Request:

NASS-95: The Management Committee noted particularly that abundance estimates from NASS-95 have not been completed for some species. The Management Committee therefore recommended that the Scientific Committee complete abundance estimates for all species, as part of its efforts to monitor the abundance of all species in the North Atlantic.

Response of the Scientific Committee:

The Scientific Committee noted that abundance estimates for the main target species of NASS-95 (minke whale, fin whale, sei whale, pilot whale) had been completed and accepted by them, however most had not yet been published in the primary scientific literature. The Scientific Committee agreed that further analyses of the abundance of non-target species from the NASS-95 survey should be conducted if they are warranted. However, as the survey was not optimised for these species, it was recognised that the design and conduct of the survey would make this possible to a varying degree, depending on both the species and area in question. In some cases, a general description of the spatial distribution of sightings may be the only analysis warranted. The Scientific Committee agreed to pursue these analyses in the coming year. (SC/8)

The Scientific Committee considered new information on the NASS-95 Icelandic aerial and shipboard surveys for minke whales, and a new abundance estimate for humpback whales from the NASS-95 Icelandic shipboard survey. (SC/9)

Code/Meeting: 4.6/NAMMCO/9

Request:

The Management Committee recommended that the Scientific Committee continue its efforts to co-ordinate future sighting surveys and analyses of the results from such surveys in the North Atlantic. Priority species should be minke whales and fin whales, and the Management Committee recommended that that the survey design be optimised for these species. The survey should also be optimised to cover those areas where abundance estimates are most urgently required.

Response of the Scientific Committee:

The Working Group on Abundance Estimates met in November 2000 to plan for NASS-2001. The survey was conducted in June/July 2001. (SC/9)

Code/Meeting: 4.7/NAMMCO/11

Request:

The Management Committee recommended that remaining abundance estimates from the NASS-95 and new estimates from the NASS-2001 surveys should be developed as soon as feasible, with the target species of the surveys being of highest priority. The Management Committee emphasised that this work should be published in a timely manner.

Response of the Scientific Committee:

The Working Group on Abundance Estimates met in March 2002 and developed preliminary abundance estimates for fin whales, minke whales, humpback whales, sperm whales and dolphins. In addition a full evaluation of the 2001 survey was conducted, and recommendations for future surveys were made. (SC/10).

The Working Group on Abundance Estimates met in February 2003 and considered abundance estimates for minke, fin, humpback, blue, pilot and northern bottlenose whales (SC/11)

Code/Meeting: 4.8/NAMMCO/13
Request:

The Management Committee welcomed the new abundance estimates for particularly minke and humpback whales in the Central North Atlantic.
The NASS have been highly successful in providing important information on the distribution and abundance of cetaceans over a broad area of the North Atlantic. This information becomes more valuable every time a survey is completed, as it provides an indication of trends in abundance over meaningful time periods.
The Management Committee therefore requested that the Scientific Committee co-ordinate the efforts of member countries in planning and conducting a large-scale sightings survey in 2006. In order to ensure as broad a coverage as possible, this should include co-ordination with planned surveys by non-member countries, and inviting other jurisdictions, particularly in the Western Atlantic, to participate in the surveys.

Response of the Scientific Committee:

Pending.

Central North Atlantic minke whales:

Code/Meeting: 4.9/NAMMCO /7
Request:

In the light of the new survey abundance results the Scientific Committee is requested to undertake an assessment of the status of the Central North Atlantic minke whale stock, including to evaluate the long-term effects of past and present removal levels on the stock.

Response of the Scientific Committee:

The Scientific Committee agreed to assign the task of assessing the status of the stock to the Working Group on Management Procedures. The Council had requested the Scientific Committee to provide its advice on this matter prior to the next meeting of the Council, however it was the general view of the Committee that it was unlikely that this work could be completed within this time frame. (SC/5)

The Scientific Committee used the report of the Working Group on Management Procedures as the basis for providing advice and research recommendations to Council. The Committee agreed that catches of 292 per year (the mean of the catch between 1980-84) are sustainable for the Central stock, and that catches of 185 whales per year are sustainable for the costal (SC/6)

Code/Meeting: 4.10/NAMMCO/8
Request:

In order to ascertain the stock structure of minke whales in the North Atlantic, the Scientific Committee is requested to investigate the possibility of supplementing present sampling with existing older material from NAMMCO countries and other countries in joint genetic analyses. If possible, such analyses should be undertaken.

Response of the Scientific Committee:

It was noted that such exchanges of samples are ongoing between Norway and Greenland. Samples collected in the past from Iceland and Norway have already been analysed concurrently, and there are no recent samples from Iceland. The Scientific Committee concluded that available samples are being utilised effectively. (SC/7)

Code/Meeting: 4.11/NAMMCO/11

Request:

The Management Committee recommended that the Scientific Committee should complete an assessment of Central Atlantic minke whales once new abundance estimates from NASS-2001 become available.

Response of the Scientific Committee:

The Working Group on Fin and Minke Whales met in November 2003 to complete an assessment of the Central Atlantic Stock of minke whales (SC/11).

Northern bottlenose whales:

Code/Meeting: 4.12/NAMMCO/2

Request:

To undertake an assessment of the status of the northern bottlenose whale (*Hyperoodon ampullatus*) stock in the North Atlantic.

Response of the Scientific Committee:

A Working Group on Northern Bottlenose and Killer Whales established, and provided a preliminary assessment which was used as the basis of advice and recommendations for further research given by the Scientific Committee. (SC/2)

Code/Meeting: 4.13/NAMMCO/4

Request:

To undertake the necessary modelling of the species as suggested under ... items 9.2. and 10.2.2 of ...[the Report of the Third Meeting of the Scientific Committee, 1993]. (SC/3)

Response of the Scientific Committee:

A joint session was held of the Working Group on Northern Bottlenose Whales and the Working Group on Management Procedures in order to consider the request from the Council to undertake the necessary modelling of the population using catch series and abundance estimates. Their report was used as the basis for advice and research recommendations conveyed by the Scientific Committee. (SC/3)

Killer whales:

Code/Meeting: 4.14/NAMMCO/2

Request:

To advise on stock identity for management purposes; to assess abundance in each stock area; to assess effects of recent environmental changes, changes in the food supply and interactions with other marine living resources in each stock area.

Response of the Scientific Committee:

A Working Group on Northern Bottlenose and Killer Whales established by the Scientific Committee, and provided a preliminary assessment. This provided the basis

for advice and research recommendations given by the Scientific Committee. (SC/2) The Chair noted that it had not yet been possible to complete a full assessment of the killer whale as requested by the Council. Few new data were available, other than recent sightings data from NASS-95 which had not been analysed. (SC/5)

Code/Meeting: 4.15/NAMMCO/13
Request:

The Management Committee requested the Scientific Committee to review the knowledge on the abundance, stock structure, migration and feeding ecology of killer whales in the North Atlantic, and to provide advice on research needs to improve this knowledge. Priority should be given to killer whales in the West Greenland – Eastern Canada area.

Response of the Scientific Committee:

Pending.

Long-finned pilot whales:

Code/Meeting: 4.16/NAMMCO/1
Request:

To provide an assessment of the state of the pilot whale stock in the north eastern Atlantic, based on the information sampled from the Faroese drive fishery and the NASS sighting surveys.

Response of the Scientific Committee:

The Scientific Committee decided to base its advice on the report of the ICES Study Group on Long-Finned Pilot whales. They concluded that an evaluation of status could not be provided without further work.(SC/2)

Code/Meeting: 4.17/NAMMCO/2
Request:

To analyse the effects of the pilot whale drive hunt in the Faroe Islands on North Atlantic pilot whales (*Globicephala melas*), especially whether the numbers taken are consistent with sustainable utilisation.

Response of the Scientific Committee:

This matter was addressed by the Scientific Committee, based on the findings of the ICES Study Group and the review of the results of NASS-95. The Scientific Committee agreed to endorse the list of future research requirements listed by the ICES Study Group in its report, and provided advice on the sustainability of the Faroese catch. (SC/5)

Narwhal and beluga:

Code/Meeting: 4.18/NAMMCO/7
Request:

The Scientific Committee was requested to examine the population status of narwhal and beluga (white whales) throughout the North Atlantic.

Response of the Scientific Committee:

The Scientific Committee established a Working Group on the Population Status of Narwhal and Beluga in the North Atlantic, which met in March 1999. The Scientific Committee used the report of the Working Group to evaluate the stock status of the

various narwhal and beluga aggregations, and provided recommendations to Council. (SC/7)

Code/Meeting: 4.19/NAMMCO/8

Request:

The Management Committee requested advice from the Scientific Committee on the level of sustainable utilisation of West Greenland beluga in different areas and under different management objectives. For narwhal, the Management Committee requested that the Scientific Committee identify the information which is lacking in order to answer the same question proposed with respect to beluga.

Response of the Scientific Committee:

The Scientific Committee reactivated the Working Group on the Population Status of Narwhal and Beluga and used its report as the basis of its recommendations to the Council. The Scientific Committee concluded that the stock is substantially depleted and that present harvests are several times the sustainable yield, and, if continued, will likely lead to stock extinction within 20 years. The Committee assessed a range of harvest options with the overall objective of arresting the decline of West Greenland Beluga, and provided prioritised research recommendations. (SC/8)

The Scientific Committee noted that developing recommendations on the sustainable harvest of narwhal in Greenland will require significant additional research and cannot be done at present. To this end, the Scientific Committee provided research recommendations to answer questions about catch statistics, stock identity and abundance. (SC/8).

Code/Meeting: 4.20/NAMMCO/10

Request:

The Management Committee recommended that the Scientific Committee continue its assessment of West Greenland beluga with reference to the short-term research goals identified. It is anticipated that a joint meeting of the Scientific Working Group of the JCNB and the NAMMCO Scientific Working Group on the Population Status of Narwhal and Beluga in the North Atlantic can be held in spring 2001.

Response of the Scientific Committee:

The Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic met jointly with the Scientific Working Group of the Joint Commission on the Conservation and Management of Narwhal and Beluga (JCNB) to deal with these requests. The Scientific Committee used their report to provide catch options for West Greenland Beluga and research recommendations for West Greenland beluga and narwhal. (SC/9)

Code/Meeting: 4.21/NAMMCO/10

Request:

The Management Committee recommended that the Scientific Committee complete an assessment of narwhal in West Greenland when the necessary data are available. Specifically, the Scientific Committee is requested to evaluate the extent of movements of narwhal between Canada and Greenland.

Response of the Scientific Committee:

See 4.16. The Scientific Committee used evidence from genetic and contaminant analysis, satellite tagging and hunter knowledge to evaluate the extent of movement between Greenland and Canada. (SC/9).

Code/Meeting: 4.22/NAMMCO/11
Request:

The Management Committee recommended that the Scientific Committee should concentrate its assessment efforts on the West Greenland narwhal in the near term.

Response of the Scientific Committee:

Response pending.

Code/Meeting: 4.23/NAMMCO/12
Request:

The Management Committee noted that a new survey of West Greenland beluga will be conducted in 2004. The Scientific Committee was therefore requested to update the assessment of West Greenland Beluga in light of the new survey results and any other new information. The main management objective is to halt the decline of this stock.

Response of the Scientific Committee:

Response pending.

Harbour porpoises:

Code/Meeting: 4.24/NAMMCO/7
Request:

The Council noted that the harbour porpoise is common to all NAMMCO member countries, and that the extent of current research activities and expertise in member countries and elsewhere across the North Atlantic would provide an excellent basis for undertaking a comprehensive assessment of the species throughout its range. The Council therefore requested the Scientific Committee to perform such an assessment, which might include distribution and abundance, stock identity, biological parameters, ecological interaction, pollutants, removals and sustainability of removals.

Response of the Scientific Committee:

The Scientific Committee decided that the matter could best be dealt with by convening an international workshop/symposium on harbour porpoises, which would involve experts working on this species throughout its North Atlantic range. The agenda would include the following themes: distribution, abundance and stock identity; biological parameters; ecological interactions; pollutants; removals and sustainability of removals. (SC/6)

The Scientific Committee utilised the report of the Symposium to develop its own assessment advice to the Council. Recent abundance estimates are available for only a few places in the North Atlantic. Directed harvesting occurs in some areas, but most removals are through by-catch. In some areas, present removals are not sustainable. The Scientific Committee developed research recommendations to address some of the information needs for management of this species. (SC/8)

Atlantic walrus:

Code/Meeting: 4.25/NAMMCO/2
Request:

To advise on stock identity for management purposes; to assess abundance in each stock area; to assess long-term effects on stocks by present removals in each stock area; to assess effects of recent environmental changes (i.e. disturbance, pollution) and changes in the food supply.

Response of the Scientific Committee:

The assessment was postponed pending report of Walrus International Technical and Scientific Committee (WITS). (SC/2) It was decided in late 1994 to request Erik Born of the Greenland Fisheries Research Institute in Copenhagen to co-ordinate the compilation of a status report on the Atlantic walrus in time for the present Scientific Committee meeting. The result of this collaboration was the report, E.W. Born, I. Gjertz and R.R. Reeves, "Population assessment of Atlantic walrus (*Odobenus rosmarus rosmarus*)" This report was used by the Scientific Committee as the basis of its management and research recommendations to Council. (SC/3)

Code/Meeting: 4.26/NAMMCO/13

Request:

The Management Committee noted that the Scientific Committee had last provided an assessment of walrus in 1994. Noting that considerable new information has become available since then, the Management committee therefore requested the Scientific Committee to provide an updated assessment of walrus, to include stock delineation, abundance, harvest, stock status and priorities for research.

Response of the Scientific Committee:

Pending.

Harp and hooded seals:

Code/Meeting: 4.27/NAMMCO/2

Request:

– to assess the stock size, distribution and pup production of harp seals in the Barents Sea and White Sea, and of harp and hooded seals in the Greenland Sea and the Northwest Atlantic;
– to assess sustainable yields at present stock sizes and in the long term under varying options of age composition in the catch;
– to provide advice on catch options in the White Sea/Barents Sea/Greenland Sea and NAFO areas;
– to assess effects of recent environmental changes or changes in the food supply and possible interaction with other living marine resources in the areas.

Response of the Scientific Committee:

- These requests forwarded to Joint ICES/NAFO Working Group on Harp and Hooded Seals. A partial assessment was completed, but more work was required. (SC/2)
- The Scientific Committee considered the report of the Joint ICES/NAFO Working Group on Harp and Hooded Seals which had met in Dartmouth, Canada, 5-9 June 1995. The Scientific Committee endorsed the recommendations in the report and identified further research needs. However the required assessments had not yet been completed. (SC/4).
- The Scientific Committee considered the report of the Joint ICES/NAFO Working Group on Harp and Hooded Seals which had met in Copenhagen in 1997. The Scientific Committee used this report as the basis for its advice to Council, while noting that catch options had not been completed for Greenland Sea harp and hooded

seals, and White Sea and Barents Sea harp seals. (SC/6)
- The Joint ICES/NAFO Working Group on Harp and Hooded Seals met in 1998 to complete the assessments for Greenland Sea harp and hooded seals, and White Sea and Barents Sea harp seals. The Scientific Committee used their report as the basis of its advice to Council, and noted that the required assessments had now been completed. Assessment of the effects of recent environmental changes or changes in the food supply and possible interaction with other living marine resources in the areas is ongoing. (SC/7)

Code/Meeting: 4.28/NAMMCO/8
Request:

The Scientific Committee is requested to co-ordinate joint feeding studies of harp and hooded seals in the Nordic Seas (Iceland, Greenland and Norwegian Seas) and off West Greenland.

Response of the Scientific Committee:

The Scientific Committee noted that preparations to co-ordinate such studies between member countries were already under way, outside of the NAMMCO Scientific Committee. The Scientific Committee therefore emphasised its support for such joint studies and urged member countries to participate. (SC/7)

Code/Meeting: 4.29/NAMMCO/11
Request:

The Management Committee recommended that the Scientific Committee regularly update the stock status of North Atlantic harp and hooded seal stock as new information becomes available.

Response of the Scientific Committee:

Ongoing as new information becomes available.

Code/Meeting: 4.30/NAMMCO/12
Request:

The Management Committee noted that new information recently had become available on the abundance of harp seals in the Greenland Sea and the Northwest Atlantic. In addition new information is available on movements and stock delineation of harp seals in the Greenland, Barents and White seas. The Management Committee therefore reiterated its previous request to the Scientific Committee to regularly update the stock status of North Atlantic harp and hooded seals as new information becomes available. The Management Committee noted the likely impact of increasing abundance of these species on fish stocks. For harp seals in the Northwest Atlantic, the immediate management objective is to maintain the stocks at their present levels of abundance.

Response of the Scientific Committee:

Ongoing as new information becomes available.

Code/Meeting: 4.31/NAMMCO/13
Request:

The Management Committee requests that the Scientific Committee annually discusses the scientific information available on harp and hooded seals and advice on catch quotas for these species given by the ICES/NAFO Working Group on Harp and

Hooded Seals. The advice by the Scientific Committee on catch quotas should not only be given as advice on replacement yields, but also levels of harvest that would be helpful in light of ecosystem management requirements
For the Barents/White Sea and Greenland Sea stocks, in addition to the advice on replacement yields, advice should be provided on the levels of harvest that would result in varying degrees of stock reduction over a 10 year period.
Noting that Canada has instituted a multi-year management plan with a 3- year allowable catch of harp seals totalling 975,000 (not including the catch by Greenland), the Management Committee requested the Scientific Committee to provide advice on the likely impact on stock size, age composition, and catches in West Greenland and Canada under the conditions of this plan.

Response of the Scientific Committee:

Pending.

Ringed seals:

Code/Meeting: 4.32/NAMMCO/5
Request:

To advise on stock identity of ringed seals (*Phoca hispida*) for management purposes and to assess abundance in each stock area, long-term effects on stocks by present removals in each stock area, effects of recent environmental changes (i.e. disturbance, pollution) and changes in the food supply, and interactions with other marine living resources.

Response of the Scientific Committee:

The Scientific Committee established a Working Group on Ringed Seals. The Scientific Committee considered the report of the Working Group and provided advice to Council. They also provided recommendations for future research. (SC/5) Papers considered by the Working Group as well as other papers were published in the first volume of NAMMCO Scientific Publications, *Ringed Seals in the North Atlantic.*

Code/Meeting: 4.33/NAMMCO/7
Request:

The Scientific Committee was requested to advise on what scientific studies need to be completed to evaluate the effects of changed levels of removals of ringed seals in West and East Greenland.

Response of the Scientific Committee:

It was noted that the exploitation level of ringed seals in Greenland has shown considerable variability over decades in this century. The Scientific Committee chose to focus on scenarios where exploitation is raised by more than twice the level reported in recent years. The Scientific Committee then identified the main gaps in knowledge, and recommended research required to address them. (SC/6)

Grey seals:

Code/Meeting: 4.34/NAMMCO/5
Request:

To review and assess abundance and stock levels of grey seals (*Halichoerus grypus*) in the North Atlantic, with an emphasis on their role in the marine ecosystem in general, and their significance as a source of nematodal infestations in fish in particular.

Response of the Scientific Committee:

The Scientific Committee established a Working Group on Grey Seals. The Scientific Committee considered the report of the Working Group and provided advice to Council, including recommendations for further research. (SC/4)

Code/Meeting: 4.35/NAMMCO/11

Request:

The Management Committee noted that there has been a decline in the numbers of grey seals around Iceland, possibly due to harvesting at rates that are not sustainable. The Scientific Committee had previously provided advice in response to a request to review and assess abundance and stock levels of grey seals in the North Atlantic, with an emphasis on their role in the marine ecosystem in general, and their significance as a source of nematodal infestations in fish in particular (NAMMCO 1995). Given the apparent stock decline in Iceland, an apparent increase in Southwest Norway and in the United Kingdom, and the fact that this species interact with fisheries in three NAMMCO member countries, the Management Committee recommended that the Scientific Committee provide a new assessment of grey seal stocks throughout the North Atlantic.

Response of the Scientific Committee:

The Working Group on Grey Seals met in April 2003 and considered the status of grey seal stocks in Canada, the USA, Iceland, the Faroes, Norway, Great Britain and the Baltic (SC/11)

Dolphin species *(Tursiops* and *Lagenoryhncus spp.):*

Code/Meeting: 4.36/NAMMCO/7

Request:

The Council recommended that NAMMCO member countries study the ecological interaction between dolphin species (e.g., *Lagenorhynchus spp.*) and fisheries, with the view to future assessments of such interactions.

Response of the Scientific Committee:

Not addressed due to insufficient information.

Code/Meeting: 4.37/NAMMCO/8

Request:

Noting that ecological interactions between dolphin species of the *Lagenorhynchus* genus and fisheries have caused concern in NAMMCO countries, the Scientific Committee is requested to perform an assessment of distribution, stock identity, abundance and ecological interactions of white-beaked and white-sided dolphins in the North Atlantic area.

Response of the Scientific Committee:

The Scientific Committee noted that the IWC Scientific Committee had dealt with these species in 1996. Generally, it was considered that there is insufficient information on stock structure, abundance and feeding ecology to carry out a meaningful assessment of these species at this time. Some new information on abundance may become available from the NASS-95 survey, but these data have not yet been analysed. The Scientific Committee agreed to begin compiling available information on these species in member countries, with the objective of identifying knowledge gaps and creating a basis for assessment in the longer term. (SC/7)

Code/Meeting: 4.38/NAMMCO/9
Request:

At its Eighth Meeting in 1998, the Council agreed to the recommendation of the Management Committee to request the Scientific Committee to perform an assessment of distribution, stock identity, abundance and ecological interactions of white-beaked and white-sided dolphins in the North Atlantic area. The Management Committee noted the conclusion of the Scientific Committee that there is insufficient information on stock structure, abundance and feeding ecology to carry out a meaningful assessment of these species at this time. The Management Committee further noted that, in addition to the focus of the Management Committee's former request for advice on these species in relation to their ecological interactions with fisheries, these dolphin species are harvested in significant numbers in the Faroe Islands. The Management Committee therefore agreed to recommend that the Scientific Committee be requested to facilitate the requested assessment of these species, with an emphasis on the following:
to analyse results from NASS 95 and other sightings surveys as a basis for establishing abundance estimates for the stocks; to co-ordinate the efforts of member countries to conduct research to fill the noted information gaps, taking advantage in particular of the sampling opportunities provided by the Faroese catch, as well as dedicated samples in other areas.

Response of the Scientific Committee:

The Scientific Committee noted that the NASS surveys were optimised for species other than dolphins, and that in some cases, it was not possible to identify dolphins to species. In these cases, mapping of sightings may be the only analysis warranted. Further analyses may be feasible from the Faroese and Icelandic survey areas, and the Scientific Committee made preparations to begin these analyses.

These species are harvested sporadically in drive hunts in the Faroe Islands, and there is some by-catch in Iceland. They are rarely taken in Norway or Greenland. Scientific papers on feeding ecology and life history in Icelandic waters are expected to be published soon. The Scientific Committee recommended that a sampling program be initiated in the Faroe Islands for white-sided, white-beaked and bottlenose dolphins, primarily to collect information on feeding ecology, life history and stock delineation. They also recommended that sampling should continue in Iceland and Norway on an opportunistic basis.

Code/Meeting: 4.39/NAMMCO/9
Request:

The Management Committee noted that bottlenosed dolphins, like white-sided and white-beaked dolphins, are also harvested in the coastal drive fishery in the Faroe Islands. The Management Committee agreed to recommend that, in connection with the updated request for advice from the Scientific Committee on white-sided and white-beaked dolphins, that bottlenosed dolphins also be included in this assessment

Response of the Scientific Committee:

See 4.38

Code/Meeting: 4.40/NAMMCO/10

Request:

The Management Committee noted that the requested assessments for these species could not at present be completed because of a lack of information on stock identity, distribution, abundance and biology. The Management Committee therefore recommended that the Scientific Committee monitors developments in this area and continues its assessments, as new data become available.

Response of the Scientific Committee:

To be completed as new information becomes available.

Code/Meeting: 4.41/NAMMCO/13

Request:

The Management Committee has asked the Scientific Committee to carry out assessments of these species, but to date insufficient information has been available on stock delineation, distribution, abundance and biological parameters to initiate the work. The Committee was pleased to note that considerable progress has been made in the Faroes in describing the ecology and life history of white sided dolphins and that information on white beaked dolphins should be available from Iceland and Norway in about 2 years time. Abundance estimates are lacking in all areas except Icelandic coastal waters, and no information on stock delineation or pod structure is yet available. The SCANS survey planned for 2005/6 and coastal surveys planned for Norway (see 9.3) should provide information on distribution and abundance in some areas. The Committee endorsed the plan of the Scientific Committee to proceed with the assessments once the above-mentioned studies have been completed, probably by 2007.

Response of the Scientific Committee:

Pending.

Fin whale:

Code/Meeting: 4.42/NAMMCO/8

Request:

The Scientific Committee is requested to undertake an assessment of the status of fin whales in the North Atlantic based on all available data. (This request was later elaborated as follows: "Acknowledging the large amount of work involved in such a comprehensive assessment of all possible fin whale stocks in the North Atlantic, the Council requests the Scientific Committee, when conducting such comprehensive assessment, particularly to: - assess the stock structure of fin whales in the whole North Atlantic. - assess the long-term effects of annual removal of 50, 100 and 200 fin whales in the stock area traditionally assumed to have a main concentration off East Greenland and Iceland (EGI stock area), - identify MSY exploitation levels for that stock area.")

Response of the Scientific Committee:

The Scientific Committee established a Working Group on Fin Whales to deal with this request. The Working Group met in April 1999. Their report dealt with the stock structure of fin whales throughout the North Atlantic, and with assessment of the EGI stock. The Scientific Committee used the report of the Working Group to formulate advice and research recommendations to NAMMCO Council. Detailed assessment of

other fin whale stocks was not carried out, but will be if further requests from Council are forthcoming.

Code/Meeting: 4.43/NAMMCO/9
Request:

The Management Committee noted that the Scientific Committee has completed its assessment of the stock structure of fin whales in North Atlantic, and that more research on stock structure is required before firm conclusions can be drawn. The Management Committee therefore recommended that member countries initiate the research required to elucidate the stock structure of fin whales.
The Management Committee recommended that the Scientific Committee continue its assessment of fin whale stocks in the North Atlantic, focussing in the near term on the status of fin whales in Faroese territorial waters. The Scientific Committee should focus particularly on the following issues:
- Assess the long-term effects of annual removals of 5, 10 and 20 fin whales in Faroese waters;
- Information gaps that may need to be filled in order to complete a full assessment in this area.

Response of the Scientific Committee:

The Scientific Committee reactivated the Working Group on North Atlantic Fin Whales and used their report as the basis for their advice to the Council. The results of the assessments indicated that fin whales in the area have likely been substantially depleted by past harvests, but there was great uncertainty in the results. The Scientific Committee noted that in attempting to respond to the Council's request for advice on the long-term effect of various catch levels in the Faroese area, it had immediately become apparent that there is insufficient information on stock identity to carry out a reliable assessment of the status of fin whales in Faroese waters, and thus provide reliable advice on the effects of various catches. The Scientific Committee therefore recommended a research program primarily geared to understanding the stock relationships of fin whales around the Faroes.

Code/Meeting: 4.44/NAMMCO/10
Request:

The Management Committee noted that the requested assessment (see 4.38) had not been fully completed and awaited in particular the provision of more information on stock delineation. The Management Committee therefore recommended that the Scientific Committee continue its assessment, as new data become available.

Response of the Scientific Committee:

To be addressed as new information becomes available.

Code/Meeting: 4.45/NAMMCO/11
Request:

The Management Committee clarified its previous request for advice on fin whales, asking that the Scientific Committee continue with its assessments of fin whale stocks in the areas of interest to NAMMCO countries with existing and new information on abundance and stock delineation as it becomes available.

Response of the Scientific Committee:

The Working Group on Fin and Minke Whales met in November 2003 and provided stock assessments for the East-Greenland/Iceland stock and for Faroese fin whales

(SC/11).

Code/Meeting: 4.46/NAMMCO/13
Request:

The Management Committee noted that it had previously asked that the Scientific Committee continue with its assessments of fin whale stocks in the areas of interest to NAMMCO countries with existing and new information on abundance and stock delineation as it becomes available, and endorsed the plan of the Scientific Committee to complete an assessment for the Northeast Atlantic stocks and update assessments for other areas, probably in 2005.

Response of the Scientific Committee:

Pending.

Humpback whale:

Code/Meeting: 4.47/NAMMCO/11
Request:

The Management Committee noted the conclusions of the Scientific Committee that there was evidence of a rapidly increasing abundance of humpback whales around Iceland, and recommended that the Scientific Committee complete abundance estimates for this species as a high priority. The Scientific Committee should also consider the results of the "Years of the North Atlantic Humpback" (YoNAH) project as it pertains to member countries in providing advice for this species.

Response of the Scientific Committee:

The Scientific Committee concluded that the discrepancy between the NASS and YoNAH estimates suggests that the North Atlantic population of humpback whales is likely considerably larger than estimated in the YoNAH study (SC/11).

Code/Meeting: 4.48/NAMMCO/13
Request:

The Management Committee noted the conclusion of the Scientific Committee that there is evidence from the NASS of a rapidly increasing abundance of humpback whales in the Central North Atlantic. The Scientific Committee was requested to assess the sustainable yield levels for humpback whales, particularly those feeding in West Greenlandic waters. The management objective in this case would be to maintain the stock at a stable level.

Response of the Scientific Committee:

Pending.

5. OTHER

Code/Meeting: 5.1/NAMMCO/8
Request:

Greenland noted the need for greater input from hunters and users in the work of the Scientific Committee. While noting the need for scientists to be able to conduct their work on their own scientific terms in the context of their Committee meetings, it was suggested that scientists and users of marine mammal resources which are the subject of examination by the Scientific Committee could, for example, meet prior to meetings of the Scientific Committee in order to exchange information relevant to the work planned by the Scientific Committee. With these ideas in mind, Greenland recommended that concrete steps should be taken to provide for a more active dialogue between scientists and resource users. This recommendation was endorsed by Council.

Response of the Scientific Committee:

The Scientific Committee agreed to consider a proposal put forward by the Secretariat, to use the "Status of Marine Mammals in the North Atlantic" stock status reports as a means of incorporating the knowledge of marine mammal users. This proposal will be presented to NAMMCO Council for approval. (SC/7)

The Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic met jointly with the Scientific Working Group of the Joint Commission on the Conservation and Management of Narwhal and Beluga (JCNB) in May 2001. Prior to the main meeting, the Joint Working Group met with hunters from Greenland and Canada, and Canadian hunters participated throughout the meeting. (SC/9)

Code/Meeting: 5.2/NAMMCO/9

Request:

With respect to the language used in the Report of the Scientific Committee, Greenland suggested that it must be kept precise and simple. The Management Committee agreed to convey this as a suggestion to the Scientific Committee.

Response of the Scientific Committee:

No response.

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2.2
REPORT OF THE MANAGEMENT COMMITTEE WORKING GROUP ON BY-CATCH

Teleconference 19 February 2004

Droplaug Ólafsdóttir, chair of the Working Group, welcomed the participants (Appendix 1) to the meeting.

1. ADOPTION OF AGENDA

The draft agenda (Appendix 2) was adopted with minor changes. The List of Documents is provided in Appendix 3.

2. APPOINTMENT OF RAPPORTEUR

Daniel Pike, Scientific Secretary of NAMMCO, was appointed as Rapporteur.

3. INFORMATION REGARDING ONGOING MONITORING AND MANAGEMENT OF MARINE MAMMAL BY-CATCHES OUTSIDE THE NAMMCO AREA

3.1 European Union initiative

Bjørge presented proposed new regulatory measures to take effect in the EU designed to reduce the by-catch of dolphins and porpoises in selected EU fisheries (COM(2003)451). This regulation is sent to the Council and the Parliament for consideration and implementation.

The proposed Council regulation contains three specific technical measures, designed to address by-catch in EU waters and by EU vessels:

- Restrictions on Baltic Sea drift-net fisheries, to a maximum length of 2.5 km. The use of drift nets is to be prohibited altogether in the Baltic from 1 January 2007.
- Mandatory use of acoustic deterrent devices (pingers) in bottom-set gillnet, entangling net and gillnet fisheries in the Baltic Sea, North Sea and south western approaches.
- Use of on board observers in 'high risk' fisheries (including high opening, and single and pair pelagic trawl fisheries, as well as drift-nets, gillnets and entangling nets) in the North Sea, Baltic Sea, Mediterranean Sea, and in waters west of the British Isles, France and Spain. A minimum percentage of observer coverage for each fishery is specified in the proposal, being either five or ten per cent. It will be the Member States' responsibility to design and implement a monitoring scheme and appoint 'independent, properly-qualified and experienced' observers. Member States are required to take the necessary measures to ensure that vessels too small to accommodate on board observers are still covered, such as employing an inspection vessel to accompany fishing vessels.

It is proposed that this regulation will come into force on 1 July 2004, but could be subject to delays.

In discussion it was noted that no country appears to have a by-catch monitoring system that covers all fisheries where by-catch potentially occurs. Monitoring efforts are generally concentrated on "high risk" fisheries. Pre- and post-implementation data would be required to evaluate the success of the proposed mitigation measures.

4. REVIEW PROGRESS IN MONITORING AND MANAGEMENT OF MARINE MAMMAL BY-CATCHES WITHIN THE NAMMCO AREA

4.1 Progress in monitoring marine mammal by-catches by NAMMCO Member Countries

Mikkelsen noted that there had been no changes in the by-catch reporting system in the Faroe Islands. Fishery logbooks are mandatory for all vessels larger than 110 BRT, and no logbook system is in place for smaller boats. The logbook reporting system is not formatted for by-catch reporting, but fishers are instructed to report all by-catch as supplementary comments. Reporting is not mandatory for foreign vessels fishing in Faroese waters.

Motzfeldt reported that there had been no new developments in by-catch monitoring in Greenland over the past year.

Bjørge reported that the reporting of marine mammal by-catch in fishery logbooks has been mandatory for 1 year on larger fishing vessels in Norway. However there is no system in place to collect and analyse the data from the logbooks, so the effectiveness of the program is not known. The database program used by fishery observers in some fisheries has been modified to include recording of marine mammals, but these data have not been looked at as yet. There is presently no program in place to obtain data from small vessel (Sjark) fisheries.

Ólafsdóttir noted that the reporting of marine mammal by-catch in fishery logbooks is mandatory on all vessels in Iceland. These obligations were however not met by fishermen and no effective official control was in function until 2002. An effort to facilitate and introduce a procedure for reporting marine mammal by-catch through the log book system was initiated for the gillnet fishing fleet in 2002. The system is unchanged from last year.

4.2 Evaluation of procedures developed and implemented by NAMMCO Member Countries

The Working Group noted that, with the exception of Iceland, there had been little progress in developing and implementing procedures for monitoring by-catch in NAMMCO member countries. Although some by-catch is reported in the Faroes and Greenland, it is unlikely that this reflects the total amount of by-catch in these areas. Norway does not have a reporting system in place for non-observed fisheries. The Icelandic system is beginning to deliver some data but the coverage in terms of the proportion of vessels reporting remains low.

The Working Group considered that one way to move forward in improving by-catch monitoring would be to have each jurisdiction prepare a working document on the existing knowledge about marine mammal by-catch. These documents would be evaluated by the Working Group and used to develop recommendations and priorities for by-catch monitoring in member countries. Detailed terms of reference for the documents were not developed but at a minimum they should include:

- description of area fisheries, including species, areas, season and gear type; regulatory regime;
- description of existing by-catch monitoring programs, including methodology and coverage;
- known or estimated magnitude of marine mammal by-catch by species and fishery, using direct and indirect evidence;
- future plans to improve by-catch monitoring.

These documents should be prepared as working papers for the next meeting of the Working Group.

The by-catch monitoring system in Iceland has been operational for 2 years and it is now feasible to estimate total by-catch using these data. The Working Group decided that it would be useful at this point to have the Scientific Committee of NAMMCO evaluate the data collection procedures, data analysis and uncertainties associated with by-catch estimation using these data. This evaluation should be completed in time for the next meeting of the Working Group.

5. REPORTING OF BY-CATCH TO NAMMCO

5.1 Reporting in 2002.

Pike reviewed the by-catch information in the National Progress Reports for 2002. Norway did not use the revised format and hence did not report by-catch. The Faroe Islands reported no by-catch, but did not include a description of the methodology used, the fisheries covered or the extent of coverage. Greenland reported by-catch of humpback, fin and minke whales in the year 2001 and provided a brief description of how the data were collected. Iceland used the required format and provided a complete description of their monitoring program and the reported by-catch.

In the discussion the Working Group noted the continued lack of adequate reporting by some member countries and reiterated its recommendation from 2002 and 2003 for member countries to report their by-catch to NAMMCO through the new National Progress Report format.

6. OTHER ITEMS

No other items were discussed.

7. RECOMMENDATIONS

I. The Working Group, noting that the reporting of by-catch to NAMMCO was still not adequate, reiterated its recommendation from 2002 and 2003, that NAMMCO member countries report their by-catch to NAMMCO through the new National Progress Report format.

II. Noting the lack of progress in implementing monitoring programs for marine mammal by-catch in NAMMCO member countries, the Working Group recommended that the Management Committee should encourage member countries to increase their efforts in this area.

III. Member countries should prepare working documents outlining the existing knowledge about marine mammal by-catch in their jurisdiction, for the consideration of the Working Group at the next meeting. The documents should include, but not be limited to, the points noted under 4.2 above.

IV. The Scientific Committee should be requested to carry out an evaluation of the data collection and estimation procedures used in the Icelandic monitoring program.

8. FURTHER MEETINGS

The Working Group recommended that they meet in person in advance of the 14th meeting of the Council. At this meeting, the Working Group will evaluate the extent of marine mammal by-catch in member countries, based on the working documents noted above, and develop recommendations and priorities to improve monitoring programs. In addition the Working Group will consider the evaluation of the Icelandic program carried out by the Scientific Committee.

9. ADOPTION OF REPORT

The Report was adopted by correspondence on 24 February 2004.

Appendix 1 - **LIST OF PARTICIPANTS**

Ms Droplaug Ólafsdóttir (Chair, Iceland)
Dr Arne Bjørge (Norway)
Mr Bjarni Mikkelsen (Faroe Islands)
Ms Ulla Wang (Faroe Islands)
Ms Karen Motzfeldt (Greenland)
Mr Daniel Pike (NAMMCO)

Appendix 2 - **AGENDA**

1. Adoption of agenda
2. Appointment of rapporteur
3. Information regarding ongoing monitoring and management of marine mammal by-catches outside the NAMMCO area
   3.1 European union initiative
4. Review progress in monitoring and management of marine mammal by-catches within the NAMMCO area
   4.1 Progress in monitoring marine mammal by-catches by NAMMCO member countries
   4.2 Evaluation of procedures developed and implemented by NAMMCO member countries
5. Reporting of by-catch to NAMMCO
   5.1 Reporting in 2002.
6. Other items
7. Recommendations
8. Further meetings
9. Adoption of report.

Appendix 3 - **LIST OF DOCUMENTS**

NAMMCO/13/MC/BC/1	List of participants
NAMMCO/13/MC/BC/2	Draft agenda.
NAMMCO/13/MC/BC/3	List of documents
NAMMCO/13/MC/BC/4	National Progress Reports: By-catch reporting for 2002.
NAMMCO/13/MC/BC/5	Bjørge, A. Update on the European Union initiative.
NAMMCO/13/MC/BC/6	Ólafsdóttir, D. By-catch data on marine mammal from the sink net fishing fleet in Iceland 2002 and 2003

2.3
REPORT OF THE MEETING OF THE MANAGEMENT SUB-COMMITTEE ON INSPECTION AND OBSERVATION

Copenhagen, Denmark, 14 January 2004

The Management Sub-Committee on Inspection and Observation met in the Office of the Faroe Islands Government in Copenhagen, 14 January 2004 from 10:00 - 1130. Present were Egil Ole Øen, chair, (Norway), Jústines Olsen (Faroe Islands), Kristjan Loftsson (Iceland), Mads Lillelund (Greenland), Grete Hovelsrud-Broda and Charlotte Winsnes from the Secretariat.

1. - 2. ADOPTION OF THE AGENDA AND APPOINTMENT OF RAPPORTEUR

The agenda was adopted and the Secretariat was appointed as rapporteur.

3. THE 2003 SEASON

Enclosed as background documents were: Report from the last meeting, Provisions of the Scheme and Report from the Secretariat from the 2003 season.

Charlotte Winsnes gave a brief presentation of the 2003 observation season, drawing special attention to the following points:
- many uncontrollable factors among which weather plays a major role
- time-consuming for the Secretariat
- positive experience to focus on one activity

Based on a general discussion, the Committee recommended that the Secretariat review and evaluate the implementation of the Scheme after the 2004 season. To have a well functioning international Inspection and Observation Scheme on whaling and sealing is of the outmost importance. During the six years the Scheme has been in operation the focus has been on a variety of scope and range, such as in 3 countries with focus on all whaling and sealing activities to one country and one activity. The Committee agreed that it would be important to look at what we have learned so far. To see within which areas the Scheme has succeeded and where not and suggestions for improvement. The evaluation should only look at the implementation process and not the actual Provisions and Guidelines. The Committee stressed that the impression is that the Scheme is working according to the intentions of the Provisions.

The Committee reiterated the following recommendations from the last meeting:

- that member countries follow the prescribed procedures governing nomination and appointment of observers, and also nominate more than one observer candidate. It was emphasised that candidates may come from outside the nominating country.
- that each member country provides the Secretariat with detailed information on hunting statistics, quotas and time frames and places for the most optimum areas of observation, name of contact person in each region. This information is

imperative to ensure a well functioning scheme. It is however the Secretariat's responsibility to remind member countries to provide this information.
- that the one-page information sheet be translated into Greenlandic before the start of the 2004 season. Currently it is only in Norwegian.
- that the Secretariat update the NAMMCO web site with respect to the information on the Observation Scheme.

4. ANY OTHER BUSINESS

The Chair thanked the Committee members and the Secretariat for their efforts and especially thanked the Faroe Islands for their kind hosting of the meeting of the Committee.

5. ADOPTION OF THE REPORT

The final report of the meeting was approved by correspondence on 9 February 2004.

SECTION 3 - SCIENTIFIC COMMITTEE

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3.1
REPORT OF THE ELEVENTH MEETING OF THE NAMMCO SCIENTIFIC COMMITTEE

EXECUTIVE SUMMARY

The eleventh meeting of the NAMMCO Scientific Committee was held at the Greenland Institute of Natural Resources in Nuuk, Greenland.

HARP AND HOODED SEALS

The Scientific Committee used the report of the ICES/NAFO Working Group on Harp and Hooded Seals (WGHARP) as a basis for advice on these species. When WGHARP met in Arkhangelsk in September 2003, the stocks of Greenland Sea harp seals, White Sea / Barents Sea harp seals and Greenland Sea hooded seals were assessed. Management agencies had requested advice on "sustainable" yields for the stocks. "Sustainable catch" as used in the yield estimates for seals means the catch that is risk neutral with regard to maintaining the population at its current size within the next 10 year period.

Population assessments performed were based on a new population model that estimates the current total population size using the historical catch data and estimates of pup production. These estimates are then projected into the future to provide a future population size for which statistical uncertainty is provided for each set of catch options.

Harp seals
Distribution and migration
Results of a recent study on the movements of adult harp seals tagged in the Greenland Sea with satellite linked time depth recorders showed that many of the animals migrated to and stayed in the northern parts of the Barents Sea around and to the east of the Svalbard archipelago in the period July-December, to a lesser extent also in April. In January-March their occurrence was confined to the Denmark Strait and the Greenland Sea, where some of the animals stayed during the entire tracking period. While the seals spent much of their time in close association with the pack-ice, occurrence in open waters appeared to be quite common, particularly during summer and early autumn

Preliminary results were presented from a joint Norwegian/Russian study of marine mammal distribution in the Barents Sea, based upon aerial surveys in September and October 2002.The main conclusions were that harp seals were only observed near the ice edge which was north of the major areas of capelin and polar cod (*Boreogadus saida*) distributions. This confirms the findings of preliminary surveys in September 2001 which also concluded that there was no evidence of overlap between harp seals and capelin.

<u>The Greenland Sea stock</u>
Catches over the past 3 years have been only 4-15% of the allocated quota, which was 15,000 animals one year old or older (1+ animals). Parts of, or the whole quota, could

be taken as weaned pups assuming 2 pups equalled one 1+ animal.

From 14 March to 6 April 2002 airplane (photographic) and helicopter (visual) surveys were carried out in the Greenland Sea pack-ice to assess the pup production of harp seals using traditional strip transect methodology. The total estimate of pup production was 98,100 (cv 0.20). The stock in 2003 was estimated by modelling to be 349,000 (95% C.I. 319,000-379,000) 1+ animals with a pup production of 68,000 (95% C.I. 62 000-74 000).

Continuation of current catch level will likely result in an increase in population size. A catch of 8,200 1+ animals in 2004 would sustain the population at present level within a 10 year period. Catches twice the sustainable levels will result in the population declining by approximately 20-25% in the next 10 years.

The Barents Sea / White Sea stock

Combined Russian and Norwegian catches over the past 3 years have been 31-39% of the recommended sustainable yields (53,000 1+ seals, where 2.5 pups equalled one 1+ animal).

New airplane surveys of White Sea harp seal pups were conducted in March 2002 and 2003 using traditional strip transect methodology and multiple sensors. Pup production was estimated as 330,000 pups (cv 0.10) in 2002 and preliminarily as 328,000 (cv 0.18) in 2003. Based on Russian surveys in 1998, 2000 and 2002, the stock in 2003 was estimated by modelling to be 1,829,000 (95% C.I. 1,651,000 – 2,006,000) 1+ animals with a pup production of 330,000 (95% C.I. 299,000 – 360,000).

Continuation of current catch level will likely result in an increase in population size. A catch of 45,100 1+ animals, in 2004 would sustain the population at the present level within a 10 year period. If a harvest scenario including both 1+ animals and pups is chosen, one 1+ seal should be balanced by 2.5 pups. Catches twice the sustainable levels will result in the population declining by approximately 20-25% in the next 10 years.

Hooded seals

The Greenland Sea stock

Norwegian catches over the past 3 years have been 27-49% of the given quota (10,300 1+ animals where 1.5 pups equalled one 1+ animal).

Based on a Norwegian aerial survey in 1997, the stock in 2003 was estimated by modelling to be 120,000 (95% C.I. 65,000-175,000) 1+ animals with a pup production of 29,000 (95% C.I. 17,000-41,000). Because this estimate is over 6 years old it was decided that any advice provided should be extremely cautious. The Potential Biological Removals (PBR) approach was used to recommend a maximum catch level of 5,600 hooded seals in 2004.

NARWHAL

A successful narwhal survey was conducted in the Qaanaaq area in 2002 using aerial digital photography. However a survey in Melville Bay in August did not result in any sightings of narwhals. The surveys near Uummannaq in November had problems with darkness and wind conditions. Satellite tracking of narwhals in Baffin Bay is ongoing and data from previous satellite tracking studies are presently being analysed. Surveys of narwhal aggregations in Canada, and sample collection for genetic studies, are ongoing in Canada. There are plans for a survey of the narwhal wintering grounds in Disko Bay in March 2004. The Scientific Working Group of the JCNB will meet jointly with the NAMMCO Working Group in February 2004. The main topic of the meeting will be the assessment of narwhal stocks using all available information.

BELUGA

The next survey of belugas on the wintering ground in West Greenland is planned for March 2004. Results from this survey will – assuming successful completion – be available for revising the present advice in the autumn of 2004.

The Scientific Committee has advised on 2 occasions (2000 and 2001) that the West Greenland stock is substantially depleted and that present harvests are several times the sustainable yield, and that harvests must be substantially reduced if the stock is to recover. As yet no system of harvest control has been implemented in Greenland, and catches have not been reduced. The Committee stressed that the delay in reducing the catch to about 100 animals per year will result in further population decline and will further delay the recovery of this stock.

FIN WHALES

The Report of the Working Group on Minke and Fin Whales (Annex 1) from the meeting held in Copenhagen 20-22 November 2003 was considered under this item. The Scientific Committee has carried out fin whale assessments on 2 previous occasions. In 1999, the Committee dealt with the East Greenland-Iceland (EGI) stock. The Committee concluded that catches of up to 200 fin whales per year would be sustainable, but that such catches should be spread over the EGI stock area. In 2000, the Committee considered fin whales around the Faroe Islands, subjected to projected annual catch levels of 5, 10 and 20 whales. This assessment was problematic because there was virtually no information of the stock identity of fin whales around the Faroes. Nevertheless, it was concluded that fin whales in this area are likely substantially depleted, under all scenarios that were examined.

Given that new information has become available from abundance surveys, satellite tracking programs and reconsideration of historical catch series, in 2002 the NAMMCO Council requested that the Scientific Committee continue with its assessments of fin whale stocks in the areas of interest to NAMMCO countries.

New information

No new genetic information on fin whale stock structure has become available since the last review was conducted in 1998. Stock delineation remains the greatest barrier to the reliable assessment of North Atlantic fin whales, especially at a finer scale. One of 2 fin whales satellite tagged in the Faroes in August 2001 migrated southward as far as 46° N, at the latitude of the Bay of Biscay. This may indicate a stock connection between whales around the Faroes and off the Iberian peninsula, but it would be premature to draw conclusions from the movements of 1 animal.

An improved catch series derived from Faroese and other archival sources is under development. The new figures are somewhat lower for the early part of the 20th century than those in the IWC database.

New estimates of abundance for the EGI and Faroese areas were available from the NASS-2001. In addition a new estimate was available from the Norwegian 1995 shipboard sightings survey, covering the Northeastern Atlantic including the North Sea, the Norwegian Sea, the Greenland Sea and the Barents Sea.

Assessments

EGI

Assessment of the EGI fin whales utilised recent estimates of abundance from sighting surveys, and CPUE series for the 1901-1915 and 1962-1987 periods. Two independent assessments were available, one using HITTER/FITTER methodology and the other using a Bayesian approach. However approaches which treat the stock as homogeneous throughout the Central North Atlantic area fail because the population models applied cannot be reconciled with all 3 sources of data (the absolute abundance estimates and the 2 sets of CPUE data). In particular, such models have great difficulty in reflecting the large decline in CPUE observed in the 1901-1915 period.

To address this, two alternative assessment models used a 2 or more substock model approach, where historic catches have been taken from an "inshore" substock only, and there is diffusive mixing between this "inshore" and the "offshore" substock (in the 2-substock model). CPUE data reflect the behaviour of the "inshore" substock only, whereas sightings estimates relate to the combination of all substocks. This age-aggregated models allows both MSYR and the inter-substock mixing rates to be estimated, and provides an acceptable fit to all 3 sources of data. Under such analyses, the resource as a whole is estimated to be close to its pre-exploitation abundance. Projections under constant catch levels suggest that the inshore substock will maintain its present abundance (which is above MSY level) under an annual catch of about 150 whales for either assumption concerning the form of density dependence. It is important to note that this result is based upon the assumption that catches are confined to the "inshore" substock, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that the "offshore" substock was also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales.

Research recommendations provided by the Working Group included splitting the early CPUE series (1901-1915) between eastern and western Icelandic whaling areas. If new catches are taken, samples should be taken if possible both within and outside the traditional whaling grounds. The material should be investigated to get an updated view of age structure and sex distribution on and outside the whaling grounds, and biological parameters such as age at sexual maturity and fecundity. Additional samples for genetic analysis are required particularly from areas outside the traditional whaling grounds, such as East Greenland and northern and eastern Iceland. Satellite tracking should be attempted to investigate the movements of fin whales, particularly between the traditional whaling grounds west of Iceland and areas outside.

Faroes

The new information on abundance from NASS-2001 and the updated catch history available for the Faroes did not greatly change the conclusion reached in 2000 (NAMMCO 2001), that the fin whale stock around the Faroes was likely to be heavily depleted under most stock scenarios considered plausible. Under some of these stock scenarios even catches as low as 5 animals per year slow or halt the recovery of the stock, and higher catches result in further depletion in nearly all cases. The uncertainties about stock identity are so great as to preclude carrying out a reliable assessment of the status of fin whales in Faroese waters, and thus the Working Group was not in a position to provide advice on the effects of various catches. It may also be necessary to obtain clearer guidance on the management objectives for harvesting from what is likely to be a recovering stock before specific advice can be given.

In order to get better information on stock delineation in this area, biopsy sampling for genetic analysis from the Faroes and adjacent areas should be continued. Existing biopsy samples should be analysed as soon as possible. In addition satellite tracking should continue. The revision of catch statistics for Faroese and adjacent whaling operations should be completed, and the feasibility of preparing a CPUE index from Faroese and adjacent whaling operations should be investigated.

Other stocks

The Working Group considered that the availability of abundance estimates from NASS-1995 and the development of abundance estimates from more recent Norwegian surveys for fin whales in the Northeast Atlantic will make the assessment of fin whales in this area feasible. A careful examination and compilation of available data, including catch data, incidental sightings, Discovery tag markings and genetic sampling, is needed before such an assessment is conducted.

Discussion by the Scientific Committee

The Scientific Committee appreciated the recommendations of the Working Group toward an update of the spatially structured models in order to aim for a better reconciliation of the different data sources for EGI fin whales. The Committee furthermore recommended a sensitivity test based on alternative hypotheses, for example changing carrying capacity or inertial dynamics with an additional layer of density dependence that operates on intrinsic life history parameters. It was also noted that the data on trends in the age at sexual maturity for fin whales harvested by Iceland had not been compared to the model runs, and suggested that such comparisons be conducted because they may help to clarify whether the different model hypotheses are likely to reflect the true dynamics of the stock/s.

The Scientific Committee considered that the scheduling of future assessment meetings should be dependent on the completion of additional research and necessary preparatory work, as noted above. The next meeting will concentrate on assessment in the Northeast Atlantic (North and West Norway stocks), and on further development of assessments for the EGI and Faroes areas.

MINKE WHALES

The Scientific Committee carried out an assessment of the Central North Atlantic stock of minke whales in 1998 (NAMMCO 1999). The Committee concluded then that the stock was close to its carrying capacity, and that present removals would not adversely affect the stock. Similar conclusions were reached when the analysis was restricted to the feeding stock in the coastal waters of Iceland, the CIC small area. Since that time, more information has become available on the stock delineation of minke whales in the North Atlantic. New abundance estimates are available for the Central Stock area from NASS-2001, and for the Northeast Atlantic from Norwegian surveys conducted from 1996-2001. Therefore in 2002, the Council of NAMMCO requested that the Scientific Committee complete a new assessment of Central North Atlantic minke whales.

Recent genetic analyses have indicated that animals from the CM Small Area are different from those from the Eastern Medium Area (Annex 1 Fig. 1), and the existence of a separate sub stock in the North Sea. The Working Group concluded that for the purposes of assessment, the existence of a separate Central Stock of minke whales was supported by the available evidence. However there may be sub-structure within this area. While there is no data to support the existence of a separate stock in the CIC Small Area, most catching by Iceland has historically occurred here so it made sense to consider this as a separate area for precautionary sensitivity tests.

No new information on biological parameters had been published since the last review of this stock in 1998 (NAMMCO 1999). However recent work (Olsen 2002) had demonstrated that age estimates based on counting annulae in *tympanic bullae* were not reliable. Therefore any biological parameters that included age as a component (*e.g.* age at maturity, mortality, survival) must now be considered suspect. Other ageing methods, were being developed but had not yet been widely applied. The Working Group nevertheless decided to use the estimates of parameters used in the previous assessment, as they are unlikely to differ greatly from those for the Antarctic minke whale for which valid ageing methods are available. It was also noted that the assessment models used were relatively insensitive to variations in these parameters within a plausible range.

The catch series used in assessments were the same as that used in the 1998 assessment, with the addition of more recent catches by Norway in the CM Small Area and by East Greenland. A “High Catch” case was also developed which included assumed maximum annual levels of both bycatch (5) and unreported catch (10 per annum from 1986-2002) in Icelandic waters.

New abundance estimates available to the Working Group included those from the NASS-2001 and NASS-1987 aerial surveys covering coastal Iceland (CIC small area). A new estimate was also available from the NASS-2001 shipboard survey, considered to be negatively biased because of animals missed on the trackline and diving animals.

Assessment
The results from two independent analytical approaches indicated that the Central Stock of minke whales has not been appreciably impacted by past whaling, having a current abundance of mature females that is at least 85% of the corresponding pre-exploitation level. This result holds regardless of whether the CIC area is treated as an isolated stock, and across a wide range of assumptions concerning past catches, stock

boundaries, MSYR values and abundance estimates. Projections over the next 20 years indicate that, under all scenarios considered, a catch of 200 minke whales per year would maintain the mature component of the population above 80% of its pre-exploitation level over that period. Similarly, a catch of 400 per year would maintain the population above 70% of this level. This constitutes precautionary advice, as these results hold even for the most pessimistic combination of the lowest MSYR and current abundance, and the highest extent of past catches considered plausible. The advice applies to either the CIC Small Area (coastal Iceland), or to the Central Stock as a whole.

Questions remain about the stock delineation of minke whales in the Central Area, and further genetic sampling, particularly from Icelandic waters, East and West Greenland, and the Faroes is recommended. Analyses should use the same markers and methodologies as used by Norway so the datasets will be comparable. In addition, further satellite tracking to investigate spatial and temporal distribution in all areas is recommended. The development of valid ageing methods for North Atlantic minkes, using amino acid racemisation in the eye lens or other techniques, is required for the reliable estimation of biological parameters. Use of the number of *corpora albicantia* in females as a proxy for age in estimating biological parameters should be investigated.

WHITE-BEAKED, WHITE-SIDED DOLPHINS AND BOTTLENOSE DOLPHINS

The Council has asked the Scientific Committee to carry out assessments of these species, but to date insufficient information has been available on stock delineation, distribution, abundance and biological parameters to initiate the work. This year a series of working papers from the Faroes reported on research in progress on white sided dolphins, providing information on catches, biological parameters, feeding and genetics. Little progress has been made in analysing samples from white beaked dolphins collected from bycatch in Iceland. A report on the distribution and abundance of dolphins from the 4 aerial surveys carried out around Iceland between 1986 and 2001 is nearly complete, and further information on distribution is available from the NASS ship surveys. As yet no reliable information is available on bycatch of these species in Iceland. Norway will begin a sampling program focussing on white beaked dolphins in 2004, involving biopsy sampling for genetic and fatty acid analyses, and satellite tracking.

The Committee noted that considerable progress has been made in the Faroes in describing the ecology and life history of white sided dolphins, but that some analytical work remains to be completed and sampling will continue. The Committee was informed that satellite tracking will be attempted in the coming years in the Faroes, and that information on white beaked dolphins should be available from Iceland and Norway in about 2 years time. Abundance estimates are lacking in all areas except Icelandic coastal waters, and no information on stock delineation or pod structure is yet available. The SCANS survey planned for 2005/6 and coastal surveys planned for Norway (see below) should provide information on distribution and abundance in some areas. At this point the Scientific Committee considered that there was still insufficient information on abundance, stock relationships, life history and feeding ecology to go forward with the requested assessments for these species. This may become feasible once the above-mentioned studies have been completed, probably by 2007.

GREY SEALS

In 2001 the Scientific Committee noted that the abundance of grey seals around Iceland had decreased from an estimated 12,000 in 1992 to 6,000 in 1998, and that the annual catch of around 500 seals may not be sustainable. In contrast there have been apparent increases in the abundance of grey seals in other areas, including Southwest Norway, the United Kingdom and Canada. Grey seals are harvested or taken incidentally by fisheries and aquaculture operations in the Faroe Islands, Iceland and Norway. Subsequently the Scientific Committee was asked to provide a new assessment of grey seal stocks throughout the North Atlantic.

The Scientific Committee formed a Working Group on Grey Seals, chaired by Kjell Nilssen, which met in Reykjavik in April 2003 (Annex 2). The general terms of reference of the Working Group were:

- to assess the status of greys seals around Iceland, the UK, the Faroes, Norway, the Russian Federation, the Baltic, Canada and other areas;
- survey methods;
- stock delineation (genetics, temporal and geographical distribution);
- recommendations to the NAMMCO Council.

Iceland

The population status of the Icelandic grey seal, which has been investigated in the years of 1982, 1986, 1989, 1990, 1992, 1995, 1998 and 2002 by aerial census of grey seals pups on breeding sites. The Icelandic grey seal population appeared stable between 1982 and 1990, but since then, the pup-production has been declining by about 6% (95% CI 3% to 9%) annually. The abundance of the grey seals around Iceland in the year 2002 was about 5,000 animals. Recently following the decrease in population size, its distribution has contracted and it is now not found off the northeast coast, where some breeding occurred about 10 years ago.

The Working Group noted that it was obvious that harvests had been above sustainable levels for more than 10 years, and that the resulting decline in the population was well documented. While no management objectives have been identified explicitly, it is apparent that the implicit objective has been to reduce the stock to some undeclared level. There is an urgent need to identify clear and explicit limits for the stock and to regulate the level of harvest accordingly. If exploitation is continued at its present rate, it is likely that the population will be reduced to very low levels, and likely extirpated in many areas, within the next 10 years. The Working Group cautioned that, because the stock has been reduced and is still apparently declining, increased survey and monitoring effort will be required in the future. A formal assessment of the effect of present levels of harvest on the population, including the risk of extinction and the sensitivity of the survey program to detect a population decline, should be conducted as soon as possible.

If aerial surveys are used to monitor the population, a power analysis should be conducted using past data to determine what frequency of surveys is required to reliably monitor trends in the population. A minimum of 3 surveys per site within the breeding season are required. An alternative might be to combine a single aerial count with a ground survey with staging, or to use ground counts on the larger colonies. Harvesting, S/L and bycatch data should be directly included in the population model used to calculate the factor to convert pup counts to 1+ numbers.

Faroes

Based on historical sources, there seems to have been a long tradition for harvesting grey seals in the islands, mainly at breeding grounds. Grey seals in the Faroes mainly breed in caves, which is exceptional for the species. Today, the only take occurs in defence of fish farms. Catch statistics are not available, but from direct contact with fish farmers, the catch in 2001 was estimated to be in the order of 250 to 500 seals, which seems surprisingly high for the population. Present population size is unknown. No tagging experiments have been conducted on Faroese grey seals, but such studies on neighbouring populations have indicated that the annual number of British grey seals migrating into Faroese waters may be significant.

The Working Group expressed concern that the Faroese grey seal population is subject to an apparently high but unknown level of exploitation, and that this exploitation has developed rather recently since the advent of fish farming activities. There is no information on stock identity or abundance on which to base management advice. Nevertheless, the relatively high level of take, combined with the likely small size of the population, suggests that a precautionary approach is warranted.

The Working Group therefore strongly recommended immediate efforts to obtain better information on the population of Faroese grey seals, and on the nature and impact of the take in the Faroes. This should include documentation of all used and potential pupping sites, genetic studies, better data on removals and studies on life-history parameters.

Norway

Ship based surveys along the Norwegian coast in 2000-2002, combined with aerial surveys conducted in 1998 in northern parts of Nordland and Troms, show the number of pups born in Norwegian waters is about 1,030, which corresponds to about 4,400-5,500 seals (1+). Total annual catches of grey seals in Norwegian waters ranged from 34-176 animals in 1997-2002, which corresponds to 13%-49% of the scientifically based recommended quotas(which are 5% of the estimated population size), and 11%-35% of the given quotas. There are no catch statistics available prior to 1997. A change in management occurred in 2003 when quotas were at 25% of current population estimate. Also, a bounty of NOK 500 is to be awarded for each grey seal documented killed.

In discussion the Working Group noted that the new quota levels of 25% of the estimated population size would, if taken, certainly result in population reduction. In addition, some proportion of the animals shot are killed but not landed, and there may be a substantial bycatch of seals in the area. No formal analysis of the effect of this level of harvest on the population, including the risk of extinction the sensitivity of the survey program to detect a population decline, has been conducted. While harvests have been considerably below quota levels to date, the possibility that the quotas might be filled should be considered, especially now that a bounty system is in place. Clear management objectives should be developed for this stock.

The vessel-based surveys conducted from 2000-2002 have provided good information on the location and approximate size of breeding colonies along the Norwegian coast. This information can be used to develop a survey design that will provide more reliable estimates of seal abundance in the area. Regular surveys are required to determine trends in the population, and power analysis should be used to determine the survey interval and level of effort required. The possibility of using repeated aerial surveys, at least in areas to the south of Lofoten, should be further explored. Surveys should be co-ordinated with those along the Murman coast in the Russian Federation. In addition a more complete sampling program from the hunt should be established, including the collection of reproductive tracts and genetic samples.

United Kingdom
A 40 year time series of pup production estimates for the majority of the British grey seal colonies is available. The most reliable time series of estimates covers the period from 1984 to 2001. The average annual rate of increase between 1984 and 1999 was 6.3% ±0.26%, but this varied locally and regionally. Recent declines in pup production estimates from the surveys suggest one or more of the demographic parameters may be exhibiting some trend over time as well as year to year variation. The estimate for the total number of females alive just before the 1999 breeding season is 63,000 (95% CI 54,000 to 73,000). The point estimate for females and males is 109,000. These figures refer to seals associated with the annually monitored colonies, which hold over 85% of the British population. The reasons for the rapid population expansion in many areas of Scotland since 1960 are uncertain. There has been little harvest of this population since early in the 20th century. Some culling was carried out in the 1970's and 1980's, and this may have had the unintended effect of forcing females to found new pupping colonies, thus expanding the breeding habitat of the population. In addition, the human occupation of the isolated outer islands has decreased over the past 50 years, allowing the development of breeding colonies on these islands.

Baltic
The Baltic population is severely depleted relative to historical levels, but is recovering after a century of bounty hunting and 3 decades of low fertility rates caused by environmental pollution. However there have been radical changes in the Baltic Sea environment, due to the effects of fishing, depletion of other seal species, environmental pollution and possibly climate change, so there is no reason to expect that carrying capacity would be the same as historical levels. Nevertheless there appears to be room for expansion of this population. The growing population has led to increased interactions with the fishery, and demands have increased for the re-introduction of hunt. A demographic analysis and a risk assessment of the population has been carried out to make recommendations on how to decrease the risk of quasi-extinction (*i.e.* reduction below a threshold level) by overexploitation. Although hunting increases the risk of quasi-extinction, the risk can be significantly reduced by the choice of a cautious hunting regime. The least hazardous regimes allow no hunting below a ‘security level’ in population size. Obviously, to implement such a hunting regime knowledge of the population size and growth rate are required. A hunt

exceeding 300 females (less than 600 of both sexes) increases the risk for quasi-extinction substantially.

Russia (Murman Coast)

Grey seals on the Murman coast have been protected since 1958 and are included in the Red Data Book of the USSR and the Russian Federation. Few estimates of the numbers of grey seals inhabiting the Murman coast have been made. Investigations in the early 1960s suggested that about 600 seals inhabited the area at that time. Subsequent studies carried out in 1986 and 1991/92 have indicated that *ca* 850 pups are born in the area, suggesting a population of about 3,500 animals.

Eastern North America - Canada

Northwest Atlantic grey seals form a single stock, but are often considered as two groups, named for the location of the main pupping locales for management purposes. The largest group whelps on Sable Island. The second group, referred to as non-Sable Island or Gulf animals, whelps on the pack ice in the southern Gulf of St. Lawrence, with other smaller groups pupping on small islands in the southern Gulf of St. Lawrence and along the Nova Scotia Eastern Shore. Visual aerial surveys flown during January-February 1996, 1997 and 2000 in the southern Gulf of St Lawrence and along the Eastern Shore show that pup production has declined in this area. However, including Sable Island, the grey seal population has increased from slightly less than 30,000 animals in 1970 to over 260,000 animals in 2000. Currently, there is no commercial harvest for grey seals in Canada. In 2002, the Department of Fisheries and Oceans adopted an Objective Based Fisheries Management approach for seal populations. For “data rich” populations, management objectives ensure that the population size remains above a specific reference point. If harvesting results in a declining population, harvest quotas must be established at a level assuming a much lower risk that the population will continue to decline. If a population continues to decline below a reference limit point set at 30% below the maximum estimated population size, then it is considered that the population has suffered serious harm and harvesting is discontinued. For a population considered data poor, a more conservative approach, such as Potential Biological Removal (PBR), will be adopted.

Eastern North America - USA

Grey seals were historically distributed along the U.S. east coast (from Maine to Connecticut). Native and bounty hunting extirpated the population and they were rarely sighted for most of the 20th century. Seals tagged on Sable Island as pups were observed in New England during the 1980’s and 1990’s. Breeding began in 1988 and minimum pup production increased from 4 in 1988 to over 800 in 2002. Two additional breeding sites were discovered in Maine in 1994. The grey seals currently found in New England are probably a mixture of Canadian migrants and animals born locally. Continued surveys, historic research, genetic analysis and fieldwork should provide further insight into this recolonisation event and the current status of grey seals in the U.S.

Discussion by the Scientific Committee

The Scientific Committee endorsed the management advice and recommendations for research put forward by the Working Group. Víkingsson informed the Committee that the Marine Research Institute in Iceland had assumed more responsibility for research on grey seals. Surveys will be conducted annually at selected breeding colonies in

Iceland. Repeated surveys will be flown and ground surveys will be conducted to assess pup staging. Haug noted that the last portion of the Norwegian coastal survey is being conducted and a complete estimate should be available in 2004. No research on grey seals is presently being conducted in the Faroes.

HUMPBACK WHALES

The Scientific Committee has previously noted that there is evidence of a rapidly increasing abundance of humpback whales around Iceland, and the Council has recommended that the Scientific Committee complete abundance estimates for this species as a high priority. The Scientific Committee was also asked to consider the results of the "Years of the North Atlantic Humpback" (YoNAH) project as it pertains to member countries in providing advice for this species.

A new abundance estimate calculated from the Norwegian NASS-1995 shipboard sightings survey covered the Northeastern Atlantic including the North Sea, the Norwegian Sea, the Greenland Sea and the Barents Sea. The sightings of humpback whales were nearly exclusively made in the Bear Island shelf area, which is known to be an important habitat for humpbacks in summer time. The abundance estimate for the entire survey area was 1,210 (cv 0.255).

The total abundance of humpbacks in the North Atlantic has been estimated at 10,752 (cv 0.068) for the West Indies breeding population only, and 11,570 (95% CI 10,290-13.390) for the entire North Atlantic (Stevick *et al.* 2003). These estimates, which apply to 1992-93, are derived from the YoNAH project, which used mark recapture analysis of photo-id and biopsy data. The estimates from the NASS in 1995 and 2001 are higher, but these apply only to the survey area around Iceland and the Faroes (and Norway in 1995). Because of the low precision of the NASS estimates, there is no significant difference between YoNAH and NASS estimates. However, the YoNAH estimate is said to apply to the entire North Atlantic whereas the NASS estimates apply only to the area around Iceland and the Faroes (and Norway in 1995). Other areas with known concentrations of humpback whales, such as eastern Canada, the Gulf of Maine, and West Greenland, are not included in the NASS estimates. The YoNAH estimate should therefore be considerably larger than the NASS estimates, which apply only to 1 or 2 of potentially 5 feeding areas in the North Atlantic.

The YoNAH estimate for the North Atlantic is negatively biased for at least 2 reasons: animals that do not breed in the West Indies are under-represented; and the area east of Iceland was poorly sampled. This latter area accounted for the bulk of the NASS estimates in 1995 and 2001. Conversely the NASS shipboard estimate from 1995 may be positively biased because of possible double counting, although most other potential biases for the NASS estimates are negative. Nevertheless these biases could not fully account for the apparent difference between the YoNAH and NASS point estimates.

The Scientific Committee concluded that the discrepancy between the NASS and YoNAH estimates suggests that the North Atlantic population of humpback whales is likely considerably larger than estimated in the YoNAH study. Further studies are needed to resolve these differences more fully. In particular, photo-id/biopsy studies need to sample humpback whales in all important habitats around Iceland. It is also recommended that available humpback survey estimates from all feeding aggregations in the North Atlantic should be compiled. For future NASS, consideration should be given to designs suitable for humpback whale feeding aggregations, and to extending the survey coverage.

NORTH ATLANTIC SIGHTINGS SURVEYS

The Working Group on Abundance Estimates met in St Andrews, UK in March 2003. The Working Group was tasked with continuing the evaluation of abundance estimates for target and non-target species, determining if additional analyses are required and recommending estimates for acceptance by the Scientific Committee.

Minke whales

An estimate of the abundance of minke whales form the NASS ship survey around Iceland and the Faroes was presented. This area is exclusive of the aerial survey block around Iceland. The point estimate of 23,955 (cv 0.30) is higher but not significantly so than the estimate from roughly the same area from the 1995 NASS. The distribution of minke whales differed somewhat between the surveys, with many more sightings in the Faroese block in 2001 than in 1995. The distribution of radial, and especially perpendicular distances realised in the survey was highly peaked, possibly due to operational problems on the survey. However the Working Group concluded that the detection function was appropriate for these data, and that the abundance estimate should be comparable to earlier surveys. The Working Group recommended that further efforts be made to use the double platform data to estimate bias due to visible whales missed by observers for this species.

New abundance estimates from the NASS aerial surveys around Iceland carried out in 1987 and 2001 were considered. The new estimates included corrections for previously uncorrected biases. For the 1987 survey the new estimate was 19,320 (cv 0.28) animals for the originally designed strata, while for 2001 it was 43,600 (cv 0.19). Both estimates assume a cueing rate for minke whales of 53 surfacings per hour. Sampling variability in this estimated cueing rate has not been accounted for in the variance of the abundance estimate, which therefore is negatively biased. The estimate from the aerial survey for coastal Iceland in 2001 is more than double that for 1987, however the difference is not significant. The Working Group concluded in 2002, based on line transect analysis of the density of minke whales from the 4 aerial surveys carried out since 1986, that the abundance of minke whales around Iceland has been stable or shown a moderate increase over the period. This conclusion remained unchanged.

Humpback whales

New estimates of humpback whale abundance from the 1995 and 2001 Icelandic and Faroese surveys were considered. These estimates used “spatial analysis”, which relates observed density to environmental variables such as location and water depth. The estimate for the 1995 ship survey was higher than that from a conventional analysis, but less precise. The estimate from the 2001 shipboard survey 14,259 (cv 0.50). A calibration factor to make the aerial and shipboard abundance estimates compatible was calculated using data from the areas of overlap between the respective shipboard and aerial surveys. Using this calibration factor, the estimated abundance from the aerial survey was 15,270 in 1995, and 9,920 in 2001. The high variance of these estimates was a disappointment to the Working Group which had hoped the use of spatial covariates would increase the precision of the abundance estimates. The major reason suggested for this was that the main variables determining humpback distribution are probably not location and depth, so that spatial models using these variables alone have limited ability to reduce variance.

In 2002 the Working Group reviewed an analysis of the trend in encounter rate over the course of the 4 Icelandic aerial surveys carried out since 1986 which showed an increase of 11.4% (SE 2.1%) per year over the period in the survey area. This rate of increase is in accordance with that of 11.6% over the period 1970 to 1988 in recorded sightings humpback whales by whalers operating west of Iceland reported by Sigurjónsson and Gunnlaugsson (1990). The total estimates from the spatial analyses of the 1995 and 2001 surveys do not reveal a trend over the period, but they are much higher than estimates from earlier surveys. All available evidence indicates that the abundance of humpback whales around Iceland has increased since 1987.

Other species

New estimates from Icelandic and Faroese NASS shipboard surveys were considered for pilot whales (2001), northern bottlenose whales (1995 and 2001), and blue whales (1995 and 2001). These estimates are negatively biased by animals missed by observers, diving animals and inadequate spatial/temporal coverage (especially for pilot and northern bottlenose whales). For northern bottlenose and blue whales the Working Group considered that these serve as useful first approximations of abundance in the survey area. The Scientific Committee agreed with the conclusion of the Working Group that estimates from the NASS-1995, 1987 and 2001 for pilot whales were likely biased mainly because they did not cover the area occupied by the stock early in the summer. The estimate from NASS-89, which covered areas farther to the south and occurred later in the summer, is still considered the best available for this species. Monitoring of the abundance of this stock is advisable as it is a harvested species, and future surveys should take this into consideration. However it may be possible to derive an abundance index from the other surveys, which covered similar areas at the same time of year, and the Committee recommended that such an index be developed as an interim measure. The SCANS and other coordinated surveys to be conducted in 2005/6 may provide an opportunity to get a new abundance estimate for this species

Future of the NASS

The NASS have been highly successful in providing important information on the distribution and abundance of cetaceans over a broad area of the North Atlantic. This information becomes more valuable every time a survey is completed, as it provides an indication of trends in abundance over meaningful time periods. The Scientific Committee emphasised the importance of these surveys and recommended that they be continued in some form at regular intervals.

Several countries are planning surveys which may offer opportunity for integration into a large-scale survey. Iceland will continue surveys on a 5-6 year rotation, with the next survey tentatively planned for 2006. A new SCANS is being planned for 2005/6, with the offshore portion to be conducted in 2006. The survey will cover the North Sea and adjacent waters, and the North Atlantic EEZ's of all European Union countries. The Faroe Islands is planning a survey of small cetaceans to coincide with the offshore portion of SCANS in 2006. Norway will continue its rotational survey program, but integrate it with other surveys to the extent feasible. Therefore the best opportunity for a future large-scale integrated sightings survey would appear to be in 2006. The Scientific Committee recommended that Iceland, the Faroes, Greenland and Norway make every effort to coordinate their survey activities with other countries into an integrated NASS in 2006. Such co-ordination can occur through this Committee, as has been done in 1995 and 2001.

PUBLICATIONS

Five volumes of NAMMCO Scientific Publications have now been published:

- Vol. 1 *Ringed seals in the North Atlantic*, Vol 2 *Minke whales, harp and hooded seals: Major predators in the North Atlantic ecosystem,* and Vol. 3 *Sealworms in the North Atlantic: Ecology and population dynamics*, Vol. 4 *Belugas in the North Atlantic and the Russian Arctic,* and Vol. 5 *Harbour porpoises in the North Atlantic.* The latter was published late in 2003.

The following volumes are planned:

- Vol. 6: North Atlantic Sightings Surveys, ed. Nils Øien and Daniel Pike. To be published early in 2005. Vol. 7: Grey Seals in the North Atlantic, ed. Tore Haug and Droplaug Ólafsdóttir. To be published in 2005. Vol. 8: Narwhal, ed. Mads Peter Heide-Jørgensen and Øystein Wiig. Planning is tentative, but may be published in 2006 if it goes forward.

The Committee recognised that the production of these volumes involved a significant cost and workload to the Secretariat. Every effort should be made to streamline the publishing process to reduce the workload and the time required to produce the books. It was also recommended that the papers in the volumes be made available on the internet some time after publication. The Secretariat will investigate this possibility.

FUTURE WORK PLANS

The 12th meeting will be held in the Faroes in October at a location and date yet to be determined.

Working Group on the Status of Beluga and Narwhal in the North Atlantic

The Working Group will meet jointly with the Scientific Working Group of the JCNB in February 2004, mainly to deal with narwhal assessments. Dr Øystein Wiig is chairman.

Working Group on Marine Mammal – Fisheries Interactions

The Working Group will meet immediately prior to the Scientific Committee meeting in October 2004 to evaluate new applications of multispecies models and new empirical data on the diet of and consumption by marine mammals. Lars Walløe is chairman.

Satellite Tagging Correspondence Group

The Scientific Committee stressed the necessity for the Satellite Tagging Correspondence Group to complete its task of addressing methodological/technical

Gissues in a timely manner. Chairman Bjarni Mikkelsen anticipated that the Group would begin its work early in 2004.

ELECTION OF OFFICERS

Lars Walløe was elected as Chairman, and Dorete Bloch as Vice Chairman, of the Scientific Committee. The Committee expressed its thanks to Gísli Víkingsson for his able chairmanship over the past 3 years.

OTHER ITEMS

By-catch

In reviewing the National Progress Reports, it was noted that there were as yet not systematic programs to report by-catch in any member country. There are indications that by-catch of harbour porpoises in Iceland may be substantial, and the extent of by-catch in Norway is completely unknown as no reporting system is in place. The Scientific Committee expressed concern about this matter and noted that all human induced mortality must be accounted for in assessments.

REPORT OF THE ELEVENTH MEETING OF THE NAMMCO SCIENTIFIC COMMITTEE

1. CHAIRMAN'S WELCOME AND OPENING REMARKS

Chairman Gísli Víkingsson welcomed the members of the Scientific Committee to their 11th meeting (Appendix 1), held at the Greenland Institute of Natural Resources in Nuuk. He also welcomed the Observer from Japan, Tomio Miyashita. Member Lars Walløe did not attend the meeting.

2. ADOPTION OF AGENDA

The Draft Agenda was accepted without changes (Appendix 2).

3. APPOINTMENT OF RAPPORTEUR

Daniel Pike, Scientific Secretary of NAMMCO, was appointed as Rapporteur.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

4.1 National Progress Reports

National Progress Reports for 2001 from the Faroes, Greenland, Iceland, and Norway were presented to the Committee. In addition a Report was presented from Canada.

It was noted that there were as yet not systematic programs to report bycatch in any member country. There are indications that bycatch of harbour porpoises in Iceland may be substantial, given that over 200 were reported bycaught in 2002 with an unknown but probably low incidence of reporting. Bycatch rate in Norway is completely unknown as no reporting system is in place. The Scientific Committee expressed concern about this matter and noted that all human induced mortality must be accounted for in assessments.

Because of the timing of the Scientific Committee meeting, much of the information on research programs in the reports is nearly one year old when they are received. It was therefore recommended that a new section be added to the Reports to briefly describe research activities being carried out in the current year.

The Observer from Japan, Dr Tomio Miyashita, presented a report on recent Japanese research on cetaceans in the North Pacific. Research is conducted on several species, including minke, Brydes, fin, Baird's beaked and pilot whales, and several species of dolphins and porpoises. In the past year sightings surveys have been conducted in the Sea of Okhotsk and the Sea of Japan, with minke whales and Dall's porpoises as the main target species. Aerial surveys have been conducted in other areas. Other research has included satellite tracking of dolphins, photo ID studies of Brydes whales, and acoustic surveys of sperm whales. The Chairman thanked Dr Miyashita for his interesting presentation and noted the many areas of shared research interest between NAMMCO and Japan.

4.2 Working Group Reports and other documents

Working Group Reports and other documents available to the meeting are listed in Appendix 3.

5. CO-OPERATION WITH OTHER ORGANISATIONS

5.1 IWC

The 55th meeting of the Scientific Committee of the International Whaling Commission (IWC SC) was held in Berlin from 24 May to 6 June. Daniel Pike attended as observer for the NAMMCO Scientific Committee. Items relevant for the interest for the NAMMCO Scientific Committee that were covered at the meeting are presented below.

The RMP Subcommittee carried out an implementation review of North Atlantic minke whales. Consideration of recent analyses using genetics, fatty acids, trace elements, radioisotopes and organochlorine pollutants led the Subcommittee to conclude that the present stock boundaries of the West Greenland, Central and Northeast Atlantic stocks should be maintained. There was evidence for a distinct North Sea (EN) stock within the Northeast Medium Area. The northern border of the EN small area was moved from 65° N to 62° N based on genetic evidence. There was no evidence for a distinct stock in the EC small area. This small area was therefore eliminated and merged into a new small area designated EW. A western boundary to the EB small area was added at 28° E, based on genetic differences between this area and areas further east.

The Subcommittee reviewed abundance estimates which had become available since the previous review, and their suitability for use in Implementation Simulation Trials (IST) and/or setting catch limits under the RMP. Estimates from Norwegian surveys carried out between 1996-2001 and the Icelandic aerial survey from NASS 2001 were accepted for IST and the RMP. Estimates from Icelandic and Faroese ship surveys from NASS-1995 were accepted while recognising that they are biased because of uncorrected *g(0)*. It was considered that further work was required on the Icelandic ship survey estimate from NASS-2001 to address the significance of the very spiked detection function.

In light of the new information on stock delineation and abundance, the Subcommittee decided that no further IST were necessary at present. It was recognised that if evidence emerges that site specific feeding behaviour is heritable for this stock, a new series of trials incorporating this trait may be required. However the evidence for this is equivocal at present and it was decided this issue could be taken up at the next Implementation Review if necessary.

The IWC SC noted that the need for an abundance estimate for West Greenland minke whales was urgent and recommended that a conventional cue counting survey be carried out off West Greenland in 2003.

A great deal of time was devoted to selecting an RMP variant for North Pacific minke whales. This process has taken more than 10 years. Discussion centred around the relative plausibility of the 4 stock hypotheses considered. In the end no consensus could be reached and all hypotheses were assigned equal plausibility. The Committee could not reach a full consensus on recommending an RMP variant to the Commission, due primarily to the disagreement over stock structure plausibility mentioned above. The Committee therefore gave the Commission a choice of 2 variants.

The Committee also considered the effects of restricting catches to Exclusive Economic Zones (EEZ), in terms of risk to stocks and catch performance. It was concluded that catches could be taken from small areas within an EEZ or straddling an EEZ boundary, but not from small areas outside an EEZ. Therefore, in the case of a management situation with at least some small areas outside an EEZ, restricting catches to within the EEZ would have the effect of reducing catch and reducing risk to the stock.

In June 2002 the Committee held a workshop on modelling cetacean – fishery interactions. In considering the report from the workshop, the Committee agreed that this was an important area of research, but there was disagreement as to whether it was important for the management of whale populations. It was agreed that existing modelling approaches have not developed to the stage where they can be used for quantitative prediction, but that it might be possible to make tentative qualitative predictions if several models predict similar results. The Committee suggested that a possible next step in this area would be to hold a workshop on the functional responses of predators to varying prey abundance.

Iceland presented a proposal for a feasibility study involving the take of 100 minke, 100 fin and 50 sei whales annually for 2 years. The proposal has multiple objectives, but the main ones are feeding ecology for minke whales and estimating biological parameters for fin and sei whales. Criticism of the proposal centred on the "feasibility" nature of the study, the need for lethal sampling to achieve the stated objectives of the program, and the effect of the lethal takes on stocks of fin and sei whales. In this regard NAMMCO assessments of fin and minke whales were presented.

The IWC Scientific Committee is initiating a major project called "Testing of Spatial Structure Models" (TOSSM). This will involve the development of software to generate simulated genetic data, which will be used to test statistical methods for stock discrimination. The software will be made publicly available. Next year the Scientific Committee will consider non-genetic methods of stock delineation, including satellite tracking.

5.2 ICES

Haug reported on recent developments in ICES. The ICES Working Group on Marine Mammal Ecology (WGMME) met 25-29 March 2003 in Hel, Poland, to develop further the response to the European Commission standing request regarding fisheries that have a significant impact on small cetaceans and other marine mammals. Updated information on cetacean populations and on by-catches in gillnets, pelagic trawls and other gear were reviewed, and various ways to avoid by-catches were discussed. WGMME concluded that more information about small cetacean abundance as well as the magnitude of by-catches are required throughout EU (and Norwegian) waters, and that work on new mitigation methods should be given high priority.

WGMME also reviewed the status of populations of Baltic seals (Baltic, Saimaa and Ladoga ringed seals, harbour seals and grey seals) and harbour porpoises. Theses reviews included abundance, distribution, migrations, reproduction, pollutants, health, and interactions with commercial fisheries and iontentional killing. Development of a monitoring programme for Baltic mmarine mammals was discussed.

Another item discussed by WGMME was the Ecological Quality Objectives (EcoQOs) for seal populations in the in the North Sea. One of the EcoQOs adopted in the Bergen Declaration assumes that no seal population in the North Sea shall decline more than 10% in 10 years. The group concluded that management strategies in most countries are appropriate in relation to this. However, the recent changes to Norwegian management of grey and harbour seals in achieving substantial reductions in the populations was a matter of concern for the group. EcoQOs for the bycatch of harbour porpoises (great concern) and for seal breeding sites were also discussed, and preliminary findings from the 2002 seal epizootic event in the North Sea were reviewed. Finally, census techniques for grey and harbour seals were reviewed, and a process to construct a time series of marine mammal abundance, diet, and consumption rates for the North Sea since 1963 was discussed.

After evaluating its history of providing advice on harp and hooded seal harvests in the North Atlantic the Joint ICES/NAFO Working Group of Harp and Hooded Seals (WGHARP) felt the need to re-evaluate its approaches to harvest modelling for the two species. For this reason, a workshop to "Develop Improved Methods for Providing Harp and Hooded Seal Harvest Advice" was convened in Woods Hole, Massachusetts, USA on 11-13 February 2003 (ICES 2003). The workshop reviewed and discussed a variety of marine mammal harvest management regimes and different assessment models (including data availability and requirements). Also, the workshop concluded that a management framework for harp and hooded seals needs to be developed which incorporates biological reference points, and it provided WGHARP with some guidelines in this respect. When WGHARP met at SevPINRO, Arkhangelsk, Russia, from 2-6 September 2003 the report from the workshop was evaluated. Furthermore, WGHARP assessed harp seals in the Barents Sea / White Sea and harp and hooded seals in the Greenland Sea, under terms of reference provided by the ICES Advisory Committee of Fishery Management (ACFM), and the process with definition and implementation of biological reference points for the stocks in question was started (See also sections 9.1, 9.2 and 9.9).

The 2003 ICES Annual Science Conference (ASC, at the 91st Statutory Meeting of ICES) was held in Tallinn, Estonia, 24-27 September 2003. Several ICES committees (*e.g.*, Living Resource Committee and Marine Habitat Committee) deal with marine mammal issues. Thus, both present and future theme sessions at the ASC are designed with marine mammals included as an integral part. Relevant sessions at the 2003 ASC were:

- In theme session N ("Size-Dependency in Marine and Freshwater Ecosystems") information presented on diets of cetaceans stranded on the English Channel coast showed that the prey size of common dolphins were smaller than expected and suggested that the common dolphin could be a competitor with many finfish species in the area. The issue of sample size, due to the reliance on strandings and bycatch data, was discussed in the session, and various methods apart from stomach analyses, as well as the comparison of bycatch and stranding results were suggested as possibilities for future comparison.

- Theme session U ("The Scope and Effectiveness of Stock Recovery Plans in Fishery Management") was aimed to review the origin, structure and implementation of recovery plans for a wide range of stocks and locations in order to provide the oportunity to identify their common features and the factors relevant to their success. In many stocks recovery have not been particularly successful, and the causes of failure were discussed and assumed to be a combination of management implementation, coupled with scientific issues such as concerns about the precision of many age-structured stock assessment procedures, and the frequent difficulty of distinguishing between fishing, environment, multispecies interactions and non-fishery factors such as seal predation.
- In theme session V ("Mixed and Multi-Stock Fisheries – Challenges and Tools for Assessments, Prediction and Management") a number of papers dealing with mixed and multi-stock fisheries , including those for whales, were presented. The whale presentation described how IWC had developed the Revised Management Procedure (RMP) through simulation to ensure that management is robust to uncertainty regarding the population dynamics.
- Theme session Y addressed the issue "Reference Point Approaches to Management within the Precautionary Approach", and one of the presentations suggested that it would be possible to identify aspects of predator (birds, mammals) ecology as indicators of healthy ecosystems. It was assumed that the identification of "sensitive" predator species could permit development, from empirical studies, of reference points that would act in a precautionary way to protect the broad community of dependent wildlife.

Future theme sessions relevant to marine mammal issues include, but may not be restricted to: "The Life History, Dynamics and Exploitation of Living Marine Resources: Advances in Knowledge and Methodology" and "Modelling Marine Ecosystems and Their Exploitation" (intended for the 2004 ASC in Vigo, Spain); "Monitoring Techniques and Estimating Abundance of Seals and Whales" and "Mitigation Methods for Reduction of Marine Mammal and Sea Turtle By-Catch in Fisheries" (intended for the 2005 ASC in Aberdeen, Scotland).

Hovelsrud-Broda informed the Committee that efforts to establish a Memorandum of Understanding with ICES to increase cooperation at the scientific level were underway. Given the large area of shared interest between the 2 organisations, the Scientific Committee considered that it would be useful to have such a formal relationship.

5.3 Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga

Neither the NAMMCO nor the Joint Commission Scientific Working Groups have met since the last meeting of the Scientific Committee. Witting, Chairman of the JCNB Scientific Working Group, reported that the next meeting would be held in February 2004, jointly with the NAMMCO Working Group (chairman Øystein Wiig). The resulting Joint Working Group will concentrate on the assessment of narwhal stocks at this meeting (see section 9.4 and 9.5).

6. INCORPORATION OF THE USERS KNOWLEDGE IN THE DELIBERATIONS OF THE SCIENTIFIC COMMITTEE.

Hovelsrud-Broda reported to the Scientific Committee from the Conference on User Knowledge and Scientific Knowledge in Management Decision-Making, held in Iceland in January 2003. More than 120 participants from 11 countries attended the Conference, among them hunters, fishermen, scientists, resource managers and others. The goal of the conference was to find ways to incorporate user knowledge into the management decision-making process in parallel with science, and not as a part of the scientific enterprise. Users (whalers, sealers, fishers etc) hold valuable knowledge that can be better utilised by the managers of the resources. The key topics for the Conference were:

- National and international aspects of resource management, and the structure of the decision-making process at several levels;
- Existing projects that consider user knowledge in management;
- How user knowledge and scientific knowledge is gathered, kept and transmitted;
- The strength and weaknesses of the two types of knowledge;
- An examination of the co-operation between scientists and users with respect to the utilisation of their knowledge; and
- The role and application of user knowledge and scientific knowledge in management decisions.

A number of common themes emerged from the presentations and discussions, including the following:

- There is a need for involvement by the users in both scientific projects and in the management decision-making process. This involvement should be formal and maintained throughout the process starting with the design of the projects;
- There is a need for documenting the availability of user knowledge and its characteristics;
- Continuity and accountability are important to build trust between the parties. The concept of social learning was introduced as a methodology for achieving this;
- A significant investment of time, effort and money is necessary for the process to go forward. There are no simple, short-term solutions;
- All parties must show humility, and recognise the fallibility and limitations of both forms of knowledge;

The Conference drafted a set of recommendations (NAMMCO 2003 p. 73), and the Secretariat presented a set of conclusions to be considered by the Council. At its 12 meeting in March 2003 the NAMMCO Council agreed to move the process forward by 1) publishing the presentations from the Conference along with a review of other management system that have involved user knowledge, and 2) establishing a Working Group under the Management Committee with its terms of reference based on the recommendations and conclusions from the Secretariat.

In discussion it was noted that the incorporation of users knowledge into management decision making was now being treated as a process parallel to the use of scientific advice by the Council. The Scientific Committee will therefore await the conclusions of the new Working Group about what role, if any, the Committee can play in this process.

7. UPDATE ON STATUS OF MARINE MAMMALS IN THE NORTH ATLANTIC

At its 8th meeting in 1998 the Council asked the Scientific Committee to develop a strategy for how to incorporate the knowledge of users in the advice provided by the Scientific Committee. A strategy to utilise Stock Status Reports as a means to incorporate user knowledge was approved by the Scientific Committee at their 7th meeting. Under this system stock status reports would be developed by the Scientific Committee on stocks for which the Committee had provided advice. These documents would be used as the basis of discussion with user groups, and their input would be incorporated. The resulting documents would then reflect the best available scientific and user knowledge about the stock.

At its 9th meeting in 1999 the Council endorsed this proposal. Two stock status reports, on minke and pilot whales, have since been completed, but the process of integrating user knowledge has been delayed pending the outcome of a NAMMCO conference on this topic (see Item 6). Last year the Scientific Committee reiterated the importance of completing these documents, and suggested the idea of contracting out production of the reports should be considered. Pike reported that competing priorities continued to delay production of these reports. However, 3 reports (minke whales, pilot whales and ringed seals) have been placed on the NAMMCO Web Site this year. In addition, a contractor is presently working on the reports for walrus, beluga and fin whales, and these should be ready for review by the Scientific Committee by the end of the year.

8. ROLE OF MARINE MAMMALS IN THE MARINE ECOSYSTEM

8.1 Progress on modelling

Walløe provided a written report on this item. Dr Tore Schweder (Norway) has developed a new scenario model which incorporates harp seals, minke whales and 3 fish species (cod, capelin and herring). Evaluation and further development of this model has just started. This new *Scenario Barents Sea* incorporates improved minke whale and cod predation models. Results from the new combined model will be presented in March in the planned governmental white paper to the Norwegian parliament on marine mammals (*Stortingsmelding om sjøpattedyr*). In addition, work on assessment models for capelin and herring which incorporates predation by harp seals and minke whales is continuing in Norway.

In Iceland work on the *GADGET* model is in progress. Incorporation of marine mammals in the model is planned as a part of the Icelandic Research Program (see 16). The work is planned as a full time job for one year starting early in 2004.

8.2 Other matters

New data on the seasonal migration of seals are accumulating from satellite tags, and more data on prey species of minke whales and other marine mammals are now available or will be available in the near future both in Iceland and Norway from analyses of stomach contents. In addition new information on the diet of dolphins (see Section 9.8) should be available in the coming year from the Faroes and Iceland.

In order not to lose momentum on marine mammal-fisheries interactions the Scientific Committee decided that a new working group meeting should be held in the autumn of 2004, both to discuss progress in the modelling and to review and discuss the new empirical data on diet and consumption. If possible the meeting should be held after the ICES Annual Science Conference, which will have a special session on multi-species modelling (see Section 5.2), so the results from that meeting can be available. A final decision on holding this workshop should be made by the Chairman after consideration of progress in this area.

9. MARINE MAMMAL STOCKS -STATUS AND ADVICE TO THE COUNCIL

9.1 and 9.2 Harp and hooded seals

The Scientific Committee considered 2 reports from the Joint ICES/NAFO Working Group of Harp and Hooded Seals (WGHARP). After evaluating its history of providing advice on harp and hooded seal harvests in the North Atlantic WGHARP felt the need to re-evaluate its approaches to harvest modelling for the 2 species. For this reason, a workshop to “Develop Improved Methods for Providing Harp and Hooded Seal Harvest Advice” was convened in February 2003 (ICES 2003). WGHARP met in September 2003 to evaluate the report from the workshop and to complete assessment work with harp seals in the Barents Sea / White Sea and harp and hooded seals in the Greenland Sea, under terms of reference provided by the ICES Advisory Committee of Fishery Management [ACFM] (ICES 2004).

Workshop to “Develop Improved Methods for Providing Harp and Hooded Seal Harvest Advice”

Methods used to assess population status and provide management advice were reviewed and compared. Due to variability in data availability it was concluded that more than one model should be used (one for the Northeast Atlantic, one for the Northwest Atlantic, at least for now) but that the outcome of modelling using the different models on the same data set should be compared. Simulations should be carried out to evaluate sensitivity to the various input parameters (such as age at maturity and late term pregnancy), and the importance of a valid age structure in the Northeast Atlantic model should be evaluated. WGHARP remanded the modelling recommendations to a modelling subgroup for prioritization and intersessional work by correspondence.

Alternative methods used to assess marine mammal status and provide management advice were explored, in particular the suitability of IWC’s Revised Management Procedure (RMP) and the US Marine Mammal Protection Act’s Potential Biological Removals (PBR). It was concluded that the RMP and PBR approaches are based on different management objectives which probably would not satisfy the ICES/NAFO objectives in most cases (though there may be situations where the PBR approach could be applied to data poor species).

Data requirements were discussed, and the conclusion was that the primary data needs are for:

- pup production on regular intervals, reproductive rates, harvest numbers by stage, and age composition of the population and/or harvest. Existing models can get by with limited data but the full suite of data is ultimately needed.

The workshop concluded that WGHARP needs to further discuss the distinction between assessment models and management framework. Also, a management framework for harp and hooded seals needs to be developed which incorporates the biological reference points, and the workshop provided WGHARP with some guidelines and good advise in this respect.

<u>New assessment model</u>
When WGHARP met in Arkhangelsk in September 2003, the stocks of Greenland Sea harp seals, White Sea / Barents Sea harp seals and Greenland Sea hooded seals were assessed. Management agencies had requested advice on "sustainable" yields for the stocks. "Sustainable catch" as used in the yield estimates for seals means the catch that is risk neutral with regard to maintaining the population at its current size within the next 10 year period.

Population assessments performed were based on a new population model that estimates the current total population size using the historical catch data and estimates of pup production. These estimates are then projected into the future to provide a future population size for which statistical uncertainty is provided for each set of catch options.

There are several significant differences between the current model and the one used for the previous assessment (WGHARP meeting in 2000, see ICES 2001). The previous model used only two age classes (pups and 1+ animals), while the new model uses 20 age classes. Work carried out following the previous assessment, including discussions on and recommendations from the workshop mentioned above, indicated that the earlier model was less appropriate than a model with a full age structure. The same population dynamic model was used for all three of the northeast Atlantic populations, but with stock specific values of biological parameters. The inclusion of a full age structure into the model was an improvement from previously used estimation programs. In general the new model gives lower catch options than previous models. This is due to uncertainty in, in some cases also complete lack of, updated relevant data for the assessed stocks.

Harp seals
Distribution and migration
Results of a recent study on the movements of adult harp seals tagged in the Greenland Sea with satellite linked time depth recorders were presented at the WGHARP meeting. Eleven adult harp seals (male and female) were equipped with satellite transmitters after moulting in the Greenland Sea in 1999. The results showed that many of the animals migrated to and stayed in the northern parts of the Barents Sea around and to the east of the Svalbard archipelago in the period July-December, to a lesser extent also in April. In January-March their occurrence was confined to the Denmark Strait and the Greenland Sea, where some of the animals stayed during the entire tracking period. While the seals spent much of their time in close association with the pack-ice, occurrence in open waters appeared to be quite common, particularly during summer and early autumn. It was noted that there are likely to be interannual differences in migration and therefore, additional deployments are required to determine inter-annual variation. These studies provide exceptionally interesting information, but it must be remembered that they are based on a very small sample (n=11) of adults. Also, movements of other age groups are unknown.

Preliminary results were presented from a joint Norwegian/Russian study of marine mammal distribution in the Barents Sea, based upon aerial surveys in September and October 2002.The main conclusions were that harp seals were only observed near the ice edge which was north of the major areas of capelin and polar cod (*Boreogadus saida*) distributions. In contrast, cetaceans were observed in areas of high capelin abundance. This confirms the findings of preliminary surveys in September 2001 which also concluded that there was no evidence of overlap between harp seals and capelin. Thus, there was no evidence that large numbers of harp seals migrated to areas of capelin abundance at this time of the year.

<u>The Greenland Sea stock</u>
Recent catches
Only Norway took catches of harp seals in the Greenland Sea pack ice from 2001 through 2003. The total catches were 2,992 (including 2,267 pups), 1,232 (1,118 pups) and 2,277 (161 pups) animals in 2001, 2002 and 2003, respectively. Removals were 4-15% of the allocated quotas, which was 15,000 animals one year old or older (1+ animals). Parts of, or the whole quota, could be taken as weaned pups assuming 2 pups equalled one 1+ animal.

Abundance
From 14 March to 6 April 2002 airplane (photographic) and helicopter (visual) surveys were carried out in the Greenland Sea pack-ice to assess the pup production of harp seals using traditional strip transect methodology. The total estimate of pup production was 98,100 with a coefficient of variation for the survey of 20%. This is a minimum estimate as it was not corrected for areas not photographed and for pups born after the survey in one of the three areas surveyed. Based on previous (1983-1991) mark-recapture data and the recent (2002) aerial survey data, the stock in 2003 was estimated by modelling to be 349,000 (95% C.I. 319,000-379,000) 1+ animals with a pup production of 68,000 (95% C.I. 62 000-74 000).

Catch options
Continuation of current catch level will likely result in an increase in population size. ICES identified that a catch of 8,200 1+ animals in 2004 would sustain the population at present level within a 10 year period. If a harvest scenario including both 1+ animals and pups is chosen, one 1+ seal should be balanced by 2 pups. Catches twice the sustainable levels will result in the population declining by approximately 20-25% in the next 10 years.

<u>The Barents Sea / White Sea stock</u>
Recent catches
Combined Russian and Norwegian catches of harp seals in the White and Barents Sea were 44,316 (including 40,555 pups), 36,535 (34,598 pups) and 43,234 (40,279 pups) in 2001, 2002 and 2003, respectively. This is 31-39% of the recommended sustainable yields (53,000 1+ seals, where 2.5 pups equalled one 1+ animal).

Abundance
New airplane surveys of White Sea harp seal pups were conducted in March 2002 and 2003 using traditional strip transect methodology and multiple sensors. In 2002, the pup production was estimated as 330,000 pups (SE = 34,000) from the survey observations. The results from the 2003 surveys are preliminary, but indicate a

production of 293,000 pups (SE =53,000) before corrections are made for hunted pups - total pup production in 2003, including a landed catch of 35,000 pups, was 328,000. Based on Russian surveys in 1998, 2000 and 2002, the stock in 2003 was estimated by modelling to be 1,829,000 (95% C.I. 1,651,000 – 2,006,000) 1+ animals with a pup production of 330,000 (95% C.I. 299,000 – 360,000).

Catch options
Continuation of current catch level will likely result in an increase in population size. ICES identified that a catch of 45,100 1+ animals, in 2004 would sustain the population at the present level within a 10 year period. If a harvest scenario including both 1+ animals and pups is chosen, one 1+ seal should be balanced by 2.5 pups. Catches twice the sustainable levels will result in the population declining by approximately 20-25% in the next 10 years.

Hooded seals
The Greenland Sea stock
Recent catches
Catches of Greenland Sea hooded seals during 2001-2003 remained well below the estimated sustainable yields (10,300 1+ animals). Thus, only 27-49% of the given quotas were fulfilled. Total catches (all taken by Norway, Russian sealers did not operate in the Greenland Sea in the period) were 3,820 (including 3 129 pups), 7,191 (6,456 pups) and 5 283 (5,206 pups) animals in 2001, 2002 and 2003, respectively. Parts of, or the whole quota, could be taken as weaned pups assuming 1.5 pups equalled one 1+ animal.

Abundance
Based on a Norwegian aerial survey in 1997, the stock in 2003 was estimated by modelling to be 120,000 (95% C.I. 65,000-175,000) 1+ animals with a pup production of 29,000 (95% C.I. 17,000-41,000).

Catch options
The 1997 estimate of pup production is the only estimate available for the Greenland Sea hooded seal stock. The single estimate of pup production is over 6 years old and there are no estimates of reproductive rates for this stock. Therefore, any advice provided should be extremely cautious. One method of providing advice in such data poor situations is through the use of the Potential Biological Removals (PBR) approach. The Potential Biological Removal (PBR) has been defined as:

$PBR=0.5 \cdot R_{Max} \cdot F_r \cdot N_{Min}$,

where R_{Max} is the maximum rate of increase for the population , F_r is a recovery factor with values between 0.1 and 1 and N_{Min} is the estimated population size using 20th percentile of the log-normal distribution. R_{Max} is set at a default of 0.12 for pinnipeds. It is appropriate to set the recovery factor (F_r) 0.75 given the time since the last survey and uncertainty in parameters used to determine the total abundance. ICES recommended that the PBR approach be used for the Greenland Sea hooded seals, resulting in a recommended maximum catch level of 5,600 hooded seals in 2004.

9.3 Harbour porpoise

9.3.1 Update on progress

Haug reported that feasibility studies into assessing the abundance of harbour porpoise in Norwegian inshore waters have been undertaken in 2000 and 2001. Technical problems with survey design and analysis had arisen and the program is now being reconsidered. It is hoped that the project will be continued but there are no concrete plans in place.

9.3.2 Future work

A second SCANS is tentatively planned for 2005 and 2006. The Faroes is planning to participate in this survey, and other surveys (NASS and Norwegian surveys) may also be planned to coincide. Given that there are presently no abundance estimates for this species for NAMMCO member countries, and that bycatch for this species is unknown but may be significant in some areas (see 4.1), the Scientific Committee recommended that member countries co-operate to the extent possible to maximise the coverage and effectiveness of these surveys.

9.4 Narwhal

9.4.1 Update on progress

A successful narwhal survey was conducted in the Qaanaaq area in 2002 using aerial digital photography. However a survey in Melville Bay in August did not result in any sightings of narwhals. The surveys near Uummannaq in November had problems with darkness and wind conditions. Satellite tracking of narwhals in Baffin Bay is ongoing and data from previous satellite tracking studies are presently being analysed. Surveys of narwhal aggregations in Canada, and sample collection for genetic studies, are ongoing in Canada. There are plans for a survey of the narwhal wintering grounds in Disko Bay in March 2004.

9.4.2 Future work

The Scientific Working Group of the JCNB will meet jointly with the NAMMCO Working Group in February 2004. The main topic of the meeting will be the assessment of narwhal stocks using all available information.

9.5 Beluga

9.5.1 Update on progress

The next survey of belugas on the wintering ground in West Greenland is planned for March 2004. Results from this survey will – assuming successful completion – be available for revising the present advice in the autumn of 2004.

The Scientific Committee has advised on 2 occasions (2000 and 2001) that the West Greenland stock is substantially depleted and that present harvests are several times the sustainable yield, and that harvests must be substantially reduced if the stock is to recover. As yet no system of harvest control has been implemented in Greenland, and catches have not been reduced. The Committee stressed that the delay in reducing the catch to about 100 animals per year will result in further population decline and will further delay the recovery of this stock.

Lydersen informed the Committee that a population genetic study is ongoing using samples from West Greenland, Svalbard and the White Sea. In addition a co-operative project to satellite track belugas in the White Sea will be carried out in 2004 pending funding decisions.

9.5.2 Future work

If the 2004 survey off West Greenland is successful, it should be possible to reconsider this stock for assessment in 2005.

9.6 Fin whales

9.6.1 Update on progress

The Report of the Working Group on Minke and Fin Whales (Annex 1) from the meeting held in Copenhagen 20-22 November 2003 was considered under this item. The Scientific Committee has carried out fin whale assessments on 2 previous occasions. In 1999, the Committee dealt with the East Greenland-Iceland (EGI) stock. The Committee concluded that catches of up to 200 fin whales per year would be sustainable, but that such catches should be spread over the EGI stock area. In 2000, the Committee considered fin whales around the Faroe Islands, subjected to projected annual catch levels of 5, 10 and 20 whales. This assessment was problematic because there was virtually no information of the stock identity of fin whales around the Faroes. Nevertheless, it was concluded that fin whales in this area are likely substantially depleted, under all scenarios that were examined.

Given that new information has become available from abundance surveys, satellite tracking programs and reconsideration of historical catch series, in 2002 the NAMMCO Council requested that the Scientific Committee continue with its assessments of fin whale stocks in the areas of interest to NAMMCO countries.

Stock structure

In 1999, the NAMMCO Working Group on Fin Whales concluded that there was evidence to indicate the presence of subpopulations with limited gene flow between adjacent subpopulations (NAMMCO 2000). The North Atlantic populations are all different from the Mediterranean Sea population. There is some indication that the western North Atlantic and Iceland areas have populations different from those found off the coasts of Spain and north Norway. Finally, deviations from Hardy-Weinberg genotypic proportions within and between years in the Icelandic samples suggest some sub-structure in this area. Beyond this, there is insufficient evidence to delineate stocks of fin whales in the North Atlantic. No new genetic evidence has come to light since 1998 that would change these conclusions, so stock delineation remains the greatest barrier to the reliable assessment of North Atlantic fin whales, especially at a finer scale.

One of 2 fin whales satellite tagged in the Faroes in August 2001 migrated southward as far as 46° N, at the latitude of the Bay of Biscay. It then moved northeast and reached an area off northwest Ireland, where it stayed within a restricted area for 2 months before contact was lost in November of the same year. While noting that this indicates a possible stock connection between whales around the Faroes and off the Iberian peninsula, the Working Group felt that it would be premature to draw conclusions from the movements of 1 animal.

Biological parameters

Biological parameters for fin whales adopted by the IWC in 1991 (Lockyer and

Sigurjónsson 1991) have been used in previous NAMMCO assessments (NAMMCO 2000, 2001). The Working Group agreed that at present there is no new information to change any of these parameters.

Catch data
The catch series available to the Working Group were for the most part the same as those used in previous NAMMCO assessments (NAMMCO 2000, 2001) and were derived from those extracted for the Comprehensive Assessment Meeting on North Atlantic Fin Whales held in 1991 (IWC 1992). A new "Faroese South" area included abundance estimates and catches from the previous "Faroese Medium" area plus Spanish and Portuguese catches, thus capturing the possibility of a link between fin whales caught in the Faroes and areas farther south (see Annex 1 Fig. 3 for area definitions).

Bloch reported on the development of an improved catch series derived from Faroese and other archival sources. The new figures are somewhat lower for the early part of the 20th century than those in the IWC database.

Abundance estimates
Estimates of abundance used in assessments were those accepted by the NAMMCO Scientific Committee from NASS-2001 and earlier surveys, disaggregated by area as appropriate.

A new estimate was available from the Norwegian 1995 shipboard sightings survey. The survey covered the Northeastern Atlantic including the North Sea, the Norwegian Sea, the Greenland Sea and the Barents Sea. Most of the fin whale sightings were made in the Svalbard area, that is, along the continental slope from Bear Island and northwards to the northwest of Spitsbergen. Compared to earlier surveys, the 1995 distribution was more northerly. The abundance estimates based on the combined platform data were considered to give the best estimates of absolute abundance of 5,395 animals (c.v. 0.204) for the survey area.

The Working Group welcomed this new estimate, and urged the timely completion of estimates from the 1996-2001 series of surveys, which is required for future assessments of fin whales in this area.

Assessments
EGI
Assessment of the EGI fin whales utilised recent estimates of abundance from sighting surveys, and CPUE series for the 1901-1915 and 1962-1987 periods. Two independent assessments were available, one using HITTER/FITTER methodology and the other using a Bayesian approach. However approaches which treat the stock as homogeneous throughout the Central North Atlantic area fail because the population models applied cannot be reconciled with all 3 sources of data (the absolute abundance estimates and the 2 sets of CPUE data). In particular, such models have great difficulty in reflecting the large decline in CPUE observed in the 1901-1915 period.

To address this, two alternative assessment models used a 2 or more substock model approach, where historic catches have been taken from an "inshore" substock only, and there is diffusive mixing between this "inshore" and the "offshore" substock (in the 2-substock model). CPUE data reflect the behaviour of the "inshore" substock only, whereas sightings estimates relate to the combination of all substocks. This age-aggregated models allows both MSYR and the inter-substock mixing rates to be estimated, and provides an acceptable fit to all 3 sources of data. Under such analyses, the resource as a whole is estimated to be close to its pre-exploitation abundance. The precise status of the inshore substock differs depending on which of 2 forms of density dependence is assumed for the model, but in either event is estimated to be above MSY level.

Gunnlaugsson extended the 2-substock model by including the existing mark recapture data. Differences had been observed in the rate of recovery of marks applied on the whaling grounds west of Iceland compared to those from East Iceland and East Greenland. In addition there were obvious differences in the mark returns by sex and area. Therefore, the model was sex disaggregated. The model was also expanded from 2 to 4 components for consistency with the marking data. The main results of the analysis are that the higher proportion of females than males in the catch on the grounds is maintained by a higher rate of mixing of females among substock components so that females are more readily replenished, rather than by a heavy selection for larger animals by the whalers. The stochastic runs showed an annual catch of 200 animals over the next two decades from the whaling grounds west of Iceland to be sustainable with high probability.

The Working Group noted that the more complex models involving 2 or more spatial components appeared to fit the historical and modern CPUE and abundance data better than single homogeneous stock models. It is therefore likely that the more complex models will provide a more accurate forecast of the behaviour of the resource under differing catch regimes.

Faroes

As described above, 2 independent analyses were available for Faroese fin whales. These analyses were conducted over a range of assumptions concerning the geographical extent of the resource and the past catches taken from it. The Working Group noted that the results from both modelling efforts were qualitatively and quantitatively very similar. Both indicated that the fin whale stock around the Faroes was heavily depleted under most plausible scenarios about the size and extent of the stock area from which catches were taken. Under some of these stock scenarios even catches as low as 5 animals per year slow or halt the recovery of the stock, and higher catches result in further depletion in nearly all cases. The exception was the "Faroese South" stock area, which linked whales around the Faroes with the relatively large stock off the Iberian peninsula, but the Working Group considered that more evidence was needed before this scenario could form the basis of management advice.

Other

The Working Group considered that the availability of abundance estimates from NASS-1995 and the development of abundance estimates from more recent Norwegian surveys for fin whales in the Northeast Atlantic will make the assessment of fin whales in this area feasible. A careful examination and compilation of available data, including catch data, incidental sightings, Discovery tag markings and genetic sampling, is needed before such an assessment is conducted. In addition the boundary used in this assessment between the Faroe Islands-West-Norway stock and the British-Spain-Portugal stock (as defined in the IWC Schedule) should probably be moved southwards as this does not seem to be in accordance with historical catch distribution or more recent distributional data.

<u>Management recommendations</u>

EGI

Because of the inability of models which treat the EGI fin whale stock as homogeneous to fit all sources of abundance-related data satisfactorily, the Working Group decided to base management advice on the 2-substock model which does fit such data. Projections under constant catch levels suggest that the inshore substock will maintain its present abundance (which is above MSY level) under an annual catch of about 150 whales for either assumption concerning the form of density dependence. It is important to note that this result is based upon the assumption that catches are confined to the "inshore" substock, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that the "offshore" substock was also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales.

Faroes

The new information on abundance from NASS-2001 and the updated catch history available for the Faroes did not greatly change the conclusion reached in 2000 (NAMMCO 2001), that the fin whale stock around the Faroes was likely to be heavily depleted under most stock scenarios considered plausible. The uncertainties about stock identity are so great as to preclude carrying out a reliable assessment of the status of fin whales in Faroese waters, and thus the Working Group was not in a position to provide advice on the effects of various catches. It may also be necessary to obtain clearer guidance on the management objectives for harvesting from what is likely to be a recovering stock before specific advice can be given.

<u>Research recommendations</u>

The Scientific Committee noted that a stock assessment of the EGI could be completed with the information available whereas the assessment of the Faroes stock could not be completed due to lack of information on stock delineation and for North Norway the main obstacle was the lack of recent abundance estimates (after 1995). In light of this it was recommended that the following research should be initiated for the 3 stock areas.

Faroes

- The revision of catch statistics for Faroese and adjacent whaling operations should be completed;
- The feasibility of preparing a CPUE index from Faroese and adjacent whaling operations should be investigated;
- Biopsy sampling for genetic analysis from the Faroes and adjacent areas should be continued. Existing biopsy samples should be analysed as soon as possible.
- Satellite tracking should continue.

EGI

- The early CPUE series (1901-1915) should be reanalysed and split between eastern and western Icelandic whaling areas. The possibility of using data prior

to 1901 should be investigated;
- If new catches are taken, samples should be taken if possible both within and outside the traditional whaling grounds. The material should be investigated to get an updated view of age structure and sex distribution on and outside the whaling grounds, and biological parameters such as age at sexual maturity and fecundity;
- Additional samples for genetic analysis are required particularly from areas outside the traditional whaling grounds, such as East Greenland and northern and eastern Iceland;
- Existing analyses of data on biological parameters from previous commercial and research whaling should be published;
- Satellite tracking should be attempted to investigate the movements of fin whales, particularly between the traditional whaling grounds west of Iceland and areas outside.

Analyses indicate that fin whales are not homogeneously distributed in the conventional EGI stock area with respect to age, sex and behaviour. To facilitate the development of spatially structured models to better represent the overall dynamics, it was recommended that all data (catch, effort, catch-at-age, sightings survey abundance and mark-recapture) be split into 4 subareas as described in the Working Group Report.

North Norway
- Preparation of abundance estimates from the 1996-2001 survey series;
- Compilation and revision of catch statistics;
- Preparation of a CPUE series;
- Collection of additional biopsy samples for genetic analysis, and analysis of existing samples;
- Satellite tracking should continue.

<u>General discussion</u>
The Scientific Committee endorsed the management advice and recommendations for research put forward by the Working Group.

The Scientific Committee appreciated the recommendations of the Working Group toward an update of the spatially structured models in order to aim for a better reconciliation of the different data sources for EGI fin whales. The Committee furthermore recommended a sensitivity test based on alternative hypotheses, for example changing carrying capacity or inertial dynamics with an additional layer of density dependence that operates on intrinsic life history parameters. It was also noted that the data on trends in the age at sexual maturity for fin whales harvested by Iceland had not been compared to the model runs, and suggested that such comparisons be conducted because they may help to clarify whether the different model hypotheses are likely to reflect the true dynamics of the stock/s.

9.6.2 Future work
The Scientific Committee considered that the scheduling of future assessment meetings should be dependent on the completion of additional research and necessary preparatory work, as noted above. The next meeting will concentrate on assessment in the Northeast Atlantic (North and West Norway stocks), and on further development

of assessments for the EGI and Faroes areas.

9.7 Minke whales

9.7.1 Update on progress

The Report of the Working Group on Minke and Fin Whales (Annex 1) was considered under this item. The NAMMCO Scientific Committee carried out an assessment of the Central North Atlantic stock of minke whales in 1998 (NAMMCO 1999). The Committee concluded then that the stock was close to its carrying capacity, and that present removals would not adversely affect the stock. Similar conclusions were reached when the analysis was restricted to the feeding stock in the coastal waters of Iceland, the CIC small area. Since that time, more information has become available on the stock delineation of minke whales in the North Atlantic. New abundance estimates are available for the Central Stock area from NASS-2001, and for the Northeast Atlantic from Norwegian surveys conducted from 1996-2001. Therefore in 2002, the Council of NAMMCO requested that the Scientific Committee complete a new assessment of Central North Atlantic minke whales.

Stock structure

The IWC Scientific Working Group on North Atlantic Minke Whales RMP Implementation Review (IWC in press) reviewed an extensive analysis of population structure using samples from Norwegian commercial catches. Over 3000 samples were analyzed using both mitochondrial and microsatellite DNA markers. Both conventional hypothesis testing and the Boundary Rank method, which does not require an *a priori* assignation into stock areas, were used. Both approaches indicated that animals from the CM Small Area were different from those from the Eastern Medium Area (Annex 1 Fig. 1) using mitochondrial markers. Boundary Rank suggested a difference within the CM Small Area, but this difference was not significant using a hypothesis testing approach. Both approaches also indicated the existence of a separate sub stock in the North Sea.

Another recent analysis using mitochondrial and microsatellite DNA sampled from a wider area including East and West Greenland (Andersen *et al.* 2003) also supports the conclusion that animals from the Central Area (East Greenland and CM in this case) are different than those from the Northeast Atlantic and the North Sea.

The Working Group concluded that for the purposes of assessment, the existence of a separate Central Stock of minke whales was supported by the available evidence. However there may be sub-structure within this area. While there is no data to support the existence of a separate stock in the CIC Small Area, most catching by Iceland has historically occurred here so it made sense to consider this as a separate area for precautionary sensitivity tests.

Biological parameters

No new information on biological parameters had been published since the last review of this stock in 1998 (NAMMCO 1999). However recent work (Olsen 2002) had demonstrated that age estimates based on counting annulae in *tympanic bullae* were not reliable. Therefore any biological parameters that included age as a component (*e.g.* age at maturity, mortality, survival) must now be considered suspect. Other ageing methods, especially based on the racemisation of amino acids in the eye lens, were being developed but had not yet been widely applied. The Working Group nevertheless decided to use the estimates of parameters used in the previous assessment, as they are unlikely to differ greatly from those for the Antarctic minke whale for which valid ageing methods are available. It was also noted that the assessment models used were relatively insensitive to variations in these parameters within a plausible range.

Catch data

The catch series used in assessments were the same as that used in the 1998 assessment, with the addition of more recent catches by Norway in the CM Small Area and by East Greenland. A "High Catch" case was also developed which included assumed maximum annual levels of both bycatch (5) and unreported catch (10 per annum from 1986-2002) in Icelandic waters.

Abundance estimates

New abundance estimates available to the Working Group included:

- NASS-2001 and NASS-1987 aerial surveys covering coastal Iceland (CIC small area). The estimate from 1995 is considered biased to an unknown direction and extent and was not used;
- NASS-2001 shipboard survey, considered to be negatively biased because of animals missed on the trackline and diving animals.

Other estimates were the same as those used in previous assessments.

Assessments

Two independent assessments were available for minke whales, one using the HITTER/FITTER program as used in the previous assessment of this stock, and the other using a Bayesian methodology. In the HITTER runs population trajectories were computed for different assumed levels of productivity rates for the resource (designated by MSY rates – $MSYR^{1+}$) that pass through a given abundance in a recent year. The abundance was set to the inverse variance-weighted average of the available abundance estimates, and the year taken as the average of the years in which the associated surveys took place. Trajectories were computed for $MSYR^{1+}$ values of 1, 2 and 4%, and also projected forward for 20 years under different fixed levels of future catch. Exploratory FITTER analyses, which attempt to estimate the value of MSYR by matching the trends in population trajectories to those of a series of survey results, were also carried out. However the results are not yet regarded as reliable because only a few survey estimates are available to date from which to estimate trend. The Bayesian analysis used available catch series and abundance estimates in an age- and sex-structured model to perform an assessment of Central North Atlantic (C) and CIC minke whales.

The results from both analytical approaches indicated that the Central Stock of minke whales has not been appreciably impacted by past whaling, having a current abundance of mature females that is at least 85% of the corresponding pre-exploitation level. This result holds regardless of whether the CIC area is treated as an isolated stock, and across a wide range of assumptions concerning past catches, stock boundaries, MSYR values and abundance estimates.

Management recommendations
Projections over the next 20 years using HITTER indicate that, under all scenarios considered, a catch of 200 minke whales per year would maintain the mature component of the population above 80% of its pre-exploitation level over that period. Similarly, a catch of 400 per year would maintain the population above 70% of this level. This constitutes precautionary advice, as these results hold even for the most pessimistic combination of the lowest MSYR and current abundance, and the highest extent of past catches considered plausible. The advice applies to either the CIC Small Area (coastal Iceland), or to the Central Stock as a whole.

Research recommendations
- Further genetic sampling, particularly from Icelandic waters, East and West Greenland, and the Faroes. Analyses should use the same markers and methodologies as used by Norway so the datasets will be comparable.
- Development of valid ageing methods for North Atlantic minkes, using amino acid racemisation in the eye lens or other techniques. Use of the number of *corpora albicantia* in females as a proxy for age in estimating biological parameters should be investigated.
- Further satellite tracking to investigate spatial and temporal distribution in all areas.

General discussion
The Scientific Committee endorsed the management advice and research recommendations put forward by the Working Group.

9.7.2 Future work
It was considered that further assessment work was not required until more information on stock delineation, distribution, abundance and biological parameters becomes available.

9.8 White-beaked, white-sided dolphins and bottlenose dolphins
9.8.1 Update on progress
The Council has asked the Scientific Committee to carry out assessments of these species, but to date insufficient information has been available on stock delineation, distribution, abundance and biological parameters to initiate the work. This year a series of working papers from the Faroes reported on research in progress on white sided dolphins (SC/11/16-19).

Sampling has been carried out on 32 pods taken in drive fisheries between 1986 and 2003. Annual catches ranged from 0 to 744 (average 156) between 1872-2003, and the size of pods taken in drive fisheries has averaged 60 (SC/11/16). Catches have been taken throughout the year but peaked between July-November. Males are larger than females (SC/11/18). Animals of all ages up to 27 years were caught, but fewer than expected juveniles (4-8 years) were present in the catches. The sex ratio of 1.3 favoured males. No pregnant females were taken. Sexual maturity appears to occur at age 6-7 in both sexes. A preliminary analysis of stomach contents from 3 pods indicated that the diet was dominated by small pelagic fish, especially blue whiting and Norway pout (SC/11/17). Genetic analyses are underway but have not been completed (SC/11/19).

Ólafsdóttir reported that little progress had been made in analysing samples from white beaked dolphins collected from bycatch in Iceland. A report on the distribution and abundance of dolphins from the 4 aerial surveys carried out around Iceland between 1986 and 2001 is nearly complete, and further information on distribution is available from the NASS ship surveys. As yet no reliable information is available on bycatch of these species in Iceland.

Haug informed the Committee that Norway will begin a sampling program focussing on white beaked dolphins in 2004, involving biopsy sampling for genetic and fatty acid analyses, and satellite tracking.

9.8.2 Future work
Considerable progress has been made in the Faroes in describing the ecology and life history of white sided dolphins. Some analytical work remains to be completed and sampling will continue. The Committee was informed that satellite tracking will be attempted in the coming years in the Faroes, and that information on white beaked dolphins should be available from Iceland and Norway in about 2 years time. Abundance estimates are lacking in all areas except Icelandic coastal waters, and no information on stock delineation or pod structure is yet available. The SCANS survey planned for 2005/6 and coastal surveys planned for Norway (see 9.3) should provide information on distribution and abundance in some areas. At this point the Scientific Committee considered that there was still insufficient information on abundance, stock relationships, life history and feeding ecology to go forward with the requested assessments for these species. This may become feasible once the above-mentioned studies have been completed, probably by 2007.

9.9 Grey seals
9.9.1 Update on progress
In 2001 the Scientific Committee noted that the abundance of grey seals around Iceland had decreased from an estimated 12,000 in 1992 to 6,000 in 1998, and that the annual catch of around 500 seals may not be sustainable. In contrast there have been apparent increases in the abundance of grey seals in other areas, including Southwest Norway, the United Kingdom and Canada. Grey seals are harvested or taken incidentally by fisheries and aquaculture operations in the Faroe Islands, Iceland and Norway. Subsequently the Scientific Committee was asked to provide a new assessment of grey seal stocks throughout the North Atlantic.

The Scientific Committee formed a Working Group on Grey Seals, chaired by Kjell Nilssen, which met in Reykjavik in April 2003 (Annex 2). The general terms of reference of the Working Group were:
- to assess the status of greys seals around Iceland, the UK, the Faroes, Norway, the Russian Federation, the Baltic, Canada and other areas;
- survey methods;
- stock delineation (genetics, temporal and geographical distribution);
- recommendations to the NAMMCO Council.

Iceland

The population status of the Icelandic grey seal, which has been investigated in the years of 1982, 1986, 1989, 1990, 1992, 1995, 1998 and 2002 by aerial census of grey seals pups on breeding sites. The Icelandic grey seal population appeared stable between 1982 and 1990, but since then, the pup-production has been declining by about 6% (95% CI 3% to 9%) annually. The abundance of the grey seals around Iceland in the year 2002 was about 5,000 animals. In the first census in 1982, the population was estimated at about 9,000 and 1990 it reached a maximum of about 12,000 animals. Grey seals are distributed all around the Icelandic coast. Recently following the decrease in population size, its distribution has contracted and it is now not found off the northeast coast, where some breeding occurred about 10 years ago. There is very little evidence for the Icelandic grey seal stock mixing with other grey seal stocks in the North Atlantic.

The Working Group noted that it was obvious that harvests had been above sustainable levels for more than 10 years, and that the resulting decline in the population was well documented. While no management objectives have been identified explicitly, it is apparent that the implicit objective has been to reduce the stock to some undeclared level. There is an urgent need to identify clear and explicit limits for the stock and to regulate the level of harvest accordingly. If exploitation is continued at its present rate, it is likely that the population will be reduced to very low levels, and likely extirpated in many areas, within the next 10 years. The Working Group cautioned that, because the stock has been reduced and is still apparently declining, increased survey and monitoring effort will be required in the future. Once a limit value for the stock has been identified, surveys may have to be carried out more frequently and with higher effort in order to have an acceptable probability of detecting a further decline in population.

Research recommendations

The Icelandic population is small and declining. Improved and more frequent surveys are urgently required to monitor the trend in the population and ensure that further declines can be detected in time for management action to be taken. Specific recommendations include:

1. If aerial surveys are used, a minimum of 3 surveys per site within the breeding season are required. An alternative might be to combine a single aerial count with a ground survey with staging, or to use ground counts on the larger colonies.
2. A power analysis should be conducted using past data to determine what frequency of surveys is required to reliably monitor trends in the population. If clear management objectives are established for the stock, the power analysis can be used to determine the level of survey effort required to determine if the population has reached a threshold value, with a given degree of certainty.
3. Harvesting, S/L and bycatch data should be directly included in the population model used to calculate the factor to convert pup counts to 1+ numbers.

Management recommendations

The observed decline and continued exploitation of this stock was of great concern. If present trends continue the stock will be reduced to very low levels. The Working Group recommended the immediate establishment of management objectives and conservation reference limits for this stock as an urgent priority. Survey frequency and intensity should be increased to facilitate monitoring of the trend in the population. A formal assessment of the effect of present levels of harvest on the population, including the risk of extinction and the sensitivity of the survey program to detect a population decline, should be conducted as soon as possible.

Faroes

Based on historical sources, there seems to have been a long tradition for harvesting grey seals in the islands, mainly at breeding grounds. Grey seals in the Faroes mainly breed in caves, which is exceptional for the species. This may explain why biological investigations have not been initiated on grey seals in Faroese waters: as a result biological knowledge is limited and certainly insufficient. No management regime has been implemented. Today, the only take occurs in defence of fish farms. Catch statistics are not available, but from direct contact with fish farmers, the catch in 2001 was estimated to be in the order of 250 to 500 seals, which seems surprisingly high for the population. Present population size is unknown. No tagging experiments have been conducted on Faroese grey seals, but such studies on neighbouring populations have indicated that the annual number of British grey seals migrating into Faroese waters may be significant.

The Working Group expressed concern that the Faroese grey seal population is subject to an apparently high but unknown level of exploitation, and that this exploitation has developed rather recently since the advent of fish farming activities. Unlike the historical harvest, which targeted seals in their breeding caves, salmon farmers take seals in open water. The inaccessibility of some breeding caves therefore no longer provides protection against depletion of the local breeding population. The abundance of breeding and migrant seals in the area is unknown. However it was considered that the number of seals breeding in the Faroes is unlikely to be large because breeding habitat is limited. Therefore, even if the human take includes a large proportion of migrant animals, the local population might still be subject to depletion.

The Working Group therefore strongly recommended immediate efforts to obtain better information on the population of Faroese grey seals, and on the nature and impact of the take in the Faroes.

Research recommendations

1. Further basic research is required before surveys are attempted in the Faroes, especially documentation of all used and potential pupping sites. The cave breeding habit of Faroese grey seals will require non-standard survey methods, perhaps including diving and the use of automated camera systems.
2. Genetic studies to investigate the stock identities of grey seals in Faroese waters, and their association with those in adjacent waters, are required. This could be part of the proposed North Atlantic study (see below).
3. Better data on removals is required. This could be achieved by implementing mandatory logbooks for seal hunters; in order to monitor the harvest level.
4. Studies on life-history parameters are required, based on samples from the catch or other sources.

Management recommendations

For this area better information on the level of catch, both direct and as bycatch, is required. There is no information on stock identity or abundance on which to base management advice, and research programs to get this information have been recommended (see above). Nevertheless, the relatively high level of take, combined with the likely small size of the population, suggests that a precautionary approach is warranted.

Norway

Preliminary results from grey seal ship based surveys along the Norwegian coast in 2000-2002, and how these compared with results from 1996-1998, were presented. Most of the grey seal whelping areas from Rogaland county to Finnmark county were investigated. Seal pups were observed from an inflatable boat, after which researchers landed where pups were observed. When possible, pups were caught, tagged, and developmental stage was recorded. In some cases only developmental stage was recorded. Total population estimates were derived from estimates of pups by using a range of multipliers (4.28 and 5.35). When results from aerial surveys conducted in 1998 in northern parts of Nordland and Troms are combined with the estimates from the 2000-2002 study, the number of pups born in Norwegian waters are calculated to be about 1,030, which corresponds to about 4,400-5,500 seals (1+).

Total annual catches of grey seals in Norwegian waters ranged from 34-176 animals in 1997-2002, which corresponds to 13%-49% of the scientifically based recommended quotas(which are 5% of the estimated population size), and 11%-35% of the given quotas. There are no catch statistics available prior to 1997.

In areas with particular conflicts between grey seals and fisheries, Norwegian management authorities have occasionally attempted to use hunting to control population growth and population size by increasing the recommended quotas by 20%-30%. When quotas were set for the 2003 season this approach was taken a large step further in that the quotas in most areas were set at 25% of current population estimate. Also, a bounty of NOK 500 is to be awarded for each grey seal documented killed.

In discussion the Working Group noted that the new quota levels of 25% of the estimated population size would, if taken, certainly result in population reduction. However no formal analysis of the effect of this level of harvest on the population, including the risk of extinction the sensitivity of the survey program to detect a population decline, has been conducted. While harvests have been considerably below quota levels to date, the possibility that the quotas might be filled should be considered, especially now that a bounty system is in place.

It is likely that some proportion of the animals shot are killed but not landed. This proportion of shot but lost (S/L) animals has been observed to be up to 50% in some areas, because many seals sink when they are shot, depending on their condition and the water salinity. As the quotas are based on landed animals, the actual anthropogenic take is likely to be considerably higher than the reported harvest. The Working Group recommended that a study be carried out to determine S/L rates in different areas, seasons and under different conditions.

There is some indication from tag returns that bycatch, particularly of young seals, in bottom set gill nets may be considerable in this area. This source of mortality must also be included in any assessment of the population.

Research recommendations

The vessel-based surveys conducted from 2000-2002 have provided good information on the location and approximate size of breeding colonies along the Norwegian coast.

This information can be used to develop a survey design that will provide more reliable estimates of seal abundance in the area.

1. Regular surveys are required to determine trends in the population. Power analysis should be used to determine the survey interval and level of effort required. However, as in the Icelandic case, clear management objectives from the Norwegian authorities would be helpful in specifying the survey requirements.
2. The possibility of using repeated aerial surveys, at least in areas to the south of Lofoten, should be further explored. In northern areas, the lack of light during the breeding season may preclude the use of aerial survey. In these areas ground-based surveys with staging could be used. The possibility of using aerial infrared camera surveys in these areas should be investigated.
3. It will be desirable to co-ordinate surveys efforts in Finnmark with those along the Murman coast in the Russian Federation.
4. A more complete sampling program from the hunt should be established, including the collection of reproductive tracts and genetic samples.

Management recommendations

The new quota levels implemented for this area would, if filled, almost certainly lead to a rapid reduction in population in the area. A formal analysis of the effect of the quota levels of harvest on the population, including the risk of extinction and the sensitivity of the survey program to detect a population decline, should be conducted as soon as possible. It will be necessary to increase the intensity and frequency of surveys in the area if higher levels of exploitation are realised, in order to have a realistic probability of detecting a decline in the population within a time scale relevant to management.

United Kingdom

British grey seals are monitored using a 2 stage process. Firstly pup production is estimated at most of the major breeding colonies, accounting for approximately 85% of pups born in Britain. Then the total pup production is used to obtain estimates of total grey seal population aged one year and over.

Pup production is determined annually using a series (4 to 7) of aerial photographic surveys, carried out at 10-13 day intervals over 40 primary breeding colonies. A 40 year time series of pup production estimates for the majority of the British grey seal colonies is available. The most reliable time series of estimates covers the period from 1984 to 2001. The average annual rate of increase between 1984 and 1999 was 6.3% ±0.26%. Observed trends in pup production varied locally and regionally. Total pup production for the west coast of Scotland increased more slowly than at colonies in Orkney and on the North Sea coast. All of the increase on the west coast of Scotland was the result of changes at one group of islands: the Monach Isles.

The annual estimates of pup production can be used to update, each year, a trajectory of total population size estimates, with associated levels of uncertainty. Simulation models are used to approximate the likelihood function for all the data combined and hence provide maximum likelihood estimates for the demographic parameters, female population size and other statistics of the population that are not directly observable. The simulation models allow for measurement error and random variation in juvenile survival and recruitment. If these stochastic processes are assumed to be stationary the 95% confidence limits on estimates of female population size over the last 15 years are in the range ±15% to 20%. The estimate for the total number of females alive just before the 1999 breeding season is 63,000 (95% CI 54,000 to 73,000). The point estimate for females and males is 109,000. These figures refer to seals associated with the annually monitored colonies, which hold over 85% of the British population.

Recent declines in pup production estimates from the surveys suggest one or more of the demographic parameters may be exhibiting some trend over time as well as year to year variation. The available data do not provide evidence for this, significant at the 95% level. However, the fact that such trends can have a large effect on the total population size estimate increases the real level of uncertainty beyond that derived under the stationary assumption.

The reasons for the rapid population expansion in many areas of Scotland since 1960 are uncertain. There has been little harvest of this population since early in the 20th century. Some culling was carried out in the 1970's and 1980's, and this may have had the unintended effect of forcing females to found new pupping colonies, thus expanding the breeding habitat of the population. In addition, the human occupation of the isolated outer islands has decreased over the past 50 years, allowing the development of breeding colonies on these islands.

Baltic

This population is recovering after a century of bounty hunting and 3 decades of low fertility rates caused by environmental pollution. The growing population has led to increased interactions with the fishery, and demands have increased for the re-introduction of hunt. A demographic analysis and a risk assessment of the population has been carried out to make recommendations on how to decrease the risk of quasi-extinction (i.e. reduction below a threshold level) by overexploitation. Although hunting increases the risk of quasi-extinction, the risk can be significantly reduced by the choice of a cautious hunting regime. The least hazardous regimes allow no hunting below a ‘security level’ in population size. Obviously, to implement such a hunting regime knowledge of the population size and growth rate are required. With the current survey methodology, it would take more than 9 years to detect a 5% change in the annual rate of population increase. A hunt exceeding 300 females (less than 600 of both sexes) increases the risk for quasi- extinction substantially. The age and sex composition of killed animals influences the ‘cost of the hunt’.

The Baltic population is severely depleted relative to historical levels. The estimate of pre-exploitation population size is based on information from the commercial and bounty harvests, when hunters were required to return a lower jaw to win the bounty. The former population size has been back-calculated based on historical harvests and more recent estimates of absolute population size. At present there seem to be no signs of density dependence in the population. However there have been radical changes in the Baltic Sea environment, due to the effects of fishing, depletion of other seal species, environmental pollution and possibly climate change, so there wais no reason to expect that carrying capacity would be the same as historical levels. Nevertheless there appears to be room for expansion of this population.

Even with annual estimates of abundance a considerable period of time might pass before a negative population trend could be reliably detected. Other triggers for management action, such as local depletion or changes in spatial distribution, might also be developed. However it was noted that the distribution of Baltic grey seals has changed historically and varies quite dramatically from year to year, partially dependent on ice conditions.

<u>Russia (Murman Coast)</u>
Grey seals on the Murman coast have been protected since 1958 and are included in the Red Data Book of the USSR and the Russian Federation. On the Murman coast grey seals are generally confined to two main breeding areas, the western Aynov (Big and Little Aynov Islands and Big Kiy Island) and the eastern "Seven Islands" (pups are born mainly on Big Litskiy and Veshnyak islands) archipelagos. Most grey seal breeding areas on the Murman coast are included in Kandalaksha Nature Reserve.

Few estimates of the numbers of grey seals inhabiting the Murman coast have been made. Investigations in the early 1960s suggested that about 600 seals inhabited the area at that time. Subsequent studies carried out in 1986 and 1991/92 have indicated that *ca* 850 pups are born in the area, suggesting a population of about 3,500 animals.

<u>Eastern North America - Canada</u>
Northwest Atlantic grey seals form a single stock, but are often considered as two groups, named for the location of the main pupping locales for management purposes. The largest group whelps on Sable Island. The second group, referred to as non-Sable Island or Gulf animals, whelps on the pack ice in the southern Gulf of St. Lawrence, with other smaller groups pupping on small islands in the southern Gulf of St. Lawrence and along the Nova Scotia Eastern Shore. Estimates of pup production in this group have been determined using mark-recapture and aerial survey techniques. Aerial surveys use a combination of reconnaissance surveys to detect whelping patches, visual strip transect techniques to estimate the number of animals on the ice, and corrections to the visual estimates for births that occurred after the survey has been flown. Visual aerial surveys flown during January-February 1996, 1997 and 2000 in the southern Gulf of St Lawrence and along the Eastern Shore resulted in pup production estimates of be 11,110 (6,720-14,540), 5,810 (3,480-8,150) and 5,450 (3,860-7,040) in 1996, 1997 and 2000 respectively after correcting for births and including counts of pups on small islands. Incorporating information on pup production, reproduction rates and removals during government sponsored culling and bounty programs into a population model indicates that the Canadian component of the Northwest Atlantic grey seal population has increased from slightly less than 30,000 animals in 1970 to over 260,000 animals in 2000. The Sable Island and Gulf components of the population have followed very different population trajectories over time owing in part to the greater protection afforded Sable animals and higher mortality rates for Gulf animals whelping on the less stable pack ice. At the same time, differences between the two groups in predicted adult mortality rates suggest that some other mechanisms may be involved. The last complete survey of this population was completed in 1997. Given the rapid growth observed this population, and the significant environmental changes that have occurred over the last 6 years, population projections cannot be considered reliable. A new assessment is needed.

Currently, there is no commercial harvest for grey seals in Canada. A few hundred are taken as part of industry interest in market development. In 2002, the Department of Fisheries and Oceans adopted an Objective Based Fisheries Management approach for seal populations. In 2002, the Department of Fisheries and Oceans adopted an Objective Based Fisheries Management approach for seal populations. This scheme adopts two different approaches based on whether seal populations are considered data rich or data poor. A population is considered data rich if recent estimates of catch levels, reproductive rates and estimates of mortality are available. Under a data rich scenario, two precautionary reference points are established at 70% (N_{70}) and 50% (N_{buffer}) of the largest estimated population size. Management objectives ensure that the population size remains above $N_{70.}$ If harvesting results in a declining population, harvest quotas must be established at a level assuming a much lower risk that the population will continue to decline. If a population continues to decline below a Reference limit point set at 30% below the maximum estimated population size, then it is considered that the population has suffered serious harm and harvesting is discontinued. For a population considered data poor, there is still some discussion concerning the exact approach to establish permissible harvests. Current thinking is leaning towards the use of the Potential Biological Removal (PBR) approach developed in the United States. This approach is extremely conservative, but appears to be suitable in situations where recent population dynamics data are limited. Grey seals are currently considered data poor because the last survey was completed more than five years ago. However, a new survey would result in grey seals being considered data rich.

In discussion the Working Group noted that the Objective Based approach used in Canada has the advantage specifying explicit and easily understood rules for management. It was considered that similar approaches could be applied in Iceland and Norway.

The very rapid growth of the population breeding on Sable Island, along with the recent decline in the ice-breeding Gulf population, raises the possibility that seals are emigrating from the Gulf to Sable Island to breed. There is no direct evidence for this, but such an influx would be difficult to detect given the relative sizes of the populations. It appears that space is not a limiting factor at present on Sable Island, and it is not known when or at what level carrying capacity for this group will be reached.

Eastern North America - USA

Grey seals were historically distributed along the U.S. east coast (from Maine to Connecticut). Native and bounty hunting extirpated the population and they were rarely sighted for most of the 20th century. Seals tagged on Sable Island as pups were observed in New England during the 1980's and 1990's. Breeding began in 1988 on Muskeget Island (Massachusetts) and minimum pup production there increased from 4 in 1988 to over 800 in 2002. Two breeding sites were discovered in Maine in 1994. These sites have been surveyed during the breeding season from 1994 to –2002. Minimum pup production was approximately 180 in 2002. The previous years' surveys have not yet been analysed. The grey seals currently found in New England are probably a mixture of Canadian migrants and animals born locally. Continued surveys, historic research, genetic analysis and fieldwork should provide further insight into this recolonisation event and the current status of grey seals in the U.S.

Recommendations for research applying to all stocks

1. More data on stage durations are required for improved input into models for abundance estimation. Stage durations should be estimated at several sites in each country that uses stage durations as model input. The distributions of stage durations, rather than summary statistics for stage durations, should be provided for model input.
2. There should be an ongoing exchange and verification of samples among laboratories conducting age determination for this species.
3. A North Atlantic wide genetic study of grey seal population structure should be initiated. The study should use the same genetic markers, and laboratory and sampling methods should be standardised to the extent feasible. It was considered that such a study could best be done by co-ordinating the existing studies ongoing in range states including the UK, Norway and Canada.
4. Studies to determine struck and lost rates in different seasons and under different hunting conditions should be carried out in the Faroes, Norway and Iceland. Further information on bycatch mortality of grey seals is required from Norway and Iceland.
5. To monitor changes in grey seal populations, anthropogenic mortality should be incorporated explicitly into population models. These sources of mortality include removals due to harvests corrected for animals killed but not recovered (struck and& loss) and bycatch in commercial fisheries.
6. Satellite tracking experiments should be carried out in the Faroe Islands, Iceland and Norway. The studies should be directed towards determining the movements of animals while at sea, and their habitat use through recording of dive profiles. Such studies will have particular relevance to determining possible interactions with fisheries in the area, but also to possible movements of animals between areas. For the Faroe Islands it may help to determine the proportion of animals that are resident in the area.

General discussion

The Scientific Committee endorsed the management advice and recommendations for research put forward by the Working Group. Víkingsson informed the Committee that the Marine Research Institute in Iceland had assumed more responsibility for research on grey seals. Surveys will be conducted annually at selected breeding colonies in Iceland. Repeated surveys will be flown and ground surveys will be conducted to assess pup staging. Haug noted that the last portion of the Norwegian coastal survey is being conducted and a complete estimate should be available in 2004. No research on grey seals is presently being conducted in the Faroes.

9.9.2 Future work

This Working Group was the first dedicated to grey seals over the entire North Atlantic. Members considered the Working Group very worthwhile in terms of exchange of information about research and management programs in other jurisdictions. The Scientific Committee therefore recommended that it meet again at some point to update the status of all stocks, and possibly to conduct detailed assessments of those stocks for which concern has been expressed.

The possibility of dedicating a volume of NAMMCO Scientific Publications to a North Atlantic-wide overview of this species was considered. Several of the working papers could be published in such a volume, and more might be contributed by other authors. Such a volume would be unique and of value. The Scientific Committee therefore nominated Tore Haug and Droplaug Ólafsdóttir to co-ordinate planning for such a volume and report back to the Scientific Committee with a list of potential papers.

9.10 Humpback whales

9.10.1 Update on progress

The Scientific Committee has previously noted that there is evidence of a rapidly increasing abundance of humpback whales around Iceland, and the Council has recommended that the Scientific Committee complete abundance estimates for this species as a high priority. The Scientific Committee was also asked to consider the results of the "Years of the North Atlantic Humpback" (YoNAH) project as it pertains to member countries in providing advice for this species.

Abundance estimates calculated from the Norwegian NASS-1995 shipboard sightings survey were provided to the Committee (SC/11/MF/10). The survey was conducted with 2 independent platforms on each of 11 vessels. The target species was the minke whale and the survey was designed specifically to get a best estimate of abundance for this species. The survey was run in passing mode, that is, without closing on sightings for species identification or group size confirmation. As a result, more than 30% of the sightings of large whales were not identified to species. The survey covered the Northeastern Atlantic including the North Sea, the Norwegian Sea, the Greenland Sea and the Barents Sea. Estimates were based on standard line transect analyses for each of the survey platforms, and the 2 platforms combined. The sightings of humpback whales were nearly exclusively made in the Bear Island shelf area, which is known to be an important habitat for humpbacks in summer time. Compared to earlier surveys, however, the 1995 distribution was much more focused around Bear Island, as both in 1988 and in 1989 most of the humpback whale observations were made in the Norwegian Sea far west off the continental slope. The abundance estimate for the entire survey area was 1,210 (cv 0.255). Abundance estimates from the NASS around Iceland and the Faroes have been completed and are reported under Item 10.

The abundance of humpbacks in the North Atlantic has been estimated at 10,752 (cv 0.068) for the West Indies breeding population only, and 11,570 (95% CI 10,290-13.390) for the entire North Atlantic (Stevick *et al.* 2003). These estimates, which apply to 1992-93, are derived from the YoNAH project, which used mark recapture analysis of photo-id and biopsy data. The estimates from the NASS in 1995 and 2001 are higher, but these apply only to the survey area around Iceland and the Faroes (and Norway in 1995) (NASS-1995: 15,100 (95% CI 6,500 – 35,100); NASS-2001: 14,300 (95% CI 5,700 – 36,000). The broad confidence limits of the NASS estimates are a result of the uncertainty related to sighting surveys of animals having a highly aggregated distribution. Because of this, there is no significant difference between YoNAH and NASS estimates. However, the YoNAH estimate is said to apply to the entire North Atlantic whereas the NASS estimates apply only to the area around Iceland and the Faroes (and Norway in 1995). Other areas with known concentrations of humpback whales, such as eastern Canada, the Gulf of Maine, and West Greenland, are not included in the NASS estimates. The YoNAH estimate should therefore be considerably larger than the NASS estimates, which apply only to 1 or 2 of potentially 5 feeding areas in the North Atlantic.

The YoNAH estimate for the North Atlantic is negatively biased for at least 2 reasons: animals that do not breed in the West Indies are under-represented; and the area east of Iceland was poorly sampled. This latter area accounted for the bulk of the NASS estimates in 1995 and 2001. Conversely the NASS shipboard estimate from 1995 may be positively biased because of possible double counting, although most other potential biases for the NASS estimates are negative. Nevertheless these biases could not fully account for the apparent difference between the YoNAH and NASS point estimates.

The Scientific Committee concluded that the discrepancy between the NASS and YoNAH estimates suggests that the North Atlantic population of humpback whales is likely considerably larger than estimated in the YoNAH study. Further studies are needed to resolve these differences more fully. In particular, photo-id/biopsy studies need to sample humpback whales in all important habitats around Iceland. It is also recommended that available humpback survey estimates from all feeding aggregations in the North Atlantic should be compiled. For future NASS, consideration should be given to designs suitable for humpback whale feeding aggregations, and to extending the survey coverage.

9.10.2 Future work

The Scientific Committee welcomed the new information from the NASS-95 Norwegian survey and recommended that estimates for large whales from the 1996-2001 survey series be completed in a timely manner. Otherwise the Committee will await further requests from the Council on this species.

9.11 Sperm whales

9.11.1 Update on progress

Abundance estimates for sperm whales from the NASS-95 Norwegian shipboard survey were provided to the Committee (SC/11/MF/10, see ***9.10.1*** for a description of the survey). Most sperm whales were sighted in the Norwegian Sea off the continental slope west of northern Norway. A considerable number of sightings were relatively evenly spread out over most of the Norwegian Sea south of about 73˚ N. Two sightings were made far north of Spitsbergen, which is quite unexpected. The 1995 distribution is relatively similar to the 1989 survey distribution, except that more whales were observed in the southern Norwegian Sea in 1995. The 1988 sperm whale survey distribution showed the same pattern in the northern Norwegian Sea, but in that survey the southern part was not covered. The traditional line transect abundance estimate for the entire survey area was 4,319 animals (cv 0.199) with no correction for diving animals, which is likely to be substantial for this species.

9.11.2 Future work

No advice has been requested for this species and no further work was identified.

10. NORTH ATLANTIC SIGHTINGS SURVEYS

10.1 NASS-2001 and earlier surveys

10.1.1 Report of the Working Group on Abundance Estimates

The Working Group on Abundance Estimates met in St Andrews, UK in March 2003. The fourth North Atlantic Sightings Survey was carried out in June/July 2001. The Working Group was tasked with continuing the evaluation of abundance estimates for target and non-target species, determining if additional analyses are required and recommending estimates for acceptance by the Scientific Committee (Annex 3).

Minke whales

An estimate of the abundance of minke whales form the NASS ship survey around Iceland and the Faroes was presented. This area is exclusive of the aerial survey block around Iceland. Double platform data were available and indicated that *g(0)* was less than 1, however an attempt to apply the double platform hazard probability method to these data was not successful due to the distributional properties of the data. The distribution of perpendicular distances showed a steep decline from the trackline and almost no “shoulder”, and a long tail extending out to about 3,000 m from the trackline. This made the estimation of effective strip width (esw) problematic as the estimate was not robust to changes in truncation, binning of distance intervals or model choice. The estimated *esw* was narrower than those seen in previous NASS or other similar surveys. The point estimate of 23,955 (cv 0.30) is higher but not significantly so than the estimate from roughly the same area from the 1995 NASS. The distribution of minke whales differed somewhat between the surveys, with many more sightings in the Faroese block in 2001 than in 1995.

The Working Group examined the distributions of sighting angles, radial and perpendicular distances from the ship survey in an effort to determine the source of the highly peaked detection function, but could not conclusively explain the unusual distributions of radial, and especially perpendicular distances realised in the survey. The Working Group concluded that the detection function was appropriate for these data, and that the abundance estimate should be comparable to earlier surveys. The Working Group recommended that further efforts be made to use the double platform data to estimate bias due to visible whales missed by observers for this species.

Borchers provided new abundance estimates from the NASS aerial surveys around Iceland carried out in 1987 and 2001. Estimates for the 1987 survey were previously reported by Hiby *et al.* (1989) and Borchers *et al.* (1997). The former estimate was corrected for bias due to error in measuring radial distance, while the latter, considerably higher estimate was not. However it was not certain whether the difference between the 2 estimates was due to the measurement error bias or to apparent differences in the datasets analysed.

Maximum likelihood estimators of abundance for cue counting surveys with measurement error were developed and their properties were investigated by simulation. Conventional estimators not corrected for measurement errors were found to be insensitive to low levels of measurement error but increasingly biased as measurement error increased. The new estimators were found to be practically unbiased.

For the 1987 survey estimation using this model yielded an abundance estimate of 19,320 (cv 0.28) animals for the originally designed strata. Using analysis options that make the estimate as comparable as possible to the estimates obtained by Hiby *et al.* (1989), yielded an estimate of 10,700, compared to an estimate of about 9,000 obtained by Hiby *et al.* (1989). Estimates obtained using the same methods as were used by Borchers *et al.* (1997) yielded an abundance estimate of 11,100 – compared to the estimate of over 20,000 obtained by them. This indicates that the main source of this discrepancy was differences in the data used in the two analyses, but these differences are not understood.

For the 2001 survey analysis, measurement error had an estimated cv of only 11% for these data. Simulations show that bias due to errors of this magnitude are negligible. One of the primary observers on this survey detected cues at small radial distances with estimated probability of only around 0.25. Correcting estimates accordingly results in an abundance estimate with very high variance. Two approximately unbiased estimators were presented - one using all data and correcting for missed animals at distance zero, the other using only data from the side of the plane with the more efficient observer. Both methods yield abundance estimates of about 43,000 animals. The estimate using only the more effective observer has greater precision (cv 0.19) than the estimate using both observers (cv 0.32). The estimate using data from the more effective observer was considered preferable, as it was more precise and straightforward in calculation than the estimate using both observers. This estimate was therefore recommended for acceptance by the Scientific Committee.

Both estimates assume a cueing rate for minke whales of 53 surfacings per hour. Sampling variability in this estimated cueing rate has not been accounted for in the variance of the abundance estimate, which therefore is negatively biased.

The apparent inconsistencies in the datasets from the 1987 survey analysed by Hiby *et al.* (1989), Borchers *et al.* (1997) and Borchers (SC/11/AE/4) were troubling, however it seems likely that the dataset analysed by Borchers *et al.* (1997) was corrupted in some way, as the results of the other two analyses are consistent. The new estimate by Borchers (SC/11/AE/4) for 1987 was therefore recommended for acceptance by the Scientific Committee.

Trends in abundance

The estimate from the aerial survey for coastal Iceland in 2001 is more than double that for 1987, however the difference is not significant. The Working Group concluded in 2002, based on line transect analysis of the density of minke whales from the 4 aerial surveys carried out since 1986, that the abundance of minke whales around Iceland has been stable or shown a moderate increase over the period. This conclusion remained unchanged.

The results from the NASS series indicate an increase in minke whale abundance to the south of Iceland and around the Faroes from 1995 to 2001. There seems also to have been a decrease in the abundance of minke whales in the Barents Sea, the Norwegian Sea and the North Sea in the same period. These changes in spatial distribution are not statistically significant, but might indicate a shift towards more southern and central Atlantic waters in the Central and Eastern Stocks of minke whales.

Humpback whales

Burt *et al.* (SC/11/AE/7) presented estimates of humpback whale abundance from the 1995 and 2001 Icelandic and Faroese surveys. The data were analysed using the "count" variant of the methodology of Hedley *et al.* (1999). The effort data was divided into small segments, over which covariates were assumed not to vary, and the number of sightings within each segment was estimated. This number formed the response variable and locational variables were used as explanatory variables in a generalised additive model (GAM). A school density surface was obtained by predicting over a grid of the whole survey region and abundance was then estimated by integrating under the surface. Data from these surveys were analysed separately, and results were compared in regions of overlap. The estimated abundance for the region covered by the aerial surveys was 950 (cv 0.37) in 1995 and 3,371 (cv 0.79) in 2001. The estimated abundance for the region covered by the aerial surveys was 950 (95% CI 470 -1,920)) in 1995 and 3,371 (95% CI 860 – 13,260) in 2001. The estimated abundance of humpback whales from the shipboard surveys was 22,305 (95% CI 7,655 – 63,437) in 1995 and 14,259 (95% CI 11,258 – 72,271) in 2001. A calibration factor to make the aerial and shipboard abundance estimates compatible was calculated using data from the areas of overlap between the respective shipboard and aerial surveys. Using this calibration factor, the estimated abundance from the aerial survey was 15,270 in 1995, and 9,920 in 2001.

The high variance of the GAM bootstraps in both the aerial and shipboard surveys was a disappointment to the Working Group which had hoped the use of spatial covariates would increase the precision of the abundance estimates. The major reason suggested for this was that the main variables determining humpback distribution are probably not location and depth, so that spatial models using these variables alone have limited ability to reduce variance. The aerial and shipboard surveys were not integrated into a single spatial model, which would have reduced the variances of the estimates..

Trends in abundance

In 2002 the Working Group reviewed an analysis of the trend in encounter rate over the course of the 4 Icelandic aerial surveys carried out since 1986 which showed an increase of 11.4% (SE 2.1%) per year over the period in the survey area. This rate of increase is in accordance with that of 11.6% over the period 1970 to 1988 in recorded sightings humpback whales by whalers operating west of Iceland reported by Sigurjónsson and Gunnlaugsson (1990). The total estimates from the spatial analyses of the 1995 and 2001 surveys do not reveal a trend over the period, but they are much higher than estimates from earlier surveys. All available evidence indicates that the abundance of humpback whales around Iceland has increased since 1987.

<u>Fin whales</u>

Pike *et al.* (SC/11/AE/8) reported revisions to the estimates of fin whale abundance in the Faroese and Icelandic blocks reported by Gunnlaugsson *et al.* (2002). The new estimates use estimates of *esw* adjusted for the vessel covariate at the stratum level. This should result in somewhat more accurate block estimates, as most blocks were surveyed by only one vessel. In addition a bootstrap estimate of variance was used in the new estimates. The revised total estimate is virtually identical to that reported by Gunnlaugsson *et al.* (2002), however the block estimates differ slightly.

The Working Group noted that the new stratum estimates, while having slightly lower precision than those presented last year, should be more accurate, and recommended their acceptance by the Scientific Committee.

<u>Dolphins</u>

Pike reported that an analysis of *Lagenorhyncus* spp. dolphin abundance from the

Icelandic aerial surveys conducted since 1986 was in progress. The Working Group reiterated its conclusions from previous meetings, that while an analysis of the shipboard dolphin data from the Icelandic 2001 and earlier surveys is feasible, the problems of uncertain species identification, uncertain group size estimation, and possible responsive movement of these species would present significant problems for abundance estimation. As a first step, the data should be closely inspected to determine if further analyses are likely to be useful.

Pilot whales

Pike *et al.* (SC/11/AE/10) provided abundance estimates, uncorrected for availability or perception biases, for pilot whales from the Faroese and Icelandic shipboard components of NASS-2001. The estimate was derived using conventional line transect methods. The total estimate for the Faroese and Icelandic blocks of 65,315 (cv 0.39) is considerably but not significantly lower than estimates for comparable areas from NASS 1987, 1989 and 1995. The estimated *esw* was higher for this survey than for most previous surveys. If it is positively biased then the abundance estimate is negatively biased.

The Working Group noted that pilot whales had not been a target species for the 2001 survey. The estimation of group size and the discrimination of sub-groups are problematic for this species and require specialised methods that were not implemented fully in the 2001 survey. It was also suggested that there were probably differences in operational procedures between vessels. More importantly, there was no coverage in areas to the south of Iceland and the Faroes that are known from previous surveys to have relatively high densities of pilot whales. The Working Group concluded that a survey targeting this species requires a different spatial coverage and special field methods that were not used in 2001. The estimate is therefore not representative of the numbers in the Northeast Atlantic and should not be used for assessment purposes.

Bottlenose whales

Pike *et al.* (SC/11/AE/11) provided abundance estimates for northern bottlenose whales from the shipboard components of NASS 1995 and 2001. There were not enough sightings in the 1995 survey to reasonably estimate the detection function. Therefore sightings from both surveys were combined for the purpose of estimating a single detection function. This was considered reasonable because the same basic field methods, and some of the same vessels and observers were used in both surveys. A separate analysis was also done for the 2001 survey, using only sightings from that survey to estimate the detection function. Double platform data was available for the 2001 survey, and from the Faroese block in 1995, but was not used here for bias correction.

Distribution was similar in the two surveys, however more sightings were made to the northeast of Iceland in 2001 than in 1995. Most sightings were made in the Faroese block in both years. The estimates for the two surveys were almost identical although the 1995 estimate was much less precise. The estimate for 2001 using data from both surveys to estimate the detection function was similar to that using only data from that year. The uncorrected estimates from 1995 (27,900, cv 0.67) and 2001 (28,000, cv 0.22) are significantly higher than the uncorrected estimate from the 1987 survey of 5,800 (cv 0.15) (NAMMCO 1995). These estimates are negatively biased due to whales missed by observers and whales that were diving as the vessels passed. The latter bias is likely severe for this long-diving species. In addition neither survey covered the entire summer range of the species, which extends farther south of Iceland and the Faroes at this time of year.

The Working Group concurred with the authors that bias due to diving animals being missed was likely severe for this species. Bias due to animals on the surface being missed was likely of less significance as this species frequently occurs in groups that are easy to see at short distances. It was suggested that bounds on the bias due to diving whales being missed could be estimated from recent radio tracking experiments on 2 whales off Eastern Canada (Hooker and Baird 1999). Based on these data a correction factor for this bias is unlikely to be greater than 3. However these data may not be applicable as they were collected from only 2 animals and in another part of the Atlantic. The Working Group recommended that telemetry studies be conducted on this species, both to further elucidate migratory patterns and stock structure, and to obtain data on diving to be used for determining correction factors for survey data.

Blue whales

Pike *et al.* (SC/11/AE/12) provided estimates of blue whale abundance from the NASS-1995 and 2001 shipboard surveys around Iceland and the Faroes. An insufficient number of sightings were made in either survey to reliably estimate the detection function, so sightings from the 2 surveys were combined for this purpose. Blue whale sightings were recorded in 4 levels of uncertainty of species identification. For this reason 2 estimates were calculated: a "High" estimate including all classes of sightings, and a "Low" estimate excluding the most uncertain classes of sightings.

Blue whales were concentrated to the west and north of Iceland in both surveys. The difference between the HIGH and LOW estimates was not as great as might be expected given the difference in the number of sightings, primarily because sightings with more uncertain species identification tended to be far from the trackline, and therefore their addition had the effect of increasing the effective strip width. The estimates from both surveys are consistent with a population of between 700 and 1,900 blue whales in the survey area. An area of blue whale concentration off western Iceland near the Snæfellsnes Peninsula has not been covered well particularly in the 2001 survey.

Additional analyses to be carried out

The Working Group provided a list of future work to be carried out to refine abundance estimates from the 2001, 1995 and earlier surveys (see Annex 3 Table 2). The Working Group noted with pleasure that estimates had been completed for target species, and preliminary estimates had been completed for most non-target species for which abundance estimation was feasible.

Structuring integrated analyses from all NASS

Table 1 in Annex X provides a first step towards integrating the results of all NASS by providing estimates by species and survey for comparable areas. However some other issues remain to be addressed to improve comparability between surveys. The analytical methods used in estimating abundance for some species from the 1987 and

1989 Faroese and Icelandic ship surveys differed somewhat from those used for later surveys. Some re-analyses may therefore be required for these surveys using a more standardised analytical approach.

Future of the NASS

The first surveys had the major objective of producing a first description of the distribution and abundance of cetaceans over large areas of the North Atlantic. This objective has been in large part fulfilled. Later Norwegian surveys focussed specifically on providing abundance estimates for minke whales for input into their management program. It is necessary to determine the necessity and objectives of continued large-scale integrated cetacean surveys in the North Atlantic, as the nature of the objectives will determine the optimal form of the survey.

For all countries involved in NASS, the main objective now is to provide abundance estimates for target species for input into harvest management programs. For this purpose periodic estimates of absolute abundance are required, and these estimates should be as unbiased and precise as possible, and with quantified uncertainty. A secondary objective will be to provide information on distribution and abundance for research into ecosystem relations, long-term environmental change and fisheries interactions.

Several countries are planning surveys which may offer opportunity for integration into a large-scale survey. Iceland will continue surveys on a 5-6 year rotation, with the next survey tentatively planned for 2006. A new SCANS is being planned for 2005/6, with the offshore portion to be conducted in 2006. The survey will cover the North Sea and adjacent waters, and the North Atlantic EEZ's of all European Union countries. The Faroe Islands is planning a survey of small cetaceans to coincide with the offshore portion of SCANS in 2006. Norway will continue its rotational survey program, but integrate it with other surveys to the extent feasible. Therefore the best opportunity for a future large-scale integrated sightings survey would appear to be in 2006. The Working Group recommended that contacts be made between the organisations planning these surveys in order to integrate them to the extent possible.

A particular problem is the differing target species of the surveys. Experience with NASS suggests that surveys with large whales as target species do not provide adequate data for small whales and dolphins. The Working Group recommended that survey protocols be modified to make them applicable to multiple species, to the extent feasible given the overall objectives of the surveys.

The Working Group considered the idea of conducting "mosaic" type surveys after the Norwegian model, in which a portion of the total survey area is surveyed annually on a rotational basis. Norway has completed a first 6 year rotation and has had a positive experience with this survey mode. The main advantages are logistical, with annual use of equipment and personnel, rather than a more long-term rotation. This allows more continuity in the use of observers, which in turn results in more experienced observers and better-quality data. The main disadvantage is the loss of synoptic coverage in chosen years, and thus for these years the precision would have been better with a synoptic than with a mosaic design. This would indeed be the case if the whole stock is present in the area covered. If, however, there are shifts in the spatial distribution on a large scale (*e.g.* see 5.iv), the true uncertainty in abundance might be higher than the estimated uncertainty in the synoptic survey. In the long run, a well-designed mosaic of frequent partial surveys might provide a better basis for estimating trends in time and space than do infrequent large-scale surveys. The Working Group recommended that this model be considered for application on an international basis over the entire area covered by NASS.

The NASS have provided important information on the distribution and abundance of cetaceans in the North Atlantic that will be useful for many years to come.

General discussion

The Scientific Committee welcomed the new abundance estimates and accepted those recommended by the Working Group.

The Scientific Committee agreed with the conclusion of the Working Group that estimates from the NASS-1995, 1987 and 2001 for pilot whales were likely biased mainly because they did not cover the area occupied by the stock early in the summer. The estimate from NASS-89, which covered areas farther to the south and occurred later in the summer, is still considered the best available for this species. Monitoring of the abundance of this stock is advisable as it is a harvested species, and future surveys should take this into consideration. However it may be possible to derive an abundance index from the other surveys, which covered similar areas at the same time of year, and the Committee recommended that such an index be developed as an interim measure. The SCANS and other coordinated surveys to be conducted in 2005/6 may provide an opportunity to get a new abundance estimate for this species (see 10.1.3).

10.1.2 Future analytical work

The Committee endorsed the recommendations for further analytical work developed by the Working Group (Annex 3, Table 2). Much of this work will be done in the preparation of the new volume of NAMMCO Scientific Publication on the NASS (see 12.1).

10.1.3 Recommendations for future NASS

The NASS have been highly successful in providing important information on the distribution and abundance of cetaceans over a broad area of the North Atlantic. This information becomes more valuable every time a survey is completed, as it provides an indication of trends in abundance over meaningful time periods. The Scientific Committee emphasised the importance of these surveys and recommended that they be continued in some form at regular intervals.

The Scientific Committee concurred with the Working Group that 2006 will be the best year to hold an international sightings survey, in conjunction with the SCANS. Víkingsson informed the Committee that regular surveys in Icelandic waters were planned, and these could be coordinated with other jurisdictions. The Scientific Committee recommended that Iceland, the Faroes, Greenland and Norway make every effort to coordinate their survey activities with other countries into an integrated NASS in 2006. Such co-ordination can occur through this Committee, as has been done in 1995 and 2001.

10.2 Status of publications from previous NASS surveys

See 12.1.

10.3 Establishment of a sightings survey database

The stratification and coverage in the Faroese and Icelandic ship surveys has varied greatly between surveys. Post-stratification into comparable areas would be facilitated by assembling all NASS data into a standardised database format from which spatially bounded sub-sets could be easily extracted. The DESS program used by the IWC is one example of such a program that could be modified for use with the NASS for storing and extracting data. There would be some cost involved in creating such a database and formatting the data for inclusion in it. However, given the costs and effort that have gone into conducting these surveys, the Working Group considered that this would be a good investment that would facilitate the use of these data. The Working Group on Abundance Estimates therefore recommended that such a database be established for the NASS data.

The Scientific Committee agreed that the use of the DESS system would be advantageous in that the system is designed for this purpose and most of the NASS data have already been entered and verified by the IWC, with the exception of the Faroese NASS-95 and 2001 data. However the establishment and maintenance of such a database would be costly in time, effort and money, and would be largely duplicative of the database already held at the IWC Secretariat. The Scientific Committee therefore recommended that the Secretariat investigate the possibility of reaching an agreement with the IWC for access to these data, with the permission of the data owners. It was also recommended that the data from the 1995 and 2001 surveys be integrated into the database.

11. DATA AND ADMINISTRATION

Nothing was identified for discussion under this item.

12. PUBLICATIONS

12.1 NAMMCO Scientific Publications

Five volumes of NAMMCO Scientific Publications have now been published: Vol. 1 *Ringed seals in the North Atlantic*, Vol 2 *Minke whales, harp and hooded seals: Major predators in the North Atlantic ecosystem,* and Vol. 3 *Sealworms in the North Atlantic: Ecology and population dynamics*, Vol. 4 *Belugas in the North Atlantic and the Russian Arctic,* and Vol. 5 *Harbour porpoises in the North Atlantic.* The latter was published late in 2003.

Pike provided an update on Volume 6 on the North Atlantic Sightings Surveys, to be edited by Dr Nils Øien and Pike. The purpose of the volume will be to publish new estimates from the recent NASS (1995 and 2001) which have not been published elsewhere. In addition the volume will integrate the results by species for all NASS, providing information on the trends in distribution and abundance over the period 1987-2001, and looking into the ecological consequences of these observations. It is expected that papers will be received for peer review in April 2004, making publication likely sometime in 2005.

The Working Group on Grey Seals recommended that the Scientific Committee publish a volume on the status of grey seal stocks in the North Atlantic. In addition to the papers developed for the Working Group meeting, other papers could be invited. Haug and Ólafsdóttir agreed to act as editors for the volume, with the possible assistance of others from outside the Committee. They anticipated that the volume could be ready for publication by 2005.

Heide-Jørgensen informed the Committee that the upcoming assessment meeting on narwhal (see 9.4) will produce a wealth of previously unpublished information for that species. He agreed to investigate the possibility of producing a volume on narwhal, but noted that a long delay in publication might render the volume unattractive to potential authors.

The Committee recognised that the production of these volumes involved a significant cost and workload to the Secretariat. Every effort should be made to streamline the publishing process to reduce the workload and the time required to produce the books. It was also recommended that the papers in the volumes be made available on the internet some time after publication. The Secretariat will investigate this possibility.

12.2 Other publications

Under the Rules of Procedure for the Scientific Committee, working papers prepared for the Scientific Committee cannot be distributed without the permission of the working paper author. While supporting this stipulation, the Scientific Committee considered that working papers could be made more readily available to members, and their existence better known to others. It was recommended that the Secretariat investigate the possibility of maintaining a password-protected web site to provide access to all working papers in electronic form to members. In addition, a list of papers could be provided to others, with contact information for obtaining permission from authors.

13. BUDGET

The Scientific Secretary presented a draft budget for the Scientific Committee for 2003. He noted that the budget allocation of the Scientific Committee was utilised for the most part for funding invited experts to participate in Working Group meetings, and for contracted work. The Scientific Committee approved the budget as presented.

14. FUTURE WORK PLANS

14.1 Scientific Committee

The 12th meeting will be held in the Faroes in October at a location and date yet to be determined.

14.2 Working groups

Working Group on the Status of Beluga and Narwhal in the North Atlantic

The Working Group will meet jointly with the Scientific Working Group of the JCNB in February 2004, mainly to deal with narwhal assessments. Dr Øystein Wiig is chairman.

Working Group on Marine Mammal – Fisheries Interactions
The Working Group will meet immediately prior to the Scientific Committee meeting in October 2004 to evaluate new applications of multispecies models and new empirical data on the diet of and consumption by marine mammals. Lars Walløe is chairman.

Satellite Tagging Correspondence Group
The information from satellite tracking studies has been deemed essential to future assessment efforts. The Scientific Committee therefore stressed the necessity for the Satellite Tagging Correspondence Group to complete its task of addressing methodological/technical issues in a timely manner. Bjarni Mikkelsen is chairman. He anticipated that the Group would begin its work early in 2004.

Other working groups may be required depending on requests received from the Council.

15. ELECTION OF OFFICERS

Lars Walløe was elected as Chairman, and Dorete Bloch as Vice Chairman, of the Scientific Committee. The Committee expressed its thanks to Gísli Víkingsson for his able chairmanship over the past 3 years.

16. ANY OTHER BUSINESS

Research takes of minke whales in Iceland in 2003
In 2003 the Marine Research Institute introduced a 2 year plan involving limited takes of minke, fin and sei whales. This plan was discussed earlier this year by the IWC Scientific Committee and Commission. In August 2003 it was decided to implement research takes of minke whales, and 36 were taken before the program ended at the end of September.

The main objective of the program for minke whales is to collect information on feeding ecology for incorporation into multispecies models. Other objectives include investigations on stock structure, parasites, diseases, biological parameters and pollutants.

Whaling was conducted from 3 vessels with catches distributed around Iceland in proportion to the relative abundance observed from sightings surveys. There was a prevalence of males taken (23) and indications of sex segregation in the catching areas. Animals were dissected and sampled onboard the vessels, and a subsample of animals was examined by veterinarians.

At present it is anticipated that the program will continue in 2004 and 2005, with a total take over the period of 200 minke whales.

Oceanographic sampling using satellite tagged belugas around Svalbard
Lydersen demonstrated how large amounts of oceanographic information could be collected and retrieved in a cost-efficient manner using ice-associated marine mammals as carrier of oceanographic sampling equipment. In addition a vast amount of information regarding the habitat of these animals is concomitantly sampled.

Satellite-linked conductivity-temperature-depth (CTD) loggers purpose built by Sea Mammal Research Unit were deployed on wild, free-ranging white whales to study the oceanographic structure of an Arctic fjord (Storfjorden, Svalbard, Norway). The whales dove to the bottom of the fjord routinely during the study and occupied areas with up to 90% ice-cover. During the initial period of freezing in the fjord, over a period of approximately 2 weeks, 540 CTD profiles were successfully transmitted. The data indicate that Storfjorden has a substantial inflow of warm North Atlantic Water (NAW); this is contrary to conventional wisdom that has suggested that it contains only cold Arctic water.

Free-living ringed seals equipped with satellite-relayed data loggers with incorporated oceanographic-quality temperature sensors were used to collect data from a large sector of the northern Barents Sea during the autumn and early winter. A total of 2,346 temperature profiles were collected over a 4-month period from Norwegian and Russian Arctic waters in areas that were at times 90-100% ice-covered. Temperature distributions at different depths from north-eastern parts of Svalbard, Norway, show warm NAW flowing along the continental slope and gradually cooling at all depths as it flows eastwards. The data suggests that most of the cooling takes place west of 30° E. Vertical temperature profiles from the area between Svalbard and Franz Josef Land, Russia, show how the surface water cools during freeze-up and demonstrates a warm water flow, which is probably NAW, coming in from north through a deep trench west of Franz Josef Land.

17. ACCEPTANCE OF REPORT

The Report was accepted on November 27, 2003. The Scientific Committee expressed their thanks for the fine hospitality shown by the Greenland Institute of Natural Resources and the Greenland Home Rule Government.

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Appendix 1: **LIST OF PARTICIPANTS**

Faroe Islands
Dorete Bloch
Geneviève Desportes
Bjarni Mikkelsen

Greenland
Aqqalu Rosing-Asvid
Lars Witting
Mads Peter Heide-Jørgensen

Iceland
Þorvaldur Gunnlaugsson
Droplaug Ólafsdóttir
Gísli A. Víkingsson (Chairman)

Norway
Tore Haug
Lars Walløe
Christian Lydersen

Ex-Officio Members
Grete Hovelsrud-Broda, NAMMCO
Daniel Pike, NAMMCO

Other
Charlotte Winsnes, NAMMCO

Appendix 2: **AGENDA**

1. Chairman's welcome and opening remarks
2. Adoption of agenda
3. Appointment of rapporteur
4. Review of available documents and reports
    - 4.1 National progress reports
    - 4.2 Working group reports
    - 4.3 Other reports and documents
5. Cooperation with other organisations
    - 5.1. IWC
    - 5.2 ICES
    - 5.3 Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga
6. Incorporation of the users knowledge in the deliberations of the scientific committee.
7. Update on status of marine mammals in the North Atlantic
8. Role of marine mammals in the marine ecosystem
    - 8.1 Progress on modelling
    - 8.2 Other matters
9. Marine mammal stocks -status and advice to the council
    - 9.1. Harp seals
        - 9.1.1 Update on progress
        - 9.1.2 Future work
    - 9.2. Hooded seals
        - 9.2.1 Update on progress
        - 9.2.2 Future work
    - 9.3. Harbour porpoise
        - 9.3.1 Update on progress
        - 9.3.2 Future work
    - 9.4. Narwhal

9.4.1 Update on progress
9.4.2 Future work
9.5 Beluga
9.5.1 Update on progress
9.5.2 Future work
9.6 Fin whales
9.6.1 Update on progress
9.6.2 Future work
9.7 Minke whales
9.7.1 Update on progress
9.7.2 Future work
9.8 White-beaked, white-sided dolphins and bottlenose dolphins
9.8.1 Update on progress
9.8.2 Future work
9.9 Grey seals
9.9.1 Update on progress
9.9.2 Future work
9.10 Humpback whales
9.10.1 Update on progress
9.10.2 Future work
10. North Atlantic Sightings Surveys
10.1 NASS-2001 and earlier surveys
10.1.1 Report of the working group on abundance estimates
10.1.2 Future analytical work
10.1.3 Recommendations for future NASS
10.2 Status of Publications from previous NASS surveys
10.3 Establishment of a sightings survey database
11. Data and administration
12. Publications
12.1 NAMMCO scientific publications
12.2 Other publications
13. Budget
14. Future work plans
14.1 Scientific committee
14.2 Working groups
14.3 Other matters
14.3.1 Provision of advice on sustainable catch to council
15. Election of officers
16. Any other business
16.1 Satellite tagging correspondence group

Appendix 3

LIST OF DOCUMENTS

SC/11/1	List of Participants
SC/11/2	Provisional Annotated Agenda (Draft)
SC/11/3	List of Documents
SC/11/NPR-F	National Progress Report – Faroe Islands
SC/11/NPR-G	National Progress Report – Greenland
SC/11/NPR-I	National Progress Report – Iceland
SC/11/NPR-N	National Progress Report – Norway
SC/11/NPR-C	National Progress Report – Canada
SC/11/4	Observers Report: 54th Meeting of the IWC Scientific Committee, Shimonoseki, Japan
SC/11/5	ICES/NAFO "Workshop to Develop Improved Methods for Providing Harp and Hooded Seal Harvest Advice"
SC/11/6	Report of the Joint ICES/NAFO Working Group on Harp and Hooded Seals
SC/11/7	Report of the NAMMCO Scientific Committee Working Group on North Atlantic Fin and Minke Whales
SC/11/8	Report of the NAMMCO Scientific Committee Working Group on Grey Seals
SC/11/9	Report of the NAMMCO Scientific Committee Working Group on Abundance Estimates.
SC/11/10	Status of *NAMMCO Scientific Publications* volume on the NASS.
SC/11/11	Establishment of a sightings survey database
SC/11/13	NAMMCO Scientific Committee Budget 2002.
SC/11/14	Summary of requests by NAMMCO Council to the Scientific Committee, and responses by the Scientific Committee
SC/11/16	Bloch, D. and Mikkelsen, B. Catch history and distribution of White-sided dolphin, *Lagenorhynchus acutus* in the Faroe Islands
SC/11/17	Mikkelsen, B. Feeding ecology of White-sided dolphins, *Lagenorhynchus acutus*, in the Faroe Islands
SC/11/18	Bloch, D., Mikkelsen, B. and Zachariassen, M. Age and growth parameters of White-sided dolphins, *Lagenorhynchus acutus*, in the Faroe Islands
SC/11/19	Jacobsen, Á., Mikkelsen, B. and Bloch, D. Genetic evidence of stocks of White-sided dolphins, *Lagenorhynchus acutus*, in the Faroe Islands
SC/11/MF/10	Distribution and abundance of large whales in the Northeast Atlantic, 1995.
SC/11/For information	Víkingsson, G.A. and Ólavsdóttir, D. Research takes of minke whales in Icelandic waters during autumn 2003.

ANNEX 1

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON MINKE AND FIN WHALES

Copenhagen, Denmark, 20-22 November 2003

1. OPENING REMARKS

Chairman Lars Walløe welcomed participants (Appendix 1) to the meeting.

Minke and fin whales are likely the two most abundant species of baleen whales in the North Atlantic, and have a long history of exploitation in the area. They are the only species of baleen whales presently being taken in the North Atlantic, by NAMMCO member countries.

The NAMMCO Scientific Committee carried out an assessment of the Central North Atlantic stock of minke whales in 1998 (NAMMCO 1999). The Committee concluded then that the stock was close to its carrying capacity, and that present removals would not adversely affect the stock. Similar conclusions were reached when the analysis was restricted to the feeding stock in the coastal waters of Iceland, the CIC small area. Since that time, more information has become available on the stock delineation of minke whales in the North Atlantic. New abundance estimates are available for the Central Stock area from NASS-2001, and for the Northeast Atlantic from Norwegian surveys conducted from 1996-2001. Therefore in 2002, the Council of NAMMCO requested that the Scientific Committee complete a new assessment of Central North Atlantic minke whales.

The Scientific Committee has carried out fin whale assessments on 2 previous occasions. In 1999, the Committee dealt with the East Greenland-Iceland (EGI) stock. The Committee concluded that catches of up to 200 fin whales per year would be sustainable, but that such catches should be spread over the EGI stock area. In 2000, the Committee considered fin whales around the Faroe Islands, subjected to projected annual catch levels of 5, 10 and 20 whales. This assessment was problematic because there was virtually no information of the stock identity of fin whales around the Faroes. Nevertheless, it was concluded that fin whales in this area are likely substantially depleted, under all scenarios that were examined.

Since 2000, new abundance estimates from NASS-2001 and the Norwegian survey program have become available. Satellite tagging programs have begun to yield some new information on fin whale movements. In addition, some new information on historical harvests has come to light. In 2002 the NAMMCO Council requested that the Scientific Committee continue with its assessments of fin whale stocks in the areas of interest to NAMMCO countries with existing and new information on abundance and stock delineation as it becomes available. It was emphasised that assessments for the East Greenland-Iceland and Northeast Atlantic stocks should proceed as a high priority for the Scientific Committee.

2. ADOPTION OF AGENDA

The Draft Agenda (Appendix 2) was adopted as written.

3. APPOINTMENT OF RAPPORTEUR

Daniel Pike, Scientific Secretary of NAMMCO, was appointed as Rapporteur for the meeting.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

The documents considered by the Working Group are listed in Appendix 3.

5. MINKE WHALES – CENTRAL NORTH ATLANTIC STOCK

5.1 Stock structure

The IWC Scientific Working Group on North Atlantic Minke Whales RMP Implementation Review (SC/11/MF/4) reviewed an extensive analysis of population structure using samples from Norwegian commercial catches. Over 3000 samples were analyzed using both mitochondrial and microsatellite DNA markers. Both conventional hypothesis testing and the Boundary Rank method, which does not require an *a priori* assignation into stock areas, were used. Boundary Rank analysis used only mitochondrial markers. Both approaches indicated that animals from the CM Small Area were different from those from the Eastern Medium Area (Fig. 1) using mitochondrial markers. Boundary Rank suggested a difference within the CM Small Area, but this difference was not significant using a hypothesis testing approach. Both approaches also indicated the existence of a separate sub stock in the North Sea.

Another recent analysis using mitochondrial and microsatellite DNA sampled from a wider area including East and West Greenland (Andersen *et al.* 2003) also supports the conclusion that animals from the Central Area (East Greenland and CM in this case) are different than those from the Northeast Atlantic and the North Sea.

In discussion the Working Group noted the need for additional samples, especially from around Iceland, the Faroes and Greenland. As mentioned above, there may be substructure within the Central area, but stock delineation on a finer scale will not be possible without additional data from areas other than the Northeast Atlantic and the North Sea. Samples have been collected from all animals taken in the Icelandic Research program in 2003, but have not yet been analysed. Additional samples have been collected from West and East Greenland since 1997, but have not yet been analysed. Only one sample is presently available from the Faroes.

Víkingsson reported on the movements of 3 minke whales tracked using satellite-linked tags in 2001 and 2002 around Iceland. The tags functioned for 16, 66 and 88 days. Movements between August and mid-October were local and the whales remained in inshore waters. One of the whales began moving south after 31 October and had reached 56 N 27 W by 8 November when transmissions ceased. Migration was rapid with the whale covering at least 200 nm in 4 days.

The Working Group noted that, while interesting, this information is based on the movements of only a few whales, and recommended that further tag applications be conducted to describe the spatial and temporal distribution of minke whales. Øien reported that the 2 successful Norwegian applications of satellite tags to minke whales, as well as VHF tag experiments, had shown that the whales there were also rather stationary in the summer and early fall. No tags had lasted long enough to track a migration. Fishermen have reported seeing minke whales in the area in mid-winter, so some whales apparently remain in the area year-round.

The Working Group concluded that for the purposes of assessment, the existence of a separate Central Stock of minke whales was supported by the available evidence. However there may be sub-structure within this area. While there is no data to support the existence of a separate stock in the CIC Small Area, most catching by Iceland has historically occurred here so it made sense to consider this as a separate area for precautionary sensitivity tests.

5.2 Biological parameters

Víkingsson reported that no new information on biological parameters had been published since the last review of this stock in 1998 (NAMMCO 1999). However Øien noted that recent work (Olsen 2002) had demonstrated that age estimates based on counting annulae in tympanic bullae were not reliable. Therefore any biological parameters that included age as a component (*e.g.* age at maturity, mortality, survival) must now be considered suspect. Other ageing methods, especially based on the racemisation of amino acids in the eye lens, were being developed but had not yet been widely applied. It was noted that further development of racemisation is included in the Icelandic research program. Almost all mature female minke whales caught in Norwegian waters are pregnant, so the number of *corpora albicantia* may serve as a proxy for age for estimation of parameters such as natural mortality. Ear plugs have been used for age determination on Icelandic minke whales with some success (Sigurjónsson 1980a, b). The Working Group urged further development of ageing methods for North Atlantic minke whales.

The Working Group nevertheless decided to use the estimates of parameters used in the previous assessment, as they are unlikely to differ greatly from those for the Antarctic minke whale for which valid ageing methods are available. It was also noted that the assessment models used were relatively insensitive to variations in these parameters within a plausible range.

5.3 Catch data

Catch data for the CIC and Central areas were compiled in SC/11/MF/16 (Appendix 4). The catch series were the same as that used in the 1998 assessment, with the addition of more recent catches by Norway in the CM area and by East Greenland. A “High Catch” case was also developed which included assumed maximum annual levels of both bycatch (5) and unreported catch (10 per annum from 1986-2002) in Icelandic waters.

Recent Norwegian catches include reported struck and lost whales. It was noted that past catches do not include struck and lost animals, and it is likely that they were simply not reported. However it was considered unlikely that this would add substantially to the reported take.

5.4 Abundance estimates

The Report of the NAMMCO Scientific Committee Working Group on Abundance Estimates was available as SC/11/MF/11. A new estimate from NASS-2001 and a re-analysis from NASS-1987 of the aerial survey component covering coastal Iceland were available. These estimates were corrected for animals missed along the trackline and for error in measuring distances to sightings, and were considered unbiased. The estimate from the 1995 aerial survey is considered biased to an unknown degree and it was recommended that it not be used in assessments. A new estimate from the NASS-2001 shipboard survey was considered to be negatively biased because of animals missed on the trackline and diving animals. Nevertheless this estimate is comparable with previous ones from the area.

Available abundance estimates, with associated biases, for the CIC and Central areas are shown in Appendix 5. The results from the NASS series indicate an increase in minke whale abundance to the north and west of Iceland and around the Faroes from 1987 to 2001. There seems also to have been a decrease in the abundance of minke whales in the Barents Sea, the Norwegian Sea and the North Sea in the same period. These changes in spatial distribution might indicate a shift towards more southern and central Atlantic waters in the Central and Eastern Stocks of minke whales.

5.5 Assessments

Two independent assessments were available for minke whales. SC/11/MF/5 replicated the methodology used on a previous occasion by the NAMMCO Scientific Committee (NAMMCO 1998), though now updated to take account of further information from abundance surveys as discussed above. This involves applying the HITTER methodology (de la Mare 1989) to compute population trajectories for different assumed levels of productivity rates for the resource (designated by MSY rates – $MSYR^{1+}$) that pass through a given abundance in a recent year. The abundance was set to the inverse variance-weighted average of the available abundance estimates, and the year taken as the average of the years in which the associated surveys took place. Trajectories were computed for $MSYR^{1+}$ values of 1, 2 and 4%, and also projected forward for 20 years under different fixed levels of future catch. Figure 2 provides an example of the results obtained.

Exploratory FITTER analyses, which attempt to estimate the value of MSYR by matching the trends in population trajectories to those of a series of survey results, were also carried out. However the results are not yet regarded as reliable because only a few survey estimates are available to date from which to estimate trend.

The results from HITTER analyses indicated that the Central Stock of minke whales has not been appreciably impacted by past whaling, having a current abundance of mature females that is at least 85% of the corresponding pre-exploitation level. This result holds across a wide range of assumptions concerning past catches, stock boundaries, MSYR values and abundance estimates.

SC/11/MF/7 used the high and low catch series from 1930 (Appendix 4) and the abundance estimates from 1987 and 2001 (Appendix 5) in an age- and sex-structured model to perform a Bayesian assessment of Central North Atlantic (C) and the Central Icelandic Coastal (CIC) minke whales. The model treated the 2 aggregations as isolated populations, it assumed density regulated dynamics, populations in population dynamic equilibrium in 1930, and it projected the populations under the influence of the historical catches. Given the data, the model, and the priors in Table 1, the model estimated the probability by which the IWC management objective for Commercial Whaling[2] (IWC 2000) is met for future catches between zero and 400 individuals per year. It was noted that although priors had been chosen as uniform with the intention that they be uninformative, the effect of constraints imposed by the approach was to adjust the priors to be informative about quantities such as MSYR. The results were rather similar for the four combinations of stock and catch hypothesis. For all hypotheses the historical catches have been low compared with the abundance, with the highest depletion being estimated to 0.94 (CI:0.89-0.97) in 1985, and the highest current depletion being estimated to 0.97 (CI:0.92-0.99). The information in the two abundance estimates was generally insufficient to update the priors to new posterior estimates of the parameters in the model. The exception was the equilibrium pre-exploitation abundance that was estimated to 38,000 (CI:28,000-51,000) individuals for the CIC stock, and 62,000 (CI:41,000-93,000) individuals for the C stock. The probabilities of fulfilling the IWC management objectives for commercial whaling over the next ten years for annual catches of up to 400 individuals were found to be above 0.98 for both the C and the CIC stock hypotheses.

Parameter	s_{ad}	s_{juv}	b_{max}	a_m	**msyr**	**msyl**
Min.	0.80	0.40	0.50	3.00	0.01	0.50
Max.	0.99	0.99	1.00	9.00	0.07	0.70

Table 1. Minimum and maximum values for uniform prior distributions of parameters used in minke whale modelling. s_{ad}- adult survival; s_{juv} – juvenile survival; b_{max} – maximal birth rate; a_m – age of reproductive maturity; msyr – maximum sustainable yield rate; msyl – maximum sustainable yield level.

In discussion the Working Group noted that the results from these two approaches were very similar and that both indicated that the present population in this area was near or very near its pre-exploitation level.

5.6 Management recommendations

Projections over the next 20 years using HITTER (Fig. 2) indicate that, under all scenarios considered, a catch of 200 minke whales per year would maintain the mature component of the population above 80% of its pre-exploitation level over that period. Similarly, a catch of 400 per year would maintain the population above 70% of this level. This constitutes precautionary advice, as these results hold even for the most pessimistic combination of the lowest MSYR and current abundance, and the highest extent of past catches considered plausible. The advice applies to either the CIC Small Area (coastal Iceland), or to the Central Stock as a whole.

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[2] As applied in the assessment, these objectives imply that the permitted catch for stocks at or above the MSY level shall not exceed 90% of the MSY. For stocks between the MSY level and 90% of that level, the permitted catch shall not exceed the number of individuals obtained by taking 90% of the MSY and reducing that number by 10% for every 1% by which the stock falls short of the MSY level.

5.7 Research recommendations

- Further genetic sampling, particularly from Icelandic waters, East and West Greenland, and the Faroes. Analyses should use the same markers and methodologies as used by Norway so the datasets will be comparable.
- Development of valid ageing methods for North Atlantic minkes, using amino acid racemisation in the eye lens or other techniques. Use of the number of *corpora albicantia* in females as a proxy for age in estimating biological parameters should be investigated.
- Further satellite tagging to investigate spatial and temporal distribution in all areas.

6. FIN WHALES

6.1 Stock structure

In 1999, the NAMMCO Working Group on Fin Whales concluded that there was evidence to indicate the presence of subpopulations with limited gene flow between adjacent subpopulations (NAMMCO 2000). The North Atlantic populations are all different from the Mediterranean Sea population. There is some indication that the western North Atlantic and Iceland areas have populations different from those found off the coasts of Spain and north Norway. Finally, deviations from Hardy-Weinberg genotypic proportions within and between years in the Icelandic samples suggest some sub-structure in this area. Beyond this, there is insufficient evidence to delineate stocks of fin whales in the North Atlantic. No new genetic evidence has come to light since 1998 that would change these conclusions, so stock delineation remains the greatest barrier to the reliable assessment of North Atlantic fin whales, especially at a finer scale. The present Working Group therefore supported the recommendations of previous Working Groups (NAMMCO 2000, 2001) for increased sampling and new genetic analyses for fin whales throughout the North Atlantic.

Some evidence from a tagging experiment conducted in 2001 in the Faroes opens intriguing possibilities for stock relationships of fin whales in the area (SC/11/MF/14). Two applications have been successful, lasting 48 and 116 days. The whale tracked for the shorter period stayed on the Faroese shelf for the entire time. The other whale migrated southward as far as 46° N, at the latitude of the Bay of Biscay. It then moved northeast and reached an area off northwest Ireland, where it stayed within a restricted area for 2 months before contact was lost in November.

While noting that this indicates a possible stock connection between whales around the Faroes and off the Iberian peninsula, the Working Group felt that it would be premature to draw conclusions from the movements of 1 animal. Further tagging work in all areas was encouraged.

Øien presented information on the distribution of fin whales in the Northeast Atlantic based on incidental sightings between 1967 and 2002 (SC/11/MF/18). A total of 986 fin whale sightings have been compiled from research, fishing and coast guard vessels, with the majority from the latter type. Most of the sightings have been made in the summer, but fin whales have been recorded in every month of the year. Sightings are spread throughout the Norwegian survey area, with apparent “hot spots” around Bear Island – Spitzbergen, Jan Mayen and in the eastern Norwegian Sea.

These concentration areas are similar to those revealed by dedicated sighting surveys (see **6.4**), but the continuous distribution of fin whale sightings in all areas probably means that there are seasonal or annual shifts in fin whale distribution. There are no gaps in the distribution that may be indicative of stock boundaries.

The Working Group welcomed these data, but noted that their interpretation would be facilitated by some indication of searching effort, particularly vessel tracks, or by presenting the sightings alongside those of other species for which distribution is better known. Without this the apparent distribution of sightings is confounded by the unknown distribution of effort. Bloch noted that similar data on incidental observations exist from the Faroes (Bloch *et al* 2001), and some data previously presented to NAMMCO (NAMMCO 2001) compiled from whaling logbooks and other sources had shown a continuous presence of fin whales around the Faroes, but with some apparent shifts in seasonal distribution.

6.2 Biological parameters

Biological parameters for fin whales adopted by the IWC in 1991 (Lockyer and Sigurjonsson 1991) have been used in previous NAMMCO assessments (NAMMCO 2000, 2001). The Working Group agreed that at present there is no new information to change any of these parameters. It was noted that much of the information on biological parameters for Icelandic fin whales had not yet been published, and the Working Group urged that this information be published at the earliest opportunity.

6.3 Catch data

The catch series available to the Working Group (Appendix 4) were for the most part the same as those used in previous NAMMCO assessments (NAMMCO 2000, 2001) and were derived from those extracted for the Comprehensive Assessment Meeting on North Atlantic Fin Whales held in 1991 (IWC 1992). A new “Faroese South” area included abundance estimates and catches from the previous “Faroese Medium” area plus Spanish and Portuguese catches, thus capturing the possibility of a link between fin whales caught in the Faroes and areas farther south (see Fig. 3 for area definitions).

Bloch reported on the development of an improved catch series derived from Faroese and other archival sources (SC/11/MF/13). Pre-1920 catches used in previous assessments contained a large proportion of large whales of unknown species, all of which were assumed to be fin whales. However species identity is retrievable from archival sources in most cases. When catch is allocated by species, early catches of fin whales from Faroese land stations are substantially lower than in the previous catch series because species other than fin whales were caught. However only about half of the available material has been consulted to date. The Working Group commended this work and urged that it be completed. It was also considered that the new figures could be used in sensitivity analyses to determine the effect of lower historical catches on the assessments.

6.4 Abundance estimates

The NAMMCO Scientific Committee has accepted estimates of abundance from the NASS-2001 Icelandic and Faroese ship surveys (NAMMCO 2003). These new estimates were included in a compilation of abundance estimates from past surveys presented in Appendix 5. Area divisions used were identical to those used in previous assessments (NAMMCO 2000, 2001) with the addition of the "Faroese South" block (see 6.3, Fig. 3).

Øien presented abundance estimates calculated from the Norwegian 1995 shipboard sightings survey (SC/11/MF/10). The survey was conducted with 2 independent platforms on each of 11 vessels. The target species was the minke whale and the survey was designed specifically to get a best estimate of abundance for this species and thus involved tracking procedures for minke whale sightings. The survey was run in passing mode, that is, without closing on sightings for species identification or group size confirmation. As a result, more than 30% of the sightings of large whales were not identified to species. The survey covered the Northeastern Atlantic including the North Sea, the Norwegian Sea, the Greenland Sea and the Barents Sea. Estimates were based on standard line transect analyses for each of the survey platforms, and the 2 platforms combined. Most of the fin whale sightings were made in the Svalbard area, that is, along the continental slope from Bear Island and northwards to the northwest of Spitsbergen. Compared to earlier surveys, the 1995 distribution was more northerly; in 1988 fin whales were observed around Jan Mayen and within the Norwegian Sea; in 1989 there were 2 distinct occurrences, one in the northern Norwegian Sea and one in the Norwegian Sea west of northern Norway (Jan Mayen was not surveyed that year). The abundance estimates based on the combined platform data were considered to give the best estimates of absolute abundance of 5,395 animals (c.v. 0.204) for the survey area.

The Working Group welcomed this new estimate, and urged the timely completion of estimates from 1996-2001 series of surveys in the Northeast Atlantic. Completion of these estimates is required for future assessments of fin whales in this area (see **6.7**).

6.5 Assessments

6.5.1 EGI

Assessment of the EGI fin whales differs from that for other fin and minke whale stocks discussed elsewhere in this report because, in addition to recent estimates of abundance from sighting surveys, there are CPUE data available which provide information on trends in abundance over the 1901-1915 and 1962-1987 periods.

However, approaches such as the HITTER or FITTER methodology of SC/11/MF/5, or the Bayesian approach of SC/11/MF/8, both of which treat the stock as homogeneous throughout the Central North Atlantic area, fail because the population model applied cannot be reconciled with all 3 sources of data (the absolute abundance estimates and the 2 sets of CPUE data). In particular, such models have great difficulty in reflecting the large decline in CPUE observed in the 1901-1915 period.

To address this, SC/11/MF/5 considered a 2-substock model approach, where historic catches have been taken from an "inshore" substock only, and there is diffusive mixing between this "inshore" and the "offshore" substock. CPUE data reflect the behaviour of the "inshore" substock only, whereas sightings estimates relate to the combination of both substocks. This age-aggregated model allows both MSYR and the inter-substock mixing rates to be estimated, and provides an acceptable fit to all 3 sources of data. Under such an analysis, the resource as a whole is estimated to be close to its pre-exploitation abundance. The precise status of the inshore substock differs depending on which of 2 forms of density dependence is assumed for the model, but in either event is estimated to be above MSY level.

Gunnlaugsson extended the 2-substock model described above by including the existing mark recapture data in an assessment model described in SC/11/MF/6. Differences had been observed in the rate of recovery of marks applied on the whaling grounds west of Iceland compared to those from East Iceland and East Greenland. In addition there were obvious differences in the mark returns by sex and area. Therefore, the model was sex disaggregated. The model was also expanded from 2 to 4 components for consistency with the marking data. Density response was assumed to occur on the feeding grounds (that is within the component) as in the sensitivity runs of the 2-substock model of SC/11/MF/5. This however makes less difference in this case since the mixing between components is estimated as being considerable, so density changes soon carry over to other components.

The main results of the analysis are that, as predicted by Butterworth and Cunningham (2000), the marking data do constrain the range of the estimated intrinsic growth rate parameter. The higher proportion of females than males in the catch on the grounds is maintained by a higher rate of mixing of females among substock components so that females are more readily replenished, rather than by a heavy selection for larger animals by the whalers. The stochastic runs showed an annual catch of 200 animals over the next two decades from the whaling grounds west of Iceland to be sustainable with high probability.

Satellite telemetry data would be most valuable to clarify how the components in the model relate to abundance by blocks from sighting surveys. The model could be augmented by including age structure and biological parameters. As changes in these would be expected to have occurred during the years with no catch, fresh samples from the grounds would be valuable in this respect.

The Working Group could not draw firm conclusions from these modelling exercises, but noted that the more complex models involving 2 or more spatial components appeared to fit the historical and modern CPUE and abundance data better than single homogeneous stock models. It is therefore likely that the more complex models will provide a more accurate forecast of the behaviour of the resource under differing catch regimes. However further work is needed to clarify the relationships in this area, particularly with regard to area boundaries, sex and age segregation in space and time, and mixing rates. The Working Group provided some recommendations for facilitating this work under 6.7.

6.5.2 Faroes

The primary assessment conducted of the Faroese fin whales (SC/11/MF/5) was an updated HITTER analysis. The process is identical to that described above (5.5) for Central Atlantic minke whales. These analyses were conducted over a range of assumptions concerning the geographical extent of the resource and the past catches taken from it. Exploratory FITTER analyses were also carried out, but the estimates of MSYR attained were not considered reliable because of the shortness of the time series of abundance estimates available from surveys.

The dominant factor influencing results is the assumption regarding the geographical extent of the stock. At the one extreme, if the stock is restricted to the Faroese EEZ, it is at present highly depleted (only some 10% of the pre-exploitation abundance), and even catches as low as 10 per annum may not be sustainable (see Fig. 4). At the other extreme, for the "Faroese South" stock specification, which includes abundance estimates and past catches as far south as Spain, depletion is much less severe, and for $MSYR^{1+}$ = 4% the resource is estimated to already have recovered to its MSYL.

The model described in SC/11/MF/7 for minke whales (see **5.5)** using priors listed in Table 2 was also used to model the Faroese EEZ, Medium, and Large areas (SC/11/MF/8). For these areas the model could better explain recent increases in abundance estimates than in the EGI case, and it estimated equilibrium abundances of 7,000 (CI: 6,300-8,100) for the EEZ, 9,200 (CI: 8,000-11,000) for the Medium, and 26,000 (CI: 23,000-30,000) for the Large areas (the high catch series). In all these cases the populations have been heavily depleted, with minimum depletion ratios of 0.02 (CI: 0.01-0.04) for the EEZ in 1959, 0.04 (CI: 0.02-0.08) for the medium area in 1958, and 0.09 (CI: 0.05-0.14) in 1963 for the large area with the high catch. Current depletion levels are still low [0.14 (CI:0.09-0.21) for the EEZ, 0.26 (CI: 0.17-0.38) for the medium area, and 0.30 (CI: 0.21-0.43) for the large area with high catch], and this is the reason that the probability of meeting the IWC management objectives for commercial whaling is below 0.04 for all areas even for catches as low as 5 individuals per year. For the Faroese South area, where the equilibrium abundance was estimated to 18,000 (CI: 15,000-21,000), the depletion has been less severe, with a maximal depletion of 0.30 (CI: 0.22-0.37) in 1931, and a current depletion of 0.56 (CI: 0.41-0.72). In this case, annual catches between 5 and 20 whales over the next 10 years result in intermediate probabilities of meeting the IWC management objectives for commercial whaling.

Parameter	s_{ad}	s_{juv}	b_{max}	a_m	**msyr**	**msyl**
Min.	0.93	0.30	0.33	7.00	0.01	0.50
Max.	0.99	0.99	0.50	11.00	0.07	0.70

Table 2. Minimum and maximum values for uniform prior distributions of parameters used in fin whale modelling. s_{ad}- adult survival; s_{juv} – juvenile survival; b_{max} – maximal birth rate; a_m – age of reproductive maturity; msyr – maximum sustainable yield rate; msyl – maximum sustainable yield level.

The Working Group noted that the results from both modelling efforts were qualitatively and quantitatively very similar. Both indicated that the fin whale stock around the Faroes was heavily depleted under most plausible scenarios about the size and extent of the stock area from which catches were taken. Under some of these stock scenarios even catches as low as 5 animals per year slow or halt the recovery of the stock, and higher catches result in further depletion in nearly all cases. The exception was the "Faroese South" stock area, which linked whales around the Faroes with the relatively large stock off the Iberian peninsula, but the Working Group considered that more evidence was needed before this scenario could form the basis for management advice.

6.5.3 Other

The Working Group considered that the availability of abundance estimates from NASS-1995 and the development of abundance estimates from more recent Norwegian surveys for fin whales in the Northeast Atlantic (see 6.4) will make the assessment of fin whales in this area feasible. A careful examination and compilation of available data (specified below), and further research, is needed before such an assessment is conducted.

Catch data

Catch data are presently available. However, examination of historic Faroese catches indicated that the statistics held by IWC may require revision, involving investigations of the original logbooks, where available, to elucidate problems with species identification and ancillary information. The Working Group recommended that Bloch extend her work on the Faroese data to include Norwegian, Irish and northern British Isles land stations. The catch data includes information on catch position, and therefore can be aggregated by any potential stock division and might provide a basis for valuable CPUE series. This work should be encouraged by NAMMCO .

Other data

Other positional data useful in assessment include incidental sightings and sightings from dedicated surveys, marking with Discovery tags, satellite tagging tracks, biopsy samples and age determinations of some samples. These data should be compiled before assessment proceeds.

Boundaries between present stock divisions

The boundary between the Faroe Islands-West-Norway stock and the British-Spain-Portugal stock should probably be moved southwards. Historically, catches taken by Faroese whalers were sometimes landed at other places, and catches taken by Shetland land stations were sometimes landed at Faroe Islands; furthermore there is no hiatus in catch positions across the present boundary. The recent satellite tagging of a fin whale off the Faroe Islands which migrated southwest in the Atlantic and then returned north again to the grounds west of Ireland makes it possible that the same whales use feeding areas both north and south of the present IWC boundary. The specific placement of this boundary should be based on the distribution of historic catches, distribution from past sighting surveys, and possibly on genetic data if available. The boundary between Faroe Island – West Norway stock and the North Norway stock should be kept since the recent distribution of northern fin whales is associated with the continental slope from Bear Island and northwards to Spitsbergen, so the whales in that area could equally well migrate through the Denmark Strait as through the Norwegian Sea.

6.6 Management recommendations

6.6.1 EGI

Because of the inability of models which treat the EGI fin whale stock as homogeneous to fit all sources of abundance-related data satisfactorily, the Working Group decided to base management advice on the 2-substock model described in SC/11/MF/5, which does fit such data.

Projections under constant catch levels suggest that the inshore substock will maintain its present abundance (which is above MSY level) under an annual catch of about 150 whales for either assumption concerning the form of density dependence (see Fig. 4 for an example of such projections).

It is important to note that this result is based upon the assumption that catches are confined to the "inshore" substock, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that the "offshore" substock was also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales.

6.6.2 Faroes

The new information on abundance from NASS-2001 and the updated catch history available for the Faroes did not greatly change the conclusion reached in 2000 (NAMMCO 2001), that the fin whale stock around the Faroes was likely to be heavily depleted under most stock scenarios considered plausible. The uncertainties about stock identity are so great as to preclude carrying out a reliable assessment of the status of fin whales in Faroese waters, and thus the Working Group was not in a position to provide advice on the effects of various catches. The Working Group therefore reiterated the recommendations made in 2000 (NAMMCO 2001) to carry out a research program (see **6.7**) to elucidate the stock structure of fin whales in this area, and their relationships to other areas. Once this is done, it may be necessary to obtain clearer guidance on the management objectives for harvesting from what is likely to be a recovering stock before specific advice can be given.

6.6.3 *Other*

The Working Group were not in a position to provide management advice for the North Norway stock area. Once the work identified under 6.5.3 has been done assessments can be carried out for this area.

6.7 Research recommendations

All stocks

- Additional genetic sampling in all areas, but particularly in areas from which samples are few or lacking, such as East Greenland, northern and eastern Iceland, the Faroes and Norway. Any existing samples from past whaling should be analysed using modern techniques;
- Satellite tagging to determine habitat use and migratory patterns. If possible, a biopsy should be obtained from all tagged animals for genetic analysis and sex determination;
- Noting the application of Bayesian stock assessment methodology, it is important that checks are conducted to ensure that computations have converged numerically.

Faroes

For this area, the detailed research recommendations developed in the previous assessment (NAMMCO 2001) are supported and reiterated.

- The revision of catch statistics for Faroese and adjacent whaling operations should be completed;
- The feasibility of preparing a CPUE index from Faroese and adjacent whaling operations should be investigated;

- Biopsy sampling for genetic analysis from the Faroes and adjacent areas should be continued. Existing biopsy samples should be analysed as soon as possible.
- Satellite tagging should continue once methodological/technical issues are addressed.

EGI

The detailed research recommendations developed during the previous assessment for this area (NAMMCO 2000) are supported and reiterated.

- The early CPUE series (1901-1915) should be reanalysed and split between eastern and western Icelandic whaling areas. The possibility of using data prior to 1901 should be investigated;
- If new catches are taken, samples should be taken if possible both within and outside the traditional whaling grounds. The material should be investigated to get an updated view of age structure and sex distribution on and outside the whaling grounds, and biological parameters such as age at sexual maturity and fecundity.
- Additional samples for genetic analysis are required particularly from areas outside the traditional whaling grounds, such as East Greenland and northern and eastern Iceland;
- Existing analyses of data on biological parameters from previous commercial and research whaling should be published as soon as possible;
- Satellite tagging should be attempted to investigate the movements of fin whales, particularly between the traditional whaling grounds west of Iceland and areas outside.

Analyses presented in SC/11/MF/6 in particular indicate that fin whales are not homogeneously distributed in the conventional EGI stock area with respect to age, sex and behaviour. To facilitate the development of spatially structured models to better represent the overall dynamics, it was recommended that all data (catch, effort, catch-at-age, sightings survey abundance and mark-recapture) be split into 4 subareas. These would be defined as follows: western and eastern sections would be separated by the lines running roughly north and south from Iceland that delineate the B area used in abundance estimation (Fig. 3). The western sector would then be divided by a line drawn from the coast of Iceland to surround the distribution of catch positions until its westernmost point, from which the line continues southward. For the eastern sector, the division line would be conceptual to separate catches to the east of Iceland and those around Jan Mayen without exact specification of geographical location. The separation of abundance estimates for the eastern sector into 2 components for these 2 subareas would be determined by the best fit of a population model to the data. Similar flexibility might need to be exercised for the split of abundance estimates for the western sector.

Other

Research recommendations for the North Norway stock area are identified under 6.5.3.

- Preparation of abundance estimates from the 1996-2001 survey series;
- Compilation and revision of catch statistics;
- Preparation of a CPUE series if possible;

- Collection of additional biopsy samples for genetic analysis, and analysis of existing samples in a timely manner;
- Satellite tagging once methodological/technical problems have been addressed.

7. OTHER BUSINESS

The Working Group considered that the scheduling of future assessment meetings should be dependent on the completion of additional research and necessary preparatory work. For the Norwegian area these preparations are described under **6.5.3**. For the Faroes, additional work is required particularly on stock delineation, as described under **6.7**. Assessment modelling for the EGI area could be usefully extended once the CPUE, abundance estimate and tag return data are disaggregated as described under **6.7**. It was suggested that a 1 day planning/preparatory meeting be held in connection with the NAMMCO Scientific Committee meeting in 2004, to determine what work has been completed and plan for a future assessment meeting, ideally in 2005.

8. ADOPTION OF REPORT

The Report was adopted by the Working Group on 22 November 2003.

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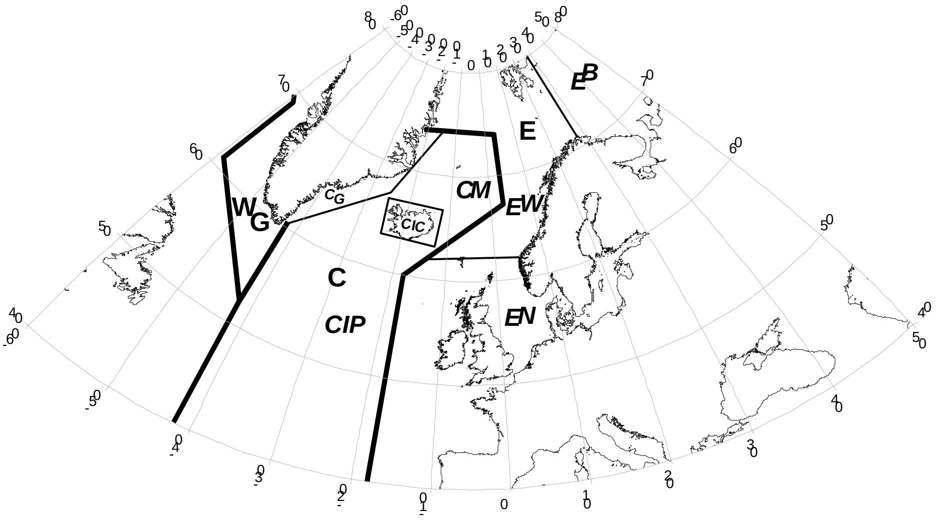

Fig. 1. Minke whale stock areas as defined by the IWC. Thick lines separate medium areas, while thin lines separate small areas. Small area names are given in italics.

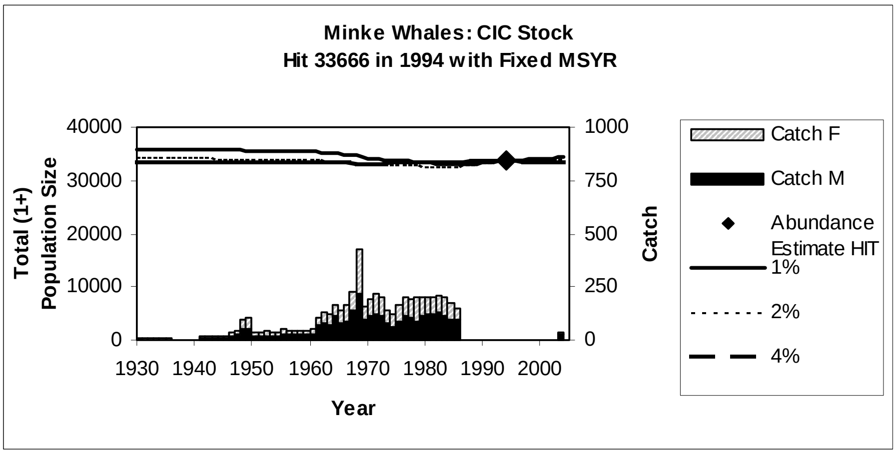

Fig. 2a. Total (1+) population trajectories from 1930 to 2004 in the minke whale CIC stock when assuming a total population size of 33666 in 1994 for $MSYR^{1+}$ values of 1, 2% and 4%. The trajectory corresponding to the lowest MSYR lies highest on the left hand side of this and Fig. 2b. Annual catches are indicated at the bottom of the plot.

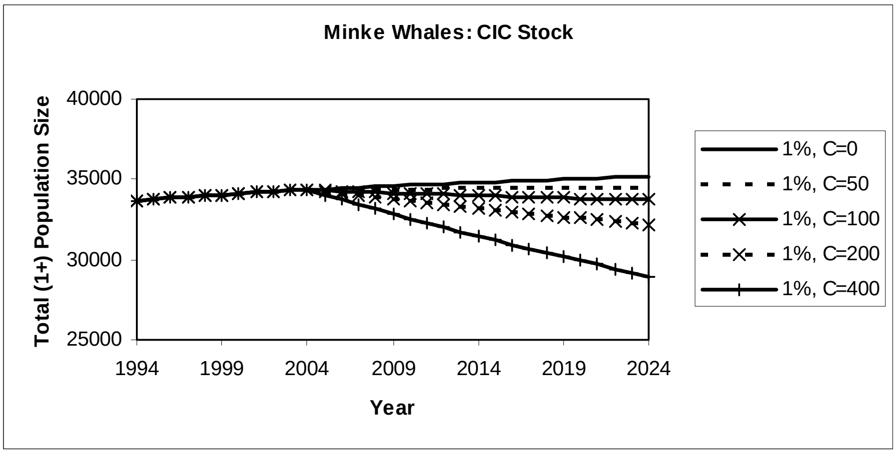

Fig. 2b. Total (1+) population trajectories in the minke whale CIC stock when hitting a best estimate of N^{1+}_{1994} = 33666 for $MSYR^{1+}$ = 1% for future annual catches of 0, 50, 100, 200 and 400 animals. Note that the vertical axis minimum is 25000 animals and not zero.

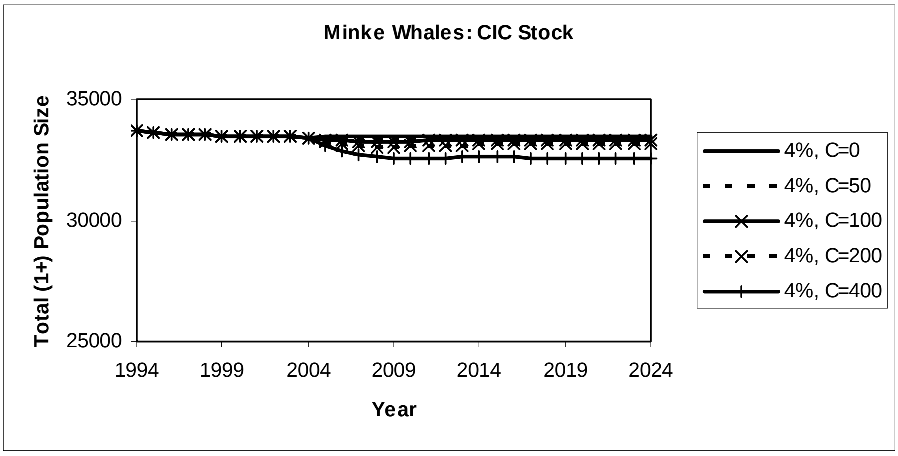

Fig. 2c. Total (1+) population trajectories in the minke whale CIC stock when hitting a best estimate of N^{1+}_{1994} = 33666 for $MSYR^{1+}$ = 4% for future annual catches of 0, 50, 100, 200 and 400 animals. Note that the vertical axis minimum is 25000 animals and not zero.

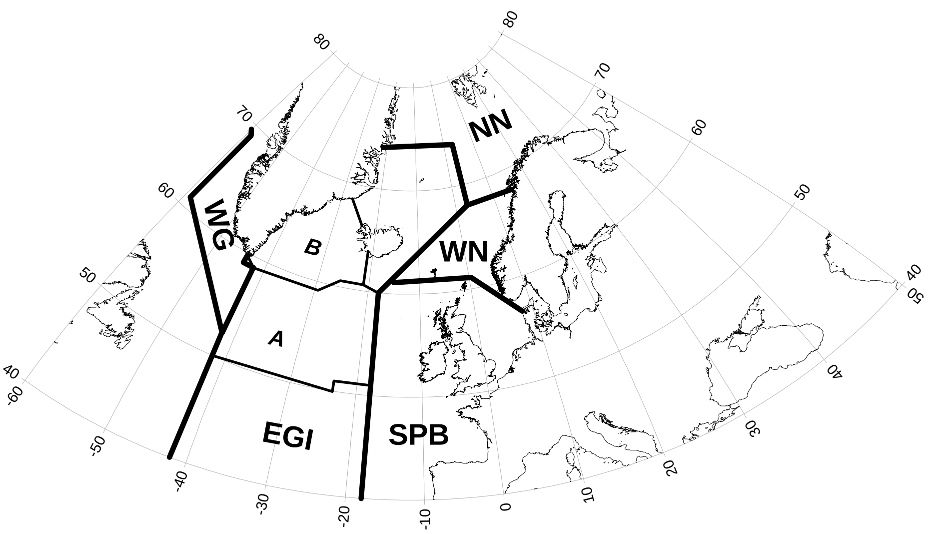

Fig 3a. Fin whale stock areas as defined by the IWC (bold letters), and other areas used in assessments (italics). WG – West Greenland; EGI – East Greenland-Iceland; NN – North Norway; WN – West Norway; SPB – Spain-Portugal-British Isles.

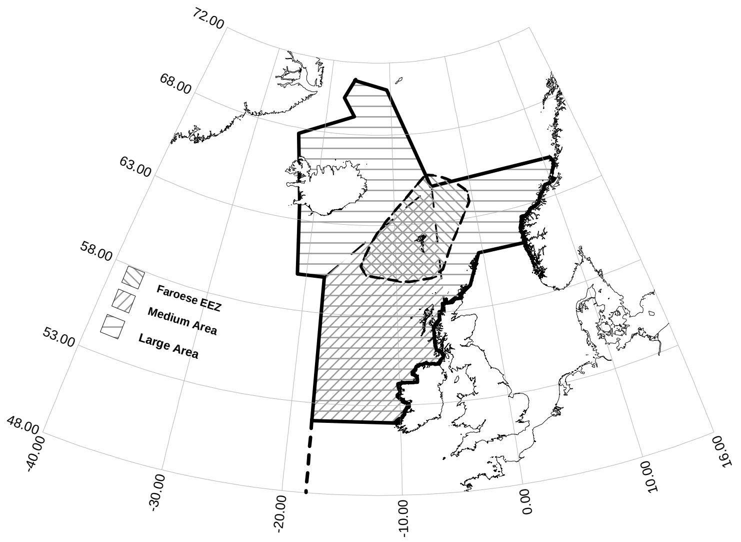

Fig. 3b. Areas used in assessments of Faroese fin whales. The "Faroese South" area includes the Medium Area and continues south to include the remainder of the SPB stock area (see Fig. 3a)

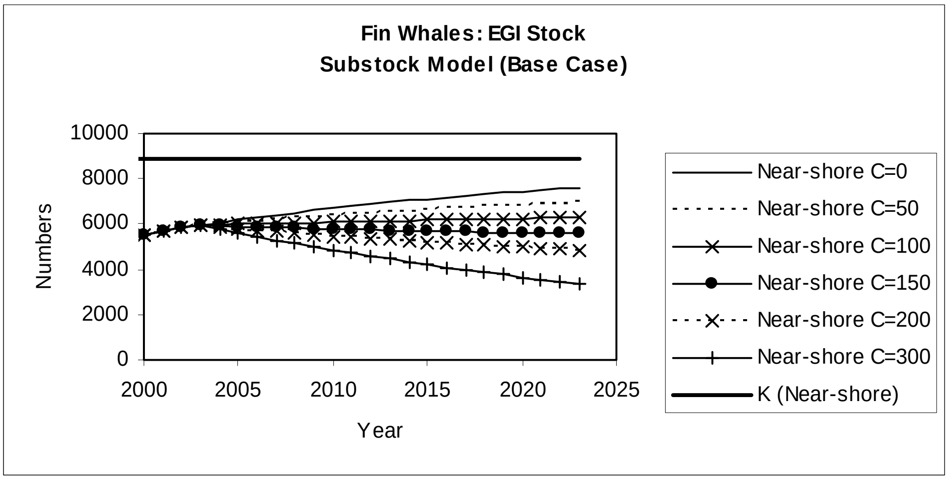

Fig. 4a. Near-shore substock population trajectories of the fin whale EGI stock in terms of the base case (Equations (A.1)) sub-stock model of SC/11/MF/5 for future annual catches of 0, 50, 100, 150, 200 and 300 animals.

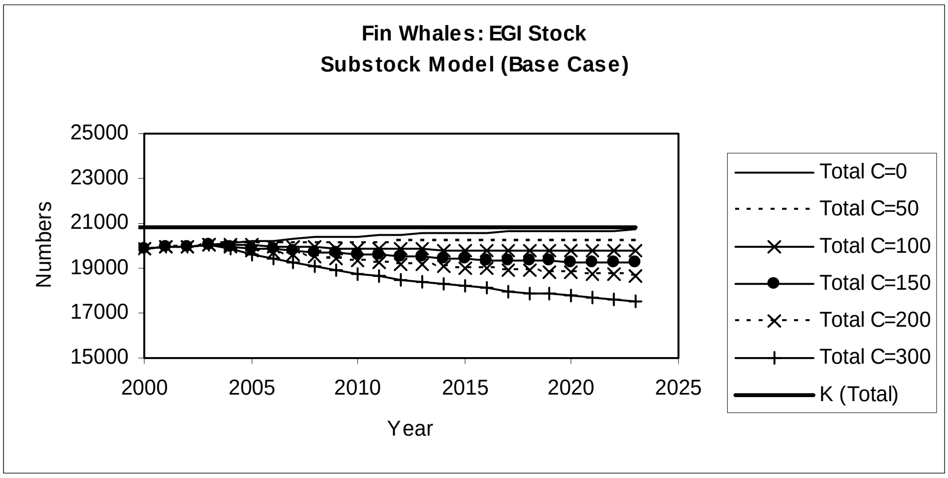

Fig. 4b. Total population trajectories of the fin whale EGI stock in terms of the base case (Equations (A.1)) substock model of SC/11/MF/5 for future annual catches of 0, 50, 100, 150, 200 and 300 animals. Note that the vertical axis minimum is 15000 animals and not zero.

Appendix 1 - **LIST OF PARTICIPANTS**

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Appendix 2 - **AGENDA**

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2. Adoption of agenda
3. Appointment of rapporteur
4. Review of available documents and reports
5. Minke whales – central atlantic stock
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   - 5.2 Biological parameters
   - 5.3 Catch data
   - 5.4 Abundance estimates
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   - 5.6 Management recommendations
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6. Fin whales
   - 6.6 Stock structure
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   - 6.10 Assessments
     - 6.5.1 EGI
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     - 6.6.1 EGI
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     - 6.6.3 Other
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7. Other business
8. Adoption of report

Appendix 3

LIST OF DOCUMENTS

SC/11/MF/1	List of participants
SC/11/MF/2	Draft agenda
SC/11/MF/3	Draft list of documents
SC/11/MF/4	[IWC] International Whaling Commission. 2003. Report of the Scientific Committee. Annex D. Report of the Sub-committee on the Revised Management Procedure. Appendix 14. Report of the Working Group on North Atlantic Minke Whales RMP *Implementation Review*
SC/11/MF/5	Cunningham, C.L. and Butterworth, D.S. Updated Assessments of the Central Stock of Minke Whales and the East Greenland-Iceland and Faroese Stocks of Fin Whales in the North Atlantic.
SC/11/MF/6	Gunnlaugsson, Th. Assessment of the East Greenland-Iceland fin whale in a subs-stock model with mixing based on marking data.
SC/11/MF/7	Witting, L. Bayesian assessments of Central Stock minke whales based on density regulated dynamics.
SC/11/MF/8	Witting, L. Bayesian assessments East Greenland-Iceland and Faroese fin whales based on density regulated dynamics.
SC/11/MF/9	Pike, D.G., Gunnlaugsson, Th. and Víkingsson, G.A. Abundance of fin whales southwest of Iceland in 2003, and comparisons with earlier surveys.
SC/11/MF/10	Øien, N. Distribution and abundance of large whales in the Northeast Atlantic, 1995.
SC/11/MF/11	[NAMMCO] North Atlantic Marine Mammal Commission. 2003. Report of the Working Group on Abundance Estimates.
SC/11/MF/13	Bloch, D. and Stefansson. Revised catch data for large whales in the Faroes
SC/11/MF/14	Mikkelsen, B., Bloch, D. and Heide-Jørgensen, M.-P. Preliminary results from satellite tagging of fin whales in the Faroe Islands
SC/11/MF/15	Pike, D.G. Abundance estimates for assessments of North Atlantic minke and fin whales.
SC/11/MF/16	Pike, D.G. Catch statistics for North Atlantic minke and fin whales.
SC/11/MF/17	Allison, C. Comments on SC/11/MF/13: Revised catch data for large whales in the Faroes
SC/11/MF/18	Øien, N. And Hartvedt, S. Distribution of fin whales in the Northeast Atlantic based on incidental sightings, 1967-2002.
SC/11/MF/19	Vikingsson, G. and Heide-Jørgensen, M.P. A note on the movements of minke whales tracked by satellite in Icelandic waters in 2001 and 2002.

Appendix 4

CATCH STATISTICS FOR NORTH ATLANTIC FIN AND MINKE WHALES

File: EGI Fin
Source: NAMMCO 2000
Notes: None.

Year	M	F
1883	2	4
1884	10	12
1885	12	16
1886	10	12
1887	15	16
1888	25	28
1889	54	61
1890	55	61
1891	66	72
1892	90	97
1893	213	232
1894	156	171
1895	208	226
1896	137	149
1897	223	241
1898	155	168
1899	233	254
1900	221	237
1901	260	281
1902	280	304
1903	390	418
1904	251	271
1905	279	300
1906	195	209
1907	316	338
1908	316	339
1909	424	455
1910	270	291
1911	204	219
1912	72	77
1913	52	57
1914	24	26
1915	59	62
1916	21	21
1917	0	0
1918	0	0
1919	0	0

Year	M	F
1920	34	34
1921	22	22
1922	20	19
1923	24	24
1924	30	31
1925	29	28
1926	19	20
1927	23	20
1928	36	34
1929	53	56
1930	157	112
1931	1	8
1932	98	96
1933	118	102
1934	59	56
1935	21	23
1936	37	56
1937	165	124
1938	82	77
1939	84	63
1940	0	0
1941	0	0
1942	0	0
1943	0	0
1944	0	0
1945	0	0
1946	13	10
1947	27	22
1948	106	116
1949	123	156
1950	162	172
1951	143	200
1952	99	127
1953	107	111
1954	70	107
1955	120	120
1956	134	165

Year	M	F
1957	190	235
1958	143	151
1959	97	81
1960	81	79
1961	65	77
1962	166	139
1963	152	134
1964	114	116
1965	161	136
1966	163	149
1967	111	128
1968	102	101
1969	117	134
1970	153	138
1971	97	111
1972	122	116
1973	135	132
1974	142	143
1975	127	118
1976	132	143
1977	64	80
1978	106	131
1979	127	133
1980	117	120
1981	121	133
1982	96	98
1983	70	74
1984	67	100
1985	73	88
1986	27	49
1987	38	42
1988	31	37
1989	23	45

File: EGI Area B Fin
Source: NAMMCO 2000
Notes: Some corrections made to published file.

Year	M	F
1883	2	3
1884	8	9
1885	9	12
1886	8	9
1887	11	12
1888	19	21
1889	41	46
1890	41	46
1891	50	54
1892	68	73
1893	169	174
1894	113	124
1895	154	167
1896	97	107
1897	161	174
1898	106	116
1899	162	178
1900	149	161
1901	174	190
1902	183	200
1903	252	273
1904	164	179
1905	182	197
1906	123	134
1907	199	216
1908	201	218
1909	272	296
1910	180	196
1911	133	145
1912	44	47
1913	29	32
1914	7	8
1915	16	18
1916	0	0
1917	0	0
1918	0	0
1919	0	0
Year	M	F
1920	0	0
1921	0	0
1922	0	0
1923	0	0
1924	0	0
1925	0	0
1926	0	0
1927	0	0
1928	0	0
1929	37	32
1930	131	79
1931	1	8
1932	98	96
1933	90	80
1934	50	46
1935	12	13
1936	27	45
1937	119	85
1938	55	58
1939	66	43
1940	0	0
1941	0	0
1942	0	0
1943	0	0
1944	0	0
1945	0	0
1946	0	0
1947	0	0
1948	92	103
1949	107	142
1950	97	129
1951	123	189
1952	98	126
1953	101	106
1954	70	107
1955	118	118
1956	116	149
Year	M	F
1957	150	198
1958	141	148
1959	97	81
1960	81	79
1961	65	77
1962	165	138
1963	152	131
1964	110	107
1965	156	132
1966	162	148
1967	111	128
1968	101	101
1969	117	134
1970	153	138
1971	97	111
1972	122	116
1973	135	132
1974	142	143
1975	127	118
1976	132	143
1977	64	80
1978	105	131
1979	127	133
1980	117	120
1981	121	133
1982	96	98
1983	70	74
1984	67	100
1985	73	88
1986	27	49
1987	38	42
1988	31	37
1989	23	45

File: Faroes EEZ Fin
Source: NAMMCO 2001
Notes: None

Year	M	F
1894	22	22
1895	12	12
1896	30	29
1897	37	37
1898	55	56
1899	69	68
1900	93	93
1901	111	111
1902	145	146
1903	215	214
1904	131	131
1905	147	147
1906	124	124
1907	202	201
1908	193	193
1909	243	243
1910	121	121
1911	106	105
1912	55	55
1913	56	56
1914	59	59
1915	151	151
1916	84	84

Year	M	F
1920	136	137
1921	87	87
1922	78	77
1923	96	97
1924	121	124
1925	114	110
1926	77	79
1927	92	79
1928	143	137
1929	65	94
1930	102	131
1933	49	41
1934	34	40
1935	36	39
1936	40	42
1937	73	69
1938	108	75
1939	73	80
1945		
1946	53	39
1947	107	89
1948	112	111
1949	101	121

Year	M	F
1950	211	165
1951	78	78
1952	15	5
1953	43	44
1954	6	11
1955	46	34
1956	22	21
1957	71	70
1958	7	9
1962	5	1
1963	0	3
1964	4	9
1965	5	5
1966	3	1
1968	4	2
1977		
1978	5	2
1979	4	7
1981	2	1
1982	1	2
1983	1	4
1984	2	0

File: Faroes Medium Fin
Source: NAMMCO 2001
Notes: None

Year	M	F
1894	22	22
1895	12	12
1896	30	29
1897	37	37
1898	55	56
1899	69	68
1900	93	93
1901	111	111
1902	145	146
1903	215	214
1904	149	150
1905	186	186
1906	134	135
1907	250	249
1908	228	229
1909	383	383
1910	203	204
1911	203	201
1912	119	120
1913	133	132
1914	143	142
1915	151	151
1916	84	84
1920	251	253
1921	87	87
1922	107	104
1923	173	174
1924	196	198
1925	196	192
1926	154	156
1927	169	162
1928	166	166
1929	65	94
1930	102	131
1933	49	41
1934	34	40
1935	36	39
1936	40	42
1937	73	69
1938	108	75
1939	73	80
1946	53	39
1947	107	89
1948	112	111
1949	101	121
1950	229	180
1951	81	88
1952	15	5
1953	43	44
1954	6	11
1955	46	34
1956	22	21
1957	71	70
1958	7	9
1962	5	1
1963	0	3
1964	4	9
1965	5	5
1966	3	1
1968	4	2
1978	5	2
1979	4	7
1981	2	1
1982	1	2
1983	1	4
1984	2	0

File: Faroes Large High Fin
Source: NAMMCO 2001
Notes: Some corrections made to published version.

Year	M	F
1883	2	3
1884	8	9
1885	9	12
1886	8	9
1887	11	12
1888	19	21
1889	41	46
1890	41	46
1891	50	54
1892	68	73
1893	160	174
1894	135	146
1895	166	179
1896	127	136
1897	198	211
1898	161	172
1899	231	246
1900	242	254
1901	285	301
1902	328	346
1903	525	545
1904	513	529
1905	554	569
1906	406	418
1907	599	615
1908	593	611
1909	815	839
1910	517	534
1911	467	477
1912	274	278
1913	275	277
1914	264	264
1915	167	169
1916	84	84
1918	302	303
1919	239	238
1920	402	429
1921	105	106
1922	279	275
1923	326	326
1924	508	510
1925	435	435
1926	475	457
1927	421	372
1928	440	407
1929	163	215
1930	146	187
1931	39	30
1932	92	98
1933	278	229
1934	91	115
1935	82	98
1936	112	117
1937	350	304
1938	248	196
1939	207	228
1941	5	1
1942	33	25
1943	67	43
1944	55	57
1945	80	79
1946	260	224
1947	245	236
1948	222	220
1949	196	230
1950	355	305
1951	225	195
1952	169	142
1953	142	160
1954	114	115
1955	111	84
1956	51	61
1957	118	115
1958	28	41
1959	51	47
1960	32	45
1961	62	57
1962	48	27
1963	9	15
1964	7	12
1965	8	7
1966	3	1
1967	1	5
1968	8	6
1969	1	1
1978	5	2
1979	4	7
1981	2	1
1982	1	2
1983	1	4
1984	2	0

File: Faroes Large Low Fin
Source: NAMMCO 2001
Notes: Some corrections made to published version

Year	M	F
1883	1	1
1884	3	3
1885	3	4
1886	3	3
1887	4	4
1888	6	7
1889	14	15
1890	14	15
1891	17	18
1892	23	24
1893	53	58
1894	60	63
1895	63	68
1896	62	65
1897	91	95
1898	90	95
1899	123	127
1900	143	147
1901	169	174
1902	206	213
1903	357	363
1904	404	410
1905	433	438
1906	324	329
1907	466	471
1908	459	466
1909	634	642
1910	397	403
1911	378	380
1912	245	247
1913	256	256
1914	259	259
1915	156	157
1916	84	84
1918	302	303
1919	239	238
1920	402	429
1921	105	106
1922	279	275
1923	326	326
1924	508	510
1925	435	435
1926	475	457
1927	421	372
1928	440	407
1929	163	215
1930	146	187
1931	39	30
1932	92	98
1933	278	229
1934	91	115
1935	82	98
1936	112	117
1937	350	304
1938	248	196
1939	207	228
1941	5	1
1942	33	25
1943	67	43
1944	55	57
1945	80	79
1946	260	224
1947	245	236
1948	222	220
1949	196	230
1950	355	305
1951	225	195
1952	169	142
1953	142	160
1954	114	115
1955	111	84
1956	51	61
1957	118	115
1958	28	41
1959	51	47
1960	32	45
1961	62	57
1962	48	27
1963	9	15
1964	7	12
1965	8	7
1966	3	1
1967	1	5
1968	8	6
1969	1	1
1978	5	2
1979	4	7
1981	2	1
1982	1	2
1983	1	4
1984	2	0

File: Faroes South Fin
Source: NAMMCO 2001, IWC
Notes: Includes Faroes Medium + Spanish/Portuguese catches

Year	M	F
1894	22	22
1895	12	12
1896	30	29
1897	37	37
1898	55	56
1899	69	68
1900	93	93
1901	111	111
1902	145	146
1903	215	214
1904	149	150
1905	186	186
1906	134	135
1907	250	249
1908	228	229
1909	383	383
1910	203	204
1911	203	201
1912	119	120
1913	133	132
1914	143	142
1915	151	151
1916	84	84
1917	0	0
1918	0	0
1919	0	0
1920	251	253
1921	248	249
1922	393	389
1923	713	714
1924	805	807
1925	966	955
1926	797	785
1927	351	349
1928	166	166
1929	65	94
1930	102	131
1931	0	0
1932	0	0
1933	49	41
1934	67	73
1935	36	39
1936	40	42
1937	73	69
1938	108	75
1939	73	80
1940	0	0
1941	0	0
1942	0	0
1943	0	0
1944	19	19
1945	18	18
1946	74	60
1947	183	170
1948	178	177
1949	101	121
1950	257	192
1950	246	197
1951	118	113
1952	61	51
1953	57	59
1954	28	33
1955	64	52
1956	25	24
1957	96	95
1958	23	30
1959	26	28
1960	65	59
1961	79	80
1962	29	27
1963	8	14
1964	43	29
1965	87	78
1966	61	50
1967	54	45
1968	64	48
1969	73	43
1970	97	84
1971	58	41
1972	41	56
1973	57	54
1974	65	55
1975	77	60
1976	113	121
1977	129	118
1978	342	293
1979	314	259
1980	113	105
1981	80	69
1982	59	94
1983	63	62
1984	35	69
1985	18	30

File: C-M Minke **Source**: 1930-1996- NAMMCO 1999; Catches post 1996 are compiled from from IWC National Progress Reports for Greenland. Information for Norway was provided by Nils Øien. Catches for Iceland in 2003 were provided by Gísli A. Víkingsson.
Notes: S/L means struck and lost. For Norway these are animals with unreported sex, probably because they were struck and lost. By-catch (B) is assumed to be 5 per year in Iceland for a "high catch" case. IUC means illegal unreported catch and is assumed to be 10 per year in Iceland after 1986 for a "high catch" case

Year	M	F	S/L	B	IUC
1930	5	5		5	0
1931	3	3		5	0
1932	3	3		5	0
1933	3	3		5	0
1934	3	3		5	0
1935	3	3		5	0
1936	1	0		5	0
1937	1	0		5	0
1938	0	0		5	0
1939	0	0		5	0
1940	0	0		5	0
1941	7	7		5	0
1942	7	8		5	0
1943	7	7		5	0
1944	7	7		5	0
1945	7	7		5	0
1946	18	15		5	0
1947	27	18		5	0
1948	56	43		5	0
1949	59	52		5	0
1950	18	15		5	0
1951	20	18		5	0
1952	21	19		5	0
1953	20	18		5	0
1954	20	18		5	0
1955	25	33		5	0
1956	26	21		5	0
1957	25	21		5	0
1958	23	21		5	0
1959	33	28		5	0
1960	37	32		5	0
1961	120	61		5	0
1962	164	125		5	0
1963	114	105		5	0
1964	208	114		5	0
1965	194	206		5	0
1966	181	173		5	0
1967	315	159		5	0
1968	386	350		5	0
1969	171	120		5	0
1970	203	159		5	0
1971	172	131		5	0
1972	204	166		5	0
1973	250	127		5	0
1974	143	109		5	0
1975	180	221		5	0
1976	175	110		5	0
1977	107	88		5	0
1978	146	162		5	0
1979	166	118		5	0
1980	198	120		5	0
1981	129	117		5	0
1982	212	109		5	0
1983	164	125		5	0
1984	136	149		5	0
1985	113	123		5	0
1986	6	46		5	10
1987	12	42		5	10
1988	4	1		5	10
1989	1	0		5	10
1990	5	0		5	10
1991	5	2		5	10
1992	8	0		5	10
1993	7	8		5	10
1994	8	38		5	10
1995	6	38		5	10
1996	12	40		5	10
1997	1	29	4	5	10
1998	9	58	0	5	10
1999	10	59	3	5	10
2000	25	41	1	5	10
2001	4	41	3	5	10
2002	6	39	0	5	10
2003	23	13	0	5	0

File: CIC Minke
Source: NAMMCO 1999. Catch for Iceland in 2003 was provided by Gísli A. Víkingsson.
Notes: S/L means struck and lost. Bycatch is assumed to be 5 per year in Iceland for a "high catch" case. IUC means illegal unreported catch and is assumed to be 10 per year in Iceland after 1986 for a "high catch" case.

Year	M	F	By-catch	IUC
1930	5	5	5	0
1931	3	3	5	0
1932	3	3	5	0
1933	3	3	5	0
1934	3	3	5	0
1935	3	3	5	0
1936	1	0	5	0
1937	1	0	5	0
1938	0	0	5	0
1939	0	0	5	0
1940	0	0	5	0
1941	7	7	5	0
1942	7	7	5	0
1943	7	7	5	0
1944	7	7	5	0
1945	7	7	5	0
1946	18	15	5	0
1947	27	18	5	0
1948	56	43	5	0
1949	56	48	5	0
1950	18	15	5	0
1951	20	18	5	0
1952	21	19	5	0
1953	20	18	5	0
1954	20	18	5	0
1955	24	27	5	0
1956	23	21	5	0
1957	24	21	5	0
1958	23	21	5	0
1959	24	21	5	0
1960	30	23	5	0
1961	71	34	5	0
1962	78	50	5	0
1963	69	54	5	0
1964	114	48	5	0
1965	80	62	5	0
1966	87	77	5	0
1967	135	87	5	0
1968	219	206	5	0
1969	93	66	5	0
1970	112	81	5	0
1971	121	98	5	0
1972	115	87	5	0
1973	78	64	5	0
1974	61	63	5	0
1975	89	80	5	0
1976	114	87	5	0
1977	106	88	5	0
1978	85	114	5	0
1979	111	87	5	0
1980	121	81	5	0
1981	119	82	5	0
1982	127	85	5	0
1983	117	87	5	0
1984	100	78	5	0
1985	94	51	5	0
1986	0	0	5	10
1987	0	0	5	10
1988	0	0	5	10
1989	0	0	5	10
1990	0	0	5	10
1991	0	0	5	10
1992	0	0	5	10
1993	0	0	5	10
1994	0	0	5	10
1995	0	0	5	10
1996	0	0	5	10
1997	0	0	5	10
1998	0	0	5	10
1999	0	0	5	10
2000	0	0	5	10
2001	0	0	5	10
2002	0	0	5	10
2003	23	13	5	0

Appendix 5

ABUNDANCE ESTIMATES FOR ASSESSMENTS OF NORTH ATLANTIC MINKE AND WHALES

AREA/SPECIES	YEAR	ESTIMATE	CV	BIAS	SOURCE AND COMMENTS
FIN WHALE					
EGI: entire EGI area	1988	15,614	0.216	1,2	NAMMCO 2000. Variance-weighted average from NASS-87 and NASS-89.
	1995	19,432	0.156	1,2	NAMMCO 1998, SC/11/MF/10
	2001	22,307	0.146	1,2	Pike *et al*. 2003. Re-calculated excluding Faroese block.
EGI "Area B" (Southwest Iceland)	1988	4,586	0.132	1,2	NAMMCO 2000. Variance-weighted average from NASS-87 and NASS-89.
	1995	15,008	0.200	1,2	NAMMCO 2000.
	2001	19,000	0.180	1,2	NAMMCO 2003, Southwest Iceland (blocks A, B, W).
Faroes EEZ	1995	413	0.310	1,2	NAMMCO 2001, but corrected as wrong surface area of Faroese EEZ was used in that estimate. Correct surface area (excluding land) is 79,423 sqr. nm.
	1989	345	0.530	1,2	NAMMCO 2001
	1987	319	0.410	1,2	NAMMCO 2001
	2001	1,612	0.325	1,2	Pike *et al*. 2003. Applied density in Faroese block to EEZ area of 79,423 sqr. nm

AREA/SPECIES	YEAR	ESTIMATE	CV	BIAS	SOURCE AND COMMENTS
Faroese Medium	1987	651	0.410	1,2	NAMMCO 2001
	1989	703	0.530	1,2	NAMMCO 2001
	1995	1,184	0.310	1,2	NAMMCO 2001
	2001	4,617	0.325	1,2,5	Pike *et al*. 2003. Applied density in Faroese block to area of 227,000 sqr. nm.
Faroese large	1987	7,118	0.400	1,2	NAMMCO 2001
	1995	3,603	0.300	1,2	NAMMCO 2001
	2001	6,649	0.224	1,2,4	Pike *et al.* 2003. Including only blocks N, J and Faroes. No estimate available for NSC or southern Iceland.
Faroese South- Includes Faroese medium + remainder of British Isles, Spain and Portugal stock.	1987	5,269	0.100	1,2,4	Buckland *et al*. 1992
	1989	18,038	0.256	1,2,6	Buckland *et al*. 1992
MINKE WHALE					
CIC	1987	19,200	0.280	4	NAMMCO 2003, Borchers *et al*. 2003a.
	1995	55,900	0.310	1,3	NAMMCO 1998. **Not recommended for use** (NAMMCO 2002).
	2001	43,600	0.190		NAMMCO 2003, Borchers *et al*. 2003.

AREA/SPECIES	YEAR	ESTIMATE	CV	BIAS	SOURCE AND COMMENTS
Central Stock	1987	25,800	0.212	1,2,4	NAMMCO 2003, Borchers *et al*. 2003. Based on Icelandic and Norwegian ship surveys, and Icelandic aerial survey.
	1995	72,100	0.244	1,2,3	NAMMCO 1998. Based on Icelandic and Norwegian ship surveys, and Icelandic aerial survey. **Aerial survey portion not recommended for use** (NAMMCO 2002).
	2001	63,500	0.158	1,2,4	NAMMCO 2003, Borchers *et al*. 2003, Gunnlaugsson *et al*. 2003. Based on Icelandic ship and aerial surveys.

BIASES

1. Negative, availability
2. Negative, perception
3. Positive, measurement error (cue counts)
4. Negative, coverage
5. Unknown. Density applied to areas not covered in the survey.
6. Positive, coverage

ANNEX 2

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON GREY SEALS

Marine Research Institute, Iceland, 9-11 April, 2003

1. OPENING REMARKS

Chairman Kjell T. Nilssen welcomed the participants (Appendix 1) to the NAMMCO Scientific Committee Working Group on Grey seals. The Scientific Committee of NAMMCO has previously provided advice on the abundance and stock levels of grey seals in the North Atlantic, with an emphasis on their role in the marine ecosystem and as a source of nematodal infestations in fish (NAMMCO 1997, 1998). However this assessment is now dated, and there have been new developments in some areas that warrant an updated assessment.

In 2001 the Scientific Committee noted that the abundance of grey seals around Iceland had decreased from an estimated 12,000 in 1992 to 6,000 in 1998, and that the annual catch of around 500 seals may not be sustainable. In contrast there have been apparent increases in the abundance of grey seals in other areas, including Southwest Norway, the United Kingdom and Canada. Grey seals are harvested or taken incidentally by fisheries and aquaculture operations in the Faroe Islands, Iceland and Norway. They also have significant direct and indirect interactions with fisheries in these areas. The main task of the Working Group will therefore be to update the status of grey seals in all areas of the North Atlantic.

The general terms of reference of this Working Group are:

- to assess the status of greys seals around Iceland, the UK, the Faroes, Norway, the Russian Federation, the Baltic, Canada and other areas;
- survey methods;
- stock delineation (genetics, temporal and geographical distribution);
- recommendations to the NAMMCO Council.

2. ADOPTION OF AGENDA

The draft agenda (Appendix 2) was accepted without change.

3. APPOINTMENT OF RAPPORTEUR

Daniel Pike, Scientific Secretary of NAMMCO, was appointed as rapporteur for the meeting, with the help from various members of the Working Group.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

Documents available to the Working Group are listed in Appendix 3.

5. STATUS OF GREY SEAL STOCKS

5.1 Iceland

Hauksson (SC/11/GS/4) presented information on the population status of the Icelandic grey seal, which has been investigated in the years of 1982, 1986, 1989, 1990, 1992, 1995, 1998 and 2002 by aerial census of grey seals pups on breeding sites. Eight out of a total of 10 surveys have been successful, and have been completed as planned in the months October and November, the main breeding time of the Icelandic grey seal.

The Icelandic grey seal population appeared stable between 1982 and 1990, but since then, the pup-production has been declining by about 6% (95% CI 3% to 9%) annually. The abundance of the grey seals around Iceland in the year 2002 was about 5,000 animals. In the first census in 1982, the population was estimated at about 9,000 and 1990 it reached a maximum of about 12,000 animals.

Grey seals are distributed all around the Icelandic coast. The majority of the population feeds off the west and northwest, with a second area of high density in the southeast coastal waters of Iceland. The breeding distribution of grey seals is somewhat more limited to the southeast and northwest part of the coast. Historically, the distribution of the Icelandic grey seals has changed somewhat. In the last 5 decades grey seals have dispersed from the west coast to the northwest, north and northeastcoasts. Recently following the decrease in population size, its distribution has contracted a little and it is now not found off the northeast coast, where it was breeding about 10 years ago. There is very little evidence for the Icelandic grey seal stock mixing with other grey seal stocks in the North Atlantic.

In discussion the Working Group noted that it was obvious that harvests had been above sustainable levels for more than 10 years, and that the resulting decline in the population was well documented. While no management objectives have been identified explicitly, it is apparent that the implicit objective has been to reduce the stock to some undeclared level. There is an urgent need to identify clear and explicit limits for the stock and to regulate the level of harvest accordingly. If exploitation is continued at its present rate, it is likely that the population will be reduced to very low levels, and likely extirpated in many areas, within the next 10 years. However Hauksson pointed out that the exploitation rate would probably decline as the stock size decreased. Furthermore, Gunnlaugsson noted that the trend predicted above was not based on any modelling of the population, but simply assumed a continued 6% decline per year.

While documented harvests have declined somewhat in recent years, they are still high relative to the size of the stock. In addition, the proportion of animals aged 1 year or older (1+) animals in the catch has increased, which increases the impact of the harvest on the stock. Other sources of human induced mortality include animals shot but lost, and animals killed as bycatch in other fisheries. There are some indications that bycatch may be substantial among young seals, but bycatch has not been adequately documented in Iceland.

The Working Group cautioned that, because the stock has been reduced and is still apparently declining, increased survey and monitoring effort will be required in the future. Once a limit value for the stock has been identified, surveys may have to be carried out more frequently and with higher effort in order to have an acceptable probability of detecting a further decline in population (see Section 6).

It was noted that nature reserves in the southeast, south, west and northwest would likely ensure that the population would not completely vanish there, but there were no nature reserves planned in the north and east of the country. However the efficacy of these protected areas in protecting the population has not been assessed.

The Working Group noted some problems with the estimation of total population size in Icelandic waters. The use of the Leslie Matrix to derive the factor to convert pup counts to estimates of total numbers carries with it the assumption that the population has a stationary age distribution. In addition it is assumed that the age distribution from the hunt is representative of the population. The Working Group considered both assumptions rather unlikely. It was suggested that the model could be improved by explicitly including hunting and other known sources of mortality.

Hauksson and Gunnlaugsson considered that pup counts alone could provide an adequate index of population size on which to base management decisions. The main advantage would be that the assumptions and uncertainties associated with converting pup counts to estimates of total abundance would be avoided. The other members regarded the estimation of total abundance and incorporating known sources of anthropogenic mortality as essential to the setting of risk-averse harvest levels. Under certain types of catch mortality, pup production could remain relatively constant as the adult population ages, which could lead to a sudden crash in the population as more females die or become reproductively senescent. Monitoring pup numbers alone would give no forewarning under such circumstances.

5.2 United Kingdom

Duck reported on the estimation of grey seal numbers in British waters, as presented in SC/11/GS/5, 13 and 14. British grey seals are monitored using a two stage process. Firstly pup production is estimated at most of the major breeding colonies, accounting for approximately 85% of pups born in Britain. Then the total pup production is used to obtain estimates of total grey seal population aged one year and over.

Pup production is determined annually using a series (4 to 7) of aerial surveys, carried out at 10-13 day intervals over 40 primary breeding colonies. The surveys use a large format aerial camera mounted in a vibration-damped, motion compensating cradle. The photographs can give a resolution of 5-7 mm from a height of 365 m. Counts of pups are made directly from the photographs on a microfiche reader which magnifies the photos by 22 times. Pups are classed as whitecoat, moulted or dead. In the modelling process, the whitecoat and dead totals are combined. Using whitecoat and moulted stages provides sufficient degrees of freedom for the model to estimate various parameters including: total production, 95% CIs, birth start date and mean birth date.

This stochastic modelling of the birth process and the development of pups allows the generation of a 40 year time series of pup production estimates for the majority of the British grey seal colonies (see Fig. 1). The most reliable time series of estimates covers the period from 1984 to 2001. The average annual rate of increase between 1984 and 1999 was 6.3% ±0.26%. Observed trends in pup production varied locally and regionally. Total pup production for the west coast of Scotland increased more slowly than at colonies in Orkney and on the North Sea coast. All of the increase on the west coast of Scotland was the result of changes at one group of islands: the Monach Isles.

Since 1992 pup production at the Monach Isles has been virtually constant and the annual rate of increase in the combined production for all colonies on the west coast of Scotland has declined from 5.6 ± 0.53% to 0.8 ± 0.62%. The rate of increase in pup production for all British colonies declined from 5.8 ± 0.63% before 1992 to 4.5 ± 0.38% from 1992 to 1999.

The Sea Mammal Research Unit (University of St Andrews, Scotland) is in the process of revising the method used to estimate the total grey seal population size. Three alternative approaches are available: a model devised by I.L. Boyd, a second by K. Newman and L Thomas which is under development and a third by L. Hiby which has been used since 1984. The descriptions below relate to this last model.

The annual estimates of pup production can be used to update, each year, a trajectory of total population size estimates, with associated levels of uncertainty. Simulation models are used to approximate the likelihood function for all the data combined and hence provide maximum likelihood estimates for the demographic parameters, female population size and other statistics of the population that are not directly observable.

The simulation models allow for measurement error and random variation in juvenile survival and recruitment. If these stochastic processes are assumed to be stationary the 95% confidence limits on estimates of female population size over the last 15 years are in the range ±15% to 20%. The estimate for the total number of females alive just before the 1999 breeding season is 63,000 (to the nearest 1,000 with 95% confidence limits from 54,000 to 73,000. The point estimate for females and males is 109,000. These figures refer to seals associated with the annually monitored colonies, which hold over 85% of the British population.

Recent declines in pup production estimates from the surveys suggest one or more of the demographic parameters may be exhibiting some trend over time as well as year to year variation. The available data do not provide evidence for this, significant at the 95% level. However, the fact that such trends can have a large effect on the total population size estimate increases the real level of uncertainty beyond that derived under the stationary assumption.

In discussion the Working Group noted that this was certainly one of the longest and most precise time series of abundance for any marine mammal, and possibly for any mammal, in existence. The precision and detail in the time series will allow analyses of environmental effects on pup production and other life history parameters. Because data is collected every year, the effects of extreme events such as epizootics can be determined at both the population and breeding colony levels. Given that there is little direct harvest or bycatch from the population, less frequent or partial surveys might be adequate for management purposes. In general the frequency and precision of surveys should be tailored to the objectives of management. However the synoptic and annual nature of the time series make it unique, and serious consideration should be given to its value for the study of marine mammal population dynamics in general before major changes are made to the program.

The reasons for the rapid population expansion in many areas of Scotland since 1960 are uncertain. There has been little harvest of this population since early in the 20th century. Some culling was carried out in the 1970's and 1980's, and this may have had the unintended effect of forcing females to found new pupping colonies, thus expanding the breeding habitat of the population. In addition, the human occupation of the isolated outer islands has decreased over the past 50 years, allowing the development of breeding colonies on these islands.

While there is substantial annual variation in pup production at individual colonies, there is little evidence that females switch between breeding sites. Most females seem to return to the same breeding site year after year. The specific timing of breeding can vary substantially even between nearby sites, so it is necessary to derive the pupping ogive individually for each site. At least 4 surveys at each site are necessary to parameterise the log-normal model used. However this level of effort may not be possible in some other areas.

It was noted that the models used to convert pup counts to estimates of total population size were different between the UK, Canada and Iceland, and these differences are explored further under Item 6.

5.3 Baltic

Harding *et al.* (SC/11/GS/6) reviewed the status of the grey seal in the Baltic Sea. This population is recovering after a century of bounty hunting and three decades of low fertility rates caused by environmental pollution. The growing population has led to increased interactions with the fishery, and demands have increased for the re-introduction of hunt. A demographic analysis and a risk assessment of the population has been carried out to make recommendations on how to decrease the risk of quasi-extinction (i.e. reduction below a threshold level) by overexploitation. Although hunting increases the risk of quasi-extinction, the risk can be significantly reduced by the choice of a cautious hunting regime. The least hazardous regimes allow no hunting below a ‘security level’ in population size. Obviously, to implement such a hunting regime knowledge of the population size and growth rate are required. With the current survey methodology, it would take more than 9 years to detect a 5% change in the annual rate of population increase. A hunt exceeding 300 females (less than 600 of both sexes) increases the risk for quasi-extinction substantially. The age and sex composition of killed animals influences the ‘cost of the hunt’.

In discussion the Working Group considered that the risk assessment methodology used in SC/11/GS/6 might be applicable to other grey seal assessments. In particular it could be applied to the Norwegian situation, where takes of up to 25% of the population are planned (see 5.5).

The Baltic population is severely depleted relative to historical levels. The estimate of pre-exploitation population size is based on information from the commercial and bounty harvests, when hunters were required to return a lower jaw to win the bounty. The former population size has been back-calculated based on historical harvests and more recent estimates of absolute population size (Harding and Härkönen 1999). At present there seem to be no signs of density dependence in the population. However there have been radical changes in the Baltic Sea environment, due to the effects of fishing, depletion of other seal species, environmental pollution and possibly climate change, so there is no reason to expect that carrying capacity would be the same as historical levels. Nevertheless there appears to be room for expansion of this population.

Even with annual estimates of abundance a considerable period of time might pass before a negative population trend could be reliably detected. Other triggers for management action, such as local depletion or changes in spatial distribution, might also be developed. However it was noted that the distribution of Baltic grey seals has changed historically and varies quite dramatically from year to year, partially dependent on ice conditions.

5.4 Faroes

Mikkelsen (SC/11/GS/7) reviewed present knowledge of the Faroese grey seal population. Based on historical sources, there seems to have been a long tradition for harvesting grey seals in the islands, mainly at breeding grounds. Grey seals in the Faroes mainly breed in caves, which is exceptional for the species. But it may explain why biological investigations have not been initiated on grey seals in Faroese waters: biological knowledge is limited and certainly insufficient. No management regime has been implemented. Today, the only harvest occurs around fish farms, when seals are interacting with the farms. Logbooks are not mandatory; therefore, hunting statistics are lacking. From direct contact to fish farmers, the annual harvest level is estimated to be in the order of 250 to 500 seals, which seems surprisingly high for the population. Present population size is unknown. No tagging experiments have been conducted on Faroese grey seals, but such studies on neighbouring populations have indicated that the annual number of British grey seals migrating into Faroese waters may be significant. The British and Canadian grey seal populations have been increasing for many years, but this has not been observed in the Faroese grey seal population. The main reason may be the cull of grey seals around the 30 fish farms in operation today. Also, the number of good quality breeding caves may be limited in the Faroes, preventing the population from increasing above the carrying capacity of breeding sites.

In discussion it was noted that the cave breeding habit of Faroese grey seals, while unusual, is not unique to the Faroes, and that cave breeding occurs in the UK as well. It does make counting pups considerably more difficult, and perhaps impossible in some cases. There are no recent observations of Faroese grey seals breeding in caves or anywhere else, but there are historical accounts of people entering caves to hunt breeding grey seals. In addition some whitecoated and weaned pups are observed in the winter, so there is evidence that some breeding does occur in the Faroes.

It was considered likely that the population around the Faroes is a mixture of animals that breed there and possibly form a distinct population, and migrant animals from the UK and possibly other areas. There is direct evidence from satellite tagging experiments and flipper tag returns that UK seals do reach the Faroes, perhaps in considerable numbers. More information will be required to determine the proportion of each component in the grey seals around the Faroes.

The Working Group expressed concern that the Faroese grey seal population is subject to an apparently high but unknown level of exploitation, and that this exploitation has developed rather recently since the advent of fish farming activities. Unlike the historical harvest, which targeted seals in their breeding caves, salmon farmers take seals in open water. The inaccessibility of some breeding caves therefore no longer provides protection against depletion of the local breeding population. The abundance of breeding and migrant seals in the area is unknown. However the number of seals breeding in the Faroes is unlikely to be large because breeding habitat is limited. Therefore, even if the human take includes a large proportion of migrant animals, the local population might still be subject to depletion.

The Working Group therefore strongly recommended immediate efforts to obtain better information on the population of Faroese grey seals, and on the nature and impact of the take in the Faroes. The highest priorities will be improved harvest monitoring, sample collection for genetic analysis, and cataloguing of breeding sites (See Section 8.1).

5.5 Norway

Nilssen *et al*. (SC/11/GS/8) summarised preliminary results from grey seal ship based surveys along the Norwegian coast in 2000-2002 (and how these compared with results from 1996-1998), and also provided information about catch regulations and known removals from the population. Most of the grey seal whelping areas from Rogaland county to Finnmark county were investigated. Due to difficult weather conditions the areas north of Vega in Nordland county and Troms county were poorly covered. Seal pups were observed from an inflatable boat, after which researchers landed where pups were observed. When possible, pups were caught, tagged, and developmental stage was recorded. In some cases only developmental stage was recorded. Total population estimates were derived from estimates of pups by using a range of multipliers (4.28 and 5.35).

In Rogaland, pupping occurred only on the Kjør Islands where 28-30 pups were counted each year in the period 2000-2002, which gives an abundance estimate of 128-160 seals (1+). No whelping was observed between the Kjør Islands in Rogaland and Froan in Sør-Trøndelag.

It was estimated that 303 pups were born in the Froan archipelago, which gives an abundance estimate of 1,296-1,620 seals (1+). The pup production was comparable with observations made both in 1993 and 1996.

A total production of 340 pups were estimated in the area of Hortavær in Nord-Trøndelag to Storbraken in Nordland, which gives an estimate of 1,455-1,819 seals (1+). The estimated number of pups born in 2001 was about 24% above results from aerial photographic surveys conducted in the same area in 1998.

In Finnmark, a total of 142 pups were recorded, which corresponds to an abundance estimate range of 608-760 seals (1+). This is an increase of approximately 21% compared with the results from a similar survey conducted in 1998. However, both results are probably underestimates because only one visit was made to each whelping site.

When results from aerial surveys conducted in 1998 in northern parts of Nordland and Troms are combined with the estimates from this study the number of pups born in

Norwegian waters are calculated to be about 1,030, which corresponds to about 4,400-5,500 seals (1+).

Total annual catches of grey seals in Norwegian waters ranged from 34-176 animals in 1997-2002, which corresponds to 13%-49% of the scientifically based recommended quotas(which are 5% of the estimated population size), and 11%-35% of the given quotas. There are no catch statistics available prior to 1997.

In areas with particular conflicts between grey seals and fisheries, Norwegian management authorities have occasionally attempted to use hunting to control population growth and population size by increasing the recommended quotas by 20%-30%. When quotas were set for the 2003 season this approach was taken a large step further in that the quotas in most areas were set at 25% of current population estimate. Also, a bounty of NOK 500, is to be awarded for each grey seal documented killed.

In discussion the Working Group noted that the new quota levels of 25% of the estimated population size would, if taken, certainly result in population reduction. However no formal analysis of the effect of this level of harvest on the population, including the risk of extinction the sensitivity of the survey program to detect a population decline, has been conducted. While harvests have been considerably below quota levels to date, the possibility that the quotas might be filled should be evaluated, especially considering that a bounty system is now in place.

It is likely that some proportion of the animals shot are killed but not landed. This proportion of shot but lost (S/L) animals has been observed to be up to 50% in some areas, because many seals sink when they are shot. As the quotas are based on landed animals, the actual anthropogenic take is likely to be considerably higher than the reported harvest. The Working Group recommended that a study be carried out to determine S/L rates in different areas, seasons and under different conditions.

There is some indication from tag returns that bycatch, particularly of young seals, in bottom set gill nets may be considerable in this area. This source of mortality must also be included in any assessment of the population.

Frie informed the Working Group that a research program had been started to look at the population genetics of grey seals in Norwegian waters. Samples have been collected from pups on the breeding sites during surveys, and both mitochondrial and microsatellite DNA analyses will be carried out. Co-operation with other areas, especially the UK and Russia, will be sought to compare samples from these areas. The research program will also include photo-identification at selected breeding sites to look at site fidelity. This could also form the basis for future mark-recapture estimates of abundance, and studies of paternity and mating systems.

5.6 Russia (Murman Coast)

Mishin (SC/11/GS/9) presented information on investigations on grey seals along the Murman coast of the Russian Federation. Grey seals on the Murman coast have been protected since 1958 and are included in the Red Data Book of the USSR and the Russian Federation. On the Murman coast grey seals are generally confined to two main breeding areas, the western Aynov (Big and Little Aynov Islands and Big Kiy

Island) and the eastern "Seven Islands" (pups are born mainly on Big Litskiy and Veshnyak islands) archipelagos. Most grey seal breeding areas on the Murman coast are included in Kandalaksha Nature Reserve.

Few estimates of the numbers of grey seals inhabiting the Murman coast have been made. Investigations in the early 1960s suggested that about 600 seals inhabited the area at that time. Subsequent studies carried out in 1986 and 1991/92 have indicated that *ca* 400 pups are born in the area, suggesting a population of about 3,500 animals.

Recent research has been carried out from shore-based sighting stations on the coast, from which sightings of all seals and cetaceans are registered. Grey seals begin to be seen in the area in early April. Numbers sighted peak in June and July, after which sightings slowly decline to the end of the sighting period in September. Additional research on captive grey seals has been carried out at the Murmansk Oceanarium.

Preliminary plans are being made to repeat the vessel-based surveys conducted in 1991/92 on the breeding areas during the pupping season.

In discussion the Working Group noted that the Murmansk breeding colonies were the largest Eastern Atlantic colonies outside of the UK. The seals have been fully protected from exploitation for many years. There is no coastal fishery in the area so bycatch is likely low. It is possible that the population has grown. The Working Group therefore recommended that a new survey be conducted in the area at the earliest opportunity.

5.7 Eastern North America

Canada

Hammill *et al.* (SC/11/GS/10) presented information on the status of Northwest Atlantic grey seals in Canada. Northwest Atlantic grey seals form a single stock, but are often considered as two groups, named for the location of the main pupping locales for management purposes. The largest group whelps on Sable Island, 290 km east of Halifax, Nova Scotia. The second group, referred to as non-Sable Island or Gulf animals, whelps on the pack ice in the southern Gulf of St. Lawrence, with other smaller groups pupping on small islands in the southern Gulf of St. Lawrence and along the Nova Scotia Eastern Shore. Estimates of pup production in this group have been determined using mark-recapture and aerial survey techniques. Aerial surveys use a combination of reconnaissance surveys to detect whelping patches, visual strip transect techniques to estimate the number of animals on the ice, and corrections to the visual estimates for births that occurred after the survey has been flown. Visual aerial surveys flown during January-February 1996, 1997 and 2000 in the southern Gulf of St Lawrence and along the Eastern Shore resulted in pup production estimates of be 11,110 (6,720-14,540), 5,810 (3,480-8,150) and 5,450 (3,860-7,040) in 1996, 1997 and 2000 respectively after correcting for births and including counts of pups on small islands. Incorporating information on pup production, reproduction rates and removals during government sponsored culling and bounty programs into a population model indicates that the Canadian component of the Northwest Atlantic grey seal population has increased from slightly less than 30,000 animals in 1970 to over 260,000 animals in 2000. The Sable Island and Gulf components of the population have followed very different population trajectories over time owing in part to the greater protection afforded Sable animals and higher mortality rates for

Gulf animals whelping on the less stable pack ice. At the same time, differences between the two groups in predicted adult mortality rates suggest that some other mechanisms may be involved. The last complete survey of this population was completed in 1997. Given the rapid growth observed this population, and the significant environmental changes that have occurred over the last 6 years, population projections cannot be considered reliable. A new assessment is needed.

Currently, there is no commercial harvest for grey seals in Canada. A few hundred are taken as part of industry interest in market development. In 2002, the Department of Fisheries and Oceans adopted an Objective Based Fisheries Management approach for seal populations. This scheme adopts two different approaches based on whether seal populations are considered data rich or data poor. A population is considered data rich if recent estimates of catch levels, reproductive rates and estimates of mortality are available. Under a data rich scenario, two precautionary reference points are established at 70% (N_{70}) and 50% (N_{buffer}) of the largest estimated population size. Management objectives ensure that the population size remains above $N_{70.}$ If harvesting results in a declining population, harvest quotas must be established at a level assuming a much lower risk that the population will continue to decline. If a population continues to decline below a Reference limit point set at 30% below the maximum estimated population size, then it is considered that the population has suffered serious harm and harvesting is discontinued. For a population considered data poor, there is still some discussion concerning the exact approach to establish permissible harvests. Current thinking is leaning towards the use of the Potential Biological Removal (PBR) approach developed in the United States. This approach is extremely conservative, but appears to be suitable in situations where recent population dynamics data are limited. Grey seals are currently considered data poor because the last survey was completed more than five years ago. However, a new survey would result in grey seals being considered Data Rich.

In discussion the Working Group noted that the Objective Based approach used in Canada has the advantage specifying explicit and easily understood rules for management. It was considered that similar approaches could be applied in Iceland and Norway.

The very rapid growth of the population breeding on Sable Island, along with the recent decline in the ice-breeding Gulf population, raises the possibility that seals are emigrating from the Gulf to Sable Island to breed. There is no direct evidence for this, but such an influx would be difficult to detect given the relative sizes of the populations. It appears that space is not a limiting factor at present on Sable Island, and it is not known when or at what level carrying capacity for this group will be reached.

USA

Wood (SC/11/GS/11) presented information on grey seals breeding along the United States East Coast. Grey seals were historically distributed along the U.S. east coast (from Maine to Connecticut). Native and bounty hunting extirpated the population and sightings were rare for most of the 20th century. Seals tagged on Sable Island (Canada)as pups were observed in New England during the 1980's and 1990's. Breeding began in 1988 on Muskeget Island (Massachusetts) and minimum pup production at that site increased from 4 in 1988 to over 800 in 2002. Two breeding sites were discovered in Maine in 1994. These sites have been surveyed during the breeding season from 1994 to 2002. To date, only the 2002 survey photographs have been analysed, resulting in minimum pup production of approximately 180 The grey seals currently found in New England are probably a mixture of Canadian migrants and animals born locally. Continued surveys, historic research, genetic analysis and fieldwork should provide further insight into this recolonisation event and the current status of grey seals in the U.S.

In discussion it was considered that the colonisation of new areas might be by first-time breeders. Juvenile animals have been shown to wander longer distances than mature seals. Studies conducted in the UK indicate that mature animals are for the most part faithful to their breeding sites, and that animals tend to return to the sites at which they were born. However colonisation events offer proof that site fidelity cannot be complete for all animals.

5.8 Summary

A summary of the abundance and trends in abundance of grey seals in all areas considered by the Working Group is presented in Table 1.

6. SURVEY METHODS

Corkeron (SC/11/GS/12) discussed information needs for monitoring the Norwegian grey seal population. Despite decades of monitoring effort, the abundance of grey seals in Norwegian waters remains poorly quantified. Quantitative estimates of trends in abundance are unavailable, although anecdotal information suggests that populations have increased over recent decades. Recently a method for estimating grey seal abundance based on counts of pups allocated into different developmental stage was developed. However, use of this method to quantify seals' abundance requires better data on stage length, the distribution of pupping over time, and life history parameters for Norwegian grey seals than are available at present. This Working Paper demonstrated why these data are required, and discussed issues that need addressing if scientific advice is to inform the management of grey seals in Norwegian waters. These include (i) statistics on the durations of pup "stages"; (ii) fitting a distribution to estimates of pup births over time; and (iii) construction of a Leslie matrix for grey seals to derive an appropriate multiplier for the non-pup population. Design questions included: (i) whether studies should enumerate seal pup abundance or use stratified random surveys to estimate pup abundance; (ii) what the management objectives are for grey seals, which affects where surveys should be conducted, and how often they are required.

In discussion the Working Group found that the issues identified had general application to all grey seal monitoring programs. Recommendations for survey programs are detailed under Item 8.1.

Additional investigations

Detailed and valuable information can be obtained from longterm studies of individual animals. Hot iron branding has been used to great effect on Sable Island and UK grey seals, while freeze branding has been used on Swedish harbour seals. In time, information on demographic parameters such as cohort survival, age at first reproduction and age specific fecundity rates can be obtained.

An alternative method for identifying individual grey seals uses their unique pelage characteristics. This has been used to estimate population size in the Baltic and the west North Sea (Hiby and Lovell 1990, Hiby 1994).

7. METHODS FOR STOCK DELINEATION

Genetic analyses, particularly using DNA microsatellites, can be very powerful for this species. It is relatively easy to sample animals on their breeding sites, something that is often difficult with other marine mammal species. Research in the UK has demonstrated that it is possible in some cases to determine the breeding locations of individual animals through genetic analysis. The Working Group considered that genetic techniques could be especially useful in the Faroese case, where the grey seals in the area are almost certainly a mixture of a local breeding population and migratory animals from the UK and elsewhere. The Working Group recommended that a co-ordinated, North Atlantic wide study on the genetic stock structure of grey seals be carried out. The study could be initiated by co-ordinating the activities already ongoing in the UK, Norway, Canada, the Baltic and other areas.

Tagging with satellite-linked transmitters is a very powerful technique for studying various aspects of grey seal ecology. Successful programs have been carried out in the UK and Canada. The transmitters are costly, as are the field programs required to apply the transmitters and the satellite time to download the data. As a result it is often not feasible to apply large numbers of tags. The Working Group considered that satellite tagging programs will have their greatest application in determining where the animals go while at sea. From this it is sometimes possible to infer what they are most likely to be feeding on, although such inferences must be confirmed by other studies. Such studies will have particular importance in determining foraging areas and the possible extent of interactions between grey seals and commercial fisheries.

8. RECOMMENDATIONS FOR RESEARCH AND MANAGEMENT

8.1 Recommendations for future research

Survey Programs

<u>General considerations</u>

1. Enumeration surveys are applicable to small, discrete breeding sites that can be completely covered by plane or by walking with a reasonable amount of effort. Sampling surveys should be considered for larger, more dispersed areas such as ice breeding sites or large islands.
2. While it is generally desirable to cover the entire breeding range of the stock within a single season, this is not an absolute requirement. Partial surveys should be considered when the survey effort and time available will not allow total coverage. A multi-year design should minimise the likelihood that animals will move between breeding areas, by surveying discrete regions if possible.
3. At least 3 and preferably 4 or more surveys within a single season are required for each breeding site to derive the pupping ogive. An alternative is to survey once and simultaneously monitor the age stages of the pups at each site or at least several sites distributed throughout the survey area. It is not adequate to monitor pup staging at a single site and apply the data to other sites.
4. Staging methods should be standardised across regions and stocks.

5. More data on stage durations are required for improved input into models for abundance estimation. Stage durations should be estimated at several sites in each country that uses stage durations as model input. The distributions of stage durations, rather than summary statistics for stage durations, should be provided for model input.

<u>Faroe Islands</u>
Further basic research is required before surveys are attempted in the Faroes. A first step will be to document all used and potential pupping sites. The cave breeding habit of Faroese grey seals will require non-standard survey methods, perhaps including diving and the use of automated camera systems.

<u>Iceland</u>
The Icelandic population is small and declining. Improved and more frequent surveys are urgently required to monitor the trend in the population and ensure that further declines can be detected in time for management action to be taken. Specific recommendations include:

1. If aerial surveys are used, a minimum of 3 surveys per site within the breeding season are required. An alternative might be to combine a single aerial count with a ground survey with staging, or to use ground counts on the larger colonies.
2. A power analysis should be conducted using past data to determine what frequency of surveys is required to reliably monitor trends in the population. If clear management objectives are established for the stock, the power analysis can be used to determine the level of survey effort required to determine if the population has reached a threshold value, with a given degree of certainty.
3. Harvesting, S/L and bycatch data should be directly included in the population model used to calculate the factor to convert pup counts to 1+ numbers.

<u>Norway</u>
The vessel-based surveys conducted from 2000-2002 have provided good information on the location and approximate size of breeding colonies along the Norwegian coast. This information can be used to develop a survey design that will provide more reliable estimates of seal abundance in the area.

1. Regular surveys are required to determine trends in the population. Power analysis should be used to determine the survey interval and level of effort required. However, as in the Icelandic case, clear management objectives from the Norwegian authorities would be helpful in specifying the survey requirements.
2. The possibility of using repeated aerial surveys, at least in areas to the south of Lofoten, should be further explored. In northern areas, the lack of light during the breeding season may preclude the use of aerial survey. In these areas ground-based surveys with staging could be used. The possibility of using aerial infrared camera surveys in these areas should be investigated.
3. It will be desirable to co-ordinate surveys efforts in Finnmark with those along the Murman coast in the Russian Federation. Joint survey efforts should be considered.

Other recommendations for research

General

1. There should be an ongoing exchange and verification of samples among laboratories conducting age determination for this species.
2. Härkönen informed the Working Group of a project comparing 5 methods of preparing and ageing teeth from 4 seal species. New methodologies may allow the estimation of age of maturity from tooth sections. The Working Group recommended that the results of this project be published as soon as possible.
3. A North Atlantic wide genetic study of grey seal population structure should be initiated. The study should use the same genetic markers, and laboratory and sampling methods should be standardised to the extent feasible. It was considered that such a study could best be done by co-ordinating the existing studies ongoing in range states including the UK, Norway and Canada.
4. Studies to determine struck and lost rates in different seasons and under different hunting conditions should be carried out in the Faroes, Norway and Iceland.
5. Further information on bycatch mortality of grey seals is required from Norway and Iceland.
6. To monitor changes in grey seal populations, anthropogenic mortality should be incorporated explicity into population models. These sources of mortality include removals due to harvests corrected for animals killed but not recovered (struck and loss) and bycatch in commercial fisheries.
7. Satellite tagging experiments should be carried out in the Faroe Islands, Iceland. and Norway. The studies should be directed towards determining the movements of animals while at sea, and their habitat use through recording of dive profiles. Such studies will have particular relevance to determining possible interactions with fisheries in the area, but also to possible movements of animals between areas. For the Faroe Islands it may help to determine the proportion of animals that are resident in the area

Faroes

1. Mapping of used and suspected breeding caves and sites is required.
2. Genetic studies are required to investigate the stock identities of grey seals in Faroese waters, and their association with those in adjacent waters. This could be part of the proposed North Atlantic study (see above).
3. Better data on removals is required. This could be achieved by implementing mandatory logbooks for seal hunters.
4. Studies on life-history parameters are required. This could best be based on samples from the catch.

Iceland

1. A formal analysis of the effect of present levels of harvest on the population, including the risk of extinction and the sensitivity of the survey program to detect a population decline, should be conducted as soon as possible.

Norway

1. A formal analysis of the effect of the quota levels of harvest on the opulation, including the risk of extinction and the sensitivity of the survey program to detect a population decline, should be conducted as soon as possible.

2. A more complete sampling program from the hunt should be established, including the collection of reproductive tracts and genetic samples.

8.2 Recommendations for management, by area and stock

In general it was considered that the NAMMCO member countries should be in a position to take a leading role in developing and implementing risk-averse conservation and management programs for this species. It was noted in this regard that the NAMMCO Council had recently adopted recommendations of the Scientific Committee concerning the development of clear management objectives, and the information required to develop advice on catch levels. The Working Group therefore recommended that clear management objectives be set for grey seal stocks. The Objective Based Management system used by Canada was considered a good example of such an approach. Once this is done, it will be possible to specify the information needs, in terms of monitoring, survey effort and survey frequency, required to meet the proposed management objectives.

Faroe Islands

For this area better information on the level of catch, both direct and as bycatch, is required. There is no information on stock identity or abundance on which to base management advice, and research programs to get this information have been recommended (see 8.1). Nevertheless, the relatively high level of take, combined with the suggested low size of the population, suggests that a precautionary approach is warranted.

Iceland

The observed decline and continued exploitation of this stock was of great concern. If present trends continue the stock will be reduced to very low levels. The Working Group recommended the immediate establishment of management objectives and conservation reference limits for this stock as an urgent priority. Survey frequency and intensity should be increased to facilitate monitoring of the trend in the population. A formal assessment of the effect of present levels of harvest on the population, including the risk of extinction and the sensitivity of the survey program to detect a population decline, should be conducted as soon as possible.

Norway

The new quota levels implemented for this area would, if filled, almost certainly lead to a rapid reduction in population in the area. A formal analysis of the effect of the quota levels of harvest on the population, including the risk of extinction and the sensitivity of the survey program to detect a population decline, should be conducted as soon as possible. It will be necessary to increase the intensity and frequency of surveys in the area if higher levels of exploitation are realised, in order to have a realistic probability of detecting a decline in the population within a time scale relevant to management.

9. OTHER BUSINESS

This Working Group was the first dedicated to grey seals over the entire North Atlantic. Members considered the Working Group very worthwhile in terms of exchange of information about research and management programs in other jurisdictions. The Working Group therefore recommended that it meet again at some point to update the status of all stocks, and possibly to conduct detailed assessments of those stocks for which concern has been expressed.

The possibility of dedicating a volume of NAMMCO Scientific Publications to a North Atlantic-wide overview of this species was considered. Several of the working papers could be published in such a volume, and more might be contributed by other authors. Such a volume would be unique and of value. The Working Group recommended that the Scientific Committee consider the idea of publishing such a volume.

10. ADOPTION OF REPORT

The Report was adopted on 11 April 2003.

REFERENCES

Harding, K. C., and Härkönen, T.J. 1999. Development in the Baltic grey seal (*Halichoerus grypus*) and ringed seal (*Phoca hispida*) populations during the 20th century. *Ambio* 28:619-627

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Hiby AR 1994 Abundance estimates for grey seals in summer based on photo-identification data. In Grey seals in the North Sea and their interactions with fisheries. In: Hammond, P.S. and Fedak, M.A. (eds) Unpublished report to the Ministry of Agriculture, Fisheries and Food, pp 5-21. Contract MF 0503

[NAMMCO] North Atlantic Marine Mammal Commission. 1997. Report of the Scientific Committee. In: NAMMCO Annual Report 1996, Tromsø, Norway, pp. 97-178.

[NAMMCO] North Atlantic Marine Mammal Commission. 1998. Report of the Scientific Committee. In: NAMMCO Annual Report 1997, Tromsø, Norway, pp. 85-202.

Population	Year	Estimate	Trend	Reference	Comments
Baltic	2001	10,250	Increasing	SC/11/GS/6	Based on enumeration of moulting animals. Depleted from historical levels.
British	2001	130,000	Increasing	SC/11/GS/14	Based on annual pup surveys of the main breeding colonies.
Murman Coast, Russia	1991/ 92	3,500	Unknown	SC/11/GS/9	
Norway	2000-2002	4,200	Unknown	SC/11/GS/8	Average of range given in paper. Does not include some known colonies in northern Nordland and Troms Counties.
Iceland	2002	5,000	Decreasing	SC/11/GS/4	
Faroes	NAM MCO	NA	NA	SC/11/GS/7	No abundance estimate available. Likely a mixture of seals that pup in the Faroes and seals that pup in other areas, especially UK.
Northwest Atlantic: Canada	2,000	260,000	Increasing	SC/11/GS/10	Combined estimate for Gulf of St Lawrence and Sable Island breeding areas. Gulf population has declined since 1996, but the much larger Sable Island population continues to increase.
Northwest Atlantic: USA	2002	NA	Increasing	SC/11/GS/11	Minimum pup production 1,000 at 3 sites in 2002. Colonised since 1988.

Table 1. Status of grey seal stocks in the North Atlantic.

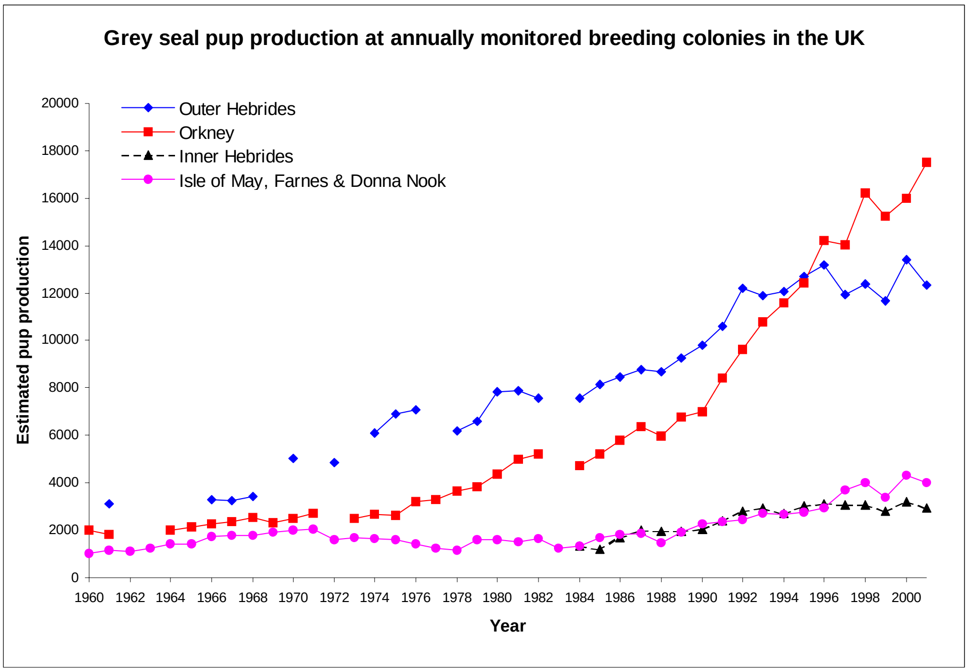

Fig. 1. Grey seal pup production at annually monitored breeding colonies in the UK.

Appendix 1 - LIST OF PARTICIPANTS

Dr Peter Corkeron
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Appendix 2 - AGENDA

1. Opening remarks
2. Adoption of agenda
3. Appointment of rapporteur
4. Review of available documents and reports
5. Status of grey seal stocks
   - 5.1 Iceland
     - 5.1.1 Distribution, migration and stock delineation
     - 5.1.2 Population sizes and trends
     - 5.1.3 Exploitation and sustainability of catch
   - 5.2 United Kingdom
     - 5.2.1 Distribution, migration and stock delineation
     - 5.2.2 Population sizes and trends
     - 5.2.3 Exploitation and sustainability of catch
   - 5.3 Baltic
     - 5.3.1 Distribution, migration and stock delineation
     - 5.3.2 Population sizes and trends
     - 5.3.3 Exploitation and sustainability of catch
   - 5.4 Faroes
     - 5.4.1 Distribution, migration and stock delineation
     - 5.4.2 Population sizes and trends
     - 5.4.3 Exploitation and sustainability of catch
   - 5.5 Norway
     - 5.5.1 Distribution, migration and stock delineation
     - 5.5.2 Population sizes and trends
     - 5.5.3 Exploitation and sustainability of catch
   - 5.6 Russia (Murman Coast)
     - 5.6.1 Distribution, migration and stock delineation
     - 5.6.2 Population sizes and trends
     - 5.6.3 Exploitation and sustainability of catch
   - 5.7 Eastern North America
     - 5.7.1 Distribution, migration and stock delineation
     - 5.7.2 Population sizes and trends
     - 5.7.3 Exploitation and sustainability of catch
6. Survey methods
7. Methods for stock delineation

8. Recommendations for research and management
   8.1 Recommendations for future research
   8.2 Recommendations for management, by area and stock
9. Other business
9. Adoption of report

Appendix 3 - **LIST OF DOCUMENTS**

SC/11/GS/1	List of participants
SC/11/GS/2	Draft agenda
SC/11/GS/3	Draft list of documents
SC/11/GS/4	Hauksson, E. Distribution, abundance and trends in abundance of grey seals in Icelandic waters, including methods for abundance estimates.
SC/11/GS/5	Duck, C. Pup production in the British grey seal population.
SC/11/GS/6	Harding, K., Härkönen, T. and Helander, B. Status of the Baltic grey seal population, including growth, abundance and ecological risk assessment.
SC/11/GS/7	Mikkelsen, B. Present knowledge of grey seals in Faroese waters.
SC/11/GS/8	Nilssen, K.T., Corkeron, P. and Haug, T. Status of the Norwegian grey seal, *Halichoerus grypus,* population.
SC/11/GS/9	Mishin, V. Grey seal investigations on the Murman coast, Russia, including research plans and needs.
SC/11/GS/10	Hammill, M.O., Gosselin, J.F. and Stenson, G.B. Abundance of Northwest Atlantic grey seals in Canadian waters.
SC/11/GS/11	Wood, S. and Brault, S. Status of the United States grey seal (*Halichoerus grypus*) population, including future research plans.
SC/11/GS/12	Corkeron, P., Nilssen, K.T. and Haug, T. Data requirements for estimating the abundance of Norwegian grey seals, *Halichoerus grypus,* using pup counts.
SC/11/GS/13	Duck, C.D., Hiby, L.R. and Thompson, D. The use of aerial photography to monitor local and regional populations of grey seals, *Halichoerus grypus*
SC/11/GS/14	Hiby, L. and Duck, C. Estimates of the size of the British grey seal *Halichoerus grypus* population and levels of uncertainty.

ANNEX 3

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON ABUNDANCE ESTIMATES

University of St Andrews, Scotland, 19-21 March, 2003

1. OPENING REMARKS

Chairman Nils Øien welcomed all participants to the meeting (see Appendix 1). He reviewed the terms of reference for the Working Group.

The fourth North Atlantic Sightings Survey was carried out in June/July 2001. The survey was planned and co-ordinated by this Working Group under the auspices of the NAMMCO Scientific Committee. The Working Group met in March 2002 and considered survey reports and preliminary abundance estimates from the survey. In addition the Working Group conducted a full evaluation of the survey protocols and methodologies, to be used in the planning of future surveys. The Working Group made recommendations for work to be carried out to complete abundance estimates for several species from the NASS-2001 and earlier surveys.

The present Working Group is therefore tasked with continuing the evaluation of abundance estimates for target and non-target species, determining if additional analyses are required and recommending estimates for acceptance by the Scientific Committee. In addition there will be some discussion of the publication of survey results, and the future of the NASS.

2. ADOPTION OF AGENDA

The Draft Agenda (Appendix 2) was adopted without changes.

3. APPOINTMENT OF RAPPORTEUR

Daniel Pike, Scientific Secretary of NAMMCO, was appointed as Rapporteur for the meeting.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

The documents considered by the Working Group are listed in Appendix 3.

5. MINKE WHALES

i. 2001 ship survey

An estimate of the abundance of minke whales form the NASS ship survey around Iceland and the Faroes was presented by Gunnlaugsson *et al*. (SC/11/AE/6). This area is exclusive of the aerial survey block around Iceland. Because of weather and ice related revisions to the survey plan, coverage probability was higher close to the East Greenland ice edge than in other portions of the same blocks. As the area close to the ice edge corresponds to an area of high minke whale density, it was considered that uneven coverage within the original block structure would likely have resulted in a positively biased estimate. The area was therefore post-stratified to include narrow blocks near the ice edge. Double platform data were available and indicated that *g(0)* was less than 1, however an attempt to apply the double platform hazard probability method to these data was not successful due to the distributional properties of the data. The distribution of perpendicular distances showed a steep decline from the trackline and almost no "shoulder", and a long tail extending out to about 3,000 m from the trackline. This made the estimation of effective strip width (esw) problematic as the estimate was not robust to changes in truncation, binning of distance intervals or model choice. The estimated *esw* was narrower than those seen in previous NASS or other similar surveys.

The point estimate was 23,955 (cv 0.30) for the original strata and almost the same for the post-strata: the estimate using the original strata is therefore preferred. This is higher but not significantly so from the estimate from roughly the same area from the 1995 NASS (Pike *et al.* 2002). The distribution of minke whales differed somewhat between the surveys, with many more sightings in the Faroese block in 2001 than in 1995.

The Working Group examined the distributions of sighting angles, radial and perpendicular distances from the ship survey in an effort to determine the source of the highly peaked detection function. The distribution of radial distances was highly peaked near the vessel, especially for the primary platform. However there was not a great difference between the platforms. It was noted that similar problems were evident in the detection functions of small whales (northern bottlenose, pilot whales) but not of large whales such as fin and blue whales. Conclusive explanations for the unsusual distributions of radial, and especially perpendicular distances were not possible. There were several possible explanations proposed, including:

a. rounding error to favoured distances and angles;
b. distance estimation error caused by estimates being made in different measurement units at different distances;
c. target species being both fin and minke whales, possibly resulting in observers scanning in a way that is incompatible with conventional line transect assumptions;
d. use of both binocular and naked eye searching with no record of which ttributed to each sighting, resulting in a mix of both types in the distributions of perpendicular and radial distances.
e. other factors causing heterogeneity in detection probabilities such as weather.

Nevertheless the Working Group concluded that the detection function used by Pike *et al.* (SC/11/AE/6) was appropriate for these data, and that the abundance estimate should be comparable to earlier surveys. The Working Group recommended that further efforts be made to use the double platform data to estimate bias due to visible whales missed by observers for this species.

ii. 2001 and 1987 aerial surveys around Iceland

Borchers (SC/11/AE/4) provided new abundance estimates from the NASS aerial surveys around Iceland carried out in 1987 and 2001. Estimates for the 1987 survey were previously reported by Hiby *et al.* (1989) and Borchers *et al.* (1997). The former estimate was corrected for bias due to error in measuring radial distance, while the latter, considerably higher estimate was not. However it was not certain whether the difference between the 2 estimates was due to the measurement error bias or to apparent differences in the datasets analysed. An estimate for the 2001 survey was previously reported by Pike *et al.* (2002), but this estimate was not corrected for biases due to measurement error or whales missed by observers.

Borchers (SC/11/AE/4) developed maximum likelihood estimators of abundance for cue counting surveys with measurement error and investigated their properties by simulation. Conventional estimators not corrected for measurement errors were found to be insensitive to low levels of measurement error but increasingly biased as measurement error increased. The new estimators were found to be practically unbiased.

For the 1987 survey analysis, measurement error was judged from duplicate detections to be additive with an estimated std. err. of 0.11. However, a model with multiplicative errors was selected on the basis of AIC when fitting to all the survey data. Estimation using this model yielded an abundance estimate of 19,320 (cv 0.28) animals for the originally designed strata. Using analysis options that make the estimate as comparable as possible to the estimates obtained by Hiby *et al.* (1989), yielded an estimate of 10,700, compared to an estimate of about 9,000 obtained by Hiby *et al.* (1989). Estimates obtained using the same methods as were used by Borchers *et al.* (1997) yielded an abundance estimate of 11,100 – compared to the estimate of over 20,000 obtained by them. This indicates that the main source of this discrepancy was differences in the data used in the two analyses, but these differences are not understood.

For the 2001 survey analysis, measurement error had an estimated cv of only 11% for these data. Simulations show that bias due to errors of this magnitude are negligible. One of the primary observers on this survey detected cues at small radial distances with estimated probability of only around 0.25. Correcting estimates accordingly results in an abundance estimate with very high variance. Two approximately unbiased estimators were presented - one using all data and correcting for missed animals at distance zero, the other using only data from the side of the plane with the more efficient observer. Both methods yield abundance estimates of about 43,000 animals. The estimate using only the more effective observer has greater precision (cv 0.19) than the estimate using both observers (cv 0.32).

For 2001, the estimate using data from the more effective observer was considered preferable, as it was more precise and straightforward in calculation than the estimate using both observers. This estimate was therefore recommended for acceptance by the Scientific Committee.

Both estimates assume a cueing rate for minke whales of 53 surfacings per hour. Sampling variablility in this estimated cueing rate has not been accounted for in the variance of the abundance estimate, which therefore is negatively biased. The group discussed whether variability in dive times for given overall surfacing rates would add to the uncertainty in the abundance estimate, but concluded that this is not the case.

The apparent inconsistencies in the datasets from the 1987 survey analysed by Hiby *et al.* (1989), Borchers *et al.* (1997) and Borchers (SC/11/AE/4) were troubling, however it seems likely that the dataset analysed by Borchers *et al.* (1997) was corrupted in some way, as the results of the other two analyses are consistent. The new estimate by Borchers (SC/11/AE/4) for 1987 was therefore recommended for acceptance by the Scientific Committee.

In discussion the Working Group noted that it was not clear whether the measurement error had an additive or multiplicative distribution, and that a more flexible error model, such as the gamma distribution, might be more appropriate. While this was considered unlikely to have much effect on the point or variance estimates, the Working Group recommended that such a model be developed for these data.

Pike *et al.* (SC/11/AE/5) presented a conventional line transect estimate of minke whale density from a shipboard transect through Faxaflói Bay in SW Iceland. This area corresponds to block 1 of the aerial survey and is an area of consistently high minke whale densities. It was therefore of interest to determine if the densities realised by the shipboard survey would correspond with those found from the aerial survey. The transit was conducted under optimal conditions with higher searching effort than was normal on the rest of the survey. Double platform data, while not analysed, indicated that bias due to animals being missed by observers was much lower than during the rest of the survey. The realised density was 1.63 whales nm^{-2} is very similar to estimate for the same block from the aerial survey of 1.74 whales nm^{-2} (cv 0.22) obtained by Borchers (SC/11/AE/4).

The Working Group considered that this provided some independent indication that the estimates obtained in the aerial survey using cue counting were realistic. The shipboard estimates would be expected to be somewhat negatively biased due to diving whales unavailable to the observers, however these biases might be small because of the high survey effort and optimal sighting conditions on this portion of the survey.

iii. Combined estimates

For the 2001 survey there is no overlap between the estimates from the aerial and shipboard components. Combined abundance can therefore be obtained by summation.

iv. Trends in abundance

Abundance estimates for minke whales from all NASS and Norwegian surveys are provided in Table 1.

The estimate from the aerial survey for coastal Iceland in 2001 is more than double that for 1987, however the difference is not significant. The Working Group concluded in 2002, based on line transect analysis of the density of minke whales from the 4 aerial surveys carried out since 1986, that the abundance of minke whales around Iceland has been stable or shown a moderate increase over the period. This conclusion remained unchanged.

The results from the NASS series (Table 1) indicate an increase in minke whale abundance to the south of Iceland and around the Faroes from 1995 to 2001. There seems also to have been a decrease in the abundance of minke whales in the Barents Sea, the Norwegian Sea and the North Sea in the same period. These changes in spatial distribution are not statistically significant, but might indicate a shift towards more southern and central Atlantic waters in the Central and Eastern Stocks of minke whales.

6. HUMPBACK WHALES

Burt *et al.* (SC/11/AE/7) presented estimates of humpback whale abundance from the 1995 and 2001 Icelandic and Faroese aerial and shipboard surveys. The data were analysed using the "count" variant of the methodology of Hedley *et al.* (1999). The effort data was divided into small segments, over which covariates were assumed not to vary, and the number of sightings within each segment was estimated. This number formed the response variable and locational variables were used as explanatory variables in a generalised additive model (GAM). A school density surface was obtained by predicting over a grid of the whole survey region and abundance was then estimated by integrating under the surface. Data from these surveys were analysed separately, and results were compared in regions of overlap. The estimated abundance for the region covered by the aerial surveys was 950 (cv 0.37) in 1995 and 3,371 (cv 0.79) in 2001. The estimated abundance of humpback whales from the shipboard surveys was 22,305 (cv 0.59) in 1995 and 14,259 (cv 0.50) in 2001. A calibration factor to make the aerial and shipboard abundance estimates compatible was calculated using data from the areas of overlap between the respective shipboard and aerial surveys. Using this calibration factor, the estimated abundance from the aerial survey was 15,270 in 1995, and 9,920 in 2001.

Discussion in the Working Group focused on two issues, the high ratio (16.55) of the shipboard survey abundance estimate compared to the aerial survey abundance estimate in 1995 and the high variances associated with the GAM bootstrap estimates. It was concluded that the high shipboard to aerial abundance ratio in 1995 was probably not a feature of the modelling method *per se* as the shipboard abundance estimate for 1995 was similar to the existing abundance estimate calculated with conventional line transect methods, although the GAM point estimates were sensitive to the given degrees of freedom.

The high variance of the GAM bootstraps in both the aerial and shipboard surveys was a disappointment to the Working Group which had hoped the use of spatial covariates would increase the precision of the abundance estimates. The major reason suggested for this was that the main variables determining humpback distribution are probably not location and depth, so that spatial models using these variables alone have limited ability to reduce variance. The Working Group therefore recommended that, as a first step, available maps of oceanographic features such as sea surface temperature and chlorophyll be examined for an apparent relationship to the concurrent distribution of humpback whales in the area. If so, these variables could be off value in the spatial analysis.

The Working Group considered that an integrated spatial analysis of the aerial and shipboard data might provide less biased and more precise estimates of abundance for both 1995 and 2001, and recommended that this be done if more promising potential covariates can be found. In addition, a conventional line transect analysis of the 1995 aerial survey would be useful for comparison to the estimate derived from the spatial analysis.

The Working Group noted that the abundance of humpbacks in the North Atlantic has been estimated at 10,600 (cv 0.067) for 1992-93 using mark-recapture analysis of photo-id (and biopsy) data (Smith *et al.* 1999). Because of the very high cv's of the NASS estimates, there is no significant difference between YoNAH and NASS estimates. However, the YoNAH estimate is for the whole North Atlantic; only a proportion of the population is found around Iceland.

The YoNAH estimate for the North Atlantic is negatively biased for 2 reasons: animals that do not breed in the West Indies are under-represented; and the area east of Iceland was poorly sampled. Nevertheless these biases could not fully account for the difference in the YoNAH and NASS point estimates. Conversely the NASS shipboard estimate from 1995 may be positively biased because of possible double counting.

The Working Group concluded that the discrepancy between the NASS and YoNAH estimates was likely a combination of the above-mentioned biases and the large cv's of the NASS estimates. Further studies are needed to resolve these differences more fully. In particular, photo-id/biopsy studies need to sample humpback whales in all important habitats around Iceland. For future NASS, consideration should be given to designs suitable for humpback whale feeding aggregations.

Combining estimates
As the aerial and shipboard components of the 1995 and 2001 surveys overlapped for this species, the estimates are not additive. Estimates for the aerial and shipboard survey blocks are provided in Table 1.

Trends in abundance
In 2002 the Working Group reviewed an analysis of the trend in encounter rate over the course of the 4 Icelandic aerial surveys carried out since 1986 which showed an increase of 11.4% (SE 2.1%) per year over the period in the survey area. This rate of increase is in accordance with that of 11.6% over the period 1970 to 1988 in recorded sightings humpback whales by whalers operating west of Iceland reported by Sigurjónsson and Gunnlaugsson (1990). The total estimates from the spatial analyses of the 1995 and 2001 surveys do not reveal a trend over the period, but they are much higher than estimates from earlier surveys. All available evidence indicates that the abundance of humpback whales around Iceland has increased since 1987.

7. OTHER SPECIES

i. Fin whales
Pike *et al.* (SC/11/AE/8) reported revisions to the estimates of fin whale abundance in the Faroese and Icelandic blocks reported by Gunnlaugsson *et al.* (2002). The new estimates use estimates of *esw* adjusted for the vessel covariate at the stratum level. This should result in somewhat more accurate block estimates, as most blocks were surveyed by only one vessel. In addition a bootstrap estimate of variance was used in the new estimates. The revised total estimate is virtually identical to that reported by Gunnlaugsson *et al.* (2002), however the block estimates differ slightly. The most notable differences are in the Iceland SW (revised lower) and Faroese (revised higher) blocks. The vessel that surveyed the Iceland SW block (AF2) had a somewhat wider *esw* than the average while the Faroese vessel had a somewhat narrower *esw*.

The Working Group noted that the new stratum estimates, while having slightly lower precision than those presented last year, should be more accurate, and recommended their acceptance by the Scientific Committee.

Øien reported that estimates of large whale abundance from the 1995 and 1996-2001 Norwegian surveys were presently in preparation. Noting that this information would be required for an upcoming assessment of fin whales in the Norwegian and East Greenland-Iceland stock areas by the NAMMCO Scientific Committee, the Working Group recommended the completion of these estimates on a timely basis.

Trends in abundance
Estimates from NASS around Iceland and the Faroes are listed in Table 1.

ii. Dolphins
Pike reported that an analysis of *Lagenorhyncus* spp.. dolphin abundance from the Icelandic aerial surveys conducted since 1986 was in progress.

The Working Group reiterated its conclusions from previous meetings, that while an analysis of the shipboard dolphin data from the Icelandic 2001 and earlier surveys is feasible, the problems of uncertain species identification, uncertain group size estimation, and possible responsive movement of these species would present significant problems for abundance estimation. As a first step, the data should be closely inspected to determine if further analyses are likely to be useful.

Desportes reported that an analysis of the abundance of *Delphinus* sp. from the Faroese area of the NASS-1995 was presently underway. In addition an analysis of the abundance of *Lagenorhyncus* spp. dolphins from the Faroese NASS-2001 block is in progress. The Working Group recommended that these analyses be completed in a timely manner.

iii. Pilot whales
Pike *et al.* (SC/11/AE/10) provided abundance estimates, uncorrected for availability or perception biases, for pilot whales from the Faroese and Icelandic shipboard components of NASS-2001. The estimate was derived using conventional line transect methods. The total estimate for the Faroese and Icelandic blocks of 65,315 (cv 0.39) is considerably but not significantly lower than estimates for comparable areas from NASS 1987, 1989 and 1995. The estimated *esw* was higher for this survey than for most previous surveys. If it is positively biased then the abundance estimate is negatively biased. The authors considered it unlikely that the observed differences in abundance between surveys reflected a real change in the population. Pilot whales are migratory and move into the survey area during the summer months. Some variation between years can be expected, due to differences in the timing of the surveys and/or the advance of the season in a given year. None of the surveys have covered the total summer range of this species.

The Working Group noted that pilot whales had not been a target species for the 2001 survey. The estimation of group size and the discrimination of sub-groups are problematic for this species and require specialised methods that were not implemented fully in the 2001 survey. It was also suggested that there were probably differences in operational procedures between vessels. The Faroese vessel, which encountered generally good weather, was able to close on sightings and count subgroups. The Icelandic vessel surveying Block B to the southwest of Iceland operated in higher sea states, and was not able to identify and record separate subgroups so precisely. Correspondingly, this resulted in a substantially higher estimated mean school size for Block B than for the Faroese block. Probably most importantly, there was no coverage in areas to the south of Iceland and the Faroes that are known from previous surveys to have relatively high densities of pilot whales. The Working Group concluded that a survey targeting this species requires a different spatial coverage and special field methods that were not used in 2001. The estimate is therefore not representative of the numbers in the Northeast Atlantic and should not be used for assessment purposes.

iv. Sperm whales

No new information was available for this species since the last meeting of the Working Group.

v. Bottlenose whales

Pike *et al.* (SC/11/AE/11) provided abundance estimates for northern bottlenose whales from the shipboard components of NASS 1995 and 2001. There were not enough sightings in the 1995 survey to reasonably estimate the detection function. Therefore sightings from both surveys were combined for the purpose of estimating a single detection function. This was considered reasonable because the same basic field methods, and some of the same vessels and observers were used in both surveys. A separate analysis was also done for the 2001 survey, using only sightings from that survey to estimate the detection function. Double platform data was available for the 2001 survey, and from the Faroese block in 1995, but was not used here for bias correction.

Distribution was similar in the two surveys, however more sightings were made to the northeast of Iceland in 2001 than in 1995. Most sightings were made in the Faroese block in both years. The estimates for the two surveys were almost identical although the 1995 estimate was much less precise. The estimate for 2001 using data from both surveys to estimate the detection function was similar to that using only data from that year. These estimates are negatively biased due to whales missed by observers and whales that were diving as the vessels passed. The latter bias is likely severe for this long-diving species. In addition neither survey covered the entire summer range of the species, which extends farther south of Iceland and the Faroes at this time of year.

The Working Group concurred with the authors that bias due to diving animals being missed was likely severe for this species. Bias due to animals on the surface being missed was likely of less significance as this species frequently occurs in groups that are easy to see at short distances. It was suggested that bounds on the bias due to diving whales being missed could be estimated from recent radio tracking experiments on 2 whales off Eastern Canada (Hooker and Baird 1999). Based on these data a correction factor for this bias is unlikely to be greater than 3. However these data may not be applicable as they were collected from only 2 animals and in another part of the Atlantic.

The changes in distribution were of interest but difficult to interpret. The 2001 survey covered this area about 2 weeks earlier than in 1995. This species is known to migrate out of Norwegian and northern Icelandic waters early in the summer, so it is possible that the 1995 survey missed the seasonal peak in the occupation of these areas. It is also possible that environmental changes may have lead to shifts in distribution, but this could not be assessed. The Working Group recommended that telemetry studies be conducted on this species, both to further elucidate migratory patterns and stock structure, and to obtain data on diving to be used for determining correction factors for survey data.

The uncorrected estimates from 1995 and 2001 are significantly higher than the uncorrected estimate from the 1987 survey of 5,800 (cv 0.15) (NAMMCO 1995).

vi. Blue whales

Pike *et al.* (SC/11/AE/12) provided estimates of blue whale abundance from the NASS-1995 and 2001 shipboard surveys around Iceland and the Faroes. An insufficient number of sightings were made in either survey to reliably estimate the detection function, so sightings from the 2 surveys were combined for this purpose. Blue whale sightings were recorded in 4 levels of uncertainty of species identification. For this reason 2 estimates were calculated: a "High" estimate including all classes of sightings, and a "Low" estimate excluding the most uncertain classes of sightings.

Blue whales were concentrated to the west and north of Iceland in both surveys. The difference between the HIGH and LOW estimates was not as great as might be expected given the difference in the number of sightings, primarily because sightings with more uncertain species identification tended to be far from the trackline, and therefore their addition had the effect of increasing the effective strip width. The estimates from both surveys are consistent with a population of between 700 and 1,900 blue whales in the survey area. An area of blue whale concentration off western Iceland near the Snæfellsnes Peninsula has not been covered well particularly in the 2001 survey.

8. ADDITIONAL ANALYSES TO BE CARRIED OUT

Table 2 provides a summary of future work to be carried out to refine abundance estimates from the 2001, 1995 and earlier surveys. The Working Group noted with pleasure that estimates had been completed for target species, and preliminary estimates had been completed for most non-target species for which abundance estimation was feasible.

In addition to the work listed in Table 2, the Working Group recommended that estimates of the abundance of non-target species, particularly fin whales, from the Norwegian surveys be completed as soon as possible. The Working Group also reiterated its previous recommendations with regard to estimating dolphin abundance from NASS shipboard data (see 7.ii.).

9. STRUCTURING INTEGRATED ANALYSES FROM ALL NASS

Table 1 provides a first step towards integrating the results of all NASS by providing estimates by species and survey for comparable areas. However some other issues remain to be addressed to improve comparability between surveys. The analytical methods used in estimating abundance for some species from the 1987 and 1989 Faroese and Icelandic ship surveys differed somewhat from those used for later surveys. Some re-analyses may therefore be required for these surveys using a more standardised analytical approach.

The stratification and coverage in the Faroese and Icelandic ship surveys has varied greatly between surveys. Although the groupings used in Table 1 address this to some extent, there is still some variation in the size and extent of the areas. Post-stratification into comparable areas would be facilitated by assembling all NASS data into a standardised database format from which spatially bounded sub-sets could be easily extracted. The DESS program used by the IWC is one example of such a program that could be modified for use with the NASS for storing and extracting data. There would be some cost involved in creating such a database and formatting the data for inclusion in it. However, given the costs and effort that have gone into conducting these surveys, the Working Group considered that this would be a good investment that would facilitate the use of these data. The Working Group therefore recommended that such a database be established for the NASS data.

10. FUTURE OF THE NASS

The first surveys had the major objective of producing a first description of the distribution and abundance of cetaceans over large areas of the North Atlantic. This objective has been in large part fulfilled. Later Norwegian surveys focussed specifically on providing abundance estimates for minke whales for input into their management program. It is necessary to determine the necessity and objectives of continued large-scale integrated cetacean surveys in the North Atlantic, as the nature of the objectives will determine the optimal form of the survey.

For all countries involved in NASS, the main objective now is to provide abundance estimates for target species for input into harvest management programs. For this purpose periodic estimates of absolute abundance are required, and these estimates should be as unbiased and precise as possible, and with quantified uncertainty. A secondary objective will be to provide information on distribution and abundance for research into ecosytem relations, long-term environmental change and fisheries interactions.

Several countries are planning surveys which may offer opportunity for integration into a large-scale survey. Iceland will continue surveys on a 5-6 year rotation, with the next survey tentatively planned for 2006. A new SCANS is being planned for 2005/6, with the offshore portion to be conducted in 2006. The survey will cover the North Sea and adjacent waters, and the North Atlantic EEZ's of all European Union countries. The Faroe Islands is planning a survey of small cetaceans to coincide with the offshore portion of SCANS in 2006. Norway will continue its rotational survey program, but integrate it with other surveys to the extent feasible. Therefore the best opportunity for a future large-scale integrated sightings survey would appear to be in 2006. The Working Group recommended that contacts be made between the organisations planning these surveys in order to integrate them to the extent possible.

A particular problem is the differing target species of the surveys. Experience with NASS suggests that surveys with large whales as target species do not provide adequate data for small whales and dolphins. The Working Group recommended that survey protocols be modified to make them applicable to multiple species, to the extent feasible given the overall objectives of the surveys.

The Working Group considered the idea of conducting "mosaic" type surveys after the Norwegian model, in which a portion of the total survey area is surveyed annually on a rotational basis. Norway has completed a first 6 year rotation and has had a positive experience with this survey mode. The main advantages are logistical, with annual use of equipment and personnel, rather than a more long-term rotation. This allows more continuity in the use of observers, which in turn results in more experienced observers and better-quality data. The main disadvantage is the loss of synoptic coverage in chosen years, and thus for these years the precision would have been better with a synoptic than with a mosaic design. This would indeed be the case if the whole stock is present in the area covered. If, however, there are shifts in the spatial distribution on a large scale (*e.g.* see 5.iv), the true uncertainty in abundance might be higher than the estimated uncertainty in the synoptic survey. In the long run, a well-designed mosaic of frequent partial surveys might provide a better basis for estimating trends in time and space than do infrequent large-scale surveys. The Working Group recommended that this model be considered for application on an international basis over the entire area covered by NASS.

The NASS have provided important information on the distribution and abundance of cetaceans in the North Atlantic that will be useful for many years to come.

11. PUBLICATION OF SURVEY RESULTS

A future volume of NAMMCO Scientific Publications will be a compilation of the results of all NASS conducted to date. The volume, to be edited by Nils Oien and Daniel Pike, is scheduled for publication in late 2004. A list of titles has been prepared and authors have been contacted to begin work on the papers.

12. OTHER BUSINESS

There was no other business.

13. ADOPTION OF REPORT.

The final version of the report was adopted by correspondence on 30 April 2003.

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Table 2: Further work to be carried out on abundance estimates from recent NASS.

SURVEY	SPECIES	RECOMMENDED FUTURE WORK	Ref
1987 air	Minke	1. More flexible error model based on gamma distribution.	SC/11/AE/4
1995 air	Minke	1. Redo conventional analysis to determine integrity of the dataset analysed by Borchers (1997). 2. Depending on results, investigate the effect of various levels of measurement error.	SC/5/AE/2
	Dolphins	Estimate unfinished from this and earlier surveys.	
	Humpback	1. Conventional analysis. 2. Determine availability/applicability of other covariates to improve spatial analysis. 3. Carry out integrated spatial analysis of aerial and shipboard survey.	SC/11/AE/7
1995 ship	Minke	None.	SC/10/AE/6
	Fin	None.	SC/5/AE/1
	Sei	None.	SC/5/AE/1
	Humpback	None.	SC/9/9
	Humpback	1. Determine availability/applicability of other covariates to improve spatial analysis. 2. Carry out integrated spatial analysis of aerial and shipboard survey.	SC/11/AE/7
	Blue	None.	SC/11/AE/12
	Pilot	None.	SC/5/AE/3
	Bottlenose	None.	SC/11/AE/11
2001 air	Minke	None.	SC/11/AE/4
	Dolphins	1. Use double platform data to correct perception bias.	SC/10/AE/9
	Humpback	None.	SC/10/AE/9
	Humpback (spatial analysis)	1. Determine availability/applicability of other covariates to improve spatial analysis. 2. Carry out integrated spatial analysis of aerial and shipboard survey.	SC/11/AE/7

SURVEY	SPECIES	RECOMMENDED FUTURE WORK	Ref
2001 ship	Minke	1. Use double platform data to correct perception bias.	SC/11/AE/6
	Fin	None.	SC/11/AE/8
	Humpback	1. Determine availability/applicability of other covariates to improve spatial analysis. 2. Carry out integrated spatial analysis of aerial and shipboard survey.	SC/11/AE/7
	Blue	None.	SC/11/AE/12
	Pilot	None.	SC/11/AE/10
	Bottlenose	Use available diving data to place bounds on a correction for availability bias.	SC/11/AE/11
	Sperm	Conduct studies to determine dive times and cueing rate, and use to correct abundance estimate.	SC/10/AE/13

Appendix 1 - LIST OF PARTICIPANTS

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Appendix 2 - AGENDA

1. Opening remarks
2. Adoption of agenda
3. Appointment of rapporteur
4. Review of available documents and reports
5. Minke whales
    - I. 2001 ship survey
    - Ii. 2001 and 1987 aerial surveys around Iceland
    - Iii. Combined estimates
    - Iv. Trends in abundance
6. Humpback whales
    - I. Spatial analysis- 2001 shipboard and aerial surveys
    - Ii. Spatial analysis- 1995 shipboard and aerial surveys
    - iii. Trends in abundance
    - iv. Combining estimates
7. Other species
    - i. Fin whales
    - ii. *Lagenorhynchus* dolphins
    - iii. Pilot whales
    - iv. Sperm whales
    - V. Bottlenose whales
    - Vi. Blue whales
    - vii. Killer whales
8. Additional analyses to be carried out
9. Structuring integrated analyses from all NASS
10. Future of the NASS
11. Publication of survey results
12. Other business
12. Adoption of report.

Appendix 3 - LIST OF DOCUMENTS

SC/11/AE/1	List of participants
SC/11/AE/2	Draft agenda
SC/11/AE/3	Draft list of documents
SC/11/AE/4	Borchers, D.L. Analyses of the NASS 1987 and 2001 minke whale cue counting surveys taking account of distance estimation errors.
SC/11/AE/5	Pike, D.G. and Gunnlaugsson, Th. A note on the density of minke

	whales in Faxaflói Bay, from a NASS-2001 shipboard survey transit.
SC/11/AE/6	Gunnlaugsson, Th., Pike, D.G, Vikingsson, G.A., Desportes, G. and Mikkelsen, B. An estimate of the abundance of minke whales (*Balaenoptera acutorostrata*) from the NASS-2001 shipboard survey.
SC/11/AE/7	Burt, M.L., Hedley, S.L. and Paxton, C.G.M. Spatial modelling of humpback whales using data from the 1995 and 2001 North Atlantic Sightings Surveys.
SC/11/AE/8	Pike, D.G., Gunnlaugsson, Th., Víkingsson, G.A., Desportes, G. and Mikkelson, B. Fin whale abundance in the North Atlantic, from Icelandic and Faroese NASS-2001 shipboard surveys: Slightly revised estimates
SC/11/AE/10	Pike, D.G., Gunnlaugsson, Th., Víkingsson, G.A., Desportes, G. and Mikkelson, B. An estimate of the abundance of long finned pilot whales (*Globicephala melas*) from the NASS-2001 ship survey.
SC/11/AE/11	Pike, D.G., Gunnlaugsson, Th., Víkingsson, G.A., Desportes, G. and Mikkelson, B. Surface abundance of northern bottlenose whales (*Hyperoodon ampulatus*) from NASS-1995 and 2001 shipboard surveys.
SC/11/AE/12	Pike, D.G., Víkingsson, G.A. and Gunnlaugsson, Th. Preliminary abundance estimates for blue whales (*Balaenoptera musculus*) in Icelandic and adjacent waters

3.2
REPORT OF THE SCIENTIFIC COMMITTEE INTERSESSIONAL MEETING ON NARWHAL AND BELUGA

The NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic met February 3-6, 2004 in Montreal, Canada. The meeting was held jointly with the Scientific Working Group of the Joint Commission on the Conservation and Management of Narwhal and Beluga (JCNB). The group (referred to as the JWG) reviewed 23 working papers, containing information on stock structure, catches, harvesting patterns, ecology, behaviour, population sizes, and population dynamics of especially narwhal in the Baffin Bay area.The Scientific Committee considered the report of the JWG (see Annex 1) by correspondence.

MARINE MAMMAL STOCKS -STATUS AND ADVICE TO THE COUNCIL

Narwhal and Beluga

Narwhal

Stock structure

Narwhal stock structure was investigated using genetic analyses and contaminant levels in samples from diverse areas. The genetic analyses found only two or three genetic types that dominated all samples, and the analyses were generally not helpful in resolving detailed differences and relationships among narwhal from different areas. The contaminants information showed that narwhal from different parts of the Baffin Bay carry different contaminant concentrations, showing that different animals are aggregating in the different areas. It hereby confirmed the hypothesis that narwhals from Repulse Bay, Grise Fjord and Pond Inlet, and from east Baffin Island represent at least three different stocks.

Repulse Bay narwhals were the most distinct group. In western Baffin Bay, narwhals hunted at Pangnirtung may be from the same stock as those hunted at Qiqiqtarjuaq. Narwhals taken in Clyde River were not convincingly associated with or separated from other groups. Among the four major sample groups, narwhals from Pond Inlet and Grise Fiord were the most similar. However, narwhals from Pond Inlet had a notably lower PCB/DDT ratio than those from Grise Fiord. These differences are assumed to be due to food web differences. No new information was presented to resolve the stock structure problem for Greenland.

A model of the population structure of narwhals in Baffin Bay and adjacent waters was then proposed, integrating all available information. Stocks, or management units, should represent discrete summering aggregations with little or no exchange between whales from other summering grounds. Coastal summering aggregations in Canada have been identified in Eclipse Sound, Admiralty Inlet, Somerset Island, East Baffin Small Stocks and Cumberland Sound. Summering aggregations in Greenland have been identified in Inglefield Bredning and Melville Bay. Aggregations in Jones Sound and Smith Sound are shared between Canada and Greenland.

Narwhal hunting will have differential impacts on the stocks in Canada and Greenland depending upon the temporal dispersal of the whales. It should therefore be determined which aggregations contribute to which hunt in order to assess the sustainability of the hunts. There are eighteen major hunting grounds in Canada and Greenland at which several stocks appear to be hunted more than once. Evidence suggests whales from Canadian stocks have a low risk of being harvested in West Greenland, and that whales from Greenlandic stocks have a low risk of being harvested in Canada.

Biological parameters

There was no new information on age composition or biological rates of narwhal. It is still not possible to tell the true age of narwhal beyond the age of sexual maturity, and in the assessments it has been necessary to use estimates of biological parameters for beluga as proxies for those of narwhal.

Catch statistics

New catch data from Canada were presented. The average annual Canadian catch from selected Eastern Canadian Arctic Communities around Baffin Bay was 420 individuals for 1999-2003. This can be compared to a reported average at the last meeting of 364 individuals for 1996-2000, and 304 individuals from 1977-2000. Catches from more southerly and westerly areas are thought to be from other stocks resident in Canada and are not reported here. New data on narwhal killed-and-lost from a few communities were also considered but no firm conclusions could be drawn.

Information and statistics on catches of narwhals in West Greenland since 1862 were presented. Although detailed statistics split by hunting grounds are missing for most of the years, a time series has been constructed with catches split into hunting grounds. The time series has been corrected for under-reporting detected from purchases of mattak, for periods without catch records, and for killed-but-lost whales. This results in a low, medium and high time series of somewhat realistic catch levels from 1862 through 2000. There has been an overall increase in catches during the 20th century, which is especially pronounced after 1950. There has not been a significant increase during the 1990s.

Abundance

Canada has conducted visual surveys of narwhal in Eclipse Sound, Prince Regent Inlet, the Gulf of Boothia, Admiralty Inlet and in inlets along the eastern coast of Baffin island during the summers of 2002 and 2003. Preliminary analyses showed that substantial numbers of narwhals were found along the previously un-surveyed East Baffin coastline, and that tens of thousands of narwhal are likely to summer in the Canadian High Arctic. However, the analysis is at a preliminary stage and the JWG is looking forward to final estimates at the next meeting.

Greenland has conducted aerial digital photo surveys of narwhal in Inglefield Bredning and adjacent fjords in Northwest Greenland in August 2001 and 2002. When corrected for submerged whales, abundance estimates of 2,297 (95% CI: 1,472-3,122) individuals in August 2001 and 1,478 (95% CI 1,164-1,793) in August 2002 were obtained for Inglefield Bredning. When the uncorrected estimates were compared to the results of visual line-transect surveys conducted in 1985 and 1986 it showed an annual decline of 10% in the abundance of whales visible at the surface. Total estimated abundance in 2002 was about 15% of the total estimated abundance in 1986. A photo survey was also performed in Melville Bay in August 2002. Here no narwhal were sighted on 990 km of trackline flown, and Melville Bay is therefore considered to contain low numbers of narwhals. This is consistent with reports from hunters who observe few whales in the area. A third photo survey in Uummannaq in November 2002 was unsuccessful because of the short days and poor weather conditions at that time of year.

Ecology

An increase in the sea ice in the present wintering areas of narwhal in Baffin Bay has been detected over the last 25 years. Less than 3% open water was available to narwhals between 15 January and 15 April, and reached a minimum of 0.5% open water at the end of March. Decreasing trends in the fraction of open water, together with increasing trends in between- year variability, were significant in the northern wintering grounds. The impact on the risk of ice entrapments, however, remains unclear due to incomplete understanding of sea ice dynamics. It was recommended that future studies on ice entrapments aim at a better understanding of known entrapments.

Effects of predation by narwhals on Greenland halibut during the winter period in Baffin Bay have been examined. Whales in two separate wintering grounds were estimated to require 738 tons and 90 tons of Greenland halibut per day, assuming a diet of 50% Greenland halibut. The difference in Greenland halibut biomass between an area with many and few whales, approximately 18,000 tons, corresponded well with the predicted biomass annually removed by narwhals. Further studies to illuminate the interaction between narwhals and Greenland halibut were encouraged.

Assessment

Assessments were made of the stocks of narwhals in West Greenland to estimate their current status and the sustainable levels of harvest. Although no explicit management goals have been identified for West Greenland narwhal, the JWG considered that, given the rapid decline in numbers suggested by the assessments, the main goal must be to halt the decline in the short term. Therefore the JWG worked under the assumption of an immediate goal of halting the decline of narwhal in West Greenland. Although a likely model for the population structure of narwhals in Canada and Greenland had been agreed upon by the JWG as a working concept, the population structure of narwhals in West Greenland remains uncertain. To cope with this problem a total of seven different population structure hypotheses were investigated to combine the harvest from four sub areas [Inglefield Bredning (including Qaanaaq), Melville Bay (including Upernavik and Savissivik), Uummannaq, and Disko Bay and the area south thereof] with estimates of the summer abundance in Inglefield Bredning and the winter abundance in Disko Bay.

Another important issue is whether the abundance estimates from especially Inglefield Bredning are partial or complete estimates of the stock that is harvested. It is likely that the estimate of abundance in Inglefield Bredning supplies the hunt for that area. However, it may not be the only component that supplies the hunt in other areas.

The results of the assessments show that West Greenland narwhals are depleted to approximately one quarter of their pre-harvested abundance (estimates between 0.13

and 0.35 dependent upon the mode), and that a future harvest at the present level may result in the extinction of West Greenland narwhals in the near future.

For the Inglefield Bredning, Uummannaq, and Disko Bay areas most stock scenarios examined indicate that an annual removal of 135 narwhals for the entire area should result in a probability of 0.7 for some increase within ten years (survey estimates are scaled by the model to an abundance in 2005 between 5,500 and 7,800 narwhal depending upon the model). Another scenario, where the entire West Greenland catch (other than Melville Bay) is supplied by the Inglefield Bredning summer aggregation, suggests that annual removals would have to be reduced to about 20 animals to achieve the same result (based on a survey estimate of 1,500 narwhal in 2002). There was not general agreement within the JWG on what model scenarios should be used in a final assessment. However, there was general agreement to recommend that the total removals should be reduced to no more than 135 individuals.

Delay in implementing catch reductions will result in delay in stock recovery and probably in lower available catches in the medium term. The JWG emphasized that this is an interim recommendation only. More work must be done on the assessments and this advice may change once this is done. The JWG will revisit this assessment at their next meeting and should be able to offer a more complete range of management options at that time. However the situation was considered so serious that an interim recommendation was warranted.

It was also emphasised that this recommendation is given in terms of total annual removal rather than a landed catch. Given the unknown but perhaps substantial loss rates in some areas, limits on landed catch should be lower.

Satellite tagging studies have suggested that whales from the Melville Bay area do not winter in Disko Bay and are not available for harvest once they leave Melville Bay in the fall. A survey conducted in Melville Bay in 2003 was unable to detect any narwhal despite a considerable amount of effort. The JWG was informed that local hunters have noted a decline in narwhal numbers in the area. This indicates that numbers are very low and it was considered highly unlikely that present harvests in the area could be sustainable. The JWG therefore recommended a cessation of narwhal hunting in the Melville Bay area. It was emphasized that this advice was based on the assumption of a discrete summer stock in Melville Bay. If future work reveals that Melville Bay receives influxes of narwhal from other areas, this advice could be revised.

No formal assessments of Canadian stocks were available to the JWG. A three-year survey program will be completed in 2004, and more complete and up to date abundance information will be available once the analysis of these data has been completed. Allocation of community harvests into stock units will be complex but a way forward has been developed. Formal assessment work will be carried out in time for the next meeting of the JWG.

Beluga

Given the focus on narwhal relatively little new information was presented for beluga, and an update of the assessment for beluga in West Greenland, as requested by the

NAMMCO council in 2003, was postponed to the next meeting in order to incorporate a planned abundance estimate for 2004.

New information on catches of beluga in Canada was presented. Landed catches in Canada between 1999 and 2003 averaged 34 beluga annually for communities hunting in the Baffin Bay and High Arctic areas. This is comparable to catch levels over the past 25 years. Belugas are harvested in other part of Canada but these animals are not believed to be part of the Baffin Bay-High Arctic population.

Recent catches from Greenland were not presented, but are likely comparable to the average of 660 individuals that was taken in the 1990s, as new hunting regulations have not yet been implemented.

Belugas occurring on the Greenland West Coast can be separated into two stocks for management purposes: One stock wintering in the North Water and summering in Canadian High Arctic, and another stock that winters in West Greenland south of Melville Bay and summers in the Canadian High Arctic. Some satellite-tracked belugas have been shown to move from the Canadian High Arctic toward the southerly wintering areas in West Greenland before or near 1 October. Of a total number of 26 belugas that had been satellite-tracked in Canada beyond 1 October, 15% (95% CI:6%-35%) moved to the southerly wintering grounds in West Greenland. The remaining 85% apparently stayed in the North Water during the winter.

The timing of this migration and evidence from satellite tracking strongly suggest that these are the same animals that pass by Upernavik later in the fall. Therefore, animals taken in September and October at Qaanaaq should be considered part of the West Greenland wintering stock. Beluga taken later in the fall and in the winter are likely to be animals wintering in the North Water. Beluga are rarely taken in the summer in this area, and these may be stragglers from other areas or perhaps part of a small summering stock. Given the relative rarity of belugas in the summer in this area, it was suggested that they should be protected during this period.

Annex 1

JOINT MEETING OF THE

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON THE POPULATION STATUS OF NARWHAL AND BELUGA IN THE NORTH ATLANTIC

AND THE

CANADA/GREENLAND JOINT COMMISSION ON CONSERVATION AND MANAGEMENT OF NARWHAL AND BELUGA SCIENTIFIC WORKING GROUP

1 OPENING REMARKS

Chairmen Lars Witting and Øystein Wiig welcomed the participants (see section 5.8) to the second joint meeting of the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB) Scientific Working Group and the North Atlantic Marine Mammal Commission (NAMMCO) Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic (hereafter referred to as the Joint Working Group or JWG).

In 1998 the Council of NAMMCO made a general request for the Scientific Committee to "examine the population status of narwhal and beluga (white whales) throughout the North Atlantic". Subsequently the Scientific Committee has held 3 specialist working group meetings on narwhal and beluga, the most recently in 2001 held jointly with the JCNB. Previous meetings have concentrated on beluga, mainly on establishing sustainable harvesting levels for West Greenland stocks. In 2001, the Management Committee recommended that the Scientific Committee should concentrate its assessment efforts on the West Greenland narwhal in the near term.

The Management Committee noted in 2003 that a new survey of West Greenland beluga will be conducted in winter 2004. The Scientific Committee was therefore requested to update the assessment of West Greenland Beluga in light of the new survey results and any other new information. This assessment could take place in late 2004 or early 2005.

No specific management goals have been identified for narwhal, but the overall objective will in all cases be to sustain populations at their present or a greater size. For West Greenland beluga, the Management Committee of NAMMCO has identified the main objective as halting the population decline.

Similarly the JCNB has requested a general assessment of all narwhal stocks potentially shared between Canada and Greenland. The JCNB has mentioned that the JWG should put an emphasis on research on narwhal. The JCNB had also some specific question on beluga stock discrimination in North West Greenland and on how it relates to the Qaanaaq harvest.

2 ADOPTION OF JOINT AGENDA

The draft Agenda (Appendix 1) was adopted with minor changes.

3 APPOINTMENT OF RAPPORTEURS

Daniel Pike and Patrice Simon were appointed as rapporteurs for the JWG.

4 REVIEW OF AVAILABLE DOCUMENTS

Documents that were available for the meeting are listed in Appendix 2. In addition to the scientific documents, the Joint Working Group received input from Canadian and Greenlandic hunters who participated in the JWG meeting.

5 NARWHALS

5.1 Stock structure

5.1.1 Genetic information

JWG/7: de March, B.G.E.,Tenkula, D. and Postma, L.D. Molecular genetics of narwhal (*Monodon monoceros*) from Canada and West Greenland (1982-2001).

We examined the molecular genetics of 433 narwhals, collected between 1982 and 2001, from hunts in 12 Nunavut communities in Canada and 2 locations in west Greenland. Major sampling locations in Canada were Repulse Bay, Grise Fiord, Broughton Island, Pond Inlet, and Arctic Bay. Narwhals from Repulse Bay were significantly differentiated from most high Arctic locations for both microsatellite alleles and mitochondrial DNA. Narwhals hunted in Igloolik were weakly differentiated from several other locations and most resembled high Arctic, not Hudson Bay, narwhals. Narwhals from Grise Fiord resembled some Greenland locations most and were very weakly differentiated from those hunted in several other locations. Otherwise, no differences could be shown among high Arctic locations in Canada. Narwhals from the Uummannaq district in Greenland may be a stock that differs from narwhal sampled in most locations in Canada. Weak overall differentiation may be due interbreeding and because narwhals may originate from few recent ancestors.

If sample sizes were increased, some comparisons would possibly have sufficient power to distinguish additional differences among stocks. However, we predict that even with larger samples sizes, considerable genetic overlap would exist between locations examined, and that year-to-year differences would continue to be the greatest source of statistical variation.

Discussion

The JWG noted that some communities likely harvested from several stocks, especially when hunting in the spring and fall when narwhals were migrating to and from their summering areas. Therefore comparisons should be made by community and season. However this would probably require more samples than are currently available from most areas. Since very little variation is seen in microsatellite DNA among sampling locations, this may indicate that there is enough exchange of animals among breeding areas to prevent differentiation. Variation in mitochondrial DNA might still occur because of maternally directed migrations to summering areas, as is seen in belugas. However the social structure of narwhal is poorly described and it is not known if they follow the same patterns seen in belugas and some other whale species. In any event the lack of significant variation in the proportions of maternally inherited mitochondrial haplotypes among sampling areas suggests that either mixing among summering areas is occurring, or that there is simply insufficient variation among areas for differences to be detected.

The JWG concluded that further genetic analyses of this type were unlikely to be productive in answering questions about stock identity in narwhals. Taken at face value, the apparent lack of differentiation among most areas would indicate very few stocks in Canada and Greenland, but this is in conflict with other sources of data described later (see 5.1.3 and 5.1.4). The absence of a detectable genetic difference is not in itself conclusive evidence that no differences exist.

5.1.2 Satellite tracking
Information on satellite tracking is dealt with under section 5.1.4

5.1.3 Other information
SWG-2004-6: de March, B.G.E. and Stern, G. Stock separation of narwhal (*Monodon monoceros*) in Canada based on organochlorine contaminants

This document describes organochlorine contaminants (OCs) in narwhal tissue, analysed for the purpose of stock discrimination, with data available in August 2003.

Canonical discriminant function analysis using 14 OC groups separated narwhals hunted in Repulse Bay, Broughton Island, Pond Inlet and Grise Fiord. Canonical functions were most strongly correlated with the concentrations of several PCB congeners and DDT compounds. While narwhals from all sample locations had overlapping OC contaminant concentrations, OC ratios differed. Repulse Bay narwhals were the most distinct, with overall lower OC levels and high PCB/DDT ratios. Narwhals from Broughton Island had relatively high OC levels and high PCB/DDT ratios. Narwhals hunted in Pangnirtung may be from the same stock as those hunted in Broughton Island. Narwhals from Clyde River were not convincingly associated with or separated from other groups; however this may be due to the small sample size of six animals. Among the 4 major sample groups, narwhals from Pond Inlet and Grise Fiord were the most similar. However, narwhals from Pond Inlet had a notably lower PCB/DDT ratio than those from Grise Fiord. These differences are assumed to be due to food web differences. Several hypothesized stock differences, existed scientific knowledge, and traditional knowledge are confirmed by the results presented here.

Discussion
The ensuing discussion centred on the retention time of organochlorine in blubber, and the potential for change in organochlorine signature over weeks or months. It was noted that the retention time of these contaminants was long and that they bioaccumulated. Mature females generally have lower concentrations as they are able to offload contaminants in their milk. Therefore the observed mix of organochlorines in the blubber should be the result of feeding activities over years, and would not be

expected to change seasonally as animals moved into new areas. However, if the condition of the animal varies seasonally, the absolute concentrations (although not necessarily the ratios) of organochlorines in the blubber might vary seasonally.

It was also suggested that the concentration and mix of organochlorines can vary with both depth in the blubber, and the location on the animal that is sampled. In this study all samples were taken from the same location on the animal, and a full depth section of blubber was used in the analyses.

Some communities, notably Qiqiqtarjuaq and Pond Inlet in this collection, take animals in the summer, and in the spring and fall during migrations. The same situation mentioned for the genetic work (see 5.1.1) therefore applies here, and it would be useful to disaggregate the community samples seasonally for comparison. Indeed, it was noted that one of the bivariate plots of organochlorine concentrations presented in JWG/6 suggested that 2 different groups of animals were being sampled at Qiqiqtarjuaq. It is planned to do seasonally disaggregated comparisons in the future.

The contaminant information presented in JWG/6 is confirmatory of the genetic information in that the strongest contrast is seen between Repulse Bay and the rest of the areas sampled. Although some difference is seen between Pond Inlet/Grise Fiord and the east Baffin communities, these differences are not absolute and there is considerable overlap. This contrasts with the situation with beluga, where strong differences were observed between many sampling locations. It was noted that differences in organochlorine signatures will develop only if there is sufficient contrast in organochlorine concentrations in narwhal prey between feeding areas to drive such differentiation. There is evidence that most feeding may be done in the winter (see 5.5) and that some wintering areas are rather close together (see 5.1.4). Although there is evidence suggesting differences in feeding and diving behavior on different wintering grounds, this may not be reflected in contaminant profiles. It cannot therefore be concluded that a lack of differentiation indicates that there are few stocks of narwhal.

5.1.4 Management units

JWG/20: Heide-Jørgensen, M.P., Richard, P., Dietz, R. and Laidre, K. Metapopulation structure and hunt allocation of narwhals in Baffin Bay.

A model of the metapopulation structure of narwhals in Baffin Bay and adjacent waters is proposed based on a review of recent genetic studies, heavy metals, oroganoclorines, stable isotobes, satellite tracking, hunting statistics and compilations of local knowledge. The default definition of a stock or management unit should be based on the assumption that disjunct summering aggregations of narwhals are separate stocks with little or no exchange between whales from other summering grounds. Coastal summering concentrations of narwhals in Canada are proposed to constitute at least five separate stocks: Eclipse Sound, Admiralty Inlet, Somerset Island, East Baffin Small Stocks and Cumberland Sound. Coastal summering concentrations in Greenland constitute at least two separate stocks: Inglefield Bredning and Melville Bay. Stocks that are shared between Canada and Greenland include Jones and Smith sound. In northwest Greenland, whales in Inglefield Bredning likely migrate south to Uummannaq and winter in Disko Bay, although this is the only major aggregation of narwhals that has not been tracked by satellite. Inuit hunting of narwhals will differentially impact the stocks in Canada and Greenland depending on the temporal dispersal of the whales. Therefore, it is important to identify which stocks and aggregations contribute to which hunt in order to assess hunt sustainability. Eighteen major hunting grounds in Canada and Greenland are identified at which several stocks appear to be hunted more than once. Evidence suggests whales from Canadian stocks have a low risk of being harvested in West Greenland. Similary Greenlandic stocks also have a low risk of being harvested in Canada.

Discussion

The JWG recognised that there was new tagging information on narwhal but also that there is a need to increase sample size to better understand migration patterns. It was also concluded that there is a lack of information on narwhal from eastern Baffin Island and Cumberland Sound and from the Inglefield Bredning, Uummannaq and Disko Bay.

Although previous surveys have shown a rather continuous occurrence of narwhals across Baffin Bay during the winter, the scheme advanced in JWG/20 implies that animals return to discrete wintering areas within the larger area. This is suggested by the results of satellite tagging studies, where animals from different summering areas have returned to specific n and non-overlapping wintering areas. It was noted that individual fidelity to wintering areas has not been conclusively demonstrated, as no animal has been tracked through 2 winters. However, stock interannual fidelity to wintering areas has been demonstrated for stocks studied over several years. Little movement occurs once the animals are on their wintering areas. None of the animals tagged in Canada have approached the Greenland coast and they would therefore not be available to Greenlandic hunters. The JWG therefore accepted that discrete wintering areas do exist in Baffin Bay and there is likely no panmixia of narwhals from different summering stocks in the area, while noting that there are uncertainties in this concept.

The general pattern of movement in Baffin Bay is southbound in autumn and northbound in spring. This provides a model for seasonal movements of narwhal from stocks that have not yet been studied.

The tagging evidence for philopatry to summering areas is based on only 2 tag applications that have endured an entire migratory cycle. However it conforms with Inuit knowledge on the subject, and is analogous to some other cetacean species including beluga. In addition, there is no evidence that there are great variations in abundance in summering areas, which might be expected if animals shifted between summering areas. The JWG therefore considered that the assumption of philopatry to summering areas was supported by the available evidence.

Narwhals generally abandon offshore areas in Baffin Bay in the summer, and no observations suggest that narwhals are found in large summer aggregations in offshore Baffin Bay.

The method used in apportioning harvests to summering stocks in communities taking from more than one stock is based on the observed seasonal distribution of harvest and the relative abundance of putative summer stocks based on survey data. It was noted that both these proportions are uncertainan that this uncertainty should be accounted for in assessment models.

The JWG concluded that the model for apportioning of catches to putative stocks presented in JWG/20 (see Fig. 1) was acceptable based on the available evidence. This carries with it the implication that management advice offered by the JWG should contain 2 components: 1) sustainable harvest levels for the putative stocks, and 2) where and when each stock is thought to be harvested. This will enable managers to allocate the sustainable harvest level to communities. For some communities that apparently take 2 or more stocks, this may require seasonal allocations.

5.2 Biological parameters

No new information on biological parameters was available to the JWG.

5.3 Catch statistics

SWG/10 Ditz, K. Catch statistics (1999-2003) for narwhal and beluga in selected communities in the Eastern Canadian Arctic.

Catch statistics for narwhal in Canadian High Arctic region (Nunavut) for the period 1999-2003 are presented. In general it is believed that the reports for narwhal landed are accurate since a tag system is in place. Communities receive a specific number of tags and hunters are required to fill in specific information on the catch, report sex and attach a portion of the tag to the tusk when present. The other portion of the tag is returned to Fisheries and Oceans Canada (DFO) from which the information is recorded. For communities participating in Comunity Based Management, there is now the possibility to transfer up to 50% of the annual harvest limit to the following year.

Igloolik and Hall Beach have been included in the past based on genetic information from samples taken from narwhal hunted near the community. However, local incidental hunts have now been supplement with hunting in Lyon Inlet near Repulse Bay where narwhal are more numerous. Recent requests have included intentions to hunt their entire quota in this area. If this continues, the communities' hunts will be considered with the Northern Hudson Bay narwhal stock.

Not including Igloolik and Hall Beach, the average reported landed catch for the period reported is 420 per year

5.3.1 Struck and lost

Struck and lost includes the two categories 'killed and lost' and 'wounded and escaped'.

In some communities which are part of a Community Based Management program, total hunting mortality is reported. Results are presented in SWG/10. The struck and lost information is based on self-reported data by the hunters. Systems of reporting vary from community to community but in general they are required to report animals that are wounded (wounded and escaped) and animals that have been killed but the hunter is unable to retrieve it (sunk and lost). Estimates of hunting mortality are calculated based on minima and maxima data (min = landed + killed and lost; max =

landed + killed and lost + wounded and escaped). Not all wounds result in latent mortality. Many hunting wounds are superficial and heal leaving the scars that are sometimes observed on narwhals. In some cases hunters report scars and whether animals that they have wounded are likely to survive or not.

Discussion

The success of the program to collect struck and lost information has had various degrees of success in the different communities. The struck and lost information collected is based on self-reported data by the hunters. Some communities are still hesitant at reporting their struck and lost animals. The collecting program is being improved. The data collected so far is consistent with struck and lost information collected by direct observation of the hunts in other studies.

It would be useful if the data were reported by sex and for the different hunt types (floe edge, open water, ice cracks) so that catch statistics can be corrected according to hunting method (or date of harvest).

The correction factor for killed and lost would be difficult to apply to the Greenland harvest because of the different environmental factors and hunting methods. However, data from the Canadian hunt can be used to provide a general indication of loss rate in Greenland.

5.3.2 Ice entrapments

No information on new ice entrapments was presented.

5.3.3 Catch histories by management units

JWG-2004-5 Richard, P. Seasonal distribution of narwhal catches in the Baffin region of Nunavut Territory, Canada.

The distribution of seasonal catches of narwhals in the Baffin region of Nunavut Territory, Canada, was studied using hunter tag information archived at the Department of Fisheries and Oceans since 1979. Histograms of catches by julian date and a breakdown of catches pre day 205, between days 205 (roughly floe edge season) and 274 (roughly summer open water season) and post day 274 (30 Sept and later) are given to estimate the proportion of animals taken during these periods. The results indicate that, in many communities, there is more than one season of hunting. Many communities hunt mostly in summer but several communities take a substantial proportion of their catch in spring or autumn. These results are important in allocating the catch to different sub-stocks, either local summering sub-stocks or spring or autumn migrating sub-stocks.

JWG-2004-15 Heide-Jørgensen, M.P. Reconstructing catch statistics for narwhals in West Greenland, 1862-2001: A preliminary compilation (ver. 3).

Information and statistics including some trade statistics on catches of narwhals in West Greenland since 1862 are reviewed. Detailed statistics split by hunting grounds are missing for most of the years. For the northernmost area, the municipality of Qaanaaq, only sporadic reporting exists. Based on statistics from the most recent three decades a time series is constructed with catches split into hunting grounds and corrected for under-reporting detected from purchases of mattak (*low option*), for periods without catch records (*medium option*) and from rates of killed and lost (K/L) whales (*high option*). This reveals a time series of somewhat realistic catch levels from 1862 through 2000.

Discussion

There was discussion on the range of correction factor for killed and lost to use. The K/L correction factors used in JWG-2004-15 were 1.05 for Qaanaaq, 1.15 for Upernavik, and 1.30 for Uummannaq and Disko Bay. A correction factor higher than 1.30 for open water hunts was discussed, but there is little data to support this.

The Working Group requested an evaluation of the feasibility of preparing a narwhal catch history for Canada from 1860-present that would complement the Greenland catch history presented by Heide-Jørgensen. Such an exercise would require consideration of at least three components for at least parts of that period. *Subsistence hunting* for domestic use by the Inuit is known to have been conducted but there is very little quantitative data on numbers of whales taken or products obtained (e.g. meat, oil, ivory) prior to the 1970s (Mitchell and Reeves 1981, Reeves 1992). Therefore any estimation of this component would require crude assumptions and inferences derived from information on numbers of people and their habitation and consumption patterns. *Commercial bowhead whalers* from Europe and North America were active in portions of the eastern Canadian Arctic until about 1915. These hunters killed narwhals opportunistically, and their tendency to do so seems to have increased with time as bowheads became more scarce. In contrast to the large numbers of belugas taken in drive hunts in Cumberland Sound and Prince Regent Inlet (Reeves and Mitchell 1987), the numbers of narwhals killed directly by the commercial whalers were small (i.e. probably in the low 100s, at most, in any given year). The whalers probably obtained more tusks in trade from the Inuit than by their own hunting efforts. *Trading companies*, including the Hudson's Bay Company and a series of "free traders," became established in northern and eastern Baffin Island in the early 1900s (Mitchell and Reeves 1981). The activities of these concerns, including their promotion of narwhal hunting for oil, skins, and tusks, declined by the late 1920s although the Hudson's Bay Company continued to purchase tusks through at least the 1970s (Reeves 1992). It would be feasible from the fragmentary data on catches by individual hunters, amounts of skins or tusks traded, etc. to develop a set of annual removal estimates (e.g. low, best, high) for the Canadian Arctic, based on what is presently available in the literature. There is no reason to believe that further investigation of primary data sources would be warranted.

5.4 Abundance

5.4.1 Recent estimates

Two new estimates were available to the JWG: one from West Greenland (JWG-2004-14) and one from Nunavut (JWG-2004-4). In 2001, the JWG discussed survey plans for narwhal, and decided that the best way to proceed was to establish a subcommittee to plan, conduct, and analyse surveys in the Canadian High Arctic and other areas, as had been done for beluga in the past. At their meeting in 2001 the JCNB supported this recommendation and further recommended that the planning include community consultation and participation by resource users. However no joint planning was done for either survey, primarily due to time and cost considerations. While some consultation was done, it was not as extensive as it should have been. In this regard it was pointed out that extensive consultation can add significantly to the cost of the survey, and insufficient funding was available to conduct the surveys and carry out extensive community consultations.

JWG-2004-14 Heide-Jørgensen, M.P. Aerial digital surveys of narwhals, *Monodon monoceros*, in northwest Greenland.

Narwhal abundance in Inglefield Bredning and adjacent fjords in Northwest Greenland was estimated using aerial digital photographic techniques in August 2001 and 2002. Two digital medium-format cameras continuously downloaded images to two laptop computers together with information on position, altitude, pitch, and roll of the aircraft. In 2001, a total of 11,628 images were obtained corresponding to a swept area of 840 km^2. The survey of the entire area was repeated four times and produced a count of 360 narwhals on the images or an average abundance in the surveyed area of 873 narwhals (cv = 0.35) at the surface. In 2002, the area was surveyed seven times and approximately 11,402 images were obtained. This corresponded to a swept area of 2,208 km^2 with 566 narwhals counted on the images, and an average estimated abundance of 562 narwhals (cv = 0.24) at the surface. Correcting these figures for availability bias (assuming narwhals are submerged deeper than 2 m for 62% of the time) results in abundance estimates of 2,297 (95% CI: 1,472-3,122) in August 2001 and 1,478 (95% CI 1,164-1,793) in August 2002.

Discussion

The JWG agreed that the survey methodology and analysis described in JWG-2004-14 appeared to offer several advantages over more traditional line transect methods. Probably the most important advantage is that no correction for whales on the surface that are missed by observers is required, as all or nearly all whales were apparently detected on the photos in one reading. Also, a correction for diving animals is relatively straightforward to apply to instantaneous photographic counts. In addition, less manpower in the field is required to conduct such a survey. However the reading of the photos is labour intensive and no automated detection methods are presently available. The cost-effectiveness of the methodology remains to be assessed, and may vary depending on the situation. It was considered more likely to be applicable to smaller areas that could be surveyed in a relatively short period of time.

The author of JWG-2004-14 also presented estimates from surveys conducted in 1985 and 1986 (Born *et al.* 1994), corrected for whales missed by observers (perception bias) and for submerged whales (availability bias). The perception bias correction was based on data from other surveys and may or may not be applicable to this survey. The correction for availability bias was the same as that used for the photographic survey, based on the estimated proportion of time narwhals spend in the 0-2 m depth zone.

JWG-2004-4 Richard, P., Laake, J.L. and Asselin, N. Baffin Bay narwhal population distribution and numbers: A preliminary analysis of aerial surveys in the Canadian High Arctic 2002-2003.

Narwhals were surveyed in Eclipse Sound, Prince Regent, Gulf of Boothia, Admiralty Inlet and in inlets along the eastern coast of Baffin Island during the summers of 2002 and 2003 with visual line transect aerial surveys. The visual survey estimates were based on the number of narwhals visible to the observers using systematic line transect methods, corrected for whales that were missed by the observers, and adjusted to account for observations without distance measurements. Using data from narwhals tagged with time-depth recorders, the estimates were further adjusted for individuals that were diving when the survey plane flew by. The survey from Admiralty Inlet is considered unreliable due to extreme clumping of the animals. The coefficients of variations in all strata were fairly high, in large part due to variation in sighting rate between transects, and consequently, the confidence limits were quite wide. That variance could be reduced by running the estimates for sub-strata. Further analysis is required but it appears that the narwhal population in the Canadian High Arctic is large, probably several tens of thousands of animals, with most of the animals in the western part of the summer range. It is also clear that substantial numbers of narwhals are found along the previously un-surveyed East Baffin coastline.

Discussion

The JWG noted the low precision of the estimates in comparison with previous surveys. Variance in encounter rate between survey lines accounted for the largest proportion of the total variance. It was considered that precision could be improved by post-stratification, where appropriate. This would be particularly applicable in the case of fiords flown in Eclipse Sound and east Baffin Island. Areas within the fiords had higher coverage probability that areas outside, and should be considered as separate strata. These areas accounted for most of the sightings in both Eclipse Sound and eastern Baffin Island. It was considered that such a restratification would increase the precision of the estimate and might also change the point estimates considerably. The JWG recommended that analysis be redone by stratifying areas surveyed based on prior knowledge of narwhal distribution and variation in survey effort in different areas.

The JWG concluded that the analysis of these data was at a preliminary stage, and that further work will be required before the estimates can be accepted. Much more detail will be required to fully evaluate the analysis, including reporting of abundance estimates before and after correction for biases. The survey will be completed in summer 2004 (see 5.4.3) and it is expected that a full analysis will be completed by 2005.

<u>JWG-2004-22 Heide-Jørgensen, M.P. Status for knowledge about narwhals in the Melville Bay, Northwest Greenland.</u>

The catch of narwhals is presently at a level of about 20 taken in Savissivik and approximately 40 by hunters in Upernavik (half the catches in Upernavik are assumed to be taken from the Melville Bay stock). Satellite tracking of narwhals in 1993 and 1994 showed that the animals remain in the Melville Bay area during August and that they move towards central parts of the northern Davis Strait for wintering; no contact with narwhals in other areas in Greenland seems likely. However, on the wintering ground the whales are located in the same area where narwhals from the Eclipse Sound stock are found.

Digital aerial photographic surveys of Melville Bay in 2002 revealed no sightings of whales despite an effort of 990 km^2 covered on 4,558 photos. However, during the survey some narwhals were observed visually from the airplane along the coast.

The coastal area of Melville Bay is protected as a wildlife sanctuary in order to protect polar bears, but parts of the sanctuary has been opened for narwhal hunting in recent years.

Discussion

The JWG agreed with the conclusion of the paper that narwhal numbers in Melville Bay were likely at a low level. While the population size in this area may never have been very large, given the historical harvest levels in the area it seems likely that it has been reduced by exploitation.

Heide-Jørgensen informed the JWG that an aerial photographic survey had been attempted in the Uummannaq Fiord system in November 2002. However the survey was unsuccessful due to low light conditions and poor weather. Heide-Jørgensen considered it unlikely that a successful aerial survey could be conducted at the time of year (November/December) when narwhal are in this area.

5.4.2 Survey estimates by management units

Table 1 presents survey estimates and indices of the abundance of narwhals in Baffin Bay and adjacent waters by putative stock, which the JWG considered suitable for use in stock assessments. While other survey estimates exist, for various reasons the JWG found that they were not acceptable for input into assessment models.

5.4.3 Future survey plans

In 2004 the survey series in the Canadian High Arctic will be completed, covering Peel Sound, Barrow Strait and the Parry Channel and adjacent waters. In addition Admiralty Inlet will be surveyed with higher coverage (JWG-2004-4).

Heide-Jørgensen informed the JWG that an aerial survey will be conducted in Central West Greenland in March 2004. This will be a continuation of the index series for beluga but will also provide data for narwhal assessments.

5.5 Ecology

5.5.1 Ice entrapments

JWG-2004-12: Laidre, K.L. and M.P. Heide-Jørgensen. Arctic sea ice trends and narwhal vulnerability

Conservation measures related to global climate change require that species vulnerability be incorporated into population risk models, especially for those that are highly susceptible to rapid or extreme changes due to specialized adaptation. In the case of Arctic cetaceans, effects of climate change on habitat and prey availability have been subject to intense speculation. Climate perturbations may have significant impacts on the fitness and success of this group, yet measuring these parameters for conservation purposes is complicated by remote and offshore preferences. The narwhal in Baffin Bay occupies a habitat where reversed (increasing) regional sea ice trends have been detected over 50 years. We used a combination of long-term narwhal satellite tracking data and remotely-sensed sea ice concentrations to detect localized habitat trends and examine potential vulnerability. Spatial and temporal variability in the fraction of open water were examined on two narwhal wintering grounds between November-April, 1978-2001 using approximate sea ice concentrations from microwave SSMR/SSMI passive brightness temperatures. Less than 3% open water was available to narwhals between 15 January and 15 April, and reached minima of 0.5% open water at the end of March (125 km^2 out of a 25,000 km^2 area). Decreasing trends in the fraction of open water, together with increasing trends in interannual variability, were detected on both wintering grounds, significantly so in northern Baffin Bay (-0.04% per year, SE 0.02). The limited number of leads and cracks available to narwhals during the winter, in combination with localized decreasing trends in open water, leaves little doubt that their high site fidelity makes them exceedingly vulnerable to changes in Arctic sea ice conditions. Increasing risk of ice entrapments, many of which may go undetected in remote offshore areas, should be incorporated into population risk assessments as this may exceed the natural response capacity of the species.

Discussion

This is the first study quantifying wintering habitats of narwhals including the fraction of available open water. However, the JWG recognised that the fraction of open water does not necessarily reflect the risk of ice entrapments.

A discussion of general habitat issues on the wintering grounds included considerations of:

- how much and what type of habitat narwhal require to survive;
- natural oscillation in ice conditions and temperature in the north Atlantic;
- the role of currents currents in creating and maintaining cracks;
- how stable the narwhal use of this wintering habitat is.

5.5.2 Feeding ecology

SWG-2004-11: Laidre, K.L. and M.P. Heide-Jørgensen. seasonal feeding intensity of narwhals (*Monodon monoceros)*

Stomach contents from 94 narwhals harvested in the eastern Canadian High Arctic and West Greenland were used to quantify seasonal changes in feeding activity and prey selection. Stomachs collected from summer harvests were mostly empty with little evidence of recent feeding. Stomachs collected from late fall and winter harvests contained clear evidence of intense, recent feeding, where every stomach examined contained considerable amounts of fleshy undigested material. In summer, Arctic cod (*Arctogadus glacialis*), polar cod (*Boreogadus saida*) and *Gonatus* squid sp. constituted the narwhal diet. In late fall and winter, Greenland halibut (*Reinhardtius hippoglossoides*), *Gonatus fabricii*, and *Pandalus* shrimp sp. were the dominant prey items. The low diversity of prey species indicated narwhals have a restricted diet across all seasons. Greenland halibut is an important winter resource, observed in 64% of stomachs collected in winter and the only prey species detected in almost half of all stomachs in the sample. Greenland halibut taken by narwhals were on average 36 cm (SD 9) and 430 g (SD 275) and *Gonatus* prey were on average 35.6 g (SD 31.1) with mean mantle lengths (mm) of 95.1 (SD 36.2). This study presents the first information on the winter diet of the narwhal and suggests that the wintering grounds in Baffin Bay and Davis Strait are heavily utilized for feeding, in contrast to broad limited food intake during the summer period.

SWG-2004-13: K. L. Laidre, M. P. Heide-Jørgensen, O. A. Jørgensen, and M. A. Treble Deep-ocean predation by a high Arctic cetacean

Effects of predation by narwhals on Greenland halibut during the winter period in Baffin Bay were examined with respect to population consumption rate and prey abundance. A bioenergetic model for two narwhal sub-populations was developed to quantify daily gross energy requirements and estimate the biomass of Greenland halibut needed to sustain the sub-populations for their 5-month stay on wintering grounds. Whales in two separate wintering grounds were estimated to require 738 tons (SD 272) and 90 tons (SD 40) of Greenland halibut per day, assuming a diet of 50% Greenland halibut. Mean densities and length distributions of Greenland halibut inside and outside of the narwhal wintering grounds were calculated from data collected during bottom trawl surveys in Baffin Bay and Davis Strait between 1999-2001. Differences in Greenland halibut density and length frequency were correlated with predicted whale predation levels based on diving behavior. The difference in Greenland halibut biomass between an area with high predation and a comparable area without whales, approximately 18,000 tons, corresponded well with the predicted biomass removed by the narwhal sub-population on a diet of 50-75% Greenland halibut. Influences of latitude, longitude, and productivity on Greenland halibut in low-density regions were examined and ruled out. Narwhal wintering grounds with lower predation rates (assumed from shallow dive behavior) also correlated well with observations of densities of mid-water fish species.

Discussion

Because narwhals may have a different diet in different wintering area, this could be used to predict contaminant level in narwhal based on trophic structure of their diet.

Koski and Davis (1994) reported a continuous distribution of narwhal in southern Baffin Bay and northern Davis Strait in the winter. Therefore the overall wintering area of all narwhal stocks is wider than the stock-specific wintering areas considered in this paper.

The JCNB is interested in narwhal diet because of the potential interaction between narwhal and existing and developing Greenland halibut fisheries. The fact that Greenland halibut are a important part of the narwhal diet should be considered when making decisions about the Greenland halibut fisheries. It is unclear if Greenland halibut fishing can have an impact on narwhal and beluga. Narwhal consume a much larger amount of Greenland halibut than is taken by fisheries in the areas studied.

It is recommended that the JWG continue to monitor the situation. New information on the distribution and abundance of Greenland halibut should be reviewed to examine if we can learn more about the relationship between these two species. As the Greenland halibut stocks of Baffin Bay are relatively unexploited, it is one of the few places where the interactions between fish and marine mammals can be examined without interference from fisheries.

5.6 Assessment

5.6.1 Assessment models

JWG-2004-21 Alvarez-Flores, C.M. and Heide-Jørgensen, M.P. A risk assessment of the hunt of narwhals in West Greenland.

An assessment of the narwhal hunt in West Greenland was conducted using a generalized logistic model and Bayesian methods to estimate the parameters. Catch data from Inglefield Bredning, Uummannaq, Disko Bay and south of Disko Bay was used assuming that the narwhals occupying these locations belong to one single stock that is found during the summer in Inglefield Bredning and migrates south in winter. Estimates of absolute abundance obtained during late summer in Inglefield Bredning were available for years 1986, 2001 and 2002. Estimates of relative abundance obtained in late winter in the area of Disko Bay were available for the years 1981, 1982, 1990, 1991, 1994, 1998 and 1999. Once the posterior distributions of the parameters were computed, the population was projected into the future up to 50 years. The projections were done applying different levels of constant catch to evaluate the risk of extinction. To evaluate the use of an optimal catch policy, two management goals were set as to observe population growth (no timeline specific) and to observe population recovery to a fraction of the pre-exploitation size (with no specific target defined). The optimal catch was computed as the product of a harvest rate (0.6 * R_{max}) and the best available estimate of abundance. For years 2003-2007 the abundance in 2002 was used. For subsequent years, abundance was simulated by sampling every five years from a lognormal distribution with the mean being the model predicted abundance. The resulting posterior probability distributions show a high level of uncertainty reflecting the high level of uncertainty included in the data. However, the distribution of the level of depletion shows that there's little probability that the population is more than 20% of the pre-exploitation abundance and most likely is around 13%. The risk assessment indicates that an annual catch of 150 animals imply a risk of extinction near 80% after 30 years. The risk is reduced but still higher than zero if the catch is reduced to 80 and 50 animals. The only catch level that appear to have zero risk of extinction, even after 50 years, is 20 animals. The analysis of risk under the optimal catch condition shows probability of less than 20% that the decline could be stopped in 5 years and smaller than 40% in 10 years. On the other hand, application of an optimal catch implies a probability of only 20% that after 50 years the population will recover to 60% of the pre-exploitation level. The median catch for the first ten years in the analysis of optimal catch is around 40 animals. Considering the level of depletion, the estimated current population size and the magnitude of the impact that ice entrapments, it is not recommended to apply an optimal catch policy, but rather to reduce the catch to half. This is an annual catch for the following next 10 years of 20 animals, which implies a zero risk of extinction. Half the optimal catch leads to an estimated probability of the population continuing the decline of near 40% after 10 years.

Discussion

The JWG discussed the sources of uncertainty in the model and their relative importance. The stock scenario used is presented and JWG-2004-20 and is considered the most likely with available information. However uncertainty remains about the origin of narwhal hunted in Upernavik, Uummannaq and Disko Bay, and it is possible that they are supplied by sources other than or in addition to Inglefield Bredning. If so the estimates of absolute abundance for Inglefield Bredning used in the model would not be applicable. Nevertheless the decline in absolute and relative abundance in the widely separated Inglefield Bredning and Disko Bay areas strongly suggests that they are being overexploited. Therefore, while changes in the stock scenario would certainly change the parameter estimates and other details of the model, it was considered that the broader conclusion that the stock is being overexploited was unlikely to change.

The catch series is subject to considerable uncertainty, particularly in the years previous to the 1980's. Similarly there was some uncertainty about the suitability of some of the abundance estimates and indices used in the modelling. The JWG recommended that these sources of uncertainty should be investigated through sensitivity analyses, by using the "Low" and "High" catch series in separate runs and by selecting different sets of abundance estimates and indices as input. However, it was again considered that such analyses were unlikely to change the major conclusions of the assessment.

A "harvest rule" based on simulated survey results and estimates of the maximum rate of increase (R*max*) was used to generate catches in forward projections of the model. It was recommended that the model be developed to inform of the risk of population decline under several harvest scenarios in the medium term of 5 to 10 years. Given the apparent depleted situation of the stock, relatively few harvest options need be investigated. It was considered likely that abundance surveys would be conducted at intervals of 5 years or less in this area, so the advice could be updated as new data becomes available.

<u>JWG-2004-16: Witting, L. An assessment of West Greenland Narwhals</u>
This paper applied Bayesian statistics to an age- and sex-structured density-regulated model in order to 1) reconstruct the population dynamics of narwhals in West Greenland starting from 1862, to 2) assess the current status, and 3) to estimate the uncertainty trade-off between management objectives and future levels of harvest. The uncertainty in the catch histories were incorporated into the assessment by setting a uniform prior on the catch interval between the low and the high catch series in JWG/15.

The management objectives were based on the objectives for aboriginal whaling in the Schedule of IWC. This was done because these objectives coincide with the NAMMCO-objective of an increase in the depleted population of beluga in West Greenland, while at the same time they define reasonable objectives also for a non-depleted population, a case that has not been specified by NAMMCO.

The population structure of narwhals in West Greenland is uncertain making it difficult to combine harvest and abundance data, and to decide on the correct units to investigate. To cope with this problem the paper performed nine different assessments of seven possible populations. The assessments of these population units combined in different ways the harvest from four sub areas [Inglefield Bredning (including Thule/Qaanaaq), Melville Bay (including Upernavik), Uummannaq, and Disko Bay and the area south thereof] with the absolute and relative estimates of the summer abundance in Inglefield Bredning and the winter abundance in Disko Bay and south.

By assuming that West Greenland narwhals are not harvested outside West Greenland, and that they belong either to the same population or to two adjacent populations with unknown boundaries, the analysis combined the four harvest areas so that they included all possible population structure hypotheses, i.e., three models with two populations, and one model with a single population. Assessments were made for these four models to estimate future sustainable catches and to distribute these catches among the four identified harvest areas.

The results suggest that West Greenland narwhals are depleted to approximately one quarter of their pre-harvested abundance (point estimates between 0.13 and 0.35), with the abundance in 2005 being estimated to approximately 7,600 narwhal (point estimates between 4,900 and 9,100 narwhal). The total recommended catches for West Greenland were found to be relatively independent of our assumptions of the underlying population structure. If the probability of meeting the management objectives shall exceed 0.8, the upper limit to the total annual removal in West Greenland in the period 2005 to 2015 lies between 120 and 136 individuals for the four population structure models, with an average of 128 individuals.

JWG-2004-17 Witting, L. An assessment of West Greenland narwhals, excluding Melville Bay

This paper performs an assessment like JWG/16, except that the harvest from the Melville Bay and Upernavik area is excluded from the analysis. This provides a model that assumes that narwhals in that area belong to a separate population that should be managed separately; a hypothesis for which there is evidence from satellite tracking. While this model might solve a population structure problem of uncertain importance it does not, as JWG/16, allow the recommended catches to be allocated among all four harvest-areas in West Greenland.

The exclusion of the Melville Bay area from the analysis does not alter the general conclusions on the status of West Greenland narwhals. The estimated depletion ratios were the same, with the abundance in 2005 being estimated to approximately 6,800 narwhal (point estimates between 5,500 and 7,800 narwhal). The recommended catches were slightly reduced. If the probability of meeting the management objectives shall exceed 0.8, the upper limit to the total annual removal in West Greenland in the period 2005 to 2015 lies between 111 and 117 individuals (with an average of 115), depending upon the population structured model.

JWG-2004-23 Witting, L. Some extra IUD sub-models

The results in JWG/16 and 17 are based on the assumption that the absolute abundance estimates form Inglefield Bredning shall be used only in the assessment of an isolated summer hunt in Inglefield Bredning. As soon as the summer hunt in Inglefield Bredning is assessed in combination with hunts further south, JWG/16 and 17 assumes that the summer concentration of narwhals in Inglefield Bredning might only be a fraction of the total population from which the hunt is taken. This assumption is applied by assessing the impact of combined hunts through the use of the index estimates of the abundance in Inglefield Bredning.

If instead whenever the summer hunt in Inglefield Bredning is assessed in combination with hunts further south, it is assumed that the summer concentration of narwhals in Inglefield Bredning represents the total population from which the hunt is taken, then, it is more appropriate to apply the absolute abundance estimates from Inglefield Bredning. If this assumption is applied in combination with the exclusion of Melville Bay, we obtain the population structure model that is applied by JWG/21. In this case, there is a strong reduction in the recommended catches, i.e., if the probability of meeting the management objectives shall exceed 0.8, the upper limit to the total annual removal in the period 2005 to 2015 is only 18 individuals. This estimate is comparable with JWG/21 that recommends an annual take of no more than 20 individuals.

JWG-2004-18 Witting, L. Some sensitivity in West Greenland narwhal assessments.
The range of likely values for the birth interval (every third year) and the age of first reproduction (5-8 year old first time mothers) in narwhal and beluga have been debated. The estimated age of reproductive maturity depends on an assumption of two dental growth layers per year, and hunters have argued that females can give birth every year. JWG/18 examines the implications of the alternative values of these two parameters on the assessment performed in JWG/16. It is found that the alternative values change the estimated sustainable catches by up to approximately 20 percent. The two alternative adjustments, however, influence the catch in opposite directions so that their average estimate is close to the estimate of the original assessment.

Discussion
The JWG was gratified to see the many possible stock scenarios examined in these papers, which showed the impacts of the various stock model assumptions. It is apparent that the major factor here is whether the Inglefield Bredning aggregation fully supplies the hunts at Uummannaq and Disko Bay, or whether the latter two areas also take whales from other summer aggregations. While all scenarios examined indicate that the stocks are substantially depleted, if the entire coastal hunt is supplied by the Inglefield Bredning aggregation, the stock is more depleted and sustainable harvests are much lower than in the other cases.

The JWG noted that some of the abundance index estimates used in these assessments were not those recommended in Table 1. Particularly, the surface abundance indices from the 1985 and 1986 visual surveys are not directly comparable to those from the 2001 and 2002 aerial digital surveys because the latter are not biased by whales missed by observers, while the former are. The JWG recommended that the assessments be repeated using only those indices and estimates recommended for use. However there was not sufficient time to carry this out at the meeting.

There was some discussion about the relative merits of the fully age and sex structured model used here, vs. the more simple model used in JWG/21. No reliable ageing methods are presently available for narwhal, so the actual age structure of the catch is unknown, as are such critical parameters as the mean age of maturity and the pregnancy interval. These are assumed to be similar to those in beluga. Some members considered that the simpler model used in JWG/21, which collapsed age related parameters into a single R*max* parameter, was more applicable to this case. Others felt that the age structured model was closer to biological reality and allowed the input of additional data, should it become available. It was also noted that it may be preferable to derive models in terms of length and maturity as these data are obtainable. In any case the overall results of both types of model are driven by the signal in the abundance estimates and indices, and they give similar results in the near term.

5.6.2 Sustainable harvest levels

West Greenland
Although no explicit management goals have been identified for West Greenland narwhal, the JWG considered that, given the rapid decline in numbers suggested by the assessments, the main goal must be to halt this decline in the short term. Other more long-term management goals can be defined at a later date by managers.

Therefore the JWG worked under the assumption of an immediate goal of halting the decline of narwhal in West Greenland.

Inglefield Bredning, Uummannaq and Disko Bay

For these areas, most stock scenarios examined indicate that an annual removal of 135 narwhals for the entire area should result in a probability of 0.7 for some stock recovery within 10 years. Another scenario, where the entire West Greenland catch (other than Melville Bay) is supplied by the Inglefield Bredning summer aggregation, suggests that annual removals would have to be reduced to about 20 animals to achieve the same result. There was not general agreement within the JWG on what model scenarios to use in a final assessment. However, there was general agreement to recommend that total removals should be reduced to no more than 135 individuals.

Delay in implementing catch reductions will result in delay in stock recovery and probably in lower available catches in the medium term. The JWG emphasized that this is an interim recommendation only. More work must be done on the assessments (see 5.7) and this advice may change once this is done. The JWG will revisit this assessment at their next meeting and should be able to offer a more complete range of management options at that time. However the situation was considered so serious that an interim recommendation is warranted.

It was also emphasised that this recommendation is given in terms of a annual removal rather than a landed catch. Given the unknown but perhaps substantial loss rates in some areas, limits on landed catch should be lower.

Melville Bay

Satellite tagging studies have suggested that whales from this area do not winter in Disko Bay and are not available for harvest once they leave Melville Bay in the fall. A survey conducted in Melville Bay in 2003 was unable to detect any narwhal despite a considerable amount of effort. The JWG was informed that local hunters have noted a decline in narwhal numbers in the area. This indicates that numbers are very low and it was considered highly unlikely that present harvests in the area could be sustainable. The JWG therefore recommended a cessation of narwhal hunting in the Melville Bay area. It was emphasized that this advice was based on the assumption of a discrete summer stock in Melville Bay. If future work reveals that Melville Bay receives influxes of narwhal from other areas, this advice could be revised.

Canadian stocks

No formal assessments of Canadian stocks were available to the JWG. A 3 year survey program will be completed in 2004, and more complete and up to date abundance information will be available once the analysis of these data has been completed. Allocation of community harvests into stock units will be complex but a way forward has been developed in JWG/20 (see 5.1.4). Formal assessment work will be carried out in time for the next meeting of the JWG.

In 1999, the NAMMCO WG examined the status of all narwhal status given the information then available. The JWG used information gathered since that time to update this examination, and the results are available in Table 2.

5.7 Future research requirements

Canada

- Finalise analysis of Canadian surveys;
- Split Canadian catches into stock components;
- Investigate the possibility of a longer catch series (at least a series that spans the time period of the survey estimates)
- Disaggregate catch by sex;
- Develop assessment models for the next meeting (probably independent models for each stock component). It was recommended that the data and estimates to be used in the assessments be made available to the JWG at least 3 months before the meeting.

Greenland

- Finalise assessments with parameter adjustments including:
  - priors incorporating alternative values on B*max* and age of reproduciton for sensitivity analyses;
  - Alternative catch histories with higher catches, including ice entrapments;
  - Alternative stock structure sets;
  - choice of abundance estimates for Inglefield (index and absolute).
- Development of a monitoring plan, survey intervals;
- Stock structure: investigate movements from Inglefield Bredning and from wintering grounds.

Research of relevance to both countries

- investigations of known ice entrapments;
- better understanding of feeding ecology;
- age determination, pregnancy rate;
- stock structure, morphology;
- development of estimation techniques suitable for small stocks, for example small boat surveys or mark recapture;
- Genetic/contaminant analysis: Allocate samples to presumed stocks;
- satellite tracking;
- one year large-scale effort to obtain dive time data for survey correction;
- struck and lost information – important for understanding allowable takes.

Specific recommendations regarding survey analysis

It was recommended that survey results of the 2002 and 2003 Canadian High Arctic surveys be further analysed as follows. Further stratification could be done given prior information on narwhal use of different areas surveyed. This would in all likelihood reduce the variance of estimates. In particular, it is recommended that fiords be analysed as a separate stratum to the main body of Eclipse Sound. Also, based on the surveys of 1996, Prince Regent was known to have high densities of narwhals in August and should have been treated as a separate stratum to the Gulf of Boothia. This would also allow comparisons with previous surveys of that stratum (Innes *et al.*). It was suggested that the serial difference method of estimating variance might also reduce the confidence limits by using the information contained in the spatial distribution between transects. It is recommended that the densities of narwhals in each set of fiords and the characteristics of the fiords be compared as it relates to the hypothesis of local summering stocks along the coast of Baffin. With respect to the sight-resight aspect of the estimation, the criteria used for matching resights should be more fully documented and the front and rear observer resights should be tabulated. The analysis should look at the sensitivity of the estimation process to recapture classification assumptions. Beluga estimates from these surveys should be provided. Winter surveys of narwhals in Cumberland Sound should also be analysed. Finally, new summer surveys should be conducted in Admiralty Inlet.

The issue of the appropriateness of the inverse of the near-surface proportion as a correction factor to estimates form survey sightings that are not instantaneous was discussed. Data on time near-surface suggest that the sighting time (a few seconds) is insignificant compared to the time (1-3+ minutes) narwhals are available to be sighted (Laidre *et al.* 2002. Can. J. Zool. 80: 624–635) and therefore there is no concern about bias in using the inverse of the near-surface proportion as a correction factor.

6 BELUGA

6.1 Stock structure

<u>SWG-2004-09: de March, B.G.E., G.A. Stern, S. Innes. The combined use of organochlorine contaminant profiles and molecular genetics for stock discrimination of white whales (Delphinapterus leucas) hunted in three communities on southeast Baffin Island.</u>

Putative stock differences in white whales landed by hunters between 1992 and 1996 from the southeast Baffin Island communities of Kimmirut (KI), Iqaluit (IQ), and Pangnirtung (PA) were examined using organochlorine contaminant (OC) profiles of 124 whales, the molecular genetics of 270 whales, and both types of data from 97 whales.

OC concentrations were generally lower in whales than those hunted in KI and IQ, and many OCs were lower in KI than IQ. In canonical discriminant function (CDA) using 13 OC predictor variables (10 OC groups, mirex, octachlorostyrene, and endosulfan), the first canonical function accounted for 77% of the variance and separated whales from PA from those from IQ and KI, and the second canonical function separated whales from KI from those from IQ. A previous study of the molecular genetics of white whales showed that whales hunted in the three communities were significantly differentiated on the basis of haplotype and/or microsatellite allele frequencies (de March *et al*. 2002).

When the results of two studies were combined, many whales were slightly more strongly associated with a particular source hunting community than they were in the component studies. Using *a posteriori* cross-validation probabilities in an analysis with variables from both studies, 70 of 97 (72%) of white whales were correctly crossvalidated to their source hunting community, 47/57 = 82.5% from PA, 13/23 = 56.5% from IQ, and 10/17 = 58.8% from KI. The highest misclassification rates were KI to IQ (4/17 = 23.5%), IQ to KI, and IQ to PA (5/23 = 21.7% both cases) and the lowest were PA to KI (2/57 = 3.5%), PA to IQ (8/57 = 14.0%), and KI to PA (3/17 = 17.6%). This pattern of assignments was not significantly different from those in the Genetics or Contaminants studies alone. However, the cross-validation probabilities to the most likely source communities were approximately 20% larger in the combined analysis than in the component studies. Canonical scores in the combined analysis were more strongly correlated with variables from the OC Study than with variables from the Genetics Study. Whales place to PA and IQ could be identified primarily by their OC signatures, however many whales from PA also had a strong PA genetics signature. Whales from IQ were identifiable only by their OC signatures. Both a strong KI genetics and OC signature described approximately ½ of whales from KI. We believe that at least three stocks were sampled from the three communities.

Some whales in PA were very distinct, confirming previous beliefs separate stock occurs in Cumberland Sound. Whales hunted in IQ and KI differed to a lesser degree, and may be from stocks subject to a gradient or from a mixture of stocks. Some whales from PA are more likely to have genotypes and OC signatures that are also found in IQ and KI than the reverse. It is possible that summering areas of the stocks that were identified in KI and IQ are not consistent from year to year or across generations.

The main problems in combining results for individuals used in several studies, particularly when there are many measurements for relatively few individuals, is to find a limited number of relevant predictor variables that can be used in the combined analysis, while avoiding both overpararmeterization and results blurred by meaningless variables.

Discussion

There are apparently no recurrent summer aggregations of beluga in Frobisher Bay or the Kimmirut area, so belugas taken here must be migratory animals or "stragglers" from other populations. Local knowledge studies also indicate that there are 2 populations of beluga in Cumberland Sound: one that occupies the inner part of Cumberland Sound in the summer, and another that occurs at the floe edge and the western side of the Sound. There is no indication from satellite tracking, genetics or contaminants studies that there is any link between these stocks and stocks migrating between Canada and Greenland.

<u>Paper presented for information: Heide-Jørgensen et al. 2003 published in Journal of Polar Biology. An estimate of the fraction of belugas (Delphinauperus leucas) in the Canadian high Arctic that winter in West Greenland.</u>

Five belugas were tracked by satellite from Creswell Bay, Somerset Island, in the Canadian High Arctic towards West Greenland in Autumn 2001. After October 1, three of the whales stayed in the North Water polynya and the other two whales moved to West Greenland. One of the whales that moved to Greenland migrated south along the west coast, following a route and timing similar to another beluga tracked in 1996. The belugas that moved towards West Greenland from Canada did so before or near October 1. The movements of both these whales followed a similar timing and assumed migratory route of belugas harvested in autumn in West Greenland. In Greenland the harvest begins in September, where the first whales are taken in the northernmost community of Qaanaaq. Hunting takes place farther south in Upernavik in October, and finally in November and December, belugas are taken even farther south in Uummannaq and Disko Bay. The whales that remain in the

North Water after October 1 most likely do not contribute to the harvest in West Greenland. Based on the total number of belugas satellite-tracked in Canada between 1995 and 2001 with tags that lasted beyond October 1, approximately 0.154 (95% CI 0.06-0.35; n=26) of the summering stock of belugas in the Canadian High Arctic move to West Greenland for the winter. Genetic studies have indicated that belugas moving east through Lancaster Sound are significantly differentiated from belugas taken in the autumn hunt in West Greenland. These conflicting results suggest molecular genetics cannot be solely relied on to reveal the stock identity of these belugas.

6.2 Recent catch statistics

SWG-2004-10: Ditz, K. Catch Statistics (1999-2003) for Narwhal and Beluga in Selected Communities in the Eastern Canadian Arctic.
Catch statistics for beluga in Canadian high Arctic region (Nunavut) for the period 1999-2003 are presented. In general it is believed that the reports for beluga are moderately accurate. The Hunters and Trappers Organizations (HTO) for each community are contacted by phone by DFO throughout the hunting season and are asked to report catch statistics. In some cases the HTO requires their hunters to report and in other cases the HTO will give an estimate of hunting that has occurred.

In some communities which are part of a Community Based Management program, hunting mortality is required to be reported. Systems of reporting vary from community to community but in general they are required to report animals that are wounded (wounded and escaped) and animals that have been killed but the hunter is unable to retrieve it (sunk and lost). Estimates of hunting mortality are calculated based on minima and maxima data (min = landed + wounded and escaped; max = landed + sunk and lost + wounded and escaped). Although data collection methods vary, hunting mortality data is considered relatively accurate.

The average reported landed catch from communities hunting from Baffin Bay beluga stock for the period reported is 34.

Discussion
The reliability of beluga harvest statistics may not be as good as for narwhal because the hunt is not managed with a tag system. In Iqaluit, a new monitoring program using radio reporting was developed. This system allow for the daily collection of landed and struck and lost information from Frobisher Bay.
The harvest data from the Nunavut Harvest Study will be available this year. This study compiles harvest information for most Nunavut fish and wildlife harvested by Nunavut Inuit for a 5-year period.

6.3 Abundance

6.3.1 Recent and future estimates

Heide-Jørgensen reported that a new survey would be flown in the central West Greenland overwintering area in March 2004. This will provide an update of the index surveys that have been conducted in the area since 1981.

Richard reported that abundance estimates for beluga will be developed from the Canadian High Arctic surveys conducted from 2002 to 2004, and that these estimates should be available for consideration at the next meeting.

6.4 Assessment update

6.4.1 West Greenland

The JWG will be able to update the assessment of West Greenland beluga once the new survey results noted above are available, probably in 2005.

The JCNB has requested specific advice from the JWG on the stock identity of beluga taken in the Qaanaaq area. Most beluga are taken during September and October when animals migrate through the area towards the south. The timing of this migration and evidence from satellite tracking strongly suggest that these are the same animals that pass by Upernavik later in the fall. Therefore, animals taken in September and October at Qaanaaq should be considered part of the West Greenland wintering stock. Beluga taken later in the fall and in the winter are likely to be animals wintering in the North Water. Beluga are rarely taken in the summer in this area, and these may be stragglers from other areas or perhaps part of a small summering stock. Given the relative rarity of belugas in the summer in this area, it was suggested that they should be protected during this period.

6.4.2 Other stocks

Assessment of the Canadian High Arctic stocks was not considered a priority at this time because of the continued low harvest and relatively high abundance. This can be further evaluated once the new survey results noted above are available.

6.5 Other information

No other information was presented.

6.6 Future research requirements

- Update of Greenland beluga assessment;
- Survey West Greenland beluga in March 2004.

In 2001 the JWG supported a proposal for a new effort to elucidate the origin of the large number of whales presently being harvested in West Greenland. It was proposed that a two-year field period should be launched to tag a large number of belugas and to track them through the winter. Areas that have not previously been sampled would be given priority and samples for genetic analyses would be taken as well. The results of the tracking will be used to develop a model for the dispersal of the belugas that can be tested by the genetic studies. The JWG reiterated its support for this proposal and recommended that the research be carried out as a high priority.

7 IMPLEMENTATION OF EARLIER ADVICE

JWG-2004-19: Pike, D. Implementation of earlier advice on beluga and narwhal from the NAMMCO Scientific Committee

JWG-2004-19 presents a summary of the requests for advice made by the Council to the Scientific Committee, and how the Scientific Committee responded to these requests, and the proposals for conservation and management put forward by the Management Committee, and how (or if) they have been implemented by Greenland. In 2000, the Council of NAMMCO acknowledged that the JCNB had the primary role in providing management advice for these stocks, and therefore NAMMCO has not provided management advice since that time. The Scientific Committee continues however to participate in the provision of scientific advice through joint meetings with the JCNB Scientific Working Group.

Discussion

The government of Greenland has not yet implemented quotas for beluga or narwhal. A law allowing the government to set quotas should be passed shortly. If it is passed, this law would come into force on March 1, 2004 and quotas will be implemented for West Greenland beluga and narwhal. The municipalities will be involved in the allocation of the quota.

The law would also call for the protection of calves and females with calves and limit the size of vessels that are involved in beluga and narwhal hunting as well as hunting methods. The Municipalities will have the power to limit or prohibit the use of nets for narwhal/beluga harvesting.

8 TRADITIONAL KNOWLEDGE

The JCNB has recommended the development of 1) a practical and useful way to include traditional ecological knowledge in research and management of narwhal and beluga and 2) potential methods to standardize hunter observations to facilitate their use in tracking changes in marine mammal population size.

Greenland has concluded recently an agreement with a hunters organisation focussing on establishing a forum for open and transparent dialogue between senior levels. One of the goals is to strengthen mutual respect and understanding. The agreement will facilitate the conduct of regular meeting at senior level, adn the exchange of priorities and cooperation between organisations on common projects including scientific and TEK. Following this agreement, a cetacean observation project has been developed.

NAMMCO held an International forum on the use of TEK and scientific knowledge in management decision making in January 2003. A publication from this forum is under
development and will be available in 2004.

In Canada, the stock assessment process for resources includes representative from hunter and fisher organisations. The Oceans Sector of DFO is also developing a program to collect hunter observations to detect changes in the marine environment. The project is being implemented in Hudson Bay area. In Canada, assessments are conducted in consultation with resource users to identify areas of agreement and disagreement. If areas of disagreement cannot be resolved, both views are presented in the status report. These meeting are considered to be useful and productive.

In addition, informal exchanges of information between scientist, biologist, mangers and resource harvester is taking place regularly during field work activities and meeting.

The JCNB had recommended the creation of a joint hunter-scientist team to work on the planning of the Canadian High Arctic survey. Although an official team was not created, regular exchanges of information between scientists and hunters took place throughout the planning and the conduct of the survey.

9 IMPACT OF HUMAN-MADE-NOISE

At the Iqaluit meeting in August 2001 the JCNB recommended that the JWG investigate the impact of human-made noise (icebreaker, ship, submarine, sonar) on narwhal and beluga through a review of existing information.

A study to investigate the exposure of beluga to outboard motor noise at 2 estuaries in Nunavik (Little Whale and Nastapoka Rivers) was briefly reported upon. The results are preliminary but they indicate that bathymetry represents an important factor in noise propagation.

A literature review of the impact of human-made noise on narwhal and beluga was not done.

10 OTHER BUSINESS

The issue of potential pollution problem cause by cruise ships dumping sewage in fiords and bays was raised. This is apparently a problem on some areas of the west coast of Alaska. The number of cruise ships in Davis Strait and Baffin Bay is relatively small at present so it is unlikely that they are an important source of pollution at this time.

10.1 Next Meeting

The next meeting of the SWG should be held in February or March 2005.

11 ADOPTION OF REPORT

The Report was adopted by consensus on February 6 2004.

Table 1. Estimates and indices of stock sizes of narwhals in Baffin Bay and adjacent waters adopted for by NAMMCO/JCNB Scientific Working Group to be used for stock assessment. * indicate that corrections were applied by the NAMMCO/JCNB Working Group.

Putative stock	Year and ref.	Method	Estimate (cv)	Perception bias	Availability bias	Fully corrected stock size estimate	Reservations
Inglefield Bredning Stock surveyed in Inglefield Bredning	1984 a)	Land	4000-8000	-	-	-	Covering ~1/3 of the area
	1985 b)	Line t.	1,091 (0.12)	-	-	-	Late in the season, 27 August -3 September
	1986 b)	Line t.	3,002 (0.25)	0.75 (0.25) *	0.46 (0.07) *	10,333 (0.36)	Perception biased assumed
	2001 b)	Photo	873 (0.33)	0	0.38 (0.06)	2,297 (0.35)	
	2002 b)	Photo	562 (0.24)	0	0.38 (0.06)	1,478 (0.25)	
Central West Greenland or Inglefield Bredning Stock wintering in central West Greenland	1981 c)	Strip	358 (0.31)			Index	
	1982 c)	Strip	440 (0.20)			Index	
	1990 c)	Strip	252 (0.34)			Index	Late in the season: 9-14April
	1991 c)	Strip	273 (0.28)			Index	
	1993 c)	Strip	63 (0.48)			Index	
	1994 c)	Strip	263 (0.36)			Index	
	1998 c)	Strip	213 (0.60)			Index	
	1999 c)	Strip	206 (0.32)			Index	
	1998-99 c)	Line t.	524 (0.51)	0.5 (0.25)	0.35 (0.23)	2,861 (0.61)	
Melville Bay	2002 d)	Photo	-	-	-	Low numbers	
Eclipse Sound	1984 e)	Photo	1,218 (0.59)	0	0.38 (0.06) *	3,205 (0.59)	
Admiralty Inlet	1984 f)	Photo	5,556 (0.22)	0	0.38 (0.06) *	14,621 (0.23)	
Somerset Island	1981 f)	Strip	11,142 (0.09)	-	-	-	Partial coverage
Somerset Island	1996 g)	Line t.	-	-	0.38 (0.25)	45,358 (0.35)	Partial coverage
Cumberland Sound	-	-	No data	-	-	-	

Putative stock	Year and ref.	Method	Estimate (cv)	Perception bias	Availability bias	Fully corrected stock size estimate	Reservations
Jones Sound	-	-	No data	-	-	-	
Parry Islands	-	-	No data	-	-	-	
Smith Sound	1978 h)	Total	>1,500	-	-	-	
Mixed stock surveyed in Baffin Bay	1979 h)	Strip	34,363 (0.24)	-	-	-	

a) Born 1986, b) Heide-Jørgensen 2004, c) Heide-Jørgensen and Acquarone 2002, d) Heide-Jørgensen 2003, f) Richard et al. 1994, g) Innes et al. 2002, h) Koski and Davis 1993.

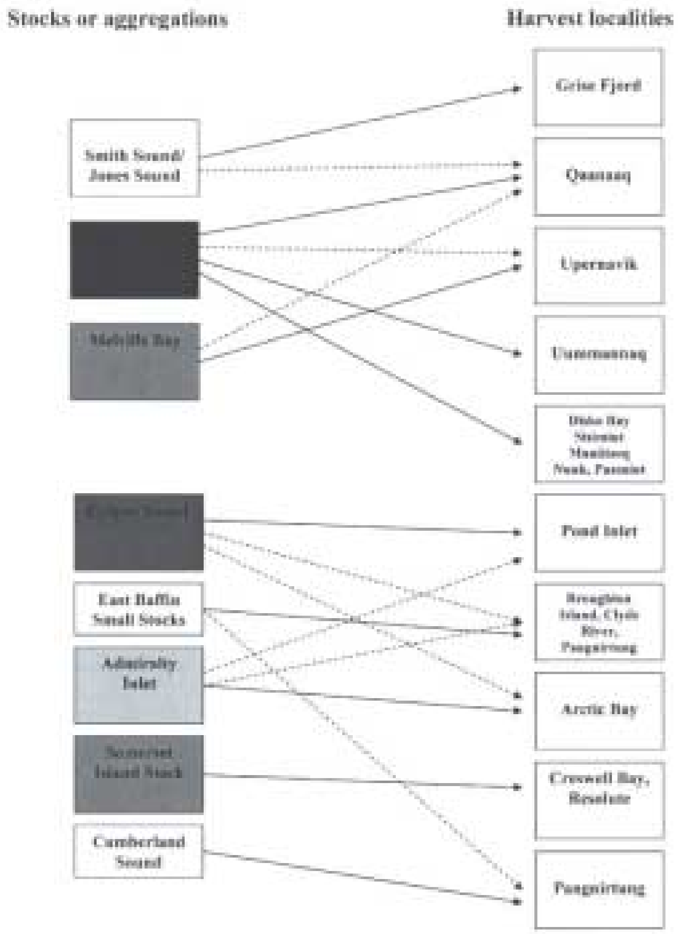
Born, E. W. 1986. Observations of narwhals (*Monodon monoceros*) in the Thule area (NW Greenland), August 1984. Rep. int. Whal. Commn 36: 387-392.

Table 2: Status of narwhal stocks in Canada.
Qualifiers for population surveys: T=total count, S=sample survey, O=observer corrected, D=dive corrected, A= Anecdotal.
'Level of exploitation' refers to reported landings and does not include underreporting or whales that are killed-but-lost.

Aggregation	Stock identification	Population size	Level of exploitation	Other potential threats	Present status	References
Eclipse Sound Area	Summering areas, spring and fall migration route. Satellite telemetry shows no exchange with neighbouring stocks during summer. These whales migrate south along the east coast of Baffin I. to a wintering area in southern Baffin Bay	1984 S,D: 3,205 (SE 64%; 90% CI 1,221-8,412) Photo survey, partial coverage. New 2002-03 surveys under review.	2001-03 Pond Inlet: mean 74/yr	Exploitation in other areas	Total catches by Pond Inlet hunters may or may not be sustained by the estimated size of local summer aggregation. However, survey coverage was partial. Also, an estimated 31% of the catch may originate from other stocks but the narwhal in the summer aggregation may also be hunted by other communities at other times of the year. Status uncertain.	Richard et al. 1994 JWG/04/05 JWG/04/10 JWG/04/20
Admiralty Inlet	Summering areas, spring and fall migration route. Satellite telemetry shows no exchange with neighbouring stocks during summer. These whales migrate south along the east coast of	1984 S,D: 14,621 (CV 33%; 90% CI 8,576-24,927) Photo survey. New 2002-03 surveys under review.	2001-03 Arctic Bay: mean 113/yr	Exploitation in other areas	Not threatened	Richard et al. 1994 JWG/04/05 JWG/04/10 JWG/04/20

Aggregation	Stock identification	Population size	Level of exploitation	Other potential threats	Present status	References
Admiralty Inlet (cont'd)	Baffin I. to a wintering area in southern Baffin Bay-Davis Strait					
Somerset Island	Summering area These whales migrate to a wintering area in central Baffin Bay	1996 S,O,D: 45,358 (CV 35%; 90% CI 25,930-79,343) Visual survey. New 2002-03 surveys under review.	2001-03 Igloolik + Hall Beach + Kugaaruk + Taloyoak + Resolute: 45/yr	Exploitation in other areas	Not threatened	Richard et al. 1994 JWG/04/05 JWG/04/10 JWG/04/20
Jones Sound	Summering area	No estimate.	2001-03 Grise Fiord: 11/yr	Exploitation in other areas possible (!?)	Unknown but small local catch	Innes et al 2002 JWG/04/05 JWG/04/10 JWG/04/20
East Baffin fiord stocks	Summering areas May be several stocks. Spring and fall migration route from Eclipse Sound and Admiralty Inlet	No estimate (New 2002-03 estimates under review)	2001-03 Clyde River, Qkiqarjuaq: 121/yr	Exploitation in other areas possible (!?)	Unknown but half of catch may be from other migrating stocks	JWG/04/05 JWG/04/10 JWG/04/20
Cumberland Sound	Summering area Probable spring and fall migration to Cumberland Sound from other areas	No estimate on summer numbers but thought to be small (mainly an autumn and spring catch of unclear stock origin; winter surveys presently in review)	2001-03 Pangnirtung: 27/yr	Exploitation likely in other areas if this is a wintering stock.	Unknown. Local catch small and estimated 77% of catch from spring and autumn so likely other from migratory or wintering stocks.	JWG/04/05 JWG/04/10 JWG/04/20

Fig. 1. Conceptual model of the relationships between stocks or aggregations and hunts in different areas for Canadian and West Greenland stocks of narwhals. The dotted darts illustrate unknown levels of contributions to the hunt: 1) indicate probably a very small contribution, 2) indicate a minor contribution during winter months, 3) indicate that 30 hunting may take place along the ice edge in spring, 4) indicate that one settlement, Savissivik, from the municipality of Qaanaaq hunt this stock, and 5) indicate that hunting takes place during autumn migration.



Appendix 1

Agenda

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    5.1.2 Satellite Tracking
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8 Traditional Knowledge
9 Impact of Human-Made-Noise
10 Other Business
11 Adoption of Report

Appendix 3

LIST OF DOCUMENTS

NAMMCO/SC/12-JCNB/SWG/2004-JWG/1	List of participants.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/2	Agenda.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/3	Draft list of documents.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/4	Richard, P., Laake, J.L. and Asselin, N. Baffin Bay narwhal population distribution and numbers: A preliminary analysis of aerial surveys in the Canadian High Arctic 2002-2003
NAMMCO/SC/12-JCNB/SWG/2004-JWG/5	Richard, P. Seasonal distribution of narwhal catches in the Baffin region of Nunavut Territory, Canada
NAMMCO/SC/12-JCNB/SWG/2004-JWG/6	de March, B.G.E. and G. Stern Stock separation of narwhal (*Monodon monoceros*) in Canada based on organochlorine contaminants" by [presentedby L.Postma]
NAMMCO/SC/12-JCNB/SWG/2004-JWG/7	de March, B.G.E., D. Tenkula, and L. D. Postma Molecular genetics of putative stocks of narwhal (*Monodon monoceros*) in Canadian and west Greenland (1982-2001)". [presented by L. Postma]
NAMMCO/SC/12-JCNB/SWG/2004-JWG/9	De March, B.G.E., G.A. Stern, and S. Innes. The combined use of organochlorine contaminant profiles and molecular genetics for stock discrimination of white whales (*Delphinapterus leucas*) hunted in three communities on southeast Baffin Island. [presented by L. Postma]
NAMMCO/SC/12-JCNB/SWG/2004-JWG/10	Ditz, K. Catch Statistics for Narwhal and Beluga in selected communities in the Eastern Canadian Arctic (1996-2003).
NAMMCO/SC/12-JCNB/SWG/2004-JWG/11	Laidre, K.L. and Heide-Jørgensen, M.P. Seasonal feeding intensity of narwhals (*Monodon monoceros*).
NAMMCO/SC/12-JCNB/SWG/2004-JWG/12	Laidre, K.L. and Heide-Jørgensen, M.P. Arctic sea ice trends and narwhal vulnerability.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/13	Laidre, K.L., Heide-Jørgensen, M.P, Jørgensen, O.A. and Treble, M.A. .Deep-ocean predation by a high Arctic cetacean.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/14	Heide-Jørgensen, M.P. Aerial digital surveys of narwhals, *Monodon monoceros*, in northwest Greenland
NAMMCO/SC/12-JCNB/SWG/2004-JWG/15	Heide-Jørgensen, M.P. Reconstructing catch statistics for narwhals in West Greenland, 1862-2001: A preliminary compilation (ver. 3)
NAMMCO/SC/12-	Witting, L. An assessment of West Greenland narwhals.

JCNB/SWG/2004-JWG/16	
NAMMCO/SC/12-JCNB/SWG/2004-JWG/17	Witting, L. An assessment of West Greenland narwhals, excluding Melville Bay
NAMMCO/SC/12-JCNB/SWG/2004-JWG/18	Witting, L. Some sensitivity in West Greenland narwhal assessments.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/19	Pike, D.G. Implementation of earlier advice on beluga and narwhal from the NAMMCO Scientific Committee.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/20	Heide-Jørgensen, M.P., Richard, P., Dietz, R. and Laidre, K. Metapopulation structure and hunt allocation of narwhals in Baffin Bay
NAMMCO/SC/12-JCNB/SWG/2004-JWG/21	Alvarez-Flores, C.M. and Heide-Jørgensen, M.P. A risk assessment of the hunt of narwhals in West Greenland.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/22	Witting, L. Some extra IUD sub-models.
NAMMCO/SC/12-JCNB/SWG/2004-JWG/23	Heide-Jørgensen, M.P. Status for knowledge about narwhals in the Melville Bay, Northwest Greenland.

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Alvarez-Flores, C.M. and Heide-Jørgensen, M.P. In press. A risk assessment of the sustainability of the harvest of beluga, *Delphinapterus leucas*, in West Greenland. *ICES J. Mar. Sci.* 61.

Heide-Jørgensen, M.P, Dietz, R., Laidre, K.L., Richard, P., Orr, J. and Schmidt, H.C. 2003. The migratory behaviour of narwhals (*Monodon monoceros*). *Can J. Zool.* 81:1298-1305.

Heide-Jørgensen, M.P, Dietz, R., Laidre, K.L., and Richard, P. 2002. Autumn movements, home ranges, and winter density of narwhals (*Monodon monoceros*) tagged in Tremblay Sound, Baffin Island. *Polar Biol.* 25:331-341.

Heide-Jørgensen, M.P, Richard, P., Dietz, R., Laidre, K.L., Orr, J. and Schmidt, H.C. 2003 An estimate of the fraction of belugas (*Delphinapterus leucas*) in the Canadian high Arctic that winter in West Greenland. *Polar Biol*. 26:318-326.

JWG. 2001. Working Papers of the NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic and the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga Scientific Working Group. 9-13 May 2001. Qeqertarsuaq, Greenland.

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Laidre K. L., M. P. Heide-Jørgensen, and R. Dietz. 2002. Diving behavior of narwhals (*Monodon monoceros*) at two coastal localities in the Canadian

High Arctic. *Canadian Journal of Zoology* 80: 624-635.

Laidre K. L., M. P. Heide-Jørgensen, R. Dietz, R. C. Hobbs, and O. A. Jørgensen. 2003. Deep-diving by narwhals, *Monodon monoceros*: differences in foraging behavior between wintering areas? *Marine Ecology Progress Series* 261:269-281.

[NAMMCO] North Atlantic Marine Mammal Commission. 2001. Report of the NAMMCO Scientific Working Group on the Population Status of Narwhal and Beluga in the North Atlantic. In: NAMMCO Annual Report 2000, NAMMCO, Tromsø, pp. 252-273.

[NAMMCO] North Atlantic Marine Mammal Commission. 2001. Report of the Joint Meeting of the NAMMCO Scientific Working Group on the Population Status of Narwhal and Beluga in the North Atlantic and the Scientific Working Group of the Joint Commission on the Conservation and Management of Narwhal and Beluga. In: NAMMCO Annual Report 2001, NAMMCO, Tromsø, pp. 213-248.

SECTION 4 - NATIONAL PROGRESS REPORTS

4.1	**Faroe Islands**	**Progress Report on Marine Mammals in 2002**	313
4.2	**Greenland**	**Progress Report on Marine Mammals in 2002**	319
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4.1
FAROE ISLANDS - PROGRESS REPORT ON MARINE MAMMALS IN 2002

Dorete Bloch, Bjarni Mikkelsen, Maria Dam and Jústines Olsen

1. INTRODUCTION

This report summarises the Faroese research on cetaceans and pinnipeds conducted in 2002. Since 1984, the main bulk of research on marine mammals in the Faroes has been conducted by the Zoological Department of the Faroese Museum of Natural History, supplied with some assistance from the Faroese Fisheries Laboratory, the Food and Environmental Agency of the Faroes, and the veterinarians from the Veterinary Service involved in the pilot whaling.

2. RESEARCH

2.1 Species and stocks studied

Pinnipeds

- Grey seals (*Halichoerus grypus*) - coastal waters of the Faroes
- Ringed seal (*Phoca hispida*) - coastal waters of the Faroes

Cetaceans

- Fin whale (*Balaenoptera physalus*) - biopsy
- Minke whale (*Balaenoptera acotorostrata*) – Bycatch, biopsy
- Sperm whale (*Physeter macrocephalus*) - stranded animals
- Bottlenose whale (*Hyperoodon ampullatus*) – Bycatch, landed animal
- Pilot whales (*Globicephala melas*) - landed animals
- White-sided dolphins (*Lagenorhyncus acutus*) - landed animals

2.2 Field Work (e.g. sighting, tagging, scientific catches, research)

Opportunistic observations

Different local sources have reported observations of marine mammals to the Museum of Natural History. Again, fin whales (*Balaenoptera physalus*) were the most commonly observed <u>baleen whale</u> in Faroese coastal and offshore waters, in 2002 followed by minke whales. Among <u>toothed whales</u>, the following species have been observed: sperm whales (*Physeter macrocephalus*), as early as in January in pods until 6; bottlenose whales (*Hyperoodon ampullatus*) in pods until 20; killer whales (*O. orca*) in pods estimated until 20), pilot whales (*Globicephala melas*) in pods until 250, white-sided dolphins (*Lagenorhynchus acutus*) estimated until 1,250 in pods; and the harbour porpoise (*Ph. phocoena*) which as permanent seen in Faroese waters.

A Humback whale (*Megaptera novaeangliae*) was seen in June outside the village of Kvívík at Streymoy.

A ringed seal (*Phoca hispida*) was for some days in December seen in the harbour of Vestmanna at Streymoy.

<u>*Fin whales (Balaenoptera physalus)*</u>

For the last three summers, a modified Larsen gun has been located onboard the Faroese fishery inspection vessels taking biopsies of fin whales at opportunity. Three biopsies were taken in 2001, but none since. Nine more biopsies have been taken by staff at the Natural History Museum in 2000 and 2001, giving a total of twelve biopsies. These will be sent for genetic analysis in USA in Autumn 2003.

Pilot whales (Globicephala melas)

Sex, *skinn* values and total body length in cm have been recorded from nearly all pilot whales caught in 2002 with kind assistance from the *sýslumenn* and the men valuating the whales. The museum have had the attention to every pilot whale catch (grind) looking for the four whales satellite tagged 15 July 2000.

At October 2002 a fishing boat observed two pods of pilot whales, each containing a satellite tagged whale, the one at 10 and the other at 16 nautical miles north of Fugloy, the Faroes. The satellite tag was still in place on the dorsal fin.

A new knife with a longer and modified blade than on the traditional knife has been tried with positive results and further examinations will go on.

Samples are taken regularly by the Food-, Veterinary- and Environmental Agency in the pilot whaling to examine the levels of pollutants carried by pilot whales. In 2002 samples were taken in connection with the *grindadráp* in Tórshavn on September 3rd. Samples of muscle, blubber, liver and kidney were taken from the 42 individuals landed on that day. The muscle samples were analysed for mercury within few days after the landing at the laboratory of the Food-, Veterinary- and Environmental Agency and made available to the public trough a press release. Generally, the pod in Sandagerði had high levels of muscle mercury, with mean levels of 2,6 mg/kg, the reason for which must be sought in the overall large mean individual age as indicated by the individual size. The relative number of adult males was an unusually large in the Sandagerði pod, with 13 out of a total of 42 individuals being males of a length of 510 cm or more, however, the highest mercury concentration recorded in this pod, 6,9 mg/kg, was found in an adult female. A subset of liver samples from the same pod is presently being analysed for per fluorinated substances which is what may be termed a ”new pollutants” in the sense that its presence in wildlife is recently detected. This investigation is done in cooperation with the Nordic countries and is funded by the Nordic council of ministers. A broader screening for what may all be named new contaminants is presently underway as a cooperation with National Environmental Research Institute in Denmark and the results are just coming up. This screening includes analyses of perfluoroalkyl sulphonates, phthalates, musk, brominated flame retardants and polychlorinated naphthalene's and is done on liver or blubber tissue from a pilot whale landing in Miðvágur on July 6, 2001.

White-sided dolphins (Lagenorhynchus acutus)

Sex, *skinn* values and total body length in cm have been recorded from nearly all white-sided dolphins caught in 2002 with kind assistance from the *sýslumen* and the men valuating the whales. Besides sex and body length, full samples were taken from the following catches named in Table 2: Hvalvík 3. September 2002 (36 whales); Gøtu 17. September 2002 (44 whales); Hvannasund 17. September 2002 (5 whales); Hvalba 23. September 2002 (5 whales).

2.3 Other studies

Cetaceans

Fin whales (Balaenoptera physalus)

In connection with the NAMMCO study group on fin whales, there were discovered some differences in the hunting statistics between the material kept at the IWC office in Cambridge and the material kept by the Faroese Museum of Natural History and those found from different archives. The differences concerned the main whaling period, 1894-1950, and there was no clear tendency visible in the differences. To clarify this, further examinations are still ongoing carried out by the Faroese Museum of Natural History, Tórshavn in the different archives in the State Archive in Tórshavn, the whale Museum in Sandefjord, and in Copenhagen at Zoological Museum, ICES main office, State Archive, and Fisheries Institute. The study is continued and now more than half of the material has appeared.

Pilot whales (Globicephala melas)
New satellite tags will be placed on pilot whales from two grinds in the coming Autumn-Winter 2003.

Bottlenose whales (Hyperoodon ampullatus)
Ballistic studies were made on six heads of dead bottlenose whales taken in Hvalba 25. September 2002 to investigate the effect of different type and strength of ammunition.

2.4 Research results

Cetaceans

White-sided dolphins (Lagenorhynchus acutus)
A length-weight formula was constructed in 2000, men since then several more length and weight measurements have been obtained from later white-sided dolphin catches. The new formula is: W = -13.902 + 0.00056884 * L**2.321 (r = 0.984) with W as total weight in kg and L as total length in cm.

3. CATCH DATA

Pinnipeds

Species Year Stock_Area Fishery Gear Catch(pups)Catch(adults)
A unknown number of grey seals are shot every year when interacting with salmon fish farms. Proposals are made, in order to obtain catch numbers and samples.

Cetaceans

Species Year Stock_Area Catch

Table 1: Pilot whale drives in the Faroe Islands, 2002.

Date	Locality	Number of whales
24 June	Sandavágur	86
4 July	Bøur	36
11 August	Hvalba	89
19 August	Klaksvík	48*
19 August	Fuglafjørður	3*

3 September	Tórshavn	42
3 September	Hvalba	114
4 September	Fámjin	90
9 September	Sandur	75
15 September	Vestmanna	43
Total	**10 grinds**	**626 whales**

Table 2: Drives of species other than *G. melas* in the Faroe Islands, 2002

Date	Locality	Number	Species
19 August	Hvannasund	6	L. acutus
3 September	Hvalvík	36	L. acutus
3 September	Hvalba	42	L. acutus
14 September	Vágur	280	L. acutus
16 September	Tórshavn	11	L. acutus
17 September	Klaksvík	7	T. truncatus
17 September	Klaksvík	11	T. truncatus
17 September	Gøta	110	L. acutus
17 September	Hvannasund	148	L. acutus
23 September	Hvalba	99	L. acutus
25 September	Hvalba	6	H. ampullatus
26 September	Vestmanna	26	L. acutus
27 September	Vestmanna	16	L. acutus
	2 pods	**18**	**T. truncatus**
	10 pods	**774**	**L. acutus**
	1 pod	**6**	**H. ampullatus**

4. BY-CATCH DATA

No by-catch has occurred in 2002.

5. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

None.

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4.2
GREENLAND - PROGRESS REPORT ON MARINE MAMMALS IN 2002

1. INTRODUCTION

This report summarises the Greenland research on pinnipeds and cetaceans done in 2002. Most of the research was conducted by The Greenland Institute of Natural Resources, but some projects also involved DFO (Department of Fisheries and Oceans, Canada), The Danish Environmental Research Institute (Department of Arctic Environment), Denmark. Hafrannsoknastofnunin (Iceland). Cowi Consult (Denmark) and Biodinamica, Rio de Janeiro. The catch numbers are from 2001, since the catches for 2002 are not yet available.

2. RESEARCH

2.1 Species and stocks studied

Pinnipeds

- Walrus *Odobenus rosmarus* – Northeast Greenland

Cetaceans

- Narwhal *Monodon monoceros* – West Greenland
- Minke Whale *Balaenoptera acutorostrata* – Iceland
- Humback Whale *Megaptera novaeangliae* – West Greenland and Brazil
- Bowhead Whale *Balaena mysticetus* – Disko Bay - Foxe Basin (West Greenland and East Canada)

2.2 Field work

Pinnipeds

Id-photos and DNA samples were collected from walrusses on Sandøen – Northeast Greenland.

Cetaceans

<u>Tagging</u>

The following whale species has been instrumented with satellite transmitters from the Greenland Institute of Natural Resources in 2002.

Species	*No.of whales*	*Month*	*Area*	*Country*	*Co-operators*
Bowhead whale	11	May	Disko Bay	Greenland	
Bowhead whale	7	July	Foxe Basin	Canada	DFO
Minke whale	2	August	North Atlantic	Iceland	HAFRO
Humpback whales	6	August-October	North Atlantic	Greenland	
Humpback whales	9	November	South Atlantic	Brazil	Biodinamica, Rio de Janeiro

Surveys
An aerial photographic based strip-survey was conducted for large cetaceans off West Greenland in the periods July 14th to August 4th, and September 9th to October 14th.

An aerial survey for narwhals was successfully completed in Inglefield Bredning, Qaanaaq, in August 2002 following methods developed in 2002.

2.3 Research results

Pinnipeds
Id-photos and DNA samples were collected from walruses as part of an ongoing study that will estimate population numbers.

Cetaceans
The aerial photographic based strip-survey for large cetaceans off West Greenland will continue in 2004, where more data will be collected before estimates are made.

The narwhale survey in Qaanaaq utilized a specially developed technique where two large format digital cameras continuously photographed the sea surface. The photos are spatially oriented to allow for calculation of area coverage and exact geographic positions. The 11.000 photos obtained were later examined and the whales (171 sightings) were enumerated from the images. The survey is corrected for submerged whales with data obtained from satellite transmitters and from instrumentation's of narwhals with time-depth-recorders. Surveys of additional narwhal aggregations either provided no sightings of narwhals (Melville Bay) or did not adequately cover the area due to increasing darkness (Uummannaq).

Data from the tagging studies also need further examination before results can be released.

3. CATCH DATA

For ringed seals the East Greenland population is here defined as ringed seals that are caught in East Greenland or in one of the three southernmost municipalities on the West coast, whereas the rest belongs to the Baffin Bay population. Hooded seals are only considered East Atlantic if they are caught north of Ammassalik. All harp seal caught north of Ammassalik are considered as coming from the Greenland Sea population, whereas catches from Ammassalik are split fifty-fifty between the Greenland Sea and the West Atlantic populations. The catch figures are provisional and small adjustments might be made.

Reported catches in 2001 were:

Pinnipeds
Walrus: East Greenland: 8, Central West Greenland: 116, Avanersuaq: 95
Ringed seal: East Greenland Population: 14.251, Baffin Bay Population: 57.766
Hooded seals: East Atlantic: 5, West Atlantic: 6.259
Harp seals (adult): Greenland Sea: 251, West Atlantic: 32.701
Harp seals (Juvenile): Greenland Sea: 957, West Atlantic: 45.367
Habour seals: 73
Bearded seals: 2205

Cetaceans

Narwhals: East Greenland: 112, West Greenland: 497
Belugas: East Greenland : 1, West Greenland : 397
Habour porpoises: 1.946
Pilot Whales: 45
Fin Whales: 13 (all West Greenland)
Minke Whales: East Greenland: 10, West Greenland: 138

4. BY-CATCH DATA

Fishermen in Greenland are obliged to report any by-catch of large cetaceans to the Home Rule Department for Fishery. Seals are not reported as by-catch, but should be reported as catch. In 2002 following were reported:

3 Humpback Whales, 1 Minke Whale, 1 Fin Whale: all in fishing gear in West Greenland.

One humpback whale was entangled in salmon nets the other four whales were all entangled in gear (rope) used in connection with traps for catching crabs.

5. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

None

6. PUBLICATIONS AND DOCUMENTS

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4.3
ICELAND - PROGRESS REPORT ON MARINE MAMMALS IN 2002

Compiled by Gísli A. Víkingsson, Droplaug Ólafsdóttir and Erlingur Hauksson

1. INTRODUCTION

The following are reports on studies conducted by or in co-operation with the Marine Research Institute (MRI), the Research Committee for Biological Seafood Quality (RCBSQ), and the Icelandic Institute of Natural History (INH) Reykjavík, Iceland.

2. RESEARCH

2.1 Species/stocks studied

Pinnipeds

- Grey seal (*Halichoerus grypus*)
- Harbour seal (*Phoca vitulina*)
- Hooded seal (*Cystophora cristata*)
- Harp seal (*Pagophilus groenlandica*)
- Ringed seal (*Phoca hispida*)
- Bearded seal (*Eringnathus barbatus*)

Cetaceans

- Blue whale (*Balaenoptera musculus*)
- Fin whale (*Balaenoptera physalus*)
- Sei whale (*Balaenoptera borealis*)
- Minke whale (*Balaenoptera acutorostrata*)
- Humpback whale (*Megaptera novaeangliae*)
- Sperm whales (*Physeter macrocephalus*)
- Northern bottlenose whale (*Hyperoodon ampullatus*)
- Long-finned pilot whale (*Globicephala melas*)
- Killer whale (*Orcinus orca*)
- White-beaked dolphins (*Lagenorhyncus albirostris*)
- Harbour porpoise (*Phocoena phocoena*)

2.2 Field Work

Pinnipeds

<u>Grey seal</u>
Aerial survey on grey seal pups was performed in the autumn of 2002.
<u>Harbour seal</u>
Abundance of harbour seals was observed at some predetermined haul-out sites, during low tide, at the South coast and Northwest coast.
<u>Vagrants</u>
One walrus was observed on Selvík, Skagi, Northwest coast.

Cetaceans

Information on stranded or beached whales at the Icelandic coast in 2002 was collected by the MRI. These include two sperm whales, one minke whale, one sei whale, three humpback whales, three northern bottlenose whales and one white-beaked dolphin, one unidentified dolphin and three unidentified cetaceans.

Cetacean sightings data were collected from whale watching vessels operating in Icelandic coastal waters. This is a 4 year pilot project, initiated in 1999, for investigating the feasibility of using whale watching boats for systematic collection of data on distribution and relative abundance of cetaceans in near-shore Icelandic waters.

Surveys for collection of photographs and biopsies from humpback whales northeast of Iceland and blue whales west of Iceland were carried out in July 2002. Photos of 5 humpback and 5-10 blue whales were obtained as well as biopsies of 5 humpback whales. Some photographs were collected from platforms of opportunity by MRI's co-operative partners for ongoing long-term studies on blue, humpback and killer whales. The photos from 2002 have not as yet been analysed.

Two minke whales were marked with satellite tags north off Iceland 20. August 2002. One of the tags transmitted data for 80 days (SC/11/MF/)).

2.3 Laboratory work

Pinnipeds

Tooth material collected from the grey seal catch was aged, from growth layers of 0.5 mm cross-sections of canine teeth. Analysis of the grey seal data from the aerial survey in autumn 2002 gave pup-production as 1,350 (95% CL 1,100 –1,750) and the whole population as about 5,500 (95% CL 4,000 – 8,000) animals.

Cetaceans

Laboratory work on material sampled from stranded and by-caught cetaceans was continued. This includes determination of age, reproductive status, diet and screening for morbilli-virus.

Photo-id studies on killer, humpback and blue whales were continued in co-operation with the following partners: MICS (Canada), Wild Idea (Norway) and Icelandic whale watching companies. All photo-id material (photographs and associated data) is being entered into a specially designed database at the MRI.

A research project on the biology of white-beaked dolphins in Icelandic waters, based on sampling of by-caught animals during 1992-1997 is at a final stage. The project includes the first systematic investigations on various aspects of the biology of white beaked dolphins in Icelandic waters, such as feeding ecology, reproductive biology, growth and energetics.

A study on feeding ecology of northern bottlenose whales and beaked whales based on samples obtained from stranded animals in Iceland in recent decades is at a final stage.
Systematic monitoring of marine mammal by-catch in fishing gear was initiated in January 2002.

Analysis of data collected during the NASS-2001 sightings survey is being co-ordinated through a special working group under the Scientific Committee of

NAMMCO. Estimates of abundance and/or trends of fin, blue, minke, humpback, long-finned pilot, northern bottlenose, and sperm whales as well as *Lagenorhynchus* dolphins have been discussed by the working group. Abundance estimates for fin, humpback and sperm whales were also submitted to the IWC Scientific Committee meeting in 2002.

3. CATCH DATA

Pinnipeds

Catch figures for 2002 are 371 harbour seals (364 pups and 7 1+ animals), 341 grey seals (162 pups and 179 1+ animals), 4 hooded seals, 4 bearded seals, 4 ringed seals and one harp seal. Norwegian sealers caught 1,050 hooded and 124 harp seals inside the Icelandic EEZ.

Cetaceans

No direct catch of cetaceans was reported in Icelandic waters in 2002.

4. BY-CATCH DATA

Introduction

Systematic reporting of by-caught marine mammals was established for the sink net fisheries and took effect from the start of the calendar year 2002. The by-catch is reported in log books delivered by the fishermen to the Fisheries Directory in Iceland.

Pinnipeds/cetaceans

Reports of 195 by-caught marine mammals were received from 15 of the 331 (4,5%) boats operating with sink nets. The total number of settings by the entire sink net fleet was 19 051 whereas 1 600 (8%) were set by boats reporting by-catch at least once. The detailed list of reported by-catch by species is shown in Table 1.

Table 1 Marine mammals by-catch reported from the set net fleet in Iceland 2002

Species		Number
Hooded seal	*Cystophora cristata*	4
Harbour seal	*Phoca vitulina*	42
Grey seal	*Halichoerus grypus*	6
Harp seal	*Pagophilus groenlandicus*	1
Bearded seal	*Eringnathus barbatus*	4
Ringed seal	*Phoca hispida*	4
Harbour porpoise	*Phocoena phocoena*	128
White beaked dolphin	*Lagenorhyncus albirostris*	4
Dolphin		2

5. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

No whaling permits were issued in 2002. A precautionary TAC of 200 fin whales and 250 minke whales within the Icelandic EEZ was recommended by the MRI. These recommendations were based on recent assessment by the Scientific Committee of NAMMCO. No special management measures were taken regarding seals.

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4.4
NORWAY - PROGRESS REPORT ON MARINE MAMMALS IN 2002

Sidsel Grønvik, Tore Haug & Nils Øien

1. INTRODUCTION

This report summarises the Norwegian research on pinnipeds and cetaceans conducted in 2002. The research was conducted at the University of Tromsø: the Department of Arctic Biology (UIT-AAB) and the Norwegian College of Fishery Science (UIT-NFH), the Norwegian School of Veterinary Science, Department of Arctic Veterinary Medicine in Tromsø (NVH-IAV), the Institute of Marine Research in Bergen (IMR), the Norwegian Institute of Fisheries and Aquaculture in Tromsø (NIFA), the Norwegian Polar Institute in Tromsø (NP), the National Veterinary Institute (VI), Statens næringsmiddeltilsyn (SNT), the University of Oslo, Zoological Museum (UIO-ZM) and Origo Miljø as, Stavanger (OM).

2. RESEARCH

2.1 Species and stocks studied

Pinnipeds

- Harp seals *Phoca groenlandica* - Greenland and Barents Seas
- Hooded seals *Cystophora cristata* - Greenland Sea
- Harbour seals *Phoca vitulina* - Svalbard, Norwegian coastal waters
- Grey seals *Halichoerus grypus* - Norwegian coastal waters
- Ringed seals *Phoca hispida* - Svalbard
- Bearded seals *Erignathus barbatus* - Svalbard
- Ross seal *Ommatophoca rossi* - Weddell Sea
- Antarctic fur seals *Arctocephalus gazella*-Bouvetøya
- Southern elephant seals *Mirounga leonina* – Bouvetøya
- Steller sea lion *Eumetopsia jubatus* – North Pacific Ocean and Okotsk Sea

Cetaceans

- Minke whales *Balaenoptera acutorostrata* - Northeast Atlantic
- Humpback whales *Megaptera novaeangliae* - North Atlantic
- Bowhead whale *Balaena mysticetus* - Arctic
- Pilot whales *Globicephala melas* - North Atlantic
- Killer whales *Orcinus orca* - Northeast Atlantic
- White whales *Delphinapterus leucas* - Svalbard
- Harbour porpoise *Phocoena phocoena* - Norwegian coastal waters

2.2 Field work

Pinnipeds

Comprehensive aerial surveys to provide estimates of current pup production of the Greenland Sea population of harp seals during their whelping period (March-April) were conducted during the period 14 March – 6 April. One fixed-wing twin-engined aircraft (stationed in Scoresbysound, Greenland, but permitted also to use the Jan Mayen Island as base) was used for reconnaissance flights and photographic surveys along transects over the whelping patches once they had been located and identified. A helicopter, stationed on and operated from the applied research vessel (R/V “Lance”), assisted in the reconnaissance flights, and subsequently flew visual transect surveys over the whelping patches. Also, behavioural studies of harp seal pups were undertaken during the survey. (NIFA, UIT-NFH)

Sampling of demographic data from 1yr+ animals taken in commercial catches was performed on the Norwegian vessel operating in the southeastern Barents Sea in April – May. (NIFA)

A project aimed to provide the data necessary for an assessment of the ecological role of Greenland Sea harp and hooded seals throughout their distributional area of the Nordic Seas (Iceland, Norwegian, and Greenland Seas) was initiated with a pilot study in 1999. The project was continued in 2000-2002 as a joint effort for the four Nammco-countries. In 2002, a research cruise with R/V "Jan Mayen" to coastal and ice filled areas east of Greenland was performed in the period 26 September – 16 October. (NIFA)

In September, Norwegian and Russian scientists performed an aerial survey, using a specially designed Russian aeroplane, in the northeastern Barents Sea to assess whether there was an overlap in distribution, and thus potential predation, between harp seals and capelin. The personnel in the plane cooperated with Norwegian and Russian research vessels, which assessed the distribution and abundance of capelin in the area simultaneous with the aerial survey. (NIFA)

Three pregnant female hooded seals from the Greenland Sea stock were collected during a research cruise with FF “Jan Mayen” in the Greenland Sea between 12 February and 4 March, 2002. *In vitro* studies of the effect of the hormone melatonin on vasomotor responses were conducted using their uterine arteries, and blood samples were collected from both fetus and mother for later measurements of plasma levels of melatonin. Another three juvenile hooded seals were live-captured and brought back to Department of Arctic Biology (AAB). These animals were later used in studies of brain temperature variations in animals diving freely in the seal holding facilities (40,000 l sea-water tanks) at AAB. (UiT-AAB)

During landing of the seal catches from the hunting areas in the West Ice and East Ice muscle samples from 16 adult harp seals and fore flippers (muscle and blubber) of 30 yearlings were collected for evaluation of the toxic components PCB, dioxin, furan and mercury (VI/SNT)

Ringed seals (N=20) were live-captured in Storfjorden, Svalbard, for a satellite-tracking study of habitat utilisation. Eleven of the seals were equipped with Sea Mammal Research Unit’s satellite-relayed data loggers. This is part of a larger programme to study climate impacts on ringed seals and polar bears (NP).

An aerial survey of ringed seals hauled out on the ice during molting was conducted in 10-20 June. A total of 18,000 digital pictures were taken covering all fjords from Hornsund in the south, northwards and around Spitsbergen up until Wijdefjorden. The photographic coverage varied from 25% - 100% of the ice-cover. (NP)

Ringed seals (N=71) were collected in Wijdefjorden and Billefjorden. This is part of a larger study of population dynamics, diets, pollution and general health status. (NP)

Two boat surveys were conducted for harbour seals in Van Mijenfjorden; one during late breeding period and the other during the molting period. About 50 harbour seals, mainly sub-adults, use this fjord in the ice-free period. (NP)

Newly developed walrus satellite tags were deployed on 6 adult male walruses on the east side of Svalbard. Previously used walrus tags have not been able to transmit positions unless the walrus is hauled out. These new tags made by Sea Mammal Research Unit have a different design in relation to position of saltwater-switch and antennae, and they were able to transmit positions from swimming animals. (NP)

Abundance estimation (using pup counts) and sampling of biological material for studies of breeding biology (including tagging of pups), in particular the temporal distribution of births, stock identity and feeding ecology were performed for grey seals in ship borne surveys in Mid and South Norway in September - November. (NIFA)

Materials to assess demographic parameters were collected from the Norwegian grey and harbour seal hunt. (NIFA)

Attendance periods and foraging trips of lactating Antarctic fur seal females were studies at Bouvet Island. This was achieved by a combined use of satellite tags (n=3), time-depth recorders (n=10) and VHF-transmitters (n=40). Pup growth rates were monitored according to CEMP-monitoring procedures by weighing 50 random pups of each sex at day 30, 60 and 74 days of age. Pup production was estimated based on a mark-recapture experiment involving 1720 marked pups, resulting in an estimated pup production of 15,523. This should correspond to a total population of 66,128 animals. Adult male territorial behaviour was also studied using information from 30 animals that were drugged, weighed and equipped with VHF-transmitters. In addition material was collected for studies of pollution, diets and craniometry. (NP)

Weekly counts of hauled-out southern elephant seals were performed on Bouvetøya with highest number of 379. 19 animals were tagged with flipper tags, and skin samples were collected from 50 molting individuals (NP)

Incidental observations of marine mammals have been collected by IMR vessels and coastguard vessels. Recorded data include date, position, species and numbers.

Cetaceans

During the period 19 June to 6 August 2002 a sighting survey was conducted with two vessels covering the central Norwegian Sea and the coastal area off Finnmark, northern Norway. This was the first year of a new six-year program 2002-2007 to cover the northeast Atlantic to provide a new abundance estimate of minke whales every sixth year as part of the management scheme established for this species. During the survey biopsy samples were collected from several whale species (white-beaked dolphins, killer whales, humpback, and minke whales) and fluke photos were taken of humpback whales. Instrumentation of minke whales with VHF tags to collect dive time information was also conducted, and two whales were followed for about two days. (IMR)

In August/September mapping of whale distributions was conducted during 0-group fish surveys in the Barents Sea. (IMR)

Biological material, and especially material relevant for studying alternative age determination techniques for baleen whales, was collected during the commercial minke whale catch operations off Jan Mayen. During this trip, also attachment devices for VHF and satellite instruments were tested. (IMR)

In May one minke whale was VHF tagged in the North Sea, and dive time data were collected for about four hours. (IMR)

During the commercial whaling season (May-June), stomach samples, body condition data and biological material for studies of demography, reproduction and pollutants were collected from minke whales by scientific personnel on 4 of the participating vessels. Additionally, governmental inspectors collected tissue materials for studies of stock identity from all whales taken by the other vessels participating in the Norwegian small type whaling. (NIFA)

During the whaling season minke whale muscle samples were collected from 577 animals, and blubber samples (403 from the back and 103 from tongue) were collected from individuals where the blubber was intentionally stored for human consumption (VI/SNT).

During November, field work was undertaken for a pilot project on the ecology of killer whales, and the manner in which the whales interact with the herring fishery. Behavioural and acoustic data were collected. Additionally, biopsy samples were collected for a pilot project investigating the ecotoxicology of killer whales. (NIFA, UIT-NFH, NP)

In August/September mapping of whale distributions was conducted during 0-group fish surveys in the Barents Sea. (IMR)

2.3 Laboratory work

Pinnipeds

Databases containing recapture information and incidental observations of marine mammals have been updated. (IMR)

Pictures from aerial photographic surveys aimed to estimate harp seal pup production in the Greenland Sea are being analysed. (NIFA)
Data on age and body condition and stomach samples from harp and hooded seals taken in scientific operations in pack ice areas in the Greenland Sea are being analysed. (NIFA)

Blubber samples from harp seals collected in the northern Barents Sea have been analysed for fatty acid profiles. (NIFA, NP)

Grouped blubber samples (n=3) of harp and hooded seals (yearlings) were analysed with respect to chlororganic pollutants (PCBs, DDTs, CHLs, HCHs and HCB), as well as dioxins and furans. (VI-NVH/SNT)

Grouped muscle samples of adult harp seals from (n=1; Østisen) and hooded **seals** (n=1;

Vestisen), as well as grouped muscle samples of yearlings from the "Vestisen" hunting area (n=3), were analysed with respect to the concentration of total mercury. (VI/SNT)

In a study on the role of the hormone melatonin in diving seals, plasma samples from female hooded seals and their fetuses were analysed for levels of melatonin by use of the RIA-technique (Radio-Immuno-Assay). (UiT-AAB)

Dietary biomarker kinetics in juvenile hooded seals. A three-week experimental study was performed at AAB (collaboration between O.T. Oftedal & R. Eisert (Nutrition Laboratories, Dept. Conserv. Biology, Smithsonian National Zoological Park, Washington) and E.S. Nordøy (AAB)) where the kinetics of the dietary markers thrimethylamine *N*-oxide and arsenobetaine were studied in 6 juvenile hooded seals. The purpose was to establish both the short-term and long-term turnover rates of these two naturally occurring dietary markers, given either in natural concentrations or in spiked concentrations. Using data from these experiments it may be possible in the future to determine the time of the last meal and to estimate the meal size, based on blood samples collected from seals caught in the wild. (UiT-AAB)

*Brain temperature of freely diving seals***.** Hooded seals were surgically instrumented with brain probes with thermistors connected to data loggers and then released into 40 000 l water tanks at AAB, and diving activity and brain temperature were continuously recorded in animals swimming and diving freely in the tanks. The hypothesis is that brain temperature decreases during periods of active diving, which would reduce the oxygen consumption of the brain of the animal and thereby extend its diving capacity. (UiT-AAB)
Demographic data from harp and hooded seals taken in commercial catches and from the Norwegian coastal grey and harbour seal hunt are being analysed. (NIFA)

Data on age and body condition and stomach samples from grey seals taken for scientific purposes in North Norway are being analysed. (NIFA, UIT-NFH)

Distribution and food consumption of Ross seals. A total of 10 Ross seals were tagged in the pack ice off Queen Maud Land (Antarctica) in early February 2001 in order study the seasonal distribution and diving behaviour of this species. Of the 10 seals, 6 were followed during a complete yearly cycle and into the next moulting period in early February 2002. Analyses of collected data have continued during the course of 2002. (UiT-AAB)

An inventory of scientific collections of Steller sea lions is made. The project is performed in cooperation between UIO-ZM and Memorial University, Newfoundland, and is funded by North Pacific Marine Science Foundation.

Cetaceans
Studies of a number of alternative methods, including an evaluation of current methods for age determination of minke whales have been finalised. (IMR)

Stomach content samples from minke whales have been analysed using traditional methods where the original biomass of prey items are reconstructed based on remaining hard parts in the contents. Acoustic and biological data from prey estimate surveys on the whaling grounds have also been analysed. (NIFA, UIT-NFH)

Tissues sampled for stock identity studies of minke whales have been archived and analysed using DNA techniques. (NIFA)

Blubber samples from 4 minke whales were analysed with respect to PCB (NVH).

An extensive mapping on the concentration of the total mercury (T-Hg) in **minke** whales was preformed on the whale catches from the 2002 season. The overall analyses of mercury (n=125) were performed on 64 grouped samples containing up to 10 individuals and 61 individual samples, including a total of 542 minke whales (VI/SNT).

Feeding and reproduction of harbour porpoises are being studied based on material collected in recent years from by caught animals. (IMR)

The population structure of bowhead whales during postglacial time is studied using DNA extracted from ancient (bones and baleen) and recent tissue material. The project is performed in cooperation between UIO-ZM, IMR and Wildlife Conservation Society, NY.

Databases containing incidental observations of marine mammals have been updated. (IMR)

2.4 Other work

Pinnipeds

Reproductive data from Greenland Sea harp seals have been analysed and presented. (NIFA, UIT-NFH)

Data on the diet of harbour seals (Vesterålen, Norway) and grey seals (Faroe Islands) have been analysed and presented. (NIFA, UIT-NFH)

Cetaceans

Methods used in diet studies of cetaceans have been assessed. (NIFA)

Recent studies of minke whale foraging ecology have been reviewed. (NIFA, UIT-NFH)

Data on temporal diet variations and prey selectivity of Northeast Atlantic minke whales have been analysed and presented. (NIFA, UIT-NFH)

Data on the stock identity of North Atlantic minke whales have been analysed (using methods based on analyses of DNA, organochlorines, heavy metals, stable isotopes and fatty acid signatures) and presented. (NIFA, UIT-NFH)

The research work on pathological studies of minke whales killed by penthrite grenades was continued in 2002. Analysing and processing of the material have been finished and some of the results were published in 2002. The above study aims to conclude in a veterinary doctoral degree. (NVH-IAV)

Data on white whale vocalisation (collected in Spitsbergen waters) have been analysed and presented. (NIFA, NP, UIT-NFH)

Scientists from NVH-IAV have been engaged in co-operative work with scientists, authorities, whale hunters and whale hunters' organisations in Norway, Greenland, Alaska, and Japan to refine the design of hunting gears and penthrite grenades used for whale hunting. They have also been engaged in the planning of workshops, preparation of manuals and lecturing for whale hunters and/or administrators in Norway, Greenland, Faroe Islands, Alaska USA and Japan. (NVH-IAV)

2.5 Research results

Pinnipeds

A model for an historical assessment of Barents Sea harp seals has been developed. The population size of White Sea/Barents Sea harp seals has been estimated to be between 3.5 million and 5.5 million individuals in the year 1875, when exploitation by Norwegian and Russian hunters started. Different density dependent structures are investigated and the work will be finalised in 2003. (IMR)

Norwegian scientists participated in Russian aerial harp seal pup surveys in the White Sea during the 2000 breeding season. Two fully independent surveys of the breeding lairs were conducted, one with helicopter and one with aeroplane. The helicopter photographic (black and white) survey was performed during the period 10-12 March. Using the strip transect method, a mean uncorrected estimate of pups of 322,474 (SE=28,706), including pups harvested prior to the survey (30,729 pups), was obtained. The estimate was not corrected for pups born after the survey. On 18 March a full coverage strip transect photographic survey was successfully performed with the aeroplane. An uncorrected pup production estimate of 339,710 (SE=32,400), which includes pups harvested prior to the survey (30,729), was obtained. The material is now being published. (NIFA)

Norwegian – Russian aerial surveys were conducted in September 2001 and 2002 in the northeastern Barents Sea, aimed to assess whether there was an overlap in distribution, and thus potential predation, between harp seals and capelin at this time of the year. The aerial surveys occurred concurrently with the annual Norwegian and Russian ship borne assessment of the distribution and abundance of capelin in the area. Preliminary results seem to indicate very little overlap between the two species in September, in particular in areas east of Svalbard. (NIFA, IMR)

Aerial surveys to assess the status of the Greenland Sea population of harp seals during their whelping period (March-April) were conducted during the period 14 March to 6 April 2002. Field work included participation of a Canadian scientist with substantial experience from similar surveys in the Northwest Atlantic. One fixed-wing twin-engined aircraft (stationed in Scoresbysound, Greenland, but permitted also to use the Jan Mayen Island as base) was used for reconnaissance flights and photographic surveys along transects over the whelping patches once they had been located and identified. A helicopter, stationed on and operated from the applied research vessel (R/V "Lance"), assisted in the reconnaissance flights, and subsequently flew visual transect surveys over the whelping patches. The helicopter was also used for age-staging (also performed along transects over the patches) of the pups to assess temporal distribution of births. Three harp seal breeding patches (A, B and C) were located. Systematic visual strip transect surveys were flown over harp seal patch A (20 March) and patch B (28 March), whereas photographic strip transect surveys were flown over patches B and C on 29 March and 6 April, respectively. Subsequent analyses of images from the photographic surveys are still in progress. These analyses include participation of Canadian and Russian scientific personnel with experience from similar analyses from harp seal surveys in the northwest Atlantic and in the White Sea, respectively. The results from the aerial surveys will be used to estimate the total 2002 harp seal pup production. Subsequently, the status of the stock will be assessed by fitting population models to the pup production estimate. (NIFA)

To enable an assessment of the ecological role of harp and hooded seals throughout their distributional range of the Nordic Seas (Iceland, Norwegian, Greenland Seas) a project was initiated in 1999 by members of the NAMMCO Scientific Committee. The project pays particular attention to the period July-February (i.e., between moulting and breeding), which is known to be the most intensive feeding period for both species. To provide data, seals were collected for scientific purposes on expeditions with R/V ”Jan Mayen”, conducted in the pack ice belt east of Greenland in September/October 1999 (autumn), July/August in 2000 (summer) and in February/March in 2001 (winter). Results from analyses of stomach and intestinal contents from captured seals revealed that the diet of both species in this particular habitat was comprised of relatively few prey taxa. Pelagic amphipods of the genus *Parathemisto* (most probably almost exclusively *P. libellula*), the squid *Gonatus fabricii*, the polar cod *Boreogadus saida*, the capelin *Mallotus villosus,* and sand eels *Ammodytes* spp. were particularly important. Although their relative contribution to the diet varied both with species, sampling period and area, these five prey items constituted 63-99% of the observed diet biomass in both species, irrespective of sampling period. For the hooded seals, *G. fabricii* was the most important food item in autumn and winter, whereas the observed summer diet was dominated by polar cod, however with important contribution also from *G. fabricii* and sand eels. The latter was observed on the hooded seal menu only during summer, while polar cod, which contributed importantly also during autumn, was almost absent from the winter samples. During the latter survey, capelin also contributed to the hooded seal diet. *Parathemisto* was most important for the harp seal during summer and autumn, whereas in winter the contribution from krill, capelin, and some other fish species was comparable and even larger. Harp seals appeared to consume some *G. fabricii* at all sampling periods, whereas polar cod taken mainly in summer and autumn, was replaced by capelin and other fish species in the winter diet. A final survey within the framework of the project was conducted using R/V “Jan Mayen” in the pack ice waters off the east coast of Greenland in September-October 2002. In addition to the dedicated surveys, samples have been obtained from local hunters operating on the east coast of Greenland and from animals taken as by catch and hunt in Icelandic waters. (NIFA, UIT-NFH)

Physiological concentrations of melatonin were found to suppress the *in vitro* vasoconstrictive effect of noradrenaline in uterine arterial segments from pregnant female hooded seals. This could be an effect aimed at maintaining the blood supply to the fetus during maternal diving. Plasma levels of melatonin were found to be high in the hooded seal fetuses, and consistently about 3-5 times the plasma levels in their mothers. This is similar to levels found in previously collected samples (2001), and is unique among other mammals, where the plasma level of melatonin is consistently higher in the mother than in her fetus. (UIT-AAB)

No results are yet available from the project dealing with the kinetics of the dietary markers thrimethylamine *N*-oxide and arsenobetaine in juvenile hooded seals. All samples will be analysed in April-May 2003. (UiT-AAB)

Preliminary results of studies of brain temperature changes in unrestrained captive hooded seals diving in a 40,000 l tank suggest that brain temperature is not much influenced by the short-duration dives that are typical of the diving behaviour of captive animal in a small (shallow) tank. However, brain temperature abruptly dropped by about 0.6°C in connection with feeding (intake of a meal consisting of 3 kg of cold fish). Otherwise, brain temperature displayed typical diurnal variations (within a range of about 1 – 1.5ºC) that are similar to those documented in other mammalian species. (UiT-AAB)

Result from a ship-borne survey of harbour seals in Lysefjord in Rogaland County 25-26 June, revealed an observed breeding population of 30 adults and 11 pups. (OM)

In a project aimed to provide temporally data to examine the content of the potentially most toxic components in muscle and blubber of seals caught during Norwegian sealing operations, overall analyses of total mercury (n=5), PCB (n=3), dioxins (n=3) and furans (n=3) were performed on 8 grouped samples containing up to 10 individuals. The concentration of total mercury (T-Hg) varied from 0,1 to 0,4 µg/g wet weight (ww). The highest level was detected in muscle from adult harp seals caught in Vestisen (0,38 µg/g ww). These concentrations are similar to recent findings of total mercury in muscle of minke whale caught in Norwegian waters during the 2001 and 2002 hunting seasons. The concentrations of dioxins and dioxin-like PCBs are given as toxicity equivalents (pgTE/g blubber), and the mean concentration of sum TE (sum of toxic equivalents PCDD/PCDF/non-orthoPCB/mono-orthoPCB) was overall 11,0 pg/g. The non-ortho PCB and mono-ortho PCB were the main components with 38% and 48% of sum TE, respectively. These results indicate relatively low levels of all analysed toxic components in seals harvested during Norwegian sealing operations in 2002. Although it is relevant to carry out further analysis on the pooled adult muscle sample from the Vestisen hunting field, in order to detect the variation in total mercury within this sample. (VI/SNT)

Surveys aimed to assess the abundance of grey seals in mid Norway and southern Norway in September-November 2001 and 2002 indicated that the population(s) in these areas might be increasing. (NIFA)

The satellite tagging study of Ross seals that was initiated in February 2001 and terminated in February 2002 has provided new and epoch-making results showing that Ross seals leave the pack ice just after moulting in February and remain pelagic for most of the year. The projects has also provided extensive information on seasonal changes in dive depths, dive duration and time spent at various depths, as well as information on haul-out behaviour and the timing of the lactation period. Data are currently subject to detailed analyses. (UiT-AAB)

Cetaceans

A new estimate for Northeast Atlantic minke whales based on the survey data collected over the six-year period 1996-2001 has been presented. The estimate indicates a more westerly distribution pattern compared to earlier surveys, however, no specific cause of this has been revealed. (IMR)

Dive time data collected by VHF tagging have been analysed. Blow rates calculated are comparable to earlier data collected by VHF instrumentation and visual experiments. (IMR)

Preliminary analyses of minke whale stock structure based on the established DNA register were presented to the IWC Scientific Committee. Mitochondrial DNA indicates differences between the Jan Mayen area and the other catching areas used by Norwegian whalers in the northeast Atlantic, while microsatellite DNA does not show this pattern. (IMR)

Age estimation of minke whales based on reading growth zones in bullae has been shown to be of little use. This conclusion is based on experiments where several readers have done multiple readings of bullae sections and then compared to other length-related parameters like total length and number of ovulations. Growth structures in mandibles have also been investigated but not found to be formed at a regular rate with poor agreement in within and between reader estimates. The contents of specific fatty acids in blubber seem to be correlated to age. Age estimation of minke whales using the aspartic acid racemization reaction is also apparently a promising technique. (IMR)

The scientific whaling under special permit and subsequent establishment of a routine sampling scheme during commercial whaling operations have yielded a time series (1992-2001) which permits assessment of spatial, seasonal and year-to-year variations in diets, of foraging behaviour, of prey selectivity, and of the total annual consumption by the minke whales. The collected data has also permitted multispecies modelling exercises with minke whales involved. The dietary composition of the northeast Atlantic minke whales varies considerably both in space and time, presumably due to geographic differences in the distribution and abundance of potential prey. The whales exploit a multiplicity of species, and sizes, of fish and crustaceans. In general, they find capelin, herring and, occasionally, krill more preferable than other prey, which may have several contributory explanations such as mobility, schooling behaviour, prey refuge use and other anti-predator responses. Apparently, minke whales switched to other prey in years of low densities of herring and capelin, thereby reducing the mortality on these two fish species. Although results from the multispecies modelling exercises should be taken as tentative, they all point in the same direction, i.e., that minke whale abundance may affect important fisheries. They show that, for the Barents Sea, it is possible to make predictions regarding ecosystem changes, following a specific management manipulation or change in the ecosystem, that are accurate within an order of the actual response. The results given demonstrate the usefulness of performing ecological investigations over a range of scales. The minimum requirement of data for both the small, medium and large scale investigations is information on the relative diet composition of the animals. Recent reviews of methods used in studies of marine mammal diets have concluded that, although identifying and measuring items in vomit, scats, and gastrointestinal contents have several disadvantages and sources of errors, it provides more information at considerably less cost than other methods (such as fatty acid signatures, stable isotopes and genetics), and cannot be replaced effectively by any other method at present. To assess the large scale variations on population level, information about the body condition of the whales is also of interest. To put the large scale results in an ecological perspective, one needs information about population size and structure, and, of course, large scale information about the resource base. More detailed small scale studies of prey selection must, however, is supported with resource mapping studies which occur concurrently and synoptically with the sampling of whale diet data. (NIFA, NFH-UIT)

An extensive mapping on the concentration of the total mercury (T-Hg) in minke whales were performed on the whale catches from the 2002 season. The overall analyses of mercury (n=125) were performed on 64 grouped samples containing up to 10 individuals and 61 individual samples, including a total of 542 minke whales. The concentration of total mercury varied from 0,01 to 0,80 mg Hg/kg wet weight, while the overall mean for the grouped samples was 0,25 mg Hg/kg wet weight, and the overall mean for the individual samples was 0,22 mg Hg/kg wet weight. When grouped according to hunting area the overall mean for the grouped samples was 0,28 mg Hg/kg wet weight (North Sea, n=7), 0,34 mg Hg/kg wet weight (Jan Mayen, n=2), 0,14 mg Hg/kg wet weight (Barents Sea, n=19) and 0,25 mg Hg/kg wet weight (Spitsbergen, n=9). These concentrations are similar to recent findings of total mercury in muscle of minke whale caught in Norwegian waters during the hunting season 2001, and considerably lower than total mercury concentrations reported from pilot whales in Faroe Island waters. The latest catches from the North Sea and the Spitsbergen had considerably higher total mercury concentrations than the early catches. These variations are likely to be associated with biological aspects (age and sex) and variations in the migratory pattern. Especially for the Spitsbergen material it is notable to report that the latest catches in June had significantly higher total mercury concentrations than minke whales caught one month earlier. It is possible that we here examine minke whales with different origin. However, ongoing studies may reveal different sub-populations of minke whales in the presented material (VI/SNT).

Data from seven killer whales instrumented with satellite tags in 2000 and 2001 are being analysed. The tag that functioned longest was a so-called SPOT tag, which is very small in size and transmits only data on the position of the whale. This tag transmitted data 30.11.2001 – 14.9.2002. These data are now being worked up to describe movement patterns, home ranges and dive behaviour. (IMR)

3. CATCH DATA

Sealing

Three Norwegian vessels participated in the commercial harp and hooded seal catches in the West Ice (the Greenland Sea) in 2002. One of the vessels also made one trip to the East Ice (the southeastern Barents Sea). All quotas were permitted taken as weaned pups subject to prescribed conversion factors between pups and 1+ animals. Table III.I shows the Norwegian catches of harp and hooded seals in 2002. These catches represent only fractions of the quotas: In the West Ice only 4.5% of the harp seal quota and 49% of the hooded seal quota were taken. In the East Ice the total result based on both Russian and Norwegian catches was 31% of the quota recommended by the Joint Norwegian-Russian Fisheries Commission.

Table III.1. Norwegian catches of harp and hooded seals in 2002. 1+ means one year old or older seals.

Catching area:	*The West Ice*			**The East Ice**		
Species	Pups	1+	Total	Pups	1+	Total
Harp seals	1,118	114	1,232	411	1,937	2,348
Hooded seals	6,456	735	7,191			

Whaling

After a temporary suspension, the traditional small type Norwegian minke whaling was again permitted in 1993 and quotas were implemented based on the Revised Management Procedure (RMP) developed by the International Whaling Commission's (IWC) Scientific Committee. The RMP allocates catch quotas to specific management areas. There are five such management areas within the region of interest to Norwegian whalers. These are (1) the Svalbard-Bear Island area (coded ES), (2) the eastern Norwegian Sea and the central and northeastern Barents Sea (EB), (3) the Lofoten area (EC), (4) the North Sea (EN) and (5) the western Norwegian Sea-Jan Mayen area (CM). Table III.2 shows the number of minke whales taken by area in the 2002 season.

Table III.2. Quotas and catches of minke whales in 2002 by management area as defined in RMP.

2002	*Management area*					
Small-type whaling	EB	EN	ES	EC	CM	Total
Catch	308	132	146	13	35	**634**
Quota	318	155	148	14	36	671

4. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

Sealing

Advice on the management of harp and hooded seals is based on deliberations in the ICES/NAFO Working Group on Harp and Hooded Seals (WGHARP). At its most recent meeting in the fall of 2000, WGHARP assessed West and East Ice harp seals and West Ice hooded seals. The management agencies requested advice on "sustainable" yields for these stocks. "Sustainable catch" as used in these yield estimates for seals means the catch that is risk neutral with regard to maintaining the population at its current size. The population assessments were based on a population dynamics model that estimates the development of future population size, for which statistical uncertainty is provided for the catch options. The age structure of the model was restricted to two age classes, 0 (pups) and 1+(one year old or older), because of limited information on catch at age and age structure for the populations in question, and because of the fact that catches were rather small compared to population size for the years for which catch at age is known. The model requires estimates of mortality and reproductive parameters that include variance. Using the historical catch data and estimates of pup production, the model estimates mortality (M_0 and M_{1+}) and a birth rate within the 1+ population of females (f). The freedom with which the model can estimate these parameters is dependent upon the standard deviations provided. The model is fitted to pup production estimates weighted inversely to their variance in cases where more than one estimate are available. The possibility of including multiple pup production estimates in the assessment model is an improvement from previously used estimation programs. However, models of this nature do not estimate parameters well when pup production estimates are from a limited period in time compared to generation time. The model has the option to allow estimation of population size and sustainable catch, but when given no prior information about M_{1+} and f, the model treats these parameters as independent parameters. To stabilize the model, the range of these parameters had to be constrained. As a result, the estimates of uncertainty may be negatively biased, and the confidence intervals for future population sizes may be too narrow.

Based on the assessments performed by WGHARP, the ICES Advisory Committee on Fishery Management (ACFM) provided advice on quotas for the 2001 season. The recommended sustainable TACs were set as follows: Harp seals in the East Ice 53,000 1+ equivalents, harp seals in the West Ice 15,000 1+ equivalents, and for hooded seals in the West Ice 10,300 1+ equivalents. If pups are to be taken, 2.5, 2 and 1.5 pups are equivalent to 1 one year old or older seal for the three stocks respectively. There were no WGHARP meetings in 2001 or 2002, and there is, therefore, no new advice from ACFM for the 2003 season. For this reason, the advice given for 2001 was prolonged to apply also for the 2003 sealing season. Traditionally, both Russia and Norway have participated in the sealing operations in the West Ice and the East Ice and have, therefore, allocated quotas on a bilateral basis in negotiations in the Joint Norwegian-Russian Fisheries Commission. However, the Russians cancelled their sealing operations in the West Ice in 2001. The Norwegian shares of the 2003 quotas will be 15,000 harp seals and 10,300 hooded seals in the West Ice (the total quotas in this area) and 10,000 harp seals in the East Ice (all given as 1+ equivalents). There is a general ban on catching females in the breeding lairs in the West Ice. The Norwegian ban on catching pups of the year, introduced in 1989, was lifted from the 1996 season onwards, and weaned pups can now be taken.

In 1996 new regulations for the “sustainable” hunt of coastal seals as well as compulsory catch reports were introduced. Quotas have been set based on the available information on abundance and allocated along the coast according to abundance within counties (harbour seals) or regions (grey seals). The total 2002 quotas were 535 harbour seals and 355 grey seals. Of this, 498 harbour seals (93% of the quota) and 110 grey seals (35% of the quota) were taken. Advice for the 2003 season was for quotas of 501 harbour seals and 373 grey seals. However, the Norwegian Ministry of Fisheries decided to increase the coastal seal quotas substantially, such that 1186 grey seals (25% of the current abundance estimate) and 949 harbour seals (13% of current abundance estimate) are allowed to be taken in 2003.

Whaling

At the IWC Annual Meeting in 1992 Norway stated that it intended to reopen the traditional minke whaling in 1993. So far, IWC has accepted the RMP developed by its Scientific Committee as a basis for future management decisions but has not implemented the procedure. The Norwegian Government therefore decided to set quotas for the 1993 and following seasons based on RMP, with parameters tuned to the cautious approach level as expressed by the Commission and using the best current abundance estimates as judged by the IWC Scientific Committee.

The total quota for the northeast Atlantic and the Jan Mayen area in 2002 was set to 671 minke whales (Table III.2). This number also includes quotas not taken earlier in the current five-year quota period, which started in 2001. The catch quotas are set for each of five management areas, and allocated on a per vessel basis with some over-regulation, which means that there also is some competition between vessels for the total quota. The basic catching season was from 13 May to 31 August. All the participating vessels had inspectors on board to survey the whaling operation.
RMP essentially sets a five year block quota where animals not taken a particular year may be transferred to later years within the block. A new quota period was started in 2001. For 2003 a total quota of 711 has been set with the following *Small area* allocation: EB 330, EN 179, ES 150, EC 15 and CM 37.

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