NAMMCO

Annual Report 2005

North Atlantic Marine Mammal Commission

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COMMITTEES AND OFFICE BEARERS

Members of the Commission		**Councillors**
Faroe Islands	(F)	Mr Andras Kristiansen
Greenland	(G)	Ms Amalie Jessen
Iceland	(I)	Ms Ásta Einarsdóttir
Norway	(N)	Mr Halvard P. Johansen

Council

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

Committee on Hunting Methods

Chairs –	*1994-1998*	Ms Amalie Jessen (G)
	1998-2005	Mr Jústines Olsen (F)
	2005…	Dr Egil Ole Øen (N)

Management Committee

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

Management Committee Sub-Committee on Inspection and Observation

Chairs –	*1993-1995*	Mr Einar Lemche (G)
	1995-2005	Dr Egil Ole Øen (N)
	2005…	Ms Karen A. Motzfeldt (G)

Management Committee Working Group on By-Catch

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

Scientific Committee

Chairs –	*1993-1995*	Dr Jóhann Sigurjónsson (I)
	1995-1997	Prof. Tore Haug (N)
	1997-2000	Dr Mads Peter Heide-Jørgensen (G)
	2000-2004	Mr Gísli A. Víkingsson (I)
	2004-2005	Prof. Lars Walløe (N)
	2005…	Dr Geneviève Desportes (F)

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 –	*1998-1999*	Dr Gunnar Stefánsson (I)
	1999-2000	Dr 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 –	*1999-2003*	Mr Gísli A. Víkingsson (I)
	2003….	Prof. Lars Walløe (N)

Scientific Committee Working Group on the Stock Status of Walruses in the North Atlantic and Adjacent Seas

Chair –	*2005….*	Dr Erik Born (G)

Finance and Administration Committee

Chairs –	*1999-2000*	Mr Øyvind Rasmussen (N)
	2000-2005	Mr Einar Lemche (G)
	2005…	Ms Ásta Einarsdóttir (I)

The NAMMCO Fund (Dissolved as of 2005)

Chairs –	*1998-2000*	Ms Ulla S. Wang (F)
	2000-2001	Ms Kate Sanderson (F)
	2001-2005	Ms Ulla S. Wang (F)

Secretariat

General Secretary	Dr Christina Lockyer
Scientific Secretary	Mr Daniel Gordon Pike
Administrative Coordinator	Ms Charlotte Winsnes

SECTION 1 - COUNCIL

1.1
REPORT OF THE FIFTEENTH MEETING OF THE COUNCIL

Selfoss, Iceland 14-16 March 2006

EXECUTIVE SUMMARY – MAIN ACTIONS AND RECOMMENDATIONS BY AGENDA ITEM

2. FINANCE AND ADMINISTRATION:

2.1 Report of the Finance and Administration Committee

Several recommendations were approved including a Staff Employment Survey where it was accepted as a principle that staff salaries that should be brought in line with other organisations and preliminary adjustments be implemented as from January 2006, and that investigation on the pay scales and staff benefits should continue. This might take some years for all issues to be resolved and adopted.

2.2 Adoption of 2005 accounts

These were approved.

2.3 Commission Budget 2006 and Forecast Budget 2007

NAMMCO/15/4 Annex 1 rev 15 March was approved and adopted. Concerns were expressed that potential problems may arise with a deficit in 2008 and that it should be considered how to manage this situation. TNASS funding request for 10,000 NOK in 2006 was approved, with consideration of requests for additional funding in 2007 depending on the outcome of external funding applications (see item **3.2** below).

2.4 Guidelines for the Secretariat of NAMMCO on participation of staff members in external fieldwork

These were approved and will be appended to the Staff Rules for reference.

2.5 Observers

An amendment to the Rules of Procedure (Article 5 item b) was agreed in principle and that this and other specifications for the admission of observers should be prepared by the Finance and Administration Committee for review at the next meeting.

3. SCIENTIFIC COMMITTEE:

3.1 Report of the Scientific Committee

This included a number of recommendations with respect to species and stocks.

3.2 TNASS – Trans North Atlantic Sightings Survey

Council heard that there was still a shortfall in the total budget of 28 million DKK needed to conduct the wider trans-oceanic survey in 2007. Participation will involve NAMMCO member countries, all of whom pledged support, and also Canada and the Russian Federation.

3.3 Rules of Procedure (RoP) amendment

Council approved an amendment to the RoP that reflects the usual practice of inviting experts, but assuring that "attendance of invited experts *may* be funded by NAMMCO". The main report reflects background and views on the matter.

4. CONSERVATION AND MANAGEMENT:

4.1 Report of the Management Committee

The report of the Management Committee was not finalised for the Council meeting, although the essential items were covered. The finalisation of the MC report would be by correspondence.

4.2 New requests for advice from the Scientific Committee, proposals for conservation and management and recommendations for scientific research

These were formally accepted by Council.

Harp and hooded seals – NAMMCO should explore the possibility of ICES and NAFO assuming a formal joint role in the Working Group on Harp and Hooded Seals. The Secretariat should contact ICES and NAFO in this regard. As a starting point, the Working Group, jointly with the NAMMCO Scientific Committee, should be asked to provide advice on outstanding requests (see NAMMCO Annual Report 2004, p. 27). A more complete discussion would be anticipated next year

Beluga - West Greenland

Proposals for conservation and management **-** While commending Greenland for the recent introduction of quotas and reduction in the harvest, and recognizing that the actual catch in 2004/2005 was within the level recommended, serious concern was expressed that present quotas for beluga in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB Scientific Working Group, are not sustainable and will lead to further reduction of the presently depleted stock.
In 2000 NAMMCO accepted that the JCNB would provide management advice for this stock, and Council therefore strongly urged the JCNB and the Government of Greenland to take action to bring the removal of belugas in West Greenland to sustainable levels.

Requests for scientific advice **-**The Scientific Committee should provide advice on the effects of human disturbance, including noise and shipping activities, on the distribution, behaviour and conservation status of belugas, particularly in West Greenland.

Recommendations for scientific research **-** It is recommended that future surveys for beluga should be planned using the international expertise available through the Scientific Committee of NAMMCO, and with input from hunters at the planning stage. In addition, if and when new survey methods are applied, they should be calibrated against previously used methods so that the validity of the survey series for determining trends in abundance is ensured.

<u>Narwhal - West Greenland</u>

Proposals for conservation and management – Council endorsed the Scientific Committee's advice that the total removal of narwhals in West Greenland should be reduced to no more than 135 individuals. This conclusion was reached in a joint meeting with the JCNB Scientific Working Group, using the best scientific advice available. While commending Greenland for the recent introduction of quotas and reduction in the harvest, Council expressed serious concern that present takes of narwhal in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB Scientific Working Group, are not sustainable and will lead to further depletion of the stock.

In 2000 NAMMCO accepted that the JCNB would provide management advice for this stock, and Council therefore strongly urged the JCNB and the Government of Greenland to take action to bring the removal of narwhal in West Greenland to sustainable levels.

***Recommendations for scientific research* -** It is recommended that future surveys for narwhal should be planned using the international expertise available through the Scientific Committee of NAMMCO, and with input from hunters at the planning stage. In addition, if and when new survey methods are applied, they should be calibrated against previously used methods so that the validity of the survey series for determining trends in abundance is ensured.

<u>Walrus</u>

***New requests for advice* -** Council endorsed the recommendation of the MC that the Scientific Committee should provide advice on the effects of human disturbance, including fishing and shipping activities, in particular scallop fishing, on the distribution, behaviour and conservation status of walrus in West Greenland.

Recommendations for scientific research - The recommendations for research contained in the Report of the Scientific Committee were endorsed.

4.3 International Observation Scheme

The 2006 Observation Scheme will focus on whaling in Greenland and Norway. No infractions were reported from 2005.

4.4 Report of the *Ad Hoc* Working Group on Enhancing Ecosystem-Based Management (EBM)

Council endorsed that the *Ad hoc* Working Group should continue and meet inter-sessionally, and contact other bodies dealing with marine resource and fisheries management in order to consider EBM approaches in marine mammal management and develop a so-called "shopping list" or checklist as defined and recommended in the WG report. The Working Group should report back at the next Annual Meeting.

4.5 Proposal to establish a Management Committee for seals

The proposal was introduced by Norway and approved for the establishment of a separate new seal Management Committee with the same status as the existing general

Management Committee. A planning group – to work inter-sessionally by correspondence, will prepare a work agenda to discuss details on technical matters, decision on the Chair (Greenland) and Rules of Procedure which may be based on the existing Management Committee's RoP.

5. HUNTING METHODS:

The report of the Committee on Hunting Methods was approved, and also the plans for the Workshop on "Struck and lost" scheduled for 14-16 November 2006 in Copenhagen. All proceedings of hunting methods workshops will be compiled into one publication, after the November 2006 workshop.

6. ENVIRONMENTAL QUESTIONS:

Greenland informed Council that two steering groups in the Greenlandic government – Dept of Nature and Environment, and Dept of Mineral Resources and Industry – will both look at the effects of climate change, and also involve hunters and fishermen and the department including marine and terrestrial mammals. Relevant documentation will be provided to NAMMCO. Information on arctic climate impact assessment from other organisations, including OSPAR and the Arctic Council will be examined next year.

7. EXTERNAL RELATIONS:

7.1 International Cooperation

It was agreed that the Secretariat would distribute an annual listing of meetings at which it was anticipated that Secretariat staff would participate, with a distinction between meetings of organisations with which NAMMCO had observer relations and other meetings.

7.2 Memorandum of Understanding between ICES and NAMMCO

A draft text that will provide a formal basis for collaboration between the two organisations was formally approved by Council. The Secretariat will now pursue this matter further with ICES and any progress will be reported back to NAMMCO.

8. INFORMATION:

The new NAMMCO website undergoing construction was presented to the Council for comment and input. The scheduled launch date will be the beginning of May 2006.

9. ELECTION OF OFFICERS

The Chair - Kate Sanderson (Faroes) and vice-Chair – Halvard Johansen (Norway) were both re-elected to office.

11. CLOSING ARRANGEMENTS

11.1 Next meeting
NAMMCO 16 will be held in Norway in 2007, most likely in March in Tromsø.

11.2 Press release
A press release was agreed by Council and distributed at the end of the meeting.

REPORT OF THE FIFTEENTH MEETING OF NAMMCO COUNCIL

Selfoss, Iceland 14-16 March 2006

MAIN REPORT

1. OPENING PROCEDURES

1.1 Welcome address

The Chairman of NAMMCO Council, Kate Sanderson, welcomed delegations and observers to the 15th Meeting of Council. Participants are listed in Section 5.1.

The Minister of Fisheries of Iceland, Einar Kristinn Guðfinnsson, gave an opening address. He commented that economic survival (development) based on the sustainable use of marine resources was essential in Iceland, which has one of the highest living standards in the world. He stated that it was of paramount importance to continue with the goal of sustainable use of marine resources. Icelandic policy was aimed at the future health, sustainability and biodiversity with respect to ocean issues. Responsible conservation and management were based on scientific advice. Marine mammals should be regarded as components of the ecosystem and managed accordingly. Sustainable utilisation of marine mammals was important for all NAMMCO countries, and long term prosperity depends on sustainable utilisation and collaboration between members. NAMMCO has made important steps forward in management and conservation of marine mammals in the context of the ecosystem. He expressed anticipation of a fruitful meeting.

1.2 Opening statements

The heads of the delegations of the Faroe Islands, Greenland, Iceland and Norway made opening statements to the meeting. Opening statements are in Appendix 3.

Observer countries

The observer from **St Lucia** underlined that his government supported a policy of sustainable use of marine resources, pointing out that certain cetacean species were utilised in St Lucia. St Lucia's objective in attending the meeting was to observe the structure and functioning of NAMMCO. St Lucia had hopes of setting up a sister organisation or establishing a closer association with NAMMCO.

The observer from **Canada** appreciated the opportunity to attend the annual NAMMCO Council meeting, noting that Canada planned to continue working with NAMMCO. Canada expressed thanks to the NAMMCO Hunting Committee for their work and the press statement regarding sealing which was issued in February. With respect to sealing matters, Canada had noted Greenland's opening remarks and hopes for close future collaboration with Greenland to resolve the current situation with regard to trade in seal skin.

Japan presented a written opening address which was distributed to all participants. It is included in Appendix 3.

1.3 Key Note Speaker

Gísli Víkingsson, Marine Research Institute, Reykjavik, presented *The Icelandic Research Programme on Common Minke Whales– An Introduction and some Preliminary Results from the first half.* This presentation detailed preliminary results of the Icelandic programme for the first time publicly. The results of the programme will be very important in ecosystem modelling. The main objective of the research is to collect basic information on the feeding ecology of minke whale in Icelandic waters. In addition to studies on the diet composition by analysing the stomach contents, other data that are essential for estimation of minke whale predation on various prey species will be collected. These include research on the energetics, food requirements and seasonal and spatial variation in whale abundance. The multi-species model that is being applied at the Marine Research Institute and includes cod, capelin and shrimp will be further developed by incorporating minke whales for estimation of the ecological interactions of these species. A fuller summary of the presentation is contained in Appendix 4.

Comments

The Chair enquired if there was a plan to take other whales, and it was stated that the minke whale programme will continue, but will probably not extend to other species. There had been a programme for fin and sei whales in the 1980's, and a decision on this matter had not yet been taken.

The Chair of the Scientific Committee, Lars Walløe congratulated Iceland on the programme. He suggested that in a comparison of pollutant levels, if the covariates – lengths, sex, age, etc. were considered, that observed differences between areas of Iceland might disappear. The response was that perhaps this might be the case but it could be dependent on the characteristics of the animals.

The General Secretary commented that sandeel has a large role in minke whale diet, and enquired whether the minke forage for sandeels on the bottom or in mid-water. Víkingsson replied that sandeels come up to the sea surface in summer, where minke take them, and a technique to locate minke whales was to look for bird feeding activity at the surface. No bottom debris has been observed in minke stomachs. It was queried whether there were less sandeels in recent years, and Víkingsson stated that the proportion of sandeel in the diet had decreased in 2005; less capelin and krill had also been noted than previously thought.

A member of the Press enquired about the consumption of cod by minke whales. Víkingsson replied that an estimated 10% of the cod were taken by minke whales. However these were preliminary results, and the diet probably varies depending on prey availability. No estimates of actual mass of cod and other fish that are consumed have yet been done; this will be a final step in the analysis.

1.4 Observers

The Chair of NAMMCO Council welcomed observers from the governments of Denmark, St Lucia, Canada, and Japan, and representatives of intergovernmental organisations: North East Atlantic Fisheries Commission (NEAFC), North Atlantic

Fisheries Organisation (NAFO), the International Whaling Commission (IWC), and non-governmental organisations: Inuit Circumpolar Conference (ICC), High North Alliance (HNA), World Conservation Trust (IWMC).

The USA and the EU expressed regrets that they would be unable to be represented as observers at this year's meeting. It was regretted that the Russian Federation, despite interest in attending, was unable to be represented by an observer at this year's meeting.

1.5 Adoption of agenda

The agenda was adopted without amendments (see Appendix 1). A drafting group was appointed to deal with requests for advice.

1.6 Arrangements of meeting

The General Secretary outlined the practical arrangements for the meeting, which included a dinner hosted by the Icelandic Ministry of Fisheries at *Við Fjöruborðið*, Stokkseyri. All documents for the meeting are listed in Appendix 2.

2. FINANCE AND ADMINISTRATION

2.1 Report of the Finance and Administration Committee

The Chair of the Finance and Administration Committee (FAC), Ásta Einarsdóttir, presented the report (NAMMCO 15/4). She mentioned that there had been a telephone meeting in November 2005 when a preliminary look at the accounts had been made which indicated a likely surplus. The FAC had considered a draft Guidelines for participation in fieldwork for Secretariat staff. The FAC had considered a review of staff employment status and conditions, requested from the Secretariat by the Chair of Council. The FAC concluded that there were discrepancies in salary scales relative to other organisations, and requested the Secretariat to provide a case study.

In February 2006, the FAC had a face-to-face meeting in Copenhagen, where it had reviewed the accounts for 2005, and also the draft budgets for 2006 and forecast budget for 2007 (NAMMCO 15/4 Annex 1), which took into account some new financial changes. The Guidelines for participation in fieldwork for Secretariat staff was discussed again, and the Committee agreed to recommend their approval. The FAC requested a future annual listing of external work undertaken by staff members.

With respect to the staff employment survey, it was accepted as a principle that staff salaries should be in line with other similar organisations, and considering the case study presented, salary increases for all staff members were recommended, with a request that there should be continued work on the pay scales and on benefits, but that this would take some years for all issues to be resolved.

Under the Scientific Committee budget the special request for funding for the TNASS was recommended in principle: 10,000 NOK earmarked in 2006, and a general increase up to 500,000 NOK in 2007 to cover the SC activities including TNASS.

2.2 Adoption of the 2005 accounts

The 2005 accounts as contained in Appendix 5 were approved by Council.

2.3 Commission Budgets for 2006 and Forecast Budget for 2007

The Council considered document NAMMCO/15/4 Annex 1 rev 15 March containing a revised draft budget for 2006 and preliminary draft budget for 2007. These allowed for an increase of the Scientific Committee budget to cover the extra costs of TNASS, but not to cover any projected extraordinary activities. In lieu of the General Reserve of minimum 100,000 NOK (see NAMMCO Annual Report 2002, page 13), it was decided that the Relocation Fund be incorporated back into the general budget as of 2007 as it was thought unnecessary to maintain two reserves.

The Faroes commented that overall spending was more than income, noting the projected deficit of 450,000 NOK for 2006. A potential problem could be anticipated in 2008 once the carry-over surplus is fully used. It was important to consider how to manage this situation, which would either require an increase in contributions or a reduction in the level of activity of the organisation. Norway noted that in fact the 2005 budget had not been completely used so that there had been a surplus and also a past surplus in 2004. There was a tight budget policy in general, but that any surplus should be used up before considering future changes in contributions. The current economy was good. The forecast 2007 budget would be reviewed once the 2006 expenditures are better known.

Council thus adopted the revised 2006 budget and the 2007 forecast budget (NAMMCO/15/4 Annex 1 rev 15 March), along with the FAC recommendations for staff salary increases.

2.4 Guidelines for the Secretariat of NAMMCO on participation of staff members in external fieldwork

These were approved (NAMMCO 15/14) and appended to the Staff Rules for reference.

2.5 Other business

Greenland proposed an amendment to the Rules of Procedure (Article 5 item (b)) for admission of observers. This concerned the admission of observers from political parties in NAMMCO member countries. It was considered appropriate that such Parties should be admitted as observers, but that they be represented by elected members of parliament or permanent staff with a genuine relation to the party. Norway commented that openness and transparency should prevail in NAMMCO, but that it may be necessary to develop more detailed criteria for the admission of observers. It was agreed to instruct the FAC to consider the matter with a view to developing more detailed criteria for the consideration of Council at its next meeting.

3. SCIENTIFIC COMMITTEE

3.1 Report of the Scientific Committee

The Chair of the Scientific Committee, Lars Walløe, presented the report (see Section

3 of this volume) and summarised the main points.

3.1.1 Harp and hooded seals

The Council has requested that the Scientific Committee (SC) annually discuss scientific advice on catch quotas as advised by the joint ICES/NAFO working group on harp and hooded seals. In 2005, the SC was requested to investigate how a projected decline in Northwest Atlantic harp seal population might affect the proportion over-wintering in Greenland, and also to provide harvest levels for the Barents/White and Greenland seas, that would effect a 20% reduction in harp seals over 20 years. The SC was unable to provide the requested advice this year but will attempt to do so next year. At a meeting of the ICES/NAFO working group in St John's in September 2005, the task was to set biological limits for these stocks and make assessments. The NAMMCO SC could not endorse an adoption of the management framework suggested by the ICES/NAFO working group for the reasons detailed in Section 3, 9.1 and 9.2.

There appears to have been a reduction in hooded seal abundance in the Greenland Sea. A survey conducted in 2005 resulted in an estimated 12,000 pups as opposed to 27,000 in 1997.

The Faroes asked for a clarification of the situation as it appeared that the SC had been requested last year to provide advice on harp seals (see above) that has not been delivered; with only a reference to the ICES/NAFO WG. The Chair of the SC stated that the SC had discussed if it should make an independent calculation during the meeting, but the appropriate person had not been available at that time, and it would not have been formally correct to provide an estimate made after the meeting in the SC report as it would not have been considered by the full committee.

The Chair of Council commented that it was necessary to be precise about to whom and about what requests are addressed, and that this matter should be considered further by the Management Committee.

3.1.2 Harbour porpoises

In 2004 the Scientific Committee noted that there is likely a substantial level of by-catch of harbour porpoises in Icelandic fisheries. The same is likely true in Norway. Directed catches in Greenland exceeded 2,000 in some years and were reported as 2,320 in 2003. More precise estimates of by-catch, and estimates of abundance for all areas, are required.

The Chair enquired whether the surveys conducted under the TNASS could help in providing abundance estimates for this species, but the Chair of the SC replied that this was unlikely because survey protocols were different for the target species of large whales and for harbour porpoise. The Scientific Secretary, Daniel Pike, commented that there was a possibility of modification of the Icelandic aerial surveys to provide improved estimates of porpoise abundance but this had not yet been discussed.

3.1.3 Narwhal

The status of narwhals was discussed at the joint working group on narwhal and beluga (JCNB/NAMMCO meeting) in October 2005 in Nuuk (Section 3, 9.4). Information relating mainly to stock assessment was presented and discussed, including stock structure, age estimation methods, catch statistics and abundance. Conclusions were similar to those reached previously in 2004, that the West Greenland narwhal stock was heavily depleted and that a substantial reduction in take is necessary in order to arrest further declines.

3.1.4 Beluga

The beluga was also discussed at the JCNB/NAMMCO meeting (Section 3, 9.5). Information relating mainly to stock assessment was presented and discussed, including catch statistics and abundance. Conclusions were similar to those reached in previous assessments, that the West Greenland population is severely depleted to between 16 to 46% of carrying capacity (2005 median ratios), and reducing the annual take to 100 beluga has an 80% chance of halting the decline in population by 2010, while maintaining higher catches reduces the chance of halting the decline.

3.1.5 Fin whales

The Fin whale working group met in Oslo in October 2005 (Section 3, 9.6). This meeting was regarded as a preliminary meeting to the forthcoming joint IWC-NAMMCO meeting in Reykjavik in March 2006, and focused on stock structure, catch history and abundance. Further information on stock structure will be presented at the March 2006 meeting. The SC found no reason to change their earlier conclusions about the East Greenland-Iceland stock, that the stock is currently above MSY level and that a catch of 150 animals per year should be sustainable for the grounds west of Iceland.

The observer from Denmark enquired whether the West and East Greenland stocks were the same, but the response was that this is as yet uncertain but that genetic and other analyses to be considered at the March 2006 meeting may be able to answer this question.

3.1.6 Minke whales

The work of the Icelandic research programme was referred to here, but the most up to date information was presented under item 1.3 above.

3.1.7 Grey seals

Iceland had undertaken a survey of pups in 2004 that indicated a decline relative to 2002. Management objectives had been developed in response to a NAMMCO recommendation. The SC reiterated its recommendations concerning management of stocks in the Faroes, Norway and Iceland.

3.1.8 Harbour seals

A new working group on harbour seals, will meet in the autumn of 2006 to review all North Atlantic stocks, focusing on stocks in member countries.

3.1.9 Humpback whales

The SC has not yet provided requested assessments for North Atlantic stocks and in particular for the stock off West Greenland. Greenland requested an explanation for the delay in providing advice, and queried tasking priorities. The Chair of the SC responded that the response was delayed because a new abundance estimate will be available from surveys conducted off West Greenland in autumn 2005, which will make an assessment much more reliable. With regard to other areas, the Chair of the SC suggested that it would be preferable to await the results of the TNASS in 2007 before proceeding with the assessments. Greenland commented that work priorities of the SC should be set by the Council. The Chair stated that the Management Committee (MC) should determine what levels of uncertainty are acceptable in advice.

3.1.10 Walrus

A working group meeting on walrus had been held in January 2005 in Copenhagen (Section 3, 9.13). Recent satellite tracking data and genetic information suggested a sub-division of the North Water (Baffin Bay) stock into three areas. With respect to West Greenland, great concern was expressed over the status of the stock, but information on abundance and stock identity was insufficient to complete an assessment. It was recommended that data from past surveys of the over-wintering areas should be analysed as a matter of the highest priority. An additional walrus working group meeting in late 2006 or 2007 might be necessary if new information is brought forward.

The report also commented that walruses may be susceptible to the effects of the drilling exploration in the Barents Sea in the Russian Federation sector.

3.1.11 NASS

The scheduled 2007 NASS will become TNASS – Trans North Atlantic Sightings Survey – with the possibility to achieve broader coverage than previously (see below under item 3.2).

3.1.12 Satellite telemetry Working Group

The SC report noted that this working group had not been productive and that further progress was not possible without participation of key experts who were for various reasons unable or unwilling to participate. The SC concluded that this working group should be terminated.

3.1.13 Future working plans

The following working groups would meet during 2006:
TNASS Planning group in the first half of 2006;
Fin whale working group, jointly with the IWC, March 2006 in Iceland;
Harbour seal working group, second half of 2006;
Walrus working group, depending on progress;
Other meetings as determined by Council.

3.1.14 Election of officers

Geneviève Desportes (Faroes) was elected as the new Chair, and Lars Witting was elected as vice-Chair.

3.1.15 Scientific Publications

Questions were raised as to progress on the scientific volumes scheduled. The Scientific Secretary reported that the grey seal volume should be out later in 2006, while the NASS volume containing information from surveys from1987-2001, was progressing slowly and publication was not expected until late 2006 or early 2007.

3.2 TNASS - Trans North Atlantic Sightings Survey

Geneviève Desportes (Faroes, coordinator of TNASS) gave a presentation on the Trans North Atlantic Sightings Survey scheduled for summer 2007. The main concern was funding which still had a shortfall in the total budget which would cost 28 million DKK. Greenland expressed the sincere hope that member countries fully fund the activities, and address this and try to raise additional funding. Iceland pledged support and participation, along with the Faroes who expect to participate.

The Council welcomed the expected participation of non-member countries which would include Canada and the Russian Federation. The Chair commented that NAMMCO was fully supportive of the TNASS programme and that the Council could lend its support in efforts to secure funding for the TNASS. Cooperation with other surveys for other species would also be important to provide information relevant in a multi-species context.

It was considered desirable to proceed with data analyses immediately after the survey, rather than experiencing long delays as previously, and additional funding from NAMMCO would facilitate this. The funding request has implications mainly for next year when 300,870 NOK will be required. Funding in 2008 to the amount of 110,000 NOK was also requested. Funding of 10,000 NOK in 2006 and an increased SC budget for 2007 to accommodate some of the TNASS needs were finally approved for the 2006 and forecast 2007 budgets (see item 2.3 above).

3.3 Scientific Committee Rules of Procedure (RoP) amendment

The Scientific Secretary presented, NAMMCO 15/12 which explained the background for the proposed amendment to the SC Rules of Procedure to clarify the funding of Invited Experts to SC meetings. Greenland supported the amendment (NAMMCO 15/12 Appendix 1) as it stands. The Chair of the FAC commented however that any amendment could have budgetary considerations. The Faroes and Norway agreed, but Norway noted that the amendment will not affect the procedure of the past several years. The Faroes commented that as a general rule, member countries should endeavour to fund their own experts while the Scientific Committee budget was primarily intended to provide for funding of external experts from non-member countries where necessary to ensure the best possible expertise. If countries are not in a position to fund experts from their own national scientific institutions, then NAMMCO can take part in the funding.

On condition that the report reflected national concerns, that the amendment included deletion of the existing last sentences in paragraphs 3 and 4, and the substitution of "may" for "shall", and that usual present practice should continue, all delegations agreed on and adopted the revised text which is provided below.

Extract from Rules of Procedure for the NAMMCO Scientific Committee:

> **IV. Organisation**
> The Scientific Committee decides the terms of reference of the Working Groups, their provisional agenda, membership, Chairmen and dates of meetings, and makes proposals to the Council on invitation of external experts or observers.
>
> Attendance of invited external experts at working group meetings may be funded by NAMMCO.

4. MANAGEMENT COMMITTEE(S) (MC)

4.1 Report of the Management Committee

The draft report was introduced by Halvard Johansen, the Chair of the MC. Due to time constraints, a draft partial report only was available, and it was agreed to approve the report and the finalisation of some items by correspondence.

4.1.1 Species

Under item 7. of the MC report, several different species and stocks were discussed including harp and hooded seals and the outstanding requests for advice which were not satisfied by the ICES/NAFO Working Group on Harp and Hooded Seals. Some items were deferred to next year. Council endorsed the research recommendations from the SC, including concern over the effects of human disturbance (scallop fishing) in the case of West Greenland walruses. Also Iceland expressed concern over non-sustainability of catches of walrus in West Greenland.

It was noted that once again, the SC had concluded that both beluga and narwhal off West Greenland were depleted and that current quotas were above the recommended sustainable levels. The Faroes commented that concerns regarding beluga and narwhal would be more transparent and effective if Canada could join and add their voice. Disturbance from noise in oil drilling off the Russian Barents Sea sector was also a concern for beluga.

4.1.2 By-catch Working Group

The report of the By-catch Working Group (WG) with its recommendations was accepted by the Management Committee. Member countries were urged to implement the recommendations in a timely manner.

The Faroes proposed that it would be more appropriate if the By-catch WG was transferred to the Scientific Committee rather than the Management Committee as presently. Iceland and Greenland both supported the Faroes in this initiative, although Greenland queried the role of managers in this group. Council decided that this matter should be discussed in the MC next year, as it was the MC that should make this decision.

4.1.3 User Knowledge and Scientific Knowledge in Management Decision-Making

The recent publication on *User Knowledge and Scientific Knowledge in Management Decision-Making* was distributed at the Council meeting. The Chair of Council commended the publication of the proceedings of the conference (Iceland, 4-7 January 2003), which should have wide interest in many fora. The Working Group on User Knowledge in Management was re-established and chaired by (Egil Ole Øen, Norway) with new terms of reference:

- To define in which areas of management and research a collaborating forum between users, managers and scientist would be beneficial
- To make recommendations as to how such a collaborative forum may be established.
- Member countries will appoint members to the WG.

Greenland referred to the work of KNAPK (Association of Fishermen and Hunters in Greenland), and was also looking forward to cooperating with the chair of the User Knowledge in Management WG, Egil Ole Øen (Norway).

4.1.4 Enhancing Ecosystem-Based Management (EBM)

The report of the *Ad hoc* Working Group on Enhancing Ecosystem-Based Management made several recommendations which are discussed in more detail below under item 4.4. The working group should continue, contact other organisations and develop a so-called “shopping list” or checklist as described in the report, and report back to the next MC meeting.

4.1.5 Election of officers

The Chair, Halvard Johansen (Norway) and vice-Chair, Ásta Einarsdóttir (Iceland) were re-elected to office in the Management Committee.

Thanks were expressed to all members and the Secretariat for assistance in the MC and in producing the report.

4.2 New requests for advice from the Scientific Committee, proposals for conservation and management and recommendations for scientific research

These were formally accepted by Council. The important items were as follows.

4.2.1 Harp and hooded seals

NAMMCO should explore the possibility of ICES and NAFO assuming a formal joint role in the Working Group on Harp and Hooded Seals. The Secretariat should contact ICES and NAFO in this regard. As a starting point, the Working Group, jointly with the NAMMCO Scientific Committee, should be asked to provide advice on outstanding requests (see NAMMCO Annual Report 2005, p. 27). A more complete discussion would be anticipated next year

4.2.2 Beluga - West Greenland

Proposals for conservation and management

While commending Greenland for the recent introduction of quotas and reduction in the harvest, and recognising that the actual catch in 2004/2005 was within the level recommended, serious concern was expressed that present quotas for beluga in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB Scientific Working Group, are not sustainable and will lead to further reduction of the presently depleted stock.

In 2000 NAMMCO accepted that the JCNB would provide management advice for this stock, and Council therefore strongly urged the JCNB and the Government of Greenland to take action to bring the removal of belugas in West Greenland to sustainable levels.

Requests for scientific advice
The Scientific Committee should provide advice on the effects of human disturbance, including noise and shipping activities, on the distribution, behaviour and conservation status of belugas, particularly in West Greenland.

Recommendations for scientific research
It is recommended that future surveys for beluga should be planned using the international expertise available through the Scientific Committee of NAMMCO, and with input from hunters at the planning stage. In addition, if and when new survey methods are applied, they should be calibrated against previously used methods so that the validity of the survey series for determining trends in abundance is ensured.

4.2.3 Narwhal - West Greenland
Proposals for conservation and management
Council endorsed the Scientific Committee’s advice that the total removal of narwhals in West Greenland should be reduced to no more than 135 individuals. This conclusion was reached in a joint meeting with the JCNB Scientific Working Group, using the best scientific advice available.

While commending Greenland for the recent introduction of quotas and reduction in the harvest, Council expressed serious concern that present takes of narwhal in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB Scientific Working Group, are not sustainable and will lead to further depletion of the stock..

In 2000 NAMMCO accepted that the JCNB would provide management advice for this stock, and Council therefore strongly urged the JCNB and the Government of Greenland to take action to bring the removal of belugas in West Greenland to sustainable levels.

Recommendations for scientific research
It is recommended that future surveys for narwhal should be planned using the international expertise available through the Scientific Committee of NAMMCO, and with input from hunters at the planning stage. In addition, if and when new survey methods are applied, they should be calibrated against previously used methods so that

the validity of the survey series for determining trends in abundance is ensured.

4.2.4 Walrus

New requests for advice

Council endorsed the recommendation of the MC that the Scientific Committee should provide advice on the effects of human disturbance, including fishing and shipping activities, in particular scallop fishing, on the distribution, behaviour and conservation status of walrus in West Greenland.

Recommendations for scientific research

The recommendations for research contained in the Report of the Scientific Committee were endorsed, including a new assessment for the depleted West Greenland stock of walrus, which should be completed as soon as possible.

4.3 International Observation Scheme

No infractions were reported from 2005 when focus was on sealing in Norway. The 2006 Observation Scheme will focus on whaling in Greenland and Norway.

4.4 Report of the *Ad Hoc* Working Group on Enhancing Ecosystem-Based Management

The report made several recommendations including a framework so-called "shopping list" or check-list which was considered an important and useful idea. Attention was drawn particularly to the following points under Objective 2 in the recommendations:

"Marine Mammals will be an important component of approaches in the NAMMCO area and therefore NAMMCO can play a significant role by:

- ensuring that the appropriate data on marine mammals are available as input;
- continuing to improve our understanding of all marine mammals that occur in these areas;
- promoting an awareness of ecosystem-based management with managers and the general public;
- coordinating inputs among regional approaches to ensure consistency in the way in which marine mammal data are incorporated."

After extensive discussions, detailed in the MC report, the Management Committee recommended that a start should be made on the check-list including items listed on p.22 of the report NAMMCO 15/MC/8 Annex 1, while the work on ecosystem models progresses, and also that the *Ad hoc* Working Group should continue. It was important that adequate funding should be found nationally for the modelling work required.

Council endorsed that the *Ad hoc* Working Group should continue and meet inter-sessionally, and contact other bodies dealing with marine resource and fisheries management in order to consider EBM approaches in marine mammal management and develop a check-list as defined and recommended in the WG report (see Section 2.3). The *Ad hoc* Working Group should report back at the next Annual Meeting.

4.5 Proposal to establish a Management Committee for seals

The following proposal was introduced by Norway (NAMMCO 15/11).

"In the latest few years more attention has been given to the management of seal stocks. The Scientific Committee has been tasked to monitor the stock situation for most marine mammals in the North Atlantic including seal stocks, but the Council has not asked for management advice for seal stocks.

Following the report from the Scientific Committee in 2004 the Management Committee recommended that member countries improve their management of grey seals. Iceland reported in 2005 that there would be careful monitoring of the stock size, and protective measures would be taken to stop any further decline. Norway reported that a management plan was under development.

The management of seal stocks is also raised in other forums. The Faroes and Greenland (Denmark in respect of the Faroe Islands and Greenland) delegation to the annual meeting of NAFO last autumn expressed the view that in any discussion of ecosystem approaches to fisheries management it was equally important to look at the top of the system and the role of top predators in relation to fisheries management. It was stated that there was a need to point out that the NAFO Scientific Council, in its report to the Fisheries Commission, mentions nothing about the work of the Joint ICES/NAFO WG on Harp and Hooded Seals, which is a source of information for NAMMCO's Scientific Committee and for the management authorities in Canada, Norway and Russia. However, as the work of the Joint WG is not mentioned by the NAFO Scientific Committee, there is no opportunity for questions or discussion in the NAFO Fisheries Commission related to seal stocks.

The proposal was to forward the following question to the Scientific Council, which was taken on board in the adopted compilation of requests for advice to the Scientific Council:

> *Noting the desire of NAFO to apply ecosystem considerations in the conservation and management of fish stocks in the NAFO area, the Scientific Council is requested to provide the Fisheries Commission at its next annual meeting in 2006 with an overview of present knowledge related to the role of seals in the marine ecosystems of the Northwest Atlantic and their impact on fish stocks in the NAFO area, taking into account the work of other relevant organisations, including ICES and NAMMCO.*

Therefore, at next year's NAFO Annual Meeting an overview of present knowledge can be expected. This is a promising development.

The management of harp and hooded seal stocks in the North Atlantic is based on advice from the Joint ICES/NAFO WG on Harp and Hooded Seals. However, there is currently no international body that gives management advice on coastal seal stocks like grey seal and harbour seal. Thus there may be deficiencies in the management of grey seals not only in the NAMMCO countries, but also in non-member countries like the UK and in the countries bordering the Baltic Sea.

Informal consultations concerning the establishment of a Management Committee for seal stocks took place at the Council meeting in Tromsø in 2005. There was some support for the idea to establish such a Management Committee. Non-member countries such as Canada and Russia also expressed interest for such a committee.

In the NAMMCO Agreement there is a provision for the establishment of a number of management committees (Article 3). It would be appropriate to establish a separate Management Committee for Seal Stocks. Such a committee might also be attractive for observer countries and other non-member countries.

The sequence of functioning for such a committee will then be that advice from the Scientific Committee will be sought on national management plans or on harvesting levels. Based on the scientific advice, the Management Committee for Seal Stocks could give advice to Governments upon request.

In a letter to NAMMCO Council, dated 28 November 2005, Norway has proposed the establishment of a Management Committee for Seals. It is anticipated that there will be discussion in the Council meeting on this matter, which could lead to a proposal to establish such a committee."

Greenland expressed the view that they were in a dilemma regarding seals: they were involved in NAMMCO but also held a bilateral agreement with Canada. This could perhaps be difficult sometimes. However, the timing was good for this proposal, and there had been focus on this matter for a long time in Greenland. In principle, Greenland supported the proposal.

The Faroes supported the proposal and appreciated the Norwegian initiative and Greenland's position. The remaining question for discussion was whether the existing Management Committee should remain general in nature.

Norway stated that they also have bilateral agreements with the Russian Federation with respect to the management of Barents Sea seals. There was, however, work to be done to develop cooperation on seal management in order to include an ecosystem approach. In this context a seal MC, with the same status as the current general MC, would be useful.

Iceland supported this Norwegian proposal. However, Greenland suggested that there was a need for additional discussion on the details of technical matters. Perhaps decisions on the Chair, Rules of Procedure, etc. could be made inter-sessionally. Norway responded that perhaps as a start, the FAC could act as a discussion group on setup. Greenland needed an agenda to plan the work of the new seal MC.

The Chair of Council noted a consensus agreement to establish a new Management Committee for Seals. What was needed now was to set up a planning group. As for Rules of Procedure, reference was made to the existing ones for the general MC which could also apply to the new Committee A planning group to work inter-sessionally by correspondence, was approved, and will prepare a work agenda to discuss technical details. Norway, with support of Council, invited Greenland to provide a chair for the newly established Management Committee on Seals. Greenland agreed to this proposal, but responded that they would return later with a nomination and resolve these details by correspondence.

5. HUNTING METHODS

5.1 Report of the Committee on Hunting Methods

The Chair of the Committee on Hunting Methods, Egil Øen (Norway), presented the report from the Committee's meeting 13 -14 February 2006. The report is contained in Section 1.2. Øen drew special attention to the planned “Struck and lost” workshop to be held 14 to 16 November 2006 in Copenhagen, and the trials of the effects of different ammunition on killing efficiency carried out on pilot whale heads in September 2004 in the Faroe Islands (NAMMCO 15/7 Annex 1).

Greenland raised questions about the existing “struck and lost” information and whether existing and old data would be used as Greenland regarded these as unusable. They declared two different types of hunters – professional and part-time, and that there may be very different rates of “struck and lost” between these types. Øen noted that hunters should be encouraged to relate their experiences and also suggest potential methods to reduce “struck and lost”.

The Inuit Circumpolar Conference (ICC) representative, Aqqaluk Lynge, commented on the campaign against sealing. He commented that getting information out to the public was very important, and that ICC was appreciative of the January 11th 2006 statement from the Hunting Committee which had been sent out to a variety of news agencies, including Danish ones. He enquired whether there had been any response. Generally there was poor knowledge among journalists. The Chair of Council commented that this matter could be taken up under item 8. Information.

The report of the Committee on Hunting Methods was approved, and also the plans for the Workshop on “Struck and lost”. The Council endorsed the Committee's intention to compile all proceedings of hunting methods workshops after the November 2006 workshop into one publication.

6. Environmental Questions

Following on from last year, Greenland reported that two steering groups had been established in the Greenland government: the Department of Nature and Environment, and the Department of Mineral Resources and Industry, both of which would look at the effects of climate change; they would also involve hunters and fishermen and The Greenland Home Rule, including marine and terrestrial mammals. The consequences for the biosphere also have effects on the people. Matters were very serious for Greenland. All relevant documentation from this investigation would be provided to NAMMCO.

The Chair of Council commented that NAMMCO has observer relations with OSPAR and other organisations such as the Arctic Council, that do deal with these issues. An

Arctic climate impact assessment had been undertaken by the Arctic Council, and NAMMCO should return to this to examine ongoing work in this area under the Arctic Council next year.

7. EXTERNAL RELATIONS

7.1 Cooperation with other international organisations

The General Secretary presented doc. NAMMCO 15/8 which summarised NAMMCO participation and representation at various meetings throughout the year. The following reports were received.

7.1.1 Organisations with which NAMMCO has formal observer relations

ASCOBANS - Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas

Daniel Pike attended the 12th Advisory Committee Meeting, Brest, France, 12-14 April 2005 as the observer for NAMMCO. The report and all documents for the meeting are available on the ASCOBANS web site at http://www.ascobans.org/index0502.html.

The next meeting of the Advisory Committee will be held in Finland in April 2006, and the 5th meeting of the parties to ASCOBANS will take place in either July or September 2006 in the Netherlands. The report from the meeting was available as document NAMMCO/15/8-1.

FAO RFB - Food and Agriculture Organisation Regional Fisheries Board

The General Secretary, Christina Lockyer, attended the 4th FAO RFB (Regional Fisheries Bodies) meeting, Rome, Italy, 14-15 April 2005. This meeting was attended by the secretariats of a variety of regional fisheries bodies, ranging from the North Atlantic to Antarctic. The meeting was hosted by FAO (opened by Ichiro Nomura) and chaired by Denzill Miller (CCAMLR). The report from the meeting was available as document NAMMCO/15/8-2.

NARFMO – North Atlantic Regional Fisheries Management Organisation

The 4th NARFMO meeting, Rome, Italy, 15 April 2005 was attended by Christina Lockyer from the Secretariat. The meeting was held immediately after the FAO RFB meeting in the FAO building in Rome. NEAFC, NAFO, NASCO, NAMMCO and ISBFC Secretariats were present. ICCAT did not attend. Kjartan Hoydal of NEAFC chaired the meeting with rapporteuring by NASCO. The meeting was very informal and very brief. The General Secretary's report is an informal report relating to Secretariat cooperation, and was available as document NAMMCO/15/8-3.

IWC – International Whaling Commission

Commissioners' Meeting: NAMMCO was represented by the General Secretary at the 57th Commission Meeting, held 20 – 24 June 2005, in Ulsan, Korea. An Opening Statement from NAMMCO to the IWC Commission meeting was presented that provided an update of NAMMCO activities. The opening statement was included in the document NAMMCO/15/8-5. All reports from this Commission meeting are archived and available for reference.

Scientific Committee Meeting: Lars Walløe, Chair of the NAMMCO Scientific Committee, presented a verbal report on the IWC SC proceedings from the IWC-57 Scientific Committee Meeting, 30 May – 10 June 2005, in Ulsan, Korea. He referred to the published report in the IWC in the report of the Scientific Committee pages 1-2. Council's attention was drawn to this report.

NSWA - The Norwegian Small Whalers Union

Charlotte Winsnes from the NAMMCO Secretariat attended as observer for NAMMCO at the NSWA annual Meeting, 3 – 4 December 2005, in Svolvær, Norway. The report from the meeting was available as document NAMMCO/15/8-6.

ICES – International Council for Exploration of the Sea

The ICES 2005 Annual Science Conference, 20 – 24 September 2005, Aberdeen, UK was attended by all members of the Secretariat. There was an opening lecture on "The Ecosystem Approach to Fisheries", and three invited plenary lectures on "Climate Change and Human Impacts on the Marine Environment and Ecosystems of the Arctic seas", "Anticipating Fisher Response to Management: can Economics help?" and "New Initiatives and Challenges in Fisheries Management" presented on following days.

Most relevant to NAMMCO's interests were the Scientific Theme Sessions that followed on the opening day and throughout the week, of which there were 18. The most important for NAMMCO was the "Ecosystem Approach to Fisheries" on the opening day, and which formed a core part of the meeting agenda of the NAMMCO *Ad Hoc* Working Group on Enhancing Ecosystem-Based Management which met in Aberdeen during the ICES conference (see document NAMMCO/15/MC/8).

This was a very instructive conference and all the papers and documentation, along with a CD of the papers presented are retained in the Secretariat office and are available for reference. Further information on ICES and the ICES conference can be found on www.ices.dk and www.ices.dk/iceswork/asc/2005/index.asp respectively. The report from the conference was available as NAMMCO/15/8-7.

NEAFC – North East Atlantic Fisheries Commission

The North East Atlantic Fisheries Commission held its 24th annual meeting in London 14-18 November 2005, and NAMMCO was represented as observer by Gunnar Frogner Dahl of the Ministry of Fisheries and Coastal Affairs, Norway, who prepared the report from the meeting which was available as NAMMCO/15/8-9. All Contracting Parties were represented (Denmark - in respect of the Faroe Islands and Greenland), Estonia, The European Community, Iceland, Norway, Poland and the Russian Federation). Representatives from several states, IGOs and NGOs were attending as observers. The Commission received scientific information from the International Council for the Exploration of the Sea (ICES) concerning the status of the fish stocks in the North-East Atlantic. More information about NEAFC, including the management measures, report from the annual meetings and press releases, can be found at the website www.neafc.org.

NASCO – North Atlantic Salmon Conservation Organisation
The 22nd Annual Meeting of NASCO was held 6 – 10 June 2005, Vichy, France. NAMMCO has since 2001 had observer status to the Annual Meetings of NASCO, and Andras Kristiansen (Faroes) attended as the NAMMCO observer. The press release from the 14th Meeting of the NAMMCO Council held in March 2005 and an Opening Statement was distributed to the participants at the NASCO Annual Meeting. The report from the meeting was available as NAMMCO/15/8-10. Further information about the 22nd Annual Meeting can be seen at www.nasco.int.

NAFO – Northwest Atlantic Fisheries Organisation
NAMMCO was represented by Iceland at the 27th Annual Meeting of NAFO, held 19-23 September 2005, in Tallin Estonia. The meeting was attended by 200 delegates from eleven Contracting Parties - Canada, Denmark (in respect of Faroe Islands and Greenland), European Union, France (in respect of St. Pierre et Miquelon), Iceland, Japan, Republic of Korea, Norway, Russia, Ukraine and United States of America.
The report from the meeting was available as document NAMMCO/15/8-12.

7.1.2 Other meetings and reports

ECS – European Cetacean Society
The 19th annual conference of the ECS was held in La Rochelle, France, 4-6 April 2005 with the conference theme "Marine mammals and food: from organisms to ecosystems". The conference was attended by about 500 persons, mainly from Europe but also from as far away as the USA, Canada and New Zealand, comprising predominantly scientific researchers and students, as well as interested organisations and a few commercial companies. Both Daniel Pike and Christina Lockyer from the Secretariat attended the conference, and the report from the conference was available as document NAMMCO/15/8-4.

SMM – Society for Marine Mammalogy
The 16th Biennial Conference on the Biology of Marine Mammals, was held 12-16 December 2005, in San Diego, USA, and was attended by both the General Secretary and the Scientific Secretary. The biennial conference is generally attended by hundreds of scientists worldwide working in the field of marine mammal research and management. This conference was attended by more than 2,000 people. The main conference was preceded by several different half- and full-day workshops on the 10th and 11th December.

A book of abstracts of all presentations (talks and posters) given during the conference, together with the programme, are archived at the Secretariat, and are available for viewing. More can be read at the website www.marinemammalogy.org/conference2005 and about the Society for Marine Mammalogy www.marinemammalogy.org of which NAMMCO is an institutional member. The report from the conference was available as document NAMMCO/15/8-

8.

The 2nd Symposium on Whaling and History, Sandefjord, Norway

The Symposium, held 8-10 September 2005, was attended by both the General Secretary and the Administrative Coordinator. The General Secretary received an invitation to make a presentation at this symposium, and gave a talk entitled "Cetacean feeding, growth and energetics in relation to the marine ecosystem - implications for management?" which was subsequently offered as a contribution to the proceedings of this symposium to be published by the Sandefjord Whaling Museum which organised and hosted the symposium. The report of the symposium was available as document NAMMCO/15/8-11. More information about the Sandefjord Whaling Museum and the symposium can be accessed on www.hvalfangstmuseet.no and under selection Konferanse 2005.

7.1.3 General Comments and Discussion

The **IWC** representative, who was also the Chairman of the IWC, reported on three items relevant to NAMMCO from the **IWC Commission Meeting**:

- Concerns about a contracting party, Denmark, to the IWC – where there were questions raised about fin and minke whales off West Greenland.
- Discussions concerning cooperation on research on whales between China, Russia, Korea and Japan had an important positive outcome from the meeting for these IWC members.
- Management issues concerning RMS – there had been two draft resolutions, both of which had failed. An inter-sessional meeting convened in Cambridge in late February 2006 had been unable to recommend any way forward. The outcome was not successful in taking the process forward, and it is for the time being up to individual member countires to consider ways forward.

Greenland asked for clarification on the attendance at meetings, observer relations and other meetings attended by the Secretariat on behalf of NAMMCO. It was agreed that the Secretariat would distribute the calendar of events and travel plans to Council members on an annual basis, with a distinction between observer relations and other meetings attended.

7.2 Memorandum of Understanding between ICES and NAMMCO

The General Secretary explained the background to the development of a Memorandum of Understanding (MoU) between ICES and NAMMCO. This will provide a formal basis for collaboration between the two organisations on matters of exchange of information, joint meetings, and requests for advice. The General Secretary explained that there had been some potential difficulties in the precise wording of the draft MoU text. As there was recently a change in ICES chairmanship, it was important to renew the efforts to agree the MoU, and have available a text for consideration at the next ICES board meeting in June 2006. The draft text (NAMMCO 15/9) that will provide a formal basis for collaboration between the two organisations was formally approved by Council. The Secretariat will now pursue this matter further with ICES and any progress will be reported back to NAMMCO.

8. INFORMATION

Web Site Information

The General Secretary introduced the plans for the new NAMMCO website (NAMMCO 15/10) which was currently under construction and due to be launched at the beginning of May 2006. The Faroes commented that the splash site should be expanded to show the entire map of Greenland, and made other comments regarding the appearance, but otherwise commended the efforts. The website will also have a password protected access to certain areas.

Inuit Circumpolar Conference (ICC) on hunting methods

The observer from ICC again took up the matter of hunting methods, and commented on the value of distributing information on hunting methods as widely as possible. It was confirmed that all proceedings of hunting method workshops, during the past several years would be compiled into a large compendium publication after the “Struck and lost” workshop.

IWMC - World Conservation Trust

The observer from the IWCM informed the Council about an intended proposal for a CITES amendment on the topic of trade in handicrafts from Appendix 1 species. Presently in Alaska and other areas there had been trade contrary to CITES regulations, with cases of confiscation as many items do not have CITES certification. Local people wished to sell their products to tourists but without the need for CITES certification for each article.

It was commented that this issue relates to a different organisation, and is an issue not directly relevant to NAMMCO, but it was recognised that some member countries could have concerns or interest. The IWMC observer said that comments would be welcomed on the document circulated, and that the IWMC could propose something to CITES if there was agreement. The IWC representative commented that the IWC allows trade between contracting governments. It is not legally binding but there is an agreement in principle. The IWMC replied that IWC members must still also follow CITES regulations.

Norway thanked IWMC for the information and responded that they had no formal position but would study the IWMC proposal. Greenland commented that in many cases indigenous peoples were treated separately under the IWC classification, and that they must work on these CITES issues through Denmark. Greenland has to negotiate through Denmark on CITES so the trade situation is not helpful. IWMC would be pleased to receive comments.

Inuit Circumpolar Conference (ICC) on climate change

The ICC observer informed the Council that hunters and fishers organisations are currently collaborating with the ICC on observations on climate change. This year focus would be from Sisimiut to the south, and next year (International Polar Year) would extend north to Uummannaq and beyond to the sea ice area. This comprised the IPY-related project on Sea Ice Knowledge and Use (SIKU). The Chair of Council offered good luck in the project and looked forward to the report on completion of the project.

KNAPK on cooperation between hunters and biologists
Peter Olsen of KNAPK spoke about cooperation with biologists in Greenland. KNAPK would like to seek out hunters who are willing to meet with biologists and exchange information. It was important to improve cooperation between biologists and hunters and ensure contact and interchange before projects commenced. This approach will lead to better work and more credible results.

9. ELECTION OF OFFICERS – CHAIR AND VICE-CHAIR OF COUNCIL

Norway proposed and Iceland seconded Kate Sanderson (Faroes) to a second term of office as Chair. Greenland proposed and the Faroes seconded Halvard Johansen to a second term of office as vice-Chair. Both were unanimously re-elected to office.

10. OTHER BUSINESS

There was no other business.

11. CLOSING ARRANGEMENTS

11.1 Next meeting
It was agreed that in accordance with usual practice that in alternate years the annual meeting would be held in the Secretariat's host city. The 2007 meeting, NAMMCO 16, would be held in Norway, most likely in Tromsø. The date would probably be in March.

11.2 Adoption of press release
A press release (as contained in Appendix 6) was adopted by the Council.

Greenland thanked Iceland for hosting the meeting and the excellent arrangements. The Chair thanked the Secretariat for their hard work, and then declared the meeting closed.

Appendix 1

AGENDA

1. Opening Procedures

1.1 Welcome address: Einar Kristinn Guđfinnsson, Icelandic Minister of Fisheries
1.2 Opening statements
1.3 Key Note Speaker: Gísli Víkingsson, Marine Research Institute, Reykjavik on The Icelandic Research Programme on Common Minke Whales – An Introduction and some Preliminary Results from the first half.
1.4 Observers
1.5 Adoption of agenda
1.6 Meeting arrangements

2. Finance and Administration

2.1 Report of the Finance and Administration Committee
2.2 Adoption of the 2005 accounts
2.3 Commission Budget 2006 & Forecast Budget 2007
2.4 Guidelines for the Secretariat of NAMMCO on participation of staff members in external fieldwork
2.5 Other business

3. Scientific Committee

3.1 Report of the Scientific Committee
3.2.TNASS
3.3 Scientific Committee Rules of Procedure amendment
3.4 Other business

4. Management Committee(s)

4.1 Report of the Management Committee
4.2 Recommendations for Requests for advice
4.3 International Observation Scheme
4.4 Report of the Ad Hoc Working Group on Enhancing Ecosystem-Based Management
4.5 Proposal to establish a Management Committee for Seals
4.6 Other business

5. Hunting Methods

5.1 Report of the Committee on Hunting Methods
5.2 Other business

6. Environmental questions

7. External relations

7.1 Co-operation with other international organisations
7.2 Progress on the Memorandum of Understanding between ICES and NAMMCO
7.3 Other business

8. Information

9. Election of officers – Chair and Vice-Chair of Council

10. Any other business

11. Closing arrangements

11.1 Next meeting
11.2 Adoption of press release

Appendix 2

LIST OF DOCUMENTS

NAMMCO/15/1	List of Participants
NAMMCO/15/2	Agenda
NAMMCO/15/3	List of Documents
NAMMCO/15/4	Report of Finance and Administration Committee
NAMMCO/15/4 ANNEX 1	Commission budgets – 2006, 2007, final accounts 2005
NAMMCO/15/5	Report of the SC
NAMMCO/15/6	Report of the MC
NAMMCO/15/7	Report of the Committee on Hunting Methods
NAMMCO/15/7 ANNEX 1	Shooting trials on heads of dead pilot whales
NAMMCO/15/8	External Relations
NAMMCO/15/9	Progress on the ICES – NAMMCO MoU
NAMMCO/15/10	Information – NAMMCO website
NAMMCO/15/11	Proposal to establish a Management Committee for Seals
NAMMCO/15/12	Proposal for Amendment of the Rules of Procedure for the Scientific Committee
NAMMCO/15/13	Trans North Atlantic Sightings Survey – TNASS
NAMMCO/15/14	Guidelines for the Secretariat of NAMMCO on the participation of staff members in external fieldwork and other tasks
NAMMCO/15/15	Special budget request: Trans North Atlantic Sightings Survey 2007 – TNASS

Appendix 3

OPENING STATEMENTS TO THE COUNCIL BY MEMBER DELEGATIONS AND OBSERVER GOVERNMENTS

WELCOME ADDRESS by the Icelandic Minister of Fisheries

Ladies and Gentlemen.

It is a great honour and privilege for me to have the opportunity to address you here today and formally open the Fifteenth Annual Meeting of NAMMCO here in Selfoss.

NAMMCO has a great importance for Iceland as sustainable utilisation of marine resources is of fundamental significance for the economic survival of the Icelandic people. In fact we have no other alternative then to give sustainable utilisation of marine resources such a high status. Today Iceland is one of the richest countries in the world and with one of the best standards of living. One of the main contributing factors is our responsible, technical and scientifically based management of the marine resources. If we are to keep our status among the leading nations in the fisheries sector then it is paramount to continue to base our management on the concept of sustainability.

Two years ago the Icelandic Government formally adopted its policy on ocean issues. This policy is based on maintaining the future health, biodiversity and sustainability of the ocean surrounding Iceland, in order that it may continue to be a resource that sustains and promotes the nation´s welfare. This means sustainable utilisation, conservation and management of the resource based on scientific research and applied expertise guided by respect for the marine ecosystem.

Marine mammals are of course an integral part of our ocean policy where they form a large component of the marine ecosystem. In the same way NAMMCO agrees that marine mammals should be looked at as all the other components of the ecosystem. Unfortunately, in some other international fora there is a tendency to use subjective reasoning to give marine mammals a special status as being outside the ecosystem rather than an integral part of it.

Sustainable utilisation of marine mammals is crucial for all of the NAMMCO member states. The main basis for our economic welfare is utilising the living resources of the sea, and we see no logical reason for treating marine mammals differently then other living resources of the sea. The sustainability of all living marine resources is therefore essential for the long-term prosperity of our countries.

For this reason international cooperation in this field is of a great importance to us all and we need to work together for the sustainable utilisation, conservation and study of these resources. NAMMCO has made valuable contributions to the conservation and sustainable management of marine mammals.

In the light of recent developments within other international fora NAMMCO's importance may even become of greater importance in the nearest future.

Finally, I am confident that, as past meetings, this meeting will be fruitful and constructive, based on an objective, and science-based approach.

THE FAROE ISLANDS – OPENING STATEMENT

Madam Chair, Ministers, Delegates, Observers, Ladies and Gentlemen,

Once again it is a pleasure for the Faroes to be attending the annual meeting of NAMMCO – this time in these beautiful surroundings here in Selfoss.

The Faroes are pleased to see the progress that is being made in the planning for the next major cetacean sightings survey in the North Atlantic. This will be the third of its kind organised and implemented through NAMMCO, after the successful NASS 1995 and NASS 2001 surveys, as well as the earlier surveys in 1987 and 1989. We are very encouraged to hear that the scope of the 2007 survey may well be much broader than previous surveys, if – as we are hoping – it can be coordinated with our North American and Russian neighbours, as well as with surveys planned in EU waters at the same time.

The Scientific Commitee still has a number of outstanding questions on its agenda that we in the Council have forwarded to them over the years. Much of what still needs to be done is dependent on the scientists having the right amount and type of data to be able to provide us with the advice we have requested for conservation and management purposes. The Faroes are committed to doing our part in addressing outstanding research needs on a national level which have been identified through NAMMCO, such as with regard to fin whales and white–sided dolphins, which are of particular management importance for us. We would urge all other member countries to do the same when it comes to their priority species and stocks of marine mammals.

I would also like to say that the Faroes appreciate the very constructive dialogue and exchange of information and practical experiences that we have in the Hunting Methods Committee. This is one of the cornerstones of our cooperation in NAMMCO. The same can be said of the NAMMCO International Observer Scheme, and we are pleased to see that on-board observation in whaling and sealing operations has now become an established part of the Scheme.

We have a full agenda for our meeting and we are looking forward to working hard with other delegations during this week.

GREENLAND – OPENING STATEMENT

Madam Chair, Minister, Delegates, Observers, Ladies and Gentlemen,

On behalf of the Greenlandic Delegation, I would like to express our appreciation to be here in Selfoss for the Fifteenth meeting of the Council.

Membership in NAMMCO is very important for us because, as we all know the hunt of marine mammals has a huge economic and cultural significance in Greenland.

As every year, 2006 has been and will continue to be full of events related to marine mammals in our country. We started the year with an unfortunate campaign in the Danish media against the connection between the Greenlandic fur industry and the Canadian seal hunt. The seal hunt and the marketing of seal products are extremely important for us. Therefore, in order to protect our industry and the livelihoods of our hunters, our government was forced to act quickly and issue a temporary stop to the purchase of foreign seal skin. On one hand, this measure effectively stopped the negative focus on Greenland by the Danish and international media. On the other hand, it unleashed local debates and led towards diplomatic dialogues with our neighbours in Nunavut. One of the outcomes of these dialogues was the decision to reinforce co-management of shared animal populations. A government meeting between Nunavut and Greenland is scheduled for June and co-management of polar bears, walrus and seals is likely to be in the agenda. When co-management of walrus and seals starts taking shape, we hope that NAMMCO will continue to support the scientific cooperation between Canada and Greenland, as it has been the case until now with narwhals and belugas.

When it comes to international cooperation in the management of seals, we welcome Norway’s proposal of establishing separate committee on seals. We hope that the initiative will be approved during this meeting, and if it is approved, we look forward to participating in the new seal committee.

One more thing that we are looking forward to this year is the workshop on "Struck and Lost" that will take place in November 2006. We see it as a great opportunity to hear first hand accounts from hunters and share experience and knowledge between scientists, managers and users.

In the context of users’ knowledge, we congratulate the NAMMCO Secretariat for the edition of the proceedings of the conference from 2003.

I would like to end this address by mentioning that last week our parliament and our government approved a recommendation of the West Nordic Council, which urges the governments of the Faroe Islands, Iceland, and Greenland to collaborate in the efforts to estimate the abundance of cetaceans. The recommendation indicates that this collaboration should be carried out through existing bodies, with specific mention to NAMMCO. Our parliament accepted this recommendation unanimously. During the handling of this item, all the political parties of Greenland mentioned NAMMCO as the obvious organisation that should coordinate this kind of international cooperation. In my address to the Greenlandic parliament concerning this issue, I mentioned that a concrete way to collaborate in estimating the abundance of cetaceans in our parts of the ocean was by participating in the Trans-North Atlantic Sighting Surveys to be carried out in 2007. We hope that NAMMCO will succeed in covering all the waters between Norway and Canada during this survey, so that there will as be as few gaps as possible left for speculation about the status of our populations of large whales.

With these words I wish you a fruitfull meeting. Thank you very much for your attention.

NORWAY – OPENING STATEMENT

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

On behalf of the Norwegian delegation I would like to extend our appreciation to Iceland for hosting the Fifteenth Meeting of the NAMMCO Council here in Selfoss, and we would like to thank the Government of Iceland for their well-known hospitality.

It is a pleasure to see the NAMMCO Council gathered for the fifteenth time, and that progress is made. During this meeting we will contribute to the further building of this regional management body for marine mammals.

As a starting point I would like to reiterate that Norway is aiming to establish a coherent and active management regime for marine mammals based on modern principles for the management of species, habitats and ecosystems. This is in accordance with one of the goals of the World Summit on Sustainable Development in Johannesburg in 2002, which was to encourage the application by 2010 of the ecosystem approach to fisheries management.

The sealing season is now about to start, and we see the annual gathering to protest against the sustainable harvesting of seals in both our member countries and in observer countries. It is mandatory that we stand together when old and refuted allegations about the cruelty of seal hunt are brought forward by people who want to stop seal hunt, which would be detrimental to a rational and ecosystem based management of living marine resources.

NAMMCO can be proud of the achievements of the Committee on Hunting Methods. The work of this Committee has contributed to setting the standards for seal hunt, both in the traditional hunt and the aboriginal hunt, standards which represent best practice in seal hunt. These standards also compare favourably with the current standards in any hunting activity. In this context I would like to refer to the Press Release issued by the NAMMCO Secretariat dated 16 January on the report about the Canadian seal hunt in the Danish Television news 5 January 2006. In that way NAMMCO contributes to repudiate biased descriptions of the hunting activities in Canada.

During the annual meeting last year we had informal consultations concerning the establishment of a Management Committee for seal stocks. There was some support for the idea to establish such a Committee. Also non-member countries expressed interest in it. Thus, in a letter to NAMMCO Council, dated 28 November 2005, Norway proposed the establishment of a Management Committee for Seals. This proposal will be discussion under Agenda item 4 at this meeting.

In the Scientific Committee Report, document NAMMCO/15/5, the management of seal stocks in the North Atlantic is discussed. Attention is drawn to the fact that a management framework should be specified with specific reference to goals defined by managers. If future management goals are defined in relation to ecosystem based objectives, more flexibility will be required than is allowed in the framework proposed by the ICES/NAFO Working Group on Harp and Hooded Seals. Subject like this might be discussed in a Management Committee for seal stocks, coastal seal stocks and pelagic seal stocks.

The NAMMCO Ad Hoc Working Group on Enhancing Ecosystem-based Management has made some progress this year. A comprehensive report will be presented to the Management Committee. This Committee will discuss the recommendation on how to advance the ecosystem-based management within NAMMCO. We believe that the work of NAMMCO on the ecosystem-based approach to resource management could contribute considerably to a better management of living marine resources if we act expeditiously and coordinate our research in this field.

Finally, I would like to extend my appreciation to the Secretariat for the solid preparations of this meeting. We have a small but efficient Secretariat.

JAPAN – OPENING STATEMENT

The Government of Japan is pleased to be represented at the Fifteenth Meeting of the NAMMCO Council. We continue to believe that NAMMCO's achievements concerning the science and management of marine mammals serve as a model of intergovernmental resource management based on science and respect for culture. The role for regional management of marine mammals has become increasingly important given the continuing failure of the International Whaling Commission to carry out its mandate. For this reason the establishment of an organisation in the North Pacific for the management of cetacean resources has been under consideration. We would as well, for the same reason, welcome as a positive development any expansion of NAMMCO or increased cooperation between NAMMCO and other countries bordering the North Atlantic that support the sustainable use of all marine resources.

The importance of these matters have been highlighted by the recent meeting of the IWC's RMS Working Group which concluded that further efforts to agree a management regime should be postponed. We appreciate the cooperation of NAMMCO's IWC members at that meeting and our shared commitment to normalise the functioning of the IWC based on the sustainable utilisation of whale resources.

Our shared understanding that the management of all marine living resources must be science based and in conformity with international law is also of fundamental importance for our participation in other international fora where issues such as marine protected areas, improvement of regional fisheries management organisations and the management of fisheries in waters beyond national jurisdiction are currently being discussed.

As we noted in our statement to the Fourteenth meeting of the Council, Japan's Liberal Democratic Party's Project Team is continuing to examine options for the normalisation of the IWC and resumption of commercial whaling. We are determined to make progress on this matter and seek to strengthen our cooperation towards that end.

As we have also noted in the past, research on interactions between whales and fisheries and ecosystem modelling are other subjects of shared interest between Japan and the members of NAMMCO. We reiterate our view that Japan's whale research programmes and the efforts of NAMMCO members and the NAMMCO Scientific Committee on these issues are complimentary and that collectively they will provide a strengthened scientific basis for improved management of all marine resources. We therefore look forward to continuing expressions of support for our research programmes from NAMMCO members as a part of our continuing cooperation.

Thank you.

Appendix 4

KEY NOTE PRESENTATION – SUMMARY

"The Icelandic Research Programme on Common Minke Whales – An introduction and some preliminary results from the first half" by Gísli A. Víkingsson, Marine Research Institute, Reykjavik, Iceland.

A comprehensive research project on minke whales in Icelandic waters was initiated in August 2003. The programme assumes a total catch of 200 minke whales systematically distributed in time and space throughout the Icelandic continental shelf area. The main objective of the research is to collect basic information on the feeding ecology of minke whale in Icelandic waters.

In addition to studies on the diet composition by analysing the stomach contents, other data that are essential for estimation of minke whale predation on various prey species will be collected. These include research on the energetics, food requirements and seasonal and spatial variation in whale abundance. The multi-species model that is being applied at the Marine Research Institute, Reykjavik, and that includes cod, capelin and shrimp, will be further developed by incorporating minke whales for estimation of the ecological interactions of these species. Previous studies, using all available data have indicated that cetaceans are major consumers in the Icelandic continental shelf ecosystem. Preliminary attempts to incorporate three whale species into this model were inconclusive but indicated the potential for a significant impact of these whale species on the long-term yield of the cod and capelin stocks. The largest source of uncertainty in these calculations was lack of knowledge on the feeding ecology of minke whales in Icelandic waters.

In addition to feeding ecology the following secondary objectives of the research are:
- To investigate the stock structure of the minke whale in the North Atlantic by genetic methodology and satellite telemetry;
- To investigate parasites and diseases in the minke whale in Icelandic waters;
- To collect information on age and reproduction of minke whales in Icelandic waters;
- To investigate the concentration of organochlorines and trace elements in various organs and tissue type;
- To determine the applicability of various alternative research methods by comparison with more traditional methods.

During the first three field seasons, 101 minke whales were caught for research purposes. At this stage, halfway through the programme, the first preliminary results are presented here at this meeting. It is especially stressed that, given the early status of the programme, the results are very preliminary and should be interpreted with caution.

From the distribution of the catch, clear evidence of segregation by sex and reproductive status was observed, with males dominating in the southern part of Icelandic coastal waters, particularly towards the end of summer.

According to a preliminary analysis of stomach contents, sandeels (*Ammodytidae sp.*) were the dominant prey, found in around 60% of the stomachs analysed so far. Other important prey species included cod (*Gadus morhua*), capelin (*Mallotus villosus*) and krill (small crustaceans), while various other species of fish were also found in the stomachs. Compared to the previous limited knowledge on the diet of minke whales in Icelandic waters, these preliminary findings indicate larger proportions of cod and sandeel but less of krill and capelin. There was a marked geographical variation in the diet, with sandeel completely dominating off the south and southwest coasts, while cod and other large bony fish were more common off the northern part of the study area. The ingested cod was mostly 50-80cm long and 4-8 years old although age classes from 0 to 10 were identified in the stomach remains.

In August and September 2004, satellite tags were placed on 7 minke whales. One of these was tracked until early December, deep off the west coast of Africa.

Preliminary results from analysis of pollutants show similar levels as in other common Icelandic seafood and are well below the EU maximum residue limits. Generally, the levels of both mercury and organic pollutants were similar to measurements for the Barents Sea and lower than published values from other areas of the Northeastern Atlantic (North Sea, Jan Mayen, and Svalbard).

It is anticipated that sampling for the research programme will be completed in 2007, and final results for the main sub-projects will be presented in 2008.

Appendix 5

AUDITED ACCOUNTS FOR 2004 and 2005

1. PROFIT AND LOSS ACCOUNT (NOK)

	2005	2004
Income		
Contributions	*3,043,744*	3,119,500
Interest received (net)	*22,491*	21,775
1. Book Sale	*6,550*	18,458
2. Employers Tax	*97,141*	73,102
3. Employees	*387,372*	440,870
4. Total Income	***3,557,298***	**3,673,705**
Expenditure		
Secretariat costs	*2,941,873*	2,679,169
Meetings	*121,790*	94,848
Scientific Committee	*358,104*	344,546
Observer Scheme	*92,469*	196,860
Conference	*-24,533*	60,309
5. Total operating expenses	***3,489,703***	**3,375,732**
Operating result	***67,595***	**297,973**

2. BALANCE SHEET 31 DECEMBER 2004 and 2005

Current assets		
Bank deposits (restricted 200,000)	*1,675,460*	1,444,018
Outstanding claims	*257,658*	130,160
6. Total assets	***1,933,118***	**1,574,178**
Current liabilities		
Employers tax	*39,607*	29,290
Creditors	*284,737*	47,846
NAMMCO Fund*	*133,005*	163,005
Other	*618,457*	544,320
7. Total current liabilities	***1,075,806***	**784,461**
Equity		
Restricted equity (Relocation fund)	*200,000*	200,000
Distributable equity (General reserve)	*657,312*	589,717
Total equity	***857,312***	**789,717**
8. Total liabilities and equity	***1,933,188***	**1,574,178**

* The NAMMCO Fund account is audited separately.

Appendix 6

PRESS RELEASE

The North Atlantic Marine Mammal Commission (NAMMCO) held its 15th meeting 14 - 16 March 2006 in Selfoss, Iceland. The meeting was attended by delegations from the member countries, the Faroe Islands, Greenland, Iceland and Norway, as well as observers from the Governments of Canada, Denmark, Japan and St Lucia, and representatives from a number of international organisations, including the International Whaling Commission (IWC) and the North East Atlantic Fisheries Commission (NEAFC). The opening address was given by the Icelandic Minister of Fisheries, Einar Kristinn Guđfinnsson.

Among issues discussed and decisions taken at the Fifteenth meeting were the following:

Icelandic Research Programme on minke whales
The keynote talk at this year's Council meeting was given by Gísli Víkingsson of the Marine Research Institute, Reykjavik, who presented preliminary results from an ongoing research programme for the first time publicly. The research comprises analyses based on a wealth of unique sample and data collections, and observations particularly on the life history and biology of the minke whale. Emphasis was especially given to feeding ecology, a topic that is of great importance in multi-species modelling and ecosystem based approaches to management.

Ecosystem-based management
During 2005, NAMMCO held a special Working Group meeting on Enhancing Ecosystem-Based Management. The meeting was held in collaboration with ICES (International Council for the Exploration of the Sea) at their Annual Scientific Conference. NAMMCO is firmly committed to considering the role of marine mammals in the marine ecosystem and developing multi-species approaches to management. NAMMCO will now take forward the recommendations of this Working Group and plans to identify elements in a framework for an ecosystem approach in management.

TNASS – international survey for large whales in the North Atlantic
NAMMCO has a long history of coordinating large-scale surveys for whales in the North Atlantic (NASS), and in 2007, the largest ever NASS survey is planned involving cooperation with all member countries, as well as Canada and the Russian Federation. The survey will have trans-Atlantic coverage from the European to the North American coast for the first time.

Narwhal and beluga
NAMMCO has previously expressed grave concern on the apparent decline of stocks of narwhal and belugas in West Greenland, and while commending Greenland for the recent introduction of quotas and the reduction in the harvest, there is still serious concern that present takes of narwhals and belugas in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB (Canada

Greenland Joint Commission on Narwhal and Beluga) Scientific Working Group are not sustainable and will lead to further depletion of the stocks.

Walrus in West Greenland
NAMMCO expressed concern about the situation for West Greenlandic walrus where a preliminary assessment indicates that current removals may not be sustainable.

Fin whales
Fin whales will be an important topic in Reykjavik, Iceland, 23 – 26 March this year, when a joint NAMMCO – IWC meeting will be held to progress assessment of fin whale stocks in the North Atlantic. Information relating to stock identity, historical catch and abundance will be reviewed in order to determine the status for management purposes.

Establishment of a management committee for seal stocks
Under the UN Convention on the Law of the Sea, States are obliged to cooperate on the management of all marine mammals. As an international body for cooperation on the conservation and management of marine mammals in the North Atlantic, NAMMCO's work in coordinating research, conservation and management measures for seal stocks is filling an important gap in international cooperation. An important development in this field is the establishment of a Management Committee for seal stocks in NAMMCO, which will address issues relating to management of seal stocks across the North Atlantic.

New publication on user knowledge –hot off the press!
Following an important conference in Reykjavik in January 2003 where hunters, scientists and managers joined to exchange information, NAMMCO has just published the proceedings in a volume entitled, "User Knowledge and Scientific Knowledge in Management Decision-Making" which will form a reference base for future management deliberations. The publication is available from the NAMMCO Secretariat.

Focus on hunting methods
NAMMCO provides a unique forum for the exchange of information and experiences in hunting methods used in marine mammal hunts across the North Atlantic. The NAMMCO Committee on Hunting Methods has developed guidelines on the testing of rifle ammunition for the efficiency in hunting and euthanasia in different small whale species, based on a comprehensive testing carried out on carcases under controlled conditions.

In addition, the NAMMCO Committee on Hunting Methods plans a special workshop on the issue of "Struck and lost" in November 2006 in Copenhagen, Denmark to which hunters and experts will be invited.

International observation of whaling and sealing
NAMMCO has a fully operational international scheme for the observation of whaling and sealing activities in member countries. Experience has shown that there are

valuable experiences gained from having NAMMCO observers active in the field, both land-based and onboard vessels, observing a range of different hunts. The main focus of the NAMMCO observation activities in 2006 will be Greenlandic and Norwegian whaling.

Re-election of NAMMCO Council Chair and vice-Chair

Both the Chair – Kate Sanderson (Faroes) and vice-Chair - Halvard P.Johansen (Norway) were re-elected for a further 2-year term.

The next annual meeting of NAMMCO will be held in Norway in the spring of 2007.

1.2
REPORT OF THE COMMITTEE ON HUNTING METHODS

The Committee on Hunting Methods met on 11 and 12 January 2006 from 9:00 to 16:00 and 09:00-13:00 in the Faroe Islands Representation in Copenhagen. Present were Egil Ole Øen, Chair (Norway), Jústines Olsen, (Faroe Islands), Amalie Jessen (on 12 January, agenda items 4 (partly) and 7), Ole Heinrich and Fernando Ugarte (Greenland), Kristjan Loftsson (Iceland), and Christina Lockyer, Daniel Pike and Charlotte Winsnes from the Secretariat.

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

The Chair of the Committee, Egil Ole Øen, welcomed the Committee members to the meeting. The draft agenda was adopted with two amendments, the meeting documents were reviewed and Charlotte Winsnes was appointed as rapporteur.

Fernado Ugarte was especially welcomed as a new member of the committee. Øen noted that the Committee was expanded because of agenda item 4: Workshop on Struck and Lost. In future preparatory meetings connected to the Workshop this group of people would therefore be referred to as the Organising Committee for the Workshop.

2. UPDATES ON HUNTING METHODS IN MEMBER COUNTRIES

The lists of references on hunting methods (NAMMCO/HM-January 2006-2), and laws and regulations in member countries (NAMMCO/HM-January 2006-3) were updated (see Appendices 1 and 2 of this report).

Faroe Islands

Olsen (Faroe Islands) reported that there had been no changes in the regulations for pilot whale hunting in the Faroe Islands this past year. Olsen informed the Committee that eight of the new knives developed for the pilot whale hunt had been produced and distributed. Furthermore a new longer knife (55 cm) had been developed for use on stranded northern bottlenose whales. An incident with euthanasia of a stranded bottlenose whale where for safety reason riffle could not be used had demonstrated the need for a longer knife for these whales in such circumstances.

Greenland

Ugarte (Greenland) reported that two new Executive Orders had been implemented in 2005: no. 10 of 13 April 2005 on hunting of large whales and no. 21 of 22 September 2005 on protection and hunt of polar bears.

There are three polar bear stocks in Greenland. For 2006 a quota of 150 animals has been set based on past catch history. This quota is lower than the average of previous years and lower than the total catch from the last few years. In the future the regulations on the polar bear hunt are to be set in consultation with relevant international bodies, Canada and the hunters themselves. The specifics of how this process will be have not yet been finalised.

The Executive Orders on protection and hunt of walrus and small cetaceans have been delayed. The walrus executive order is expected to be approved and in place in the first half of 2006.

Executive order no 2 of 12 February 2004 on Protection and Hunting of Beluga and Narwhal was implemented 1 March 2004. The first quota year was from 1 July 2004 to 30 June 2005. The quotas set for narwhal and beluga were less than 50 % of recent harvest levels, but were still above the catch levels recommended by the Scientific Committee. In October 2005 the 2005/2006 quota on narwhal was raised by 50 animals. This was a political decision on behalf of hunters and municipal authorities, who believe that the numbers of narwhals observed in Ummannaq fjord during the autumn, should be able to sustain larger quotas.

Iceland

Loftsson (Iceland) informed the Committee that 39 minke whales had been taken in 2005 under the scientific whaling programme that had started in 2003. The hunting method used is the same as in Norway.

Norway

Øen (Norway) noted that in Norway quota regulations on seal and whale hunting are revised every year, and that the regulations for 2006 are still under preparation.

With reference to the new electronic monitoring system for electronic surveillance of the Norwegian minke whaling, a trip recorder or “Blue Box” system (for description see last years Committee report), Øen informed the Committee that the developmental phase was completed and no major modifications are expected before it is implemented as a legitimate method for inspection on all boats from the 2006 whaling season on. The analysing tools still need some elaboration and adjustments, but judging from the analysis of data from the 2005 season so far (approximately 50 % of the whaling fleet) all hunted whales are being registered and no violation has been registered. Øen has written a report on the system to the IWC that he will also send to NAMMCO.

3. UPDATES ON RECOMMENDATIONS FROM PREVIOUS WORKSHOPS (1999, 2001 AND 2004)

The Chair asked the members to present the status of the follow-up to those recommendations from the different workshops that were not finalised at the last meeting.

From the 1999 Workshop in Nuuk:

Recommendation 3a: “*The workshop recommends that Greenland initiates studies in co-operation with the hunters, testing both pointed and blunt bullets on whale carcasses to determine the best ammunition for use in the hunt.*”

As noted in the report from last year the fulfilment of this recommendation is awaiting guidelines on shooting tests on dead animals. The shooting tests took place in September 2004 in the Faroe Islands. The work with the guidelines for standardising methods on how to perform the shooting tests must be completed before the tests can take place (see also Item 5 in this report.).

Recommendation 3b: "*The Workshop recommends that Greenland develop objective descriptions of hunting methods, equipment and how efficient these are in small cetacean hunting, considering regional variations.*"
The Committee has in previous meetings noted the following:

From NAMMCO Annual Report 2002: p. 64: 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

From NAMMCO Annual report 2004: p. 51: The three workshops held in 1999, 2001 and 2004 produced a lot of information pertaining to this recommendation. It was deemed important to find out what descriptions already exist and hence what needs to be done. The Committee tasked Lillelund (Greenland) with the responsibility of going through the reports with the aim of making a recommendation on how best to move this work forward

Due to changes in personnel in 2005 this work has not commenced, but Greenland will try to readdress the question in 2006. Through the work with the executive order on polar bears, interviews are being conducted and one could use this opportunity to also include questions about other species. Furthermore a study on climate change is planned for 2007 and here questions about the hunting of marine mammals might also be incorporated.

Recommendations under 4, Baleen whale hunting pertaining to Greenland:
The price from the producer in Norway should now be the same in Norway and in Greenland (approximately NOK 3000).

From the 2001 Workshop in Sandefjord:
Recommendations:
1) To develop guidelines for methods used to undertake more controlled and standardised studies of the effect of different weapons and ammunition on different species.
Olsen and Øen will present a document to the Council meeting in March 2006 (item 5 below).

2) To harmonise weapons and ammunition types for different species with due considerations to variation in hunting conditions in the different countries and
3) To focus on seals and seal hunting.
The Workshop on Hunting Methods for Seals and Walrus held in Copenhagen 2004 was convened as a direct response to recommendations 2 and 3 above.

From the 2004 Workshop in Copenhagen:
The recommendations from this workshop were very general, and as such not easily convertible into action. One direct result however, is the planned Workshop on Struck and Lost that will be held in Copenhagen in November 2006.

Generally the Committee recommended that all member countries review the various recommendations to check whether those pertaining to a certain country have actually been implemented in that country's laws and regulations.

4. WORKSHOP TO ADDRESS THE PROBLEMS OF STRUCK AND LOST, COPENHAGEN 14 – 16 NOVEMBER 2006

Winsnes gave an update on the present status of preparations. The meeting room has been confirmed at Nordatlantens Brygge in Copenhagen for the period 14 to 17 November 2006. In the anticipation that this Workshop will be similar to the one in 2004 the budget has been tentatively set to NOK 500 000. A more precise budget will be developed after this meeting. Based on previous experience the most costly items are meeting facilities (rental and interpretation equipment), interpreters and travel support.

Indigenous Survival International has indicated that they will contribute with some funding and applications will be sent to Nordic Council of Ministers - NMC- (Committee on Fisheries) and NORA. After consulting with the secretary and the chair of the Committee of Fisheries (NMR) the understanding is that they are positive but will not give any promises before having defined the financial needs of a big Conference being planned for 2006 under the auspices of the NMC. Clarification on funding from NMR will therefore probably not be available before March.

NAMMCO at its last annual meeting last year allocated NOK 100 000 to the Workshop. However, given that the financial situation is still somewhat uncertain, the Committee agreed that they would ask the NAMMCO Council for an enlarged financial reassurance for the Workshop.

The Workshop fee will be differentiated between representatives from organisations and private persons/students, and the Workshop will be open for all interested in attending. The "open door" policy, which has always been the rule in previous workshops, has never caused any problems. On the contrary the Committee agreed that it has always been beneficial to be open an honest about the issues at hand.

Øen emphasised the importance of having representation from Chukotka, Canada (both Arctic and Atlantic) and Alaska. Participation from Chukotka most probably requires that we pay for their travel and accommodation. Even though this is costly the Committee agreed that the Workshop would gain much through their contributions.

Based on background document NAMMCO/HM-January 2006-4 Draft proposal for the Workshop, the Committee had a thorough discussion on the various aspects of the Workshop programme, format and possible speakers. The Secretariat was tasked with contacting the proposed speakers etc, sending out invitations as soon as the preliminary programme was finalised, in addition to the overall management of the preparations for the Workshop.

The next meeting of the Organising Committee will be a telephone meeting scheduled for the end of May.

5. GUIDELINES FOR METHODS TO UNDERTAKE CONTROLLED AND STANDARDISED STUDIES OF THE EFFECT OF DIFFERENT WEAPONS AND AMMUNITION ON DIFFERENT SPECIES

Document NAMMCO/HM-January 2006-5 had been prepared by Olsen and Øen and was presented to the Committee for comments. Olsen explained the background for the paper and Øen went through the paper in detail.

The Committee made the following recommendations:

- New title: *"Shooting trials on heads of dead pilot whales. Guidelines to test the efficiency of rifle ammunition used for hunting and euthanasia of small whales"*
- Move table 1 under paragraph Results
- Under paragraph Draft Guidelines give more detailed information under each item
- Some minor editorial changes conveyed to the authors directly.

The paper will be presented to the Council at its meeting in March as a direct follow up of recommendations made at the workshops in 1999 and 2001 (see item 3 above).

6. NEXT MEETING

The next meeting will be held in Copenhagen in January 2007.

7. ANY OTHER BUSINESS

7.1. Greenland bans import of seal products

In response to pressure from animal welfare groups like the Human Society of the United States (HSUS) and following reports on the Canadian seal hunt in the Danish television news, the Greenland government (Landstyre) issued an import ban on sealskin from Canada on 6 January arguing that the killing methods were not acceptable.

The Committee viewed the report on video and felt it pertinent to issue the following statement to the NAMMCO Council to rectify the allegations made in the television news reports.

The NAMMCO Committee on Hunting Methods held its annual meeting in Copenhagen 11-12 January 2006. During the meeting the Committee was informed about recent reports about the Canadian seal hunt in the Danish Television news (DR 1, 5th January 2006 at 18:00 hr), in which it was stated that thousands of seals are skinned alive while fully conscious after being clubbed. In response to these allegations the Committee drew attention to the following.

The Committee hosted a workshop in September 2004 where hunting methods for seals and walrus around the world were discussed and evaluated in detail. Hunters, managers and researchers participated in the workshop. Hunting methods in Canada were presented in detail, and research on the killing methods showed that 98% of young seals shot with rifles were killed instantaneously, and that clubbing with a "hakapik", when properly used, was probably even a more effective and humane killing method for young seals (NAMMCO Workshop on Hunting Methods for Seals and Walrus, pp.57-60). This high rate of stunning is most likely as, or more effective than, stunning methods commonly used in slaughter houses.

Reflex movements are common in all animals after they have been stunned, but are especially prevalent and long-lasting in marine mammals. Swimming reflexes are stereotypical movements of recently killed seals. These reflex movements can continue for several minutes after the seal is dead, and are characterized by vigorous lateral movement of the body. The presence of these movements has often been wrongly interpreted to indicate that the seal is still alive and conscious and therefore "skinned alive."

7.2. Recent focus on killing methods for minke whales

There is interest in developing alternative killing methods for minke whales in Greenland today. Especially with respect to the rifle hunt, the development of alternative methods would be beneficial. The time seems optimal because the medium sized whaling boats carrying harpoon canons are old and may soon be condemned. The trend is that the new fishing fleet will consist of either smaller or much larger boats.

Bearing in mind that the development of new weapons and techniques are very time- and resource consuming the Committee nevertheless encourages innovation in hunting methods that takes into consideration both the safety of the hunter and the killing efficiency for the animal.

8. ADOPTION OF REPORT

The report was approved through correspondence on 23 February 2006.

Appendix 1

LIST OF LAWS AND REGULATIONS IN NAMMCO MEMBER COUNTRIES

(Updated February 2006)

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
- No. 25 of 18 December 2003 on animal welfare
- No. 29 of 18 December 2003 on nature protection

Executive Order

- 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. 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
- No. 2 of 12 February 2004 on protection and hunting of beluga and narwhal
- No. 10 of 13 April 2005 on hunting on large whales
- No. 21 of 22 September 2005 on protection and hunt of polar bears

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

ICELAND

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-45-2006, 20.2.2006	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.
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 January 2006)

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SECTION 2 – MANAGEMENT COMMITTEE

2.1
REPORT OF THE MANAGEMENT COMMITTEE

Selfoss, Iceland, 15 March 2006

1.-3. CHAIRMAN'S OPENING REMARKS

The Chair of the Management Committee, Halvard P. Johansen, welcomed delegations and observers to the meeting. Participants to the meeting are listed in Section 5.1 of this volume. The agenda, as contained in Appendix 1, was adopted. Documents available to the meeting are listed in Appendix 2. The Secretariat was appointed as rapporteur for the meeting.

4. NATIONAL PROGRESS REPORTS

National Progress Reports for the year 2004 were available from the Faroe Islands, Greenland, Iceland and Norway. In addition a Progress Report was provided by Canada and brought to the Management Committee as an information item. The Management Committee expressed its appreciation to Canada for providing the report. Greenland informed the Committee that information that was noted as lacking in a previous report would be provided. Norway suggested that in future, information on management systems should be provided in National Progress Reports – a proposal that was supported by the Faroes who also wanted more comprehensive coverage of management aspects. Greenland drew attention to the fact that the Committee on Hunting Methods regularly included a listing of hunting regulations and that perhaps this could be circulated more widely. It was agreed that such information should be included in all subsequent National Progress Reports.

5. STATUS OF PAST PROPOSALS FOR CONSERVATION AND MANAGEMENT

The Committee considered document NAMMCO/15/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

Last year Greenland informed the Committee of a planned regulatory initiative that would establish quotas for walrus. Greenland noted that the regulatory initiative had been delayed but was expected to be introduced this year.

5.2 Ringed seal

There was nothing to report under this item.

5.3 Harp seal

5.3.1 Northwest Atlantic

Greenland noted that there had still been no bilateral consultations with Canada on management of this stock, which is shared between the two countries. The Observer for Canada informed the Committee that a new multi-year management plan is in preparation, and that consultations with Greenland would be arranged in the near future.

5.3.2 White/Barents Sea
Last year Norway reported on a joint venture project between Russian and Norwegian commercial interests to conduct sealing in the White Sea using small vessels, as is done in Canada. The project is underway and Norway will continue to keep NAMMCO informed on progress in this area.

5.3.3 Greenland Sea
Norway reported that quotas for this stock have been roughly doubled since 2005, based on advice from NAMMCO and ICES. However at present there is insufficient capacity to take higher quotas, so catches are expected to be much lower than the quotas.

5.4 Hooded seal
A survey covering all stocks was carried out in 2005. Norway reported that, based on preliminary results from these surveys, which suggested that pup production was lower than expected, quotas have been reduced for the Greenland Sea stock. A new survey will be carried out in the near future. Greenland noted that it had given Norway permission to take seals within the Greenland EEZ this year.

5.5 Grey seal
In 2004 the Management Committee recommended that both Iceland and Norway should define clear management objectives for grey seals.

Norway reported that a management plan for grey seals is presently under development. Recent catches have been lower than the quota levels in most areas. In response to a query from Greenland, Norway informed the Committee that grey seals are not managed in cooperation with other jurisdictions as there is believed to be little exchange among stocks.

The Faroe Islands noted that a drastic decline in salmon aquaculture had likely led to a decline in killing of grey seals that were a nuisance to the industry.

5.6 Northern bottlenose whales
There was nothing to report under this item.

5.7 Long-finned pilot whales
There was nothing to report under this item.

5.8 Minke whales – Central North Atlantic
There was nothing to report under this item.

5.9 Beluga - West Greenland
Greenland noted that a quota system for beluga had been introduced in 2004, and the

quota for 1 July 2004 to 30 June 2005 of 320 had not been fully harvested due mainly to poor weather conditions. The quota for 2005/2006 is 220.

5.10 Narwhal - West Greenland

Greenland noted that a quota system for narwhal had been introduced in 2004, and the quota for 1 July 2004 to 30 June 2005 of 300 had been nearly fully taken. The quota for 2005/2006 of 260 had been raised to 310 during the hunting season, mainly because hunter observations suggested that narwhal numbers were larger than expected and because the original quota levels were exceeded.

5.11 Fin whales - East Greenland - Iceland stock area

There was nothing to report under this item.

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

There was nothing to report under this item (but see item 10).

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 (NAMMCO/15/MC/4, Appendix 4). In addition the Chairman of the Scientific Committee updated the Management Committee on the status of outstanding requests from the 2005 meeting of the Scientific Committee:

Marine mammal – fisheries interactions

In 2004 the Management Committee agreed that the Scientific Committee should monitor progress made in multi-species modelling and in the collection of input data and decide when enough progress has been made to warrant further efforts in this area. There has not been enough progress to warrant a working group meeting in 2006.

White-beaked, white-sided and bottlenose dolphins

There was still insufficient information to move forward on this request for an assessment. This may become feasible once feeding, genetic and life history studies have been completed in Iceland, the Faroes and Norway, and when new abundance estimates become available from the SCANS II, NASS and other sightings surveys. In addition a cooperative international satellite tagging programme will be conducted in Iceland in 2006. An assessment could probably be conducted by 2008 at the earliest.

Humpback whales

In 2005, the Scientific Committee was requested to assess the sustainable yield levels for humpback whales, particularly those feeding in West Greenlandic, Icelandic and Norwegian waters. The Scientific Committee decided to postpone the provision of advice for West Greenland until a new abundance estimate is available, probably in 2006. Sufficient information on historical catch, abundance and stock structure is available at present to conduct assessments for the Icelandic and Norwegian stocks. However, given other priorities, the Committee considered it advisable to delay this assessment until after the completion of the NASS-2007 survey (TNASS), when an additional estimate of abundance should become available

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

There was no comment on the following items:

7.1 Economic aspects of marine mammal - fisheries interactions
7.3 Grey seals
7.5 Harbour porpoise
7.8 Fin whales
7.9 Minke whales
7.10 White-beaked, white-sided and bottlenose dolphins
7.11 Humpback whales
7.12 Killer whales
7.14 Harbour seals
7.15 Ringed seals

However, the Management Committee endorsed the research recommendations outlined in the Scientific Committee report, where applicable.

7.2 Harp and hooded seals

7.2.1 Proposals for conservation and management

The Management Committee noted the conclusion of the Scientific Committee that the framework for the management of these species proposed by the ICES/NAFO Working Group would not be useful for NAMMCO for technical reasons and because the management objectives inherent in the framework were inflexible. In the case of harp and hooded seals, where management goals may in the future be defined in relation to ecosystem based objectives, more flexibility will be required than is allowed in this framework.

As suggested by the Scientific Committee in 2004, the Management Committee recommended that NAMMCO explore the possibility with ICES and NAFO of assuming a formal joint role in the Working Group on Harp and Hooded Seals. The Secretariat should contact ICES and NAFO in this regard. As a starting point, the Working Group, jointly with the NAMMCO Scientific Committee, should be asked to provide advice on outstanding requests (see NAMMCO Annual Report 2004, p. 27).

Greenland specifically stressed the importance of these outstanding requests, and indicated that they would expect a more complete discussion next year.

7.4 Walrus

7.4.1 Proposals for conservation and management

There was noting to report under this item.

7.4.2 New requests for advice

The Management Committee recommended that the Scientific Committee should provide advice on the effects of human disturbance, including fishing and shipping activities, in particular scallop fishing, on the distribution, behaviour and conservation status of walrus in West Greenland.

7.4.3 Recommendations for scientific research

The recommendations for research contained in Section 9.13.1 of the Report of the Scientific Committee were endorsed.

7.6 Beluga - West Greenland

7.6.1 Proposals for conservation and management

This year the Scientific Committee provided similar advice to that given previously, that reducing catches to 100 per year will have an 80% chance of halting the decline in beluga numbers by 2010. Maintaining higher catches reduces the probability of halting the decline. This conclusion was reached in a joint meeting with the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB) Scientific Working Group, using the best scientific advice available. Similar advice was first provided in 2000 and has been confirmed and reiterated in meetings held in 2003 and 2004.

It is apparent that there continues to be considerable disagreement between scientists and hunters on beluga stock structure, life history, and especially abundance and trends. While recognising the existence of this disagreement, the Management Committee concluded that it is nevertheless necessary to manage beluga in a precautionary manner in the face of uncertainty and apparently contradictory evidence. In this regard it was noted that the present quota of 200 was twice that recommended by the Scientific Committee.

While commending Greenland for the recent introduction of quotas and reduction in the harvest, and recognising that the actual catch in 2004/2005 was within the level recommended, the Management Committee expressed serious concern that present quotas for beluga in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB Scientific Working Group, are not sustainable and will lead to further reduction of the stock.

In 2000 NAMMCO accepted that the JCNB would provide management advice for this stock. The Management Committee therefore strongly urged the JCNB and the Government of Greenland to take action to bring the removal of belugas in West Greenland to sustainable levels.

7.6.2 Requests for scientific advice

The Management Committee recommended that the Scientific Committee provide advice on the effects of human disturbance, including noise and shipping activities, on the distribution, behaviour and conservation status of belugas, particularly in West Greenland.

7.6.3 Recommendations for scientific research

The recommendations for research and future work contained in Annex 1, Section 6.5 of the Report of the Scientific Committee were endorsed.

Surveys for estimating abundance and trends are an essential component of the assessment of the conservation status of all marine mammals. The Management Committee recognises that the planning, conduct and interpretation of surveys is a very contentious issue among hunters, managers and scientists in Greenland. Such surveys must be planned using the best available expertise, including input from hunters, so that all will have confidence in their results. The Committee therefore recommends that future surveys for beluga should be planned using the international expertise available through the Scientific Committee of NAMMCO, and with input from hunters at the planning stage. In addition, if and when new survey methods are applied, they should be calibrated against previously used methods so that the validity of the survey series for determining trends in abundance is ensured.

7.7 Narwhal - West Greenland

7.7.1 Proposals for conservation and management

This year the Scientific Committee provided similar advice to that given in 2004, that the total removal of narwhals in West Greenland should be reduced to no more than 135 individuals. This advice was provided with even greater emphasis due to the fact that all models reviewed suggested total annual removals even lower than this. This conclusion was reached in a joint meeting with the JCNB Scientific Working Group, using the best scientific advice available.

It is apparent that there continues to be considerable disagreement between scientists and hunters on narwhal stock structure, life history, and especially abundance and trends. While recognising the existence of this disagreement, the Management Committee concluded that it is nevertheless necessary to manage narwhals in a precautionary manner in the face of uncertainty and apparently contradictory evidence. In this regard it was noted that the 2004/2005 quota was 300 and that the quota for 2005/2006 of 260 was raised to 310. These quotas are more than two times the level recommended by the Scientific Committee.

While commending Greenland for the recent introduction of quotas and reduction in the harvest, the Management Committee expressed serious concern that present takes of narwhal in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB Scientific Working Group, are not sustainable and will lead to further depletion of the stock.

In 2000 NAMMCO accepted that the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB) would provide management advice for this stock. The Management Committee therefore strongly urged the JCNB and the Government of Greenland to take action to bring the removals of narwhals in West Greenland to sustainable levels.

7.7.3 Recommendations for scientific research

The recommendations for research contained in Annex 1, Section 5.7 of the Report of the Scientific Committee were endorsed.

The recommendation with regard to surveys in item 7.6.3 above, applies also to narwhal.

7.13 North Atlantic Sightings Surveys

The Management Committee noted that the proposed extended area TNASS in 2007 could provide new information on stocks and species for which requests for advice are still outstanding. (See also discussion at the end of item 11.)

8. REPORT OF THE WORKING GROUP ON BY-CATCH

The Working Group held a meeting on 13 March 2006, and the Report from the meeting is included in Section 2.2.

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

The Working Group reviewed the progress of member countries in establishing systems to effectively monitor by-catch. There have been no changes in the past year in the by-catch monitoring systems in the Faroes, Greenland and Iceland. In 2005 in Norway two new by-catch monitoring programmes were introduced (see below).

Evaluation of procedures developed and implemented by NAMMCO Member Countries

In 2005 Norway introduced two new programmes to monitor by-catch: an independent observer (IO) programme for large vessels, and "reference fleet" (RF) programmes for large and small vessels. These are described in detail in Section 2.2, Part 4.2.1. It is anticipated that extrapolation of by-catch estimates to entire fisheries will be feasible sometime in 2007. The Working Group welcomed the progress by Norway in monitoring by-catch in coastal and offshore fisheries and will await the results of the evaluation next year.

In 2004 the Scientific Committee recommended that full uncertainty should be incorporated into the by-catch estimates from the Icelandic logbook programme and the experimental gillnet survey, and these estimates were presented this year (Section 2.2, Part 4.2.2). The Working Group welcomed Iceland's progress in fulfilling this technical recommendation by the Scientific Committee. It was noted that the level of precision for the most commonly caught species, the harbour porpoise, may be acceptable even with the present low rate of reporting in the logbook programme. However the potential for negative bias in estimates from this programme still needs to be addressed, and the Working Group referred to the recommendations of the Scientific Committee (NAMMCO 2005) for doing so.

Evaluation of the potential risk of marine mammal by-catch in the fishery within the NAMMCO area

In 2004 the Management Committee recommended that 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. In 2005, documents from Iceland and the Faroe Islands were reviewed. This year, documentation was received from Greenland (partial) and Norway.

Greenland

Fisheries in Greenland and their potential for by-catch are described in Section 2.2, Part 5.1. The Working Group considered this work to be incomplete as it did not provide descriptions and spatial distributions of all fisheries in sufficient detail and provided no information on the potential for overlap with marine mammals. Nevertheless this was considered a first step in assessing the potential for by-catch in Greenland. In this regard the Working Group noted that there was potential for marine mammal by-catch in near-shore gillnet and trap fisheries for several species, but at present there is no way to assess the magnitude of by-catch that is occurring.

Norway

Fisheries in Norway and their potential for by-catch are described in Section 2.2, Part 5.1. In addition, the distributions of several species of toothed and baleen whales are well known for the summer months but poorly described for the remainder of the year. These distributions show considerable overlap with those of fisheries. However, these provide a static picture of fishery and marine mammal distribution, which in the real world are very dynamic both in space and time. Much more detailed data would be required to identify potential "hot spots" for marine mammal by-catch. The Working Group welcomed this contribution from Norway, noting that it added greatly to their understanding of Norwegian fisheries. The Working Group agreed with the conclusion that the coastal gillnet fishery probably has the highest risk of marine mammal by-catch and should be a priority for monitoring.

These reviews were originally requested in 2004 (NAMMCO 2004) for the purpose of developing recommendations and priorities for by-catch monitoring in member countries. While the reviews had proven quite useful in identifying fisheries that were most at risk for marine mammal by-catch, it was considered that further progress in this area would require much finer spatial and temporal resolution of both fishery and marine mammal distributions than was available for most areas. Therefore, the Working Group **recommended** that efforts be concentrated on developing effective monitoring programmes, especially for fisheries identified as being most at risk for marine mammal by-catch.

Reporting of by-catch to NAMMCO

The Working Group reviewed the by-catch information in the National Progress Reports applicable for 2004. This year all countries included the required section on by-catch in their progress reports, however the format was not followed in all cases. It is apparent that, without effective by-catch monitoring programmes in place, countries cannot report by-catch in a way that can be quantified. In no case would total by-catch be estimated from the data reported.

Proposal for a workshop on by-catch monitoring

The Terms of Reference for this working group indicate that its major focus is to improve the systems for collecting data on by-catch in NAMMCO member countries. Noting that, at present, no NAMMCO member country has an effective monitoring programme for marine mammal by-catch, the Working Group considered that there is potentially much to gain from learning from the experiences of other jurisdictions where monitoring programmes are more developed. The Working Group therefore proposed that NAMMCO host a workshop with the theme "Monitoring Marine Mammal By-catch". The details of the proposed workshop are given in Section 2.2, Part 7.1.

Recommendations

In 2005 the Working Group provided a number of recommendations to improve the monitoring of by-catch in NAMMCO member countries (NAMMCO 2005). At that time the Management Committee noted that the Working Group was not able to complete its assessment of the potential for marine mammal by-catch in NAMMCO member countries, and therefore agreed to postpone a full consideration of the recommendations put forward by the Working Group until the next annual meeting. The Working Group therefore reiterated the recommendations first put forward last year, with some additions and modifications (Section 2.2, Part 8).

The Management Committee commended the Working Group for their valuable and efficient work.

With regard to the recommendation by the Working Group to hold a workshop on by-catch monitoring, the Management Committee agreed that external expertise should be available to the Working Group if required. However, the Committee considered that it would be simpler and perhaps more efficient to invite external experts to participate directly in the Working Group, rather than holding a separate workshop. The Management Committee therefore directed the Secretariat to assist the Working Group in obtaining the expertise necessary to move forward at their next meeting.

The Management Committee supported the following recommendations put forward by the Working Group, and urged member countries to implement them in a timely manner:

1. The recommendations of the Scientific Committee made in 2005 to improve the estimation of by-catch from the Icelandic monitoring system (NAMMCO 2005) are supported.
2. The use of self reporting through fishery logbooks to estimate by-catch should be considered the minimum level of monitoring for NAMMCO member countries. To be effective, such a reporting system must report the presence or absence of by-catch for every gear set. It is also crucial that fishermen be kept informed about the programme.
3. Supplemental monitoring, probably through observer programmes, will be necessary for high risk fisheries and in cases of high conservation concern

where more precise and reliable estimates are required.

4. Target levels of precision for by-catch estimation should be established. While these may be species or stock specific it was considered likely that such a level would likely be at least as precise as that established by the EU, *i.e.* cv ≤ 0.3.
5. Norway should continue to develop its observer programme for offshore fisheries and the targeted collection of data from the coastal fishery, and provide estimates of by-catch with associated precision as soon as feasible.
6. Norway is in the process of revising their logbook system and introducing electronic logbooks. The effective recording of marine mammal by-catch should be a part of this process.
7. For Greenland, catch of marine mammals resulting from some coastal fisheries with mixed species catches should be specified with regard to catching method.
8. Greenland should complete the evaluation of the potential for marine mammal by-catch in fisheries presented in incomplete form to the Working Group this year.

9. IMPLEMENTATION OF THE JOINT NAMMCO CONTROL SCHEME

9.1 NAMMCO International Observation Scheme 2005

The Chair referred to the report of the NAMMCO International Observation Scheme under the Joint Control Scheme for the hunting of the marine mammals, prepared by the Secretariat (NAMMCO/15/MC/7). Charlotte Winsnes, Adminstrative Coordinator, presented the report to the Management Committee. For the 2005 season, the planned and approved observation activities were sealing in Iceland and Norway. However, due to low skin prices in Iceland in 2005 and the anticipation that there would be only minor hunting taking place in Iceland, the decision was made to focus on sealing in Norway alone.

One observer stayed on one sealing vessel going to the west ice and stayed onboard from 10 March to 2 May. The actual hunting period was from 24 March to 27 April in areas XIVa and IIa (ICES-division). No infringements were observed.

Prior to the observation period the observer participated in the course held for the Norwegian national inspectors. He had received and was briefed on the national laws and regulations pertaining to hunting of marine mammals in Norway, and was also provided with the Provisions of the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals.

The observer found that he could carry out his observations in accordance with the provisions of the Scheme. It was noted that NAMMCO has a well functioning system with onboard observations.

9.2 NAMMCO International Observation Scheme 2006

The Management Committee noted that the approved scope and range of the observation scheme for 2006 would be whaling in Greenland and Norway.

9.3 Other matters

Norway gave an update on the "Blue box" system which will be fully operational in Norway from 2006 and noted that implementation of the blue box may require some adjustments to the NAMMCO Control Scheme. The Management Sub-Committee on Inspection and Observation will carry out this revision.

10. USER KNOWLEDGE IN MANAGEMENT DECISION-MAKING

Charlotte Winsnes presented the published proceedings from the NAMMCO Conference on User Knowledge and Scientific Knowledge in Management Decision-Making held in Iceland in January 2003. The publication was well received and the Management Committee complimented the Secretariat for a job well done.

The Working Group on User Knowledge in Management was re-established under the chairmanship of Egil Ole Øen, Norway with the following new terms of reference:

1. To define in which areas of management and research a collaborating forum between users, managers and scientist would be beneficial;
2. To make recommendations as to how such a collaborative forum may be established.

Member countries were requested to appoint members to the WG.

Aqqaluk Lynge of the Inuit Circumpolar Conference (ICC) gave an intervention emphasising the importance of scientific knowledge as the basis of all discussion and decision-making, but also the importance of securing meaningful representation of user knowledge. It would be beneficial to get a better understanding of the work done in Alaska and Arctic Canada on these issues and for Greenland a possible solution would be to supply the KNAPK with a full-time biologist fluent in Greenlandic and Danish/English.

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

Johann Sigurjónsson (Chairman of the *Ad hoc* Working Group) presented the report. He summarised the main discussions and recommendations which are listed in the report (NAMMCO/15/MC/8, Section 2.3). Considerable discussion and comment followed.

The Faroes expressed appreciation for the report and noted that it would form a useful document for reference. The Faroes referred to the preamble to the NAMMCO Agreement which recognises the need to enhance research on the role of marine mammals in the ecosystem, including multi-species approaches to management, reminding members that NAMMCO has been committed to ecosystem-based approaches to management (EBM) from its inception. Also, in previous requests to the Scientific Committee, reference had often been made to considering the possible effects on feeding ecology and environment.

Lars Walløe, Chairman of the Scientific Committee stated that it was important to work on the ecosystem approach in management and reminded the Committee that Norway has been working on ecosystem modelling for several years, but experience has shown that ecosystems can be very complex. With reference to management plans – capelin in the Barents Sea – is a good example of a multi-species ecosystem approach to fisheries management, where supply of food for cod is considered in setting fisheries quotas. It is hoped that progress will be made on the important marine mammal ecosystem modelling work and whale feeding information currently being obtained in Iceland and Norway in the very near future. Models are necessary to an ecosystem approach. While EBM topic is important, it may also be incautious to make any concrete recommendations at this stage.

Greenland reported that an "Ecogreen" professor (based at the Greenland Institute of Natural Resources, Nuuk) has been employed to develop an ecosystem-based approach in Greenland. Greenland has no current EBM for marine mammals but this is not the case for other ecosystem components. Fishery policy approved in 2004 included EBM policies. It was noted that in Greenlandic waters 56 thousand tonnes of halibut are consumed by cetaceans annually: an amount more than double that consumed by the indigenous human population. Greenland stated that it looked forward to working with NAMMCO and WG participants on development of EBM.

Iceland stated that it sets great importance on EBM approaches and in understanding the ecosystem, and referred to the presentation of new results on the Icelandic Research Programme made by Gísli Víkingsson on the first day of the Annual Meeting.

The Faroes drew attention to other bodies that are currently working towards EBM and are currently reviewing and updating their mandates to incorporate this theme. It is important for NAMMCO to engage such other organisations in EBM, to coordinate efforts with them and to ensure that marine mammals are not forgotten in marine EBM. Particular reference was made here to NAFO, and also to the UN Law of the Sea which would be holding a meeting in June 2006 to consider EBM.

Lars Walløe, Scientific Committee Chairman, cautioned that the details of feeding models and interactions may take a long time to develop. Jóhann Sigurjónsson, Chairman of the *Ad hoc* Working Group, drew attention to the fact that it was important for NAMMCO to progress: NAMMCO had already made the first steps and that EBM is already on the agenda. We might be realistic and even pessimistic at times, but we must be committed to EBM and take a pragmatic, incremental approach as our knowledge and experiences increase. He recalled that in Iceland there had long been recognition that there may be ecological impacts of management decisions, and that historically Iceland had experimented with the sacrifice of one species to maximise another.

The General Secretary reminded the Committee that the *Ad hoc* Working Group report emphasised the importance of clear management objectives in EBM; these may change over time and in priority, and according to the ecosystem-species balance and the environment as well as the socio-economic situation prevailing.

With respect to the recommendations, Greenland considered that a framework checklist of items needed – so-called “shopping list” - is an important and useful idea. Greenland would like to explore how fishermen could be involved in the EBM approach. The Faroes noted that such a checklist should be defined, also impacts and effects down the line; user knowledge is already being taken into consideration to some extent. Attention was drawn particularly to the following points under Objective 2 in the recommendations:

> “Marine Mammals will be an important component of approaches in the NAMMCO area and therefore NAMMCO can play a significant role by:
>
> 1) ensuring that the appropriate data on marine mammals are available as input;
> 2) continuing to improve our understanding of all marine mammals that occur in these areas;
> 3) promoting an awareness of ecosystem-based management with managers and the general public;
> 4) coordinating inputs among regional approaches to ensure consistency in the way in which marine mammal data are incorporated.”

The Chair of the Management Committee proposed that a start should be made on the checklist while the work on ecosystem models progresses, and also that the *Ad hoc* Working Group should continue. At the same time he stated that it was important that adequate funding should be found nationally for the modelling work required. All members were in favour of this proposal, and Greenland requested that items listed on p.22 of the report Annex 1 should also be considered in the checklist development.

In conclusion on this matter, Geneviève Desportes (Faroes, coordinator of TNASS), enquired if the TNASS planning group should take ecosystem approaches into consideration, and, with reference to points 1 and 2, the importance of getting information on all marine mammals. While recognising that survey design was largely determined by target species, it was agreed that some additional effort could be made in collecting ancillary data and in allowing improvement of data collection for non-target species. Attempts to collaborate with fishery and oceanographic surveys, as well as global projects, such as within IPY (International Polar Year) could enhance cooperative research.

Recommendations:
The Management Committee recommended that the *Ad hoc* Working Group should continue and meet inter-sessionally, and contact other bodies dealing with marine resource and fisheries management in order to consider EBM approaches in marine mammal management and develop a checklist as recommended in the report. The Working Group should report back at the next Annual Meeting.

12. ELECTION OF OFFICERS – CHAIR AND VICE-CHAIR OF COUNCIL

Halvard P. Johansen (Norway) was re-elected as Chair, and Ásta Einarsdottír (Iceland) was re-elected as vice-Chair.

13. ANY OTHER BUSINESS

There was no other business.

14. ADOPTION OF REPORT

The draft report containing all important points was presented to Council, but formal adoption of the Management Committee report was by correspondence.

Appendix 1

AGENDA

1. Chairman's opening remarks
2. Adoption of agenda
3. Appointment of rapporteur
4. National Progress Report
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 Grey seal
    - 5.6 Northern bottlenose whales
    - 5.7 Long-finned pilot whales
    - 5.8 Minke whales – Central North Atlantic
    - 5.9 Beluga - West Greenland
    - 5.10 Narwhal - West Greenland
    - 5.11 Fin whales - East Greenland - Iceland stock area
    - 5.12 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 Grey seals
        - 7.3.1 Proposals for conservation and management
        - 7.3.2 New requests for advice
        - 7.3.3 Recommendations for scientific research
    - 7.4 Walrus
        - 7.4.1 Proposals for conservation and management
        - 7.4.2 New requests for advice
        - 7.4.3 Recommendations for scientific research
    - 7.5 Harbour porpoise
        - 7.5.1 Proposals for conservation and management

- 7.5.2 New requests for advice
- 7.5.3 Recommendations for scientific research

7.6 Beluga - West Greenland
- 7.6.1 Proposals for conservation and management
- 7.6.2 New requests for advice
- 7.6.3 Recommendations for scientific research

7.7 Narwhal - West and East Greenland
- 7.7.1 Proposals for conservation and management
- 7.7.2 New requests for advice
- 7.7.3 Recommendations for scientific research

7.8 Fin whales
- 7.8.1 Proposals for conservation and management
- 7.8.2 New requests for advice
- 7.8.3 Recommendations for scientific research

7.9 Minke whales
- 7.9.1 Proposals for conservation and management
- 7.9.2 New requests for advice
- 7.9.3 Recommendations for scientific research

7.10 White-beaked, white-sided and bottlenose dolphins
- 7.10.1 Proposals for conservation and management
- 7.10.2 New requests for advice
- 7.10.3 Recommendations for scientific research

7.11 Humpback whales
- 7.11.1 Proposals for conservation and management
- 7.11.2 New requests for advice
- 7.11.3 Recommendations for scientific research

7.12 Killer whales
- 7.12.1 Proposals for conservation and management
- 7.12.2 New requests for advice
- 7.12.3 Recommendations for scientific research

7.13 North Atlantic Sightings Surveys
- 7.13.1 Proposals for conservation and management
- 7.13.2 New requests for advice
- 7.13.3 Recommendations for scientific research

7.14 Others

8. Report of the Working Group on By-catch
9. Implementation of the Joint NAMMCO Control Scheme
   - 9.1 NAMMCO International Observation Scheme 2005
   - 9.2 NAMMCO International Observation Scheme 2006
   - 9.3 Other matters
10. User Knowledge in Management Decision-Making
11. Report of the *ad hoc* Working Group on Enhancing Ecosystem-Based Management
12. Election of officers – chair and vice-chair of management committee
14. Any other business
15. Adoption of report

Appendix 2

LIST OF DOCUMENTS

NAMMCO/15/MC/1	List of Documents
NAMMCO/15/MC/2	Agenda
NAMMCO/15/MC/3	Status of past proposals for conservation and management
NAMMCO/15/MC/4	Summary of active requests by NAMMCO Council to the Scientific Committee, and responses by the Scientific Committee
NAMMCO/15/MC/5	Report of the Management WG on By-Catch
NAMMCO/15/MC/7	Report of the implementation of the Observation Scheme in 2005
NAMMCO/15/MC/8	Report of the Ad Hoc WG on Enhancing Ecosystem-Based Management

NAMMCO/15/MC/NPR-F	Faroe Islands – Progress Report on Marine Mammals in 2004
NAMMCO/15/MC/NPR-G	Greenland – Progress Report on Marine Mammals in 2004
NAMMCO/15/MC/NPR-I	Iceland – Progress Report on Marine Mammals in 2004
NAMMCO/15/MC/NPR-N	Norway – Progress Report on Marine Mammals in 2004

NAMMCO/15/5 Report of the SC

Appendix 3

LIST OF PAST PROPOSALS FOR CONSERVATION AND MANAGEMENT

(Up to and including NAMMCO/15 - 2006)

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 overall 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*).
- Greenland informed the Committee that a regulatory initiative that will restrict walrus hunting to those holding valid hunting licences, and allow for the introduction of 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 (*NAMMCO/13*).
- Greenland announced that they plan introducing quotas for walrus, possibly in

2005. Greenland is awaiting the findings of the Scientific Committee in their assessment of walrus (*NAMMCO/14*)

- Last year Greenland informed the Committee of a planned regulatory initiative that would establish quotas for walrus. Greenland noted that the regulatory initiative had been delayed but was expected to be introduced this year (*NAMMCO/15*).

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 and hooded seals in the North Atlantic

3.1 Proposal for conservation and management

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 (*NAMMCO/13*).

The Management Committee noted the conclusion of the Scientific Committee that the framework for the management of these species proposed by the ICES/NAFO Working Group would not be useful for NAMMCO for technical reasons and because the management objectives inherent in the framework were inflexible. In the case of harp and hooded seals, where management goals may in the future be defined in relation to ecosystem based objectives, more flexibility will be required than is allowed in this framework. (*NAMMCO/15*)

Management measures/response by member countries:

None

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*).

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 *(NAMMCO/13)*.

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*)

Greenland informed the Management Committee that bilateral discussions with Canada on the Canadian Management Plan had taken place over the past year *(NAMMCO/13)*
Greenland noted that there had still been no bilateral consultations with Canada on management of this stock, which is shared between the two countries. The Observer for Canada informed the Committee that a new multi-year management plan is in preparation, and that consultations with Greenland would be arranged in the near future. (*NAMMCO/15*)

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:

- Norway informed the Committee that measures were being considered to improve the efficiency of the seal harvest in this area. The possibility of introducing smaller vessels into the seal hunt is being pursued. The long-term goal will be to reduce the need for subsidising the hunt and increase the take of seals from this stock *(NAMMCO/13).*
- Last year Norway reported on a joint venture project between Russian and Norwegian commercial interests to conduct sealing in the White Sea using small vessels, as is done in Canada. The project is underway and Norway will continue to keep NAMMCO informed on progress in this area.

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:

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. 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 *(NAMMCO/13).*
Norway reported that quotas for this stock have been roughly doubled since 2005, based on advice from NAMMCO and ICES. However at present there is insufficient capacity to take higher quotas, so catches are expected to be much lower than the quotas. (*NAMMCO/15*)

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*)

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 *(NAMMCO/13).*

Norway reported that, based on preliminary results from surveys, which suggested that pup production was lower than expected, quotas have been reduced for the Greenland Sea stock. A new survey will be carried out in the near future. Greenland noted that it had given Norway permission to take seals within the Greenland EEZ this year. (*NAMMCO/15*)

5. Grey Seal

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 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 *(NAMMCO/13).*

Management measures/response by member countries:

Iceland reported that the management objective for grey seals would be to maintain the stock size close to the current level, and that protective measures would be taken should further declines continue. A precondition to this objective will be careful monitoring of the stock size (*NAMMCO/14*). Norway reported that a management plan for grey seals is presently under development (*NAMMCO/14*). The Faroe Islands noted that a drastic decline in salmon aquaculture had likely led to a decline in killing of grey seals that were a nuisance to the industry. (*NAMMCO/15*)

CETACEANS

6. 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.

7. 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, 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*)

8. Minke Whales - Central North Atlantic

8.1 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.

8.2 Proposal for conservation and management

The Management Committee took note of the conclusions of the Scientific Committee with regard to the Central Atlantic Stock, which, 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.

9. Beluga - West Greenland

9.1 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 over-exploitation.
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 over-exploitation.
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*)

9.2 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.

9.3 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 cooperation 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/11)*

Management measures/response by member countries:

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 (NAMMCO/13).

Greenland informed the Committee that a quota of 320 had been introduced in West Greenland and Qaanaaq year-round from 1st July 2004. (*NAMMCO/14*)

Greenland noted that the quota for 2005/2006 is 220. (*NAMMCO/15*)

9.4 Proposal for conservation and management

The Management Committee expressed serious concern that present quotas for beluga in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB Scientific Working Group, are not sustainable and will lead to further reduction of the stock. The Management Committee therefore strongly urged the JCNB and the Government of Greenland to take action to bring the removal of belugas in West Greenland to sustainable levels. (*NAMMCO/15*)

10. Narwhal - West Greenland

10.1 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*)

10.2 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)*

Management measures/response by member countries:

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 (*NAMMCO 13*).

10.3 Proposal 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. *(NAMMCO 13)*

Management measures/response by member countries:

Greenland informed the Committee that quotas of 200 in West Greenland and 100 in Qaanaaq had been introduced in 2004 (*NAMMCO/14*).
Greenland noted that the quota for 2005/2006 of 260 had been raised to 310 during the hunting season, mainly because hunter observations suggested that narwhal numbers were larger than expected and because the original quota levels were exceeded (*NAMMCO/15*).

10.4 Proposal for conservation and management

The Management Committee expressed serious concern that present quotas for narwhal in West Greenland, according to the advice of both the NAMMCO Scientific Committee and the JCNB Scientific Working Group, are not sustainable and will lead to further reduction of the stock. The Management Committee therefore strongly urged the JCNB and the Government of Greenland to take action to bring the removal of narwhals in West Greenland to sustainable levels. (*NAMMCO/15*)

11. North Atlantic fin whales

11.1 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 sub-stock 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" sub-stock, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that the "offshore" sub-stock 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

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

12.1 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 cooperation with the hunters. (*NAMMCO/9*)

Management measures/response by member countries:

Status Reports under development.

12.2 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

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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 NAMMCO/15 - 2006), and notes the response of the Scientific Committee (SC) to these requests. Requests forwarded from NAC (North Atlantic Committee for Cooperation 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. Unless otherwise stated the status of the request and response is ongoing.

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 – Status: COMPLETED
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 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 multi-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 8th 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 consumption - 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 multi-species 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:

The Scientific Committee convened a Working Group to to review the progress that has been made in the last two years, in 2 specific areas: 1) quantifying the diet and consumption of marine mammals, and 2) the application of multi-species models that include marine mammals to candidate areas of the North Atlantic (SC/12).

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:

Forwarded to ICES.

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/2
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: 4.1.1/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: 4.1.2/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: 4.1.3/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: 4.1.4/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 4.1.3.

Code/Meeting: 4.1.5/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: 4.1.6/NAMMCO/9
Request:

The Management Committee recommended that the Scientific Committee continue its efforts to coordinate 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: 4.1.7/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: 4.1.8/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 coordinate 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:

The next NASS will take place in 2007, and planning will begin in 2006 (SC/12).

Code/Meeting: 4.1.9/NAMMCO/14
Request:

Efforts of the Scientific Committee to expand the NASS to include involvement from countries in the Western and Eastern Atlantic should be continued.

Response of the Scientific Committee:

It was decided to establish a steering group to begin planning NASS-07 and its coordination with other surveys. It is anticipated that a planning meeting, involving participation from all relevant jurisdictions, should be held sometime in 2006 (SC/13).

Central North Atlantic minke whales:

Code/Meeting: 4.2.1/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 coastal Iceland (SC/6).

Code/Meeting: 4.2.2/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: 4.2.3/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 Scientific Committee completed the assessment and provided advice on sustainable catches to the Council (SC/11).

Northern bottlenose whales:

Code/Meeting: 4.3.1/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 was 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: 4.3.2/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: 4.4.1/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 was 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: 4.4.2/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:

The Scientific Committee concluded that there was not enough information to carry out the assessment at this time, particularly for the West Greenland area. The Scientific Committee will review new information on killer whales annually with the aim of completing the assessment once sufficient information becomes available for a particular area (SC/12).

Long-finned pilot whales:

Code/Meeting: 4.5.1/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: 4.5.2/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: 4.6.1/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: 4.6.2/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: 4.6.3/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: 4.6.4/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 4.6.1. 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: 4.6.5/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:

The Scientific Committee concluded that West Greenland narwhal were depleted and recommended catch levels for the Inglefield Bredning, Uummannaq, Disko Bay and Melville Bay areas (SC/12)

Code/Meeting: 4.6.6/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:

The survey was not successful in 2004. Response is pending.

Code/Meeting: 4.6.7/NAMMCO/13

Request:

The Committee noted that a new survey will 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.

Response of the Scientific Committee:

The survey was not successful in 2004, and may be attempted again in 2005.

Code/Meeting: 4.6.8/NAMMCO/14

Request:

The Management Committee requested that the Scientific Committee carry out an assessment of East Greenland narwhal, and provide an estimate of sustainable yield for the stock. The management objective in this case is to maintain the stock at a stable level. If the assessment cannot be completed with available information, the Scientific Committee should provide a list of research that would be required to complete the assessment.

Response of the Scientific Committee:

Given that almost nothing is known about the stock structure and seasonal migrations of East Greenland narwhal, and that the abundance estimate for Scoresbysund is more than 20 years old, a reliable assessment is not possible without new information. Research recommendations are provided (SC/13).

Code/Meeting: 4.6.9/NAMMCO/15

Request:

The Scientific Committee should provide advice on the effects of human disturbance, including noise and shipping activities, on the distribution, behaviour and conservation status of belugas, particularly in West Greenland.

Response of the Scientific Committee:

Pending.

Code/Meeting: 4.6.10/NAMMCO/15

Request:

The Committee recommends that future surveys for beluga and narwhal should be planned using the international expertise available through the Scientific Committee of NAMMCO, and with input from hunters at the planning stage. In addition, if and when new survey methods are applied, they should be calibrated against previously used methods so that the validity of the survey series for determining trends in

abundance is insured (*NAMMCO/15*)

Response of the Scientific Committee:

Pending.

Harbour porpoises:

Code/Meeting: 4.7.1/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: 4.8.1/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 the report of the 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 coordinate 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: 4.8.2/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.

Code/Meeting: 4.8.3/NAMMCO/15
Request:

The Scientific Committee should provide advice on the effects of human disturbance, including fishing and shipping activities, in particular scallop fishing, on the distribution, behaviour and conservation status of walrus in West Greenland.

Response of the Scientific Committee:

Pending.

Harp and hooded seals:

Code/Meeting: 4.9.1/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 were forwarded to the 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: 4.9.2/NAMMCO/8
Request:

The Scientific Committee is requested to coordinate 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 coordinate 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: 4.9.3/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: 4.9.4/NAMMCO/12
Request:

The Management Committee noted that new information had recently 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: 4.9.5/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 the 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:

With regard to the Canadian Management Plan, the Scientific Committee concluded that the likely effect of the harvest levels outlined in the Plan was a slight drop in total abundance in the short term (3-5 years), and an accelerating decline if these harvest levels are maintained over a longer period (*ca* 10 years), and that the availability of seals to Greenlandic hunters would likely decrease as the total population decreased. (SC/12)

Code/Meeting: 4.9.6/NAMMCO/14
Request:

The Management Committee recommended that the Scientific Committee evaluate how a projected decrease in the total population of Northwest Atlantic harp seals might affect the proportion of animals summering in Greenland.

Response of the Scientific Committee:

Pending.

Code/Meeting: 4.9.7/NAMMCO/14
Request:

The Management Committee requested the Scientific Committee to specify harvest levels for these 2 stocks that would result in a population reduction of 20% over a period of 20 years.

Response of the Scientific Committee:

See 4.9.6

Ringed seals:

Code/Meeting: 4.10.1/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: 4.10.2/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: 4.11.1/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: 4.11.2/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 *Lagenorhynchus spp.):*

Code/Meeting: 4.12.1/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: 4.12.2/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: 4.12.3/NAMMCO/9
Request:

At its 8th 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 coordinate 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 programme 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: 4.12.4/NAMMCO/9

Request:

The Management Committee noted that bottlenose 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 bottlenose dolphins also be included in this assessment

Response of the Scientific Committee:

See 4.12.3

Code/Meeting: 4.12.5/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: 4.12.6/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 two 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: 4.13.1/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: 4.13.2/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, focusing in the near term on the status of fin whales in Faroese territorial waters. The Scientific Committee should focus particularly on the following issues:

1. 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 programme primarily geared to understanding the stock relationships of fin whales around the Faroes.

Code/Meeting: 4.13.3/NAMMCO/10
Request:

The Management Committee noted that the requested assessment 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: 4.13.4/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 Scientific Committee completed assessments of EGI and Faroese fin whales. Future effort will be concentrated on Northeast Atlantic fin whales. (SC/11)

Code/Meeting: 4.13.5/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: 4.14.1/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: 4.14.2/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:

Mainly because of a lack of current information on abundance, the Scientific Committee was unable to complete the Assessment for West Greenland. The Scientific Committee noted that they would be able to estimate sustainable yield levels for humpback whales in the Northeast Atlantic. (SC/12)

Code/Meeting: 4.14.3/NAMMCO/14
Request:

The Scientific Committee is requested to continue its assessment of humpback whale stocks in the North Atlantic. For West Greenland, the Scientific Committee should assess the long-term effects of annual removals of 0, 2, 5, 10 and 20 whales. For the Northeast Atlantic the Scientific Committee should provide estimates of sustainable yield for the stocks. In all cases the management objective would be to maintain the stocks at a stable level. The Scientific Committee should identify information gaps that must be filled in order to complete the assessments.

Response of the Scientific Committee:

The Committee decided to postpone the provision of advice for West Greenland until a new abundance estimate is available, probably in 2006. Sufficient information on historical catch, abundance and stock structure is available at present to conduct assessments for the Icelandic and Norwegian stocks. However, given other priorities, the Committee considered it advisable to delay this assessment until after the completion of the NASS-2007 survey, when an additional estimate of abundance should become available (SC/13).

Harbour seal:

Code/Meeting: 4.15.1/NAMMCO/14
Request:

Harbour seal abundance has fluctuated in the Northeast Atlantic in recent years due to local outbreaks of viral distemper. Usually these outbreaks have been followed by rapid recoveries, and harbour seal abundance may have increased in many areas. In some areas, harbour seals are harvested and/or taken incidentally by fisheries and aquaculture operations (*e.g.* Greenland, Norway and Iceland). They also have significant direct and indirect interactions with fisheries in many areas. For these reasons, the Scientific Committee is requested to:

- Review and assess the status of harbour seals throughout the North Atlantic;
- Review and evaluate the applied survey methods;
- Assess stock delineation using available data on genetics, spatial and temporal distribution and other sources;
- review available information about harbour seal ecology;
- Identify interactions with fisheries and aquaculture.

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

13 March 2006, Selfoss

Droplaug Ólafsdóttir, chair of the Working Group, welcomed the participants to the meeting: The following were present: Dr Arne Bjørge (Norway), Ms Lisbeth Plassa (Norway), Mr Bjarni Mikkelsen (Faroe Islands), Mr Fernando Ugarte (Greenland), Mr Ole Heinrich (Greenland), and Mr Daniel Pike and Dr Christina Lockyer from the Secretariat.

1. ADOPTION OF AGENDA

The draft agenda (Appendix 1) was adopted. The List of Documents is provided in Appendix 2.

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

Bjørge reported on progress in implementing Council Regulation 812/2004 pertaining to the incidental catch of cetaceans in fisheries in European Union waters, which entered into force in July 2004. The regulation includes measures restricting Baltic Sea drift net fisheries, providing for mandatory use of acoustic deterrent devices (pingers) in some fisheries, and the use of onboard observers on vessels of over 15 m in length. Further details were provided in the 2005 report of this Working Group (NAMMCO 2005). An evaluation workshop is scheduled for 2007 but may be delayed. There have been problems in some areas with the introduction of pingers into the fishery, and some reluctance by fishermen to use them because of technical difficulties. The Working Group will continue to monitor progress in implementing this regulation.

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** since last year. Fishery logbooks are mandatory for all vessels larger than 110 BRT, however the reporting of by-catch in these logbooks is encouraged but not required. The logbooks are not formatted for recording by-catch, and such records must be entered as supplementary comments. There is no logbook system in place for smaller boats. Mikkelsen noted that there had been a close cooperation between fisheries and science, and that there was no indication that substantial numbers of marine mammals were being by-caught.

Ugarte reported that, since last year, the format of the mandatory logbook reporting system in **Greenland** has been changed so that reporting of marine mammal by-catch is explicitly required. In most cases by-catch of small whales and seals in coastal fisheries is thought to be included in the catch statistics but there is no way to separate out by-catch from directed catch. By-catch of large whales is probably always reported because the fisherman must seek permission from the Department of Hunting before the whale can be killed and utilised, and the fisherman can receive compensation for damaged gear.

Ólafsdóttir reported that the by-catch monitoring programme in **Iceland** is unchanged from last year. The reporting of marine mammal by-catch in fishery logbooks is mandatory on all vessels. However reporting in most fisheries is very poor. An effort to introduce a procedure for reporting marine mammal by-catch through the log book system was initiated for the gillnet fishing fleet in 2002, and the results from this programme were evaluated by the Scientific Committee and this Working Group last year (NAMMCO 2005). The recommendations for improvement of the reporting system made last year were accepted by Iceland, but there has been no progress in implementing them.

Bjørge noted that **Norway** had the legal instruments necessary to manage marine mammal by-catch, but to date data on by-catch had been lacking. The reporting of marine mammal by-catch in fishery logbooks has been mandatory since 2003 on vessels larger than 21 m. The fisheries statistical database has recently been updated to include fields for marine mammal by-catch. In 2005 two new programmes were introduced: an independent observer (IO) programme for large vessels, and "reference fleet" (RF) programmes for large and small vessels. In the RF programme vessels are contracted to provide detailed information on their catch, effort and by-catch. The main objective of the IO programme is to monitor catch composition in order to improve fishery regulations, and recording of by-catch is a secondary objective. The offshore RF programme is designed to improve catch and effort statistics to support fish stock assessment. The coastal RF programme is designed to provide detailed data on catch, effort, by-catch and the size distribution of the catch, including by-catches of marine mammals. Further details of these programmes are provided in Section 4.2.1.

4.2 Evaluation of procedures developed and implemented by NAMMCO Member Countries

4.2.1 Norway

Working papers NAMMCO/15/MC/BC/7 and NAMMCO/15/MC/BC/8 reported on progress in using the IO and RF programmes to monitor by-catch in coastal (NAMMCO/15/MC/BC/8), shelf and offshore fisheries (NAMMCO/15/MC/BC/7).

A team of onboard independent observers reported in 2005 from shelf and offshore long line fisheries (920,400 hooks), Danish seine (355 hauls), purse seine targeting saithe (64 sets), demersal trawl (3,693 hours), shrimp trawls (3,555 hours). No marine mammals were reported by-caught during the observed fishing operations. In 2005, ten contracted commercial vessels reported from demersal trawl (9,396 hours, 2,582 hauls), Danish seine (30 hauls), purse seine (71 sets), long lines (36,683,400 hooks) and gill net (64,530 nets) operations. No marine mammal was reported by-caught in the trawl, Danish seine, purse seine, and long line fisheries. In the gill net fisheries seven seals were reported by-caught: three grey seals in statistics area 6 (Lofoten area), and four harp seals in statistics area 21 (west of Svalbard).

In order to improve the fisheries statistics for coastal and inshore fisheries, a number of coastal fishing vessels were contracted to provide very detailed information on their fishing effort, catches, by-catches including incidental catches of seabirds and marine mammals. The skippers of a sub-sample of coastal fishing vessels less than 15 m total length were contracted and offered economic compensation for providing information on their fishing operations and catches. The financial compensation in combination with the selection procedure and a continuous personal dialog with the skippers contribute to the reliability of the reported information.

By the end of 2005 a total of 18 vessels was contracted, two vessels in each of nine fishery statistics areas. Fourteen of these vessels were contracted by 1st October and for these vessels information on effort, catch and by-catch were available for the period October-December 2005.

Forty marine mammals (26 harbour porpoises, 10 harbour seals and 4 grey seals) were by-caught by the contracted vessels during the period of October to December 2005. Information on the associated gear type, fishing effort and landed catches of target species was provided. The first period of data from the contracted fishing vessels indicates that this is a promising method for monitoring by-catches and estimating total removals of marine mammals by commercial coastal fisheries.

As data on marine mammal by-catches accumulate, the next step will be to estimate the magnitude of these by-catches by extrapolating from observed and reported fishing operations to entire fisheries. It is anticipated that this will be feasible sometime in 2007.

The Working Group welcomed the progress by Norway in monitoring by-catch in coastal and offshore fisheries. In discussion it was noted that monitoring 14 of the small vessels in the coastal fleet during a three-month period was unlikely to produce estimates of by-catch with acceptable precision, as this comprised a small proportion of the total number of gillnetters. However this will be evaluated once further data are accumulated. It was also noted that misreporting by RF vessels is possible and is difficult to detect. However the intention was to minimize the likelihood of misreporting by being careful in the choice of reference vessels, maintaining contact with the skippers and by closely monitoring their reports.

4.2.2 Other countries

In 2004 the Scientific Committee recommended that full uncertainty should be incorporated into the by-catch estimates from the Icelandic logbook programme and the experimental gillnet survey. In working paper NAMMCO/15/MC/BC/12 the original estimates of marine mammal by-catch in the gill net fishery presented by Ólafsdóttir and Gunnlaugsson (2004) were verified giving confidence limits for the estimates for each species, area and time period. In addition new estimates on by-catch from observer survey in 2005 were presented. The confidence limits for the average numbers of by-caught animals in nets were estimated using a bootstrap procedure by generating 1,000 resamplings of the by-catch data for each mammal species, area and time period. Estimates of the by-catch of harbour porpoise, the most commonly by-caught species, from the logbook programme had moderate precision (95% CI plus/minus 30-50%) for the total area, while estimates from the observer programme had lower precision. Estimates of the by-catch of harbour seals, the second most commonly caught species, had somewhat lower precision. For other species, precision was very poor because of the relative rarity of by-catch events. The precision of estimates from the logbook programme could be improved by increasing the number of reporting fishermen, which is only about 5% at present. However as noted by the Scientific Committee last year some of the critical assumptions underlying the estimation of by-catch from the logbook programme are unlikely to be always met and their failure will lead to the underestimation of by-catch. This is supported by the fact that the point estimates of harbour porpoise by-catch from the experimental gillnet survey are substantially higher than those from the logbook programme for similar time periods.

The Working Group welcomed Iceland's progress in fulfilling this technical recommendation by the Scientific Committee. It was noted that the level of precision for the most commonly caught species, the harbour porpoise, may be acceptable even with the present low rate of reporting in the logbook programme. In this regard the recommendation by the Scientific Committee to carry out an analysis of the level of observer coverage required to achieve an acceptable level of precision in by-catch estimates from the Icelandic gillnet fishery was reiterated. However the potential for negative bias in estimates from this programme still needs to be addressed, and the Working Group referred to the recommendations of the Scientific Committee (NAMMCO 2005) for doing so.

It was noted in the Working Paper that the estimated number of bycaught harbour seals is high relative to the known abundance of this species. It also seems likely that seals are bycaught in substantial numbers in the lumpfish fishery, however no estimates exist for this. The Working Group therefore reiterated its recommendation of last year that the Icelandic monitoring programme should be extended to include this fishery.

5. EVALUATION OF THE POTENTIAL RISK OF MARINE MAMMAL BY-CATCH IN THE FISHERY WITHIN THE NAMMCO AREA

5.1 Spatial and temporal overlap in the fishing activity and distribution of marine mammals within the NAMMCO area

Greenland

Working paper NAMMCO/15/MC/BC/9 presented a partial and preliminary description of fisheries in Greenland, including target species, area, season, gear type, regulatory regime and potential for marine mammal by-catch. Fisheries are regulated through a system of licences that limit the species to be fished, the area, the time of the year used for fishing and/or the amount of fish to be caught. Several species have total allowable catches in accordance with international advice. The Ministry of Fisheries and hunting in Greenland regulates the catch of 18 species belonging to 16 genera of fish, crustaceans and molluscs: Greenland halibut, Atlantic halibut, golden redfish, beaked redfish, cod, polar cod, common grenadier, northern grenadier, striped wolffish, spotted wolffish, capelin, Atlantic salmon, lumpfish, Arctic char, shrimp, snow crab and scallop. Besides these commercially and/or culturally important species, there are occasional catches of other species, such as blue whiting, American plaice or Atlantic herring. The most important fisheries are those for shrimp and Greenland halibut. In the latter fishery, gillnets are used and there is some potential for by-catch. Coastal fisheries for cod, lumpfish, salmon and Arctic char also use gillnets. Pound nets set for cod and traps set for crab have resulted in occasional entanglements of humpback whales. Given that the vast majority of the fishermen who deploy fishing gear have a hunting licence, it was considered likely that most by-catch of seals and small cetaceans is consumed or sold in the same way as the animals that are shot with rifle, and probably enters the catch statistics but is not distinguished as by-catch.

The best known by-catch problem in Greenland is the entanglement of humpback whales in fishing gear. Most entanglements occur in crab pot lines and stationary pound nets, but set gillnets are also at risk. The meat of by-caught humpback whales is distributed among municipal institutions, such as hospitals and schools, and among the public that gathers where the whales are being flensed. The flensing of a humpback whale is an important social and cultural event. The by-catch benefits the community in the form of free meat and work for whaling and flensing crews. However, the affected fishermen lose because their lost and damaged gear is only partially compensated by the government, according to the fishermen's economic status. In addition, the government absorbs costs associated with replacement of damaged gear and the flensing and distribution of the whale.

The Working Group considered this work to be incomplete as it did not provide descriptions and spatial distributions of all fisheries in sufficient detail and provided no information on the potential for overlap with marine mammals. Nevertheless this was considered a first step in assessing the potential for by-catch in Greenland. In this regard the Working Group noted that there was potential for marine mammal by-catch in nearshore gillnet and trap fisheries for several species, but at present there is no way to assess the magnitude of by-catch that is occurring. The Working Group recommended the completion of this report.

Norway

Working paper NAMMCO/15/MC/BC/6 presented an overview of the main Norwegian fisheries with regard to landings, spatial and temporal distribution of catches, and the distribution of the main marine mammal species in Norwegian waters, with the intention of showing where and when there are elevated risks for by-catches of marine mammals. The Norwegian fishing fleet operates a range of gear types and individual vessels might operate more than one gear type depending on target species, season and area. Purse seines and trawl are the main fishing gear for pelagic fisheries with regard to landed catches, and demersal trawl, long lines and bottom set gill nets are the main gear types for demersal species. The majority of pelagic and demersal fish landed in Norway is caught by purse seine and demersal trawl, respectively. These gear types are supposed to have a relatively low risk of marine mammal by-catches. The majority of fishing vessels are small, coastal types deploying a variety of gears. Some of these are coastal gillnetters which are associated with higher risk of marine mammal by-catch (see 4.2.1). However the number of these vessels has declined greatly in the past 20 years.

The distributions of several species of toothed and baleen whales are well known for the summer months but poorly described for the remainder of the year. These distributions show considerable overlap with those of fisheries. However, these provide a static picture of fishery and marine mammal distribution, which in the real world are very dynamic both in space and time. Much more detailed data would be required to identify potential “hotspots” for marine mammal by-catch.

The Working Group welcomed this contribution from Norway, noting that it added greatly to their understanding of Norwegian fisheries. These reviews were originally requested in 2004 (NAMMCO 2004) for the purpose of developing recommendations and priorities for by-catch monitoring in member countries. While the reviews had proven quite useful in identifying fisheries that were most at risk for marine mammal by-catch, it was considered that further progress in this area would require much finer spatial and temporal resolution of both fishery and marine mammal distributions than was available for most areas. Therefore, the Working Group **recommended** that efforts be concentrated on developing effective monitoring programmes, especially for fisheries identified as being most at risk for marine mammal by-catch.

6. REPORTING OF BY-CATCH TO NAMMCO

6.1 Reporting in 2005

Pike reviewed the by-catch information in the National Progress Reports applicable for 2004. This year all countries included the required section on by-catch in their progress reports, however the format was not followed in all cases. It is apparent that, without effective by-catch monitoring programmes in place, countries cannot report by-catch in a way that can be quantified. The Faroe Islands provided information on their collection programme and reported some by-catch. Greenland reported some by-catch but no details as to the methodology of by-catch data collection, coverage, or monitoring effort are given. Norway provided a brief description of ongoing programmes to monitor by-catch, but it was too preliminary to provide any estimates from these programmes (see 4.2.1). Iceland provided the most detailed reporting of by-catch. However total by-catch cannot readily be estimated from these data as reported. The Icelandic monitoring programme was reviewed in detail in 2005 (NAMMCO 2005).

7. OTHER ITEMS

7.1 Proposal for a workshop on by-catch monitoring

The Terms of Reference for this working group indicate that its major focus is to improve the systems for collecting data on by-catch in NAMMCO member countries. At present no NAMMCO member country has an effective monitoring programme for marine mammal by-catch. The Icelandic programme is the most advanced, and was reviewed by the Scientific Committee in 2004 (NAMMCO 2005). By-catch monitoring in Greenland, the Faroe Islands and Norway is less developed, and no quantitative estimates of by-catch can yet be made available for these areas. Given the early stage of development of by-catch monitoring programmes in NAMMCO member countries, there is potentially much to gain from learning from the experiences of other jurisdictions where monitoring programmes are more developed.

The Working Group therefore proposes that NAMMCO host a workshop with the theme "Monitoring Marine Mammal By-catch". The meeting would focus on the following issues:

1. Review of by-catch in NAMMCO member countries, and present systems of monitoring;
2. Review of monitoring systems in other jurisdictions - what works and what does not;
3. Recommendations to establish and/or improve by-catch monitoring systems in NAMMCO member countries.

The Report from the Workshop would be available to this Working Group in 2007 and could be used to make progress on recommendations to NAMMCO member countries for improving their by-catch monitoring programmes.

The 3-day workshop would include only a few invited experts from relevant jurisdictions, as well as those members of the Working Group who wished to attend. The experts invited would be people directly involved in the setup and operation of monitoring programmes and analysis of by-catch data. The workshop would be held in January 2007, to allow sufficient time for meeting preparations. Invited experts would be offered funding support by NAMMCO, but could come at their own expense if they can. It is assumed that delegates from this Working Group would pay for their own travel and expenses. The total cost of the workshop would be approximately NOK 72,000.

The Working Group considered that such a workshop would be very useful in fulfilling its terms of reference, and **recommended** that NAMMCO support this proposal.

7.2 Information from ICES and SMM By-catch workshops

In 2005 Pike attended two workshops which focused primarily on the mitigation of marine mammal by-catch. ICES hosted a theme session "Mitigation Methods for Reduction of Marine Mammal and Sea Turtle By-catch in Fisheries" at the Annual Science Conference held in Aberdeen, 20-24 September 2005. The session dealt primarily with by-catch mitigation, but there was some information presented on by-catch monitoring programmes in Sweden and Finland. The Society for Marine Mammalogy (SMM) hosted a workshop "Science and Implementation Considerations of Mitigation Techniques to Reduce Small Cetacean By-catch in Fisheries", immediately preceding their Biannual Meeting in San Diego on 10 December 2005. As indicated by the workshop title the main focus was on mitigation of by-catch in gillnet and trawl fisheries. There was considerable discussion about the effectiveness of pingers and operational problems with using them on a large scale. Abstracts of all papers from both conferences are available from the Secretariat.

7.3 Depredation and damage to fishing gear by marine mammals

The Working Group noted that the depredation of fish from fishing gear by marine mammals, and consequent gear damage, had become a significant problem in some areas. Recognising that this item was outside its terms of reference, the Working Group suggested that this problem should be considered by the Management Committee for further action.

8. RECOMMENDATIONS

In 2005 the Working Group provided a number of recommendations to improve the monitoring of by-catch in NAMMCO member countries (NAMMCO 2005). At that time the Management Committee noted that the Working Group was not able to complete its assessment of the potential for marine mammal by-catch in NAMMCO member countries, and therefore agreed to postpone a full consideration of the recommendations put forward by the Working Group until the next annual meeting. The Working Group therefore reiterated the recommendations first put forward last year, with some additions and modifications:

1. The Working Group reiterated and supported the recommendations of the Scientific Committee made in 2005 to improve the estimation of by-catch from the Icelandic monitoring system (NAMMCO 2005).
2. NAMMCO should host and support the proposed workshop "Monitoring Marine Mammal By-catch" described under 7.1.
3. The use of self reporting through fishery logbooks to estimate by-catch should be considered the minimum level of monitoring for NAMMCO member countries. To be effective, such a reporting system must report the presence or absence of by-catch for every gear set. It is also crucial that fishermen be kept informed about the programme.
4. Supplemental monitoring, probably through observer programmes, will be necessary for high risk fisheries and in cases of high conservation concern where more precise and reliable estimates are required.
5. Target levels of precision for by-catch estimation should be established. While these may be species or stock specific it was considered likely that such a level would likely be at least as precise as that established by the EU, *i.e.* cv $\leq$ 0.3.
6. Norway should continue to develop its observer programme for offshore fisheries and the targeted collection of data from the coastal fishery, and provide estimates of by-catch with associated precision as soon as feasible.

7. Norway is in the process of revising their logbook system and introducing electronic logbooks. The effective recording of marine mammal by-catch should be a part of this process.
8. For Greenland, catch of marine mammals resulting from some coastal fisheries with mixed species catches should be specified with regard to catching method.

9. FURTHER MEETINGS

In general the Working Group found it far more productive to hold face-to-face rather than telephone meetings. If the recommended workshop is held in January 2007, it will be convenient to hold a meeting of the Working Group in conjunction with the Workshop. Otherwise the next meeting should immediately precede the next meeting of the Council.

10. ADOPTION OF REPORT

The report was adopted on 14 March 2006.

REFERENCES

NAMMCO. 2004. Report of the Management Committee. In: *Annual Report 2003*, NAMMCO, Tromsø, pp. 75-132.

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Ólafsdóttir, D. and Gunnlaugsson Th. 2004. Monitoring of marine mammal by-catch in the Icelandic gill net fishery. NAMMCO/SC/12/15

Appendix 1: 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
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
     - *4.2.1 Norway*
     - *4.2.2 Other countries*
5. EVALUATION OF THE POTENTIAL RISK OF MARINE MAMMAL BY-CATCH IN THE FISHERY WITHIN THE NAMMCO AREA

5.1 Spatial and temporal overlap in the fishing activity and distribution of marine mammals within the NAMMCO area
5.2 Other indirect or direct evidence of marine mammal by-catch within the NAMMCO area
6. REPORTING OF BY-CATCH TO NAMMCO
6.1 Reporting in 2004.
7. OTHER ITEMS
7.1 Proposal for a workshop on by-catch monitoring
7.2 Information from ICES and SMM By-catch workshops
8. RECOMMENDATIONS
9. FURTHER MEETINGS
10. ADOPTION OF REPORT.

Appendix 2: LIST OF DOCUMENTS

NAMMCO/15/MC/BC/1	List of participants
NAMMCO/15/MC/BC/2	Draft agenda.
NAMMCO/15/MC/BC/3	List of documents
NAMMCO/15/MC/BC/4	National Progress Reports: By-catch reporting for 2003.
NAMMCO/15/MC/BC/6	Bjørge, A., Ynnesdal, H. and Hartvedt, S. Spatial structure of Norwegian fisheries and the associated risk for by-catches of marine mammals.
NAMMCO/15/MC/BC/7	Bjørge, A., Borge, A. and Kleven, S. Observed and reported by-catches of marine mammals in Norwegian shelf and offshore fisheries, 2005.
NAMMCO/15/MC/BC/8	Bjørge, A. Godøy, H. and Nedreaas, K. A system for monitoring by-catches of marine mammals in Norwegian coastal and inshore fisheries.
NAMMCO/15/MC/BC/9	Ugarte, F. Potential for by-catch in Greenlandic fisheries
NAMMCO/15/MC/BC/10	Pike, D.G. Proposal for a workshop on by-catch monitoring.
NAMMCO/15/MC/BC/11	Pike, D.G. Information from ICES and SMM by-catch workshops.
NAMMCO/15/MC/BC/12	Ólafsdóttir, D. Marine mammal by-catch in the Icelandic gill net fishery.

2.4
REPORT OF THE *AD HOC* WORKING GROUP ON ENHANCING ECOSYSTEM-BASED MANAGEMENT

Aberdeen, Scotland, United Kingdom, 20-21 September, 2005

1. PROGRAMME

The meeting was convened over two days, running back-to-back with the ICES Annual Scientific Conference held at the Aberdeen Exhibition and Conference Centre. The first day comprised attendance at the opening sessions and talks of the ICES conference and the second day was a NAMMCO closed meeting. The General Secretary of NAMMCO, Christina Lockyer, welcomed participants on the evening of Monday 19 September, and clarified the arrangements.

2. AGENDA

The agenda and schedule for the meeting is shown in Appendix 1 (Doc. 1), and was adopted.

3. CHAIRMANSHIP

The Chairman for the meeting was Jóhann Sigurjónsson, Marine Research Institute, Iceland, and Rapporteurs were Daniel Pike, NAMMCO Scientific Secretary and Christina Lockyer.

4. GOALS OF THE MEETING

The Chairman summarised the goals of the WG with reference to the terms of reference (Doc. 5), and that the group should focus on:

- Mapping the status of developments with respect to EBM
- Reviewing the development of multi-species models for marine resource management which include marine mammals
- Examining the management objectives and experiences in relation to the application of EBM across the N. Atlantic where marine mammal utilisation occurs
- Identifying where the specific interests/role of NAMMCO in EBM lie
- Reporting and making recommendations to the Management Committee of NAMMCO.

5. ICES OPENING DAY

The first day of the meeting was the opening session of the ICES conference. The opening talk was delivered by Keith Sainsbury from Australia, on “The Ecosystem Approach to Fisheries”. This presentation summarised two recent initiatives: Ecosystem Approach to Fisheries (EAF) and Ecosystem-Based Fisheries Management (EBFM). Both were intended to bring improved ecosystem considerations and sustainability into fisheries management. EAF starts with a fishery target species perspective and adds ecosystem considerations while EBFM starts with an ecosystem perspective and adds fishery considerations. Both have similar goals and initial steps and recognise that implementation should and can commence regardless of widely differing fisheries risks and amounts of knowledge. The presentation was a management-oriented talk and based on practical examples from the Australian federal government. However, it was stressed that any management system depended also on scientific input and feedback. Regarding EBM, the focus is on managing people and their activities that have impact on the ecosystem. The presentation was a good basis for the tasks set before the NAMMCO WG.

Some of the important points relevant to ecosystem type management that Sainsbury raised included the following:

- Introduced species can often supercede native species
- Importance of climate change
- Use of the oceans is unsustainable both locally and globally
- Actions taken in the next 20 years will determine events in the next 100 years
- Planning is essential
- Clear limits and standards should be set for sustainable use
- Uncertainties should be recognised
- There should be an interplay between socio-economics, management and science.

With EBFM, one may operate with different levels of information:
1) Data-poor where a precautionary approach should be applied
2) Moderate data where one may effectively work with single species management
3) Future development of ecosystem-based reference points.

Both EAF and EBFM have similar initial stages where integration, prioritisation and targeting extra observations, extended reference points, increased use of spatial management, and increased precaution are involved.

In implementation, a management system and scientific support are needed.

Management systems require:
1. Structure and transparency particularly in decision making
2. Precaution in decision making – two tools were quoted: Ecological Risk Assessment (ERA) and Management Strategy Evaluation (MSE)
3. Regulators should have and use appropriate management tools. Here came a warning to beware the "single solution" that might mask a hidden agenda, and
4. Marine Protected Areas (MPA) are just one tool that should generally be regarded as a last resort in management strategy.

Scientific support can be offered in two forms:
1. ERA – should have a framework heirarchy and be qualitative or quantitative, depending on the risk level. ERA level 1 concerns Protected, Endangered and Threatened species (PET); ERA level 2 concerns Productivity and

Susceptibility Analysis (PSA). In Australia it was noted that ERA is performed on all data-poor fisheries.

2. MSE – should have a scientific design of the management strategies which in turn should have a monitoring and decision feedback loop.

In the future, Sainsbury highlighted the following as being important:

- Societal goals for sustainability
- Reforming of institutions
- Scientific risk assessment
- Full use of existing data and targeting of and obtaining new data
- EAF / EBFM pathways to full EBM.

6. ICES SPECIAL SESSION: "ECOSYSTEM APPROACH TO FISHERIES MANAGEMENT WORKED EXAMPLES"

There followed a special ICES theme session on "Ecosystem Approach to Fisheries Management: Worked Examples", co-chaired by Paul Connolly (Ireland) and Jake Rice (Canada). The session extended all day with a total of 17 presentations worldwide. The presentations were a mix of trophic system studies, ecosystem models, government implemented management schemes, and examples of developments of EAF and EBFM. A few presentations referred to marine mammals and other top predators apart from fish, as part of the ecosystem, and the key theme throughout appeared to be that management objectives depend on one's perspective. Clearly a management objective is essential before EBM can be implemented, regardless of other deficiencies. However, it was disappointing that relatively few presentations addressed EBM issues in the areas directly relevant to NAMMCO. It was unclear if this was because of actual lack of EBM initiatives in this region or an imbalance in the presentations offered. There were several presentations centred on the Canadian east coast area, US east coast, a presentation of an ECOSIM model for the Faroe Islands, a North Sea Fisheries Ecosystem Plan – that included marine mammals, and the EUR-OCEANS project (see below) that had some relevance. The remaining presentations were mainly from the Canadian west coast and the Southern Hemisphere.

Some of the main points promoted by the talks were:

- Trophic interactions and energy budgets are at the core of ecosystems, but must be coupled with environmental factors and sociological objectives for EBM
- ECOPATH and ECOSIM trophic models are widely used in ecosystem models as tools in predictions and management
- Education and outreach may increase the effectiveness of management measures
- Existing legislation may sometimes conflict with the implementation of EBM, as may the differing goals of Inter-Governmental Organisations (IGOs)
- A planned European Institute for Study of Ecosystems – EUR-OCEANS – supported by EC funding, may be useful in designing EBM in the future, but has yet to become a reality
- EBM is mostly focused on managing human activities that have an impact on ecosystems

- We have an obligation to maintain biodiversity
- There has to be a baseline or limit level for exploitation in order to balance productivity, biodiversity and habitat quality
- There is a toolbox of management measures that includes
  Effort Control, Technical Measures, Protected Areas
- A 5-year research plan of US NOAA highlighted the importance of lateral communication among and within government departments in order to achieve integrated / compatible action rather than conflict and ignorance about management goals
- Management Strategy Evaluation (MSE) is important for large complex fisheries where both initially qualitative and later quantitative approaches can be utilised; data-poor systems and their data needs can be decided upon after qualitative evaluation
- There is no excuse not to start EBM.

A summary made by the theme session Co-Chairman Jake Rice emphasised:
- Importance of objectives, indicators, risk assessment and socio-economic input in EBM
- Integrated involvement of science and management
- Necessity for communication at all levels
- Available data should be utilised – even if not complete
- A diverse toolbox exists for ecosystem management and evaluation
- The likelihood of short-term reductions in fisheries catches managed through EAF and EBFM that will involve transitional costs
- Implementation costs of EBM – EAF and EBFM and will occur and must be recognised at the outset, and in the light that ultimate gains from this management strategy will be in the form of ensuring ecosystem sustainability and biodiversity.

7. NAMMCO WORKING GROUP DISCUSSION ON THE ICES SESSION

The discussion about the ICES session centred around three topics of 1) ecological energetics, trophic system models and data input, 2) the costs associated with EBM implementation (*e.g.* reductions in catches of target species and the associated socio-economic aspects) 3) the resources necessary for associated essential research and data gathering, and 4) management structures required.

Discussion focused on the fact that there was frequently confusion as to the precise interpretation of EBM and its components. However, all EBM systems have the following features:
- Consideration of environmental forcing
- Consideration of species interactions
- Consideration of ecosystem effects of fishing
- Integrated management, e.g. fishing, oil, shipping
- Inclusive participatory decision making.

What is included in an EBM system depends on whether there is a need for wider inclusion of factors such as fishing, oil industry, gas, climate, oceanography, etc. The overriding factor is to know exactly what management objective is being addressed. A single species approach is feasible and may be adequate under many circumstances, and NAMMCO is effectively providing management advice for marine mammals using a single-species approach at present. However, NAMMCO is currently exploring trophic interactions as a prelude to an ecosystem approach.

Adi Kellerman (ICES) emphasised that in fact it is managing human activities that is important in EBM; there should be damage limitation, as ecosystems will follow their own path. It is important to examine what data are available and where one can start. Commencing with a regional approach e.g. N. Atlantic ecosystem would be very complex, but a local limited investigation for e.g. Irminger or Greenland seas had a better chance of success. One should try to integrate environmental information in fishery models.

Ulf Lindstrøm (Norway) queried whether typical multi-species modelling packages such as ECOPATH and ECOSIM would be necessary as a framework to start EBM and whether or not one could use indicators or qualitative tools. Garry Stenson (Canada) considered that instead of simple trophic models such as the the harp seal and cod/capelin trophic model, when considering EBM one should include other factors that affect MM species such as pollution and climate input: the question was where to limit the management process. The Chairman reminded the group that EBM was more holistic than hitherto used models and that it was important to recognise that management actions would have wider implications and impact than just locally and on specific target species. Jake Rice (Canada) noted that the more complex the model became, the greater likelihood that there would have to be incorporation of "assumed" factors and data input, and a loss of predictive capability.

The best way to proceed was to begin with well-defined agreed objectives: with a small number of objectives a simple model may be adequate whereas increasing numbers of objectives would require a more complex model. Ásta Einarsdóttirr (Iceland) pleaded for a start with simple objectives and a simple model. The Chairman commented that in some cases we must be satisfied with qualitative approaches. It was noted that socio-economic coupling adds a further layer of complexity and that the demand for data will increase with complexity. Daniel Pike noted that modelling is not the only available approach, with reference to the experimental approaches that have also been used in e.g. Australian reefs[1] and narwhal in Baffin Bay[2]. Christina Lockyer noted that with reference to the current Greenlandic unsustainable exploitation of narwhal and beluga, there would have to be an assessment of the socio-economic costs

[1] http://www.marine.csiro.au/LeafletsFolder/26trawl/26.html

[2] Laidre K.L., Heide-Jørgensen M.P., Jørgensen O.A., Treble M..A. 2004 Deep ocean predation by a high Arctic cetacean. *ICES J. Mar. Sci.* 61:430–440.

of quota and hence catch reductions and adoption of clear-cut management objectives in the spirit of EBM.

8. A HISTORY OF EBM DEVELOPMENT

The Chairman followed with a brief historical summary of the Reykjavik Conference on Responsible Fisheries in the Marine Ecosystem, 1-4 October 2001, and developments since then. The purpose of this FAO-sponsored international meeting was explained. The main themes were the dynamics of the marine ecosystem, the role of man in marine ecosystems, and incorporating ecosystem considerations in fisheries management. Two issues were highlighted: incentives for rationalisation under "Rights-based" fishing, and overfishing driven by overcapacity. The conclusions were similar to those reached in Keith Sainsbury's presentation on the previous day, with the promotion of an ecosystem approach to fisheries where multi-species trophic models as well as stakeholder input should feed in to ecosystem management. The conference was concluded by the Reykjavik Declaration where the following goals and activities were highlighted:

- Management plans with incentives
- Governance
- Prevention of adverse effects of non-fisheries
- Advancing science
- Interactions of fisheries and aquaculture
- Strengthening international cooperation
- Technology transfer
- Removal of trade distortions
- Collection of information on management regimes
- Development of guidelines.

In Reykjavik in 2002 the FAO Expert Consultations produced an important document: *"FAO Guidelines on the Ecosystem Approach to Fisheries"*, along with several other useful papers. These guidelines were adopted by FAO/COFI in early 2003. The World Summit on Sustainable Development, held in Johannesburg in 2002, encouraged the application of the ecosystem approach by 2010 - noting the 2001 Reykjavik Declaration, and maintaining productivity and biodiversity. More recently, ICES have made progress hosting a dialogue meeting with different stakeholders in 2004, and in 2005, publishing *"Guidance on the Application of the Ecosystem Approach to Management of Human Activities in European Marine Environment"*. Presently a European Marine Strategy is under development, although it has not been implemented yet. It is anticipated that approval may come from the EC by February 2006. There is currently also a great deal of activity at the national level.

Following this summary, Fernando Ugarte (Greenland) raised the question as to why single species management was being rejected in favour of ecosystem management. The response (Jake Rice) was that single species management was not inappropriate but that it had a history of poor results with dire consequences. It could still be used so long as more environmental conditions were considered within the ecosystem context as these had great bearing on cycles of marine productivity and subsequently of recruitment of higher predators. The Chairman also pointed out that marine productivity can quite strongly affect large baleen whale reproduction.

Christina Lockyer pointed out that many species of whales and seals are highly migratory and may move between ecosystems. It was important to recognise that management strategies – especially for single species, adopted locally may have effects elsewhere, e.g. sei whales taken according to IWC-based quotas in Antarctic Area III and off South Africa during the 1960s and early 1970s were extirpated from S.Africa because of effective double-harvesting of the same population at both ends of the migration routes (Best, 1976)[3].

9. IMPLEMENTATION OF EBM

Christina Lockyer proceeded with a presentation on applying EBM entitled: "Essentials for Implementation of Ecosystem-Based Management to Living Marine Resources". There followed the FAO definition of EBM:
"Ecosystem-Based Management strives to balance diverse societal objectives by taking account of the knowledge and uncertainties about biotic, abiotic and human components of ecosystems and their interactions, and applying an integrated approach to ecosystem management within ecologically meaningful boundaries."

The presentation (ANNEX 1) summarised some items that would require common ground among stakeholders such as interpretation of what constitutes a marine ecosystem; goal(s) for achieving benefits and opportunities from ecosystem-based management of the marine system; understanding of how living marine resources contribute to food security; understanding of the main elements of ecosystem-based management; recognition of the main obstacles to applying ecosystem-based management of living marine resources; agreement on the steps to be taken at national, regional and international levels to implement ecosystem-based management of living marine resources; and understanding of the role of the scientific community, national governments and FAO in developing the knowledge and the legal and institutional framework for applying ecosystem-based management.

In discussion of this presentation, Jake Rice noted that the core issue is getting management objectives straight. There is also a big difference between sustainable harvest and managing predation by marine mammals - the latter has a much higher data demand. The situation will therefore arise that different countries may adopt different management objectives, depending on their perspective on marine mammals.

Tore Haug (Norway) reiterated the fact that ecosystems are dynamic, but that trophic models may not necessarily be predictive. Careful monitoring is very important for feedback on performance of management objectives implemented.

The Chairman explained that EBM can be viewed as a tool to measure values of

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[3] Best, P.B. 1976. Status of whale stocks off South Africa, 1974. *Rep.int. Whal.Commn* 26: 264-286. (see Table 5, pp.279-280.)

different ecosystem components by giving them "value tags". As an example, he mentioned the Icelandic management decision to "sacrifice" the shrimp stock for the sake of cod and capelin, as it was of less economic value. Another example given was the North Sea objective to protect harbour porpoises. One might also choose to have an objective to reduce some marine mammal populations if that was desirable. In the Barents Sea, management objectives focusing on cod and capelin would have knock-on effects for marine mammals there. Mike Hammill (Canada) pointed out that there was a clear management objective set with regard to harp seals in ICES-NAFO, so the main question for NAMMCO was what objectives were set for marine mammals by member states: conserve marine mammals or satisfy fishery needs as these were different perspectives. With given objectives we can come forward with proposals to incorporate marine mammals in an ecosystem approach. If the focus is on maintaining high marine mammal populations, we should establish objectives for marine mammals.

The Chairman pointed out that NAMMCO is a creation of member states that are also interested in fish, although we should ensure that NAMMCO is contributing to development of EBM. Halvard Johansen (Norway) agreed that members of NAMMCO are fishing nations and are concerned with sustaining fisheries, and thus may want to have the option of a higher rate of use of marine mammals if it benefits fisheries. He also mentioned that it was impossible to stabilise some stocks as there is no market for the products. What can be done with the marine mammal meat if there is no consumer? The conclusion was that it is not a simple choice in setting management objectives; there is social complexity, interests of other states, etc. and that also world opinion matters. One must operate within the limits of current knowledge and also know how low a level one can reduce a population to yet retain it as part of the ecosystem.

The Chairman explained that in Iceland, the exact ramifications of whale population reductions cannot be predicted at present, but the scientific advice is to not let populations grow indefinitely because of concerns for the fishery.

Garry Stenson (Canada) noted that in data-poor situations, one can go forward with EBM but with a precautionary approach.

In concluding the discussion, clearly an EBM approach forces the setting of objectives. NAMMCO can make objectives, but these should be stock-based rather than generalised. Depending on the level of the objectives, a general outline of objectives that apply to all populations can be set. There can be individual considerations as to how they are applied and detailed target objectives can be stock specific.

In moving forward towards an ecosystem approach, it must be recognised that larger ecosystem models are under development and that NAMMCO can participate in this development. NAMMCO will also have to deal with non-hunted species as well as exploited ones. An important role for NAMMCO could be in ensuring connectivity between management organisations. Goals for NAMMCO could include:

1. A more holistic view of marine mammal management - incorporating ecosystem concepts, climate change, socio-economics, etc.
2. Provide marine mammal input to models under development by other jurisdictions and organisations, and member states
3. Investigating and monitoring species that are not harvested, and those not "important" economically; however, NAMMCO currently review non-harvested species periodically
4. Coordination between areas to ensure that activities are consistent and non-conflicting.

A draft set of objectives and options to discuss and shoot down - "straw dogs", could be provided to the Management Committee to get the EBM process rolling, and the Chairman stressed the need for establishing clear management objectives in EBM.

An additional point is the question of limited resources and manpower in implementing an ecosystem approach, and what NAMMCO can do to facilitate improvement in funding.

10. AN ECOSYSTEM CASE STUDY – BARENTS SEA

A presentation on the Barents Sea ecosystem with emphasis on marine mammal fishery interactions was presented by Ulf Lindstrøm, Institute for Marine Research, Tromsø, Norway. This elaborated in more detail than earlier on the Barents Sea trophic system with the interplay of minke whales, harp seals, capelin, herring, cod, and other prey. Ulf Lindstrom summarised the development of multi-species models for this region and the current ongoing work. Much of the data between 1992 and 1999 was collected from both scientific and commercial whaling, with an emphasis on trophic interactions and dietary analysis. His main comment was that over a 15-year period to the present, minke whale predation had tracked prey abundance and been reflected in body condition. There had been large-scale changes in habitat use, which corresponded with prey abundance and availability. He also mentioned the importance of the capelin to fisheries, whales and harp seals, wherein lay potential dilemmas and conflicts in determining management objectives. The summary of his presentation is found in ANNEX 2.

In discussion, it was noted that this study will feed into large scale ecosystem modelling projects. Modelling will include capelin, herring, cod, minke whales and maybe harp seals, although better dietary data are required for the seals. Tore Haug noted that harp seals were prime predators in the Barents Sea ecosystem and within a few years better information on harp seal foraging will be available.

The question was raised whether there should be a case study addressing harp seals, and if this would be a way forward. Daniel Pike reminded the WG that this had been put forward before, but had been put in abeyance at the last meeting of the Council (March, 2005). Ulf commented that it was better to work holistically with several species simultaneously. The Chairman stated that models are of basic importance if different values are going to be weighed, and he reported that Iceland is now recently employing a person to implement marine mammals in GADGET. Tore Haug noted that the SC has provided recommendations to improve information for harp seals, and there is now increased activity in this study area. It was concluded that a pilot study would require a trophic model, as well as information on socio-economic implications of management measures.

The Chairman proposed that the WG should be developing a shopping list for EBM, highlighting the main needs, and establishing a separate *ad hoc* group including scientists and managers to proceed with this. This in its own way is a form of management model, but the outcome might indicate whether or not modelling is critical in the EBM process. Christina Lockyer commented that a lot of work had already been invested in models in the SC, so that building upon this was a sensible move.

In concluding this discussion, it was emphasised that models are still required as originally requested by the Council for the past 8 years, and that a framework or shopping list for all stocks or a particular stock should be developed.

11. OBJECTIVES AND EXPERIENCES IN VARIOUS COUNTRIES

Norway

Halvard Johansen described the aims and objectives of the recent government White Paper in Norway. The overall objective is to maintain viable stocks in all areas, with the controlled use of any surplus. As a general policy Norway does not allow exploitation of any species unless there is sufficient information on stock status and sustainable catch levels. He presented the main points for seals, whales and coastal seals.

1) Seals:

Norway would like to know the sizes of seal stocks and have recommendations for harvest levels, particularly exact sizes for harp and hooded seals in the Greenland Sea. Although there have been no specific objectives for seals to date, increased quotas for harp seals are planned for next year, but it might not be realistic to take considerably higher quotas in the immediate future even though there is growing demand for seal products in the market. For hooded seals which are more important commercially, a different strategy is necessary and quotas may have to be reduced in order to rebuild the stock which is not as large as anticipated. Final decisions await the ICES-NAFO report on harp and hooded seals.

2) Whales:

Norway plans to increase the quota for minke whales, which has been set using the IWC Revised Management Procedure (RMP). Norway has been looking at modifications to the RMP to make it specific for Northeast Atlantic minke whales. The version of RMP used is generic for all baleen whales. However this will be taken up by the IWC Scientific Committee in 2006. Norway wants to set quotas for 5-year periods and is currently in the third year of a 5-year quota period. The increases next year will be based on a retrospective calculation, but ultimately quotas will reflect market needs.

In addition to exploitation objectives, Norway will examine the role of fin and humpback whales, and white-beaked and white-sided dolphins in the ecosystem. The first priority will be feeding studies on dolphins.

3) **Coastal seals**:
In consideration of common (harbour) seals and grey seals, Norway had a clear objective - stocks must be decreased. It is important to allow recovery of the cod stock. Quotas for seals set are an unsustainable 25% of the most recent population estimates. However, the catches have not filled these quotas, and the actual catches are thus probably sustainable. There are other fishery considerations such as competition and gear interactions, as well as seal/cod worm problems.

General information on EBM:
In Norway there is as yet no institutionalized framework for EBM, although in the Barents Sea there is some consideration in the capelin fishery.

Greenland
Fernando Ugarte reported that Greenland defers to the IWC through Denmark, for the determination of catch levels of large whales. Sustainability is thus determined by the IWC. For catches of all marine mammals, the objective is sustainability. Narwhal, beluga, walrus and polar bear, are of special concern because catch levels at the moment may be unsustainable. Currently, the immediate objective with respect to narwhal and beluga is to stop the present declines in these stocks, and therefore quotas have recently been introduced. These quotas are still higher than recommended for halting the population declines. The Scientific Committee has recommended a time limit for halting the population declines and in 2006, the quotas may be at Scientific Committee recommended levels. In the future, they also hope to introduce quotas on polar bears and walrus. Presently there is no regulation on harp and hooded seals. The lack of good population estimates for most species of marine mammals in Greenland makes it difficult to achieve adequate management plans. Greenland claims that implementation of regulations is difficult because of political and bureaucratic delays. There is a need for a better definition of what is meant by sustainability and for improved communication and consensus-building among stakeholders (i.e.: hunters, managers and scientists).

General information on EBM:
As of yet, there is no formal framework for EBM.

Canada
Mike Hammill and Garry Stenson summarised the position of Canada with regard to management of marine mammals.

1) Whales:
Here there are only native hunts for beluga, narwhal and bowhead whale. The narwhal and beluga stocks, that are shared by Canada and Greenland are regulated according to the advice of the JCNB. Here it is important to note that there are several different stocks of beluga – some of which are listed under Canada's Species At Risk Act.

Other stocks are managed under a co-management agreement with the land-claims signatories or directly by the dept of Fisheries and Oceans, each with different management objectives.

2) <u>Seals</u>:
There are three species that are currently exploited commercially (harp seals and hooded seals) or have the potential for commercial exploitation (grey seals) . An objective-based fishery management (OBFM) approach with reference levels exists. Under this management approach, species are characterized as data-rich or data-poor depending on the number of abundance estimates available, the time since the last estimate and availability of information on reproductive or mortality rates. Harp seals are considered data-rich, while hooded and grey seals are considered data-poor . For data-poor species if their numbers are thought to exceed a level of 30% of their estimated maximum abundance then harvest levels are set using the Potential Biological Removals (PBR) approach. In the case of hooded seals an additional restriction forbids the taking of *"blue-backs"(i.e. young)*. There is no market for adult hooded seals and thus very limited catch presently for this species. Harp seals are data-rich and abundant. The objective here is to maximize economic return, but maintain the population above reference level 1, which is 70% of the largest estimated population size. A 3-year management plan ended this year and a new management plan is being developed. This plan may be extended to 5 years. For a population to be considered data-rich, there have to be three population estimates, the most recent within 5 years, and recent biological parameters (reproductive and/or survival). There has been little interest in grey seals until now, primarily because of lack of markets. Since they are considered data-poor under the OBFM scheme, harvest levels are set using PBR, which is a very "risk adverse" approach.

<u>General information</u>:
EBM is being implemented, primarily in fisheries, but without any formal process. Presently, all seal management objectives are single species based without reference to fish dynamics. *Ad hoc* measures can be taken, e.g. no fishing for krill, and low capelin quotas to reserve food for fish.

Faroes
Bjarne Mikkelsen reported that no management objectives are established for pilot whales or white-sided dolphins, although catch levels are thought to be sustainable. Historically, all catches for these species are within the immediate coastal vicinity (ca 5 miles) of the Faroes and limitation on catching is determined and applied locally by the authority depending on the catch performance for that year and whether or not the need for meat is saturated. It was noted that the abundance estimates for pilot whales are difficult to determine because the distribution area is very large and not fully covered in sightings surveys. However, catches have been stable for 300 years.

The Faroes have also requested advice on sustainable harvest levels for fin whales from NAMMCO, but no takes are planned at present.

Grey seals and harbour porpoises, two resident populations, are also taken locally at very low levels. An initial future management objective for marine mammals could be to regulate the small defensive take of grey seals around fish farms.

General information:
There is no formal process at present for EBM. However, the Faroes are now looking at cod, haddock and saithe modelling in relation to ecological production on the Faroe Plateau.

Iceland
Ásta Einarsdóttir reported the management situation in Iceland.

1) **Seals**:
Iceland has a general objective of sustainable use. There is a specific objective for grey seals: to maintain the stock at current level and take protective measures if there is evidence of further decline in population.

2) Whales:
Iceland maintains an objective of sustainable use with respect to whales. Recommendations for allowable catch of fin, sei and minke whales are issued every year by the Marine Research Institute, although no fin and sei whales have been taken since 1989. The sustainable catch guidelines are conservative and for fin and minke are based on advice from the Scientific Committee of NAMMCO. Quotas will not be issued until commercial whaling recommences. There are no recommendations for blue and humpback whales.

Currently, a scientific programme for minke whales is underway. The main objective of the programme is to elucidate the ecological role of minke whales in the marine ecosystem off Iceland. So far, 100 minke whales have been caught and it is planned to take a further 100 in accordance with the original programme. This level of catch is sustainable based on NAMMCO advice for a population estimate of 44,000 minke whales in the Icelandic area.

General information:
With respect to EBM, there is no formal system. Presently there is a management system for cod, capelin and shrimp, and modelling systems of BORMICON and GADGET including marine mammals are being developed, but are only in the initial stages.

In concluding the objectives and progress on EBM, Halvard Johansen reported that there was no Norwegian ecosystem-based framework although there were models being worked on with the precautions on the capelin harvest to reflect cod and whale consumption in the Barents Sea. Tore Haug noted that biological reference points were being developed for harp and hooded seals.

Fernando Ugarte commented that although Greenland currently had no policy on EBM, they were keen to learn how to implement it. He mentioned the recent establishment of a department of marine ecology in the Greenland Institute for Natural

Resources, which would be focusing on ecological studies in the Nuuk area. This would not include marine mammals initially but might do so in the future.

In Canada, Mike Hammill stated that although there was no EBM process at present, commercial fishing of krill was not allowed and Garry Stenson indicated that capelin quotas have been set low to allow food for cod for many years.

In the Faroes, Bjarni Mikkelsen stated that with respect to the GADGET modelling, they were waiting for the outcome of the Barents Sea case study before implementing the model in Faroese waters.

In Iceland, the Chairman reported that a multi-species model had been studied for several years on the capelin – cod – shrimp (earlier whale) interactions. Thus there has been some development towards ecosystem-based management.

12. RECOMMENDATIONS.

The *Ad Hoc* WG decided on **two main recommendations** as a way of advancing EBM within the NAMMCO system. The recommendations are listed below as two over-arching objectives:

Objective 1:
Promote the development of an ecosystem-based approach to the management of marine mammals currently under consideration by NAMMCO.

- This would require a ‘holistic’ approach to the management of marine mammals that includes biological, environmental and socio-economic considerations. In order to advance this approach it is recommended to produce a framework or “shopping list” of what will have to be included in such an approach. The items could include, for example, issues such as climate change, pollution, competition for food, user knowledge (Traditional Ecological Knowledge), cultural needs, impact of fisheries on marine mammals, etc.
- It will be essential that specific management objectives relevant to EBM be developed and biological reference points be identified for marine mammal stocks of interest to NAMMCO (e.g. ICES/NAFO WG on Harp and Hooded Seals[4]. Currently, NAMMCO sets objectives on a single species basis without reference points.
- Recommend a specialist *ad hoc* group meet to develop a framework approach with an input from a variety of sources, as appropriate, possibly exploring some relevant case studies.

Objective 2:
Encourage member states to develop EBM approaches for their respective areas.

[4] Report of the ICES/NAFO Working Group on harp and hooded seals (WGHARP). ICES WGHARP Report 2005. ICES Adsvisory Committee on Fishery Management ICES C.M.2006/ACFM:06, Ref. D, G.

- These EBM approaches would include more than multi-species trophic models although such models could be included as a sub-component. It is noted that currently there are at least two multi-species trophic models under investigation in NAMMCO countries – Scenario C Barents Sea model for harp seal, minke whale, cod, herring and capelin, in Norway, and a GADGET based model for grey seals in Iceland (see NAMMCO Annual Report 2004, SC report, section 8, pp.227-229).

- These EBM approaches could build upon those developed in various parts of the world and identified during the ICES Annual Scientific Conference special session in Aberdeen, 2005.

- Marine Mammals will be an important component of approaches in the NAMMCO area and therefore NAMMCO can play a significant role by:

1. Ensuring that the appropriate data on marine mammals are available as input;
2. Continuing to improve our understanding of all marine mammals that occur in these areas (i.e. not just the ones currently hunted, but those that may be important components of the ecosystem such as tourism, by-catch and fish consumers);
3. Promoting an awareness of ecosystem-based management with managers and the general public;
4. Coordinating inputs among regional approaches to ensure consistency in the way in which marine mammal data are incorporated.

These two objectives are not mutually exclusive and can be carried out in an incremental approach as recommended by FAO. Significant progress on Objective 1 can be made in the immediate future. Progress on Objective 2 may be slower and dependent upon priorities that are not under the control of NAMMCO. However, NAMMCO can address the issues under its mandate in order to have the important data available when required.

In addition to the above, it is suggested that when NAMMCO Council, through the MC, requests advice on harvest levels or a general stock assessment from the SC, they should also request that the SC comment on the ecosystem level effects of the options they advise. This could include comments on the effects on predators, on prey, by-catch, noise, disturbance, pollutants and other relevant issues. This advice could be given in a qualitative and/or a quantitative way, depending on the information and expertise available to the Committee.

Additional suggestions
In addition to the above recommendations there were some suggestions for consideration.

Funding
An important matter raised during the meeting was that of ensuring adequate funding is available for continued progress in EBM. It has already been noted that progress on

ecosystem models within member states has not proceeded as fast as desirable because of inadequate resources (NAMMCO annual Report 2004, SC report, section on Workplan, p.231). NAMMCO may wish to actively explore ways to seek funding both internally and externally for advancing specific projects.

Socio-economic concerns
In proceeding with ecosystem-based management, socio-economic concerns should be identified specifically by area, and incorporated into the objective setting and management strategy decision process.

13. CLOSURE

The Chairman thanked all participants for their helpful input, and the rapporteurs. The report would be drafted and circulated within a short time period after the meeting. Christina Lockyer in turn thanked the Chairman for his competent guidance and leadership in the meeting and for keeping to the schedule.

Appendix 1: AGENDA

1. Programme Arrangements and Welcome
2. Adoption of Agenda and programme schedule (for ICES Sessions)
3. Appointment of Chairman and Rapporteurs
4. Goals of the meeting
5. ICES Opening day: Review of the Opening Session, General Assembly and Talk by Keith Sainsbury "The Ecosystem Approach to Fisheries".
6. Review of the ICES Special Session – "Ecosystem Approach to Fisheries Management Worked Examples"; programme and presentation list on the ICES website: http://www.ices.dk/iceswork/asc/2005/Programmespreadsheet.pdf
7. NAMMCO Working Group discussion on the ICES sessions – relevance to NAMMCO
8. A history of EBM development – Jóhann Sigurjónsson, MRI, Reykjavik
9. Implementation of EBM – "Essentials for implementation of ecosystem-based management, and reference to work of FAO" – Christina Lockyer, NAMMCO, Tromsø
10. Discussion on Implementation of EBM
11. An ecosystem case study – Barents Sea. A presentation on Barents Sea ecosystem with emphasis on marine mammal fishery interactions – Ulf Lindstrøm, IMR, Tromsø
12. Objectives and experiences in Various Countries – with reference to management strategies and EBM
13. Recommendations – specific recommendations and suggestions to NAMMCO for the way forward on enhancing ecosystem-based management
14. Closure of the meeting.

Appendix 2: LIST OF DOCUMENTS

NAMMCO/MC/ECOWG/2 Doc.1	Enhancing Ecosystem Based Management: NAMMCO *Ad Hoc* Working Group Meeting, Aberdeen, 20-21 September 2005 – Schedule and Agenda.
NAMMCO/MC/ECOWG/2 Doc.2	Enhancing Ecosystem Based Management: NAMMCO *Ad Hoc* Working Group Meeting, Aberdeen, 20-21 September 2005 – List of Documents.
NAMMCO/MC/ECOWG/2 Doc.3	Enhancing Ecosystem Based Management: NAMMCO *Ad Hoc* Working Group Meeting, Aberdeen, 20-21 September 2005 – *Ad Hoc* Working Group meeting Participants.
NAMMCO/MC/ECOWG/2 Doc.4	Report – revised 15 March 2003 - NAMMCO/13/MC/9rev: NAMMCO *Ad Hoc*

	Working Group on Enhancing Ecosystem-based Management, Copenhagen, 3-4 December 2003.
NAMMCO/MC/ECOWG/2 Doc.5	Excerpt from NAMMCO Annual Report 2004: Report of the Management Committee, pp.142-143. Mandate for the *Ad Hoc* Working Group on Enhancing Ecosystem Based Management.
NAMMCO/MC/ECOWG/2 Doc.6	Essentials in applying ecosystem based management to living marine resources – presentation summary (as handout).

Appendix 3: LIST OF PARTICIPANTS

Chairman
Jóhann Sigurjónsson, MRI, Reykjavik, Iceland

Secretariat
Christina Lockyer, General Secretary, NAMMCO, Tromsø, Norway
Daniel Pike, Scientific Secretary, NAMMCO, Tromsø, Norway
Charlotte Winsnes, Administrative Coordinator, NAMMCO, Tromsø, Norway

Council representatives
Halvard Johansen, Ministry of Fisheries, Oslo, Norway
Fernando Ugarte, Greenland Home Rule, Nuuk, Greenland
Bjarni Mikkelsen, Museum of Natural History, Tórshavn, Faroes
Ásta Einarsdóttir, Ministry of Fisheries, Iceland

Inter-governmental representatives
Adi Kellerman, ICES, Copenhagen, Denmark

Invited Participants
Mike Hammill, DFO, Mont-Joli, Canada
Garry Stenson, DFO, Canada
Jake Rice, Canadian Stock Assessment, Secretariat, Ottawa, Canada
Tore Haug, IMR, Tromsø, Norway
Ulf Lindstrøm, IMR, Tromsø, Norway

ANNEX 1

Implementation of EBM – a presentation by Christina Lockyer, NAMMCO Secretariat, Tromsø, Norway

The presentation illustrated the possible different perspectives of managers depending on whether fisheries or marine mammals are a priority. Two examples were presented:

1) Fisheries interaction in the Canadian N.W.Atlantic between harp seals and commercial fisheries for cod, where the cod fishery is unsustainable. The fishery subsequently collapsed although the seal population remains healthy, perhaps because of other prey options.
2) Fisheries interaction between Stellar's Sealion in the N.E.Pacific and the local groundfish fishery, where the fishery depleted the groundfish stocks in the area and lead to diminished prey for the Sealion population with resulting mortality and lowered recruitment. The fishery can move elsewhere to other groundfish stocks but the sealions' survival becomes threatened.

These cases illustrated the importance of management priorities and objectives and that there is always a cost in terms of biodiversity with exploitation.

The presentation continued with examples from Bax (1991)[5] (Table 1) that showed the relative impacts of different predators in a variety of ecosystems through estimated yearly loss of fish (tonnes pr. km^2) from predation / exploitation in six different ecosystems.

The two examples most relevant to NAMMCO were the North Sea and the Barents Sea, where in the latter, marine mammals comprise a significant consumer of fish, taking more than the fishery but less than predatory fish. In the North Sea, predatory fish and fisheries are more important than other predators. Such information on standing stocks and biomass with knowledge on predator-prey links is essential for an ecosystem approach to management.

Further examples were given: Barents Sea minke whale, harp seal, cod, krill, capelin and herring interaction, where it is clear that the ecosystem is dynamic with constant shifts in prey availability and preference by predators and that capelin plays a major role in determining ecosystem balance.

[5] Bax, N.J. 1991. A comparison of fish biomass flow to fish, fisheries, and mammals in six marine ecosystems. *ICES Mar. Sci. Symp.* 193:217-224.

Ecosystem	**Birds**	**Mammals**	**Fish**	**Fisheries**
Benguela Current	0.3	**2.6**	56.5	1.6
Georges Bank	2.0	**5.4**	42.5	6.1
Bals fjord	0.0	**0.0**	14.1	1.5
Eastern Bering	0.2	**1.5**	11.0	1.4
North Sea	0.6	**0.1**	7.0	4.4
Barents Sea	0.0	**3.0**	5.1	1.8

Table 1. Relative impacts of different predators in a variety of ecosystems through estimated yearly loss of fish (tonnes pr. km^2) from predation / exploitation in six different ecosystems, after Bax (1991).

A list of types of institutions that might be consulted or collaborated with in implementing EBM was presented, along with the topics that might be embraced. These included:

1) Research institutions
    - Climatology – seasonal and longer term weather cycles
    - Oceanography – ocean temperature patterns and primary production
    - Environment – pollution issues etc.
    - Marine Biology – all levels and ecosystem
    - Fisheries – all aspects including by-catches and discards, advice on catch levels
    - Dynamic modelling – predictive, impact assessment
2) Commercial Fisheries
    - Marine mammals – whales in the open sea
    - Fish – trawls, set-nets, etc.
    - Invertebrates (shrimp, etc.) – dredge, trawls, etc.
    - Algae harvesting
3) Farming
    - Fish – especially those releasing fish to the marine environment
    - Algae
4) Hunters – both private individuals and commercial cooperatives

- Marine mammals – whales, seals, walrus, polar bear, otters, etc.
- Seabirds including egg-gathering

5) Socio-economic bodies
   - Economic trade-offs and subsidies – the human aspect
6) Governmental organisations
   - Control and regulation at national and local level – policy making
7) Inter-Governmental organisations
   - Control and regulation at international and regional level; even global level
   - Legislative possibilities
8) Non-governmental organisations
   - Watch-dog activities
   - Independent advice.

Presently NAMMCO has limited contact with several of these types of organisations, and stronger contact with others, and future contacts may depend largely on what level NAMMCO wishes or is able to become involved in EBM. However, a broadening of perspective will be necessary when appropriate.

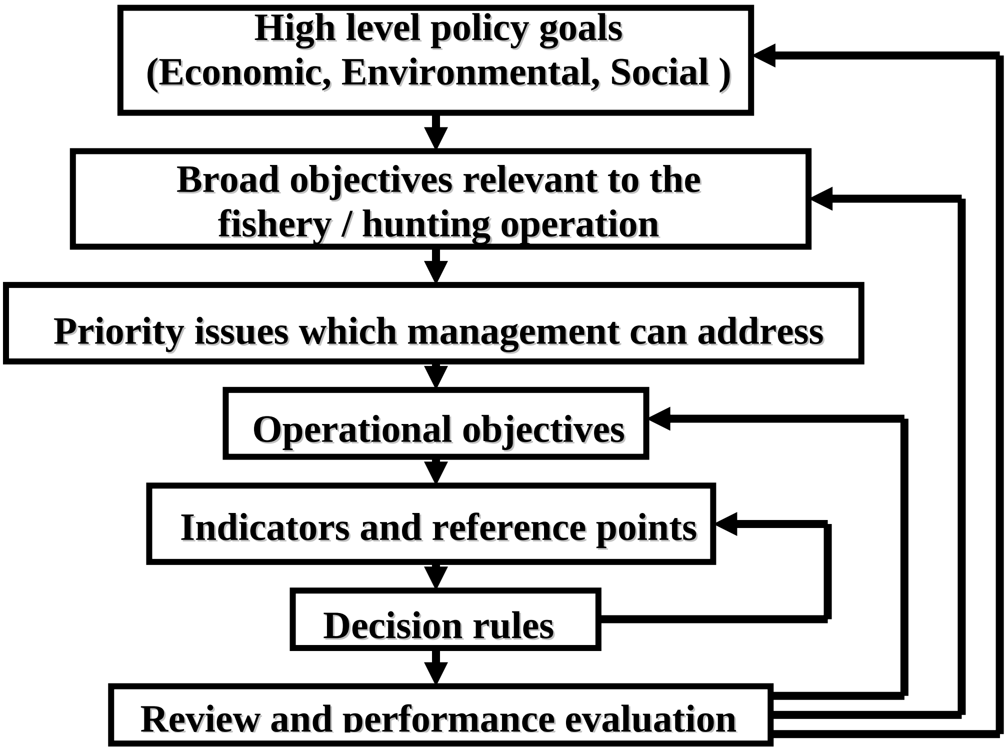
A specific but not exhaustive list of international organisations that might be most directly relevant for NAMMCO in collaborative management included ICES, ASCOBANS, ACCOBAMS, IWC, JCNB, NAFO, NEAFC, NASCO, OSPAR, AC, FAO, UNEP, UNESCO and IUCN, with most of whom NAMMCO already has observer relations. It may be mostly a matter of enhancing communication and exchange with these organisations. Currently, NAMMCO is preparing a Memorandum of Understanding with ICES, which will be a good vehicle for increased cooperation on EBM. With some organisations, there may be conflicting objectives e.g. between sustainable use and total protection such as in NAMMCO and ASCOBANS / ACCOBAMS. However, there may be more common ground than apparent when taking a broader ecosystem view of pressing issues threatening marine mammal species, that will enable cooperative action.

The key principles for an Ecosystem Approach to management based on the Convention on Bio-Diversity (CBD) decision V/6 are

1) The objectives of management of natural resources are a matter of societal choice
2) Management should be de-centralized to the lowest appropriate level
3) The effects of other activities on other ecosystems must be considered
4) There is a need to manage the ecosystem in an economic context
5) Ecosystem structure and functioning must be conserved, in order to maintain ecosystem services
6) Ecosystems must be managed within the limits of their functioning
7) Appropriate spatial and temporal scales must be set in place
8) Objectives should be set for the long term
9) There must be recognition that change is inevitable

10) The appropriate balance between conservation and use of biological diversity must be sought
11) All forms of relevant information must be considered
12) All relevant sectors of society and scientific disciplines must be involved.

In conclusion, in order to implement an ecosystem approach in management, one should start on the basis of existing knowledge and information and one should be incremental in approach. A chain of command with feedback is illustrated below and is based on information from Kevern L. Cochrane of Fishery Resources Division, FAO, Rome.



Finally, there were a number of potential obstacles noted that could impede the implementation of EBM. These were

- Mismatch between expectations and resources
- Reconciling a much expanded set of conflicting objectives
- Insufficient or inadequate participation by stakeholders
- Insufficient knowledge
- Equity issues.

ANNEX 2

An ecosystem case study – Barents Sea – summary of a presentation by Ulf Lindstrøm, Institute of Marine Research, Tromsø, Norway

The presentation suggested that Northeast Atlantic minke whales' use of prey varies considerably both in space and time, mainly due to geographic differences in the distribution and availability of favourable prey. Capelin and krill dominate the whale diets in the northernmost Arctic areas while herring is the major prey in the southernmost coastal areas. Small and medium scale prey preference studies, however, suggest that capelin is the most preferred prey species.

Changes in minke whales' use of prey and habitat during the past decade appear to correlate well with changes in the abundance of their favourable prey (capelin and juvenile herring). By adopting a flexible foraging behaviour, minke whales may to some extent compensate for changes in food availability without compromising their energy status.

Minke whale consumption of prey in the northeast Atlantic has been assessed but no practical use of this knowledge has been made for the management of the resources in this ecosystem until more recently. Minke whale predation on herring was implemented in the assessment model of herring. The result suggest that minke whale predation of herring affects the assessment of herring; the estimated stock sizes of juvenile and adult herring decrease 20% and 35%, respectively, compared with the baseline assessments. The predation mortality constituted almost half the total natural mortality of adult herring but only 10% of the total juvenile mortality.

More recently, the functional response has been assessed at various spatial scales. Minke whales exhibit a hyperbolic (type 3) functional response to their favourable prey implying that minke whales have the potential of stabilising predator-prey dynamics in the Barents Sea. Russian / Norwegian aerial surveys in the northern Barents sea in 2001-2004 indicated that several sea mammal predators use the same habitats, and perhaps food, both in time and space. The distribution of Barents Sea harp seals did not overlap with the distribution of capelin and polar cod, suggesting that they are exploiting other prey in that time period.

SECTION 3 – SCIENTIFIC COMMITTEE

3.1
REPORT OF THE THIRTEENTH MEETING OF THE NAMMCO SCIENTIFIC COMMITTEE

EXECUTIVE SUMMARY

The 13th annual meeting of the NAMMCO Scientific Committee was held at Reine in Lofoten, Norway, 25 – 27 October 2005. In addition to Scientific Committee members, observers from Canada, the Russian Federation and the High North Alliance attended the meeting.

HARP AND HOODED SEALS

In 2004 the Management Committee requested that the Scientific Committee annually discuss 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 the light of ecosystem management requirements.

In 2005 the Management Committee recommended that the Scientific Committee evaluate how a projected decrease in the total population of Northwest Atlantic harp seals might affect the proportion of animals summering in Greenland. In addition the Management Committee requested the Scientific Committee to specify harvest levels for these two (*i.e*. Barents/White Sea and Greenland Sea) harp seal stocks that would result in a population reduction of 20% over a period of 20 years.

The ICES/NAFO Working Group on Harp and Hooded Seals met in September 2005 in St. John's Newfoundland, Canada. The main tasks of the Working Group were to establish biological limits for Greenland Sea harp seals and White Sea/Barents Sea harp seals, and to provide assessments for each stock.

Biological limits for seal harvest

The Working Group proposed a framework for biological reference points and a corresponding management framework, largely based on the Canadian management system. The framework relates to population numbers with the N_{max} (not exploited) stock size as a key reference point. In accordance with the precautionary approach a distinction is made between data-adequate and data-poor situations. Data-adequate stocks should have a time series of at least five abundance estimates spanning a period of 10-15 years with surveys separated by 2-5 years, and the most recent abundance estimates should be no more than 5 years old. Stocks whose abundance estimates do not meet these and other criteria are considered data-poor. Based upon these criteria, the harp and hooded seal stocks should be classified as follows: Greenland Sea harp seal stock - data-adequate; White/Barents Sea harp seal stock - data-adequate; Northwest Atlantic harp seal stock - data-adequate; Northwest Atlantic hooded seal stock – data-poor; Greenland Sea hooded seal stock – data-poor. For the latter two stocks, new survey results will become available in 2006, after which these stocks may be considered data-adequate.

For data-adequate stocks, two precautionary and one conservation (limit) reference level are proposed. All reference levels relate to the N_{max} population size. (*e.g.* maximum population size historically observed, N_{max}). The first precautionary reference level could be established at 70% (N_{70}) of $N_{max.}$ When the population is between N_{70} and N_{max}, harvest levels may be decided that may stabilise, reduce or increase the population, so long as the population remains above the N_{70} level. When a population falls below the N_{70} level, conservation objectives are required to allow the population to recover to above the precautionary (N_{70}) reference level. N_{50} is a second precautionary reference point where more strict control rules must be implemented, whereas the N_{lim} reference point is the ultimate limit point at which all harvest must be stopped.

For data-poor stocks, it is recommended that only the lower tier (below N_{lim}) be defined. In this case, the four tiers effectively collapse to two (*i.e*., above and below N_{lim}). Below N_{lim} all harvest must be stopped, and conservative and effective management measures will at all times be required when the stock is below N_{max}.

In the absence of a historical time series which enables estimates of N_{max} it is suggested that populations are kept above the historical minimum populations with high probability. Since present populations are likely above historical minima in all cases, maintaining the populations at or above the present level will thus be in accordance with precautionary management.

Discussion by the Scientific Committee

The Scientific Committee considered that the definition of N_{max} , the maximum population level observed historically, was not clearly specified. In the case of the Northwest Atlantic harp seal stock, the highest abundance estimate is used as a proxy for N_{max}, and this procedure is advised for the Greenland Sea and White/Barents Sea populations. However it was considered that N_{max} should be related to the carrying capacity for the stock. If the maximum observed population size is used, limit levels may be set for a population that is already depleted, and N_{max} will increase over time. It was also not clear how it would be determined that a limit level had been reached, since abundance estimates typically have wide confidence intervals.

The Committee considered that a management framework should be specified with specific reference to goals defined by managers. In this case the framework in a sense pre-defines the management goals. In the case of harp and hooded seals, where management goals may in the future be defined in relation to ecosystem-based objectives, more flexibility will be required than is allowed in this framework. For these reasons the Scientific Committee could not advise the adoption of this management framework for harp and hooded seal stocks in the Greenland and White/Barents Seas.

Assessments

A full assessment of hooded seals must await availability of updated abundance estimates (based on surveys conducted in March 2005) and will be performed in 2006. For harp seal stocks options are given for three different catch scenarios: Current catch level; Maintenance catches (defined as the fixed annual catches that stabilizes the future 1+ population); and two times the maintenance catches.

Greenland Sea harp seal

The stock in 2005 is estimated to be 618,000 (95% C.I. 425,000-845,000) 1+ animals with a pup production of 106,000 (95% C.I. 71,000-141,000). The total catches were 9,895 (including 8,288 pups) in 2004 and 5,808 (4,680 pups) in 2005. Removals were 23-38% of the allocated quotas, which was 15,000 animals one year old or older (1+ animals). Catches have remained significantly less than the quota since 1993. The maintenance catch is 31,000 1+ animals, and twice this catch, taken as 1+ animals, results in a population size 55% that of the present one in 10 years time.

White Sea/Barents Sea harp seal

The adult population in 2005 is estimated to be 2,065,000 (95% C.I. 1,497,000 – 2,633,000) 1+ animals with a pup production of 361,000 (95% C.I. 299,000 – 423,000). No commercial catches were taken from this stock in 2004. The combined catches for 2005 were 22,474 (including 15,420 pups). The maintenance catch is 78,000 1+ animals, and twice this catch, taken as 1+ animals, results in a population size 67% that of the present one in 10 years time.

Northwest Atlantic harp seal.

Since 1996, catches in Canada and Greenland have resulted in average annual removals of about 471,000. Young of the year account for approximately 68% of the current removals. Photographic and visual aerial surveys to determine current pup production of northwest Atlantic harp seals were conducted during March 2004. The northwest Atlantic harp seal population is currently estimated to number ~ 5.9 million animals (SE=747,000), which is similar to the previous abundance estimate. The sustainable yield estimated from the model presented for the Northwest Atlantic harp seal population is 554,000 animals.

Greenland Sea hooded seal

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 8 years old and there are no estimates of reproductive rates for this stock. A new aerial and vessel survey of hooded seal pup production in the Greenland Sea pack-ice was conducted in March 2005. The results will be used to estimate the 2005 hooded seal pup production, but will not be available until 2006. Preliminary results suggest, however, that pup production in 2005 may be lower than observed in the previous survey (1997). Due to lack of data it is not possible to provide these options for this stock. Given the poor data available on this stock and indications that pup production may be reduced management of this stock should be extremely cautious.

Northwest Atlantic hooded seals

Canadian catches have been quite low since 1999 (~150 animals per year) with the take in 2004 increasing to around 400 animals. Catches in Greenland have been in the 6,000-7,000 range during 1970-2001, but had declined to around 3,500 in 2002. A hooded seal pup survey was conducted in 2005 in the Gulf, Front, and the Davis Strait. When completed, these results will provide an updated estimate of hooded seal abundance in the Northwest Atlantic by spring 2006.

Discussion by the Scientific Committee

The Committee regretted that the specific requests of the Council pertaining to the fraction of the Northwest Atlantic population migrating to Greenland, and catch levels necessary to reduce the population by 20% over 20 years had apparently not been conveyed to the ICES/NAFO Working Group, as had been recommended last year. The Committee noted that the Working Group would be meeting in 2006, and recommended that these questions be considered at that time. Nevertheless, given the population projections provided above for the Greenland Sea and White/Barents Sea stocks, it is possible to provide some preliminary advice on catches required to reduce the populations by 20%. For the Greenland Sea stock, annual catches of 2x the "maintenance" or equilibrium catch have the effect of reducing the population by 45-55% over 10 years, depending on the proportion of pups taken. Therefore, level of catch required to reduce the population by 20% over 20 years must be considerably less than the 2x maintenance catch. The same holds for the White/Barents Sea stock.

The Scientific Committee supported the recommendations of the Working Group concerning both stocks of hooded seals. Updated abundance estimates are expected in 2006 and at that time better advice on catch levels can be provided.

HARBOUR PORPOISE

In 2004 the Scientific Committee noted that there is likely a substantial level of by-catch of harbour porpoises in Icelandic fisheries. The same is likely true in Norway. The directed catch in Greenland exceeds 2,000 in some years and was reported as 2,320 in 2003. In order to estimate the sustainability of the ongoing by-catch and directed catch in these areas, better estimates of the present by-catch levels of harbour porpoises in Iceland and Norway, as well as estimates of absolute abundance for all areas, are required.

NARWHAL

The following is based on the report from a joint meeting of the NAMMCO Working Group on the Population Status of Narwhal and Beluga in the North Atlantic, and the Canada – Greenland Joint Commission Scientific Working Group was held 13-16 October 2005 in Nuuk, Greenland.

Stock structure

There was little new information available on the stock structure of narwhal. A model of the metapopulation structure of narwhal in Baffin Bay and surrounding areas, based on all available information, suggests that coastal summering concentrations of narwhals constitute at least four stocks in Canada (Eclipse Sound, Admiralty Inlet, Somerset Island, East Baffin Stocks), two stocks in West Greenland (Inglefield Bredning and Melville Bay), and two shared stocks (Jones sound and Smith sound). For East Greenland, little information on stock structure is available. There are summer aggregations at Scoresbysund, Kangerlussuaq, and Ammassalik that are subject to catches. Narwhal also occur north of Scoresbysund but these are likely not harvested. There is genetic evidence that East Greenland narwhal are distinct from those in West Greenland and Canada. However at present there is no basis for further distinguishing East Greenland stocks beyond observed summer concentrations.

Age estimation

Age estimation of toothed whales has traditionally used counting of growth layers in teeth, but this has limitations for narwhals. New results using the alternative method of aspartic acid racemisation in eyeballs were presented. About 20% of the whales were older than 50 yrs and there seemed to be a tendency for greater longevity in females than in males. The oldest female was found to be 115 years, the oldest male was 84 years, and age at sexual maturity was estimated to 6-7 yrs for females, and 9 yrs for males. These estimates of sexual maturity are similar to those from other studies.

Catch statistics

Catch statistics for narwhals in Greenland was updated, giving options with various degrees of correction for non-reporting, under-reporting and "struck and lost". Since 1993 catches have declined in West Greenland especially in Uummannaq where the decline is significant. There has not been a significant sex bias in the catch. There has been an increase in narwhal catches in East Greenland of 8% per year since 1993. The harvest reporting system changed in 1993 and the impacts of this change on the catch statistics are unknown.

In Canada the majority of the communities take a greater proportion of males than females throughout the seasons. Many communities hunt mostly in summer but several communities take a substantial proportion of their catch in spring or autumn. This information was used in allocating the catch to different putative sub-stocks, either local summering sub-stocks or spring or autumn migrating sub-stocks. The average reported landed catch per year from selected communities in the eastern Canadian arctic was 373 for the period between 1996 and 2004. Information on "struck and lost" is collected in a few communities through a hunter-reporting system, however, there is conflicting information on the lost rate in the narwhal hunts. The JWG therefore recommended the development of a programme to collect struck and lost information from direct hunt observation of hunts in Greenland and Canada.

Abundance

Results from the aerial surveys in the Canadian high arctic in August 2002 to 2004 were presented, and estimates accepted by the JWG are provided in Table 1 of Annex 1. The survey estimates have large standard errors due to clumping on certain transects within each stratum. Several areas known to contain narwhal were not surveyed due to weather conditions so the survey cannot provide a complete abundance estimate of the entire summer range in Canada. Some problems with the estimates for east Baffin fiords were identified and these will be addressed inter-sessionally.

Assessment

A model selection-based assessment for West Greenland narwhals was presented, using a density regulated population dynamic model to identify the more likely stock structure hypotheses for West Greenland narwhals. The assessment used the data on abundance, catch history and biological parameters that have been agreed in the past by this committee. Nevertheless there was concern about possible biases in some of the input data, particularly abundance estimates and indices. The models using the stock structures considered most likely by the JWG were examined further. To meet an objective of having a probability of 70% of some stock increase within 5 years, a total annual removal ranging from 15 to 75 narwhals is allowed for the entire area. This strengthens the conclusion reached in 2004, that West Greenland narwhal are heavily depleted and substantial reductions in catch are required immediately to arrest the decline in numbers. However the JWG could not agree on the quantitative results of the model because of the above noted uncertainties in stock structure and input parameters. The JWG agreed that the recommendation provided in 2004, that the total removal in West Greenland should be reduced to no more than 135 individuals, should be provided again and with greater emphasis. This greater emphasis is due to the fact that all models reviewed by the JWG allowed total annual removals lower than 135.

Given that almost nothing is known about the stock structure and seasonal migrations of East Greenland narwhal, and that the abundance estimate for Scoresbysund is more than 20 years old, a reliable assessment is not possible without new information. Research recommendation to improve this situation are provided in Section 5.7 of Annex 1.

A risk analysis on narwhal hunting in the Canadian High Arctic was presented. The JWG recommended that a different modelling framework be provided for the next meeting, but decided to use the present model to arrive at preliminary conclusions about the status of Canadian summer stocks. Under all but the most pessimistic scenarios of high loss rates combined with low rates of increase, there is a very low risk that the Somerset Island and Eclipse Sound will decline in the next 10 years. For Admiralty Inlet, there is a high probability of stock decline in the next 10 years under these conditions. However it was recognized that the recent estimate for this area may be biased because of the extreme clumping of narwhal. No accepted abundance estimate was available for the East Baffin Fiords, so an assessment could not be provided.

BELUGA

Catch

From 1954 to 1999 total reported catches in West Greenland ranged from 216 to 1874 and they peaked around 1970, and catches have declined at about 2% per year between 1979 and 2004. It was noted that the harvest in 2004 had been very low because of the introduction of the quota system and bad weather in some areas. The average reported landed catch from Canadian communities hunting from the Baffin Bay beluga stock for the period is 42. Reported catches in East Greenland are suspected to be possible misreporting of caught narwhals.

Abundance
An attempt to survey the West Greenland index area in March 2004 was unsuccessful due to inclement weather. The survey will likely be attempted again in 2006.

Assessment update
An updated assessment model for West Greenland beluga, using all available data on catch and abundance, and various combinations of data and parameters as sensitivity tests, was provided. All models estimate similar dynamics, where West Greenland beluga are severely depleted, with median depletion ratios in 2005 varying between 16 and 42 percent of the carrying capacity. Using the model considered most realistic by the JWG, it is predicted that reduction of catches to 100 per year will have an 80% chance of meeting the objective of halting the decline in beluga numbers by 2010. Maintaining higher catches reduces the probability of halting the decline, with the current quota of 220 beluga resulting in a 46% probability of halting the decline. These results are essentially the same as those from previous assessments of the stock.

FIN WHALES

The NAMMCO Working Group on fin whales met in Oslo 20-22 October 2005, and the Report of the meeting is included as Annex 2.

Stock structure
Based on the available genetic and non-genetic evidence, the Working Group did not find reason to change its previous view (NAMMCO 2000a), that most evidence suggests the presence of stocks with limited gene flow between adjacent summering aggregations. However, these summer aggregations could be composed of single and/or mixtures of breeding stocks. Interpretation of these data is limited by the lack of temporal and spatial coverage in the sampling.

Catch
A new analysis of historical catch records for Iceland from 1883 to 1915 split the catch between eastern and western Iceland. Catch position records show that there was very little overlap in the range of the east and west operations, but the operational range expanded with time. Another paper provided a compilation of fin whale catches in the entire North Atlantic, but including Norwegian catches only after 1915. A total of 28,559 fin whales was identified in the catch, leading to an estimate of 30,598 fin whales caught by prorating unidentified catch using the catch composition. Catches of fin whales off northern Norway exceeded 10,000 animals in the period before 1904, but these catches have been adequately documented elsewhere.

Abundance
Regionally stratified abundance estimates for fin whales from North Atlantic Sightings Surveys (NASS) conducted in 1987, 1989, 1995 and 2001 were presented to the Working Group. There has been a substantial increase in the abundance of fin whales in the area west of Iceland since 1987. This corresponds to the area where nearly all fin whaling has been conducted since 1915. Another paper used sightings survey data collected over the period 1988-2004 to calculate relative abundance estimates for fin

whales in the Northeast Atlantic. Point estimates of relative abundance in this area ranged between 1,100 and 1,800 whales in 5 surveys, with no significant trend over the period.

Assessment

A new assessment model of the EGI fin whale population was presented, modeled as four sub-populations with movement between the following areas: East Greenland, West Iceland, East Iceland and the Far East. For the base case assessment scenario, best fits to the data were obtained when the West Iceland and East Iceland are effectively fully mixed with a low level of interchange with East Greenland and virtually no interchange with the Far East region. For the base case and most sensitivity tests, the overall recruited population is increasing and above 80% of pre-exploitation abundance (*K*), and sub-populations in all areas are above 70% of the individual *K* values. Projections for annual catches of 0, 100, and 200 whales indicated that only the last would result in abundance decreases compared to current levels if catches were taken only from the West Iceland area. Based on this assessment model the Working Group found no reason to change its advice provided in 2003, that projections under constant catch levels suggest that West Iceland (termed the "inshore sub-stock" in earlier analyses) will maintain its present abundance (which is above MSY level) under an annual catch of about 150 whales. If catches were spread more widely, so that other stock components were also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales.

The Committee will be holding a special workshop "Catch History, Stock Structure and Abundance of North Atlantic Fin Whales", tentatively scheduled for March 2006 in Reykjavik, Iceland. The Scientific Committee of the IWC has been invited to sent participants to the meeting.

MINKE WHALES

Norway has continued its 6-year rotational sightings survey programme, and the blocks north of Iceland and around Jan Mayen were surveyed this year. The Icelandic Research Programme continued in 2005 with the take of 39 minke whales in coastal waters. Half the planned total of 200 minke whales have now been sampled. An aerial survey was conducted in May 2005 as part of a series to look at the seasonal distribution of minke whales in the area. In August 2004 satellite tagging was attempted on 9 minke whales. An interim report on the Icelandic Research Programme will be produced in 2006. An aerial survey with minke and fin whales as the target species was conducted successfully in West Greenland in September 2005.

DOLPHINS

An analysis of the distribution and abundance of common dolphins from the NASS and other surveys was provided. The estimated abundance in the W Block of the NASS95 Faroese survey was 273,159 (CV = 0.26; 95% CI = 153,392 – 435,104). No sightings were made north of 57º in any year, and encounter rates were highest between 51º and 53º N, with no significant differences in terms of Longitude. Other distributional relationships with depth and sea surface temperature were described. Common dolphins apparently do not occur in the waters of member countries except as occasional visitors.

GREY SEALS

Iceland reported that surveys were carried out in the main pupping areas in 2004, and preliminary results indicate that pup production has declined since 2002. Iceland also noted that, in fulfillment of the recommendation by NAMMCO in 2003 (NAMMCO 2004b), management objectives had been developed for this species. The Scientific Committee reiterated previous recommendations related to the conservation of grey seal stocks in the Faroes, Iceland and Norway.

HARBOUR SEALS

To address a request for a stock assessment brought by the Council in 2005, a Working Group on Harbour Seals has been initiated. The Working Group will meet in fall 2006 to fulfill the request for the entire North Atlantic, but concentrating on areas of interest to NAMMCO member countries.

HUMPBACK WHALES

In 2005 the Management Committee reqested that the the Scientific Committee continue its assessment of humpback whale stocks in the North Atlantic. The Committee decided to postpone the provision of advice for West Greenland until a new abundance estimate is available, probably in 2006. Sufficient information on historical catch, abundance and stock structure is available at present to conduct assessments for the Icelandic and Norwegian stocks. However, given other priorities, the Committee considered it advisable to delay this assessment until after the completion of the NASS-2007 survey, when an additional estimate of abundance should become available.

KILLER WHALES

In 2004 the Scientific Committee provided a list of researches required to conduct an assessment of killer whales, particularly in West Greenland, as requested by the Council in 2004. The Committee will review progress under this item annually with the view of conducting an assessment when sufficient information becomes available.

WALRUS

The Working Group on Walrus met in Copenhagen, 11-14 January 2005 under the chairmanship of Mads Peter Heide-Jørgensen. The Report of the Working Group is included as Annex 3.

Stock structure

The Working Group considered evidence from recent genetic, satellite tracking and trace element studies relating to stock discrimination. While the putative stock units identified in 1995 were in the main supported by new information, some revisions would be required, and these are summarised in Fig. 1 and Table 1 of Annex 3. The new information suggests a sub-division of the North Water (NOW) stock area, possibly into three areas including western Jones Sound and Penny Strait/Lancaster Sound stock areas. Also, differences in trace element profiles suggest that there may be a division between northern and southern Foxe Basin in Canada.

Catch statistics

No recent catches of walruses have been reported from Svalbard or the western Russian Federation, and walrus hunting is prohibited in these areas. By comparison with information on previous catch levels, some recent catches in East and West Greenland appear anomalously high. This might be due to multiple reporting of the same animal by hunters, but there was no data to support this. Reporting from Canada was incomplete and there was some disagreement between the two main sources of harvest data. In discussion the Working Group noted that, even with the advent of new harvest reporting systems in both Canada and Greenland, there was still a high level of uncertainty in the catch reports. Accurate catch reports are crucial for understanding the impact of hunting on the stocks. stimates of recent average harvests by stock area are presented in Table 3, Annex 3.

No new information on struck and lost rates has become available from any area. As in 1995, a loss rate of 30% for stocks lacking specific loss rate information was assumed.

Abundance and trends

A survey was conducted in the NOW area in August 1999, resulting in a total estimate of 1,500 for the NOW area, including corrections for animals seen in the water and on land and for areas not surveyed. The Working Group found that the survey was not presented in sufficient detail for evaluation purposes, accepted the estimate for information but noted that it should not be used directly in assessments without further work and documentation. The Working Group was hindered in its work by the lack of information on the abundance from all areas, and except for the Canadian High Arctic (North Water), there has been no progress in obtaining abundance estimates since 1995. Abundance estimates are an essential component of any assessment, and there can be little progress in establishing sustainable harvest levels and improving conservation measures until this need is addressed. Available estimates of abundance by stock area are provided in Table 3 of Annex 3.

Ecology

Estimates of energy consumption and consumption of bivalve prey for East Greenland walrus suggest that walrus have relatively high metabolic and feeding rates, perhaps because they must deposit blubber from a low-lipid diet, mainly during the summer.

The potential impact of global warming on walrus was discussed, but the Working Group could not come to any firm conclusions on the matter. It was emphasised in this context that the most immediate threat to walrus populations is over-exploitation, not climate change. It was noted that land haulouts have been abandoned in many areas of Canada, Greenland, Norway and Russia, probably due to hunting and/or disturbance. It is possible that walruses may become more dependent on land haulouts if ice cover is reduced due to global warming. The Working Group expressed concern about the potential disturbance of walruses by increased human activities at or near haulout sites.

New oil and gas fields are being developed on the continental shelf of the southeastern Barents Sea in the Russian Federation. This is within the area of walrus distribution in these waters. The Working Group cautioned that walruses might be susceptible to disturbance by seismic exploration, shipping, and extraction activities, and to pollution caused by spills and urged that this be assessed in development plans for this area.

Assessment by stock

A formal assessment model was provided only for the West Greenland, NOW and East Greenland populations. However the Working Group agreed that the abundance estimates for the three stocks used in the model were not suitable for use in assessment, so the findings of this model could not be accepted at face value.

The Working Group accepted the conclusion that the East Greenland walrus population was recovering or recovered after a period of over-exploitation in the early 20th century. However the present size of the stock and its status in relation to its pristine state was uncertain, and advice on sustainable harvest levels for this population could not be provided. In 1995 the reported average catches of about 20 animals per year were considered likely to be sustainable. Recent reported harvests have been considerably higher than this, so the Working Group expressed concern that continued harvests at the reported levels might not be sustainable, while acknowledging that for some years, recent (1993-2002) harvest reports are considered to be implausibly high.

In 1995 the Working Group concluded that the West Greenland stock was depleted and declining, and that a population of 1,000 to 2,500 animals would be required to support the annual harvests, at that time *ca* 50 walruses. It was considered unlikely that present abundance was over 1,000 animals, while reported harvests have increased since 1995. The Working Group saw no reason to change this conclusion, but recommended that a new assessment of this stock be completed as soon as possible. This could likely be done using existing data.

The Working Group had already concluded that the former NOW stock should be divided into three new stock areas. There is no indication that walruses from Western Jones Sound or Penny Strait/Lancaster Sound support the harvest at Grise Fiord and Qaanaaq municipality. Therefore it was recommended that any future assessments should be carried out with reallocation of the abundance estimate to the new stock areas. It was considered that a new abundance estimate for this area will be required before a meaningful assessment can be undertaken. In 1995 the Working Group concluded that what was then considered to be a single stock could not support the harvest at that time. The Working Group reaffirmed its previous conclusion that there was no indication that these combined stocks are large enough to support the current harvest levels and therefore expressed concern that current harvests are probably not sustainable. The Working Group recommended that a new assessment of these stocks should be completed as soon as possible.

The situation for West Greenland walrus is especially serious and the preliminary assessment indicates that severe reductions in catch may be required. The Scientific Committee noted that the assessment can be furthered using available data from past surveys of the West Greenland overwintering area, and recommended that these surveys be analysed as an urgent priority. Once this and other research has been completed, the Working Group should meet again to complete the assessment of the West Greenland and perhaps other stocks. It was anticipated that this could be done as early as 2006 or early in 2007.

NORTH ATLANTIC SIGHTINGS SURVEYS

The next NASS is planned for 2007. Efforts have already been made to coordinate NASS with other surveys to take place in 2007:

- The proposed project "Cetacean Offshore Distribution and Abundance in the European Atlantic" (CODA) that is planned as a follow-up to SCANS-II in 2007. The surveys will cover European Atlantic offshore waters outside the continental shelf area west to the boundary of the EEZ of the UK, Ireland, France, Spain and Portugal. There have been positive discussions with the CODA coordinator about coordination of this survey with NASS-2007, and such coordination is part of the proposal.
- Possible Canadian and US surveys on their eastern seaboards. Again there have positive discussions about coordination with NASS, particularly with the Canadian survey;
- Possible West Greenland survey;
- If an international redfish survey is conducted in the area in 2007, there will be an opportunity to share platforms as was done in 2001 on the Icelandic vessels;
- Ongoing annual surveys by the Russian Federation in the Barents and Norwegian Seas.

The Committee concluded that there is a perhaps unique opportunity to conduct a very wide ranging synoptic cetacean survey, covering areas of the eastern and western Atlantic that have never been covered simultaneously in previous surveys. The Committee strongly recommended that the Council and individual member countries encourage other jurisdictions to become involved in the NASS project for 2007.

To take advantage of this opportunity, it was decided to establish a steering group, headed by Desportes, to begin planning NASS and its coordination with other surveys. It is anticipated that a planning meeting, involving participation from all relevant jurisdictions, should be held sometime in 2006.

BY-CATCH OF MARINE MAMMALS

The Committee was informed that there had been little or no progress since last year in the development of by-catch monitoring programmes in NAMMCO member countries. Noting that estimates of all removals, including by-catch, are required for stock assessments, and there is evidence that unreported by-catch occurs in the fisheries of member countries, the Committee strongly recommended that all member countries establish by-catch monitoring systems for their fisheries.

AMENDMENT TO RULES OF PROCEDURE

It has been standard practice for the last several years that NAMMCO funds the attendance of invited experts at Working Group meetings, however this process has not been formalised in the *Rules of Procedure*. To avoid any possibility of confusion, the Committee recommended that the *Rules of Procedure* should be amended such that NAMMCO continues to fund the attendance of invited experts to meetings of NAMMCO Scientific Working Groups, irrespective of their country of origin.

SATELLITE TELEMETRY GROUP

In 2002 the Scientific Committee decided to establish an inter-sessional correspondence group to explore the technical aspects of satellite tagging, including deployment systems and to recommend ways to further the development and success of this technique in NAMMCO member countries. Attempts had been made to organise a workshop on the technical aspects of tagging large whales, but this had met with little interest from the few research groups involved in this field. These research groups are willing to enter into collaborative projects with others, but do not seem willing to share information on the more technical aspects of tagging in an open forum. The Scientific Committee recognised that the correspondence group could not make progress without the cooperation of key players in the field, and decided that the group would be terminated. The Committee will monitor developments in this field on a regular basis.

FUTURE WORK PLANS

The following working groups will hold meetings during 2006:
- NASS Planning Group, first half of 2006;
- Fin Whale Working Group (with IWC attendance), March in Iceland;
- Harbour Seal Working Group, second half of 2006;
- Walrus Working Group (depending on progress).

Other meetings may be held depending on requests received from the Council.

The next (14th) annual meeting will be held in Iceland at a time and location to be determined.

ELECTION OF OFFICERS

Genevieve Desportes was elected as chair for a 2-year term, to begin after the meeting of NAMMCO Council in March 2006.. It was decided that the vice-chair would be elected by correspondence. The Committee thanked Lars Walløe for his able chairmanship over the past 2 years.

THIRTEENTH MEETING OF THE NAMMCO SCIENTIFIC COMMITTEE
MAIN REPORT

1. CHAIRMAN'S WELCOME AND OPENING REMARKS

Chairman Lars Walløe welcomed the members of the Scientific Committee to their 13th meeting (Appendix 1), held at Reine in Lofoten, Norway, 24 – 27 October 2005. He also welcomed the Observer from Canada, Patrice Simon, the Observer from the Russian Federation, Dr. Vladimir Zabavnikov, and the Observers from the High North Alliance, Rune Frøvik and Laila Jusnes. Members Tore Haug and Mads Peter Heide-Jørgensen (Greenland) did not attend the meeting.

2. ADOPTION OF AGENDA

The Draft Agenda (Appendix 1) was adopted with minor changes.

3. APPOINTMENT OF RAPPORTEUR

Daniel Pike, Scientific Secretary of NAMMCO, was appointed as Rapporteur for the meeting, with the help of other members as needed.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

4.1 National Progress Reports

National Progress Reports for 2004 from the Faroes, Greenland, Iceland, and Norway were presented to the Committee. In addition the Scientific Committee was pleased to receive a progress report from Canada and a presentation given by the Observer for the Russian Federation.

The Committee drew to the attention of the Council that the Report from Greenland was incomplete in that it did not include all research that was conducted in 2004, and did not summarise management measures that were taken in 2004. Noting the importance of these reports, the Committee recommended that complete reports be provided.

4.2 Working Group Reports

Working Group Reports and other documents available to the meeting are listed in Appendix 2.

5. COOPERATION WITH OTHER ORGANISATIONS

5.1. IWC

The 56th meeting of the Scientific Committee of the International Whaling Commission was held in Ulsan, South Korea, 30 May - 10 June 2005. Dr Lars Walløe attended as the Observer for the NAMMCO Scientific Committee.

Last year, the IWC Scientific Committee agreed that there were sufficient data to warrant initiation of the pre-implementation assessment for North Atlantic fin whales. In the meeting this year Iceland presented both non-genetic and genetic data for stock structure. Both the non-genetic data and the genetic divergence of fin whales from different feeding grounds indicate separate breeding units. Apart from that, no firm conclusion was reached, but further work related to identification and refinement of stock structure hypotheses was identified.

Issues to be addressed in completing the pre-implementation assessment for North Atlantic fin whales at the Committee's 2006 meeting were detailed. The IWC Scientific Committee recommended that IWC scientists attend the Workshop proposed by the NAMMCO Scientific Committee (see 9.6.2), given its focus on general scientific issues related to stock structure of fin whales and other non-management related issues such as the development of a final catch series. The Committee agreed that relevant scientists from the NAMMCO Scientific Committee be invited to the 'First Annual Meeting' at which stock structure hypotheses will be discussed further.

The Scientific Committee received an analysis of the results of the photographic aerial strip-transect surveys carried out in 2002 and 2004. Corrections for whales not at the surface were applied to arrive at an estimate of 510 common minke whales, which is significantly smaller than the revised estimate of 6,390 whales in 1993. The corresponding fin whale estimate was 980 whales, which is similar to an estimate of 1,100 (95% CI 520-2,100) whales in 1987-88. The IWC Scientific Committee did not consider these estimates acceptable for a number of reasons related to both the examination of the photographs and the appropriateness of the correction factors applied. The Scientific Committee agreed that, once again, it was in the deeply unfortunate position of being unable to provide satisfactory management advice on safe catch limits. The Scientific Committee recommended (1) a re-examination of the photographs and (2) a cue-counting survey to occur, and agreed that priority should be given to carrying out the survey if insufficient funds were available.

5.2 ICES

The Joint ICES/NAFO Working Group on Harp and Hooded Seals (WGHARP) met in September 2005 and their report is dealt with under 9.1 and 9.2.

Pike reported that the NAMMCO Secretariat had attended the ICES Annual Science Conference in September in Aberdeen, Scotland. The Management Committee *Ad Hoc* Working Group on Enhancing Ecosystem Based Management took advantage of the information provided in the theme session "Ecosystem Approach to Fisheries Management: Worked Examples" to hold a meeting to discuss the role of NAMMCO in applying the ecosystem-based management approach. In addition two other theme sessions were of special interest to the Committee: "Mitigation Methods for Reducing Marine Mammal and Sea Turtle By-catch" and "Marine Mammals: Monitoring Techniques, Abundance Estimation and Interactions with Fisheries". Pike gave a presentation on trends in humpback and fin whale abundance from the North Atlantic Sightings Surveys (NASS) (SC/13/9) under the latter theme session.

5.3 Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB)

The JCNB Scientific Working Group and the NAMMCO Working Group on Narwhal and Beluga met jointly from 13-16 October 2005 and their report is dealt with under 9.4 and 9.5.

5.4 ASCOBANS

Daniel Pike attended the 12th meeting of the ASCOBANS Advisory Committee (AC) as the observer for NAMMCO.

The AC discussed plans for the SCANS-II survey (now completed), and tentative plans to conduct a survey in offshore waters in the same general area, probably in 2007. The Observer for NAMMCO informed the AC about the next (NASS) and the opportunity for coordination of surveys in 2007. The AC was supportive of these efforts.

A draft Recovery Plan for harbour porpoises in the North Sea was considered by the AC. In general the Parties found that the Plan should focus on specific stocks in the North Sea which might be depleted, as there is probably more than one stock in the area. It was also noted that the Plan should be more specific as to threats and possible mitigation actions pertaining to these stocks, and that there was a need for more stakeholder involvement in the Plan. A new version would be ready for the next meeting in 2006.

There was some discussion of the new European Regulations pertaining to by-catch, which will prohibit the use of driftnets in Baltic Sea fisheries by 2008, mandate the use of acoustic deterrent devices (pingers) in some fisheries, and mandate observer coverage in some fisheries.

The agreement establishing ASCOBANS has been amended to cover a larger area, extending west to 15° W and south to 36° N, but not including the area around the Faroes. The new area is contiguous with that of ACCOBAMS to the south. The ratification process is not yet complete but ratification is expected this year. In addition the AC was asked to consider the implications of extending the ASCOBANS agreement to include all cetaceans, not just toothed whales other than sperm whales as at present. This will be dealt with at the next meeting.

6. INCORPORATION OF THE USERS KNOWLEDGE IN THE DELIBERATIONS OF THE SCIENTIFIC COMMITTEE.

As in 2004 the Scientific Committee will await the conclusions of the Management Committee 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 7th meeting in 1999, the Scientific Committee agreed that the Secretariat should proceed with the development of stock status reports summarising the view of the NAMMCO Scientific Committee on the status of stocks/species for which it has provided advice. These Reports will be published on the NAMMCO Web Site or elsewhere as appropriate The Scientific Secretary reported that two reports had been added to the web site this year and that at present there are six reports on the web site: minke whale, long-finned pilot whale, ringed seal, Atlantic walrus, beluga whale and fin whale. However the NAMMCO web site is in the process of extensive renovation and it is anticipated that simpler information items on marine mammals may be required in addition to the stock status reports.

8. ROLE OF MARINE MAMMALS IN THE MARINE ECOSYSTEM

8.1 Working Group on Marine Mammal – Fisheries Interactions

In 2004 the Committee tasked Walløe with reporting progress in these areas at the 2005 meeting, with the goal of holding a meeting in 2006 to finalise models for the Barents Sea and assess models for other areas, if progress on the identified research and modelling priorities has been sufficient to warrant such a meeting.

Walløe reminded the Committee of the problem with the Scenario C model reported last year, that when harp seals are introduced into the model, the cod are exterminated. This happens with the harp seal stock at the estimated current abundance, and is contrary to what is known of the system. The modelled predation of harp seals on cod, in addition to cannibalism and minke whale predation, is simply excessive. It was considered likely that this was due in part to bias in the harp seal diet data, for which most samples have been collected along the ice edge, where cod are not common, but a few have been taken from coastal Norway and show a relatively large proportion of cod in the diet. Satellite tagging has shown that harp seals spend a large part of the summer and fall in open water in the Barents Sea, but almost no data are available on their diet in this area. Presently efforts are being made to combine satellite tag information on the spatio/temporal distribution of harp seals combined with their diving patterns, with the known distributions of potential prey species, particularly capelin. Also, studies on fatty acid profiles are underway to determine the relative contribution of various prey to the diet. However it is not yet known if these efforts will be successful enough to improve the model.

Víkingsson reported that a person has been hired to integrate marine mammals in GADGET models for Icelandic waters, as had been recommended in 2002. However results are not expected before 2007. The Icelandic Research Programme is ongoing and a preliminary report on the diet of minke whales in Icelandic waters will be produced in 2006.

The Observer for the Russian Federation informed the Committee about collaborative studies between PINRO and the Institute of Marine Research in Bergen, involving simultaneous aerial and ship surveys to assess the overlap between the distribution of marine mammal and potential prey species, particularly capelin and polar cod. While earlier surveys had indicated little correlation between the distribution of harp seals and capelin, such a correlation is suspected in 2005. The Committee requested that information on this study be made available at the next meeting.

The Committee tentatively decided to hold a meeting of the Working Group on Marine Mammal – Fisheries Interactions in 2007, depending on progress in modelling for the Barents Sea and Iceland. Again Walløe was asked to monitor progress in these areas.

8.2 Other matters

The Observer for Canada reported that a large amount of information on the distribution of harp and hooded seals from satellite tagging studies, as well as information on their diet in various areas, had been collected in recent years. It was expected that the results of these studies would become available in the next 2-3 years.

9. MARINE MAMMAL STOCKS - STATUS AND ADVICE TO THE COUNCIL

9.1 and 9.2 Harp and hooded seals

9.1.1 Update on progress

In 2004 the Management Committee requested that the Scientific Committee annually discuss 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 the light of ecosystem management requirements

In 2005 the Management Committee recommended that the Scientific Committee evaluate how a projected decrease in the total population of Northwest Atlantic harp seals might affect the proportion of animals summering in Greenland. In addition the Management Committee requested the Scientific Committee to specify harvest levels for these two (*i.e*. Barents/White Sea and Greenland Sea) harp seal stocks that would result in a population reduction of 20% over a period of 20 years.

The ICES/NAFO Working Group on Harp and Hooded Seals met in September 2005 in St. John's Newfoundland, Canada. The main tasks of the Working Group were:

- to establish biological limits for Greenland Sea harp seals and White Sea/Barents Sea harp seals;
- assessment of the status of the stocks of harp and hooded seals in the Greenland Sea and harp seals in the White Sea/Barents Sea;
- assessment of the impact on these stocks of three different levels of annual harvest;
- Review the recent assessment of the status of harp seals conducted by Canada;
- Review the results of other ongoing studies on harp and/or hooded seals in the NW Atlantic, in particular any available results from tagging studies using satellite telemetry tracking.

Biological limits for seal harvest

The Working Group proposed a framework for biological reference points and a corresponding management framework, largely based on the Canadian management system. The framework relates to population numbers with the N_{max} (not exploited) stock size as a key reference point. In accordance with the precautionary approach a distinction is made between data-adequate and data-poor situations. Data-adequate stocks should have data available for estimating abundance where a time series of at least five abundance estimates should be available spanning a period of 10-15 years with surveys separated by 2-5 years, the most recent abundance estimates should be prepared from surveys and supporting data (*e.g.*, birth and mortality estimates) that are no more than 5 years old, and the precision of abundance estimates should have a Coefficient of Variation about the estimate of about 30%. Stocks whose abundance estimates do not meet all these criteria are considered data-poor.

Based upon these criteria, the harp and hooded seal stocks should be classified as follows: Greenland Sea harp seal stock - data-rich; White/Barents Sea harp seal stock - data-rich; Northwest Atlantic harp seal stock - data-rich; Northwest Atlantic hooded seal stock - data-poor; Greenland Sea hooded seal stock - data-poor. For the latter two stocks, new survey results will become available in 2006, after which these stocks may be considered data-rich.

For data-rich stocks, two precautionary and one conservation (limit) reference level are proposed. All reference levels relate to the N_{max} population size. (*e.g.* maximum population size historically observed, N_{max}). The first precautionary reference level could be established at 70% (N_{70}) of $N_{max.}$ When the population is between N_{70} and N_{max}, harvest levels may be decided that may stabilise, reduce or increase the population, so long as the population remains above the N_{70} level. When a population falls below the N_{70} level, conservation objectives are required to allow the population to recover to above the precautionary (N_{70}) reference level. N_{50} is a second precautionary reference point where more strict control rules must be implemented, whereas the N_{lim} reference point is the ultimate limit point at which all harvest must be stopped. In accordance with practices in the Western Atlantic ICES recommends that the limit reference point (N_{lim}) could be either 30% of the historical accurate maximum population estimates or should be set independently using IUCNs vulnerable criteria.

For data-poor stocks, it is recommended that only the lower tier (below N_{lim}) be defined. In this case, the four tiers effectively collapse to two (*i.e.*, above and below N_{lim}). Below N_{lim} all harvest must be stopped, and conservative and effective management measures will at all times be required when the stock is below N_{max}.

In the absence of a historical time series which enables estimates of N_{max} it is suggested that a risk avoidance management strategy is implemented. As a precautionary management approach it is therefore suggested that management is implemented such that the populations are above the historical minimum populations with high probability. Recent abundance estimates implies that present populations are above historical minimum with high probability. Maintaining the populations at or above the present level will thus be in accordance with precautionary management.

Assessments

Population assessments were based on a population model that estimates the current total population size. 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. The same population dynamic model was used for both of the Northeast Atlantic harp seal populations but with stock specific population parameters. A full assessment of hooded seals must await availability of updated abundance estimates (based on surveys conducted in March 2005) and will be performed in 2006.

<u>Greenland Sea harp seal</u>

The adult population is at the highest level estimated in the historical time series. Based on previous (1983-1991) mark-recapture data and recent (2002) aerial survey data, the stock in 2005 is estimated to be 618,000 (95% C.I. 425,000-845,000) 1+ animals with a pup production of 106,000 (95% C.I. 71,000-141,000). The total catches were 9,895 (including 8,288 pups) in 2004 and 5,808 (4,680 pups) in 2005. Removals were 23-38% of the allocated quotas, which was 15,000 animals one year old or older (1+ animals). The quota has been implemented such that parts of, or the whole quota, could be taken as weaned pups assuming 2 pups equaled one 1+ animal. Russia has not participated in this hunt since 1994. Catches have remained significantly less than the quota since 1993.

Options are given for three different catch scenarios:

- Current catch level (average of the catches in the period 2001 – 2005);
- Maintenance catches (defined as the fixed annual catches that stabilizes the future 1+ population);
- Two times the maintenance catches.

The catch options are further expanded using different proportions of pups and 1+ animals in the catches.

OPTION #	**CATCH LEVEL**	**PROPORTION OF 1+ IN CATCHES**	**PUP CATCH**	**1+ CATCH**	**D_{1+}**		
PRIOR					Lower CI	point	Upper CI
1	Current	25.6% (current level)	3,303	1,138	1.18	1.51	1.83
2	Maint-enance	25.6%	36,688	12,624	0.61	1.01	1.41
3	Maint-enance	100%	0	31,194	0.66	1.05	1.44
4	2 X maint.	25.6%	73,376	25,248	0.00	0.45	0.97
5	2 X maint.	100%	0	62,388	0.058	0.55	1.03

Table 1. Catch options with corresponding population trend (D_{1+}) for the next 10-year period for harp seals in the Greenland Sea. D_{1+} is the projected ratio of the abundance in 2015 to that in 2005.

White Sea/Barents Sea harp seal

The adult population is at the highest level estimated in the historical time series. Based on Russian surveys in 1998, 2000, 2002 and 2003, the stock in 2005 is estimated to be 2,065,000 (95% C.I. 1,497,000 – 2,633,000) 1+ animals with a pup production of 361,000 (95% C.I. 299,000 – 423,000).
No commercial catches were taken from this stock in 2004. The combined catches for 2005 were 22,474 (including 15,420 pups).

OPTION #	**CATCH LEVEL**	**PROPORTION OF 1+ IN CATCHES**	**PUP CATCH**	**1+ CATCH**	**D_{1+}**		
PRIOR					Lower CI	Point	Upper CI
1	Current	11.5% (current level)	25,945	3,371	0.91	1.35	1.78
2	Maint-enance	11.5%	153,878	19,995	0.57	0.98	1.39
3	Maint-enance	100%	0	78,198	0.62	1.04	1.50
4	2 X maint.	11.5%	307,756	39,990	0.12	0.53	0.93
5	2 X maint.	100%	0	156,396	0.24	0.67	1.10

Table 2. Catch options with corresponding population trend (D_{1+}) for the next 10-year period for harp seals in the White/Barents Sea. D_{1+} is the projected ratio of the abundance in 2015 to that in 2005.

Reproductive rates in this stock are lower than those observed in other harp seal stocks. Growth rates have declined and the age of maturity for both males and females has increased since the early 1960s. All these observations may indicate density dependent factors affecting population dynamics of this stock, but this requires further investigations. There are reports that pup mortality rates may vary substantially in the White Sea region, and that in recent years these rates have been very high. For this reason, the 2005 abundance of White Sea harp seals was estimated under the assumption that the ratio between the natural mortality of pups and adults was 5 instead of 3.

Northwest Atlantic harp seal.

The average total removal from 1952 – 1982 was approximately 388,000 (including estimates for "struck and lost" and by-catch), but declined to 178,000 per year between 1983 and 1995. Since 1996, higher catches in Canada and Greenland resulted in average annual removals of 471,000. Young of the year account for approximately 68% of the current removals.

There is ongoing research involving satellite tracking of harp seal movements. Results of tracking 19 animals released off of NFLD were similar to the observations from 21 deployments in the 1990s. Most animals followed the Labrador coast northward and then dispersed into Baffin Bay, Davis Strait, and west coast of Greenland. A very few animals dispersed eastward to the east coast of Greenland, as in the 1990's deployment. Some double migrations occurred. Similar work is occurring in the Gulf of St. Lawrence.

Photographic and visual aerial surveys to determine current pup production of northwest Atlantic harp seals were conducted off Newfoundland and Labrador (the "Front"), and in the Gulf of St. Lawrence during March 2004. Surveys of four whelping concentrations were conducted between 5 and 18 March resulting in estimated pup production of 640,800 (CV=7.3%) at the Front, 89,600 (CV=25.4%) in the northern Gulf, and 261,000 (CV=9.8%) in the southern Gulf (Magdalen Island), for a total of 991,400 (CV=5.9%). Comparison with previous estimates indicates that pup production has not changed since 1999, likely due to the increased hunting of young animals which began in the mid-1990s.

A population model, incorporating uncertainty in reproductive rates, was constructed to examine changes in the size of the Northwest Atlantic harp seal population between 1960 and 2005. The model incorporated information on reproductive rates, reported removals, as well as estimates of non-reported removals and losses through by-catch in other fisheries to determine the population trajectory. The northwest Atlantic harp seal population is currently estimated to number ~ 5.9 million animals (SE=747,000), which is similar to the previous abundance estimate.

The sustainable yield estimated from the model presented for the Northwest Atlantic harp seal population is 554,000 animals. If it is assumed that the current level and age structure of catches in the Canadian Arctic and Greenland, and as by-catch in commercial fisheries remains the same, this would equate to a landed catch of 325,000 at the Front and Gulf.

Greenland Sea hooded seal

There are not sufficient data to assess the current stock status in a historical perspective. Preliminary results from a pup survey conducted in 2005 suggest that pup production in 2005 may be lower than observed in the previous survey (1997). Based on a Norwegian aerial survey in 1997, the stock in 2003 was estimated 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). Total catches (all taken by Norway as Russian sealers did not operate in the Greenland Sea in the period) were 4,881 (including 4,217 pups) in 2004 and 3,752 (3,633 pups) in 2005. This was 87% and 67% of the identified maintenance yields, respectively. The quota was implemented such that parts of, or the whole quota, could be taken as weaned pups assuming 1.5 pups equalled one 1+ animal. Between 1990 and 2000 less than 30% of the quota was taken each year.

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 8 years old and there are no estimates of reproductive rates for this stock. A new aerial and vessel survey of hooded seal pup production in the Greenland Sea pack-ice was conducted in March 2005. The results will be used to estimate the 2005 hooded seal pup production, but will not be available until 2006. Preliminary results suggest, however, that pup production in 2005 may be lower than observed in the previous survey (1997). Due to lack of data it is not possible to provide these options for this stock. Given the poor data available on this stock and indications that pup production may be reduced management of this stock should be extremely cautious.

Northwest Atlantic hooded seals

Canadian catches have been quite low since 1999 (~150 animals per year) with the take in 2004 increasing to around 400 animals. There is an annual quota of 10,000 age 1+ animals in Canada. By-catch was very limited due to the species being distributed away from commercial fisheries. Catches in Greenland have been in the 6,000-7,000 range during 1970-2001, but had declined to around 3,500 in 2002.

A hooded seal pup survey was conducted in 2005 in the Gulf, Front, and the Davis Strait. The surveys included visual and photographic estimates at the Front, and visual elsewhere. When completed, these results will provide an updated estimate of hooded seal abundance in the Northwest Atlantic by spring 2006.

Future meeting of the Working Group

It is presently planned that the Working Group will meeting in June 2006, primarily to deal with new information on hooded seals.

Discussion by the Scientific Committee

The Scientific Committee first considered the proposal by the Working Group to establish a management framework for the Greenland Sea and White/Barents Sea populations of harp seals, and the Greenland Sea population of hooded seals, based on biological reference levels. It was considered that the definition of N_{max}, the maximum population level observed historically, was not clearly specified. In the case of the Northwest Atlantic harp seal stock, the highest abundance estimate is used as a proxy for N_{max}, and this procedure is advised for the Greenland Sea and White/Barents Sea populations. However it was considered that N_{max} should be related to the carrying capacity for the stock. If the maximum observed population size is used, limit levels may be set for a population that is already depleted, and N_{max} will increase over time.

Decision rules for determining when limit levels are reached were not clearly specified in the report of the Working Group. Abundance estimates typically have wide confidence intervals, so crossing a specific population threshold can only be specified probabilistically. In the case of the Northwest Atlantic harp seals, the lower 60% confidence limit of the most recent estimate is apparently used as a metric for this.

The Committee considered that a management framework should be specified with specific reference to goals defined by managers. In this case the framework in a sense pre-defines the management goals. In the case of harp and hooded seals, where management goals may in the future be defined in relation to ecosystem-based objectives, more flexibility will be required than is allowed in this framework. For these reasons the Scientific Committee could not advise the adoption of this management framework for harp and hooded seal stocks in the Greenland and White/Barents Seas.

The Committee regretted that the specific requests of the Council pertaining to the fraction of the Northwest Atlantic population migrating to Greenland, and catch levels necessary to reduce the population by 20% over 20 years (see above) had apparently not been conveyed to the ICES/NAFO Working Group, as had been recommended last year. The Committee noted that the Working Group would be meeting in 2006, and recommended that these questions be considered at that time.

Nevertheless, given the population projections provided above for the Greenland Sea and White/Barents Sea stocks, it is possible to provide some preliminary advice on catches required to reduce the populations by 20%. For the Greenland Sea stock, annual catches of 2x the "maintenance" or equilibrium catch have the effect of reducing the population by 45-55% over 10 years, depending on the proportion of pups taken. Therefore, level of catch required to reduce the population by 20% over 20 years must be considerably less than the 2x maintenance catch noted in Table 1. The same holds for the White/Barents Sea stock (Table 2), for which the 2x maintenance catch level reduces the population by 53-67% over 10 years. More detailed advice on this matter will have to await further modelling results.

The Scientific Committee supported the recommendations of the Working Group concerning both stocks of hooded seals. Updated abundance estimates are expected in 2006 and at that time better advice on catch levels can be provided. Until then management should be precautionary, particularly for the Greenland Sea stock, for which preliminary results show that the stock may have declined.

9.1.2 Future work

The Scientific Committee recommended that the ICES/NAFO Working Group should be requested to address the question of how a projected decrease in the total population of Northwest Atlantic harp seals might affect the proportion of animals summering in Greenland. It was also recommended that the Working Group be requested to provide advice on catch levels for the White/Barents and Greenland Sea stocks harp seal stocks that would result in a population reduction of 20% over a period of 20 years.

9.3. Harbour porpoise

9.3.1 Update on progress

The SCANS-II survey was completed in 2005 and will provide estimates of abundance for this species in the North Sea and adjacent areas (see 10).

9.3.2 Future work

In 2004 the Scientific Committee noted that there is likely a substantial level of by-catch of harbour porpoises in Icelandic fisheries. The same is likely true in Norway. The directed catch in Greenland exceeds 2,000 in some years and was reported as 2,320 in 2003. In order to estimate the sustainability of the ongoing by-catch and directed catch in these areas, better estimates of the present by-catch levels of harbour porpoises in Iceland and Norway, as well as estimates of absolute abundance for all areas, are required.

9.4. Narwhal

9.4.1 Report of the Working Group

A joint meeting of the NAMMCO Working Group on the Population Status of Narwhal and Beluga in the North Atlantic, and the Canada – Greenland Joint Commission Scientific Working Group was held 13-16 October 2005 in Nuuk, Greenland. The full Report of the Joint Working Group (JWG) is included as Annex 1.

Stock structure

Four satellite-tracked narwhals had been shown to be stationary in and around Inglefield Bredning through September. Shifts to the west and south were observed for all animals by the end of the month, however no data were collected on migration routes or wintering grounds because the tag attachment duration was less than 20 days for all tags.

The JWG noted the importance of information on the migratory destination narwhals from Inglefield Bredning, but for this purpose the duration of the tags must be doubled or tripled. It was noted that this work had been carried out in cooperation with hunters, who had made an important contribution to the development of the tagging methodology.

No new information was available on stock structure in East Greenland since the NAMMCO Working Group last considered this in 1999 (NAMMCO 2000a). There are summer aggregations at Scoresbysund, Kangerlussuaq, and Ammassalik that are subject to catches. Narwhal also occur north of Scoresbysund but these are likely not harvested. There is genetic evidence that East Greenland narwhal are distinct from those in West Greenland and Canada. However at present there is no basis for further distinguishing East Greenland stocks beyond observed summer concentrations

Management units

An update on the metapopulation structure and hunt allocation of narwhals in Baffin Bay, based on all available information, was presented. The model was similar to that presented at the last meeting, but new evidence on migrations and homing of narwhals from Admiralty had been added. Coastal summering concentrations of narwhals constitute at least four stocks in Canada (Eclipse Sound, Admiralty Inlet, Somerset Island, East Baffin Stocks), two stocks in West Greenland (Inglefield Bredning and Melville Bay), and two shared stocks (Jones sound and Smith sound).

Biological parameters

Age estimation

Age estimation of toothed whales has traditionally used counting of growth layers in teeth, but this has limitations for narwhals. A paper presented results for the age estimation of West Greenland narwhals using the alternative method of aspartic acid racemization. Eyeballs and teeth from 75 narwhals were examined. About 20% of the whales were older than 50 yrs and there seemed to be a tendency for greater longevity in females than in males. The oldest female was found to be 115 years, the oldest male was 84 years, and age at sexual maturity was estimated to 6-7 yrs for females, and 9 yrs for males. These estimates of sexual maturity are similar to those from other studies.

The JWG welcomed this important advance, and it was recommended that the method should be applied to other marine mammals where ages are available through other methods, and to captive animals of known age, in order to verify the racemization method. It was also recommended that the method be applied to beluga, in order to resolve the question of whether beluga teeth accrue 1 or 2 growth layer groups per year.

Catch statistics

Catch statistics for narwhals in Greenland were updated, with time series being split into hunting grounds and corrected for under-reporting estimated from purchases of mattak, for periods without catch records and from rates of killed and lost whales. Since 1993 catches have declined in West Greenland especially in Uummannaq where the decline is significant.

Sex ratio information for West Greenland is available for some years before 2004, where there seems to have been no apparent sex bias. Since 2004, it has been forbidden to hunt females accompanied by a calf, and this may lead to a bias toward males in the sex ratio as was observed in 2004.

There has been an increase in narwhal catches in East Greenland of 8% per year since 1993. The harvest reporting system changed in 1993 and the impacts of this change on the catch statistics are unknown.

The seasonal distribution and sex ratio of narwhal catches in Baffin region of Nunavut territory, Canada was described using hunter tag information. 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. This information was used in allocating the catch to different putative sub-stocks, either local summering sub-stocks or spring or autumn migrating sub-stocks.

The majority of the communities take a greater proportion of males than females throughout the seasons. Under-reporting of females may have happened in the past, however, the authors are confident that the present reporting system is working well. In Canada, regulations forbid the harvest of female accompanied of a calf. This, as well as the high monetary value of the tusk, is the likely cause for the male bias in the harvest.

The average reported landed catch per year from selected communities in the eastern Canadian arctic was 373 for the period between 1996 and 2004.

In the communities that are part of the Canadian Community-Based Management programme, total hunting mortality should be reported as it is required that hunters report if animals are “wounded and escaped” or “sunk and lost”. However, there is conflicting information on the lost rate in the narwhal hunts. While a working paper indicated a somewhat low level of "struck and lost" in most communities and years, some anecdotal information suggests that higher loss rates are possible. The JWG therefore recommended the development of a programme to collect struck and lost information from direct hunt observation of hunts in Greenland and Canada.

Abundance

Recent estimates

There had been a failed attempt to survey narwhals and belugas in West Greenland in March 2004. Due to wind and fog the survey effort proved to be very low with only an insignificant proportion of the total area being covered, preventing the development of an abundance estimate.

A hunter had collected video recordings of narwhal pods in Melville Bay in August 2004 and 2005, with the largest number of observed whales ranging between 107 and 147 narwhals. This confirms that narwhal occur in Melville Bay during the summer. Neither survey effort nor coverage could be estimated from the recordings, and no density estimate could be calculated.

Results from the aerial surveys in the Canadian high arctic in August 2002 to 2004 was presented. Narwhals were surveyed with line transect surveys in Eclipse Sound, Admiralty Inlet, Prince Regent Inlet, Barrow Strait, Gulf of Boothia, and in fiords and bays along the eastern coast of Baffin island. Estimates were corrected for whales that were missed by the observers, and for individuals that were diving when the survey plane flew by. The survey attempt for Admiralty Inlet was unsuccessful due to extreme clumping of the animals off transects in both 2003 and 2004 and the poor weather in 2004. The survey estimates have large standard errors due to clumping on certain transects within each stratum. Several areas known to contain narwhal were not surveyed due to weather conditions so the survey cannot provide a complete abundance estimate of the entire summer range in Canada.

The survey of the east Baffin fiord area was discussed at length. In this survey, a single line was flown up the centre of small fjords with extrapolation of the results to the entire area of the fjord. This resulted in an uneven coverage probability within the fiords, and there were concerns that this may have lead to bias. It was agreed that a sub-committee, co-ordinated by the lead author, should meet by email to try to resolve this issue.

Abundance estimates that have been accepted for use in assessments are presented in Table 1 of Annex 1.

Assessment

Update of West Greenland assessment

A model selection-based assessment for West Greenland narwhals was presented, using a density regulated population dynamic model to identify the more likely stock structure hypotheses for West Greenland narwhals. The framework performed Bayesian assessments on 28 of the most likely three, two and one stock hypotheses, and used Akaike weights to determine the relative probabilities of the different models. The analysis discarded 12 of the original hypotheses as being unlikely, and it agreed with other information on the most likely stock structure hypotheses.

There was disagreement within the JWG about the appropriateness of using apparent stock dynamics as a method of selection between stock hypotheses, but this did not preclude the JWG from reaching conclusions about the most likely stock structures in the area and selecting assessment models appropriately.

The assessment used the data on abundance, catch history and biological parameters that have been agreed in the past by this committee. Nevertheless there was concern about possible biases in some of the input data, particularly abundance estimates and indices. For Inglefield Bredning, the 1986 and 2001/2 estimates were produced using different survey methodologies that have not been directly calibrated against one another, and this may influence the trend in the estimates between 1986 and 2001/2.

For Disko Bay, the index surveys conducted in the early 1980's were done by a somewhat different methodology than those done in the 1990's, and it has been recognised by this Committee that, for beluga, the two sets require different treatment. There is no reason to suppose that the situation is different for narwhal, but the assessment applied only a single bias correction factor to all index surveys.

The greatest difficulty in providing advice for West Greenland narwhal is the uncertainty in stock structure. The models using the stock structures considered most likely by the JWG were examined further. A probability of 70% of some stock increase within 5 years was considered an appropriate objective. To meet this objective, depending on the model, a total annual removal ranging from 15 to 75 narwhals is allowed for the entire area. This strengthens the conclusion reached in 2004, that West Greenland narwhal are heavily depleted and substantial reductions in catch are required immediately to arrest the decline in numbers. However the JWG could not agree on the quantitative results of the model because of the above noted uncertainties in stock structure and input parameters. There was no general agreement within the JWG on which model scenarios should be used in a final assessment. However, the JWG agreed that the recommendation provided in 2004, that the total removal in West Greenland should be reduced to no more than 135 individuals, should be provided again and with greater emphasis. This greater emphasis is due to the fact that all models reviewed by the JWG allowed total annual removals lower than 135.

The JWG recognized that new information confirmed that narwhal do occur in Melville Bay, but without an abundance estimate the JWG was unable to recommend a sustainable removal level for this stock.

The JWG recommended the research in Section 5.5.1 of Annex 1 to provide more specific advice on sustainable catches.

Canadian summer stocks

A risk analysis on narwhal hunting in the Canadian High Arctic was presented. A simple population dynamic growth model determined the risk of a decline of 5% and 10% over a period of ten years, assuming a single stock or a metapopulation structure with four different sub-stocks (Somerset, Admiralty, Eclipse, East Baffin). Results indicate little or no risk of decline over the time span in all but one case, the Admiralty Inlet sub-stock.

It was considered that including a wider range of some parameters in the analyses would improve the model. Specifically the JWG requested higher struck and lost rates, of up to two times those used initially. This analysis was performed at the meeting. The effect was to increase the probability of a decline at Admiralty Inlet but not substantially so at Eclipse Sound except under the lowest examined rate of population increase.

The model incorporated only recent abundance and catch estimates. The JWG recommended that a model incorporating all abundance estimates considered useable for assessment, with a historical catch series, be developed, as has been done for West Greenland beluga and narwhal. This would show trajectories of stocks over time, providing estimates of stock status and sustainable removal levels.

Until a new modelling framework is developed, the JWG decided to use the present model to arrive at preliminary conclusions about the status of Canadian summer stocks:

Somerset Island

This stock is the largest of the Canadian summer stocks. It is subject to a low level of harvesting in the summer, but may be hunted by several communities in the spring and fall. Even under the most pessimistic scenarios of stock size, hunting loss rates and rate of increase, there is a negligible risk that the stock will decline over the next 10 years. It was concluded that present catch levels are sustainable for this stock.

Admiralty Inlet

Under scenarios of high loss rate and/or low rate of population increase, the model predicts that there is a high probability that this stock will decline in the next 10 years. In addition the survey estimate for 2003 is substantially lower than that for 1984, indicating that there may have been a population decline over that period. However it was recognised that the recent estimate may be biased because of the extreme clumping of narwhal. It was concluded that there is a risk that present catch levels are not sustainable for this stock, and recommended that a new modelling framework as described above be developed to provide estimates of sustainable removals.

Eclipse Sound

Under all but the most pessimistic scenarios of high loss rates combined with low rates of increase, the model indicated that there is a very low risk that this stock will decline in the next 10 years with present catch levels. It was concluded that present catch levels were likely sustainable for this stock, but again recommended that a new modelling framework as described above be developed to provide estimates of sustainable removals.

East Baffin
Because the abundance estimate for this area was not accepted, advice on the sustainability of catch levels in this area could not be provided. It was also noted that there was no information about the seasonal distribution of this stock, so it was not known if it was subject to harvesting outside of the East Baffin area. It was recommended that a new abundance estimate be developed for this area, and that studies be conducted to determine the seasonal distribution of this stock.

East Greenland
Given that almost nothing is known about the stock structure and seasonal migrations of East Greenland narwhal, and that the abundance estimate for Scoresbysund is more than 20 years old, a reliable assessment is not possible without new information. Nevertheless *ad hoc* modelling carried out at the meeting indicated that, under the assumption of an independent stock at Scoresbysund, present local harvest levels are not sustainable given the abundance estimate from 1983. However the validity of these assumptions cannot be assessed without further research. Insufficient information was available to carry out assessments for other areas of East Greenland.

Future research requirements for narwhal are given in Section 5.7 of Annex 1.

Discussion by the Scientific Committee
As in 2004, the Scientific Committee supported the recommenation of the JWG that the total removals of narwhal in West Greenland should be reduced to no more than 135 individuals per year in order to halt the apparent decline in numbers. This should be considered an interim recommendation only. Modelling carried out this year suggests that, under the most likely stock structure scenarios considered, the sustainable harvest may be as low as 15 to 75 animals per year. However it was recognised that there was great uncertainty in these projections, particularly because stock structure was poorly understood, and because there may be biases in the abundance estimates and indices that have not been quantified. The Scientific Committee therefore supported the recommendations for research to improve the advice on sustainable catches for West Greenland narwhal made by the JWG, and noted that much of this research can be completed within 1 to 3 years. The Scientific Committee will continue to monitor this situation closely and will update this advice as new information is provided.

The Scientific Committee was informed that the narwhal quota for West Greenland was 300 in 2004/5, of which 294 were caught, and that the quota has been reduced to 260[6] for 2005/6. While recognising that this was a significant step towards the sustainable management of West Greenland narwhal, the Committee remained concerned that the total removals were still well above the recommended level of 135. The Committee once again advised that delay in implementing catch reductions to the

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[6] After this meeting the narwhal quota for 2005/2006 was raised by 50 to a total of 310.

recommended levels will result in delay in stock recovery and probably in lower available catches in the medium term.

The Committee noted the conclusion of the JWG that the information was not sufficient to carry out a meaningful assessment of East Greenland narwhal at this time, and supported the recommendations for research that would make an assessment possible.

9.4.2 Future work

It is planned to conduct a survey for narwhal and beluga in the West Greenland overwintering area in March 2006. Noting the difficulties in interpreting the abundance estimates at Inglefield Bredning, Melville Bay and the West Greenland overwintering area, the Scientific Committee emphasised that future surveys should be conducted in a manner such that the results are comparable to past surveys. If new techniques are used, experiments should be conducted to calibrate the new methods against the old. This pertains especially to the surveys of the West Greenland overwintering area, for which a long time series is available.

9.5 Beluga

9.5.1 Report of the Working Group

Catch statistics for belugas in Greenland were updated. From 1954 to 1999 total reported catches ranged from 216 to 1874 and they peaked around 1970, and catches have declined at about 2% per year between 1979 and 2004. It was noted that the harvest in 2004 had been very low because of the introduction of the quota system and bad weather in some areas.

Reported catches in East Greenland are suspected to be possible misreporting of caught narwhals. It was recommended that the occurrence of beluga in East Greenland be investigated, perhaps through a traditional knowledge study, to determine if they do occur there or if the reported harvests are erroneous.

Catch statistics for 1996 to 2004 for Beluga in selected communities in the Eastern Canadian Arctic were presented. The average reported landed catch from communities hunting from the Baffin Bay beluga stock for the period is 42. The JWG noted that, as in the case for narwhal, reporting of "struck and lost" is variable between years and communities and may be unreliable for some communities.

Abundance

An attempt to survey the West Greenland index area in March 2004 was unsuccessful due to inclement weather. The survey will likely be attempted again in 2006.

Assessment update

West Greenland

Historical catches from 1862 and three time series of abundance estimates were combined with density regulated population models to update the assessments for belugas in West Greenland. Seven model combinations tested for sensitivity of the assessment to variation in the MSYR, the presence versus absence of additional variance in abundance estimates, the presence versus absence of an absolute abundance estimate, high versus low catch histories, and the effects of using an age-structured or a discrete population dynamic model. All models estimate similar dynamics, where West Greenland beluga are severely depleted, with median depletion ratios in 2005 varying between 16 and 37 percent of the carrying capacity. The median of the current replacement yield was estimated to lie between 215 and 516 beluga, with the lower 2.5th percentile lying between 51 and 111 beluga. These results are very similar to those from previous assessments.

The JWG considered that the "low MSYR" case provided the most realistic assessment based on available information, with Table 2 providing the probability of halting the decline in beluga numbers in the next 5 years for a range of catch options for this case. Reduction of catches to 100 per year will have an 80% chance of meeting this objective by 2010. Maintaining higher catches reduces the probability of halting the decline, with the current quota of 220 beluga resulting in a 46% probability of halting the decline and a 54% probability of a continued decline.

The JWG also reiterated recommendations made by the NAMMCO Working Group in 2000 (NAMMCO 2001a) pertaining to other measures that would improve the conservation status of beluga in this area.

Canada
Given that the harvest of beluga in high-arctic Canada is very low relative to the summer abundance of beluga in the area (Innes *et al.* 2002), stock assessment for this area was not considered a priority at present. However some proportion of animals summering in Canada migrates to West Greenland and it was considered important to determine where in Canada these animals can be found in the summer, in order to determine if they are harvested also in Canada.

Discussion by the Scientific Committee
The Scientific Committee noted that the conclusions from the new assessment were essentially the same as those conveyed in 2000 and 2001, that a reduction of catches to 100 per year is required to have an 80% chance of meeting the objective of halting the decline in this stock by 2010. Maintaining higher catches reduces the probability of halting the decline, and delay in implementing harvest reductions will increase the risk of continued stock decline. In this regard the Scientific Committee noted that the quota for 2004/5 was 320, of which 91 were caught, and that the quota for 2005/6 was 220.

The Scientific Committee also reiterated the recommendations made in 2000 and again by the JWG this year pertaining to other measures that would improve the conservation status of beluga in this area.

9.5.2 Future work
It is planned to survey the West Greenland overwintering area in March 2006. The recommendations pertaining to this survey under 9.4.2 are reiterated.

9.6 Fin whales

9.6.1 Report of the Working Group on North Atlantic Fin Whales

The NAMMCO Working Group on fin whales met in Oslo 20-22 October 2005, and the Report of the meeting is included as Annex 2. Given that a special workshop primarily on stock structure is planned (see 9.6.3), discussion of this topic was limited, as additional genetic analyses were expected in the near future.

The available data on stock structure of North Atlantic fin whales based on non-genetic methods was summarised. This included a wide range of studies based on "Discovery" marking, morphometry, earplug morphology, photo-identification, acoustics and biological parameters. Although each method is rather inconclusive by itself, collectively they indicate a separation between fin whales summering in the western, central and eastern North Atlantic. There also appears to be a more or less isolated stock in the Mediterranean Sea.

A paper presented results of the genetic variation in 1,018 fin whales sampled at 5 North Atlantic areas; *i.e.* off West Iceland, Norway, Spain, and West Greenland and off the eastern Canadian coast. The data presented were based on genotypes of 9 microsatellite loci. The genetic analyses carried out revealed significant genetic divergence among Icelandic, Norwegian, Spanish, Greenland and Canadian samples. It was concluded that the fin whale samples taken at the feeding grounds off Iceland, Norway, Spain, Greenland and Canada most likely come from separate breeding units. The Working Group also recommended that an analysis of heterogeneity in mitochondrial DNA be carried out.

In summary, the Working Group did not find a reason to change its previous view (NAMMCO 2000a), that most evidence suggests the presence of stocks with limited gene flow between adjacent summering aggregations. However, these summer aggregations could be composed of single and/or mixtures of breeding stocks. Interpretation of these data is limited by the lack of temporal and spatial coverage in the sampling.

A new analysis of historical catch records for Iceland was presented. The catch data from the early whaling period 1883 to 1915 are split as requested in 2003 between the Westfjord and east coast regions. Catch position records show that there was very little overlap in the range of the east and west operations, but the operational range expanded with time. The Working Group welcomed this contribution, which will facilitate modelling of fin whale population dynamics.

A paper provided a compilation of fin whale catches in the entire North Atlantic. The time period covered was 1894 to 1984 for all areas except Norway, where the period covered was from 1917 onwards. A total of 28,559 fin whales were identified in the catch, leading to an estimate of 30,598 fin whales caught by prorating unidentified catch using the catch composition. In discussion it was noted that catches of fin whales off northern Norway exceeded 10,000 animals in the period before 1904, but that it was considered that the catches in this period had been adequately documented by Risting (1922) and that there was little to be gained by a recompilation of these data. The Working Group recommended that catches from this period be added to the catch series to make it complete.

Regionally stratified abundance estimates for fin whales from North Atlantic Sightings Surveys (NASS) conducted in 1987, 1989, 1995 and 2001 were presented to the Working Group. Of particular interest were areas considered useful in modelling, namely East Greenland, West Iceland, the remainder of the EGI area and areas outside. The data were re-analysed using a standardised methodology to make the estimates internally consistent. Total abundance estimates for each survey were quite close to previous published and unpublished estimates. There has been a substantial increase in the abundance of fin whales in the area west of Iceland since 1987. This corresponds to the area where nearly all fin whaling has been conducted since 1915. The Working Group welcomed this re-analysis and noted that it fulfilled a request made in 2003. It was concluded that the abundance estimates produced were acceptable for assessment.

A paper used sightings survey data collected over the period 1988-2004 to calculate relative abundance estimates for fin whales in the Northeast Atlantic. Point estimates of relative abundance in this area ranged between 1,100 and 1,800 whales in 5 surveys, with no significant trend over the period. There have been changes in fin whale distribution over the period, with more whales found west of Spitzbergen in later surveys. The abundance estimates are low by comparison with the land station catches in this area, which exceeded 1,000 per year in some years between 1875 and 1904. The stock must therefore be depleted compared with historical abundance levels. The Working Group concluded that the estimates provided would be suitable for use in assessments as an index of relative abundance in this area.

Butterworth reported a new assessment model of the EGI fin whale population, modeled as four sub-populations with movement between the following areas: East Greenland (area 1), West Iceland (area 2), East Iceland (area 3) and the Far East (area 4). The model is sex- and age-structured, and is fitted to CPUE, sightings survey abundance, and mark-recapture data using both maximum likelihood and Bayesian approaches. For the base case assessment scenario, best fits to the data were obtained when the West Iceland and East Iceland are effectively fully mixed with a low level of interchange with East Greenland and virtually no interchange with the Far East region. For the base case and most sensitivity tests, the overall recruited population is increasing and above 80% of pre-exploitation abundance (*K*), and sub-populations in all areas are above 70% of the individual *K* values. Projections for annual catches of 0, 100, and 200 whales indicated that only the last would result in abundance decreases compared to current levels if catches were taken only from the West Iceland area.

It was agreed that the base case model would be updated for the March 2006 meeting to reflect the discussion at this current meeting in the following ways:

1. Using abundance estimates for individual areas in 1988.
2. Use an adjusted set of early CPUE series.
3. Apportion the Norwegian pelagic catches, 1917-1937, to the correct areas.
4. Increase the maximum bound on *r*, the increase in calf production rate at low population sizes.

However, further work is needed to clarify the stock relationships in this area, particularly with regard to area boundaries and mixing rates.

The Working Group found no reason to change its advice provided in 2003 (NAMMCO 2004a), that projections under constant catch levels suggest that West Iceland (termed the "inshore sub-stock" in earlier analyses) 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 West Iceland, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that other stock components were also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales.

The Working Group is not yet in a position to provide management advice for the North Norway area. Once the identified work has been done assessments can be carried out for this area. However, given the rather low abundance estimates (<2,000) and the high historical harvest in the area, it can be expected that the stock will be found to be depleted relative to past levels.

No new assessments were considered for the West Norway-Faroes area. The Working Group reiterated the advice provided in 2003 (NAMMCO 2004a), that uncertainties about stock identity are so great as to preclude carrying out a reliable assessment of the status of fin whales in Faroese waters.

The Working Group reiterated research recommendations made in previous meetings (NAMMCO 2000b, 2001b, 2004), and identified those most important to refine existing assessment and extend assessments to other areas.

Discussion by the Scientific Committee

The Committee supported the management recommendations for the EGI and Faroese fin whales, and noted that they are unchanged from 2003. The Committee also supported the recommendations for research contained in Section 11 of Annex 2, noting that much of this must be completed for the fin whale workshop in March 2006.

9.6.2 Other information

Trends in the abundance of fin and humpback whales in the Central and Northeast Atlantic were examined in SC/13/9. North Atlantic Sightings Surveys (NASS) were conducted in 1987, 1989, 1995 and 2001. The NASS have covered a very large area of the central and eastern North Atlantic, from East Greenland east to coastal Norway, and from Svalbard south to the Iberian peninsula. The surveys used ships and aircraft as survey platforms. Target species were minke, fin and pilot whales, but all species encountered were registered. Abundance estimates are negatively biased because of whales diving during the passage of the survey platform and whales being missed by observers, but these and other potential biases are likely small for these species. Fin whales occurred in highest densities in Denmark Strait west of Iceland. The abundance of fin whales increased in the survey area over the period, with the greatest increase observed in the waters west of Iceland. There were 29,900 (cv 0.11) fin whales in the area in 2001. The observed trends are consistent with increases in abundance following the cessation of whaling in this area, but the magnitudes of the observed increases, taken at face value, are greater than expected. Other factors, including differential harvesting of sub-stocks, changes in carrying capacity, immigration from other areas, the near extirpation of some other cetacean species, and operational factors in the surveys themselves, may be involved.

SC/13/18 provided a summary of catches of all species of whales taken in the North Atlantic between 1894 and 1984 by Norway, the Faroes, Shetland, the Hebrides and Greenland. The compilation was carried out because discrepancies had been noted between the official records kept by the IWC and archival sources. Primary and secondary sources, including museum, institutional, company and library archives, newspapers and interviews were used to compile the summary. Catches are presented by year, species, location and station, and a crude index of CPUE (catch per boat) is derived.

The Scientific Committee welcomed the information in both papers and noted that they will be useful in future assessments of fin, humpback and other whale species.

9.6.3 Future work

The Committee will be holding a special workshop "Catch History, Stock Structure and Abundance of North Atlantic Fin Whales", tentatively scheduled for March 2006 in Reykjavik, Iceland. The Scientific Committee of the IWC has been invited to send participants to the meeting. It is expected that the IWC will wish to use the report from this workshop as input to the "Pre-implementation Assessment" of fin whales, to be held at their meeting in June 2006. Therefore the Scientific Committee will have to consider the Report from the workshop inter-sessionally.

Given the available information on catch, abundance and stock structure, the Committee considered that assessment could proceed for the Northeast Atlantic, particularly the North Norway stock, in the near future. The Committee will await the conclusions of the Workshop before proceeding with future assessments.

9.7 Minke whales

9.7.1 Update on progress

No documents pertaining to minke whales were available this year. Norway has continued its 6 year rotational sightings survey programme, and the blocks north of Iceland and around Jan Mayen were surveyed this year. Work has continued on the development of an RMP variant specific for Northeast Atlantic minke whales, and the results will be presented to the IWC Scientific Committee this year.

The Icelandic Research Programme continued in 2005 with the take of 39 minke whales in coastal waters. H4alf the planned total of 200 minke whales have now been sampled. An aerial survey was conducted in May 2005 as part of a series to look at the seasonal distribution of minke whales in the area. In August 2004 satellite tagging was attempted on 9 minke whales. Of these, 7 tags were successfully implanted, three failed immediately, two failed within a few days and one transmitted for about three weeks. The final tag did not transmit initially but began transmitting in mid-November, by which time the whale was about 500 nm west of Spain. Transmissions endured for a further three weeks by which time the whale was west of North Africa. An interim report on the Icelandic Research Programme will be produced in 2006.

An aerial survey with minke and fin whales as the target species was conducted successfully in West Greenland in September 2005. Unsuccessful attempts were made to satellite tag minke whales in Disko Bay.

9.7.2 Future work

No further work specifically on minke whales is planned, but see 8.1.

9.8 White-beaked, white-sided dolphins, bottlenose and common dolphins

9.8.1 Update on progress

Norway reported that satellite tagging of white-beaked dolphins had been attempted unsuccessfully this year. In the Faroes the examination of samples from the catch of primarily white-sided dolphins is ongoing. Sampling of bottlenose dolphins has been very limited because the catch is small. In Iceland, work on samples from the by-catch of white-beaked dolphins is continuing.

The data for common dolphins collected during the NASS surveys between 1987 and 2001 were examined in SC/13/19. There were sufficient data to attempt to estimate abundance only in 1995. The estimated abundance in the W Block of the NASS95 Faroese survey was 273,159 (CV = 0.26; 95% CI = 153,392 – 435,104). This estimate is corrected for animals missed on the trackline (g(0)) and for responsive movement. The data from all surveys were used, together with data from the MICA93 and from the Celtic Block of the SCANS survey, to examine the distribution of common dolphins in the NE Atlantic. No sightings were made north from 57ºN, and encounter rates were highest between 51º and 53º N, with no significant differences in terms of Longitude. Encounter rates were lower in shallow waters of less than 400m depth, and higher in the 400 – 1,000 m depth range. Group sizes increased with depth. Both encounter rates and group sizes increased steadily with sea surface temperature.

The Scientific Committee noted the lack of overlap between the distributions of common dolphins and especially the *Lagenorhynchus* species. Common dolphins apparently do not occur in the waters of member countries except as occasional visitors.

9.8.2 Future work

The Scientific Committee concluded in 2003 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 feeding, genetic and life history studies have been completed in Iceland, the Faroes and Norway, and when new abundance estimates become available from the SCANS II, NASS and other sightings surveys. Such an assessment could probably be conducted by 2008 at the earliest.

9.9 Grey seals

9.9.1 Update on progress

Norway and the Faroes reported that no new research had been carried out in 2004. Iceland reported that surveys were carried out in the main pupping areas in 2004, and preliminary results indicate that pup production has declined since 2002. Iceland also noted that, in fulfillment of the recommendation by NAMMCO in 2003 (NAMMCO 2004b), management objectives had been developed for this species.

The Observer for Canada reported that a complete survey of grey seals had been carried out in 2004. The results indicate that the Canadian population is the largest in the world and continues to grow.

9.9.2 Future work

In 2003 the Scientific Committee 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. Noting that this had not yet begun, the Committee reiterated the recommendations made in 2003.

The Scientific Committee welcomed the information that Iceland was continuing its survey programme for this species and had developed management objectives as had been recommended in 2003. Noting that population surveys indicated that the stock continued to decline, the Committee reiterated its previous recommendations for management of this stock. A formal assessment of the effect of present levels of harvest and by-catch on the population, including the risk of extinction and the sensitivity of the survey programme to detect a population decline, should be conducted as soon as possible.

For Norway, the Scientific committee noted as in 2003 that 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 programme to detect a population decline, should be conducted as soon as possible.

9.10 Harbour seals

9.10.1 Update on progress

Lydersen informed the Committee about studies on an isolated stock of harbour seals at Svalbard, involving the live capture and sampling of 365 seals. The population exhibits sexual dimorphism and appears to have a truncated age structure relative to other harbour seal stocks. This information will be considered by the new Working Group (see 9.10.2).

9.10.2 Future work

In 2005 the Management Committee addressed the following request to the Scientific Committee:
Harbour seal abundance has fluctuated in the Northeast Atlantic in recent years due to local outbreaks of viral distemper. Usually these outbreaks have been followed by rapid recoveries, and harbour seal abundance may have increased in many areas. In

some areas, harbour seals are harvested and/or taken incidentally by fisheries and aquaculture operations (*e.g.* Greenland, Norway and Iceland). They also have significant direct and indirect interactions with fisheries in many areas. For these reasons, the Scientific Committee is requested to:

- Review and assess the status of harbour seals throughout the North Atlantic;
- Review and evaluate the applied survey methods;
- Assess stock delineation using available data on genetics, spatial and temporal distribution and other sources;
- review available information about harbour seal ecology;
- Identify interactions with fisheries and aquaculture.

Desportes reported that a Working Group on Coastal Seals had been initiated under her chairmanship. The Working Group will meet in fall 2006 to fulfill the request for the entire North Atlantic, but concentrating on areas of interest to NAMMCO member countries. To this end, representation from the Baltic and Wadden seas will be sought from regional management organisations for those regions.

9.11 Humpback whales

9.11.1 Update on progress

SC/13/9 provided information on trends in the abundance of humpback whales in the Central and Northeastern Atlantic (see 9.6.2). Humpback whales were most abundant in shelf waters east and west of Iceland. There has been a great increase in the abundance of humpback whales around Iceland, but not in other areas. Aerial surveys conducted in Icelandic coastal waters indicate an annual rate of increase of 15% in this area. There were 14,900 (cv 0.26) humpback whales in the entire survey area in 2001.

Revised catch figures for humpback whales from whaling operations in the North Atlantic were provided in SC/13/18 (see 9.6.2).

An aerial sightings survey of West Greenland was conducted in September 2005, and a number of sightings of large humpback whale groups were made. Estimates from this survey will be available in 2006.

9.11.2 Future work

In 2005 the Management Committee requested that the Scientific Committee continue its assessment of humpback whale stocks in the North Atlantic. For West Greenland, the Scientific Committee should assess the long-term effects of annual removals of 0, 2, 5, 10 and 20 whales. For the Northeast Atlantic the Scientific Committee should provide estimates of sustainable yield for the stocks. In all cases the management objective would be to maintain the stocks at a stable level. The Scientific Committee should identify information gaps that must be filled in order to complete the assessments.

The Committee decided to postpone the provision of advice for West Greenland until a new abundance estimate is available, probably in 2006. However it was noted that the estimate from the 2005 survey may not be directly comparable to earlier estimates, as the survey was conducted later in the year.

Sufficient information on historical catch, abundance and stock structure is available at present to conduct assessments for the Icelandic and Norwegian stocks. However, given other priorities, the Committee considered it advisable to delay this assessment until after the completion of the NASS-2007 survey, when an additional estimate of abundance should become available.

9.12 Killer whales

9.12.1 Update on progress

No new information was tabled on this species.

9.12.2 Future work

In 2004 the Scientific Committee provided a list of research required to conduct an assessment of killer whales, particularly in West Greenland, as requested by the Council in 2004. The Committee will review progress under this item annually with the view of conducting an assessment when sufficient information becomes available.

9.13 Walrus

9.13.1 Report of the Working Group on Walrus

The Working Group on Walrus met in Copenhagen, 11-14 January 2005 under the chairmanship of Mads Peter Heide-Jørgensen. The Working Group had been requested to provide an updated assessment of walruses, to include stock delineation, abundance, harvest, stock status, and priorities for research. The Report of the Working Group is included as Annex 3.

Stock structure

New genetic analyses included samples from various areas in northern Canada, West Greenland, Northwest Greenland, East Greenland, Svalbard and Franz Josef Land. No genetic analyses were available from Russia. The Working Group found these results generally confirmatory of the putative stock structures suggested previously by NAMMCO (1995) (see Annex 3, Fig. 1). They supported the previous conclusion that there is no difference between walruses sampled in Franz Josef Land and Svalbard. However samples from East Greenland were discriminated from both of these areas. They strengthen the suggestion that there is a link between the North Hudson Bay-Hudson Strait-North Labrador-Southeast Baffin Island (HBDS) and West Greenland (WG) stocks, and indicate that the HBDS stock may be a source of immigration to the WG stock. It was noted that only a limited part of the HBDS stock area had been sampled, and that samples from the Southeast Baffin area in particular are urgently needed. There also remains the possibility that there may be sub-structuring within the HBDS and WG stocks. Animals from Foxe Basin could be distinguished from those from the North Water (NOW) stock area, and some sub-structuring was found within the NOW area.

Satellite tracking studies have been conducted in Svalbard, East Greenland and Northern Canada, but not in Russia. Results to date have strengthened the conclusion that there is a single stock of walruses occupying the Svalbard and Franz Josef archipelagos, and another off East Greenland. However the new information suggests a sub-division of the NOW stock area, possibly into three areas including western

Jones Sound and Penny Strait/Lancaster Sound stock areas.

In Canada and Greenland, lead isotope ratios (^{208}Pb/Pb ^{207}) and trace element profiles have been used as a tool in stock discrimination studies under the assumption that concentrations in the teeth represent a cumulative sample from the spatial/temporal environment of the animal, and therefore reflect stock differences. Walruses sampled at communities that were close together and within the same putative stock area, such as Hall Beach and Igloolik, can be differentiated on the basis of these methods. Examination of individual tooth growth layer groups of Hall Beach males indicates that some may make excursions into other areas, but it is not known if they contribute to other populations on these excursions.

There was considerable discussion about the applicability of these methodologies to discriminating stock groupings relevant to management. It is apparent that the methods have high discriminatory power even with rather low sample sizes, and where the walruses likely share a common overwintering area, as in Foxe Basin. Some members noted that isotope ratios and trace element signatures may reflect a clinal phenomenon and that the scale of sampling would have a great influence over the number of groupings discriminated. It is not known if a significant difference in isotope ratios between two adjoining areas is of relevance to determining the effects of differential harvesting on these animals. Other members noted that further substructuring of walrus populations was to be expected due to their life history and habitat requirements. Even if two groups share an overwintering area and breed as a single population unit, they may occupy different areas in the summer and be susceptible to differential exploitation. Since isotope ratios are a reflection of the migratory patterns of the animals, they are useful in discriminating management stocks. In this view the further splitting of putative walrus stocks is a conservative approach and all relevant evidence, including isotope ratios, should be considered. The Working Group agreed to use this as supplementary evidence.

The Working Group also examined information on the seasonal distributions of walruses in the Barents, Kara, and Laptev seas from Russian sea ice reconnaissance flights conducted from the 1950's to the 1990's. This distributional evidence suggested the existence of three populations in the area: a Northern population inhabiting the northern Barents, Kara, and Laptev seas, including the Franz Josef islands; a Southern population with a core area in coastal areas south of Novaya Zemlya, and a Laptev population inhabiting the Laptev Sea east to the Novosibirskie Islands. The Working Group welcomed this information, but noted that additional information, perhaps from genetic, satellite tagging or other studies, would be required before putative stocks could be identified with any certainty.

The Working Group considered that while the putative stock units identified in 1995 were in the main supported by new information, some revisions would be required, and these are summarised in Fig. 1 and Table 1 of Annex 3.

Biological parameters

A summary of new information on biological parameters is provided in Table 2, Annex 3.

Catch statistics

No recent catches of walruses have been reported from Svalbard or the western Russian Federation, and walrus hunting is prohibited in these areas. For East Greenland, there are many years with no reports prior to 1993. After the introduction of Piniarneq in 1993, reported catches generally increased and varied greatly, ranging from 1 to 99. By comparison with information on previous catch levels, some of the higher records in Piniarneq appear to be implausible. Similarly in West Greenland reported harvests have increased substantially since the introduction of Piniarneq. For northwestern Greenland there were few years with valid harvest reports prior to 1993, and reported harvests have not increased since then. The anomalously high harvest years observed in East and West Greenland since the introduction of Piniarneq might be due to multiple reporting of the same animal by hunters, but there were no data to support this.

Two sources of harvest data from Canada, the Nunavut Wildlife Harvest Study (NWHS) and a recent compilation for the Committee on the Status of Endangered Wildlife in Canada, were reviewed for reported catches in Canada since 1995. All walrus harvest data were plagued by incomplete reporting but data for almost half the annual community totals agreed between sources.

In discussion the Working Group noted that, even with the advent of new harvest reporting systems in both Canada and Greenland, there was still a high level of uncertainty in the catch reports. Accurate catch reports are crucial for understanding the impact of hunting on the stocks. It was recommended that catch data should be reported fully, including collection, analytical and extrapolation methods, and potential biases. If extrapolations are used, the statistics should include an estimate of uncertainty. Multiple reporting has not been considered an issue with respect to Canadian harvest statistics. It is suspected in Greenland and multiple reporting should be investigated in both areas. The return of a biological sample, preferably a lower jaw, would both validate harvest reports and provide important biological data, and should be considered in any new data collection programmes.

No new information on struck and lost rates has become available from any area. In 1995 this Working Group assumed a loss rate of 30% for stocks lacking specific loss rate information (NAMMCO 1995a), and the Working Group saw no reason to change this assumption.

Estimates of recent average harvests by stock area are presented in Table 3, Annex 3.

Abundance and trends

There are no recent abundance estimates for the western Russian Federation, but some "best guess" estimates were provided. An estimate for East Greenland, based on opportunistic and systematic observations, has been published (Born *et al.* 1997). The Working Group accepted these estimates for information but noted that they were not of sufficient quality to use in assessments. No recent estimates are available for the

Svalbard area.

No recent estimates of abundance were provided for West Greenland. The main wintering grounds have been surveyed from aircraft 9 times between 1981 and 1999, but as yet estimates have been developed only for the 1990 and 1991 surveys. In discussion the Working Group identified several difficulties with these estimates and recommended that they be re-calculated. It was also recommended that all available surveys from this area should be analysed in a consistent manner.

A survey was conducted in the NOW area in August 1999, resulting in a total estimate of 1,500 for the NOW area, including corrections for animals seen in the water and on land and for areas not surveyed. The Working Group found that the survey was not presented in sufficient detail for evaluation purposes, accepted the estimate for information but noted that it should not be used directly in assessments without further work and documentation.

The Working Group was hindered in its work by the lack of information on the abundance from all areas, and except for the Canadian High Arctic (North Water), there has been no progress in obtaining abundance estimates since 1995. Abundance estimates are an essential component of any assessment, and there can be little progress in establishing sustainable harvest levels and improving conservation measures until this need is addressed. Available estimates of abundance by stock area are provided in Table 3 of Annex 3.

Ecology

Estimates of energy consumption and consumption of bivalve prey for East Greenland walrus were provided. The Working Group speculated that the rather high feeding and field metabolic rates might be due to walruses depositing blubber from a low-lipid diet. Little information on the seasonality of walrus feeding is available but it was considered that in East Greenland they would have no access to their shallow water feeding areas in the winter.

The potential impact of global warming on walrus was discussed, but the Working Group could not come to any firm conclusions on the matter. While walruses could adapt to warmer conditions, perhaps more readily than other Arctic pinnipeds, it was not clear that a warmer climate would be beneficial to them. It was emphasised in this context that the most immediate threat to walrus populations is over-exploitation, not climate change.

It was noted that land haulouts have been abandoned in many areas of Canada, Greenland, Norway and Russia, probably due to hunting and/or disturbance. It is possible that walruses may become more dependent on land haulouts if ice cover is reduced due to global warming. The Working Group expressed concern about the potential disturbance of walruses by increased human activities at or near haulout sites.

New oil and gas fields are being developed on the continental shelf of the southeastern

Barents Sea in the Russian Federation. This is within the area of walrus distribution in these waters. The Working Group cautioned that walruses might be susceptible to disturbance by seismic exploration, shipping, and extraction activities, and to pollution caused by spills and urged that this be assessed in development plans for this area.

Assessment by stock

A formal assessment model was provided only for the West Greenland, NOW and East Greenland populations. The model combined recent abundance estimates with historical catches and an age- and sex-structured population dynamic model to perform Bayesian assessments of the walrus populations. The model assumed density-regulated dynamics and pre-harvest populations in population-dynamical equilibrium. It projected the populations under the influence of the catches to estimate the historical trajectories and the current population status. It was found that the West Greenland and North Water populations have been heavily exploited during the last century with the current abundance being at best only a few percent of the historical abundance. Apparently these populations are still being exploited above sustainable level. The East Greenland population was heavily exploited after 1889 and during the first half of the 20th Century and was depleted to approximately 50 percent of pristine population size in 1933. After protective measures were introduced in the 1950s this population has increased to a current level close to the abundance in 1889, and the present exploitation appears to be sustainable.

The Working Group had already agreed that the abundance estimate for East Greenland used in the assessment was not suitable for such a use. There was also great uncertainty about the catch series and life history parameters used in the analysis. Similarly, there was uncertainty about the life history parameters used in the modelling. However it was recognized that the ranges of the priors used likely captured the true values and that the use of uniform distributions constituted a conservative approach.

The Working Group accepted the conclusion that the East Greenland walrus population was recovering or recovered after a period of over-exploitation in the early 20th century. However the present size of the stock and its status in relation to its pristine state was uncertain for the reasons noted above. The Working Group could not provide advice on sustainable harvest levels for this population. In 1995 the reported average catches of about 20 animals per year were considered likely to be sustainable, and the new assessment was in accord with this. But recent reported harvests have been considerably higher than this, so the Working Group expressed concern that continued harvests at the reported levels might not be sustainable, while acknowledging that for some years, recent (1993-2002) harvest reports are considered to be implausibly high.

For West Greenland, the Working Group had agreed that the abundance estimate used was not suitable for use in assessment. It was considered that the assessment model could be improved with the use of an index series of relative abundance estimates developed from aerial surveys conducted between 1981 and 1999, scaled to absolute abundance using a correction factor entered as a prior in the model. This could be done using available data and was recommended by the Working Group. There were also uncertainties about the catch series. There are also indications that the harvest in West Greenland is supported to an unknown extent by movement of animals from eastern Canada, and a model that incorporated immigration is needed.

In 1995 the Working Group concluded that this stock was depleted and declining, and that a population of 1,000 to 2,500 animals would be required to support the annual harvests, at that time *ca* 50 walruses. It was considered unlikely that present abundance was over 1,000 animals, while reported harvests have increased since 1995. The Working Group noted that it was unlikely that an update of the abundance estimate would change either the overall outcome of the assessment or its agreement with the conclusion reached in 1995. Therefore the Working Group saw no reason to change its previous conclusion that this stock is depleted and declining, and that present harvests are very likely not sustainable and that a large reduction in harvest may be required if this stock is to recover. The Working Group recommended that a new assessment of this stock be completed as soon as possible.

The Working Group had already concluded that the former NOW stock should be divided into 3 new stock areas. There is no indication that walruses from Western Jones Sound or Penny Strait/Lancaster Sound support the harvest at Grise Fiord and Qaanaaq municipality. Therefore it was recommended that any future assessments should be carried out with reallocation of the abundance estimate to the new stock areas. The abundance estimate used here was found by the Working Group to be unsuitable for use in assessment without further analysis and documentation. This is particularly problematic given the new putative stock areas, since most of the abundance estimate in the area of interest was a "guesstimate" due to incomplete survey coverage. It was considered that a new abundance estimate for this area will be required before a meaningful assessment can be undertaken.The Working Group could not come to any firm conclusions about the present status of this stock. In 1995 the Working Group concluded that what was then considered to be a single stock could not support the harvest at that time. The Working Group reaffirmed its previous conclusion that there was no indication that these combined stocks are large enough to support the current harvest levels and therefore expressed concern that current harvests are probably not sustainable. The Working Group recommended that a new assessment of these stocks should be completed as soon as possible.

Recommendations for research

The Working Group considered that the most urgent priority at present was to complete assessments of the West Greenland and North Water stocks. The research that must be completed before these assessments can be done is detailed in Annex 3, Section 13.

The Working Group recommended that an assessment meeting should be held as soon as the required tasks for at least one of these stocks has been completed. The West Greenland stock was considered of most urgent priority for assessment.

Discussion by the Scientific Committee

The Committee accepted the conclusions of the Working Group with regard to assessments and recommendations for further research. The situation for West Greenland walrus is especially serious and the preliminary assessment indicates that severe reductions in catch may be required. The Committee noted that the assessment can be furthered using available data from past surveys of the West Greenland overwintering area, and recommended that these surveys be analysed as an urgent priority. Once this and other research have been completed, the Working Group should meet again to complete the assessment of the West Greenland and perhaps other stocks. It was anticipated that this could be done as early as 2006 or early in 2007.

9.13.2 Other studies

Lydersen reported that a partial survey of land haulouts in Svalbard had been conducted in 2005, but that the survey could not be completed due to adverse ice conditions. It will be attempted again in 2006.

The Observer for the Russian Federation informed the Committee about recent joint surveys of Pacific walrus by the Russian Federation and the USA in the Bering Sea and surrounding areas. The surveys are conducted using aircraft with an infrared scanner, video and digital photography.

9.13.3 Future work

The Working Group could convene again to complete assessments of the West Greenland and perhaps other stocks once essential research has been completed (see 9.13.1). Heide-Jørgensen will be asked to monitor the situation and report to the Committee when an assessment meeting can usefully be held.

9.14 Ringed seal

9.14.1 Update on progress

SC/13/16 detailed an investigation of the haulout behaviour of ringed seals during the spring moulting period of 2003 (May-July) in Kongsfjorden, Svalbard, Norway. Multiple regression analyses revealed that time of day and date significantly affected the number of ringed seals hauled out on the ice surface. Other factors influencing the number of seals counted on the ice were air temperature and wind speed. Daily peaks occurred in the early afternoon between 13:00 and 14:00 hrs and the seasonal high (N=385) was registered during the first week in June, after which the number of seals on the ice in the fjord declined. In addition to the visual counts, 24 ringed seals were equipped with VHF transmitters, and the haulout behaviour of individuals was monitored from May through July via an automatic recording station. The seasonal peak of haulout for the tagged seals preceded the peak seasonal counts by approximately three weeks. This may reflect significant out- and in-flux of seals from and to the area; this possibility warrants further attention because of its implications for assessment studies.

SC/13/17 used this information to provide correction factors for an aerial digital photographic survey conducted in the same area. These data were used to create a model that predicts the proportion of seals hauled out on any given date, time of day and under various meteorological conditions. Applying this model to the count data from each fjord resulted in an estimate of 7,585 (95% CI 6,332 – 9,085) ringed seals in the surveyed area during the peak moulting period. The total estimated number of ringed seals present in the study area at the time of the survey must be regarded as a population index, or at least a minimum estimate for the area, because it does not account for individuals leaving and arriving, which might account for a considerable number of animals. The same situation is likely the case for many other studies reporting aerial census data for ringed seals. To achieve accurate estimates of population sizes from aerial surveys, more extensive knowledge of ringed seal behaviour will be required.

SC/13/18 presented updated estimates of growth and population parameters from the same area, for which previous estimates are available from a study done 20 yrs ago. Mean Age at Maturity (MAM) was found to be 4.3 ± 0.3 years for males and 3.5 ± 0.4 years for females. These values are significantly lower than MAM calculated for ringed seals from the same area 20 years ago. The most likely explanation for the reduced MAM is a substantial increase in the polar bear (*Ursus maritimus*) population since its protection in 1973.

10. NORTH ATLANTIC SIGHTINGS SURVEYS

10.1 NASS-2001 and earlier surveys

Working paper SC/13/9 (see 9.7 and 9.11) provided an analysis of trends in the abundance of fin and humpback whales from the NASS. Working paper SC/13/19 (see section 9.8.1) presented information on the distribution and abundance of common dolphins from the NASS and other surveys.

10.2 Other surveys

Desportes provided a presentation on the SCANS-II survey conducted in summer 2005. The objective of SCANS II was to estimate small cetacean abundance in European Atlantic waters, allowing the assessment and management of by-catch and other anthropogenic threats, through the development of improved methods for monitoring and a robust management framework, thus defining a clear course of action to allow populations to recover to and maintain favourable conservation status. The project is coordinated by the Sea Mammal Research Unit, University of St Andrews, and financed by EC LIFE-nature programme as well as the eight countries participating.

The core action of the project is a ship based and aerial survey to determine the absolute abundance of small cetacean populations, in shelf waters of the Atlantic margin, the North Sea and adjacent waters (from 62° N to 35° N) which was conducted between June 27 and July 29, 2005. Target species were harbour porpoise, bottlenose dolphin and common dolphin, but line transect data were collected on all species encountered. The aerial surveys were conducted, adopting the ‘circle-back’ method which allows for estimating g(0) via a probabilistic model. The ship survey was conducted in Buckland and Turnock mode, *i.e.*, adopting passing mode and using two independent observation platforms. This configuration allows the estimation of abundance without the need to assume that either platform sees all cetaceans on the trackline and also accommodates responsive movements.

A substantial effort was made in introducing new techniques and equipment to accommodate the problems usually encountered in line transect surveys, such as accounting for responsive movement of the animals occurring at an unknown distance from the vessels, difficulties in estimating availability bias, lack of accuracy in sighting times, distance and angle data, data transcription errors, and amount of data needed to be computed. In addition, technical innovations were introduced to automate data collection and to make distance and angle measurements more accurate. However in all cases, techniques used in earlier surveys were used simultaneously to maintain comparability. Overall it can be said that the new techniques and equipment performed well.

10.3 Planning for future NASS

Desportes and Pike presented some information on the proposed project ”Cetacean Offshore Distribution and Abundance in the European Atlantic” (CODA) that is planned as a follow-up to SCANS-II in 2007. The main purpose of the project is to estimate abundance and map summer distribution of cetaceans in offshore waters of the European Atlantic, in particular dolphins, sperm and beaked whales.The surveys will cover European Atlantic offshore waters outside the continental shelf area covered by the SCANS-II project west to the boundary of the EEZ of the UK, Ireland, France, Spain and Portugal. The northern boundary will be approximately 62° N, and the southern limit will be the boundary of the region covered by the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area (ACCOBAMS). Pike reported that he had already had positive discussions with the CODA coordinator about coordination of this survey with NASS-2007, and that such coordination is part of the proposal.

Pike also reported that he had had discussions with Canadian and American researchers about coordination of NASS with surveys in these areas. Surveys will be conducted on the eastern seaboard of the USA in 2007. At present the Canadian surveys are uncertain, but it is hoped that a coastal aerial survey can be conducted. In addition there is some possibility that the West Greenland coastal aerial survey could be repeated in 2007, although it is presently planned for 2006.

If an international redfish survey is conducted in the area in 2007, there will be an opportunity to share platforms as was done in 2001 on the Icelandic vessels. Opportunities for platform sharing with other surveys planned for 2007 in the area could also be investigated.

The Observer for the Russian Federation informed the Committee about ongoing annual surveys in the Barents and Norwegian Seas. There is some possibility that these surveys could be coordinated with this project.

The Committee concluded that there is a perhaps unique opportunity to conduct a very wide ranging synoptic cetacean survey, covering areas of the eastern and western

Atlantic that have never been covered simultaneously in previous surveys. The Committee strongly recommended that the Council and indidual member countries encourage other jurisdictions to become involved in the NASS project for 2007.

To take advantage of this opportunity, it is necessary to begin a planning process immediately that includes representation from potential participants outside the NAMMCO member countries. It was decided to establish a steering group, headed by Desportes, with the following terms of reference:

1. To begin planning for the NASS-2007 survey, and its coordination with other surveys to be conducted that year, including NILS, CODA and Canadian, American and Russian surveys. To this end a planning meeting, involving participation from all relevant jurisdictions, should be held sometime in 2006;
2. To develop a documented plan for the NASS-2007 and its coordination with other surveys. This plan will be presented to the Council, the IWC, ASCOBANS, potential funding agencies and other interested parties.
3. To seek external funding for the project, if possible.

11. BY-CATCH OF MARINE MAMMALS

11.1 Update on progress

Ólafsdóttir reported that the Management Committee Working Group on By-catch had reviewed the Committee's findings with regard to the Icelandic by-catch monitoring programme, and had supported the Committee's recommendations (NAMMCO 2005a, b). These recommendations were in turn supported by the Management Committee and the Council. However there had been little progress in implementing these recommendations this year in Iceland. The Working Group also carried out an evaluation of the potential risk of marine mammal by-catch, by looking at the types of fisheries carried out in member countries and their overlap in time and space with marine mammal distributions. However only the Faroes and Iceland provided information to carry out this evaluation. The Working Group received new terms of reference from the Management Committee, and will now focus on improving the systems for collecting data on by-catch in NAMMCO member countries.

The Icelandic Progress Report indicated that there had been an increase in the reported by-catch in 2004. It is not known if this was due to an increase in by-catch or to more complete reporting as a result of a questionnaire sent out to the fishermen.

The Committee was informed that there had been little or no progress since last year in the development of by-catch monitoring programmes in NAMMCO member countries. Noting that estimates of all removals, including by-catch, are required for stock assessments, and there is evidence that unreported by-catch occurs in the fisheries of member countries, the Committee strongly recommended that all member countries establish by-catch monitoring systems for their fisheries.

12. DATA AND ADMINISTRATION

12.1 Amendment to Rules of Procedure

Pike reported that there had been some confusion regarding the responsibility for funding the attendance of invited experts at meetings of working groups of the NAMMCO Scientific Committee. It has been standard practice for the last several years that NAMMCO funds the attendance of invited experts at Working Group meetings.

In 1995, the Scientific Committee "sought guidance from the Council on the question of funding the participation of scientists working within member countries in the work of the Scientific Committee." (NAMMCO 1995b, p. 20). In response "the Council agreed that the general principle should be that scientists appointed by member countries as members of Scientific Committee Working Groups should be funded by member governments, and that funds earmarked for external expertise should be reserved for such use only." (NAMMCO 1995b, p. 20).

This response implies that the Council drew a distinction between invited experts from member and non-member countries. The view of the Council in 1995 was that invited experts from member countries, or at least "scientists appointed by member countries as members of Scientific Working Groups", should be funded by member governments, while those from non-member countries should be funded by NAMMCO. However it should be noted that under the present Rules of Procedure for the Scientific Committee, the Scientific Committee itself "makes proposals to the Council on invitation of external experts or observers" (Section IV.3). It is not the case that member countries appoint members to working groups: this is decided by the Scientific Committee with the support of the Council. Invitations are issued to individuals on the basis of their expert knowledge rather than as national representatives.

To clarify this matter, the Scientific Committee proposed to amend the ROP so that past practice is followed, *i.e.* that NAMMCO continues to fund the attendance of invited experts to meetings of NAMMCO Scientific Working Groups, irrespective of their country of origin. In this way, the Scientific Committee would retain control over who comes to their meetings and help to ensure that the best and most appropriate expert advice is available when required. It was noted that the budget of the Scientific Committee has up to now been sufficient to fund the attendance of all invited experts to Working Group meetings. This amendment will be presented to the Council for approval at their next meeting.

13. PUBLICATIONS

13.1 NAMMCO Scientific Publications

Pike reported that there was unfortunately still no publication imminent of the planned volume 6 on the NASS. Several papers were out for peer-review and were expected back by the end of the year, but a few key papers have still not been completed. It is planned to publish this volume in 2006. Ólafsdóttir reported that volume 7 on grey seals was nearing completion, and that only a few papers had not yet been received. The remaining papers were either out for peer-review or already being revised to the final version. Publication is expected in 2006.

The possibility of a volume on fin whales was discussed. It was clear that presently there was a need to wait until more work had been completed, the question will be reconsidered at a later time.

13.2 Other publications

13.2.1. Proceedings from the Conference on the Incorporation of User's Knowledge in Management Decision Making

Charlotte Winsnes reported that editing of the papers presented at this conference in January 2003 was ongoing and the publication would be ready by early 2006.

13.2.2 NAMMCO Website

The Secretariat is planning a renewal of the NAMMCO website. It was tentatively scheduled to open the new site before the end of the year. Members were requested to identify photos or other material that might be suitable for inclusion in the web site.

14. BUDGET

Pike presented the budget for 2005 which detailed the costs of all Scientific Committee activities throughout the year. These costs included specific travel funding provided to experts, meeting costs and work contracts. All costs were within budget, and the draft 2005 budget as presented was approved.

15. FUTURE WORK PLANS

15.1 Scientific Committee

The next (14th) annual meeting will be held in Iceland at a time and location to be determined.

15.2 Working Groups

The following working groups will hold meetings during 2006:

- NASS Planning Group, first half of 2006;
- Fin Whale Working Group (with IWC attendance), March in Iceland;
- Harbour Seal Working Group, second half of 2006;
- Walrus Working Group (depending on progress, see 9.13.3).

Other meetings may be held depending on requests received from the Council.

15.3 Other matters

The Secretariat took note of these scheduled meetings and also noted that there might be additional requests from the Council in 2006. These will be reflected in the preparation of the 2006 budget.

16. SATELLITE TELEMETRY GROUP

In 2002 the Scientific Committee decided to establish an inter-sessional correspondence group to:

- identify progress in satellite tagging made in NAMMCO member countries and elsewhere;
- explore the technical aspects of satellite tagging, including deployment systems;
- briefly consider what tagging experiments have been done and the rates of success;
- Recommend ways to further the development and success of this technique in NAMMCO member countries.

Mikkelsen presented a summary of the history and current events relating to this group. Attempts had been made to organise a workshop on the technical aspects of tagging large whales, but this had met with little interest from the few research groups involved in this field. These research groups are willing to enter into collaborative projects with others, but do not seem willing to share information on the more technical aspects of tagging in an open forum. The Scientific Committee recognised that the correspondence group could not make progress without the cooperation of key players in the field, and decided that the group would be terminated. The Committee will monitor developments in this field on a regular basis.

17. MEETING CLOSURE

17.1 Election of officers

Geneviève Desportes was elected as chair for a 2-year term, to begin after the next meeting of NAMMCO Council in March 2006. It was decided that the vice-chair would be elected by correspondence. The Committee thanked Walløe for his able chairmanship over the past 2 years.

17.2 Closing remarks

The Committee thanked the Secretariat and the staff of the High North Alliance for arranging the meeting at such a spectacular location, and for arranging contacts with people involved in the whaling industry. The hard work of the Rapporteur was aknowledged with thanks.

17.3 Acceptance of report

The report was accepted on 27 October 2005.

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Appendix 1

AGENDA

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   4.1 National Progress Reports
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9.12 Killer whales
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9.13 Walrus
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Appendix 2

LIST OF DOCUMENTS

SC/13/1	List of Participants
SC/13/2	Provisional Annotated Agenda (Draft)
SC/13/3	List of Documents
SC/13/NPR-F	National Progress Report – Faroe Islands
SC/13/NPR-G	National Progress Report – Greenland
SC/13/NPR-I	National Progress Report – Iceland
SC/13/NPR-N	National Progress Report – Norway
SC/13/NPR-C	National Progress Report – Canada
SC/13/4	Observers Report: 55th Meeting of the IWC Scientific Committee, Ulsan, Korea
SC/13/5	Observers Report: ASCOBANS 12th Advisory Committee Meeting, Brest, France.
SC/13/6	ICES/NAFO Working Group on Harp and Hooded Seals-Report 2005.
SC/13/7	Report of the Joint Meeting of the NAMMCO Working Group on the Population Status of Narwhal and Beluga in the North Atlantic, and the Canada – Greenland Joint Commission Scientific Working Group.
SC/13/8	Report of the NAMMCO Working Group on North Atlantic Fin Whales.
SC/13/9	D.G. Pike, Th. Gunnlaugsson, N. Øien, G. Desportes, G.A. Víkingsson, C.G.M. Paxton and D. Bloch. Distribution, abundance and trends in abundance of fin and humpback whales in the North Atlantic
SC/13/10	Report of the Working Group on North Atlantic Walrus.
SC/13/11	Proposed amendment to the Rules of Procedure for the Scientific Committee

SC/13/12	Draft Budget 2004
SC/13/13	Summary of requests by NAMMCO Council to the Scientific Committee, and responses by the Scientific Committee
SC/13/14	Status of *NAMMCO Scientific Publications*
SC/13/15	Carlens, H., Lydersen, C., Krafft, B.A. and Kovacs, K.M. Spring haul-out behavior of ringed seals (*Pusa hispida*) in Kongsfjorden, Svalbard.
SC/13/16	Krafft, B.A.. Kovacs, K.M., Ergon, T., Andersen, M., Aars, J., Haug, T. and Lydersen, C. Abundance of ringed seals (*Pusa hispida*) in the fjords of Spitsbergen, Svalbard, during the peak moulting period.
SC/13/17	Krafft, B.A.. Kovacs, K.M., Haug, T. and Lydersen, C. Growth and population parameters of ringed seals (*Pusa hispida*) from Svalbard, Norway, 2002 - 2004.
SC/13/18	Bloch, D. and Allison, C. 2005. Whale catches in the North Atlantic 1894-1984, taken by Norway, the Faroes, Shetland, the Hebrides, and Ireland. NAMMCO
SC/13/19	Cañadas, A., Donovan, G., Desportes, G., Borchers, D. Distribution and abundance of short-beaked common dolphins (Delphinus delphis) in the central and eastern North Atlantic.

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

Nuuk, Greenland, 13-16 October 2005

1 OPENING REMARKS

Chairmen Lars Witting and Øystein Wiig welcomed the participants (Section 5.5, p. 373) to the third 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). The chairmen noted that, since the last meeting of the JWG, the JCNB had met once and NAMMCO Council had met twice.

At the ninth meeting of the JCNB, held in May 2004, the Commission agreed to ask the Scientific Working Group to focus on narwhal and complete that assessment and to update the West Greenland beluga assessment using any new information available. In addition the Commission posed the following questions (not in order of priority) to the SWG:

1) The Scientific Working Group should consider ways to resolve the issue of reproductive rates of narwhal.
2) Recent changes have been observed in the distribution of narwhal in Canada. For instance in Pelly Bay, hundreds of narwhal now regularly occur where they seldom occurred in the past. Are there any explanations available for these distributional changes?

The Scientific Working Group was also requested to consider the implications for its own structure and the organisation of its work of a possible extension of the Commission's competence to include walrus or other marine mammal species.

NAMMCO Council endorsed the plan of the NAMMCO Scientific Committee to update and finalise the assessment of West Greenland narwhal in 2005 in cooperation with the Scientific Working Group of the JCNB. The Council also requested that the Scientific Committee carry out an assessment of East Greenland narwhal and provide an estimate of sustainable yield for the stock. The management objective in this case is to maintain the stock at a stable level. If the assessment cannot be completed with available information, the Scientific Committee was asked to provide a list of research that would be required to complete the assessment.

The JWG will therefore concentrate on the following tasks:

a. Update and finalise the assessment of West Greenland narwhal.
b. Make progress on assessments of other stocks of narwhal, particularly stocks summering in Canada. This will include provision of advice for the different putative management units.
c. Identify research required to complete an assessment of East Greenland narwhal.
d. Update the available information on the status of West Greenland beluga, taking into account recent harvest levels.
e. Address the specific questions posed by the Commission of the JCNB, above.

In addition the JWG should look at the recent information and if necessary revise previous statements about the extent of sharing of narwhal between Canada and Greenland.

2 ADOPTION OF JOINT AGENDA

The draft Agenda (Appendix 1) was adopted.

3 APPOINTMENT OF RAPPORTEURS

Daniel Pike and Patrice Simon were appointed as rapporteurs for the meeting, with the assistance of other members as required.

4 REVIEW OF AVAILABLE DOCUMENTS

The list of documents (Appendix 2) available for the meeting was reviewed.

5 NARWHALS

5.1 Stock structure

5.1.1 Genetic information

There was no new genetic information available.

5.1.2 Satellite tracking

JWG-2005-12 Laidre, K. and Heide-Jørgensen, M.P. Late summer and early fall movements of narwhals in Inglefield Bredning, Northwest Greenland

A new technique was developed for instrumenting narwhals in Inglefield Bredning, Greenland involving the deployment of satellite tags by hand harpoon from Inuit hunters in kayaks. Four narwhals were tagged in September 2004 and 2005 and movements of each animal were monitored for approximately one month. Tags were thrown into whales from a distance of 2-3 meters and all placed to the left or right of the dorsal ridge. On 6 September 2004, a female narwhal was tagged and positions were received from this animal for 19 days until 24 September. On 12 September

2004 two whales (one adult female and one adult male) were tagged. Positions were received from these two animals until 26 September and 28 September, respectively. Finally, on 30 August 2005 a male narwhal was tagged and positions were received for 20 days until 18 September. All four whales made localised movements in Inglefield Bredning and were generally stationary in the fjord through September. Shifts to the west and south were observed for all animals by the end of the month, however no data were collected on migration routes or wintering grounds because of the limited tag attachment duration. The assumption that only Inglefield Bredning supplies the fall and winter harvests in Greenland at this point should be taken with caution.

Discussion

The JWG noted the importance of the management issue being addressed by this study, the migratory destination of Inglefield Bredning whales and whether or not they contribute to catches further south, and encouraged further work in this area. For this purpose the duration of the tags must be doubled or tripled. It was considered likely that the relatively short transmission-life of the tags was due to attachment failure rather than tag failure, as the battery life of the tags should have been longer than the longest transmission time. Therefore further attempts will be made to refine the attachment system and deployment methods.

It was also noted that this work was being carried out in cooperation with hunters, who had made an important contribution to the development of the tagging methodology.

5.1.3 Management units

JWG-2005-16: Heide-Jørgensen, M.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, organochlorines, stable isotopes, satellite tracking, hunting statistics and compilations of local knowledge. This model is similar to the model presented at previous meetings but new evidence on migrations and homing of narwhals from Admiralty has been added. 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 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 beyond 1 October. 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 the sustainability of the hunt. 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. Similarly Greenlandic stocks also have a low risk of being harvested in Canada. The apparent stock delineation may be maintained through a combination of reproductive isolation at the spring mating season and matrilineally inherited site fidelity.

Discussion

The JWG concluded in 2004 that the model for apportioning of catches to putative stocks presented in the previous version of this paper (see Fig. 1) was acceptable based on the available evidence. This general conclusion was unchanged given the rather limited new information available. However the existence of summer stock of narwhal in Cumberland Sound was disputed, given that harvests are relatively low there during the summer and narwhal have not been seen in any significant numbers in extensive surveys of Cumberland Sound. The model presented in JWG/16 is qualitative in nature, using information from all available sources to identify stock units useful for management. The JWG was fully cognizant of the uncertainty of some of these conclusions. It was emphasised that the JWG will remain open to changing its understanding of narwhal stock structure as new information becomes available.

Some of the relationships between summering aggregations of narwhal and wintering areas are based mainly on very low numbers of satellite tracked narwhal. In particular only 2 narwhal from Melville Bay, both males, have been tracked to their wintering area. There was concern that basing stock relationships on such small sample sizes could lead to erroneous conclusions but there was no way to quantify the uncertainty in these conclusions. However in areas where larger numbers of narwhal have been tagged, such as Eclipse Sound, there has been little variance in migratory behaviour, giving greater confidence to conclusions based on small sample sizes. It was also noted that the identification of putative stock units was based on all available evidence, not just that from satellite tracking.

Given the logistical difficulty of deploying satellite tags, and the lack of success in some areas, the idea of using passive tags that would be recovered in the hunt, such as "spaghetti" or Discovery tags, was considered. However it was noted that deploying such tags would likely be no easier than deploying satellite tags and that large numbers would have to be deployed to have a reasonable expectation of a useful number of recoveries. It was considered preferable to maximize the information gain from every tagging opportunity by using tags that actively collect and transmit data. It was also noted that the deployment of passive tags had been tried on beluga in Canada with little success, probably because of tag rejection.

It was emphasised that the mechanism (genetic and/or behavioural) by which independent summer stocks are defined is not relevant to the importance of these stocks as management units and that management advice could be based on these units in either case. There is little evidence to support the contention put forward in JWG-16 that summer stocks of narwhal are in the main reproductively isolated from one another and it was noted in particular that the very low genetic diversity found between narwhal areas does not support this. The observed isolation of summering aggregations from one another could be maintained by maternally directed philopatry, which would not leave a genetic signal if the summer stocks are interbreeding elsewhere. In such a case some separation would be expected in the mitochondrial genetics, as is seen in beluga. That this separation is not seen in narwhal suggests that some mixing is taking place or that there has not been sufficient time since the separation of summering stocks for such differences to develop.

Sharing of stocks between Canada and Greenland

In 2004 the JCNB requested the JWG to look at the recent information and if necessary revise previous statements about the extent of sharing of narwhal between Canada and Greenland. In 2004 the JWG agreed that all available 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. No new evidence has been presented to change this conclusion. However it was emphasized that this conclusion is preliminary and based on incomplete evidence. The migratory destinations of some summer aggregations in Canada are unknown. These include the East Baffin, Smith Sound, Jones Sound and Parry Island stocks. It is therefore not known if these stocks are at risk of harvest in Greenland. In addition, the lower rate of depletion of the overwintering stock at Disko Bay compared to that of the Inglefield Bredning summer stock suggests that Inglefield Bredning cannot be the sole source of narwhal wintering at Disko Bay, implying that some of the narwhal harvested at Disko Bay must come from stocks summering elsewhere.

The JWG therefore revised its previous statement to conclude that there is a low risk that narwhal summering in the Somerset Island, Admiralty Inlet and Eclipse Sound areas are subject to harvest in Greenland. These groups constitute a large proportion of the total known number of narwhal summering in Canada. The migratory routes and destinations of other Canadian summer stocks, such as the East Baffin, Jones Sound and Parry Island stocks, are unknown and there remains a chance that these stocks are subject to harvest in Greenland, particularly at Uummannaq and Disko Bay during the fall and winter.

Stock structure in East Greenland

No new information has become available on stock structure in East Greenland since the NAMMCO Working Group last considered this in 1999 (NAMMCO 2000). There are summer aggregations at Scoresbysund, Kangerlussuaq, and Ammassalik which are subject to catches. Narwhal also occur north of Scoresbysund but these are likely not harvested. There is genetic evidence that East Greenland narwhal are distinct from those in West Greenland and Canada. However at present there is no basis for further distinguishing East Greenland stocks beyond that of their observed summer distribution.

5.2 Biological parameters

5.2.1 Age estimation

WG-2005-8 Garde, E., Heide-Jørgensen, M. P., Hansen, S. H. and Forchhammer, M. C. Age-specific growth and high longevity in narwhals from West Greenland estimated via aspartic acid racemization.

Age estimation of odontocetes (toothed whales) has traditionally been done by counting of growth layer groups (GLGs) in the teeth or mandible. However, this method has failed to provide reliable results for narwhals and development of a reliable method is needed. Here, we present new results for the age estimation of narwhals using the aspartic acid racemization technique. The technique utilises the fact that, in metabolically inactive tissues, such as eye lens nuclei and teeth, aspartic acid is converted or racemized from the L-form to the D-form with a constant rate over time. In this study eyeballs and teeth from a total of 75 narwhals taken by Inuit hunters were collected and analysed. The D/L aspartic acid ratio was measured using High Performance Liquid Chromatography (HPLC). Due to difficulties with the HPLC analysis (aspartic acid peak separation) of the teeth samples, only the results of the eye samples are presented here. Age estimates were successful for all 75 narwhals. The aspartic acid racemization rate (k_{Asp}) was estimated to be 1.045 x 10^{-3} yr^{-1} by regression of D/L ratios to age estimated by length of 15 young narwhals (≤298 cm in length, ≤2.5 years) supplemented with data from 13 fin whales (Nerini 1983) that had been age estimated by counting of earplug laminations. The initial D/L ratio ($(D/L)_0$) was estimated by regression of D/L ratios to estimated age for the 15 young narwhals. The $(D/L)_0$ value was estimated to be 0.02880. About 20% of the whales were older than 50 yrs and there seemed to be a tendency for greater longevity in females than in males. The maximum age obtained was from a 115 year (SE±10 years) old female. The oldest male in the sample was 84 years (SE±9 years). Using the Von Bertalanffy growth model, length at physical maturity was estimated to be 396 (95% CI: 387-404 cm) and 457 cm (95% CI: 443-470 cm) in females and males, respectively. Based on the assumption that cetaceans attain sexual maturity at about 85% of their physical maturity (Laws 1956), length and age at sexual maturity were estimated to be 337 cm and 6-7 yrs for females, respectively, and 388 cm and 9 yrs for males, respectively.

Discussion

The JWG welcomed this important advance in determining the ages of narwhal, for which previously no reliable method was available. It was noted that there were some uncertainties, particularly relating to the lack of studies of known age animals. Such data are mainly available for humans. It was recommended that the method should be applied to other marine mammals, such as some other toothed whales and seals, for which ages are available through other methods, and to captive animals of known age, to verify the reliability of racemization ages. It was also recommended that the method be applied to beluga, in order to resolve the question of whether beluga teeth accrue 1 or 2 growth layer groups per year.

The estimates of age of sexual and physical maturity for male and female narwhal were similar to those from other studies. It was however recommended that the uncertainty in age estimation should be included in the estimation of growth curves.

The JWG found the method very promising and recommended that eyeballs be collected in all future sampling programmes for narwhal and beluga. Once sufficient numbers of reliably aged animals have been collected, it should be possible to estimate the survival rate for narwhal stocks, which is an important parameter in stock modelling.

5.2.2 Reproductive rates

In 2004 the JCNB requested that the JWG should consider ways to resolve the issue of the reproductive rate of narwhal. The current scientific view is that narwhal reproduce about every third year. This is based mainly on the observation that roughly 1/3 of mature females in the catch are pregnant. It is also consistent with reproductive rates observed for other toothed whales. Some hunters, based on their own observations, have concluded that narwhal (and beluga) have the capacity to reproduce at a faster rate.

The JWG emphasised that the reproductive rate of one calf every 3 years is an average and does not preclude that some narwhal, at some periods of their lives, may reproduce at faster or slower rates. For example it is entirely possible and likely that younger females may reproduce at a faster rate than older ones: this is observed in other cetacean species.

It was considered that improving the estimate of reproductive rate, or calculating age-specific rates of reproduction, will be difficult. Although a method of ageing narwhal has become available (see 5.2.1), it is not possible to determine the number of pregnancies a female narwhal has had by examination of the reproductive tract, because of the production of accessory *corpora* and resorption of *corpora albicantia*. The JWG considered the idea of determining the proportion of females accompanied by calves in aerial photographs, but concluded that this was not feasible because it is often difficult to determine the sex of narwhal from aerial photographs, and because calves are often very difficult to spot. Another possibility is through repeated observations of known individuals, identified through external markings or genetics. In this way individual females could be followed throughout their lives to determine their reproductive output. However, given the large numbers of narwhal in most areas and the lack of readily identifiable external markings, it is likely that a very large sampling effort would be required to achieve this.

While recognising that the question of the reproductive rates of narwhal and beluga is important, the JWG emphasised that the assessment models that have been developed and used are not very sensitive to changes in the reproductive rate. A wide range of rates of increase are commonly used in these models. In all cases better information on stock structure, abundance and catch history is of far greater importance than a precise estimate of reproductive rate.

5.3 Catch statistics

JWG-2005-6. Heide-Jørgensen, M.P. Reconstructing catch statistics for narwhals in Greenland 1862 to 2005: A preliminary compilation.

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 estimated 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 2004. Since 1993 catches have declined in West Greenland especially in Uummannaq where the decline is significant. In East Greenland there has been an increase of 8% per year since 1993.

Discussion

There was a discussion on the correction factors used for "struck and lost" and they were considered appropriate. The correction for under-reporting and "stuck and lost" adds an average of 42% to the harvest statistics for 1954-1998.

Sex ratio is available for some of the years and there is no apparent bias. It is believed that there has been no bias toward males as females also have a high monetary value because of meat/maktak sale.

A new narwhal harvest-monitoring system has been in place since 2004. Information on the date and location of harvest and the sex of harvested animals is collected under this system. Since 2004, it has been forbidden to hunt females accompanied by a calf; this may lead to a bias toward males in the sex ratio as was observed in 2004.

According to the catch statistics provided, there has been an increase in narwhal catches in East Greenland of 8% per year since 1993. The harvest reporting system changed in 1993 and the impacts of this change on the catch statistics are unknown. There should be a better analysis of the reason for this apparent increase in harvest.

JWG-2005-9. Romberg, S. and Richard, P. Seasonal distribution and sex ratio of narwhal catches in Baffin region of Nunavut territory, Canada.

The distribution of seasonal catches and sex ratio of narwhals in the Baffin region of Nunavut Territory, Canada, was studied using hunter tag information archived at the Department of Fisheries and Oceans (DFO) from 1990 to 2004. Histograms of catches by calendar date and a breakdown of catches pre-calendar day 205, between calendar days 205 (roughly floe edge season) and 274 (roughly summer open water season) and post calendar day 274 (later than 30 September) 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 used in allocating the catch to different putative sub-stocks, either local summering sub-stocks or spring or autumn migrating sub-stocks. The distribution of catch by sex shows that the majority of the communities take a greater proportion of males than females throughout the seasons.

Discussion

Under-reporting of females in catch statistics may have happened in the past, when harvest was recorded under a different reporting system. However, the authors are confident that the present reporting system is working well.

In Canada, regulations forbid the harvest of female accompanied of a calf. This, as well as the high monetary value of the tusk, leads to bias towards males in the sex ratio of the harvest.

Fisheries officers and biologists carry out hunt observation in various communities each year. However, there is no observer programme in place to provide consistent hunt observation or to verify information on "struck-and-lost".

JWG-2005-10. Romberg. S. Catch Statistics (1996-2004) for narwhal and beluga in selected communities in the eastern Canadian arctic.

Catch statistics for narwhal in the Canadian High Arctic region (Nunavut) for the period 1996-2004 are presented. In general, it is believed that the catch reports are accurate as 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 the sex of the animal, and attach a portion of the tag to the tusk when present. The other portion of the tag is returned to DFO which records the information. For communities participating in Community-Based Management, there is the possibility to transfer up to 50% of the annual harvest limit to the following year or to “borrow” up to 15% from the following year’s harvest limit.

Igloolik and Hall Beach have been included; however it is not clear as to what proportion of narwhals are taken from the Somerset Island s and Northern Hudson Bay stocks.

The average reported landed catch for the period is 373, which does not include Igloolik and Hall Beach.

"Struck and lost" includes the two categories ‘killed and lost’ and ‘wounded and escaped’.

In the communities which are part of a Community-Based Management programme, total hunting mortality is reported. The struck and lost information is based on self-reported data by the hunters. Systems of reporting vary from community to community. In general, hunters are required to report animals that are wounded (wounded and escaped) and animals that have been killed but not retrieved (sunk and lost). Estimates of hunting mortality are calculated based on minima and maxima (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:

There was discussion on the variation of the struck and lost rate between years within some communities. There is a need for a more consistent monitoring of "struck and lost" to provide better information on total removal due to hunting.

There is conflicting information on the lost rate in the narwhal hunts. While the data provided in document JWG-2005-10 indicate a somewhat low level of "struck and lost" in most communities and years, some anecdotal information suggests that higher loss rates are possible. To address this, and to improve our knowledge on total removal at various hunting sites and using various hunting methods, the JWG recommended the development of a programme to collect struck and lost information from direct observation of hunts in Greenland and Canada. This may also assist in improving hunting techniques and efficiency and minimizing hunting losses.

NAMMCO informed the group that it will be holding a workshop on "struck and lost" in November 2006. The workshop will include participation from hunters, scientists and managers.

5.4 Abundance

5.4.1 Recent estimates

JWG-2005-5. Heide-Jørgensen, M.P. An attempt to survey narwhals and belugas in West Greenland March 2004.

A digital aerial photographic survey for belugas and narwhals was attempted in West Greenland during 19-30 March 2004. The survey aircraft was a twin engine Piper Aztec equipped with two Hasselblad cameras with digital databacks (Phase One) that downloaded images every 3rd second to onboard hard disks together with information on altitude, speed and position. Due to inclement weather with constant wind and/or fog the survey effort proved to be very low with only an insignificant proportion of the total area being covered. The survey was designed to cover the traditional strata used for estimating the winter abundance of belugas in West Greenland. Following advice from the hunters organisation, KNAPK, the survey was extended to cover Vaigat as well as the offshore parts of Uummannaq. This extension, that was conducted under favorauble conditions, did not reveal any observations of whales. However, on the 20 March pods of up to 25 belugas were seen in the northern part of Vaigat where it is known that some belugas winter. No other sightings of belugas or narwhals were made during the survey but one bowhead whale was seen on 18 March outside Ilulissat and prior to the beginning of the survey. Unusual light ice conditions were experienced in West Greenland during spring 2004. The low ice coverage created relatively unstable weather conditions with more wind (average 5.4 m/s) than usually encountered at this time of the year (<3 m/s). The wind over the wide open water fields made it impossible to complete the survey.

Discussion

Although weather often makes it difficult to complete a spring survey in West Greenland waters, the JWG reiterated its recommendation of the previous two meetings that a survey of west Greenland beluga should be conducted. It is planned to conduct a survey in March 2006.

JWG-2005-17. Heide-Jørgensen, M.P., K.L. Laidre and M.J. Simon. Video recordings of narwhal pods in the Melville Bay, northwest Greenland, 2004-2005

Digital aerial photographic surveys of Melville Bay in 2002 resulted in no sightings of whales despite 990 km of transect effort covered resulting 4.558 km^2 digital images.

Hunters utilising the Melville Bay for hunting were not satisfied with the recommendation for a zero catch quota so they proposed to make video recordings of some of the large pods that they frequently encounter in the Melville Bay to demonstrate the occurrence and perhaps numbers of whales in the area. This study reports on the results of hunter-based video recordings of narwhal pods in Melville Bay in August 2004 and 2005. Recordings of narwhal pods were collected on two days in 2004: the 21 and 23 August. On 21 August, 141 whales were estimated to be swimming to the right of the promontory and 34 were estimated to be swimming to the left. Since it is possible that the same whales were recorded on both days the highest minimum count from 21 August is the safest estimate of the minimum number of whales recorded in 2004. In 2005, video recordings were made between 2 - 15 August at Balgoni Islands in central Melville Bay. The largest number of whales was observed on the 12 August where 147 whales were counted from which 35 should be subtracted to account for possible double observations. The achieved number of 112 whales is in the same magnitude as the number from 2004. There are evidently narwhals consistently present in Melville Bay during summer, which is also obvious from the catch statistics. However the low number of narwhals spread over a very large area makes traditional surveys prohibitively expensive and generally unsuccessful.

Discussion

This study confirms that narwhal occur in some numbers in Melville Bay during the summer. Neither survey effort nor coverage could be estimated based on the results presented in this study. The height of the observer can significantly affect detectability, but the height from which each video recording was made was not indicated. For these reasons these results cannot be expanded into an estimate of density. Only a minimum estimate of the numbers seen in the video can be determined.

There is no intention to repeat this study.

JWG-2005-04. Richard, P., Laake, J.L., N. Asselin, and H. Cleator. Baffin Bay narwhal population distribution and numbers: aerial surveys in the Canadian high arctic, 2002-2004.

Narwhals were surveyed in Eclipse Sound, Admiralty Inlet, Prince Regent Inlet, Barrow Strait, Gulf of Boothia, and in fiords and bays along the eastern coast of Baffin island during the month of August of 2002 to 2004 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. This correction gave estimates of 20,788 (SE: 24,132) for the Eclipse Sound area in 2002 and 18,733 (SE 6,437) in 2004, 25,809 (SE: 14,972) for the sum of the Prince Regent and Gulf of Boothia strata in 2002 and 28,346 (SE: 15,015) for that number added to the Barrow Strait strata in 2004, and 14,957 (SE: 6,437) in the east Baffin Island bay stratum in 2003. The estimates from Admiralty Inlet should be considered biased due to extreme clumping of the animals off transects in both 2003 and 2004 and the poor weather conditions in 2004, which halted the survey of the southern end of the Inlet. Considering the bias in the Admiralty Inlet survey and the lack of survey in known areas of occupation, such as Peel Sound, Viscount Melville Sound and channels north of Resolute, we conclude that the narwhal population in the Canadian High Arctic is very large. It probably numbers in excess of 70,000 animals, with a large proportion of the animals in the western end of its summer range. It is also probable that over ten thousand narwhals summer in the bays and fiords along the previously un-surveyed East Baffin coastline. Survey estimates had large standard errors due to clumping on certain transects within each stratum. Attempts to reduce the sampling error by stratifying new surveys and increasing survey coverage were successful in the 2004 Eclipse Sound survey but not in the 2004 Admiralty Inlet survey. More dive data are required to refine the availability correction factor used in expanding the surface estimates.

Discussion:
Preliminary results of these aerial surveys were presented at the last JWG meeting in February 2004 and several recommendations to improve the analysis were made (see 2004 JWG report). The JWG noted that some of the recommendations provided in the 2004 meeting were not addressed due to logistical constraints.

The clumped distribution of narwhal and the unexpected high abundance of narwhal in eastern Baffin fiords were problems for the survey design and subsequent analyses.

Several areas known to contain narwhal (Peel Sound, Viscount Melville Sound, channels north of Resolute and east Baffin coastline) were not surveyed due to weather conditions, so this survey could not provide a complete abundance estimate of the entire summer range in Canada.

The analysis of the survey data from fiord areas (most of which were at least 2,000 meters wide) was discussed at length. In this part of the survey, a single line was flown up the centre of each fiord due to constraints of flying in the fiord environment, with the results extrapolated to the entire area of the fjord. This survey design resulted in uneven coverage probability; not all areas in a fiord had the same probability of being surveyed, possibly causing a bias depending on how the whales are distributed in the fiord. It was agreed that a sub-committee, coordinated by the lead author, would meet by email to try to resolve this issue.

There was some discussion as to the appropriateness of the application of an instantaneous correction for diving whales to a sighting process that is not instantaneous. It was argued that the duration of the chance of seeing a narwhal at the surface is very short such that it might be considered nearly instantaneous, especially for high-density areas where observers are busy with declination measurements. The surface intervals (or rather, the time at depths where they could be detected by an aerial survey crew) for some narwhals have been measured as 2-3 minutes for tagged individuals, but the actual time available to see a whale from a Twin Otter may be less than 3 seconds.

A separate issue is how widely the limited tag data can be extrapolated. The surface interval used is based on a limited number of tagged narwhal and may not apply to all narwhal in all areas. The JWG agreed that the correction was appropriate given the available data on narwhal diving behaviour, but recommended that more such data be collected.

The serial difference method of variance estimation was suggested in 2004 but results to date have not indicated an improvement using this approach.

In 2004 it was recommended that the criteria for assigning duplicate sightings should be clarified and this recommendation was reiterated.

Although the paper combined the “best” estimates from different areas and years into single estimates, this approach could confound variance estimation (the true variance is likely larger than estimated). In addition the JWG suggested providing a more detailed description of what is defined as “best”.

There were extensive discussions of how to address large groups observed off-transect such as the large groups observed in Admiralty Inlet during the survey. While there was disagreement on this issue, it was decided not to include these sightings in the Admiralty Inlet survey estimate because they were seen off-transect. Other approaches, including adaptive sampling, greater survey effort or changes in stratification, were suggested for future surveys.

Reconnaissance survey in Davis Strait/Baffin Bay

Gosselin presented the preliminary results of an aerial survey conducted in March 2005 of the area from 60° to 65° N to search for the hooded seal whelping patch. The survey was conducted at an altitude of 300 ft and a speed of 200 kts, which is lower and faster than is normal for cetacean surveys. While the target species were seals, observers also noted marine mammals in open water. A total of 55 narwhal were sighted and 1 beluga whale was sighted at the southern end of the area.

5.4.2 Estimates by management units

Abundance estimates that have been accepted for use in assessments by the JWG are presented in Table 1.

5.4.3 Recent changes in distribution in Canada

In 2004 the JCNB was informed that recent changes have been observed in the distribution of narwhal in Canada. For instance in Pelly Bay, hundreds of narwhal now regularly occur where they seldom occurred in the past. The JCNB therefore requested that the JWG look into this matter.

There was no document presented on this topic to the JWG. It was reported that lighter ice conditions had prevailed in this area in recent years, although no quantitative data were presented. It is therefore possible that narwhal are able to penetrate into areas that were not usually available to them previously because of heavier ice cover. The

JWG was also informed that narwhal sometimes use the track of an icebreaker to enter the area and that icebreakers began coming to Pelly Bay quite recently. In addition, local people have reported an increased frequency of killer whale sightings in the area, which might also change the distribution of narwhal.

The JWG could not provide any firm explanation as to why more narwhal are coming to this and other areas where previously they were seen infrequently. As a first step to addressing this question, trends in the extent and duration of ice cover in the area should be quantified. These data should be available from satellite and aerial ice reconnaissance. It was also suggested that the use by narwhal of icebreaker tracks should be studied and that the frequency of sightings of killer whales should be monitored.

5.4.4 Future survey plans

It is planned to conduct a narwhal survey in West Greenland in March 2006. Currently, there are no plans for narwhal surveys in Canadian areas.

5.5 Assessment

5.5.1 Update of West Greenland assessment

JWG-2005-15 Witting, L. A model selection based assessment for West Greenland narwhals with uncertain stock structure.

This paper uses a density regulated population dynamic model in a model selection framework to identify the more likely stock structure hypotheses for West Greenland narwhals. The framework performs Bayesian assessments on 28 of the most likely three, two and one stock hypotheses, and it uses Akaike weights to determine the relative probabilities of the different models, given four time series of abundance data and historical catches from 1862 to 2004. The analysis discards 12 of the original hypotheses as being unlikely, it agrees with other information on the most likely stock structure hypotheses, and it integrates the 16 most likely hypotheses into estimates of sustainable harvest levels.

Discussion

There was disagreement within the JWG about the appropriateness of using apparent stock dynamics as a method of selection between stock hypotheses. One view was that stock identification should be by means independent of the stock dynamics. Harvest history and abundance may be correlated in two areas for indirect reasons, for example the economic situation in West Greenland, that have nothing to do with the relatedness of the animals in the two areas. Therefore using stock dynamics as a means of assigning probabilities to stock structures could be erroneous because of spurious correlations. Another view held that, given a set of stock hypotheses, it was only reasonable to give greatest weight to those that provided the best fit to the catch and abundance/trend information at hand, unless there was other information that made them unlikely. However it was recognised that this disagreement did not preclude the JWG from itself reaching conclusions about the most likely stock structures in the area and selecting assessment models appropriately.

The models presented in JWG-15 used, as input, the data on abundance, catch history, and biological parameters that have been agreed in the past by this committee. Nevertheless there was concern about possible biases in some of the input data, particularly abundance estimates and indices. For Inglefield Bredning, the 1986 and 2001/2 estimates were produced using different survey methodologies that have not been directly calibrated against one another. There was concern that this might have influenced the apparent negative trend in the estimates between 1986 and 2001/2. The JWG therefore recommended modelling that incorporated only the later surveys and options that considered them as index rather than absolute estimates.

For Disko Bay, the index surveys conducted in the early 1980's were done by a somewhat different methodology than those done in the 1990's and it has been recognized by this Committee that, for beluga, the two sets require different treatment. Specifically, different bias correction factors were used in beluga modelling for the two index sets. There is no reason to suppose that the situation should be different for narwhal, but in the modelling reported in JWG-15 a single bias correction factor was used for all the index surveys. The JWG therefore recommended modelling that incorporated separate bias correction factors for surveys conducted in the 1980's and 1990's.

While past harvesting of narwhal in West Greenland has not been sex-selective, it was expected that the new regulatory structure will lead to a selection for male narwhal. The JWG therefore recommended that the sensitivity of the results to selection for males be examined.

The greatest difficulty in providing advice for sustainable harvest of West Greenland narwhal is the uncertainty in stock structure. The models using the stock structures considered most likely by the JWG were examined further. A probability of 70% of some stock increase within 5 years was considered an appropriate objective. To meet this objective, depending on the model, a total annual removal ranging from 15 to 75 narwhals is allowed for the entire area This strengthens the conclusion reached in 2004, that West Greenland narwhal are heavily depleted and substantial reductions in catch are required immediately to arrest the decline in numbers However the JWG could not agree on the quantitative results of the model presented in JWG-15 because of the above noted uncertainties in stock structure and input parameters. There was no general agreement within the JWG on which model scenarios should be used in a final assessment. However, the JWG agreed that the recommendation provided in 2004, that the total removal in West Greenland should be reduced to <u>no more</u> than 135 individuals, should be provided again and with greater emphasis. This greater emphasis is due to the fact that all models reviewed by the JWG allowed total annual removals lower than 135.

The JWG recognized that the new information presented in JWG-17 confirmed that narwhal do occur in Melville Bay, but without an abundance estimate the JWG was unable to recommend a sustainable removal level for this stock.

The JWG recommends the following research to provide more specific advice on sustainable catches:

1) Modelling:

The model described in JWG 15 should be revised and used with the M|IUD as the base case and M|IU|D, M|I|UD, and M|I|U|D as alternate cases. MSYR will be limited to a range of 0.01 to 0.04, and survey data from Inglefield Bredning should be included as index estimates when combined with harvest data from other areas. As the 1986 estimate for Inglefield Bredning may not be directly comparable with the later estimates, it should be included with a doubling of the CV or excluded from the runs. Also for the survey estimates from Disko Bay, the effect of treating the 1982 and 1981 estimates as a separate index series independent of the earlier estimates (as done for beluga) should be investigated. Trials should also be conducted with pseudo-data sets to determine to what degree the model can identify the true stock structure. Alternate runs could be conducted to determine to what extent new data or independent biological data will improve the performance. These runs should include testing for the existence of an unidentified stock contributing to the harvest at one or more locations, new survey and tagging data and sex ratios in the harvest other than 50:50. (Time frame: 1 year.)

2) Stock Structure:

a. Re-analysis of existing genetics and contaminants data from harvested samples to account for season of take. (Time frame: 1 year.)
b. Satellite tracking from harvest areas beginning with Uummannaq and Inglefield Bredning. (Time frame: 2-5 years.)
c. Satellite tracking from areas in northern Canada (East Baffin, Smith Sound, Jones Sound, Kane Basin, Parry Islands) that are poorly known and may contribute to these harvests.

3) Abundance Estimates:

New surveys to extend the current abundance time series and estimate abundance in areas with no distribution or abundance surveys (E. Baffin, Parry Islands, Smith Sound, Jones Sound, Kane Basin). Priorities are a beluga/narwhal survey in Disko Bay and a survey of Melville Bay/ Inglefield Bredning. (Time frame: 2-10 years.)

5.5.2 Canadian summer stocks

JWG-2005-11 Richard, P. A risk analysis of narwhal hunting in the Canadian High Arctic.

A simple stochastic dynamic growth model was used to determine the risk of change (-5% and -10%) over a period of ten years. The model runs either assumed no stock structure, a single panmictic stock, or a metapopulation structure with 4 different sub-stocks (Somerset, Admiralty, Eclipse, East Baffin). The structured model runs consider the summer hunting on local sub-stocks and the hunting of these sub-stocks by all communities during migration to or from the wintering areas. Results indicate little or no risk of decline over the time span in all but one case, the Admiralty Inlet sub-stock. The model runs pertaining to the Admiralty Inlet sub-stock assume a population size based on surveys which are considered biased because of extreme clumping of narwhals in the area. Therefore the risk analysis results for this sub-stock are questionable. Finally, risk probabilities are based on a simple model with no density dependent effects. It is conceivable that the decline of a large population will trigger increased productivity and that the real risk is smaller than estimated here.

Discussion

The JWG welcomed this contribution as an important first step in the quantitative assessment of Canadian summering stocks of narwhal.

The range of rates of increase from 1.01 to 1.03 did not include the maximum rate that is likely for narwhal. However the JWG agreed with the author of JWG-11 that this was appropriate given that the relative depletion status of these stocks was unknown, and only stocks that are at or below the maximum sustainable yield level could be expected to exhibit a higher rate of increase. The effect of a higher rate of increase would be to decrease the probability of a stock decline, so in this sense the model is conservative.

The mean loss rates used to estimate total removals were themselves estimated using recent data collected under the Community Based Management system in Canada. However the JWG had already expressed concern that these data may not be reliable and might underestimate true loss rates (see 5.3.1).

For communities taking narwhal in the spring and the fall, the catch may be composed of a mixture of animals from two or more summer stocks. In the model it is assumed that the relative proportion of animals from each stock in the catch is proportional to the abundance of each stock. It was considered that, for spring hunts in particular, animals from stocks that summer near to the spring hunting location might be taken in a higher proportion than that of their relative abundance. This was considered especially important for Arctic Bay, for which the spring catch constitutes over half the total.

Given these concerns, it was considered that the model could be improved by including a wider range of some parameters in sensitivity analyses. Specifically the JWG requested that that the following sensitivity analyses be conducted:

i. Higher struck and lost rates, of up to 2x those used initially.

This sensitivity analysis was performed at the meeting. The effect of doubling the loss rate was to increase the probability of a decline at Admiralty Inlet but not substantially so at Eclipse Sound except under the lowest examined rate of population increase.

ii. Higher probability that Admiralty Inlet narwhal are taken at the Arctic Bay ice edge.

There was insufficient time to perform this sensitivity analysis, but it could be expected to result in an increased probability of a decline at Admiralty Inlet.

The model used only recent average catches to project hunting mortality in the future. As yet an historical analysis of Canadian narwhal catches has not been developed, but published figures are available as far back as 1979. In 2004 the JWG concluded that it would be feasible 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, and it was recommended that the possibility of a longer catch series, spanning at least the time period of the survey estimates, be investigated.

The model incorporated only recent abundance estimates and did not use earlier estimates from Admiralty Inlet and Eclipse Sound from 1984. For Admiralty Inlet, the estimate for 1984 was nearly 3 times that for 2003 although the difference in point estimates is not statistically significant. In contrast the estimate for Eclipse Sound for 1984 was significantly lower than that for 2004.

The JWG therefore recommended that a model incorporating all abundance estimates considered useable for assessment, with an historical catch series, be developed, as has been done for West Greenland beluga and narwhal. Such a model would show the trajectories of the stocks over time and provide estimates of yield that would be useful in assessing stock status and determining sustainable removal levels.

In the interim and until a new modelling framework is developed, the JWG decided to use the model provided in JWG-11 to arrive at some preliminary conclusions about the status of Canadian summer stocks.

Somerset Island
This stock is the largest of the Canadian summer stocks. It is subject to a low level of harvesting in the summer but may be hunted by several communities in the spring and fall. However, even under the most pessimistic scenarios of stock size, hunting loss rates, and rate of increase, there is a negligible chance that the stock will be depleted in the next 10 years. The JWG therefore concluded that present catch levels were sustainable for this stock.

Admiralty Inlet
Under scenarios of high loss rate and/or low rate of population increase, the model predicts that there is a high probability that this stock will decline in the next 10 years. In addition the survey estimate for 2003 is substantially lower than that for 1984, indicating that there may have been a population decline over that period. However it was recognised that the recent estimate may be biased because of the extreme clumping of narwhal in the area. The JWG concluded that there is a risk that present catch levels are not sustainable for this stock and recommended that a new modelling framework as described above be developed to provide estimates of sustainable removals.

Eclipse Sound
Under all but the most pessimistic scenarios of high loss rates combined with low rates of increase, the model indicated that there is a very low risk that this stock will decline in the next 10 years with present catch levels. The JWG therefore concluded that present catch levels were likely sustainable for this stock but, again, recommended that a new modelling framework as described above be developed to provide estimates of sustainable removals.

East Baffin
Because the abundance estimate for this area was not accepted (see 5.4), the JWG could not provide advice on the sustainability of catch levels in this area. It was also noted that there was no information about the seasonal distribution of this stock so it

was not known if it was subject to harvesting outside of the East Baffin area. The JWG therefore recommended that a new abundance estimate be developed for this area and that studies be conducted to determine the seasonal distribution of this stock.

5.5.3 East Greenland

The JWG considered that, given that almost nothing is known about the stock structure and seasonal migrations of East Greenland narwhal (see 5.1.4), and that the abundance estimate for Scoresbysund is more than 20 years old, a reliable assessment will not be possible without new information. Nevertheless *ad hoc* modelling carried out at the meeting indicated that, under the assumption of an independent stock at Scoresbysund with a present abundance similar to that in 1983, present harvest levels are not sustainable. However the validity of these assumptions cannot be assessed without further research.

Insufficient information was available to carry out assessments for other areas of East Greenland.

5.6 Ecology

JWG-2005-13: Laidre, K.L. and Heide-Jørgensen, M.P. The behavior of narwhals (Monodon monoceros) before, during, and after an attack by killer whales (Orcinus orca) in the Eastern Canadian Arctic

On the 19 and 20 of August, 2005 a predation event by killer whales on narwhals was witnessed at Kakiak Point, in Admiralty Inlet, Canada. Approximately 12-15 killer whales (group structure consisted of one adult male, 7-10 adult females and rest were juveniles) were observed attacking narwhals approximately 0.3 - 1 nm off the coast of Kakiak Point. Two explicit attacks were documented on the same day, one occurred at approximately 12 noon and the second occurred at approximately 4 pm. At least 4 narwhals (or 4 independent kill events) occurred over a 6-hour period based on direct counts of observations of oil/blubber slicks at the surface, congregations of fulmars in the center of the slicks, and killer whales moving and diving in the center of oiled areas. When the killer whales entered the vicinity of Kakiak Point, the narwhals were observed to immediately move very close to the coast (<2-3 m). Some narwhals formed tight groups near the shore and lay very still at the surface. One whale was observed to strand itself on a flat gravel beach and violently thrash its tail for >30 seconds. Within hours after the attack, narwhals were observed to resume their pre-attack behaviour and distance from the shoreline, and narwhals were no longer observed in extreme proximity to the coast. Narwhals instrumented with satellite tags moved offshore and utilised a wider section of the coastline after the attack. Whether this dispersal is an effect of the killer whale occurrence or a seasonal change in behaviour remains unresolved.

5.7 Future research requirements

Research recommendations specific to refining assessments for West Greenland narwhal are listed under 5.5.1.

The JWG supported and reiterated the recommendations from previous meetings. The following were identified as most important at this meeting:

<u>All areas</u>

- Better estimates of struck and lost rates are required from all areas.
- There should be a coordinated effort between Canada and Greenland to collect samples from the catch and from animals of known age, and to conduct analyses to determine the age structure of narwhal stocks using the amino acid racemization technique.
- large-scale effort to obtain dive time data for survey correction, from different areas and seasons.

<u>West Greenland</u>

- The West Greenland index area should be surveyed in 2006 in a manner consistent with previous surveys. If a new survey methodology is used, experiments should be conducted to calibrate the new method with the old.
- Development of a monitoring plan, including survey intervals.
- Stock structure: investigate movements from Inglefield Bredning, Uummannaq and from the wintering grounds.

<u>Canada</u>

- Provide a revised abundance estimate for East Baffin narwhal.
- Conduct a new survey of Admiralty Inlet.
- Develop a longer catch series (at least a series that spans the time period of the survey estimates) incorporating options for high, low and medium catches as has been done for West Greenland.
- Develop assessment models for the next meeting for each stock component, incorporating the catch series (above) and all abundance estimates for each area that have been accepted for use in assessment by this committee (Table 1).
- Provide an abundance estimate from winter surveys in Cumberland Sound.

<u>East Greenland</u>

- Studies of the stock structure of narwhal, through satellite tagging, genetics, contaminants or other means.
- Determination of the seasonal distribution of narwhal, through satellite tagging.
- Abundance surveys for all summer stocks that are harvested.

6 BELUGA

6.1 Stock structure

There was no new information tabled on this subject.

6.2 Recent catch statistics

<u>Greenland</u>

WG-2005-07 Heide-Jørgensen, M.P. Catch statistics for belugas in Greenland 1862 to 2004.

Information and statistics including trade statistics on catches of white whales or belugas in West Greenland since 1862 are presented. The period before 1952 was dominated by large catches south of 66^{o} N that peaked with 1380 reported kills in 1922. Catch levels in the past 5 decades are evaluated on the basis of official catch statistics, trade in mattak (whale skin), sampling of jaws and reports from local residents and other observers. Options are given for corrections of catch statistics based upon auxiliary statistics on trade of mattak, catches in previous decades for areas without reporting and on likely levels of loss rates in different hunting operations. The fractions of the reported catches that are caused by ice entrapments of whales are estimated. During 1954-1999 total reported catches ranged from 216 to 1874 and they peaked around 1970. Correcting for under-reporting and killed-but-lost whales increases the catch reports by 42% on average for 1954-1998. If the whales killed in ice entrapments are removed then the corrected catch estimate is on average 28% larger than the reported catches. Catches declined at about 2% per year during 1979-2004. Reported catches in East Greenland are suspected to be erroneous and should perhaps be added to the narwhal catches.

Discussion

It was noted that the harvest in 2004 had been very low because of the introduction of the quota system and bad weather in some areas.

The JWG recommended that the occurrence of beluga in East Greenland be investigated, perhaps through a traditional knowledge study, to determine if they do occur there or if the reported harvests are erroneous.

Canada

JWG-2005-10: Romberg, S. Catch Statistics (1996-2004) for Narwhal and Beluga in Selected Communities in the Eastern Canadian Arctic.

Catch statistics for beluga in Nunavut for the period 1996-2004 are presented. In general it is believed that the reports for beluga are accurate. The Hunters and Trappers Organisations (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 Programme, 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 not retrieved (sunk and lost). Estimates of hunting mortality are calculated based as minima and maxima (min = landed + wounded and escaped; max = landed + sunk and lost + wounded and escaped).

The average reported landed catch from communities hunting from the Baffin Bay beluga stock for the period is 42.

Discussion

The JWG noted that, as in the case for narwhal, reporting of struck and lost is variable between years and communities and may be unreliable for some communities. It was recommended that the harvest figures in this compilation be compared to the figures from the Nunavut Wildlife Harvest Study, which examined the period 1996-2001.

6.3 Abundance

6.3.1 Recent and future estimates

West Greenland

JWG-5 described an attempt to survey the West Greenland index area in March 2004, which was not successful due to inclement weather (see 5.4.1). The survey will likely be attempted again in 2006. The JWG noted that a digital photographic survey was attempted, whereas all previous surveys have been visual. The index used to monitor trends abundance since 1982 is based on a visual strip transect, and could not be produced from a photographic survey. The JWG therefore recommended that either a visual survey be conducted, or that experiments be conducted to calibrate the two survey methodologies.

Canada

In 2004 the JWG recommended that the abundance of beluga be estimated from the survey carried out between 2002 and 2004 described in JWG-4 (see 5.4.1). However it was recognized that because the survey did not cover Peel Sound, where beluga are concentrated at this time of year, and did not cover estuaries used by beluga, it could not provide an estimate of abundance for beluga.

6.4 Assessment update

6.4.1 West Greenland

JWG-2005-14 Witting, L. An assessment for West Greenland beluga.

This study combined historical catches from 1862 and 3 time series of abundance estimates with density regulated population models to update the assessments for belugas in West Greenland. Given models and data, the population was projected under the influence of historical catches, to estimate the current status and the probabilities of fulfilling management objectives for different levels of future harvest. Seven model combinations were applied to test for sensitivity of the assessment to i) variation in the prior on the MSYR, ii) the presence versus absence of additional variance in abundance estimates, iii) the presence versus absence of an absolute abundance estimate, iv) high versus low catch histories, and v) the effects of choosing an age-structured or a discrete population dynamic model. All models estimate similar dynamics, where West Greenland beluga are severely depleted, with median depletion ratios in 2005 varying between 16 and 42 percent of the carrying capacity. The median of the current replacement yield was estimated to lie between 248 and 494 beluga, with the lower 2.5th percentile between 40 and 104 beluga.

Discussion

The new assessment produced results that are very similar to those from previous assessments, all of which indicate that the stock is substantially depleted.

The JWG considered that the “low MSYR” case provided the most realistic assessment based on presently available information on the rates of increase of beluga and other odontocetes. The assessment can be updated if new information on rates of increase or other parameters is provided. Table 2 provides the probability of halting the decline in beluga numbers in the next 5 years for a range of catch options for this case. Reduction of catches to 100 per year will have an 80% chance of meeting this objective by 2010. Maintaining higher catches reduces the probability of halting the decline, and delay in implementing harvest reductions will increase the risk of continued stock decline.

The JWG also reiterated recommendations made by the NAMMCO Working Group in 2000 (NAMMCO 2001) pertaining to other measures that would improve the conservation status of beluga in this area.

It was recommended that catch limits be distributed over 3 hunting areas to avoid possible local depletions, as per previous advice (NAMMCO 2001): Northern – N of 72° N; Central – 67.30° to 72° N; Southern **-** 65° to 67.30° N.

Seasonal Closures

Beluga occurred seasonally in large numbers in Southwest and South Greenland before 1930, and probably disappeared because of overharvesting (JWG-7). Beluga are however occasionally sighted during the summer in S and SW Greenland and other areas of West Greenland. Few beluga are normally caught during these periods, and the occasional stragglers seen at these times should be allowed to establish themselves. The following seasonal closures are recommended:

Northern: June through August

Central: June through October

Southern: May through October.

For the area south of 65° N, it is recommended that no harvesting of beluga be allowed at any time.

6.4.2 Other stocks

Canada

Reported harvests by communities hunting Baffin Bay beluga continue to be low, averaging 42 annually over the last 9 years (see JWG-10, section 6.2). Given that this harvest is very low relative to the summer abundance of beluga in the area (Innes *et al.* 2002), stock assessment in this area is not considered a priority at present. However some proportion of animals summering in Canada migrate to West Greenland and are at risk of harvest there. It was considered important to determine where in Canada these animals can be found in the summer, to determine if they are harvested in Canada.

6.5 Future research requirements

All stocks

- Better estimates of struck and lost rates are required from all areas.
- There should be a coordinated effort between Canada and Greenland to collect samples from the catch and from animals of known age and compare racemization age estimates to tooth layer age estimates.

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. If possible long-term tag attachments and/or passive tags should be used to find out whether individual animals use the same summer and winter areas repeatedly. The JWG reiterated its support for this proposal and recommended that the research be carried out as a high priority.

West Greenland

- The West Greenland index area should be surveyed in 2006 in a manner consistent with previous surveys. If a new survey methodology is used, experiments should be conducted to calibrate the new method with the old.
- The assessment of West Greenland beluga should be updated once a new abundance estimate has been produced.
- Determine if beluga occur in East Greenland, perhaps through a traditional knowledge study, and attempt to determine if reports of beluga harvest there are correct.

Canada

- Harvest records from DFO should be compared with those from the Nunavut Wildlife Harvest Study.

7. IMPLEMENTATION OF EARLIER ADVICE

On February 12, 2004, Greenland Ministry of Fisheries and Wildlife introduced quotas for narwhal and beluga for the season 1 July 2004 to 30 June 2005. The quotas were set at 300 narwhal and 320 beluga to be divided among municipalities of West Greenland (Table 3). Preliminary catches of beluga reported for the 2004-2005 season were lower than the established quota due to weather conditions. The 2004-2005 narwhal catches had a skewed sex ratio favouring males.

For the hunting season 1 July 2005 to 30 June 2006, the quotas have been established at 260[7] narwhal and 220 beluga, to be divided among the municipalities of West Greenland.

It was noted that the reported catches include whales that are struck and lost. The reporting of catches to management authorities in Greenland is functioning well.

There was a discussion on the management system in place in Canada and Greenland to monitor harvest level and struck and lost animals. There is a need to share information on the reporting system that is in place in Greenland and Canada. This discussion should take place at the JCNB and reported in their proceedings so that there is a better understanding of the reporting system in place in both areas. Information on catches and "struck and lost" is critical to the assessment of narwhal and beluga.

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[7] After the meeting the narwhal quota for 2005/2006 was raised by 50 to a total of 310. See Table 3.

8. TRADITIONAL KNOWLEDGE

There was no information provided under this item.

9. IMPACT OF HUMAN-MADE NOISE

JWG-2005-18: Lawson, J. Overviews: Beluga whale and noise.
Beluga whales have their best hearing sensitivity in the 40-100 KHz frequency range, with poorer hearing at lower and higher frequencies. Natural and man-made noise in the environment has the potential to reduce the probability of detecting biologically relevant signals; this process is termed masking. Beluga whales can detect echolocation signals when they are as little as 1 dB above the level of ambient noise. In studies of ice breaker noise, bubbler noise appeared to be most effective at masking beluga calls, followed by ramming noise, and lastly, ice-cracking noise. Models predicted ice breaker noise would be audible to belugas at distances as great as 35-78 km, cause masking of beluga calls at 14-71 km, and possibly cause temporary changes in hearing sensitivity if belugas stayed within 1-4 km of a large ice breaker for at least 20 minutes. Beluga responses to manmade noise are highly variable and dependent on a variety of factors which include: local habitat, age, prior experience with the noise, the beluga's activity, resource availability, sound transmission characteristics of the location OR the noise of interest, behavioural state of the whale, and individual variability in beluga behaviour. Reported responses of beluga whales to manmade noise range from the most sensitive reported for any marine mammal to ignoring intentional harassment by boats. Beluga responses include altering their swim direction and speed, changing their dive, surfacing, and respiration patterns, and/or changing their vocalisation patterns. There have been few studies of non-auditory physiological effects of exposure to noise in belugas, but several suggest that there are few if any measurable effects.

Discussion
The JWG welcomed this information which addresses a recommendation made in 2001 by JCNB.

10. OTHER BUSINESS

10.1 Implications of the inclusion of other species (*e.g.* walrus) in the work of the SWG

The cooperation between the JCNB SWG and NAMMCO WG has been very productive in providing scientific advice on narwhal and beluga.

The provision of advice on species other than beluga and narwhal from the SWG would be challenging. The addition of other species to this WG would require additional national and external expertise, take more time, may require the SWG to deal with species on a rotational basis or through independent meetings, and may require the establishment of a secretariat to deal with the additional workload.

It was noted that NAMMCO already has working groups to address issues specific to walrus and other species. Greenland being a member of NAMMCO, already participates in these working groups. Canada could also participate through the Walrus WG. This would avoid duplication of work at the scientific level and the JCNB would obtain its scientific advice through NAMMCO.

An obvious approach would be to carry out scientific activities related to walrus and other marine mammals within the existing NAMMCO structure. Alternatively, scientific advice related to other marine mammals needed by JCNB could be directed to scientists in Canada or Greenland who would examine existing literature or set up the appropriate peer review structure to provide the advice. This however might result in duplication of effort.

11 ADOPTION OF REPORT

A draft version of the Report was adopted at the meeting, and the final version was approved by correspondence. The Chairmen thanked all members for their valuable input, the Greenland Institute of Natural Resources for hosting the meeting, and the hard-working rapporteurs for so ably summarising the discussions. Noting that Lars Witting and Øystein Wiig would be leaving their posts as chairmen, the members of the JWG thanked them for their efforts over the years.

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Below and next page:

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.
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 1994, i) NAMMCO/SC/13-JCNB/SWG/2005-JWG/4

Putative stock	Year and ref.	Method	Estimate (cv)	Percep. Bias	Availab. bias	Fully cor. stock size estimate	Reserva-tions
BAFFIN BAY							
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) *	0.38 (0.06) *	10,533 (0.36)	Perception biased assumed
	2001 b)	Photo	873 (0.35)	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	1981 c)	Strip	358 (0.31)			Index	
	1982 c)	Strip	440 (0.20)			Index	

Putative stock	Year and ref.	Method	Estimate (cv)	Percep. Bias	Availab. bias	Fully cor. stock size estimate	Reserva-tions
Greenland or Inglefield Bredning Stock wintering in central West Greenland	1990 c)	Strip	252 (0.34)			Index	Late in the season: 9-14 April
	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)	Partial coverage
Eclipse Sound	2004 i)	Line t.			0.38 (0.25)	18,733 (0.41)	
Admiralty Inlet	1984 f)	Photo	5,556 (0.22)	0	0.38 (0.06) *	14,621 (0.23)	
Admiralty Inlet	2003 i)	Line t.			0.38 (0.25)	5,332 (0.76)	
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
Somerset Island	2002 i)	Line t.			0.38 (0.25)	25,809 (0.58)	Partial coverage
Cumberland Sound	-	-	No data	-	-	-	
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)	-	-	-	
EAST GREEN-LAND							

Putative stock	Year and ref.	Method	Estimate (cv)	Percep. Bias	Availab. bias	Fully cor. stock size estimate	Reserva- tions
Scoresby Sund	1983	Line t.	300 (0.31)	0.75 (0.25) *	0.38 (0.06) *	1,053 (0.40)	Late in season, probably neg. bias.
Kangerlus suaq			No data				
Tasiilaq			No data				

Table 1 cont.. 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.
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 1994, i) NAMMCO/SC/13-JCNB/SWG/2005-JWG/4.

CATCH	PROB	CATCH	PROB
0	0	250	0.42
50	0.96	300	0.32
100	0.81	350	0.26
150	0.68	400	0.19
200	0.55		

Table 2. Probability of halting the decline in West Greenland beluga numbers in the next 5 years for a range of catch options for the chosen assessment model (see 6.4.1).

BELUGA			
Municipality	**Quota 04/05**	**Catch 04/05**	**Quota 05/06**
Maniitsoq	7	7	7
Sisimiut	32	18	23
Kangaatsiaq	12	10	10
Aasiaat	3	1	3
Qasigiannguit	9	0	3
Ilulissat	78	14	54
Qeqertarsuaq	15	12	14
Uummannaq	10	8	8
Upernavik	134	19	88
Qaanaaq	20	2	10
Total	**320**	**91**	**220**
NARWHAL			
Kangaatsiaq	5	0	
Aasiaat	23	21	16
Qeqertarsuaq	21	21	16
Uummannaq	88	78	68
Upernavik-Savissivik	63	46	60 + 15
Qaanaaq-Savissivik	100	128	85
Total	**300**	**294**	**260**

Table 3. Quotas and catches of beluga and narwhal in West Greenland, 2004 to 2006. The quota year runs from July 1 to June 30. Qaanaaq including Savissivik, Melville Bay has a five year quota of 100 beluga and 500 narwhal. [NOTE: Since the meeting these quotas have been raised by 50, with the following distribution: 35 to Uummannaq, 5 to Qeqertarsuaq, 5 to Assiaat, 5 to Kangaatsiaq. The total quota for 2005/2006 will be 310.]

Appendix 1

AGENDA

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  5.1.1 Genetic information
  5.1.2 Satellite tracking
  5.1.3 Other information
  5.1.4 Management units
 5.2 Biological parameters
  5.2.1 Age estimation
  5.2.2 Reproductive rates
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 5.3 Catch statistics
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  5.3.2 Ice entrapments
  5.3.3 Histories by management units
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8 Traditional Knowledge
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10 Other Business

10.1 Implications of the inclusion of other species (e.g.walrus) in the work of the SWG.

11 Adoption of report

Appendix 3

LIST OF DOCUMENTS

Please note that all document refererences start with NAMMCO/SC/13-

JCNB/SWG/2005-JWG/1	List of participants.
JCNB/SWG/2005-JWG/2	Agenda.
JCNB/SWG/2005-JWG/3	Draft list of documents.
JCNB/SWG/2005-JWG/4	Richard, P. , Laake, J.L., Asselin, N. , and Cleator, H. Baffin Bay narwhal population distribution and numbers: aerial surveys in the Canadian High Arctic, 2002-2004
JCNB/SWG/2005-JWG/5	Heide-Jørgensen, M.P. An attempt to survey narwhals and belugas in West Greenland March 2004
JCNB/SWG/2005-JWG/6	Heide-Jørgensen, M.P. Reconstructing catch statistics for narwhals in Greenland 1862 to 2005: A preliminary compilation
JCNB/SWG/2005-JWG/7	Heide-Jørgensen, M.P. Catch statistics for belugas in Greenland 1862 to 2004.
JCNB/SWG/2005-JWG/8	Garde, E., Heide-Jørgensen, M.P., Hansen, S.H. and Forchhammer, M.C. Age-specific growth and high longevity in narwhals (Monodon monoceros) from West Greenland estimated via aspartic acid racemization.
JCNB/SWG/2005-JWG/9	Romberg, S. and Richard, P. Seasonal distribution and sex ratio of narwhal catches in the Baffin region of Nunavut Territory, Canada.
JCNB/SWG/2005-JWG/10	Romberg, S. Catch Statistics (1996-2004) for Narwhal and Beluga in Selected Communities in the Eastern Canadian Arctic.
JCNB/SWG/2005-JWG/11	Richard, P. A risk analysis of narwhal hunting in the Canadian High Arctic

JCNB/SWG/2005-JWG/12	Laidre, K. and Heide-Jørgensen, M.P. Late summer and early fall movements of narwhals in Inglefield Bredning, Northwest Greenland
JCNB/SWG/2005-JWG/13	Laidre, K.L. and Heide-Jørgensen, M.P. The behavior of narwhals (Monodon monoceros) before, during, and after an attack by killer whales (Orcinus orca) in the Eastern Canadian Arctic
JCNB/SWG/2005-JWG/14	Witting, L. An assessment for West Greenland beluga.
JCNB/SWG/2005-JWG/15	Witting, L. A model selection based assessment for West Greenland narwhals with uncertain stock structure.
JCNB/SWG/2005-JWG/16	Heide-Jørgensen, M.P., Dietz, R. and Laidre, K. Metapopulation structure and hunt allocation of narwhals in Baffin Bay
JCNB/SWG/2005-JWG/17	Heide-Jørgensen, M.P. and Laidre, K. Video recordings of narwhal pods in Melville Bay, West Greenland
JCNB/SWG/2005-JWG/18	Lawson, J. Overviews: Beluga whale and noise.

ANNEX 2

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON FIN WHALES

Oslo, 20-22 October 2005

1. OPENING REMARKS

Chairman Lars Walløe welcomed participants (Section 5.6, p. 377) to the meeting.

The Scientific Committee has carried out fin whale assessments on three 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. In 2003, the Committee revised its previous assessments based on new information from recent NASS and Norwegian surveys. The Committee also identified research to be carried out in order to refine the assessment of the EGI stock area, and continue with assessment of fin whales near the Faroes and in the Northeast Atlantic.

The Chairman noted that the NAMMCO Scientific Committee would be holding a special workshop in collaboration with the IWC Scientific Committee, "Catch History, Stock Structure and Abundance of North Atlantic Fin Whales" in 2006, so discussion of particularly stock structure at the present meeting would be limited, as additional genetic analyses were expected in the near future.

2. ADOPTION OF AGENDA

The draft agenda (Appendix 1) was adopted as written.

3. APPOINTMENT OF RAPPORTEUR

Daniel Pike, Scientific Secretary of NAMMCO, was appointed as Rapporteur for the meeting, with the assistance of other members as needed.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

Documents provided for the meeting are listed in Appendix 2.

5. STOCK STRUCTURE

In SC/13/FW/8 the available data on stock structure of North Atlantic fin whales based on non-genetic methods was summarized. This included a wide range of studies based on discovery marking, morphometry, earplug morphology, photo-identification, acoustics and biological parameters. Although each method is rather inconclusive by itself, collectively they indicate a separation between fin whales summering in the western, central and eastern North Atlantic. There also appears to be a more or less isolated stock in the Mediterranean Sea.

The Working Group noted that a single fin whale marked with a "Discovery" tag in Canada had been recovered in Iceland, indicating that some mixing must occur between these areas. Other evidence, particularly from genetics (see below) indicates that whales summering off eastern Canada are different from those summering off western Iceland. An appreciable proportion of "Discovery" marks were placed shortly before or after the cessation of whaling in the respective areas. Therefore the chance of recovery of the marks was limited given the relatively low catches and large numbers of fin whales in some areas. The Working Group suggested that it might be useful to undertake an analysis of these data, to determine how many recoveries would be expected under a range of mixing levels. However this would depend on estimates of abundance at the time of marking, which are not available for all areas. These marking data could be usefully included in models where they would set limits to rates of mixing.

Both passive acoustic studies in the North Atlantic and satellite telemetry off West Greenland have indicated that fin whales are present in northern waters in the winter, albeit at lower densities than in the summer. This is contrary to the expected migratory behaviour of most rorquals. The implications of this for stock structure are not clear. It is possible that the animals that remain in the north are non-breeding, but there are no data to support this. It is also uncertain whether all animals migrate in the same way every year, or whether migratory behaviour is more flexible. These questions could be addressed using satellite telemetry, however to date there has been a rather low success rate in using satellite telemetry with fin whales.

Paper SC/13/FW/9 presented results of the genetic variation in 1,018 fin whales sampled at 5 North Atlantic areas; *i.e.* off West Iceland, Norway, Spain, West Greenland and off the eastern Canadian coast. The data presented were based on genotypes of 9 microsatellite loci. Various genetic analyses showed significant genetic heterogeneity among the Icelandic samples, revealing temporal and seasonal differences in the samples from the years 1981-1989. However, the level of genetic differentiation was weak (FST~0.005) and no clear pattern could be detected. The genetic analyses carried out on a macrogeographical scale revealed significant genetic divergence among Icelandic, Norwegian, Spanish, Greenland and Canadian samples (FST~0.008, *P*p<0.05). Greatest difference was observed between the Canadian samples and the other areas (FST~0.022, *P*p<0.05). The authors concluded that the fin whale samples taken located at the feeding grounds off Iceland, Norway, Spain, Greenland and Canada most likely come from separate breeding units.

In discussion the Working Group noted that the reason for the low level of genetic heterogeneity among samples from West Iceland is unclear. It has been suggested (Daníelsdóttir *et al*. 1991a, 1991b; Daníelsdóttir 1994) that this may be due to the differential exploitation of "herds", or groups of closely related animals, on the whaling grounds. A similar pattern has been suggested for belugas (Palsbøll *et al.* 2002) and significant genetic heterogeneity among pods has been observed in other toothed whales (Hoelzel *et al*. 1998, Hoelzel and Dover 1991, Richard *et al*. 1996). However almost nothing is known about the social structure of fin whales on the feeding grounds, so this remains conjecture. Other possibilities include spatial segregation of sub-stocks on the feeding grounds, or variations in annual migrations of sub-stocks through the area.

SC/13/FW/9 presented results for microsatellite DNA analyses only. In cases of maternally directed philopatry, where segregation between feeding grounds is maintained by behavioural mechanisms, no differences would be expected in microsatellite DNA between feeding grounds if the whales shared a common breeding ground. Such a pattern is observed with humpback whales, where animals that share a single breeding area migrate to several feeding grounds in the North Atlantic. Therefore an analysis using maternally inherited mitochondrial DNA might reveal a different pattern than that shown by microsatellite DNA. While an analysis using mitochondrial DNA has been conducted for North Atlantic fin whales (Berubé *et al.* 1998), it did not have access to all the samples available for the analysis described in SC/13/FW/8. Therefore the Working Group recommended that an analysis of heterogeneity in mitochondrial DNA be carried out.

Most genetic and non-genetic methods cannot distinguish between cases where two or more stocks mix on a feeding ground, and cases where a single stock occupies that feeding ground. Samples from fin whale breeding grounds are not available, as the location of the breeding grounds are unknown. Therefore breeding stocks of fin whales have not been characterized genetically or by other methods. The Working Group recommended that available methods (such as the programme STRUCTURE) be used to attempt to resolve whether the whales on the feeding grounds came from a single or several stocks, as well as to estimate mixing proportions where appropriate.

The Working Group examined a summary of stock structure hypotheses produced at the 2005 meeting of the IWC Scientific Committee (IWC 2005). It was decided to reorganise the summary in a hierarchical fashion showing first comparisons between IWC stock areas, then between areas within stock areas, and noting what the Working Group considered to be strong and weak evidence for stock separation or mixing. This compilation is shown in Appendix3.

In summary, the Working Group did not find reason to change its previous view (NAMMCO 2000), that most evidence suggests the presence of stocks with limited gene flow between adjacent summering aggregations. However these summer aggregations could be composed of single and/or mixtures of breeding stocks. The North Atlantic summer aggregations are all different from the Mediterranean Sea population. There are also indications of differentiation between Canadian, West

Greenland, Icelandic, Norwegian and Spanish feeding grounds. Interpretation of these data is limited by the lack of temporal and spatial coverage in the sampling. On a microgeographic scale there is evidence of a low level of seasonal and annual variation on West Icelandic feeding area, but the implications of this are unclear.

6. BIOLOGICAL PARAMETERS

No new information was tabled on this subject.

7. CATCH DATA

7.1 EGI

SC/13/FW/6 presented a new analysis of historical catch records for Iceland. Catch data (some partial and some incomplete) from original catch reports is presented for just over half the catches from land stations in Iceland during the early whaling period 1883 to 1915, before whaling was banned in Iceland. Some graphical presentation of this data has been given in an earlier paper (Gunnlaugsson *et al.* 1989). The data are split as requested between the Westfjord and east coast regions, but stations operated on the east coast only during the years 1901-1913. Only totals by year for all stations combined can be found complete in the previously published literature. Some totals by station and even species composition have however been published and are used to complement the data where the catch record data are missing. Still some totals by station are missing for the years 1893-1900 where the published totals have to be used, and for the Westfjord operation in the years 1901-1903 when the totals by station for the east coast were subtracted from the published totals to get totals for the West. The total fin whale catch is then prorated from the observed proportion fin whales by year and region. The available sex-determined catch showed a ratio of 52% females and gives no indication off a change over time or space. Catch position records show that there was very little overlap in the range of the east and west operations, but the operational range expanded with time. Three CPUE series are derived. CPB as used in previous fin whale assessments is total catch of all species per boat by year and region, FPRB90 is fin catch per boat rectified for effort expended catching other species, and CPBM is catch per boat month where the operation time is taken to be from the first to the last whale caught. Operational factors are discussed.

The Working Group welcomed this contribution, which will facilitate modeling of fin whale population dynamics. It was noted that blue and humpback whales were the preferred prey of whalers in the early years, and that they turned to fin whales when stocks of these species had been depleted. Therefore the simple CPB CPUE series may be misleading in that it may reflect declines in species other than fin whales. The Working Group considered that the FPRB90 series was more likely to reflect fin whale densities and recommended that a similar adjustment to the CPBM series be investigated. Years with a very low percentage of fin whales in the catch might best be excluded.

Most catches between about 1917 to about 1937 (see 7.2) were taken by Norwegian pelagic whalers. It was noted that some of this catch may have come from areas other than the traditional whaling grounds off west Iceland, and therefore should be assigned appropriately in modeling. The authors agreed to look into this.

7.2 Norway, the Faroes and other areas

SC/13/FW/10 provided a compilation of whale catches of all species by Norwegian whalers. In this period, Norway carried out three types of whaling in the North Atlantic: 1) pelagic whaling, 1917-1937, in an area from Svalbard to Davis Strait; 2) coastal whaling, 1918-1971, starting with *Statens Hvalfangst*; and finally 3) the “Small type whalers”, 1938-1986. A total of 143,730 whales were taken by Norway in the period 1917-1986 by all three types of whaling. Takes by whaling type were as follows: pelagic whaling 4,314; coastal whaling 14,662; and “Small type whaling” 124,754, of which 647 were larger whales. In coastal whaling 66% of the catch were fin whales, while 71% were fin whales in pelagic whaling. By comparison with a previous treatment of Norwegian whaling published by Jonsgård (1977), this study differs by 3.7%. A measure of CPUE defined as catch per boat month is also provided, but its usefulness is questionable because of operational factors in whaling.

SC/13/FW/11 extended this analysis to cover catches of fin whales in the entire North Atlantic. The time period covered was 1894 to 1984 for all areas except Norway, where the period covered was from 1917 onwards. A total of 28,559 fin whales were identified in the catch, leading to an estimate of 30,598 fin whales caught by prorating unidentified catch using the catch composition. Of the total number of whales caught by land stations and pelagic whaling (excluding small-type whaling), 66% were fin whales. After World War II the proportion of fin whales in the catch declined steeply. The total catch was distributed by area as follows: Norway pelagic 11%, Norway coastal 36%, Faroes 27%, Shetland 17%, the Hebrides 7%, Ireland 2% and Greenland 2%. The sex ratio of the catch has been close to 50% in most areas.

In discussion it was noted that both these compilations excluded Norwegian coastal catches before 1904. Catches of fin whales off northern Norway exceeded 10,000 animals in this period and would therefore double the Norwegian catch reported in SC/13/FW/11. However it was considered that the catches in this period had been adequately documented by Risting (1922) and that there was little to be gained by a recompilation of these data. The Working Group recommended that catches from this period be added to the catch series to make it complete.

Bloch reported that catch positions were in most cases available in the archival material, but that compiling this information would require considerable additional time and effort. The Working Group considered that catch positions were primarily required for the Norwegian pelagic whaling, as these catches would have to be assigned to the appropriate stock areas. For example some catch by Norwegian pelagic whalers was taken east of Iceland, some in Denmark Strait and some off West Greenland. For shore based and small-type whaling, catch positions may be of less importance for modelling. However, it was noted that some stations reported catches year-round, so catch positions might be of interest for describing seasonal distribution, especially if combined with a CPUE index.

These compilations showed little discrepancy with that of Jonsgård (1977) for Norwegian catches, and it is likely that the Jonsgård (1977) compilation should be preferred for southwest Norway (where the discrepancy was greatest) as it seems that Jonsgård (1977) had access to original archival material that is no longer available.

Similarly to the case for Iceland, derivation of a CPUE index is problematic for the other fin whaling areas. Several species were caught by the whalers and the catch composition changed over time, so the index must be adjusted to compensate for this. The efficiency of whaling might be expected to change over time as the whalers gained experience and new technology was introduced. Also, as some of the whaling stations operated year round, the CPUE would have to be broken down by season. The simple indices presented in SC/13/FW/11 could be further refined to account for some of these factors, and the Working Group recommended that appropriate CPUE indices be developed for all areas of the North Atlantic.

8. ABUNDANCE ESTIMATES

8.1 EGI

SC/13/FW/4 presented spatially stratified abundance estimates for fin whales from North Atlantic Sightings Surveys (NASS) conducted in 1987, 1989, 1995 and 2001. Of particular interest were areas considered useful in modelling, namely East Greenland, West Iceland, the remainder of the EGI area and areas outside (Fig. 1). These areas were defined as recommended by this Working Group in 2003 (NAMMCO 2004). The data were reanalysed using a standardised methodology to make the estimates internally consistent. As the stratification scheme has been different for each survey, post stratification was used to derive common areas for comparison between surveys. Total abundance estimates for each survey were quite close to previous published and unpublished estimates, except for the 1989 survey for which this estimate was about 15% higher than that of Buckland *et al.* (1993). This is likely due to differences in analytical methods and spatial stratification. There has been a substantial increase in the abundance of fin whales in the area west of Iceland since 1987. This corresponds to the area where nearly all fin whaling has been conducted since 1915. The increases observed in the EGI stock area as a whole are largely due to the increase in the area west of Iceland.

The Working Group welcomed this re-analysis and noted that it fulfilled a request made in 2003. Some concern was expressed about the comparability of the survey series, particularly the 1987 survey. The 1987 survey vessels had lower platform heights and used fewer observers than in later surveys. Also the level of observer experience was generally lower than in later surveys. Sighting rates were lower in 1987 for most (but not all) species than in the other surveys, suggesting that survey efficiency was lower in that year (Gunnlaugsson *et al.* 2006). However Gunnlaugsson *et al.* (2006) concluded that differences in survey efficiency alone could not account for the positive trend observed for fin whales and some other species. It was also noted that the distribution of fin whales off west Iceland had changed over the period, covering a broader area in recent surveys, which again suggested that there had been growth in the population.

It was noted that double platform data had been collected by the Faroese vessel in 1995 and by all vessels in 2001. Therefore perception bias should be estimable for fin whales from these surveys. However an earlier analysis (Gunnlaugsson *et al.* 2002) indicated that perception bias was very low for fin whales in 2001. It was recommended that this be done, but also recognised that the correction could not be applied to earlier surveys.

It was concluded that the abundance estimates produced were acceptable for assessment. The Working Group decided that, as had been done in previous analyses (IWC 1992, NAMMCO 2000, NAMMCO 2004) the estimates from 1987 and 1989 should be combined into a single estimate assigned to the year 1988. This makes the spatial coverage more compatible with later surveys. It was also decided to include components of the 1987 and 1995 Norwegian surveys in estimates for the same reason. Abundance estimates found acceptable for use in modelling by the Working Group are shown in Table 1.

8.2 Norway and Faroes

SC/13/FW/7 used sightings survey data collected over the period 1988-2004 to calculate relative abundance estimates for fin whales in the Northeast Atlantic based on a standard barrel platform with two observers which has been used in all the surveys. Analyses of local abundance at the scale of survey blocks seem to be inadequate for trend information, which would require larger areas to be surveyed synoptically. In the case of the fin whale population in the Northeast Atlantic, data collection in a *kernel* area comprising parts of the Norwegian Sea with its slopes and adjacent shelf areas to northern Norway and Spitsbergen, seem to be an appropriate survey area to monitor trends in long-term abundance. Point estimates of relative abundance (not corrected for perception or availability biases) in this area ranged between 1,100 and 1,800 whales in 5 surveys, with no significant trend over the period. There have been changes in fin whale distribution over the period, with more whales found west of Spitzbergen in later surveys.

Although the estimates presented were derived from sightings from a single platform, double platforms had been used in all Norwegian surveys conducted since 1988. Therefore it should be possible to provide an estimate of perception bias for these surveys, and the Working Group recommended that this be done. It was noted that effective strip widths were lower for the Norwegian surveys as compared to the Icelandic and Faroese surveys, and it was considered likely that this resulted from the concentration on minke whales as a target species in the former. Given that forward sighting distances were also presumably less for the Norwegian surveys, it might be expected that availability bias would be greater. However there are no data to test this.

The abundance estimates are low by comparison with the land station catches in this area, which exceeded 1,000 per year in some years between 1875 and 1904. The stock must therefore be depleted compared with historical abundance levels.

The Working Group concluded that the estimates provided would be suitable for use in assessments in this area.

9. ASSESSMENTS

9.1 EGI

SC/13/FW/5 reported a new assessment model of the EGI fin whale population, modelled as four sub-populations with movement between the following areas: East Greenland (area 1), West Iceland (area 2), East Iceland (area 3) and the Far East (area 4) (see Fig. 1). The model is sex- and age-structured, and is fitted to CPUE, sightings survey abundance, and mark-recapture data using both maximum likelihood and Bayesian approaches. Movement parameters are not differentiated by sex since the inclusion of sex-specific movement parameters did not improve the AIC. For the base case assessment scenario, best fits to the data were obtained when the West Iceland and East Iceland are effectively fully mixed with a low level of interchange with East Greenland and virtually no interchange with the Far East region. For the base case and most sensitivity tests, the overall recruited population is increasing and above 80% (base case 88.5%) of pre-exploitation abundance (*K*), and sub-populations in all areas are above 70% (base case > 82%) of the individual *K* values. Projections for annual catches of 0, 100, and 200 whales indicated that only the last would result in abundance decreases compared to current levels. Under catch levels of 200 whales there was less than a 1% probability that any of the 1+, recruited or mature female components of the total EGI population would fall below 60% of pre-exploitation levels within the next 30 years. Selected results are shown in Figs 2-5.

It was noted that the catch data included catches from Norwegian pelagic whalers in the period between 1917 and 1937, and that some of this catch occurred outside of Area 2, to which it was assigned. However it was expected that this misassignment was of low magnitude and would not affect the main conclusions from the model. Possible changes in carrying capacity were not considered in the model. It was noted in this regard that blue whales apparently occurred in greater abundance in the area in the late 19^{th} century than they do at present, and their low present abundance may have resulted in a carrying capacity for fin whales higher at present than historically.

Some of the predictions of the model did not coincide exactly with our present understanding of fin whales in this area. Firstly, the model predicted a lower rate of mixing between East Greenland and West Iceland, than suggested by Discovery marking (radio tagging also confirms that mixing does occur). Secondly, the model provided a poor fit to the trends in abundance estimates in Area 1 (East Greenland), an area for which sightings surveys have shown a large and significant increase in abundance since 1987 (see Fig. 5). The model predicted little increase in this area. Finally, the model suggested a high rate of mixing between West and East Iceland, whereas the sighting surveys show a gap in summer distribution between East and West Iceland, suggesting a low rate of exchange. There are too few Discovery marks placed off East Iceland to be informative about this exchange rate.

It was suspected that these conflicting results may have been due to an overemphasis on the 2 early CPUE series in the model, because of low associated variances. These series are assumed to be linearly proportional to abundance, but there is considerable uncertainty about this for the reasons noted in 7.1. It was suggested that model runs should be conducted using improved CPUE indices, indices entered with higher levels of variance and alternative assumptions about their relationship to abundance, and without the early indices. However there was insufficient time to do this at the meeting.

Catch positions are available for all phases of Icelandic whaling, and indicate that whaling off western Iceland in the early period was conducted in coastal areas off northwest Iceland, whereas in the later period catches were taken farther offshore to the west. It was suggested that early whaling may have depleted a stock component separate from, or with a low rate of mixing with, the more offshore component targeted by later whaling operations. It was noted in this regard that fin whales presently are not common in coastal areas of Iceland, and occur almost exclusively off the shelf. It was recommended that the catch positions of all phases of Icelandic whaling should be plotted and analysed, to assist in developing alternative proposals for boundaries between stock components.

It was agreed that the base case model would be updated for the March 2006 meeting to reflect the discussion at this current meeting in the following ways:

1. Using abundance estimates for individual areas in 1988.
2. Use an adjusted set of early CPUE series.
3. Apportion the Norwegian pelagic catches, 1917-1937, to the correct areas.
4. Increase the maximum bound on *r*, the increase in calf production rate at low population sizes, from 0.142 to 0.383.

The Working Group could not draw firm conclusions from this modelling exercise, but noted that the more complex models involving 2 or more spatial components, such as this model and that of Cunningham and Butterworth (2003) (CB model), did 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. The new model provides very similar forecasts to that of the CB and earlier HITTER based models (NAMMCO 2000) for this area. However further work is needed to clarify the stock relationships in this area, particularly with regard to area boundaries and mixing rates.

10. MANAGEMENT RECOMMENDATIONS

10.1 EGI

The Working Group found no reason to change its advice provided in 2003 (NAMMCO 2004), that projections under constant catch levels suggest that West Iceland (termed the “inshore sub-stock” in earlier analyses) 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 West Iceland, *i.e.* to the grounds from which fin whales have been taken traditionally. If catches were spread more widely, so that other stock components were also harvested, the level of overall sustainable annual catch possible would be higher than 150 whales.

10.2 North Norway

The Working Group is not yet in a position to provide management advice for this area. Once the work identified under 11.2 has been done assessments can be carried out for this area. However, given the rather low abundance estimates (<2,000) and the high historical harvest in the area, it can be expected that the stock will be found to be depleted relative to past levels.

10.3 West Norway-Faroes

No new assessments were considered for this area. The Working Group reiterated the advice provided in 2003 (NAMMCO 2004), that uncertainties about stock identity are so great as to preclude carrying out a reliable assessment of the status of fin whales in Faroese waters. The Working Group therefore reiterated the recommendations made in 2000 (NAMMCO 2001) to carry out a research programme 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.

11. RESEARCH RECOMMENDATIONS

The Working Group reiterated research recommendations made in previous meetings (NAMMCO 2000, 2001, 2004), and identified those most important to refine existing assessment and extend assessments to other areas:

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 (5-10 yrs);
- Laboratory analyses of existing samples from past sampling or catches should be completed by December 2005 so that analyses based on these data can be ready by March 2006. Analyses should be based on modern techniques and include consideration of both nuclear and mitochondrial genetics;
- Use microsatellite analysis to determine if closely related individuals are present on different feeding grounds (March 2006);
- Compile a summary review of past analyses of biological parameters;
- Satellite tagging to determine habitat use and migratory patterns once methodological/technical issues are addressed. If possible, a biopsy should be obtained from all tagged animals for genetic analysis and sex determination (5-10 yrs).

Faroes

- A CPUE index from Faroese and adjacent whaling operations should be developed (March 2006);
- Biopsy sampling for genetic analysis from the Faroes and adjacent areas should be continued (ongoing). Existing biopsy samples should be analysed as soon as possible (December 2005);

- Satellite tagging should continue once methodological/technical issues are addressed (when feasible).

EGI

- Revise the model presented in 9.1 to reflect the recommendations concerning appropriate choices for a base case analysis;
- Refine the CPUE series as recommended in 7.1 (December 2005);
- The catch series should be corrected such that Norwegian pelagic catches are assigned to the proper areas (December 2005);
- Plot all available catch positions from all whaling operations (March 2006);
- Provide an estimate of perception bias for the 2001 abundance survey (March 2006);
- Extend modelling to include neighbouring areas, such as West Greenland, the Faroes and Norway (1-3 yrs);
- Analyse trends in age of maturity and other biological parameters to determine whether changes are compatible in model estimates of trends in population size (March 2006);
- 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 (ongoing);
- Satellite tagging should be attempted to investigate the movements of fin whales, particularly between the traditional whaling grounds west of Iceland and areas outside (when feasible).

Norway

- Complete revision of catch statistics, including pre-1904 catches in the series (December 2005);
- Assign catch by pelagic operations to the appropriate stock areas (December 2005);
- Provide estimates of perception bias for all surveys;
- Compile information on incidental sightings, marking with Discovery tags, satellite tagging tracks, biopsy samples and age determinations of some samples (1-3 yrs);
- Prepare CPUE series for coastal and pelagic whaling operations (March 2006);
- Collection of additional biopsy samples for genetic analysis (ongoing), and analysis of existing samples in a timely manner (March 2006);
- Satellite tagging once methodological/technical problems have been addressed (when feasible).

12. OTHER BUSINESS

There was no other business.

13. ADOPTION OF REPORT

A draft version of the Report was adopted at the meeting, and the final version was adopted by correspondence. The Chairman thanked members for their valuable contributions to the meeting, and the members thanked the Chairman for his able leadership. All thanked the Rapporteur for his efforts.

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SURVEY	REGION	DEFINITION	N	CV
1988	EG	1989 A-WEST+1987 B-WEST	5,024	0.228
1988	WI	1989 A-EAST+1987 B-EAST	3,452	0.259
1988	EI+FE	1987 EGI+1987 NOR[1]	6,856	0.427
1988	OUTFE	1987 WN-SPB	675	0.284
1988	EGI-TOT	EG+WI+EI+FE	15,332	0.216
1988	TOT	EG+WI+EI+FE+OUT	16,007	0.205
1995	EG	A-WEST+B-WEST	8,412	0.294
1995	WI	A-EAST+B-EAST	6,800	0.231
1995	EI+FE	EGI	4,145	0.442
1995	EI+FE[2]	EGI+NVN+JMC	5,053	0.368
1995	OUTFE	WN-SPB	1,594	0.285
1995	EGI-TOT	EG+WI+EI+FE	19,357	0.22
1995	EGI-TOT[2]	EG+WI+EI+FE[2]	20,265	0.211
1995	TOTAL	EG+WI+EI+FE	20,951	0.213
1995	TOTAL[2]	EG+WI+EI+FE[2]+OUT	21,859	0.205
2001	EG	A-WEST+B-WEST	11,706	0.195
2001	WI	A-EAST+B-EAST	6,565	0.195
2001	EI+FE	EGI	5,405	0.292
2001	OUTFE	WN-SPB	2,085	0.282
2001	EGI-TOT	EG+WI+EI+FE	23,676	0.133
2001	TOTAL	EG+WI+EI+FE+OUT	25,761	0.125

Table 1. Abundance estimates accepted for use in assessment. Areas are as defined in Fig. 1. [1]Includes Norwegian estimate for Jan Mayen area from 1987 (IWC 1990, p. 141); [2]Includes Norwegian blocks NVN and JMC from 1995 (Øien 2003).

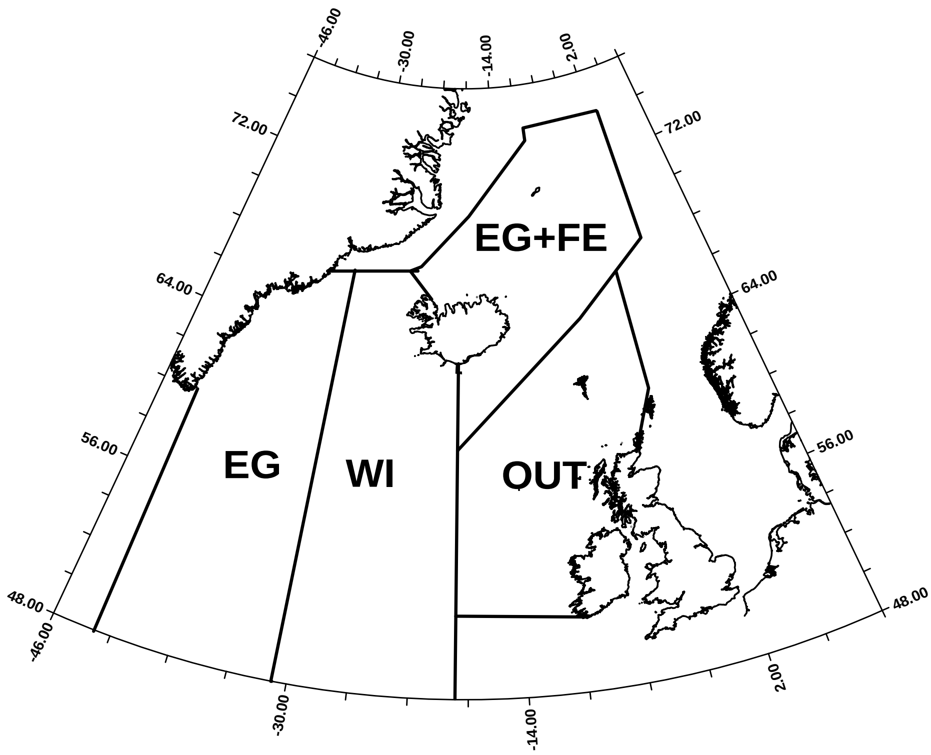

Fig. 1. Approximate boundaries of the sub-population areas used in the assessment of the EGI stock. EG – East Greenland (area 1); WI – West Iceland (area 2); EI+FE – East Iceland and Far East (areas 3+4); OUT – outside of EGA area (not used).

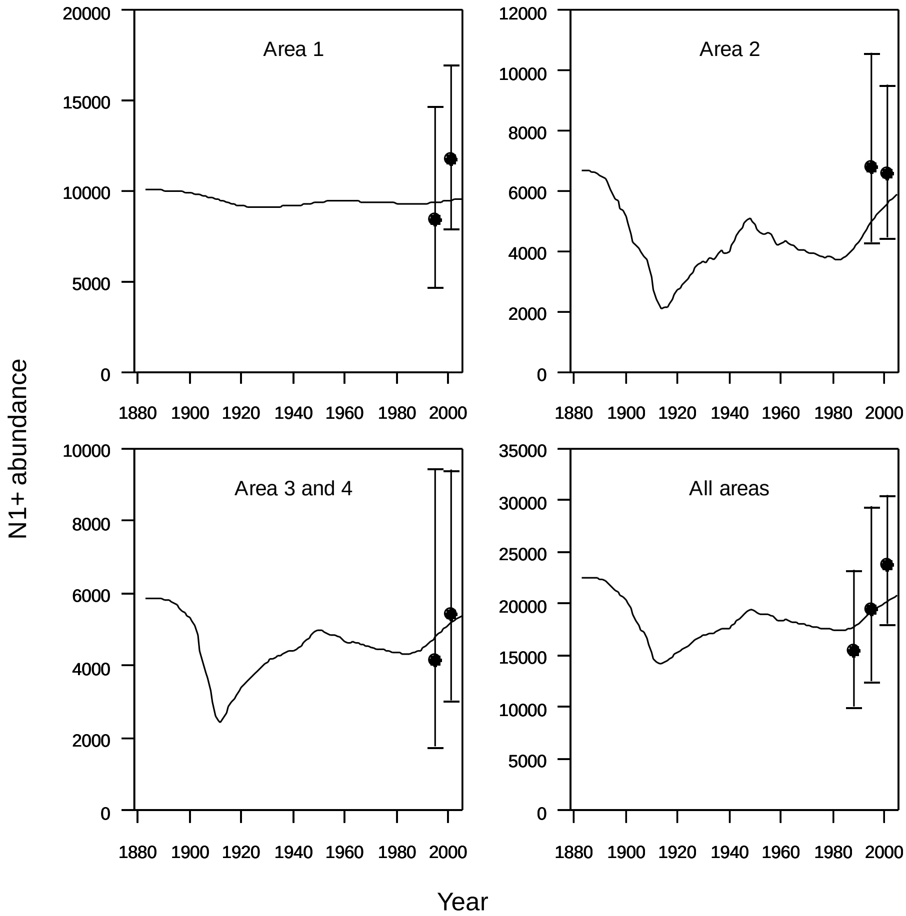

Fig. 3. Base case model fit of 1+ abundance trajectories to sighting survey estimates of abundance for area 1, area 2, area 3+4, and all areas combined. The 95% confidence intervals for the sightings estimates are indicated.

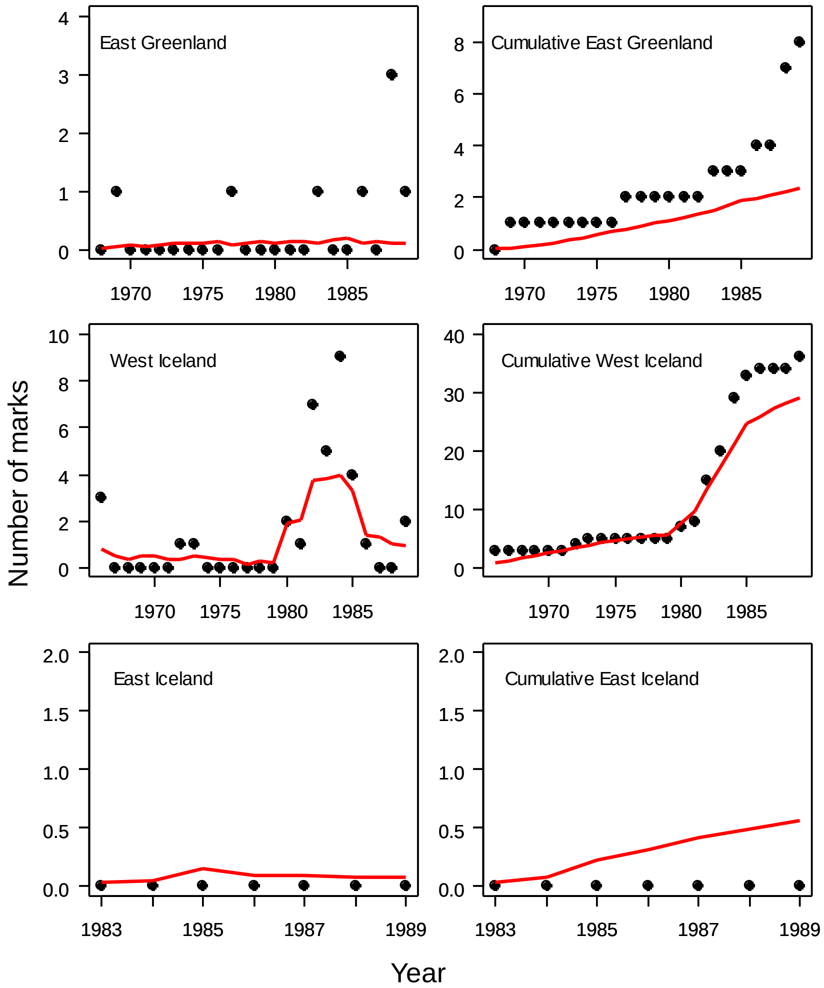

Fig. 4. Fit of the base case model (lines) to the mark-recapture data (points). The left panels represent marks and recaptures; the right panels cumulative marks and recaptures. Areas are those in which the fin whales were marked; all recaptures were in West Iceland. No fin whales marked in East Iceland were recaptured.

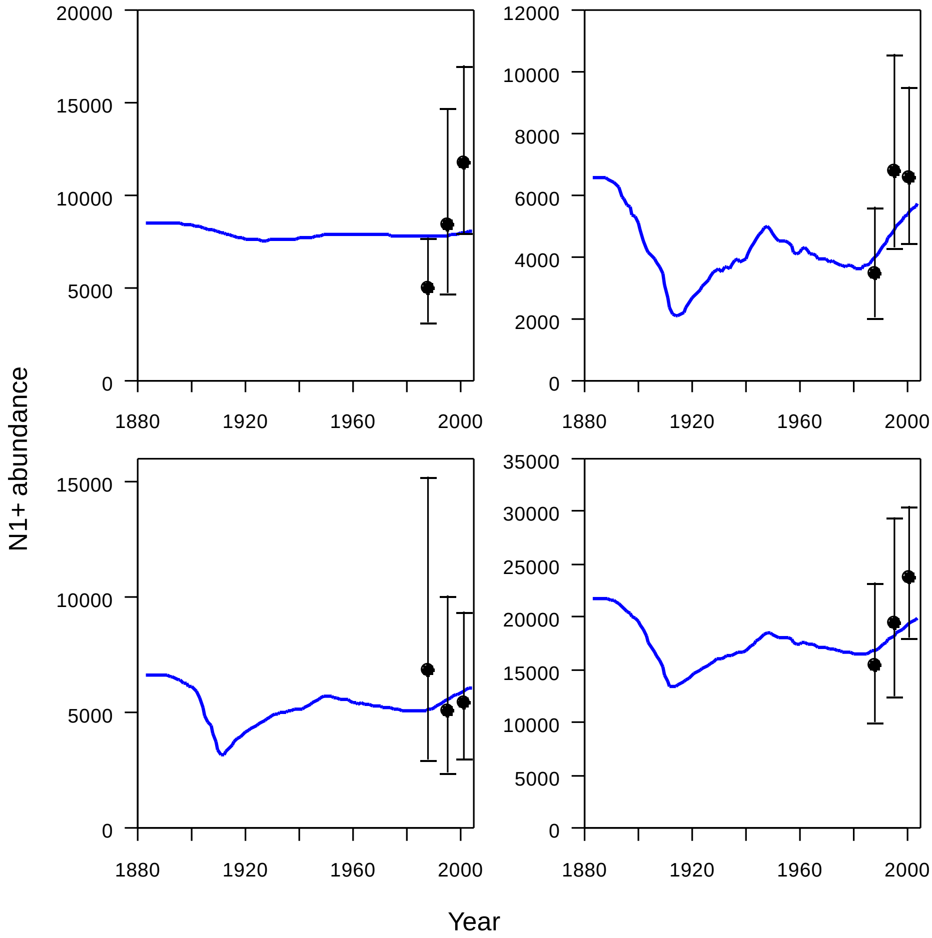

Fig. 5. Model fits when estimates for separate areas are used in "1988" (combined 1987 and 1989 results). Base case model fit of 1+ abundance trajectories to sighting survey estimates of abundance for area 1, area 2, area 3+4, and all areas combined. The 95% confidence intervals for the sightings estimates are indicated.

Appendix 1

AGENDA

1. Opening remarks
2. Adoption of agenda
3. Appointment of rapporteur
4. Review of available documents and reports
5. Stock structure
6. Biological parameters
7. Catch data
   - 7.1 EGI
   - 7.2 North Norway
   - 7.3 West Norway-Faroes
8. Abundance estimates
   - 8.1 EGI
   - 8.2 North Norway
   - 8.3 West Norway-Faroes
9. Assessments
   - 9.1 EGI
   - 9.2 North Norway
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10. Management recommendations
    - 10.1 EGI
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    - 10.3 West Norway-Faroes
    - 10.4 Other
11. Research recommendations
12. Other business
13. Adoption of report

Appendix 2

LIST OF DOCUMENTS

SC/13/FW/1 List of participants

SC/13/FW/2 Draft annotated agenda

SC/13/FW/3 Draft list of documents

SC/13/FW/4 Pike, D.G. and Gunnlaugsson, Th. Regional estimates of density and abundance of fin whales (*Balaenoptera physalus*) from Icelandic and Faroese North Atlantic Sightings Surveys.

SC/13/FW/5 Branch, T.A. and Butterworth, D.S. Assessment of the East Greenland / Iceland fin whale population using a four-sub-stock model.

SC/13/FW/6 Sigurjonsson, J., Konradsson, A. and Gunnlaugsson, Th. Catch series and CPUE for the early modern whaling landstations in Iceland.

SC/13/FW/7 Øien, N. et al. Trends in the abundance of fin whales in the Northeast Atlantic.

SC/13/FW/8 Víkingsson, G.A. and Gunnlaugsson, Th. Stock structure of fin whales (*Balaenoptera physalus*) in the North Atlantic – indications from non-genetic data.

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Appendix 3

Summary of North Atlantic fin whale stock structure information indicating "separation" or "mixing" of whales from the areas compared. "Separate" in this context means that some difference between whales in the two areas has been identified. Note however that such differenceses identified between multiple pairs of areas do not necessarily mean that each area considered contains a different stock; differences could reflect instead differing proportions of two (or more) stocks in the various areas considered. Strong evidence of separation is shown in bold letters.

I. IWC Schedule stock areas

1. Iceland (EGI) v/s Spain (UK Spain and Portugal)	**2.**	**3.**
Separate**:**	***MtDNA***	***Daníelsdóttir,* et al., *1991a***
	Allozymes	Árnason & Sigurdsson, 1983; Árnason & Jónsdóttir, 1988; Árnason *et al.,* 1989; 1992; Daníelsdóttir *et al.,* 1991b; 1991c; 1992; Daníelsdóttir, 1994
	Microsatellites	Daníelsdóttir *et al.,* 2005
	Morphometrics	Jover, 1992; Vikingsson, 1992
	Earplug morphology	Lockyer, 1981; 1982
	Heavy metals	Sanpera, 1993; 1996
	Discovery marking Iceland	No returns at Spain
	(Discovery marking Spain)	No returns at Iceland (small numbers)
Iceland (EGI) v/s N-Norway		
Separate:	Allozymes	Daníelsdóttir *et al.,* 1992
	Microsatellites	Daníelsdóttir *et al.,* 2005
	Biological parameters	Haug, 1981
	Depletion pattern	Risting, 1922; Jonsgård, 1966; Sergeant, 1977
	Discovery marking Norway	No returns at W-Iceland. Brown, 1977
Iceland (EGI) v/s W-Norway & Faroes		
Separate	Discovery marking Iceland (few)	No returns in Faroes or Norway
	Discovery marking Norway, Faroes	No returns in Iceland
	(Depletion pattern?)	

	(Genetics/Biol param??)	
Iceland (EGI) v/s Eastern Canada		
Separate:	Allozymes	Daníelsdóttir *et al.*, 1992;
	Microsatellites	Daníelsdóttir *et al.*, 2005
	Depletion pattern	Risting, 1922; Jonsgård, 1966; Sergeant, 1977
	Discovery marking Iceland (few)	No returns at Canada (few catches)
Mixing:	Discovery marking Canada (many)	Only 1 return at W-Iceland
Iceland (EGI) v/s West Greenland		
Separate:	Microsatellites (few Greenl.)	Daníelsdóttir *et al.*, 2005
	Discovery marking Iceland	No returns at W-Greenland (few catches)
	Discovery marking W-Greenl.(few)	No returns at W-Iceland
Iceland (EGI) v/s Mediterranean		
Separate	Microsatellites and mtDNA	Bérubé *et al.*, 1998
	Ligurian newborns in summer	Notarbartolo di Sciara *et al.*, 1996
Faroes & W-Norway v/s Spain		
Separate	Discovery marking (few at both places)	
Mixing:	Satellite telemetry (1 whale)	NAMMCO, 2003
Faroes & W-Norway v/s N-Norway		
Separate	Discovery marking (few)	
	(Depletion pattern??)	
Faroes & W-Norway v/s Canada	??	
Faroes & W-Norway v/s W-Greenland	**??**	
Faroes & W-Norway v/s Mediterranean		
Separate	Ligurian newborns in summer	Notarbartolo di Sciara *et al.*, 1996

N-Norway v/s Spain		
Separate	Microsatellites	Daníelsdóttir *et al.*, 2005
	Discovery marking?	No returns from Spanish catches (catches until 1985)
N-Norway v/s Mediterranean		
Separate	Ligurian newborns in summer	Notarbartolo di Sciara *et al.*, 1996
N-Norway v/s W-Greenland		
Separate	Discovery marking ??	
	Depletion pattern??	
N-Norway v/s Canada		
Separate	Allozymes	Daníelsdóttir *et al.*, 1992
	Microsatellites	Daníelsdóttir *et al.*, 2005
	Discovery marking ??	
	Depletion pattern??	
W-Greenland v/s Canada		
Separate:	Microsatellites	Daníelsdóttir *et al.*, 2005
W-Greenland v/s Mediterranean		
Separate	Ligurian newborns in summer	Notarbartolo di Sciara *et al.*, 1996
	Microsatellites and mtDNA**???**	Bérubé *et al.*, 1998
W-Greenland v/s Spain		
Separate:	Microsatellites	Daníelsdóttir *et al.*, 2005
Canada v/s Mediterranean		
Separate	Microsatellites and mtDNA	Bérubé *et al.*, 1998
	Ligurian newborns in summer	Notarbartolo di Sciara *et al.*, 1996
Canada v/s Spain		
Separate	mtDNA	Bérubé *et al.*, 1998
	Microsatellites	Daníelsdóttir *et al.*, 2005
Spain v/s Mediterranean		
Separate:	Microsatellites and mtDNA	Bérubé *et al.*, 1998
	Organochlorines	Marsili and Focardi, 1996
	Ligurian newborns in summer	Notarbartolo di Sciara *et al.*, 1996
	Accoustics	Clark, 1995; Clark *et al.*, 2002

	Lack of sightings in Gibraltar strait	Duguy *et al.,* 1988
Separate/Mixing	Stable isotope ratios	Guinet *et al.,* 2005
	Satellite telemetry	Guinet *et al.,* 2005
Nova Scotia v/s Labrador-Newfl.		
Separate:	Depletion pattern	Mitchell, 1972; Sergeant, 1977
	Organochlorines	Hobbs *et al.,* 2001
Mixing:	Discovery marking (many)	2 &1 returns
II. Within IWC Schedule areas		
W-Iceland v/s E-Iceland		
Separate:		
	Discovery marking E-Iceland (9)	No returns at W-Iceland.
Mixing	Population modelling	Branch & Butterworth 2005
W-Iceland v/s E-Greenland		
Mixing:	Discovery marking E-Greenland	Gunnlaugsson, 2004; Sigurjónsson *et al.,* 1991
	Radio tagging (W-Ice. to E-Greenl.)	Watkins *et al.,* 1984
III. Other East-West comparisons		
Bermuda/west Indies v/s Norwegian Sea		
Separate:	Acoustics	Clark, 1995; Clark *et al.,* 2002
Bermuda/west Indies v/s Mediterranean		
Separate:	Acoustics	Clark, 1995; Clark *et al.,* 2002

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ANNEX 3

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON THE STOCK STATUS OF WALRUSES IN THE NORTH ATLANTIC AND ADJACENT SEAS

1 OPENING REMARKS

Chairman Erik Born welcomed the delegates (Section 5.7, p. 379) to the meeting and wished them a pleasant and productive stay in Copenhagen.

NAMMCO has had an interest in the walrus right from its beginning in 1992. One of the first requests for advice given to the Scientific Committee in 1993 was to provide an overall assessment of Atlantic walrus populations, including stock identity, abundance, long-term effects of removals on stocks in each area, and the effects of recent environmental changes (*i.e.* disturbance, pollution) and changes in the food supply. This assessment work eventually led to the compilation of a status report on Atlantic walruses (Born *et al.* 1995, NAMMCO 1995) which identified putative walrus stocks based on available evidence, and provided an assessment on each stock. This report was used by the Scientific Committee as the basis of its management and research recommendations to Council.

Over 10 years have now passed since the first assessment of North Atlantic walruses by NAMMCO. New research has been conducted in the interim, providing information on stock delineation, distribution and abundance, ecology, biological parameters and behaviour. Noting this, in 2004 the NAMMCO Management Committee requested the Scientific Committee to provide an updated assessment of walruses, to include stock delineation, abundance, harvest, stock status, and priorities for research.

It was agreed that the meeting would be chaired by Mads Peter Heide-Jørgensen.

2 ADOPTION OF AGENDA

The Draft Agenda (Appendix 1) was adopted with minor changes.

3 APPOINTMENT OF RAPPORTEURS

Daniel Pike, Scientific Secretary of NAMMCO, was appointed as Rapporteur for the meeting, with the assistance of other members as required.

4 REVIEW OF AVAILABLE DOCUMENTS

Documents available for the meeting are listed in Appendix 2.

5. STOCK STRUCTURE

5.1 Genetic information

There have been no new genetic analyses of Russian samples. Øystein Wiig informed the Working Group that he is attempting to obtain samples from Russia for a joint project between Russia and Norway.

SC/13/WWG/13 presented genetic analyses comparing samples from 70 walruses from Hudson Bay and Hudson Strait (Canada) with previously analysed samples from West Greenland, northwest Greenland, East Greenland, Svalbard, and Franz Josef Land. These analyses indicated (1) the existence of two major complexes of walruses consisting of three sub-populations to the west of Greenland (east Hudson Bay/Hudson Strait, West Greenland, northwest Greenland) and two sub-populations to the east of Greenland (East Greenland and Svalbard-Franz Josef Land); (2) that walruses from the east Hudson Bay/Hudson Strait area are genetically different from West Greenland walruses; (3) that walruses from the east Hudson Bay/Hudson Strait area are more closely related to those wintering in West Greenland than to those occurring nearly all-year round in northwest Greenland (the NOW sub-population); (4) that the walruses in east Hudson Bay/Hudson Strait area seem to function to an unknown extent as a source for the West Greenland walruses; (5) that walruses from the east Hudson Bay/Hudson Strait area probably have been separated from the northwest Greenland walruses for a longer period of time compared to West Greenland walruses; (6) that walruses from East Greenland constitute a separate sub-population with limited connection to the Franz Josef Land- Svalbard sub-population.

The Working Group found these results generally confirmatory of the putative stock structures suggested previously by NAMMCO (1995). They supported the previous conclusion that there is no difference between walruses sampled in Franz Josef Land and Svalbard. However samples from East Greenland were discriminated from both of these areas. They strengthen the suggestion that there is a link between the North Hudson Bay-Hudson Strait-North Labrador-Southeast Baffin Island (HBDS) and West Greenland (WG) stocks, and indicate that the HBDS stock may be a source of immigration to the WG stock. It was noted that only a limited part of the HBDS stock area had been sampled, and that samples from the Southeast Baffin area in particular are urgently needed. There also remains the possibility that there may be sub-structuring within the HBDS and WG stocks.

Some new information on genetic stock delineation of Canadian populations was provided in SC/13/WWG/5. Walruses taken by the Foxe Basin communities of Igloolik and Hall Beach were not distinguishable using mitochondrial DNA and 9 microsatellites. However they could be distinguished from walruses sampled at Resolute, Grise Fiord, and Bathurst Island, indicating a difference between the putative Foxe Basin and North Water (NOW) stocks. Within the NOW stock area, preliminary microsatellite analyses of small sample sizes have indicated a difference between walruses sampled at Grise Fiord and those sampled in Penny Strait, and between West Jones Sound and the Penny Strait area, but not between Western Jones Sound and Resolute Bay. In addition there was no significant difference between walruses sampled at Grise Fiord and Resolute Bay. These results suggest that 1) the

Foxe Basin stock is separate from the NOW stock; and 2) that there is likely substructure within the NOW stock area.

There was some speculation that more complex stock structure may be generated in heavy ice areas, because of the limited size and wide separation of open water areas for overwintering. In this regard the further sub-division of the NOW stock area might be expected.

Chad Jay reported that Pacific walruses are presently considered to be one panmictic stock occupying Alaskan and Russian waters. Genetic analysis is in progress but no results were available as yet.

Conclusions

The Working Group concluded that the genetic analyses presented were generally confirmatory of the putative stock structures previously suggested by NAMMCO (1995), with the exception that HBDS differed from West and northwest Greenland and that there may be further sub-division within the NOW stock area. There is also an indication that HBDS may serve to an unknown extent as a source population for West Greenland.

5.2 Satellite tracking

No satellite tracking studies have been conducted in Russia. Christian Lydersen reported that satellite tagging had been conducted in southeast Svalbard in 2003, and in northern Svalbard in 2004. Some tags have transmitted for more than 1 year. Mainly male walruses are found in the southeast, while animals of both sexes as well as calves occur in the northern area. Some of the animals tagged in the southeast have moved between Svalbard and the Franz Josef Land, while those tagged in the northeast have, to date, remained in that area. This information suggests that while there is mixing between Franz Josef Land and Svalbard, there is sex and age segregation within the Svalbard archipelago and patterns of movement may differ locally. All the animals tagged have been adult males.

Born reported that 19 walruses have been tagged at two locations in East Greenland since 1995. The tags have lasted for a maximum of 199 days. All tagged animals have made only local movements and remained in East Greenland, with some exchange between the two land haulouts in East Greenland, indicating that the same walruses use both sites. The movement patterns of walruses in this area provide no evidence of substructure within the East Greenland stock.

Recent information from satellite tagging in western Jones Sound, Penny Strait and southern Devon Island was presented in SC/13/WWG/5. These tags have endured for a maximum of 3 months. In Western Jones Sound, the animals have remained in the area between August-November and there is no indication that they move out into Baffin Bay to overwinter. Their distribution does not appear to overlap with the hunting area used by Grise Fiord in eastern Jones Sound, suggesting a division between eastern and western Jones Sound. No tagged animals have moved through Hell Gate or Cardigan Strait. These results suggest that western Jones Sound holds a distinct stock of walruses that overwinters in the pack ice around Hell Gate and Cardigan Strait.

Walruses tagged in Penny Strait tended to remain in that area, but tag durations were short and none have endured later than September. One male walrus tagged in this area in 1993 was killed in 1994 near Pond Inlet. Another tagged animal moved to southwest Devon Island. Walruses tagged near southwest Devon Island have remained in that area. Walruses do overwinter in polynyas in Penny Strait area. This information suggests that there may be a separate stock of walruses in the Penny Strait/Lancaster Sound area, but confirmatory data are needed.

Conclusion

Satellite tagging conducted since 1995 has strengthened the conclusion that there is a single stock of walruses occupying the Svalbard and Franz Josef archipelagos, and another off East Greenland. However the new information suggests a sub-division of the NOW stock area, possibly into 3 areas including western Jones Sound and Penny Strait/Lancaster Sound stock areas.

5.3 Tissue signatures (pollutants, trace elements *etc.*)

In Canada and Greenland, lead isotope ratios (^{208}Pb/Pb ^{207}) and trace element profiles have been used as a tool in stock discrimination studies (SC/13/WWG/5, Outridge and Stewart 1999, Outridge *et al.* 2003), under the assumption that concentrations in the teeth represent a cumulative sample from the spatial/temporal environment of the animal, and therefore reflect stock differences. Walruses sampled at Akulivik (HBDS) differed from those sampled at Inukjuak (SEHB) in lead isotope ratios, trace element profiles and also in organochlorine concentrations and profiles in the blubber (Muir *et al.* 1995). Lead isotope ratios of animals taken at Coral harbour differed from those taken to the east at Akulivik. These two communities are within the putative HBDS stock area and therefore the results suggest subdivisions within this area, or possibly a cline of population characters across the area.

Walruses landed at Foxe Basin communities differ from all areas on the basis of lead isotope ratios. Within the area walruses landed at Hall Beach and Igloolik can be differentiated. Even though the communities are less than 150 km apart, their hunting areas generally do not overlap (SC/13/WWG/5). Examination of individual growth layer groups of Hall Beach males indicates that some may make excursions into other areas, but it is not known if they contribute to other populations on these excursions.

Discussion

There was considerable discussion about the applicability of these methodologies to discriminating stock groupings relevant to management. It is apparent that the methods have high discriminatory power even with rather low sample sizes, and where the walruses likely share a common overwintering area, as in Foxe Basin. Some members noted that isotope ratios and trace element signatures may reflect a clinal phenomenon and that the scale of sampling would have a great influence over the number of groupings discriminated. It is not known if a significant difference in isotope ratios between two adjoining areas is of relevance to determining the effects of differential harvesting on these animals. Other members noted that further substructuring of walrus populations was to be expected due to their life history and habitat requirements. Even if 2 groups share an overwintering area and breed as a single population unit, they may occupy different areas in the summer and be susceptible to differential exploitation. Since isotope ratios are a reflection of the migratory patterns of the animals, they are useful in discriminating management stocks. In this view the further splitting of putative walrus stocks is a conservative approach and all relevant evidence, including isotope ratios, should be considered. The Working Group agreed to use this as supplementary evidence.

5.4 Other information

SC/13/WWG/7 and SC/13/WWG/8 presented seasonal distributions of walruses in the Barents, Kara, and Laptev seas from Russian sea ice reconnaissance flights conducted from the 1950's to the 1990's. These observations show no apparent gaps in summer or winter distribution between the northern Barents, Kara, and Laptev Seas. It was considered likely that the animals in the northern Kara Sea were connected to those inhabiting the Franz Josef archipelago and areas farther west. There was a clear separation between these animals and those inhabiting coastal areas south of Novaya Zemlya. There was also an area with many sightings in the southern Laptev Sea extending east to the Novosibirsk Islands, but a clear gap between this area and the Pacific walrus population farther to the east. The authors considered that this distributional evidence suggested the existence of three populations in the area: a Northern population inhabiting the northern Barents, Kara, and Laptev seas, including the Franz Josef islands; a Southern population with a core area in coastal areas south of Novaya Zemlya, and a Laptev population inhabiting the Laptev Sea east to the Novosibirskie Islands.

The Working Group welcomed this information, but noted that additional information, perhaps from genetic, satellite tagging or other studies, would be required before putative stocks could be identified with any certainty.

5.5 Management units

The Working Group considered that while the putative stock units identified in 1995 were in the main supported by new information, some revisions would be required, and these are summarised in Fig. 1 and Table 1. In particular the Working Group agreed to adopt for this assessment the division of the NOW into 3 areas, as suggested by SC/13/WWG/5.

6. BIOLOGICAL PARAMETERS

6.1 Age estimation

Age of walruses is determined by counting growth layer groups in sectioned teeth. There was no new information available to the Working Group on this topic.

6.2 and 6.3 Biological parameters

New information and estimates of biological parameters by region are presented in

Table 2.

7. CATCH STATISTICS

7.1 Reported catch

No recent catches of walruses have been reported from Svalbard or the western Russian Federation, and walrus hunting is prohibited in these areas.

Walrus catches in Greenland from 1946 to 2002 were presented in SC/13/WWG/15 and apportioned to the three putative stocks in Greenland (West Greenland, North Water, and East Greenland). The data were extracted from various sources including the Hunters' Lists of Game (until 1987) and a system for recording hunting statistics (Piniarneq) that was introduced in 1993.

For East Greenland, there are many years with no reports prior to 1993. After the introduction of Piniarneq in 1993, reported catches generally increased and varied greatly, ranging from 1 to 99. By comparison with information on previous catch levels (Born *et al.* 1995, NAMMCO 1995), SC/13/WWG/15 considered some of the higher records in Piniarneq to be implausible. Similarly in West Greenland reported harvests have increased substantially since the introduction of Piniarneq, ranging between 116 and 265 over the period 1993 to 2002. For northwestern Greenland there were few years with valid harvest reports prior to 1993, and reported harvests have not increased since then, ranging from 72 to 265. Validation of catch records is urgently needed and Born speculated that the anomalously high harvest years observed in East and West Greenland since the introduction of Piniarneq might be due to multiple reporting of the same animal by hunters, but could not present data to support this.

Harvest data from the Nunavut Wildlife Harvest Study (NWHS) and a recent compilation for the Committee on the Status of Endangered Wildlife in Canada were reviewed for reported catches in Canada since 1995 (SC/13/WWG/4). All walrus harvest data were plagued by incomplete reporting but data for almost half the annual community totals agreed between sources. When the two estimates did not agree, the larger of the two estimates was used UNLESS the original source expressed serious concerns, in which case "no data" were recorded. Best estimates, likely reliable only to an order of magnitude, are presented for the period 1996-2001.

In discussion the Working Group noted that, even with the advent of new harvest reporting systems in both Canada and Greenland, there was still a high level of uncertainty in the catch reports. Accurate catch reports are crucial for understanding the impact of hunting on the stocks. It was recommended that catch data should be reported fully, including collection, analytical and extrapolation methods, and potential biases. If extrapolations are used, the statistics should include an estimate of uncertainty. Multiple reporting has not been considered an issue with respect to Canadian harvest statistics. It is suspected in Greenland and multiple reporting should be investigated in both areas. The return of a biological sample, preferably a lower jaw, would both validate harvest reports and provide important biological data, and should be considered in any new data collection programs.

7.2 "Struck and lost"

No new information on struck and lost rates has become available from any area. In 1995 this Working Group assumed a loss rate of 30% for stocks lacking specific loss rate information (NAMMCO 1995), and the Working Group saw no reason to change this assumption.

7.3 Catch histories by management units

Estimates of recent average harvests by stock area are presented in Table 3.

8. ABUNDANCE AND TRENDS

8.1 Recent estimates

A coastal ship survey of northern Novaya Zemlya was carried out in August-September 1998, resulting in sightings of about 400 walruses and an estimate of about 600 for the area (SC/13/WWG/7). There are no recent abundance estimates for other areas of the western Russian Federation. SC/13/WWG/7 provided "best guess" estimates of around 3,000 for the Russian part of the Barents sea and the Kara Seas, and 4-5,000 for the Laptev Sea. These estimates could not be divided by stock. The Working Group accepted these estimates for information but noted that they were not of sufficient quality to use in assessments. No recent estimates are available for the Svalbard area.

Based on opportunistic and systematic observations, the East Greenland walrus population was estimated to number *ca* 1,000 (Born *et al.* 1997). The Working Group accepted this estimate for information but noted that it was not of sufficient quality to be used in assessments.

No recent estimates of abundance were provided for West Greenland. The main wintering grounds have been surveyed from aircraft 9 times between 1981 and 1999. Estimates of abundance from 1990 and 1991 surveys using line transect methods were developed by Born *et al.* (1994) and were 458 and 631 respectively (average 545, cv 0.48). SC/13/WWG/6 applied a correction factor of 5 to the estimate of the animals seen in the water, and then added this to the total estimated to be on ice to derive a total estimate of 938 (cv 0.48).

In discussing this estimate the Working Group noted 5 main difficulties: 1) the perpendicular distance functions for animals on the ice and in the water were inappropriately pooled because the functional forms for the two types of sightings are different; 2) the correction factor for diving walruses was not specific for this survey; 3) no variance from the correction factor was included in the estimate, and this is likely to be considerable; 4) there was no correction for perception bias; 5) the two types of sightings are not independent because walruses on ice responded to the 'plane by entering the water. The Working Group could not accept this estimate and recommended that it be re-calculated. It was also recommended that all available surveys from this area should be analysed in a consistent manner.

To enumerate walruses in the North Water, an aerial survey was conducted from 11-19 August 1999 over terrestrial haulouts and along the coasts on eastern Ellesmere Island and in the Jones Sound, south Devon Island and Cornwallis Island – Grinnell Peninsula areas in Canada (SC/13/WWG/6). A total of 452 walruses was counted, of which 73.5% were hauled out. SC/13/WWG/6 used correction factors for those animals seen in the water and those animals seen on land to derive an estimate of about 1,000 walruses for the area. Unsurveyed areas included the southern coasts of Lancaster Sound and Barrow Strait and adjacent areas, and a section of the eastern coast of Ellesmere Island. SC/13/WWG/6 used a "guesstimate" of 500 animals in these areas to produce a total estimate of 1,500 for the NOW area.

The Working Group found that the survey was not presented in sufficient detail for evaluation purposes. Generally it was uncertain whether the correction factors applied for diving and hauled out walruses were appropriate, and it was noted that they were applied without additional variance. The survey was flown under "optimal" conditions and it is not known how environmental conditions affect the proportion of walruses hauled out in this area. In Svalbard, weather appears to have little effect on haulout behaviour of adult males in the summer, but some effects have been noted in Canada and in East Greenland (Salter 1979, Born and Knutsen 1997). The Working Group accepted the estimate for information but noted that it should not be used directly in assessments without further work and documentation.

No new estimates are available from Foxe Basin. Bowhead whale surveys conducted in the area recently are being analysed for walrus distribution and abundance and will form the basis of new abundance estimates.

The Working Group was hindered in its work by the lack of information on the abundance from all areas, and except for the Canadian High Arctic (North Water), there has been no progress in obtaining abundance estimates since 1995. Abundance estimates are an essential component of any assessment, and there can be little progress in establishing sustainable harvest levels and improving conservation measures until this need is addressed.

Available estimates of abundance by stock area are provided in Table 3.

8.2 Trends in abundance by management units

There was no new information on trends in abundance from any area. It was recommended that all surveys in the West Greenland should be analysed in a consistent manner to evaluate trends in abundance or relative abundance.

8.3 Future survey plans

There are no immediate plans to carry out walrus surveys in the Russian Federation.

Lydersen informed the Working Group that an aerial digital photographic survey will be carried out on all known land haulouts in Svalbard in summer 2005. A correction factor derived from satellite tagging data will be used to estimate the total number of walruses using the area.

A survey of West Greenland is presently in the planning stages and should be conducted within 2-3 years. There are no immediate plans to survey the NOW or East Greenland areas.

Stewart informed the Working Group that, in Canada there are plans to use biopsy sampling and DNA analysis to develop mark/recapture estimates for western Jones Sound, the Penny Strait/Lancaster Sound area and Foxe Basin. Data on numbers and distribution of walruses recorded during bowhead surveys in Foxe Basin are being collated in preparation for future population estimates. In addition there have been some counts at Cape Henrietta Maria in James Bay and these will be analysed in the near future. There are no plans for surveys in other areas.

9. ECOLOGY

9.1 Diet and consumption

Indirect measures of the energy consumption rate of two walruses performed by the Doubly Labelled Water technique (DLW) were presented in paper SC/13/WWG/11. These measures of CO_2 production by DLW yielded an estimate of Field Metabolic Rate (FMR) of 328.1 MJ/day for the 1,370 kg walrus and of 365.4 MJ/day for the 1,250 kg walrus. On average this corresponds to 346.8 MJ/day for a 1,300 kg walrus. Considering the average prey composition in the area, when converted to "mussel-equivalents" these FMR values correspond to 67 kg wet-weight per day (5% of total body mass (TBM)) for the 1,370 kg walrus and 75 kg wet-weight per day (6% of TBM) for the 1,250 kg walrus.

To relate this to the availability of food resources in the area (SC/13/WWG/10) the total consumption of bivalve prey by walruses was estimated. Area-use of three adult male walruses equipped with satellite transmitters was measured during the open water season in 1999 and 2001. Overall, the animals spent *ca* 30% of the time in the water in the inshore study area in Young Sound. Information on the total number of walruses using the area (n=60), occupancy in the study area, and estimates obtained from satellite telemetry on the number of daily feeding dives (118-181/24 h at sea), was used to calculate the amount of bivalve food consumed by the walruses during a total of 1,620 "walrus feeding days" inshore. Depending on the number of feeding dives, the estimated consumption by walruses of shell-free (SF) bivalve wet weight (WW) during the open water period ranged between 111 and 171 tons. Based on estimates of mean total body mass (1000 kg) of walruses using the area and daily per capita gross food intake, the corresponding estimate of consumption by walruses is 97 tons SF WW. Daily feeding rates in walruses (*ca* 6% of TBM) indicate that an estimate of total predation of around 100 tons SF WW per year is plausible. According to these parameters walrus predation during the open water season amounts to *ca* 0.8

% of the standing biomass of *Mya sp.* and *Hiatella sp.*, and *ca* 92 % of the annual production of these bivalves.

The Working Group speculated that the rather high feeding and field metabolic rates might be due to walruses depositing blubber from a low-lipid diet. Little information on the seasonality of walrus feeding is available but it was considered that in East Greenland they would have no access to their shallow water feeding areas in the winter.

Lydersen informed the Working Group that a library of fatty acid profiles from prey species from Svalbard and Greenland is being developed and will be compared to fatty acid profiles from walrus blubber from the same areas.

9.2 Impact of global warming

The predicted warming of the Arctic may have a negative effect on walruses. SC/13/WWG/14 offered the alternate hypothesis that Atlantic walruses eventually could benefit from Arctic warming and associated decrease in ice cover.

Historically, walruses lived in areas farther south than their present range. Their present status as Arctic animals is due, in large part, to persecution by man. Atlantic walruses may benefit, at both the individual and the population level, from increased productivity in near-shore waters and from greater access to inshore foraging areas due to Arctic warming. The population size of walruses in most areas of the North Atlantic is probably still far below carrying capacity. Thus, sufficient food resources are assumed to be available as long as all traditional feeding areas will still be available in spite of the lack of ice floes to rest on. A decrease in Arctic sea ice and consequential lengthening of the open-water period could increase the amount of time in which Atlantic walruses have access to the food-rich coastal areas. Walruses are not forced offshore by reduced ice cover but rather may spend more time inshore and thus benefit from the reduction in fast ice and the greater access to shallow-water foraging areas.

It is likely that the hunting pressure on walruses will increase as the amount and duration of ice cover in Arctic regions declines. Apart from humans, the main predators of walruses are polar bears and killer whales. In the absence of sea ice, walruses of all age classes will be forced to use terrestrial haulout sites more frequently and this could expose them to increased predation from polar bears. With less ice to entrap them or obstruct their movements, killer whales may be able to remain for longer periods in walrus areas and this could result in increased walrus mortality. In general then, mortality of walruses from predation might be expected to increase as a result of climatic warming.

The Working Group agreed with the authors of SC/13/WWG/14 that climatic warming was likely a lesser threat to walruses than to other ice breeding pinnipeds, mainly because of their behavioural flexibility in using ice and land haulout sites. Effects on benthic production by reduction in ice cover could not be evaluated by this group. Boreal species (fish and invertebrates) may move into areas presently occupied by walruses and compete with them for food. Ice may be a more important platform for females and calves, providing them with access to feeding areas without travelling long distances from land haulouts. Also there is little direct evidence that walruses can give birth in the water, so females may be dependent on ice for this reason.

It was also noted that the situation is quite different for Pacific walruses, which are dependent on ice as a resting platform in areas where they feed.

The Working Group could not come to any conclusions about the potential effect of global warming on walruses. While walruses could adapt to warmer conditions, perhaps more readily than other Arctic pinnipeds, it was not clear that a warmer climate would be beneficial to them. It was emphasised in this context that the most immediate threat to walrus populations is over-exploitation, not climate change.

9.3 Pollution

Organochlorines

Wiig *et al.* (2000) used samples from 10 adult male walruses from Alaska to investigate the relationship between organochlorine (OC) levels in skin and blubber of individuals. For analyses they selected eleven components that were quantified in the blubber of all individuals. The mean levels in the two types of tissues were significantly different for three of the 11 chemical components. The correlation between the levels in the two types of tissues was significant for all components. In August 1993, skin biopsies were collected from 25 adult male walruses at haulout sites in southeastern Svalbard and from 28 walruses of different sex and age at haulout sites at Franz Josef Land. For all OCs the levels were between five and ten times higher at Svalbard than at Franz Josef Land. A principal component analysis (PCA) detected differences between areas in OC levels and not in patterns. Since the Franz Josef Land samples were mainly taken from females and young individuals, while the Svalbard samples were taken largely from adult males, it is likely that differences in sex and age in the samples may be one of the main causes for the difference in OC levels.

Comparable data for organochlorine levels in skin samples from walruses from other areas are not available. Based on skin biopsy samples, the OC levels presented from Svalbard and Frans Josef Land are high in relation to levels found in walrus blubber in other areas, including northwest Greenland (Born *et al*. 1981), East and northwest Greenland (Muir *et al.* 1999, 2000), eastern Canada (Muir *et al*. 1995) and Alaska (Seagars and Garlich-Miller, in press). The relatively high levels of OCs in walruses from Svalbard and Franz Josef Land may be a combined effect of high pollution level in the environment and seal-eating habits. The study demonstrates that it is possible to use skin biopsies taken by a nondestructive method, to monitor OC levels in walruses.

Heavy metals

Wiig *et al.* (1999) analysed hair samples from adult male walruses collected from anaesthetized individuals at Svalbard for cadmium and total mercury. The mean level of cadmium was 0.860 ± 0.321 µg/g dry weight (dw) (median = 0.811, range = 0.349-1.51 µg/g dw) and the mean level of mercury was 0.235 ± 0.100 µg/g dw (median =

0.251, range = 0.121-0.424 μg/g dw). Levels of cadmium and mercury in hair of walruses from other areas are not known. Both cadmium and mercury levels in hair of walruses from Svalbard are relatively low compared to the levels found in the hair of other marine mammal species. It has been documented from a number of marine species, including marine mammals such as ringed seals and polar bears, that both cadmium and mercury levels at Svalbard are lower than in other areas. It is uncertain to what degree levels in hair reflect levels in internal organs in walruses. In rare and highly endangered species or populations, tissue samples can be difficult to collect. With walruses it is possible to collect hair from anaesthetised individuals or at the haulout sites during moult, to monitor heavy metal levels of the population.

Other

Lydersen informed the Working Group that complete blubber plugs are taken from all walruses immobilised in Svalbard for satellite tagging, and are used for pollutant analyses in ongoing screening studies.

9.4 Other

Disease

In Canada the incidence of antibodies to canine distemper virus (CDV), phocine distemper virus (PDV), canine adenovirus, influenza A and *Brucella* sp., has been examined in walruses (Duignan *et al.* 1994, Nielsen *et al.* 1996, 2000, 2001a, b, Philippa *et al.* 2004), but the implications for walrus health are not clear.

Clinical serum biochemistry analyses have been performed on 26 blood parameters for 13 samples taken from apparently healthy adult male walruses from Svalbard. These data may be useful for future monitoring of health changes in this or other populations (Tryland *et al*. 2003).

Disturbance to land haulouts

It was noted that land haulouts have been abandoned in many areas of Canada, Greenland, Norway and Russia, probably due to hunting and/or disturbance. It is possible that walruses may become more dependent on land haulouts if ice cover is reduced due to global warming. The Working Group expressed concern about the potential disturbance of walruses by increased human activities at or near haulout sites.

Oil and gas exploitation

SC/12/WWG/7 provided some information about oil and gas fields being developed on the continental shelf of the southeastern Barents Sea in the Russian Federation. This is within the area of walrus distribution in these waters. The Working Group cautioned that walruses might be susceptible to disturbance by seismic exploration, shipping, and extraction activities, and to pollution caused by spills and urged that this be assessed in development plans for this area.

10. ASSESSMENT BY STOCK

10.1 Present status

SC/13/WWG/6 combined recent abundance estimates with historical catches and an age- and sex-structured population dynamic model to perform Bayesian assessments of the walrus populations in West Greenland, the North Water in northern Baffin Bay and East Greenland. The model assumed density-regulated dynamics and pre-harvest populations in population-dynamical equilibrium. It projected the populations under the influence of the catches to estimate the historical trajectories and the current population status. It was found that the West Greenland and North Water populations have been heavily exploited during the last century with the current abundance being at best only a few percent of the historical abundance. Apparently these populations are still being exploited above sustainable level. The East Greenland population was heavily exploited after 1889 and during the first half of the 20th Century and was depleted to approximately 50% of pristine population size in 1933. After protective measures were introduced in the 1950s this population has increased to a current level close to the abundance in 1889, and the present exploitation appears to be sustainable.

East Greenland

The Working Group had already agreed that the abundance estimate for East Greenland used in the assessment in SC/13/WWG/6 was not suitable for use in assessment (see 8.1). Rather than using the point estimate, an alternative approach would be to use the count with correction factors as informative priors in the model to scale the count to total abundance. However it was noted that a series of counts would be required before this method could be used to estimate the scaling factor.

There was also great uncertainty about the catch series used in the analysis (see 7.1). The authors of SC/13/WWG/6 replaced the anomalously high catch reports 1993 with average values, and corrections for "struck and lost" and non-reporting were applied. Similarly, there was uncertainty about the life history parameters used in the modelling. However it was recognised that the ranges of the priors used likely captured the true values and that the use of uniform distributions constituted a conservative approach.

The Working Group accepted the conclusion of the authors that the East Greenland walrus population was recovering or recovered after a period of over-exploitation in the early 20th century. However the present size of the stock and its status in relation to its pristine state was uncertain for the reasons noted above.

West Greenland

The Working Group had agreed that the abundance estimate used was not suitable for use in assessment (see 8.1). It was considered that the assessment model could be improved with the use of an index series of relative abundance estimates developed from aerial surveys conducted between 1981 and 1999, scaled to absolute abundance using a correction factor entered as a prior in the model. This could be done using available data and was recommended by the Working Group.

There were also uncertainties about the catch series (see 7.1) and some recent catch reports have been anomalously high. These were however, used in the model. There are also indications that the harvest in West Greenland is supported to an unknown extent by movement of animals from eastern Canada, and a model that incorporated immigration is needed.

In 1995 the Working Group concluded that this stock was depleted and declining, and that a population of 1,000 to 2,500 animals would be required to support the annual harvests, at that time *ca* 50 walruses. It was considered unlikely that present abundance was over 1,000 animals, while reported harvests have increased since 1995. The Working Group noted that it was unlikely that an update of the abundance estimate would change either the overall outcome of the assessment in SC/13/WWG/6 or its agreement with the conclusion reached in 1995. Therefore the Working Group saw no reason to change its previous conclusion that this stock is depleted and declining, and that present harvests are very likely not sustainable.

North Water

The Working Group had already concluded that the former NOW stock should be divided into 3 new stock areas (see 5.5). There is no indication that walruses from Western Jones Sound or Penny Strait/Lancaster Sound support the harvest at Grise Fiord and Qaanaaq municipality. Therefore it was recommended that any future assessments should be carried out with reallocation of the abundance estimate to the new stock areas.

The abundance estimate used here was found by the Working Group to be unsuitable for use in assessment without further analysis and documentation (see 8.1). This is particularly problematic given the new putative stock areas, since most of the abundance estimate in the area of interest was a "guesstimate" due to incomplete survey coverage. It was considered that a new abundance estimate for this area will be required before a meaningful assessment can be undertaken.

The Working Group could not come to any firm conclusions about the present status of this stock.

10.2 Sustainable harvest levels and management recommendations

East Greenland

Because of the uncertainties noted under 10.1, the Working Group could not provide advice on sustainable harvest levels for this population. In 1995 the reported average catches of about 20 animals per year were considered likely to be sustainable, and the new assessment in SC/13/WWG/6, assuming a population size of about 1,000 animals, was in accord with this. But recent reported harvests have been considerably higher than this, so the Working Group expressed concern that continued harvests at the reported levels might not be sustainable, while acknowledging (see 7.1) that for some years, recent (1993-2002) harvest reports are considered to be implausibly high.

West Greenland

Because of the uncertainties noted under 10.1, the Working Group could not provide advice on sustainable harvest levels for this stock. In 1995, the reported average catches of about 50 animals per year was not considered to be sustainable, and the new assessment in SC/13/WWG/6, assuming a population size of about 1,000 animals, was in accord with this. It was agreed that present harvest levels are not sustainable, and that a large reduction in harvest may be required if this stock is to recover. The Working Group recommended that a new assessment of this stock be completed as soon as possible.

North Water (Penny Strait/Lancaster Sound, West Jones Sound and North Water)

Because of the uncertainties noted under 10.1, the Working Group could not provide advice on sustainable harvest levels for these stocks. In 1995 the Working Group concluded that what was then considered to be a single stock could not support the harvest at that time. The Working Group reaffirmed its previous conclusion that there was no indication that these combined stocks are large enough to support the current harvest levels and therefore expressed concern that current harvests are probably not sustainable. The Working Group recommended that a new assessment of these stocks should be completed as soon as possible.

Other areas

For other areas there was insufficient information to allow an assessment at this time.

12. SATELLITE TELEMETRY

An informal workshop was held on the technical aspects of walrus satellite telemetry, but it was agreed that no report would be produced.

13. RECOMMENDATIONS FOR RESEARCH

The Working Group considered that the most urgent priority at present was to complete assessments of the West Greenland and North Water stocks. The following research must be completed before these assessments can be done:

West Greenland

1. Analyse all West Greenland surveys in a consistent manner to obtain a relative abundance index for the area.
2. Complete a stock delineation analysis incorporating all available genetic, satellite tagging and other data to develop putative stock structures for the area and to evaluate the possibility of immigration from Canada supporting the Greenlandic harvest. If possible this analysis should include new samples from eastern Baffin Island.
3. Develop a revised catch series with corrections for “struck and lost”, non-reporting, and evaluating the accuracy of recent harvest reports.
4. Develop assessment models incorporating all the above.

North Water

1. Complete a stock delineation analysis incorporating all available genetic, satellite tagging and other data to develop putative stock structures for the area.

2. Provide a documented analysis of the surveys carried out since 1998.
3. Carry out new surveys to estimate abundance in these areas.
4. Develop a revised catch series with corrections for “struck and lost”, non-reporting, and evaluating the accuracy of recent harvest reports.
5. Develop assessment models incorporating all the above.

The Working Group recommended that an assessment meeting should be held as soon as the required tasks for at least one of these stocks has been completed. The West Greenland stock was considered of most urgent priority for assessment.

For all areas it was considered that the long term research requirements were:
1. Stock delineation, using genetic, satellite tagging and other methods (all areas);
2. Abundance estimates (all areas and especially exploited populations);
3. Accurate catch series, including corrections for “struck and lost”. Specifically the Working Group identified the need for a more reliable catch reporting system for Greenland and Canada;
4. Estimates of biological parameters, especially adult and juvenile mortality and age specific reproductive rates (all exploited areas);
5. The effects of human activities around haulouts should be investigated.
6. The potential effects of global warming should be investigated.

14. OTHER BUSINESS

There was no other business.

15. ADOPTION OF REPORT

The Report was adopted on 14 January 2005. The Chairman thanked all participants for contributing to a productive Working Group and gave special thanks to the meeting rapporteur for his valuable efforts during the Workshop.

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Table 1. New information available since 1995 relevant to the putative stocks identified by NAMMCO (1995).

STOCK	**NEW INFORMATION**
Foxe Basin (FB)	- Distinct from other areas based on isotope ratios, body size and genetics (SC/13/WWG/5) - Indication of subdivision into a northern (Igloolik) and southern (Hall Beach) area in the summer, based on isotope ratios and distribution of kills (SC/13/WWG/5)
S. & E. Hudson Bay (SEHB)	- Distinct from Northern Hudson Bay based on isotope ratios, trace element profiles, and organochlorines (SC/13/WWG/5) - Walruses taken at Inukjuak are different than those taken at Akulivik based on organochlorines and lead isotope ratios (SC/13/WWG/5). - Indicates that boundary with HBDS is likely south of Akulivik.
N. Hudson Bay Hudson Strait - N. Labrador - S.E. Baffin Island (HBDS)	- Distinct from WG based on genetics (SC/13/WWG/13) and lead isotope ratios (SC/13/WWG/5) - Indications for subdivision based on differences in lead isotope ratios between Repulse Bay, Coral Harbour, Akulivik and Loks Land (Frobisher Bay) (SC/13/WWG/5). - Indication that this is a source population for WG (SC/13/WWG/13). - Boundary with SEHB is likely north of Inukjuak (see SEHB).

STOCK	NEW INFORMATION
Central West Greenland (WG) *- Disko Group* *- Sisimiut Group*	- Distinguished from northwest Greenland and HBDS based on genetics (Andersen and Born 2000, SC/13/WWG/13). - No new information to support or refute the idea that the WG sub-population is subdivided into Disko and Sisimiut groups.
North Water (Baffin Bay) (NOW)	- Samples from eastern Jones Sound were distinguished from Foxe Basin, based on isotopic ratios and preliminary genetic data (SC/13/WWG/5). - Samples from Qaanaaq could be distinguished from Sisimiut group and from Hudson Bay- Hudson Strait based on genetics (SC/13/WWG/13, Andersen and Born 2000). - Evidence for subdivision into West Jones Sound, Penny Strait/Lancaster Sound groupings based on satellite tagging (SC/13/WWG/5). - It is unlikely that the harvest in northern Greenland and Grise Fiord is supported to any significant degree by animals from Western Jones Sound or Penny Strait/Lancaster Sound areas, therefore these areas should be treated as separate management stocks.
East Greenland (EG)	- Distinct from all other populations based on genetics (Born *et al.* 2001) and satellite tracking (Born and Knudsen 1992, Acquarone 2004). - No evidence for revision.
Svalbard - Franz Josef Land (SBFJ)	- Distinct from West Greenland, NOW, and East Greenland based on genetics (SC/13/WWG/13, Born *et al.* 2001). - Distinct from all other areas based on satellite tracking (Wiig et al. 1996, Kovacs and Lydersen Pers. Comm.). - Some indication of age and sex segregation within the area. - Continuous distribution to the east may indicate a link with Northern Kara and Laptev Sea walruses (SC/13/WWG/7). - No firm evidence for revision.
Kara Sea - S. Barents Sea - Novaya Zemlya (KBNZ)	- Apparent continuous distribution between Svalbard-Franz Josef Land and the northern Laptev and Kara seas (SC/13/WWG/7). - Gap in distribution between northern and southern areas (SC/13/WWG/7). - No firm evidence for revision.
Laptev Sea (LS)	- Apparent continuous distribution between northern Laptev Sea and northern Kara Sea (SC/13/WWG/7 and 8) - Gap in distribution between northern and southern mainland coastal areas (SC/13/WWG/8) - No firm evidence for revision

Table 2. Selected biological parameters for Atlantic walruses, by sex and putative stock (acronyms as in Table 1). Numbers in parentheses refer to the source of information. Sources: 1) Garlich-Miller and Stewart (1998); 2) Garlich-Miller and Stewart (1999); 3) DFO (2000); 4) Born *et al.* (1995); 5) Mansfield (1959); 6) Fay *et al.* (1991); 7) Born (2001); 8) Knutsen and Born (1994); 9) Chapskii (1936); 10) Born (2003); 11) SC/12/WWG/6; 12) Miller and Boness (1983); 13) Fisher and Stewart (1996)

			Greenland			Canada			
	KBNZ	**SBFJ**	**EG**	**WG**	**NOW**	**FB**	**HBDS**	**SEHB**	**NOW**
Females									
Age at first ovulation (years)	4 (9)				4-10 (7)	5-7 (2)			
Age at first birth (years)					7 (7)				
Age at sexual maturity (years)					6.1 (95% CI: 5.2-7.1) (7)				
Length at sexual maturity (cm)	250 (9)				250 (4?)				
Weight at sexual maturity (kg)					750 (4?)				
Pregnancy rate (overall, mature females)					34.6 % (7)	33% (2) 35%(5)			
Twin births	occur - uncommon (6)								
Mating season (Oestrus)					19 Jan- 25 Jun (7)	Jan-Apr (3)			
Implantation in the uterus					29/6--11/7 or 26/6--5/7 (7)	Jun-Jul (3) 29Jun-3Jul (2) 11May (5)			
Duration of pregnancy (days)					345 [5/7--18/6] (7)	380 (5) 335 (2)			

	KBNZ	SBFJ	Greenland			Canada			
			EG	WG	NOW	FB	HBDS	SEHB	NOW
Duration of lactation (years)	1/2 to 2 (5) (12) (13)								
Calf birth					20 Jun (7/2--11/11) (7)	May-Jun (3)			
Number of Calves					1				
Calving interval (years)					3 (7)	3 (5)			
Age at reproductive senescence	no current indications of senescence								
Males									
Age at sexual maturity (years)	5-6 (9)				10.9 (95% CI:9.6-12.2; range 7-13) (10)		6-7 (5)		
Age at physical maturity (years)					12-15 (8)				
Season of sexual activity					Nov-Jul (peak eary Jan - Apr) (10)				
Length at physical maturity (cm)					300 (8)				
Weight at physical maturity (kg)					1,100 (8)				
Both sexes									
Longevity									
Average annual mortality (natural)									
Calf length at birth (cm)	100 (9)				112 (110-164) (7)	125 (1) 110 (2)			
Calf weigth at birth (kg)	40 (9)				54.5 (7)				

			Greenland			Canada			
	KBNZ	SBFJ	EG	WG	NOW	FB	HBDS	SEHB	NOW
Calf Survival rate (first year only)	unknown (11)								
Sex differences in the previous three rates									
Juvenile survival rate (>1 yr.)	unknown (11)								
Calf Natural mortality									
Sex ratio at birth	unknown for Atlantic walrus (4) - 1:1 of only 15 fetuses (10) 17 fetuses (2) 14 newborn (2)								
Sex ratio in population	unknown for Atlantic walrus (4)								

Table 3. Average harvest from 1996-2001, and abundance estimates, by putative stock. Sources: (1) NAMMCO (1995); (2) Born *et al.* (1997); (3) Gjertz and Wiig (1995); (4) SC/13/WWG/7.

STOCK	**HARVEST Avg. 1996-2001**	**Yrs**	**ABUNDANCE Year (source)**	**Methods**	**Estimate (error)**	**Bias**	**Correction Factors**	**Reservations/Comments**
Foxe Basin	235	5	1989 (1)	aerial survey	5500 (95%CI 2700-11,200)	neg	none	Partial coverage.
North FB	*137*	5			None			
South FB	*98*	4			None			
South Hudson Bay	10	5			None			
Hudson Bay-Davis Strait	170	5			None			
Northwater	110	5			None			
West Jones Sound	4	1			None			Survey conducted 1999
Penny Strait/Lancaster Sound	8	5			None			Survey conducted 1999
Central West Greenland	158	5			None			Aerial survey data available but should be re-analysed.
Disko group					None			
Sisimiut group					None			

STOCK	HARVEST Avg. 1996-2001	Yrs	ABUNDANCE Year (source)	Methods	Estimate (error)	Bias	Correction Factors	Reservations/Comments
East Greenland	5	5	1984-1990 (2)	opportun-istic counts	1,000 (na)	?	haulout and dive activity data	Not synoptic, uncertain correction factors. Not of sufficient quality for use in assessment.
Svalbard - Franz Josef Land	0	5	1992/93 (3)	aerial/land counts	2,000 (na)	neg	males only, corrected for missing females and calves	Partial coverage.
Kara Sea - Barents Sea - Novaya Zemlya	0	5	1998 (4)	Ship survey	600 (na)	neg	None.	Partial coverage (northern Novaya Zemlya only). Not of sufficient quality for use in assessment.
Laptev Sea	0	5			None			

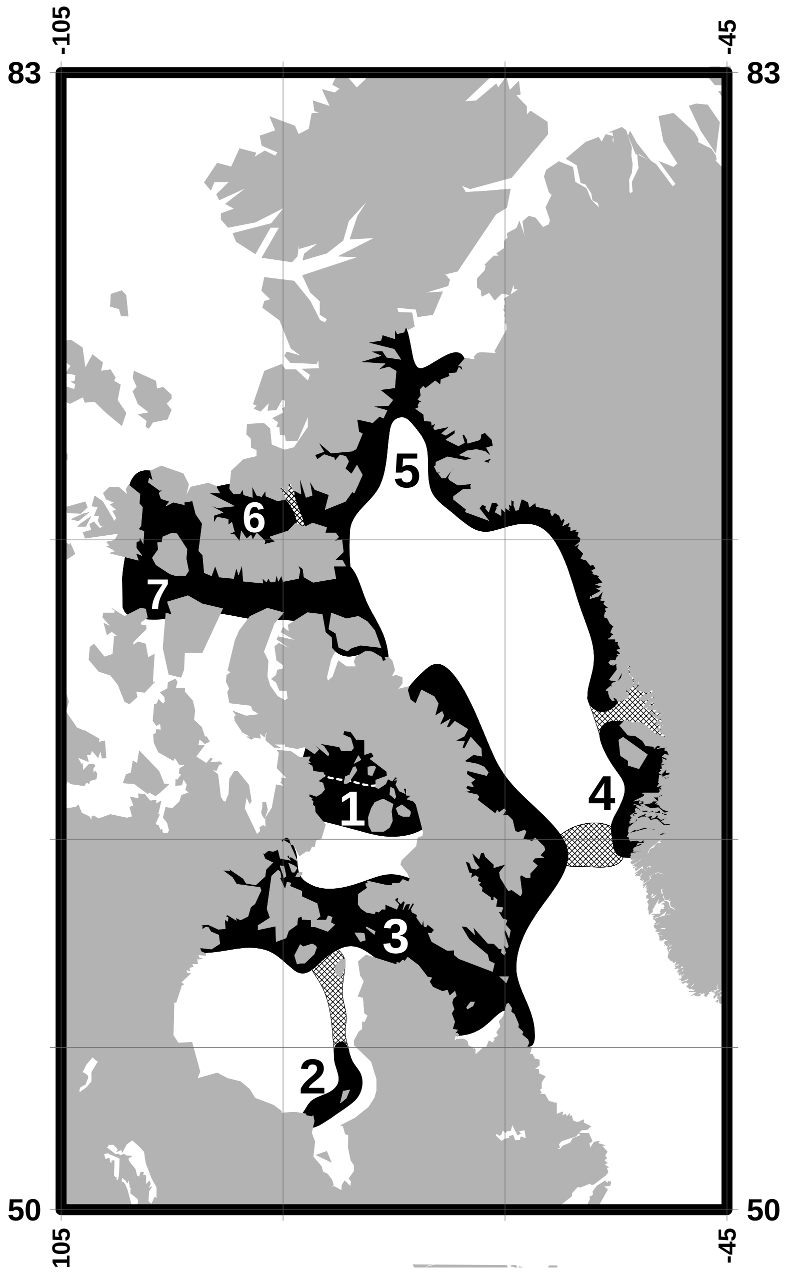

Fig. 1. Delineation of walrus stocks proposed in this report in the western (1a) and eastern (1b) Atlantic and adjacent seas. Boundaries are approximate. Hatching indicates areas of possible stock affiliation.
(1a) 1) Foxe Basin, dashed line divides N. and S. areas; 2) South and East Hudson Bay; 3) N. Hudson Bay- Hudson Strait - N. Labrador - S.E. Baffin Island; 4) Central West Greenland; 5) North Water; 6) West Jones Sound; 7) Penny Strait – Lancaster Sound.

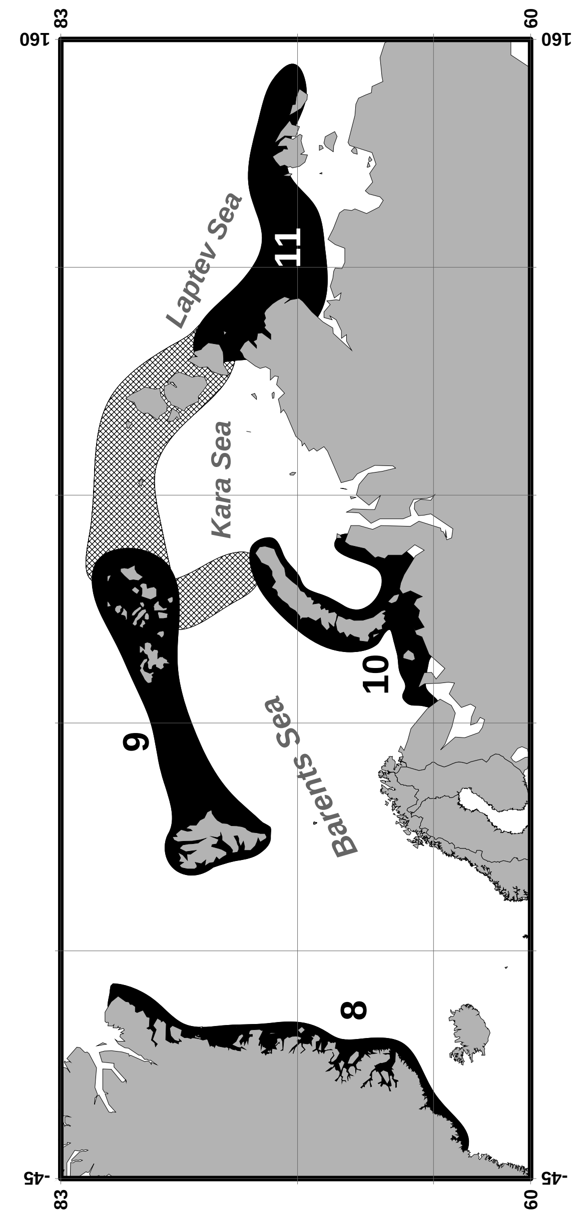

Fig. 1. contd.
(1b) 8) East Greenland; 9) Svalbard – Franz Josef Land; 10) Kara Sea - S. Barents Sea - Novaya Zemlya; 11) Laptev Sea.

Appendix 1

AGENDA

1. OPENING REMARKS
2 ADOPTION OF AGENDA
3 APPOINTMENT OF RAPPORTEURS
4 REVIEW OF AVAILABLE DOCUMENTS
5. STOCK STRUCTURE
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    - 5.2 Satellite tracking
    - 5.3 Tissue signatures (pollutants, trace elements *etc.*)
    - 5.4 Other information
    - 5.5 Management units
6. BIOLOGICAL PARAMETERS
    - 6.1 Age estimation
    - 6.2 Reproductive rates
    - 6.3 Other parameters
7. CATCH STATISTICS
    - 7.1 Reported catch
    - 7.2 "Struck and lost"
    - 7.3 Histories by management units
    - 7.4 Other information
8. ABUNDANCE AND TRENDS
    - 8.1 Recent estimates
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9. ECOLOGY
    - 9.1 Diet and consumption
    - 9.5 Impact of global warming
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10. ASSESSMENT BY STOCK
    - 10.1 Present status
    - 10.2 Sustainable harvest levels
    - 10.3 Management recommendations
11. SATELLITE TELEMETRY
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13. OTHER BUSINESS
14. ADOPTION OF REPORT

Appendix 2

LIST OF DOCUMENTS

SC/13/WWG/1	Draft List of Participants.
SC/13/WWG/2	Draft Agenda.
SC/13/WWG/3	Draft List of Documents.
SC/13/WWG/4	Stewart, R.E.A. Canadian walrus harvests.
SC/13/WWG/5	Stewart, R.E.A. Delineation of walrus in Canada.
SC/13/WWG/6	Witting, L. and Born, E. An assessment of Greenland walrus populations.
SC/13/WWG/7	Boltunov A.N., Belikov S.E. Atlantic walruses of the western Russian Arctic.
SC/13/WWG/8	Belikov S.E., Boltunov A.N. Laptev walruses.
SC/13/WWG/9	2003 Walrus Harvest Monitor Project: Annual Summary.
SC/13/WWG/10	Born, E.W. and Acquarone, M. An estimation of walrus (*Odobenus rosmarus*) predation on bivalves in the Young Sound area (NE Greenland).
SC/13/WWG/11	Acquarone, M., Born, E.W. and Speakman, J.R. Direct measures of pinniped field metabolic rate: implications for fisheries models.
SC/13/WWG/12	Acquarone, M. and Born, E.W. Body water and body composition of free-ranging Atlantic walruses *(Odobenus rosmarus rosmarus* L.) studied by isotope dilution.
SC/13/WWG/13	Andersen, L.W., Born, E.W. and Doidge, D.W. A genetic study of population structure in Atlantic walruses: Where do the Canadian walruses fit in?
SC/13/WWG/14	Born, E.W. and Wiig, Ø. Potential effects on Atlantic walrus of warming in the Arctic.
SC/13/WWG/15	Born, E.W. Estimates of the catch of walruses in Greenland (1946-2002).
SC/13/WWG/16	Kovacs, K.M., Lydersen, C. *et al.* Current research on walruses – Svalbard.

Other Documents:

SC/13/WWG/O1	Pacific walrus *(Odobenus rosmarus divergens*): Alaska Stock.
SC/13/WWG/O2	Proceedings of a workshop on the potential application of mark-recapture methods to estimate the size and trend of the Pacific walrus population.
SC/13/WWG/O3	Manly, B.F.J. Report on the Potential for Use of Mark-Recapture Methods to Estimate the Size of the Pacific Walrus Population.
SC/13/WWG/O4	Walrus Harvest Monitoring On Chukotka in 2001.
SC/13/WWG/O5	Atlantic Walrus Stock Status Report, Canada.

SECTION 4 – NATIONAL PROGRESS REPORTS

4.1
FAROE ISLANDS - PROGRESS REPORT ON MARINE MAMMALS IN 2004-2005

Dorete Bloch, Bjarni Mikkelsen, Maria Dam and Jústines Olsen

I. INTRODUCTION

This report summarises Faroese research on cetaceans and pinnipeds conducted in 2004 and updated until 1 October 2005.

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, with additional studies carried out by the Faroese Fisheries Laboratory, the Food and Environmental Agency of the Faroes, and veterinarians involved in whaling.

II. RESEARCH

II.1 Species/Stocks studied

Cetaceans

Fin whale (*Balaenoptera physalus*) - biopsy
Sperm whale (*Physeter macrocephalus*) - stranded animals
Bottlenose whale (*Hyperoodon ampullatus*) – stranded animal
Pilot whales (*Globicephala melas*) - landed animals
White-sided dolphins (*Lagenorhyncus acutus*) - landed animals

II.2 Field Work (*e.g.* sighting, tagging, scientific catches)

Fin whale

A total of 3 biopsies were collected inside the Faroese EEZ in 2005. They will probably be analysed in Iceland, while the samples taken from 2000-2001 have been analysed by Martine Berubé / Per Palsbøl in California.

Pilot whales

Sex, *skinn* values and total body length in cm have been recorded from nearly all pilot whales caught in 2004-2005 with the kind assistance of the district police and the men evaluating the whales. The museum is notified of every whale drive so as to have the possibility of assessing the potential for using the pod to attach satellite tags.

In order to investigate migration and distribution range as well as diving behaviour of pilot whales in the north Atlantic, seven pilot whales out of a pod of about 80 were fitted with satellite transmitters on 25 August 2004. The tagging locality was one of the authorized whaling bays, Sandavágur, which was also used when tagging four whales in 2000. The whole tagging procedure took about one hour. The tag applications have shown that the traditional Faroese driving procedure is very suitable for tagging small shoaling odontocetes. The movement of the whales was updated daily on www.ngs.fo. The satellite tags used in the study were three SPOT2 (transmitting every second day) and four SDR-T16 (transmitting daily and including depth measurements); both types manifactured by Wildlife Computers Inc., USA. The museum also has also five satellite tags (four SPOT2 and one SDR-T16) ready for a further tagging, hopefully in autumn/winter 2005-2006.

In 2003, the Food and Environmental Agency started a study with the aim of elucidating possible adverse effects of persistant organic pollutants. The project is done in co-operation between the Faroese Museum of Natural History and the Department of Marine Biogeochemistry & Toxicology at the Royal Netherlands Institute for Sea Research (NIOZ), and is funded by the Danish Cooperation for Environment in the Arctic Programme (DANCEA). Sampling for the project, which included blood, liver, kidney, muscle and blubber samples, began in August 2003 and ended in September 2004.

Samples were also taken by the Food and Environmental Agency from a drive of pilot whales in Hvalvík in August 2003 in order to examine the levels of heavy metals and organochlorines in meat and blubber used for food. Samples taken for the effects study have been analysed for biomarkers such as EROD activity and thyroxine hormones, and are in the process of being analysed for dioxin and pesticides.

In December 2004, a report on "new" contaminants in pilot whales and fulmars from the Faroe Islands, and a range of samples from the Greenland environment was published (Vorkamp *et al,* 2004). The report was the result of cooperation between the National Environmental Research Institute in Denmark and the Food and Environmetnal Agency of the Faroe Islands. The aim of the study was to investigate the presence of pollutants not normally included in monitoring programmes, such as the PFOS (the perfluorinated alykated substances) and PDBE (flame retardants) class of compounds. The information in the report once again highlights the vulnerability of marine mammals and seabirds to pollutants that are persistent and lipid soluble. In a Nordic cooperative study on screening of environmental samples for similarily "new" contaminants, in this instance the PFOS compounds as well as siloxanes, samples of pilot whale were included among other samples from the environments of Nordic countries. As was found in the above-mentioned "new" substances study, PFOS were found in high concentrations in seals from Denmark and pilot whales from the Faroe Islands (Kallenborn *et al*. 2004). The siloxanes, which belong to another class of compounds all together, but are widely used in a number of applications, are being analysed in blubber from pilot whales and white-sided dolphins sampled in Sandagerði and Gøta respectively in 2004.

White-sided dolphin

Sex and total body length in cm have been recorded from nearly all white-sided dolphins caught in 2004-2005 with kind assistance from the district police and the men evaluating the whales. In addition to sex and body length, full samples from the catches in Table 2 were taken from as many whales as possible within the time available.

II.3 Other studies

Cetaceans

Fin whale

In connection with the NAMMCO working group on fin whales, differences between the baleen whaling statistics kept at the IWC office in Cambridge and the material compiled by the Faroese Museum of Natural History have been examined in a joint study between NAMMCO and the IWC. The differences mainly involved the whaling period 1894-1950. With funding from the Faroes, different archives in Scotland and England as well as the IWC office in Cambridge were visited in April to find as much as possible of the missing material and to exchange materials between the institutions. With funding from NAMMCO, the archives at the Whale Museum in Sandefjord were visited in May and material copied.

The material contains the baleen whale catches taken from land stations in Ireland, the Hebrides, Shetland, the Faroes, Norway and the pelagic Norwegian catch. The material is nearly complete, and upon completion the Faroese Museum of Natural History and the IWC office will have one and the same agreed set of statistics.

The Norwegian request to the Faroese Museum of Natural History from the meeting of the NAMMCO study group on fin whales in Copenhagen in 2004 to check Norwegian catches is largely complete. Subject to further funding, future work will involve plotting of these catches.

Pilot whales

Ballistic studies were conducted on heads of dead pilot whales to investige the effect of different types and strengths of ammunition. This study is intended as a model for developing guidelines for methods used to undertake more controlled and standardised studies of different weapons and ammunition on different species, as recommended by the Council of NAMMCO in 2002.

A new knife with a longer blade than the traditional knife has been tried with positive results and further examinations will continue. In 2005 further steps have been taken in testing this new knife. Seven knives have been produced and distributed to the whaling districts. Selected hunters have received information about how the knife should be used. When this knife has been further tested and information on its use received from the hunters, the potential for more widespread production and use of this new instrument will be evaluated.

In 2005 this new knife was also tested on a stranded bottlenose whale with promising results. Two knives with a longer handle have also been made for testing in the near future.

III. CATCH DATA

Pinnipeds

Some grey seals are shot every year in defence of salmon farms, but the numbers are unknown. Proposals have been made to improve recording of this catch and to facilitate sampling.

Cetaceans

Table 1: Pilot whale drives in the Faroe Islands, 2004-2005.		
Date	Locality	Number of whales
20 March 2004	Tórshavn	1
8 June 2004	Bøur	445
28 June 2004	Vágur	26
29 June 2004	Leynar	84
5 July 2004	Fámjin	78
31 July 2004	Trongisvágur	30
4 September 2004	Tórshavn	22
22 September 2004	Bøur	82
9 October 2004	Tórshavn	242
2 May 2005	Fuglafjørður	123
16 June 2005	Sandur	54
12 July 2005	Húsavík	56
7. August 2005	Tvøroyri	22
16. August 2005	Hvalba*	49
28. august 2005	Svínoy	5
2004	**9 grinds**	**1010 whales**
2005 - until 1. October	**6 grinds**	**302 whales**

Table 2: Drives of species other than *G. melas* in the Faroe Islands, 2004-2005				
Date	Locality	Number	Species	Full samples
21 August 2004	Boðoyarvík	6	L. acutus	0
28 August 2004	Gøta	24	L. acutus	24

Table 2: Drives of species other than *G. melas* in the Faroe Islands, 2004-2005				
Date	Locality	Number	Species	Full samples
8 September 2004	Klaksvík**	291	L. acutus	35
9 September 2004	Rúnavík	7	L. acutus	0
18 September 2004	Hvannasund	5	L. acutus	0
16 April 2005	Hvannasund	7	L. acutus	0
6 May 2005	Æðuvík	1	H. ampullatus	1
12. August 2005	Fuglafjørður	271	L. acutus	21
12. August 2005	Sandavágur	12	L. acutus	12
16. August 2005	Hvalba*	20	L. acutus	22
2004	**5 pods**	**333**	**L. acutus**	**59**
2005 - 1 October	**4 pods**	**310**	**L. acutus**	**X**
2005 – 1 October	**X pods**	**1**	**H. ampullatus**	**1**

*Mixed pod, see Table 1/2.
** Part of a larger pod

IV. BY-CATCH DATA

No mandatory reporting scheme is implemented in the Faroes. In the mandatory fisheries logbook fishermen have the possibility to comment on by-catches, but the regularity of this reporting has not been investigated. By-catches of larger whales are usually reported by phone to the Museum.

Two incidents of grey seal by-catch in long-line fisheries operations were reported directly to the Museum in 2004.

V. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

None.

VI. PUBLICATIONS AND DOCUMENTS

Bloch, D. 2005. Norwegian coastal and pelagic whaling, 1917-1986. NAMMCO SC/13/FW/10.

Bloch, D. and Allison, C. 2005. Whale catches in the North Atlantic 1894-1984, taken by Norway, the Faroes, Shetland, the Hebrides, and Ireland. *NAMMCO*, report:.

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Bloch, D. and Mikkelsen, B. 2004. Skjórutur springari og hvessingur verða kannaðir. *Frøði* 2/2004: 10-14.

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4.2
GREENLAND - PROGRESS REPORT ON MARINE MAMMALS IN 2004

1. INTRODUCTION

This report summarizes the Greenland research on pinnipeds and cetaceans done in 2004. Most of the research was conducted by The Greenland Institute of Natural Resources (GINR), but some projects also involved the Department of Fisheries and Oceans, Canada (DFO), the Danish Environmental Research Institute (Department of Arctic Environment), Denmark, Marine Research Institute, Iceland, National Marine Mammal Laboratory, USA and Biodinamica, Rio de Janeiro.

2. RESEARCH 2004

2.1 Species and stocks studied

Pinnipeds

- Walrus *Odobenus rosmarus* – Northeast Greenland
- Hooded seal *Cystophora cristata* – Northwest Atlantic

Cetaceans

- Fin Whale *Balaenoptera physalus* –West Greenland
- Minke Whale *Balaenoptera acutorostrata* – West Greenland
- Humpback Whale *Megaptera novaeangliae* – Brazil
- Bowhead Whale *Balaena mysticetus* – Baffin Bay
- Right whale *Eubalanea glacialis* **-** North Pacific

2.2 Field work

Pinnipeds

In 2004 six adolescent and adult hooded seals were equipped with satellite-linked time/depth/temperature recorders.

Cetaceans

An aerial digital photo based strip survey for large whales (mainly minke and fin whales) was conducted off West Greenland in 2004 from August 8 to October 22.

One bowhead whale was instrumented with a time-depth-recorder in Disko Bay in May 2004, but the instrument was lost (GINR).

Three bowhead whales were instrumented with satellite transmitter in Cumberland Sound in June 2004 (GINR in a collaborative effort with DFO).

Two North Pacific right whales were instrumented with satellite transmitter in the southeastern Bering Sea in August 2004 (GINR in a collaborative effort with the National Marine Mammal Laboratory, USA).

Nine minke whales were instrumented with satellite transmitters off south Iceland in September 2004 (GINR in a collaborative effort with the Marine Research Institute, Iceland).

One humpback whale was instrumented off Brazil in November 2004 (GINR in a collaborative study with Biodinamica, Brazil).

Biopsies

Species	Area/stock	Calendar year 2004 total	Archived (N/Y)	Tissue type(s), stomach samples	Contact person/ institute
Minke whale	Greenland	103	Y	skin	GINR
Fin whale	Greenland	8	Y	skin	GINR
Fin or minke whale	Greenland	4	Y	skin	GINR

2.3 Research results

Pinnipeds

Three hooded seals all weighing less than 80 kg all stayed off East Greenland throughout the year whereas the others weighing more than 80 kg all went to the Davis Strait/Baffin Bay area and to the Front off Labrador during the breeding season.

2.4 Ongoing (current) research 2005

Pinnipeds:

a) This summer 16 hooded seals were equipped with satellite-linked time/depth/temperature recorders.

b) An increasing number of seals with bald spots or seals being almost completely bald have been reported the last few years. Twenty such seals will be collected for a thorough examination.

Cetaceans:

An aerial sighting survey for large cetaceans was conducted along the Greenland west coast during early fall, when also whale observations were collected from a ship conducting a capelin survey along the coast.

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 in Ittoqqortoormiit. All harp seals caught in Ittoqqortoormiit are believed to come from the Greenland Sea population, whereas catches from Ammassalik are split fifty-fifty between the Greenland Sea and the West Atlantic populations.

Reported catches on pinnipeds and small cetaceans are only available from 2003. The figures are preliminary and small adjustments are likely to be made.

Pinnipeds 2003:
Walrus:
East Greenland: 11; Central West Greenland: 130; Avanersuaq: 156
Ringed seal:
East Greenland Population: 17,849; Baffin Bay Population: 62,397
Hooded seals:
East Atlantic: 10; West Atlantic: 6,307
Harp seals (adult):
Greenland Sea: 376; West Atlantic: 29,698
Harp seals (Juvenile):
Greenland Sea: 1,071; West Atlantic: 37,061
Habour seals: (are being validated)
Bearded seals: 1,708

Small Cetaceans 2003
Narwhals:
East Greenland: 91; West Greenland: 575
Belugas:
East Greenland: (are being validated); West Greenland : 418
Habour porpoises: 2,320
Pilot Whales: 195
Killer whales: 19

Large cetaceans 2004

Catch numbers						
Species	Type of catch	Area/stock	Males	Females	Total Landed	Struck and lost
Fin whale	Aboriginal	West Greenland	5	6	11	2
Minke whale	Aboriginal	West Greenland	44	129	175*	4
Minke whale	Aboriginal	East Greenland	4	7	11	

* - no sex-data for two landed

Other non-natural mortality for the calendar year 2004

Species	Area/stock	Males	Females	Total	Cause	Methodology
Hump-back whale	West Greenland	1 1	1	2 1	By-catch* Illegal strike	Observation Observation

* - by-catch in fishing gear

4. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

None

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4.3
ICELAND -PROGRESS REPORT ON MARINE MAMMALS IN 2004

Compiled by Víkingsson, G.A., Ólafsdóttir, D., Gunnlaugsson, Th. and Hauksson, E.

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.

In 2004, research on marine mammals at the MRI was mostly confined to the research programme on minke whales initiated in 2003. Some of the other ongoing projects have therefore been delayed. Progress of the programme is reported under the respective headings of NAMMCO national progress reports.

2. RESEARCH

2.1 Species/stocks studied

Pinnipeds

Grey seal (*Halichoerus grypus*)
Harbour seal (*Phoca vitulina*)
Harp seal (*Pagophilus groenlandica*)
Ringed seal (*Phoca hispida*)

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*)
Striped dolphin (*Stenella coeruleoalba*)
Harbour porpoise (*Phocoena phocoena*)
Sowerby's beaked whale (*Mesoplodon bidens*)
Cuvier's beaked whale (*Ziphius cavirostris*)

2.2. Field Work

Pinnipeds

Grey seal pups were counted from an aircraft (3 times) during the breeding season in the autumn, on Norður Strandir (northeast coastline Vestfjord peninsula) NW-Iceland.

Cetaceans

Strandings

Information on stranded cetaceans in Iceland is compiled by the Marine Research Institute in cooperation with the Institute of Natural History and other relevant institutions (Table 1).

Table 1. Cetacean strandings in 2004

Id	*Species*	*No.*	*Sample*	*Date*	*Location*
S0401	Sperm	1	-	2004-01-08	Skipagerðisfjara, Landeyjar
S0402	Sperm	1	-	2004-01-19	Melar, Trékillisvík, Strandir
S0403	Striped dolphin	1	+	2004-01-28	Kjalarnes, Reykjanes
S0404	Northern Bottlnose	1	+	2004-02-19	Bakkafjara, A-Landeyjar, South coast
S0405	Sperm ?	1	-	2004-03-16	Hafnir, Reykjanes
S0412	Striped dolphin	1	+	2004-03-29	Héraðssandur, Héraðsflóa
S0406	Cuvier's beaked whale	1	+	2004-04-14	Víkurfjara, South coast
S0407	White beaked dolphin	1	+	2004-04-08	Eyrabakka harbour, South coast
S0408	White beaked dolphin	1	+	2004-04-26	Viðey, Faxaflói
S0409	Minke	1	-	2004-05-23	Borgarfjörður eystri
S0413	Minke	1	-	2004-06-01	Einarslón, Snæfellsnes
S0410	Pilot	1	-	2004-07-20	Selvogur, Reykjanes
S0411	Pilot	1	+	2004-07-29	Stakkhamrar, Snæfellsnesi
S0414	Northern Bottlnose	1	+	2004-11-08	Lónsreki í Kelduhverfi, Axarfjörður
S0415	Sowerby's beaked whale	1	+	2004-12-06	Lón í Kelduhverfi, Axarfjörður

Depending on the condition of the stranded animals, samples are taken for diet studies (stomach), life history studies (teeth, ear plugs, gonads), genetic studies (skin, muscle), energetic studies (muscle, blubber) and for morbillivirus antigen screening (blood). Various tissue samples for pollution studies have been routinely collected during dissections of stranded or bycaught cetaceans in recent years. These are stored frozen at the MRI (Tables 2 and 3).

Table 2. Samples from stranded animals in Iceland in 2004

Species		*Area*	*Date*	*No.*	*Tissue types**	*Contact*
S0402	Sperm whale	N	Jan	1	te	MRI
S0403	Striped dolphin	SW	Jan	1	mu, bl, sk, go, st, blood	MRI
S0404	N-bottlenose whale	E	Feb	1	te, mu, bl, sk	MRI
S0412	Striped dolphin	NE	March	1	mu, bl, sk, go, st	MRI
S0406	Cuvier's beaked whale	S	April	1	mu, ,bl, sk	MRI
S0407	White beaked dolphin	S	April	1	mu, bl, sk, go, st	MRI
S0408	White beaked dolphin	SW	April	1	mu, bl, sk, go, st	MRI
S0411	Pilot	SW	July	1	mu, bl, sk, go, st	MRI
S0414	N-bottlenose whale	NE	Nov	1	mu, bl, sk, go, st	MRI

* te=teeth, mu=muscle, bl=blubber, sk=skin, go=gonads, st=stomach

Table 3. Samples from by-catches 2004

Species	*Area*	*Date*	*Number*	*Tissue types*	*Contact*
White beaked dolphin	NE-Iceland	2004	1	mu, bl, sk, go, st	MRI

Research takes

During the period 3 June – 6 July 2004, 25 common minke whales were caught and sampled in Icelandic waters under special permit. The takes were part of a planned sample of 200 minke whales in total in a multi-year research programme that started in 2003. The whales were caught from three boats hired by the Marine Research Institute: *Njörður, KÓ-7* (18.04m, 30 tons), *Halldór Sigurðsson, ÍS-14* (17.6m, 41 tons) and *Trausti –ÍS-111* (25.0m, 93 tons). The crew was mostly composed of experienced minke whalers, and 2-4 scientists were onboard each of the vessels. Cruise leaders from the Marine Research Institute were in charge of the operation onboard each vessel.

Searching effort was distributed all around Iceland in proportion to known densities of minke whales as layed out in the sampling scheme for the nine areas. Minor sampling constraints were imposed by avoidance of whale watching areas and bad weather in offshore areas.

Basic information on the sampled animals in 2004 was provided in the Iceland progress report on marine mammal research in 2003 (NAMMCO Annual Report 2004). Females were more frequent than males (male/female ratio: 10/15) contrary to 2003 when males dominated in the sample (male/female ratio: 23/13). The large proportion of males caught off the southwest coast support the geographical segregation indicated from the 2003 sample. The sample size is however still too small to make general conclusions about sex segregation in the area.

Morphometric-, girth- and blubber measurements, quantitative estimation of ecto-parasitic infection and skin anomalies were performed on all animals onboard the vessels. Subsequently dissection and detailed tissue sampling was conducted on each animal. A sub-sample of 7 animals from SW-Iceland (Bormicon area 1) was brought to land for a full veterinary autopsy and detailed weighing of whole animals and individual organs was conducted in addition to routine investigations and samplings. By the end of the 2004 sampling season the total number of animals obtained since the beginning of the operation was 61. Samples were also obtained from 9 foetuses in 2004. Samples from these will be included in the studies as appropriate.

Systematic sighting data

Three aerial sighting surveys were conduced by one aircraft and the design implemented in the NASS-2001 survey (Pike and Víkingsson 2002) was adopted using the cue-counting procedure and minke whale as a target species. However, the flying time was reduced by roughly half compared to the 2001 survey and the effort was substantially decreased in most blocks (Pike *et al*. 2004b). The sighting surveys were primarily designed to investigate the seasonal distribution of minke whales in nearshore Icelandic waters as a part of the ongoing research programme on minke whales.

The first survey covering the whole nearshore area was conducted in the period 21-29th April (Pike *et al*. 2004d). The second survey was conducted 21 June to 10 July (Víkingsson *et al*. 2005). The tracklines north of Iceland were extended into offshore waters to the ice edge at 68°30 N in the midsummer survey. The third survey conducted 14-23. September managed limited coverage due to unfavorable weather.

MRI and a whale watching company operating in SW Iceland co-operated in reporting and compiling sightings data during whale watching excursions. This is a 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 nearshore Icelandic waters.

Telemetry data

A new type of tag for satellite tracking, developed by M.V. Jensen and M.P Heide Jørgensen was applied for the first time on a cetacean in Icelandic waters in the period 23 August to 27 September . Seven common minke whales were instrumented and positive signals were received from four animals. The last position was received 5th December about 1000 km northwest of the Cape Verde Islands, about 3700 km from the tagging location in Faxaflói Bay where the tag was instrumented more than three months previously (Víkingsson and Heide-Jorgensen 2005, Víkingsson *et al*. 2005).

Biopsy sampling

A single skin biopsy from a common minke whale was collected in connection with satellite tracking experiments.

Natural marking

Catalogues of individuals based on natural marking data are held at the MRI for blue, humpback and killer whales. Photographs are obtained in special cruises as well as from opportunistic platforms. No cruises were conducted in 2004 specifically to collect photo-id data.

2.3 Laboratory work

<u>Pinnipeds</u>

Age was determined from cross sections of the canine tooth for all grey seals whose jaws were delivered to the RCBSQ.

<u>Cetaceans</u>

The minke whale research programme

The overall programme assumes a catch of 200 minke whales spread over the Icelandic continental shelf area during May-September and is thus still in an early stage of the sampling phase. For some sub-projects, requiring complex setup for chemical analysis (pollution, genetics), it is considered unfeasible to start the laboratory work until more samples are available. Samples already obtained for most other sub-projects have been analysed or are at a final stage of laboratory analyses. Results will be reported when the total sample has been analysed. The status of different sub-projects of the programme is discussed under the representative sections below.

<u>Feeding and energetics</u>

Diet composition

Analyses of all diet samples from 2003 were finished. The contents of different stomach compartments were measured and identified to as low taxonomic level possible.

Energetics

Laboratory analysis of the energetic density of tissues, important for energy storage for samples obtained in 2003 and 2004 was initiated in 2004.

Hematology and serology

EDTA-blood samples from 20 animals and blood smears from 17 animals were collected and analysed from animals caught in 2004. The EDTA-blood was examined for the following hematological parameters: Hemoglobin, hematocrit (PCV), white blood cell count (WBC). The blood smears were examined under a microscope and a white blood cell differential count was performed. Preliminary results show no hematological abnormalities. However, final interpretation remains to be completed.

Microbiology

A total of 14 bacteriological samples from 12 animls caught in 2004 were analysed. Preliminary results of cultures from blood and major organs of these animals were negative with respect to pathogenic bacteria. However, final interpretation and further diagnostic work remains to be completed.

Virology

Faeces samples:

Rectal samples were analysed from 22 animals. 20% faeces suspensions in cell culture media were made and centrifuged at 2000g for 30 min at 4°C and the supernatant collected and frozen. The supernatants will be ultracentrifuged in 40% sucrose gradient and negative stained with uranyl acetate and examined in electron microscopy (EM). If any virus-like particles are found by EM examinations, virus isolations attempts will be made in cell culture lines from whales.

Biological parameters

Gonads from all animals caught in 2004 (15 females and 10 males) have been anlaysed for sexual maturity for both sexes and reproductive history for females. Analyses of growth layers in earplugs and of amino acid razemisation in eye lenses for the samples taken in 2003 and 2004 are underway.

Environmental contaminants

Of the 61 samples collected in 2003 and 2004, 25 animals were selected for detailed studies on organic and inorganic contaminants. All tissues to be analysed for trace elements have been processed except bones which awaits the sampling of 2005. Five animals from 2003 have been analysed for dibenzo-p-dioxins, dibenzofurans, dioxinlike PCBs and marker PCBs in blubber while the analysis of the remaining samples for organic contaminants of the original programme is ongoing. Some of these will be done in laboratories outside Iceland.

Interpretation and diagnostic work in reference to biological parameters, trophic status, body condition and geographical variation is planned to be completed by the end of this year.

Strandings

Laboratory work on blood sampled from stranded and bycaught cetaceans was screened for morbillivirus antibodies at the Institute for Pathology, University of Iceland.

Analyses of abundance and trends

Analysis of data collected during the NASS-2001 sightings survey is being coordinated through a special working group under the Scientific Committee of NAMMCO. Estimates of abundance and/or trends of fin (Pike *et al.* 2004a), blue (Pike *et al.* 2004c), minke, humpback, long-finned pilot, northern bottlenose, and sperm whales as well as *Lagenorhynchus spp.* have been discussed by the working group.

Genetics

Common minke whale

A database of the DNA profiles of Icelandic minke whales is being constructed at MRI according to the Norwegian DNA database (Olaisen 1997, Dupuy and Olaisen 2002, IWC 1998). The database will contain the profile of every legally obtained minke whale in Iceland. The DNA profile of each individual entered into the database is composed of 10 microsatellite DNA genotypes (allele sizes), Y chromosome DNA genotypes (allele sizes for sex determination) and mtDNA sequence data. The genetic analysis for the animals taken under scientific permit in 2003 and 2004 is ongoing.

Fin whale

Analysis of samples of fin whales from Iceland 1981-1989 (n=1,069), Spain 1985 (n=46), Norway (n=57), West Greenland (n=10) and Eastern Canada (n=38) using 12 microsatellite loci, Y chromosome DNA genotypes (for sex determination of biopsy samples) and mtDNA sequence data started in 2004. The aim is to study the temporal and micro- and macrogeographical population structure of Northeast Atlantic fin whales. In the study, the same loci were tried as used in the fin whale study by Bérubé *et al.* (1998) and (2002).

2.4 Other studies

Studies on historical whaling records from land stations in Iceland during 1883-1915 were initiated.

2.5 Research results

Pinnipeds

The results of the partial grey seal count in NW Iceland indicate a much lower pup production there than in the survey conducted in 2002. According to recent combined counts the forecast stock size of 1+ animals in 2004 was 4,100.

Cetaceans

Sighting analysis

Preliminary results of an analysis of densities of common minke and some other cetaceans by season, based on the aerial surveys are given in (Gunnlaugsson 2004; 2005). Table 4 gives some statistics for the aerial surveys conducted in 2004.

Table 4. Results of the sighting surveys in Icelandic waters in 2004

Type of survey:	Aerial		
Area:	Icelandic-Coastal		
Period:	April 2004	June 2004	September 2004
Effort (Nm)	2,155	3,330	1,181
Number of species	9	9	7
Number of sightings	221	430	75
Number of animals	628	1,170	370
Minke anim./sight.	17	186/176	37/33
Dolphin anim./sight.	311/79	686/148	236/40

Trends in the distribution and abundance of cetaceans in Icelandic coastal waters was analysed from sighting data from the aerial NASS surveys 1986 to 2001 (Pike *et al.* 2004b)

Sighting data from the shipboard survey in 4-30 June 2003 was compared to earlier shipboard surveys around Iceland. Sighting rates were similar to the 2001 NASS survey in July, generally higher for toothed whales but lower for baleen whales (Pike *et al.* 2004a) except for humpback whales (*Megaptera novaeangliae*) which showed a somewhat wider distribution. Estimates of the abundance of blue whales were calculated (Pike *et al.* 2004c).

2.6 Ongoing current research

In August 2003 the government of Iceland decided to start implementation of a wide ranging research programme concerning common minke whales. Progress has been reported to the Scientific Committees of NAMMCO and the IWC SC (Víkingsson *et al*. 2004, NAMMCO 2005). In July and August 2005 39 minke whales were caught as a part of the programme bringing the total catch up to 100. Thus, the sampling has proceeded considerably more slowly than assumed in the original plan where a catch of 200 common minke whales was assumed in two years. The objectives, methodology, total sample size and spatial and seasonal distribution of the sample remain unchanged from the original proposal (for details see Marine Research Institute 2003) and the modifications involve only a reduced rate of sampling. It is now envisaged that sampling will be completed in 2007 or 2008.

Analysis of historical catch statistics for fin whales from land stations in Iceland during the first period of modern whaling was conducted as a part of the the NAMMCO Scientific Committee assessment of this species (SC/13/FW/6). Studies on stock structure of North Atlantic fin whales were also conducted as a part of this assessment (SC/13/FW8, SC/13/FW/9).

4. CATCH DATA

4.1 Pinnipeds

Catch figures for 2004 are 146 harbour seals (140 pups and 6 1+ animals), 295 grey seals (96 pups and 199 1+ animals), 1 ringed seals and 5 harp seals.

As in recent years Icelandic authorities issued a permit to Norwegian sealers to catch harp and hooded seals inside Icelandic EEZ but to date they have not reported any catches in 2004.

4.2 Cetaceans

Table 4**.** Direct catches (commercial, aboriginal and scientific permits) for the calendar year 2004*

Species	*Type of catch*	*Area/stock*	*Males*	*Females*	*Total landed*	*Struck and lost*
Minke whale	Special permit	CIC	10	15	25	0

*Detailed list in Annual Report 2004

5. BY-CATCH DATA

Reporting of marine mammal by-catch in the Icelandic fishery is mandatory. All fishing vessels are obliged to report catch and by-catch in log books. No observation scheme is carried out in order to evaluate the reliability of the system. The reporting is entirely based on the cooperation of the fishermen and is therefore voluntary in practice, most likely resulting an inadequate monitoring of marine mammal by-catch in the Icelandic fishery.

The procedure of reporting marine mammal by-catch via logbooks has been introduced specially by a letter and species identification guide sent to the gill net fleet in 2002 and again with all new log books delivered to the fishermen since.

Table 5. Marine mammal by-catch reported from Iceland in 2004

Species	*Period*	*Gear*	*Number*	*Remark*
Humpback	Jan	purse seine	1	NW Icel.
Harbor porpoise	Jan-June	gill net	103	
Harbor porpoise	July-Dec	gill net	259	
Unid. Dolphin	July-Dec	gill net	3	
Common seal	Jan-June	gill net	19	
Common seal	July-Dec	gill net	51	
Grey seal	Jan-June	gill net	3	
Grey seal	July-Dec	gill net	4	
Ringed seal	Jan-June	gill net	1	
Harp seal	July-Dec	gill net	2	
Total			446	

6. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

6.1 Pinnipeds

Based on the most recent survey of harbour seals from August 2003 the MRI concluded that recent removals, including unknown numbers entangled in fishing nets, were not sustainable. It is not clear whether the decline in abundance will continue, although recent direct catches are much reduced, as the by-catch is probably underestimated. The MRI therefore stressed the importance of better by-catch recording and that the stock be monitored, including aerial surveys at two or three year intervals in the next years. The MRI called for management objectives for the stock of harbour seals.

No count of grey seal pups is planned for 2005 and the count in 2004 was only partial. The MRI drew attention to the increasing uncertainty about this stock and that this would soon lead to a call for action in light of the management objectives recently set for this stock.

6.2 Cetaceans

No commercial whaling was conducted in Icelandic waters in 2004. The MRI recommended a precautionary TAC of 150 fin whales if all catches are taken on the traditional grounds west of Iceland. If catches are distributed over a wider area the recommended TAC was 200 fin whales. Similarly a total limit of 400 minke whales within the Icelandic EEZ was recommended by the MRI. These recommendations were based on recent assessment by the Scientific Committee of NAMMCO.

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4.4
NORWAY - PROGRESS REPORT ON MARINE MAMMALS IN 2004

Sidsel Grønvik, Tore Haug & Nils Øien

1. INTRODUCTION

This report summarises the Norwegian research on pinnipeds and cetaceans conducted in 2004. 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 , Section of Arctic Veterinary Medicine (NVH-SAV), the Institute of Marine Research (IMR), the Norwegian Polar Institute (NP), the National Veterinary Institute (VI), 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, Gulf of St. Lawrence, Canada
- Hooded seals *Cystophora cristata* - Greenland Sea
- Harbour seals *Phoca vitulina* - Norwegian coastal waters
- Grey seals *Halichoerus grypus* - Norwegian coastal waters
- Bearded seals Erignathus barbatus - Svalbard
- Ringed seals *Phoca hispida* – Svalbard
- Cape fur seals *Arctocephalus pusillus pusillus* - Namibia
- Steller sea lion *Eumetopia jubatus* – North Pacific Ocean and Okotsk Sea
- Walruses *Odobenus rosmarus* - Svalbard

Cetaceans

- Sperm whales *Physeter macrocephalus* - Northeast Atlantic
- Minke whales *Balaenoptera acutorostrata* - Northeast Atlantic
- Fin whales *Balaenoptera physalus* - Northeast Atlantic
- Humpback whales *Megaptera novaeangliae* - North Atlantic
- Bowhead whale *Balaena mysticetus* - Arctic
- Killer whales *Orcinus orca* – Northeast Atlantic
- Blue whales *Balaenoptera musculus* - Northeast Atlantic
- Pilot whales *Globicephala melas* – Northeast Atlantic
- White-beaked dolphins *Lagenorhynchus albirostris* – Northeast Atlantic
- White-sided dolphins *Lagenorhynchus acutus* – Northeast Atlantic

2.2 Field work

Pinnipeds

It is recommended that comprehensive aerial surveys needed to provide estimates of current pup production should be conducted periodically (c. every 5 year), and that efforts should be made to ensure comparability of survey results. The most recent abundance estimate for harp seals in the northwest Atlantic is from 1999. For this reason, new surveys were carried out in March 2004 using an ice going vessel ('Ann Harvey'), two helicopters and three fixed-wing aircrafts. Norwegian and Russian scientific personnel participated in the field work. (IMR)

In May/June 2004, a Norwegian survey was conducted, aimed to study the feeding habits of harp seals occurring in the open waters of the Barents Sea. Very few seals were observed along the coast of Finnmark, and no seals were seen in the open, ice-free areas. In the north-western parts of the Barents Sea, however, very large numbers of seals were observed along the ice edge and 20-30 nautical miles south of this. (IMR)

As part of a larger study on diving physiology a Doppler ultrasonic device in combination with a sonographic contrast medium were used to test whether free-living harp seal pups have a closed (anatomically or functionally) foramen ovale (FO). A total of 34 examinations were performed on 34 harp seal pups with a body mass range of 9.5-37.5 kg (0–13 days old). Harp seals do not dive during the first weeks of life. A closed FO was found in only 6 pups (18%) and even in the weight group above 30 kg only 2 pups (17%) had a closed FO. Thus, harp seal pups do not seem to be in a hurry to close their FO. This study was conducted in Gulf of St. Lawrence, Canada, during early March. (NP)

Physiological studies of hooded seals from the Greenland Sea stock were conducted in connection with a research cruise with FF "Jan Mayen" in the Greenland Sea between 21 March and 7 April 2004. A total of fourteen adult female and seven newborn hooded seals were used in studies concerning a) neural tolerance to hypoxia (oxygen shortage) and b) pineal gland anatomy and physiology, as further outlined below. Another nine weanling hooded seals were live captured and brought back to the Department of Arctic Biology (AAB), for later studies of various aspects concerning neural tolerance to hypoxia during diving (UiT-AAB).

Studies of hypoxia tolerance of nervous tissue from hooded seals were conducted in collaboration with Dr. J.M. Ramirez of Department of Organismal Biology and Anatomy, University of Chicago, using in vitro electrophysiological recordings with thin slices from the cerebral (visual) cortex in a ship-based electrophysiological laboratory onboard the FF "Jan Mayen". We have previously shown that the central nervous system of diving mammals (which are regularly exposed to hypoxic conditions in connection with long duration diving) displays a higher tolerance to hypoxia than does corresponding nervous tissue from non-diving mammals. We have now conducted follow-up studies to elucidate the cellular mechanisms underlying this comparative difference, using a total of eight adult and two newborn animals. Brain samples were also collected from the same animals, for later analyses of the occurrence and levels of the neurally based respiratory pigment neuroglobin, in collaboration with Dr. T. Burmester, Institut fuer Zoologie, Universitaet Mainz, Germany (UiT-AAB).

The brains of four newborn hooded seals were collected and fixed in phosphate-buffered 4% formaldehyde for later micro- and macro-anatomical studies concerning the ontogeny of the pineal gland. Segments of uterine and renal arteries from nine adult female hooded seals were moreover frozen in liquid nitrogen, for later immunohistochemical analyses of the occurence and distribution of receptors for the hormone melatonin (which is secreted from the pineal gland). Both studies are conducted in collaboration with prof. Morten Møller, Inst. Med. Anat., University of Copenhagen, and concern the potential role of the pineal gland and its melatonin secretion in securing an adequate blood supply to the growing fetus during diving in pregnant females UiT-AAB)

During the research cruise mentioned above, faecal samples were also collected from nine adult female hooded seals in a study addressing the frequency of occurrence of antibiotic-resistant micro-organisms in animals and environments in remote areas. (UiT-IP) (IP = Institute of Pharmacology)

Studies of age- and sex composition, body condition and feeding ecology were performed on harp seals invading the coast of North Norway in February. (IMR, NFH-UIT)

Abundance estimation using aerial photographic surveys was performed for harbour seals in Mid and North Norway in August (*i.e.*, the moulting period, methodology based on total counts). Additionally, to be able to adjust the estimates for animals not hauled out during the surveys, the haulout behaviour of the species was investigated on a special location in Vesterålen in August. (IMR, NFH-UIT)

The biology and ecology of grey seals (demography, condition, diet, reproduction, genetics, pollutants, virus infections) were studied in ship-borne surveys conducted in North Norway in February. (IMR, NFH-UIT)

Material to assess demographic parameters was collected from the Norwegian grey and harbour seal hunt. (IMR)

In Rogaland County, breeding harbour seals were surveyed in Lysefjord in June. Grey seal pups were tagged in the Kjør area in December. (OM)

Polar bears were tracked to study predation on ringed seals in Storfjorden, Svalbard. This is part of a larger climate-related programme studying relations between snow and ice, polar bears and ringed seals. (NP)

Various samples were collected from 110 ringed seals for studies of population dynamics, diet, parasites, pollutants and general health assessment during April-late May in various fjords on Spitsbergen.(NP)

Satellite transmitters were deployed on 9 adult walrus males on Nordaustlandet, Svalbard, in early August. In addition blubber and blood samples were collected from these animals for studies of pollutants, diets and for a general health assessment. Skin biopsies were collected from 40 animals for genetic studies. (NP)

IMR vessels and coastguard vessels have collected incidental observations of marine mammals. Recorded data include date, position, species and numbers.

Cetaceans

During the traditional whaling season (May-June), stomach samples, body condition data and biological material for studies of demography and reproduction were collected from minke whales by scientific personnel on three 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. (IMR)

During the period 29 June to 15 August 2004 a sighting survey was conducted with two vessels covering the North Sea and the southern part of the Norwegian Sea, between the latitudes 56ºN and 65ºN. This was the third year of the recent six-year programme 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 a few whale species (white-beaked dolphin, white-sided dolphin and pilot whales).(IMR)

In May-June a feasibility study to apply satellite tags on *Lagenorhynchus* dolphins was conducted. (IMR)

In August-September field work was conducted in the Vestfjord area in cooperation with Forsvarets Forskningsinstitutt to study diving behaviour of minke whales and killer whales and the effect of active sonars on their dive patterns. (IMR)

During the MARECO survey along the mid-Atlantic ridge in June-July, marine mammal sightings were recorded. (IMR)

In August to September mapping of whale distributions was conducted during the ecosystem surveys in the Barents Sea by having dedicated whale observers onboard, who collected information following line transect protocols. During the survey, humpback whale photo IDs were also collected. (IMR)

Collection of by-catch data from fishing vessels has been initiated and information material produced and distributed. (IMR)

Work to develop an electronic monitoring system to independently monitor the activities of the Norwegian minke whale vessels started in 2001. In 2003 a new prototype was successfully tested on four whaling vessels during the whaling season The work continued with field testing on a larger number of boats during the whaling season in 2004. (NVH-SAV)

2.3 Laboratory work

Pinnipeds

Data on age, body condition, stomach samples, blubber profiles (fatty acids) and muscles (stable isotopes) of harp and hooded seals taken in scientific operations in pack ice areas in the Greenland Sea and Barents Sea are being analysed. (IMR, NP, NFH-UIT)

Demographic data from harp and hooded seals taken in commercial catches and from the Norwegian coastal grey and harbour seal hunt are being analysed. (IMR)

Pictures from aerial photographic surveys aimed to estimate the total population of harbour seals along the coast of Norway have been analysed. (IMR)

Data on age and body condition and stomach samples from grey seals taken for scientific purposes in North Norway are being analysed. (IMR, NFH-UIT)

Tissues sampled for stock identity studies of grey seals are being analysed using DNA techniques. (IMR)

Screening of OC pollutants in the outer blubber layer from biopsy samples of three baleen whale species (blue whales, fin whales and humpback whales) and four toothed whale species (sperm whales, killer whales, pilot whales and whitesided dolphins) have been finalized (VI, NVH, IMR).

Databases containing recapture information and incidental observations of marine mammals have been updated. (IMR)

Personnel from IMR have contributed to a satellite tagging project in Namibia on Cape fur seals, and arranged a course and workshop in Namibia on age determination of seals. (IMR)

Additional studies of hypoxia tolerance of nervous tissue from hooded seals were conducted in collaboration with Dr. J.M. Ramirez of Department of Organismal Biology and Anatomy, University of Chicago, using in vitro electrophysiological recordings with thin slices from the cerebral (visual) cortex that were derived from hooded seals that were live-captured during a research cruise to the Greenland Sea, as detailed above under subheading “b. Field work”. Brain samples were also collected from the same animals, for later analyses of levels of the neurally based respiratory pigment neuroglobin in hooded seal neural tissue, in collaboration with Dr. T. Burmester, Institut fuer Zoologie, Universitaet Mainz, Germany. (UiT-AAB).

Cetaceans

Stomach content samples from minke whales have been analysed using traditional methods where the original biomass of prey items is reconstructed based on remaining hard parts in the contents. (IMR)

Tissues sampled for stock identity studies of minke whales have been archived and analysed using DNA techniques. (IMR)

The population structure of bowhead whales during postglacial time is studied using DNA extracted from ancient (bones and baleen) and tissue from extant individuals. The project is performed in cooperation between UIO-ZM, University of Bergen, IMR, NP, and Wildlife Conservation Society, NY. The material forming the basis for the investigation is about 300 samples of bone remains found along the coasts of Svalbard and the Norwegian mainland. About 200 of these have been radiocarbon dated from recent to about 40,000 years old. Up to now parts of the mitochondrial DNA control region from about 80 individuals have been sequenced. (UIO-ZM)

Databases containing incidental observations of marine mammals have been updated. The work with cataloguing identification photos of humpback whales from Norwegian and adjacent waters is progressing. (IMR)

2.4 Other work

Pinnipeds

Pup vocalisations in harp seals have been analysed and published. (NFH-UIT)

Assessments of the status and data requirements for abundance estimation of grey seals have been done. (IMR)

Data on foraging habits of harp and hooded seals taken in scientific operations in pack ice areas in the Greenland Sea has been analysed and presented. (IMR, NFH-UIT)

Results from analyses of fatty acid profiles in blubber material from harp seals collected in the northern Barents Sea have been presented. (IMR, NP)

Results from analysis of bearded seal behaviour have been analysed and published. (NP, NFH-UIT)

A simplified and standardized blubber sampling procedure is suggested in future monitoring programmes with the aims to analyse time trends and demonstrate geographical differences of OCs in phocid seals. (VI, NVH, NP)

Cetaceans

Data on minke whale predation and competition with other top predators in the Barents Sea have been analysed. (IMR, NFH-UIT)

Vocalisations in killer whales have been analysed and published. (NFH-UIT)

Photo-ID data from sperm whales in Vesterålen, North Norway, have been analysed. (NFH-UIT)

NVH-SAV has been engaged in co-operative work with scientists, whale hunters and managers of whaling in Norway, USA (Alaska) and Canada (Nunavut) to improve the weapons and gear used for the hunting of whales. The Department has also been engaged in preparation of user's manuals for whale hunters and in planning and performance of workshops on whale killing methods in NAMMCO. (NVH-SAV)

2.5 Research results

Pinnipeds

From 14 March to 6 April 2002 aerial surveys were carried out in the Greenland Sea pack-ice (the West Ice), to assess the pup production of the Greenland Sea population of harp seals. One fixed-wing twin-engined aircraft was used for reconaissance flights and photographic strip transect surveys of the whelping patches once they had been located and identified. A helicopter assisted in the reconnaissance flights, and was used subsequently to fly visual strip transect surveys over the whelping patches. The helicopter was also used to collect data for estimating the distribution of births over time. Three harp seal breeding patches (A, B and C) were located and surveyed either visually and/or photographically. Results from the staging flights suggest that the majority of harp seal females in the Greenland Sea whelped between 16 and 21 March. The calculated temporal distribution of births were used to correct the estimates obtained for Patch B. No correction was considered necessary for Patch A. No staging was performed in Patch C; the estimate obtained for this patch may, therefore, be slightly negatively biased. The total estimate of pup production, including the visual survey of Patch A, both visual and photographic surveys of Patch B, and photographic survey of Patch C, was 98 600 (SE = 20 300), giving a coefficient of variation for the survey of 20.5%. This is an underestimate due to the presence of unestimated areas along transects during the photographic surveys. Adding the obtained Greenland Sea pup production estimate to recent estimates obtained using similar methods in the northwest Atlantic (in 1999) and in the Barents Sea / White Sea (in 2002), it appears that the entire North Atlantic harp seal pup production, as determined at the turn of the century, is of a magnitude of at least 1.4 million animals per year. It is recommended that comprehensive aerial surveys needed to provide estimates of current pup production should be conducted periodically (c. every 5 year), and that efforts should be made to ensure comparability of survey results. Therefore, the 2002 surveys in the Greenland Sea (with subsequent laboratory analyses) included participation by Canadian and Russian scientific personnel. (IMR)

During the 2002 Greenland Sea survey, studies were made also of harp seal pup vocalisations. The pups produced three call types: tonal, pulsed, and a combination of the two. Only tonal vocalisations were used for classification tree analyses where 43% of 4,075 vocalisations were classified correctly according to individual. 55% of 42 female pups and 8% of 49 male pups were correctly identified based on vocal parameters. Calls were misclassified according to individual, but never according to sex. Repeated measures of eight individuals over several age classes showed that 82% of 869 calls were correctly classified regardless of age. Alongside vision and smell, acoustic cues appear to be important in relocating offspring. Differences in vocal variability between sexes may reflect different selection pressures working on males and females. (NFH-UIT)

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 special attention to the period July-February (i.e., between moulting and breeding), which is known to be the most intensive feeding period for both harp and hooded seals. 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 and

2002 (autumn), July/August in 2000 (summer), and February/March in 2001 and 2002 (winter). Results from analyses of stomach and intestinal contents from captured seals revealed that the diets of both species in this particular habitat were 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 and sampling period/area, these five prey items constituted 63-99% of the observed diet biomass in both seal species, irrespective of sampling period. During sampling in summer (July/August) in 2000 and winter (February/March) in 2001, harp and hooded seals were observed to co-occur in the sampling areas. This facilitated description and comparison of their diets. For hooded seals, *G. fabricii* and capelin were the dominant food items in winter 2001, but the summer 2000 diet comprised a mixture of this squid and polar cod. *Parathemisto* was most important for the harp seals during summer 2000, whereas in winter 2001 the contribution from krill and capelin were comparable to that of *Parathemisto*. Multivariate analyses revealed significant differences in the intestinal contents of hooded and harp seals, in areas where the two species' occurrence showed spatial overlap. Different foraging depths of the two seal species may have contributed to the observed differences in diets. Studies of diving behaviour of harp and hooded seals in the Greenland Sea have revealed that both species usually perform more shallow dives during summer than during winter, and that hooded seals dive to deeper waters than harp seals in both periods. Except for the youngest stages, which may occur in the upper water layers during summer, the major hooded seal prey *G. fabricii* has a typical mesopelagic distribution with occurrence mainly at depths greater than 400 m. This is in contrast to the distribution of the major food of harp seals: the observed krill and amphipod species are usually confined to the more upper water layers (< 200m depth). (IMR)

Based on dorsal blubber cores collected in October 1995, fatty acid profiles and lipid biomarkers from 20 harp seals were used to investigate the foraging ecology of the species and the transfer of energy through the Franz Josef Land – Novaya Zemlya food chain. High level of the *Calanus* fatty acid trophic markers (FATMs) 20:1(n-9) (mean 14,6 %) and 22:1(n-11) (mean 6.5%), together with the typical dinoflagellate FATM 22:6(n-3) (mean 6.5%) and C18PUFA (mean 5.5%), were found in blubber samples. Based on analyses of the fatty acid profiles by principal component analysis, the importance of polar cod and the *Parathemisto libellula* in the diet of harp seals was confirmed. The high levels of 22:6(n-3), C18PUFA and C20 and C22 FATMs indicate that the harp seal lipids mainly originate from dinoflagellates consumed by *Calanus* copepods. (NP, IMR)

In 2001 and 2002, Norwegian and Russian scientists performed an aerial survey to assess whether there was an overlap in distribution, and thus potential predation, between harp seals and capelin in the Barents Sea. This experiment is now being followed with boat-based surveys aimed to study pelagic feeding by harp seals in the Barents Sea during summer and autumn. In May/June 2004, a Norwegian survey was conducted, aimed to study the feeding habits of harp seals occurring in the open waters of the Barents Sea. Very few seals were observed along the coast of Finnmark, and no seals were seen in the open, ice-free areas. In the north-western parts of the Barents Sea, however, very large numbers of seals were observed along the ice edge and 20-30 nautical miles south of this. In these areas, 33 harp seals were shot and sampled (stomachs, intestines, blubber cores). Additionally, samples of faeces were taken from the haul out sites on the ice. Preliminary results from the analyses indicate that krill was the main food item for the seals. (IMR)

During the period September-January in 2001-2003, ship based registrations of grey seal pups, including tagging, counting and staging of pups, were conducted along the Norwegian coast from Rogaland county in the south to Finnmark county in the north. All known and many other potential whelping areas along the Norwegian coast were surveyed. Most sub-areas were surveyed one or two times whereas some hot-spots were surveyed 3-4 times. The investigations resulted in a total minimum estimate of an annual grey seal pup production of approximately 1,200 pups in Norwegian waters. Nordland county was the most important whelping area where about 50% of the pups were born. Total population estimates were derived from estimates of number of pups born by estimating a range of multipliers (4.28-5.35), based on observed annual growth rates of 6.4-12 % in other grey seal populations. This gave a total estimate of approximately 5,150-6,440 one year and older (1+) grey seals in Norwegian waters. However, pup production was underestimated as only one pup count was conducted in most of the whelping sites. (IMR)

To enable an assessment of organochlorines (OCs) in phocid seals regardless of seasonal variations, a field and laboratory study was initiated in 1999, involving fat and thin harp seals. Females with approximately similar size, from the same population, were sampled in March (fat group) and May (thin group), respectively. This was in order to ensure the greatest degree of biological conformity between the groups (sex, age and genetics), and enabling focus and the importance of the blubber matrix. Significantly higher mean concentrations of OCs in the thin seals as compared to the fat seals were found when comparing homogenized blubber sampled through the entire blubber column. Difference in OC blubber concentrations between the two seal groups does not, however, reflect differences in OC exposure. When introducing the total blubber burden of OCs and thus considering the quantity of OCs in the entire blubber mass, this study demonstrates comparable OC levels in thin and fat seals. Hence, it is mainly a function of dilution. The present study also revealed that the OCs are relatively homogenously distributed horizontally in the seal blubber and that a concentration gradient only was apparent in a vertical direction throughout the blubber layer. It is recommended that future monitoring programmes with the aims to analyse time trends and possibly demonstrate geographical differences of OCs in phocid seals, avoid the use of solely blubber concentrations and offer more focus on the total blubber burden of OCs. The estimation of the total blubber mass in phocid seals may be found in Ryg *et al.* (1990). The biological variables of sex and age are of course still important parameters to include in the assessment of the OC results (VI, NVH, NP).

As required in the context of the ICES WGHARP, further updating of an assessment model for Barents Sea harp seals has been conducted, and the model has been implemented in a programme package for easy running and sensitivity testing. (IMR)

Studies of hypoxia tolerance of nervous tissue from hooded seals show that neurons within cerebral cortical slices from these seals do, indeed, display a higher tolerance to hypoxia than do similar preparations from non-diving mammals (*e.g.*, mice) during standard hypoxia exposure tests. The cellular mechanism(s) responsible for this difference in hypoxia sensitivity are as yet unknown. Currently analyses are performed of neuronal levels of the respiratory pigment neuroglobin in hooded seal brains. This globin, first described in mammals in 2000, appears to be important for the neural tolerance to hypoxia in mice, presumably by facilitating the transport of oxygen into the neurons. Results from these analyses are, however, not yet available (UiT-AAB).

Analyses of samples collected in the field, in connection with studies of pineal gland function and melatonin secretion in hooded seals are also under way, but results are not yet available (UiT-AAB)

On 1st December, 32 out of 37 grey seal pups were tagged on Kjør in Rogaland, and additionally 30 adult grey seals were observed in the area. During the grey seal survey biopsy samples were collected from 36 pups (OM)

Result from a ship-borne survey of harbour seals in Lysefjord in Rogaland County 26th June, revealed an observed breeding population of 40 adults and 15 pups. One pup was tagged (OM).

Cetaceans

Two new dive time series on minke whales and one on a killer whale have been collected in the Vestfjord area during September 2004. Blow rates calculated are comparable to earlier data collected by VHF instrumentation and visual experiments. (IMR)

The Norwegian DNA register for minke whales has been used for paternity studies by using DNA-profiles from 288 mother-fetus pairs to obtain partial DNA-profiles for the fathers of the fetuses. The father profiles have then subsequently been matched against the male part of the DNA-register. This has lead to identification of three likely instances of paternity. Such data can be used to obtain new biological information and to estimate the number of reproductively active males in the population. (IMR)

Data from ecosystem surveys along the Barents Sea shelf edges in 2000, 2001 and 2002 have been used to investigate the principal processes underlying distributions of minke, fin and sperm whales and *Lagenorhynchus* dolphins observed along the cruise tracks. The observations were combined with simultaneously collected data on habitat (depth, sea surface temperature, and temperature gradients) and prey (plankton, 0-group fish, capelin and herring) distributions in a Geographic Information System (GIS) to investigate habitat and prey selection. Minke whales were associated with cold waters and herring, and capelin in years with low herring abundance. Fin whales were mainly associated with northern cold and deep waters, as well as capelin, 0-group fish and plankton. *Lagenorhynchus* dolphins were associated with capelin. Finally, sperm whales were associated with deep waters and 0-group fish, probably indirectly attracted to 0-group fish through preying on predatory fish such as *Sebastes spp* and squid *Gonatus spp.*. The cetacean species responded differently to annual variation in habitat and prey distributions. Minke and fin whale distributions and abundances remained similar between years within the study area, suggesting that these species are generalists responding to environmental changes by switching between prey species. Conversely, *Lagenorhynchus* dolphins shifted northwards, likely due to tracking the shifting capelin distributions. (IMR)

The work on methodological developments on statistical applications have continued. (IMR)

Contributions have been made to developing the scientific basis for environmental quality objectives for the Barents Sea ecosystem. (IMR)

Abundance estimates for fin, sperm and humpback whales based on the 1996-2001 survey cycle have been provided. (IMR)

Data from surveys and incidental observations of cetaceans have been used in contributions towards mapping marine mammal distributions for the Lowfrequent Active Sonar (LFAS) project to study the effects of the sonar on marine life. (IMR)

The scientific whaling under special permit and subsequent establishment of a routine sampling scheme during commercial whaling operations have yielded a time series (1992-2004) 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 have 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 of 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 suggest 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. Recent attempts to include minke whale consumption of herring in the model used to assess Norwegian spring spawning herring have shown marked reduction in perceived herring stock size compared with standard "non whale" assessments. The analyses demonstrates that incorporating predation by high trophic-level predators such as the minke whale in standard assessment models is feasible and can be a valuable tool in fish stock assessment. The results given also demonstrate the usefulness of performing ecological investigations over a range of scales. The minimum requirements of data for both the small, medium and large scale investigations are information on the relative diet composition of the predators. To put the large scale results in an ecological perspective, one needs information about population size and structure, and large scale information about the resource base. More detailed small scale studies of prey selection must, however, be supported with resource mapping studies which occur concurrently and synoptically with the sampling of whale diet data. (IMR)

In a small and medium scale experiment, minke whales and cod were collected in the southern Barents Sea to investigate prey preference, niche overlap and niche width for the two species. A resource survey was conducted simultaneously with the whale and cod sampling. The diet of cod consisted mainly of capelin, deep water shrimp, gadoids and krill. The smallest cod preferred capelin whereas the largest cod preferred gadoid species including cod. The minke whale diet consisted mainly of capelin, herring and krill, and showed a particular preference for herring and capelin. Krill were consumed in large quantities, but did not seem to be a preferred food item for either cod or minke whales. In contrast to cod, which fed very little on herring, the minke whale fed heavily on herring in some areas. The niche widths for both cod and minke whales were relatively low, and the diet overlap between minke whale and cod was low, but potentially present.

Photo identification pictures taken of sperm whales on a whale watching site in Vesterålen, North Norway, in 2002 have been compared with similar pictures taken during 1987-2001 in the same area. A total of 55 individuals were identified in the area over a period from late May to early September 2002: 37 of these had not been seen in the area before, whereas 18 had been observed also in the period 1987-2001. For the latter group, there are indications of "residence" times from 1 and up to 14 years in the area. Apparently, when individuals also seen in in previous years were present in sufficient numbers, the number of "newcomers" decreased. (NFH-UIT)

Preliminary pollutant results from biopsy samples of the outer blubber layer indicate that on a step scale of A (0,1-0,5 ppm ΣPCB/lipid weight), B (1-5 ppm ΣPCB/lipid weight), C (5-10 ppm ΣPCB/lipid weight) and D (>10 ppm ΣPCB/lipid weight), we find all baleen whales in A (blue whales (n=1), fin whales (n=6) and humpback whales (n=4)), the killer whales in B (n=1), the sperm whales in C (n=4), and the pilot whales (n=2) and white sided dolphins (n=12) in the D category. Previous results locate the minke whales in the lower part of the B category (VI, NVH, IMR).

3. ONGOING (CURRENT) RESEARCH

During the period June-August 2005 a whale sightings survey was conducted in the Jan Mayen area (Small Management Area CM) as part of the six-year cycle to cover the northeast Atlantic to get regular estimates of minke whale abundance as part of the management programme for that species. Other species observed were fin, sperm, blue, humpback and Northern bottlenose whales. (IMR)

Norway has also participated in SCANS II which is a sightings survey of the North Sea and adjacent areas with harbour porpoises as target species. SCANS II was conducted in summer 2005 as a follow up to a corresponding survey in 1994. A new survey, CODA, is under planning for 2007 and is aimed at covering offshore areas from the British Isles southwards to Gibraltar. NAMMCO is involved to coordinate with future NASS surveys. (IMR)

In August/September field work was conducted off Spitsbergen to instrument minke whales with satellite tags, collect biopsy samples from minke whales and identification photos of humpback whales. About 60 skin samples from humpbacks are now being analysed in cooperation with the University of Berkeley (Palsbøll). (IMR)

Also this year marine mammals have been recorded onboard the vessels participating in the ecosystem surveys in the Barents Sea and adjacent waters. (IMR)

Norway has in 2005 conducted surveys to obtain data necessary for estimation of the abundance of hooded seals of the Greenland Sea stock. The methodological approach has been designed along the same lines as the recent (2002) Greenland Sea harp seal survey, *i.e.*, by aerial surveys of pups in the Greenland Sea pack-ice during the whelping period (March-April). A fixed-wing twin-engined aircraft (stationed in Scoresbysound, Greenland) was used for reconnaissance flights and photographic surveys along transects over the whelping patches once they were located and identified. A helicopter, stationed on and operated from a research vessel, assisted in the reconnaissance flights, and subsequently flew visual transect surveys over the whelping patches. The helicopter was also used for other purposes (staging of pups and tagging). (IMR)

In 2001 and 2002, Norwegian and Russian scientists performed an aerial survey to assess whether there was an overlap in distribution, and thus potential predation, between harp seals and capelin in the Barents Sea. This experiment is now being followed with boat-based surveys aimed to study pelagic feeding by harp seals in the Barents Sea during summer and autumn. For various reasons it was not possible to initiate the project in 2003 as planned, so the first survey to address these questions took place in May/June 2004. The project is planned to run over a three-year period (2004-2006), and the second survey to address these questions took place in June/July 2005. In the Norwegian area (NEZ) a chartered Norwegian coast guard vessel were used, whereas a Russian vessel were applied in REZ. The boat-based survey was supported with aerial reconnaissance surveys performed by a Russian aeroplane. (IMR)

In September-October, further studies designed to provide data necessary to correct and complete recent abundance estimates for harbour and grey seals have been be conducted along the coast of Norway. (IMR)

Possible methods are being developed in order to able a relatively quicker toxic screening of marine mammal products, especially with regard to the monitoring of TEQ (toxic equivalent factor) concentrations. (VI)

4. CATCH DATA

Sealing

Four Norwegian vessels participated in the commercial harp and hooded seal catches in the West Ice (the Greenland Sea), no commercial hunt occurred in the East Ice (the southeastern Barents Sea) in 2004. 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 2004. The given quotas were not fulfilled in any area: In the West Ice, 70% of the harp seal quota and 87% of the hooded seal quota were taken. In the East Ice and the White Sea only a very small number of harp seals were taken under permit for scientific purposes.

Table IV.1**.** Norwegian catches of harp and hooded seals in 2004. 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	8,288	1,607	9,895	5	33	38
Hooded seals	4,217	664	4,881			

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, and these were revised by the IWC/SC at their recent Implementation Review of North Atlantic minke whales conducted at their 2003 Annual Meeting. Starting in the 2004 season, the areas are (1) the Svalbard-Bear Island area (coded ES), (2) the eastern Barents Sea (EB), (3) the Norwegian Sea and coastal zones off North Norway, including the Lofoten area (EW), (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 2004 season. Since the quotas are given by five-year blocks, catches may deviate from quotas within year.

Table IV.2. Quotas and catches of minke whales in 2004 by management area as defined in RMP.

2004	*Management area*					
Small-type whaling	EB	EN	ES	EC	CM	Total
Catch	127	90	113	197	17	544
Quota	170	89	113	153	145	670

5. BY-CATCH DATA

Introduction

The Directorate of Fisheries operates a set of observers on board commercial fishing vessels. In 2004 these observers were instructed to also report by-catches of marine mammals. A computer programme for recording and reporting fishing effort, targetting species catches and by-catches of fish was modified to incorporate species of marine mammals. An evaluation of the effectiveness of this system was scheduled by the end of 2004. This evaluation includes a consideration of required observer coverage for marine mammal by-catch monitoring.

In 2004 IMR has made contracts with a limited number of coastal gillnetters to obtain detailed records of their fishing effort, target species catches, and by-catches of marine mammals. The effectiveness of this procedure was also scheduled for evaluation by the end of 2004, and before any decision is made on continuing this effort

6. 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 2003, 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 within the next 10 years. Population assessments 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 (in 2000). The previous model used only two age classes (pups and 1+ animals), while the new model include 20 age classes. Information about age composition in catches is available from age estimations from annual rings in canine teeth. Work carried out following the previous assessment, including discussions on and recommendations from the Workshop to Develop Improved Methods for Providing Harp and Hooded Seal Harvest Advice, 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 programmes. 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.

Based on the assessments performed by WGHARP, the ICES Advisory Committee on Fishery Management (ACFM) provided advice on quotas for the 2004 season and following years. The recommended sustainable TACs were set as follows: Harp seals in the East Ice 45,100 1+ equivalents, harp seals in the West Ice 8,200 1+ equivalents. If pups are to be taken, 2.5 and 2 are equivalent to 1 one year old or older seal for the two stocks respectively. Hooded seals were regarded more data-poor (no abundance estimates after 1997) than the two harp seal populations and required a more risk adverse management approach. Using the Potential Biological Removal approach for this purpose, a catch level of 5,600 hooded seals (of all ages) was recommended. 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 2005 quotas will be 8,200 harp seals (1+) and 5,600 hooded seals (all ages) in the West Ice (the total quotas in this area) and 10,000 harp seals (1+) in the East Ice. 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 (common seals) or regions (grey seals). From the 2003 season, quotas were increased substantially by the Norwegian Ministry of Fisheries in comparison with previous years when set quotas generally followed recommendations based on scientific advice. The 2003 quotas were set at 1,186 grey seals (25% of current abundance estimate) and 949 harbour seals (13% of current abundance estimate) – the 2004 quotas were set exactly as the 2003 quotas. Of this, 302 grey seals (25% of the quota) and 549 harbour seals (58% of the quota) were taken. The 2005 quotas are kept at exactly the same levels as in 2004.

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 2004 was set to 670 minke whales (Table III.2). 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 10 May to 31 August.

RMP essentially sets a five-year block quota where animals not taken a particular year may be transferred to later years within the block. At the annual meeting of the IWC/SC in 2003 a new abundance estimate (80,500 minke whales for the Northeastern stock area and 26,700 minkes for the Jan Mayen block) based on the data collected in the period 1996-2001 was approved. These estimates were used in new RMP calculations which resulted in a total basic quota of 670 minke whales for 2004 and each of the following four years. The Small Area allocation of this total quota is: EB 170, EW 153, ES 113, EN 89 and CM 145. Including catches not taken in 2004, the total quota for 2005 is 796 minke whales.

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