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North Atlantic Marine Mammal Commission

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CONTENTS

MEETINGS & OFFICE BEARERS 1998	5	
SECTION 1	COUNCIL	
1.1	Report of the Eight Meeting of the Council	9
Appendix 1	List of Participants	38
Appendix 2	Agenda	40
Appendix 3	List of Documents	41
Appendix 4	Opening Statements	42
Appendix 5	Audited Accounts for 1997	47
Appendix 6	List of Requests for Scientific Advice (1992-1997).....	48
Appendix 7	Press Release	54
1.2	Report of the Committee on Hunting Methods	57
Appendix 1	List of Laws & Regulations for Marine Mammal Hunting in NAMMCO Member Countries	63
Appendix 2	List of References on Hunting Methodes	65
Appendix 3	Rules of Procedure for the Committee on Hunting Methods	69
SECTION 2	MANAGEMENT COMMITTEE	
2.1	Report of the Management Committee	73
Appendix 1	Agenda	80
Appendix 2	List of Documents	81
Appendix 3	Working Group on By-Catch - Agenda and List of Participants	82
Appendix 4	List of Proposals for Conservation and Management	83
SECTION 3	SCIENTIFIC COMMITTEE	
3.1	Report of the Sixth Meeting of the Scientific Committee	89
Appendix 1	List of participants	104
Appendix 2	Agenda	105
Appendix 3	List of documents	106
ANNEX 1	Report of the Working Group on Economic Aspects of Marine Mammal – Fisheries Interactions, Reykjavík 1-2 March 1998	107

ANNEX 2	Report of the Working Group on Management Procedures, Copenhagen 13-14 October 1997	117
SECTION 4 NATIONAL PROGRESS REPORTS		
4.1	Faroe Islands Progress Report on Marine Mammal Research 1997	135
4.2	Greenland Progress Report on Marine Mammal Research 1996	139
4.3	Iceland Progress Report on Marine Mammal Research 1997	141
4.4	Norway Progress Report on Marine Mammal Research 1997	147
SECTION 5 ADDRESSES		
5.1	Delegates and Observers to the Eight Meeting of the Council	167
5.2	Management Committee Members in 1998	173
5.3	Scientific Committee Members in 1998	175
5.4	Finance and Administration Committee Members 1998	177
5.5	Working Group on Economic Aspects of Marine Mammal – Fisheries Interactions	179
5.6	Secretariat	181

MEETINGS & OFFICE BEARERS 1998

Members of the Commission

Faroe Islands (F)
Greenland (G)
Iceland (I)
Norway (N)

Councillors

Kaj P. Mortensen
Einar Lemche
Kristín Haraldsdóttir
Halvard P. Johansen

Council

Chairmen – 1995-97 Halvard P. Johansen(N)
1997 ... Arnór Halldórsson (I)

NAMMCO/8 – Eight Meeting of the Council, 1 – 4 September 1998, Oslo

Management Committee

Chairmen – 1995-98 Einar Lemche(G)
1998... Kaj P. Mortensen (F)

Seventh Meeting of the Management Committee, 2 September 1998, Oslo

Management Committee Working Group on Inspection and Observation

Chairman Egil Ole Øen (N)

Committee on Hunting Methods

Chairmen - 1994-98 Amalie Jessen (G)
1998... Jústines Olsen (F)

Management Committee Working Group on By-catch

Chairman Gislí A. Víkingsson

Scientific Committee

Chairmen – 1995-97 Tore Haug (N)
1997... Mads Peter Heide-Jørgensen (G)

Sixth Meeting of the Scientific Committee, 1-5 March 1998, Reykjavík

Scientific Committee Working Group on Management Procedures

Chairman Nils Øien (N)

Scientific Committee Working Group on Abundance Estimates

Chairman Nils Øien (N)

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

Chairman Gunnar Stefánsson (I)

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

Chairman Øystein Wiig (N)

Report of the Eight Meeting of the Council

Finance and Administration Committee

Chairman Øyvind Rasmussen (N)

The NAMMCO Fund

Chairman of the Board Ulla S. Wang (F)

Secretariat

General Secretary Kate Sanderson

Scientific Secretary Sidsel Grønvik

Administrative Assistant Tine Richardsen

SECTION 1 – COUNCIL

1.1	Report of the Eight Meeting of the Council	9
Appendix 1	List of Participants	38
Appendix 2	Agenda	40
Appendix 3	List of Documents	41
Appendix 4	Opening Statements	42
Appendix 5	Audited Accounts for 1997	47
Appendix 6	List of Scientific Requests for Advice since 1992	48
Appendix 7	Press Release	54
1.2	Report of the Committee on Hunting Methods	57
Appendix 1	List of Laws & Regulations for Marine Mammal Hunting in NAMMCO Member Countries	63
Appendix 2	List of References on Hunting Methodes	65
Appendix 3	Rules of Procedure for the Committee on Hunting Methods	69

1.1 REPORT OF THE EIGHTH MEETING OF THE COUNCIL

Oslo, Norway, 1 – 4 September 1998

The Council of NAMMCO held its Eighth Meeting at the Royal Christiania Hotel in Oslo, Norway from 1 to 4 September 1998. The meeting was attended by delegations from all Contracting Parties, the Faroe Islands, Greenland, Iceland and Norway, as well as observers from the Governments of Canada, Denmark, Japan, the Russian Federation and Saint Lucia. A number of intergovernmental and non-governmental organisations were also represented at the meeting. The List of Participants is contained in Appendix 1.

The Chairman of the Council, Arnór Halldórsson, convened the meeting.

1. OPENING PROCEDURES

1.1 Welcome address

The Chairman introduced the Secretary General of the Norwegian Ministry of Fisheries, Gunnar P. Kjønneøy, who gave an address of welcome to the Eighth Meeting of the Council on behalf of the Minister of Fisheries of Norway. The full text of the address is contained in Appendix 4.

1.2 Opening statements

The Heads of Delegations of the Faroe Islands, Greenland and Iceland made opening statements to the meeting. An opening statement was also made by the observer from the Government of Japan. These statements are contained in Appendix 4.

1.3 Admission of observers

On behalf of the Council, the Chairman welcomed the attendance of observers from governments, intergovernmental and non-governmental organisations, as listed in Appendix 1. In particular he welcomed to the Council for the first time observers from the Government of Saint Lucia, from the Nunavut Wildlife Management Board in Canada, and the non-governmental organisation Africa Resources Trust.

The Secretary informed the Council that the following had notified the Secretariat of their regrets in not being able to attend the meeting: the Government of Namibia; the Secretariat of the Agreement on the Conservation of Small Cetaceans of the Baltic & North Seas (ASCOBANS); the Arctic Council Secretariat; the Convention on the Conservation of Migratory Species of Wild Animals (CMS/Bonn Convention); the UN Food and Agriculture Organisation (FAO); the International Council for the Exploration of the Sea (ICES); the Nordic Atlantic Cooperation (NORA).

1.4 Adoption of Agenda

The Agenda as contained in Appendix 2, was adopted.

Report of the Eight Meeting of the Council

1.5 Meeting arrangements

The Secretary outlined the practical and social arrangements for the meeting, which included a reception hosted by the Norwegian Ministry of Fisheries on Wednesday 2 September at the restaurant *Solsiden* in Oslo.

A list of documents presented to the meeting is contained in Appendix 3.

2. ADMINISTRATION AND FINANCE

2.1 Report of the Finance and Administration Committee

Kristín Haraldsdóttir (Iceland) presented the Report of the Finance and Administration Committee on behalf of the Committee's Chairman, Øyvind Rasmussen (Norway), who was unable to attend the Council meeting.

The Finance and Administration Committee met in Copenhagen, 25-26 June 1998 to develop the draft budget for 1999 and forecast budget for 2000 (see also under 2.2 below), to develop Rules of Procedure for the Council (see under 2.3) and to consider other financial and administrative matters related to the activities of the Commission. The report of the Committee was available as document NAMMCO/8/4.

2.1.1 Host Agreement between NAMMCO and Norway

The Council noted the Committee's review of progress in developing a Host Agreement for NAMMCO in Norway. It was reported that the Ministry of Foreign Affairs in Norway was currently preparing a draft proposal. This proposal would provide the basis for negotiations, which were expected to begin before the end of the year. The Committee further informed the Council that this proposal had apparently been developed with a view to its use as a model for other similar agreements with international organisations hosted by Norway.

Norway informed the Council that, based on the latest information, it was expected that this proposal would be finalised within a matter of weeks.

The Council noted with appreciation that concrete steps had now been taken by authorities in Norway and looked forward to receiving the proposal in the near future.

2.1.2 Secretariat premises

The Council noted that the Secretariat had recently made preliminary enquiries to the newly opened Polar Environmental Center in Tromsø regarding the possibility of relocating the Secretariat to the Centre. The Centre houses a number of Norwegian research institutes, including the Norwegian Polar Institute, with which NAMMCO has already established working relations. The Council **endorsed** the recommendation of the Finance and Administration Committee that the Secretariat should further pursue the possibility of relocating the Secretariat to this Centre.

2.1.3 Staffing

Scientific Secretary

The Council expressed its appreciation to Sidsel Grønvik for her valuable contribution

NAMMCO Annual Report 1998

to NAMMCO as Scientific Secretary since August 1997, and wished her well in the position at the University of Tromsø to which she had recently returned.

The Council further noted the information provided by the Finance and Administration Committee on procedures taken so far to recruit a new member of staff to the position of Scientific Secretary.

General Secretary

The Council noted that the present General Secretary, Kate Sanderson, had notified the Council of her intention to leave the Secretariat, effective from 1 October 1998. It was further noted that the position had subsequently been advertised as vacant with the deadline for applications on 28 August 1998.

The Council **agreed** that the recruitment of a new General Secretary was a matter of priority and that applications should be reviewed according to agreed procedures as soon as possible after the present meeting.

Staff Rules

The Council **endorsed** the recommendation of the Finance and Administration Committee that the Secretariat continue the development of general Staff Rules for the Secretariat, in line with other administrative decisions taken, for the review of the Committee at a later date.

Pension scheme

The Council noted that, at present, NAMMCO does not pay into a pension scheme on behalf of its employees, and **agreed** to further consider this matter. It took note of the recommendation of the Finance and Administration Committee that total pension payments should not exceed 10% of agreed gross salaries, of which NAMMCO should cover 8% and the employee 2%. The Council further noted that the budget for 1999 (see under 2.2 below) allows for a pension scheme to be taken up for existing and future employees already next year.

The Council also **agreed** to the recommendation of the Finance and Administration Committee that the Secretariat should investigate the feasibility of hiring an external consultant to examine in more detail requirements for a pension scheme for the Secretariat, as well as other outstanding administrative matters which needed to be resolved. It was noted that funding for a consultant could be allowed for in the budget for 1999 under "external expertise"(see under 2.2).

2.1.4 Other matters

The Finance and Administration Committee also reported to the Council on other administrative matters, which had been discussed during its meeting. These included the administration of the International Observation Scheme (see under 4.3) and the production of general information and NAMMCO publications (see under item 10).

The Chairman thanked the Finance and Administration Committee for their report and commended the work carried out by Committee members and the Secretariat in

Report of the Eight Meeting of the Council

reviewing these important financial and administrative matters (see also further under 2.2, 2.3 & 2.4).

2.2 Commission Budget 1999 and Forecast Budget 2000

2.2.1 Accounts 1997

The Council noted that the final, audited accounts of the Commission for 1997 had been reviewed by the Finance and Administration Committee in February and were formally approved by the Council by correspondence on 27 March 1998 (see Appendix 5).

2.2.2 Commission Budget 1999

The Council **adopted** the budget for 1999, as contained in NAMMCO/8/4 - Annex 1 rev 1.

2.2.3 Forecast Budget 2000

The Council **adopted** on a preliminary basis the forecast budget for the year 2000, as contained in NAMMCO/8/4 - Annex 1 rev. 1. In so doing, it was noted that the level of funding for individual items in the budget for 1999 is retained for the 2000 forecast budget. In the absence of surplus transfers from 1999 to 2000, however, membership contributions for 2000 will increase to a total of 3,465,000 to maintain the same level of funding activity.

2.3 Rules of Procedure

The Council noted that at its last meeting it had decided that a draft proposal for Rules of Procedure for the Council should be developed by the Finance and Administration Committee for the consideration of the Council.

Kristín Haraldsdóttir, on behalf of the Committee, presented the draft Rules of Procedure which had been developed by the Committee at its June meeting and through correspondence since then. The draft, as presented to the Council, was contained in NAMMCO/8/4 - Annex 2.

The Council commended the progress made in developing the draft. However, delegations shared the view that more time was needed to review the draft in greater detail than was possible during the present meeting. It was therefore **agreed** that further refinement of the draft should continue in the interim, co-ordinated through the Finance and Administration Committee, with a view to finalising the draft as soon as possible for adoption by the Council.

Norway noted that, in addition to the general provisions already contained in the draft, procedures for amending the Rules should also be included.

2.4 Other business

The Council **agreed** to the recommendation of the Finance and Administration Committee that a sum of NOK 10,000 should be granted in response to the request from ICES for support for their planned symposium "100 Years of Science under ICES", which would be held in Helsinki in the year 2000. This support would be

offered in acknowledgement of the collaborative relations established between NAMMCO and ICES (see also under item 3.2). The Council **agreed** that this support should be drawn from the anticipated surplus of the 1998 budget.

3. SCIENTIFIC COMMITTEE

3.1 Report of the Scientific Committee

Gísli A. Víkingsson, member of the Scientific Committee for Iceland, presented the Report of the Sixth Meeting of the Scientific Committee on behalf of the Chairman of the Committee, Mads Peter Heide-Jørgensen (Greenland) who was unable to attend the Council meeting. The Scientific Committee met in Reykjavík, Iceland from 1 to 5 March 1998. The full report was available to the Council as NAMMCO/8/6 [and is contained in Section 3.1 of this volume].

At its meeting the Scientific Committee addressed both new and outstanding requests for advice forwarded to it by the Council. A new Working Group was established to deal with the request that special attention should be paid to studies related to competition and the economic aspects of marine mammal - fisheries interactions.

National Progress reports for 1997 from the Faroe Islands, Norway and Iceland, and for 1996 from Greenland were submitted to the Scientific Committee. [These are contained in Section 4 of this volume.]

3.1.1 Role of marine mammals in the marine ecosystem

i) Economic aspects of marine mammal - fisheries interactions

Gísli A. Víkingsson summarised the major findings and conclusions of the Scientific Committee regarding the Council's request to the Committee that special attention should be paid to studies related to competition and the economic aspects of marine mammal - fisheries interactions.

To address this request, the Scientific Committee had established an *ad hoc* Working Group, under the chairmanship of Gunnar Stefánsson (Iceland) with the participation of invited experts from Canada, Iceland and Norway as well as members of the Scientific Committee. The full report of the Working Group is contained as Annex 1 of the Report of the Scientific Committee [see Section 3.1 of this volume].

Bioeconomic multispecies models of varying complexity for different ecosystems were considered. It was noted that most of the analyses presented were of a preliminary nature and should only be taken as first indications. More economic factors should be included, such as potential costs of whaling and sealing to industries such as tourism and whale watching and potential benefits to the fishing industry due to a possible change in the frequency of parasites in fish. Also, some potentially important predators such as hooded seals have not been included in the multispecies models. The indications are, however, that the overall costs to the fishing, whaling and sealing industries incurred by not whaling and/or not sealing can be quite considerable, and that the effects due to predation can be an important part of the overall picture.

Report of the Eight Meeting of the Council

The Scientific Committee agreed that other species need to be included and that the models presented were not readily applicable to areas such as Greenland and the Faroe Islands. However, despite the complexity of the analyses involved, it was the view of the Scientific Committee that inclusion of economic considerations is a valuable addition to multispecies models of interactions between marine mammals and fisheries. The work presented at the Working Group was considered a 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.

The Council noted the findings and recommendations of the Scientific Committee in response to the Council's request for advice on this matter (see further under 4.2.2, *i*) below).

ii) Other matters

The Scientific Committee also discussed new information made available from the ICES/NAFO Working Group on Harp and Hooded Seals on changes in biological parameters due to environmental changes. Fluctuations in the abundance of important prey species such as capelin and herring apparently contributed to recent seal invasions in Norwegian waters.

3.1.2 Marine mammal stocks - status and advice to the Council

j) Harp and hooded seals

Based on a request forwarded by NAMMCO in May 1995, a meeting of the Joint ICES/NAFO Working Group on Harp and Hooded Seals was convened at the ICES Headquarters in Copenhagen, Denmark from 28 August to 3 September 1997. The intention of the meeting was to provide assessment advice on harp seals in the White Sea and Barents Sea, and harp and hooded seals in the Greenland Sea. Final advice was received from ICES and circulated to the Council as NAMMCO/8/8.

The terms of reference formulated by the Advisory Committee on Fisheries Management (ACFM) in response to this request and questions that arose from the 1993 meeting of the Working Group, were as follows:

- a) assess the stock size, distributions and pup production of White Sea / Barents Sea harp seals and harp and hooded seals in the Greenland Sea;
- b) subject to the availability of data, assess the sustainable yield at present stock sizes and provide catch options in the Barents and White Seas and in the Greenland Sea;
- c) review existing population models for harp seals in order to standardise the methodology used to estimate the numbers at age;
- d) assess current information on the effect of recent environmental changes or changes in the food supply on harp and hooded seals, and review available data on the possible interaction between these seal species and other living marine resources.

Harp seals

Stock Identity, Distribution and Migrations

NAMMCO Annual Report 1998

Results of recent studies on the stock identity and migration patterns of harp seals using DNA analysis and satellite tracking support previous analyses that indicate a separation between the western and eastern Atlantic groups.

The Greenland Sea stock

Only Norway took catches of harp seals in the Greenland Sea pack ice in 1996 and 1997, the total catches being 6,427 and 2,161 animals, respectively. In 1996 half the catch, and in 1997 the entire catch could be taken as weaned pups, one adult considered equal to two pups. The catches were well below the quota of 13,100 adults. Between 1990-1997 less than 60% of the quota was taken.

Updates of pup production estimates over the period 1977-1991 indicate an estimate of pup production in 1991 of 67,300 (95% C.I. 56,400-78,113). Since the new estimate of pup production falls within the range investigated at the 1993 assessment meeting (albeit 10% higher), no new catch options were calculated.

The White Sea and Barents Sea stock

Combined Russian and Norwegian catches of harp seals in the White and Barents Sea in 1995, 1996 and 1997 totalled 36,486, 41,049 and 36,399, respectively, i.e. at a level comparable to the catch during the years 1989 to 1994. The proportion of pups taken ranged between 81-86%.

Two Russian aerial surveys of harp seal pups in the White Sea conducted in mid-March 1997 yielded estimates of pup production in the range of 93,000 - 193,000, depending on the estimation method. The appropriateness of using the methods giving the highest estimates could not be evaluated from the available data. The Scientific Committee noted that all given estimates are likely underestimates, and the pup production for the White Sea and Barents Sea stock of harp seals was probably at least 100,000 in 1997. Given a pup production of 100,000, an annual take of 40,000 may not be sustainable.

No catch options were provided and this awaits completion of the assessment.

The Northwest Atlantic stock

The Canadian commercial harp seal catch was 242,362 in 1996 and 261,043 in 1997. This is approximately four times the average taken over the last ten years. There has also been a change in the age structure of the hunt with a significant increase in the proportion of pups taken (76% and 84% respectively).

After a period without catch figures for seals in Greenland (1988-92), a new system for collecting harvest data was introduced in October 1992. Catches of harp seals reported through this system for the years 1993-95 (53,642, 54,996 and 60,743, respectively) were significantly higher than the estimated catches in previous years. An examination of the official catch statistics for 1954 to 1987 suggests, however, that the figures reported previously for the period 1975-87 underestimated the true harvest level considerably.

Report of the Eight Meeting of the Council

Recaptures of tagged animals have demonstrated that harp seals from all breeding stocks do contribute to catches in Greenland. It was agreed that when incorporating Greenland catches in population models, all harp seals taken in West Greenland should be considered as being from the Northwest Atlantic stock. Similarly, harp seals taken in Northeast Greenland should be considered as being from the Greenland Sea stock, and harp seals taken in Southeast Greenland should be split equally between the two stocks.

Combining the Canadian and Greenland estimated catches suggest that the current catches are in the order of 300,000. Considering the estimates of replacement yields it was noted that the recent catches of harp seals in the Northwest Atlantic are near, or at, the established replacement levels.

Hooded seals

Stock Identity, Distribution and Migrations

A Norwegian study on the seasonal distribution of hooded seals in the Greenland Sea, using satellite telemetry, has revealed that the seals remained within the Greenland and Norwegian Sea for the majority of the year. Several of the animals undertook long-distance travels, as far south as west of the British Isles.

The Greenland Sea stock

The Norwegian catches of hooded seals in the Greenland Sea in 1996 and 1997, were 811 and 2,934, respectively, well below the quota of 9,000 animals. In 1996 half the quota, and in 1997 the entire quota, was allowed to be taken as weaned pups, one adult equal to two pups.

In March 1997 a Norwegian survey found the largest patch of breeding hoods to the north-east of Jan Mayen, in addition to a number of smaller patches. Six whelping patches were covered by photography, and the total point estimate for these was 25,300 pups (95% C.I. 18,200 to 35,100). This estimate is not corrected for the temporal distribution of births or for scattered pups.

No catch options were provided and this awaits completion of the assessment.

The Northwest Atlantic stock

The catches of hooded seals in Greenland in 1993 and 1994 (6,906 and 7,330 respectively) were slightly higher than those estimated for the 1980s, but in line with the trend shown since the early 1950s. Catches of hooded seals during the 1980s were likely underestimated, but revised estimates are not available.

In 1996, a total of 25,754 hooded seals (mainly bluebacks) were taken in Canadian waters, which is more than three times the allowable quota. In 1997, the total catch was 7,058, just under the allowable quota of 8,000. In contrast to the previous year, the catch was reported to be adults. 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.

ii) Ringed seals

In 1997 the Scientific Committee was requested to advise on what scientific studies need to be completed in order to evaluate the effects of changed levels of removals of ringed seals in west and east Greenland. The Scientific Committee discussed this item with reference to the advice given to the Council in 1996 when the Committee had identified two major gaps in knowledge:

- monitoring of catches as well as studies of loss rates in different types of hunts, the extent of under-reporting, and changes in hunting effort and trade in seal products, should be undertaken in both Greenland and Canada;
- studies are required on the stock identity, productivity and abundance of pack ice ringed seals, as these seals are believed to help sustain the catches in some areas and may be vulnerable to various human activities other than hunting which occur in the pack ice. (*NAMMCO Annual Report 1996*: 111)

When considering "changed levels of exploitation" the Scientific Committee chose to focus on scenarios where exploitation is raised by more than twice the level reported in recent years. The Committee further noted that the hunting is essentially restricted to coastal areas.

While reiterating its previous recommendations, the Scientific Committee identified the following items of particular importance for addressing the question:

Unexploited segments of the ringed seals populations inhabiting remote and inaccessible areas (e.g. the pack ice and some fast ice areas in Baffin Bay and the Greenland Sea) are likely a major contributor to the seals that are hunted in coastal areas. However, very little is known about the production and dispersal of these seals. Studies dedicated to these apparently unexploited ringed seals should include a variety of techniques: sampling of seals for studies of age structure, reproduction and genetic identity; surveys of birth lairs; and tagging and tracking of pups and adult seals to describe their movements and dependence on ice habitats.

The proposed studies should lead to a better understanding of the dispersal and mixing of ringed seals from different areas, which is critical to the understanding of their contributions to the hunted segments of the population. Having achieved that, it may be necessary to monitor population changes in certain areas of particular importance, such as breeding habitats with many adult seals.

iii) Harbour porpoises

At its Seventh Meeting in 1997, the Council requested the Scientific Committee to carry out a comprehensive assessment of the harbour porpoise in the North Atlantic, which might include distribution and abundance, stock identity, biological parameters, ecological interactions, pollutants, removals and sustainability of removals.

The Scientific Committee discussed a proposal for an international symposium on harbour porpoises, which should involve experts working on this species throughout its North Atlantic range. A preliminary agenda developed by Tore Haug in consultation with a number of other scientists was circulated for discussion.

Report of the Eight Meeting of the Council

The Scientific Committee agreed to entrust Tore Haug with the task of further developing plans for, and convening such a symposium on harbour porpoise, with the aim of holding it in the latter half of 1999. In order to ensure the broadest possible participation, the Committee further recommended that invitations should be extended to ICES, ASCOBANS and the IWC. It was envisaged that a summary report from the symposium would provide the Scientific Committee with the necessary basis for the requested assessment of this species.

The Council commended the Scientific Committee's plans for the Symposium, and noted that a first Call for Papers had since been finalised and widely distributed. The Symposium would be held from 10 to 14 September 1999 on board the Norwegian coastal ship between Bergen and Tromsø.

iv) Central North Atlantic minke whales

In 1997 the Council requested the Scientific Committee to undertake an assessment of the status of the Central North Atlantic minke whale stock, including an evaluation of the long-term effects of past and present removal levels on the stock.

The Scientific Committee decided to ask the Working Group on Management Procedures to address the request by examining the discreteness of the stock, the past history of exploitation under various assumptions of recent population sizes based on abundance estimates from NASS-87, -89 and -95, and to project a range of removal scenarios.

The Working Group on Management Procedures met in Copenhagen on 13 and 14 October 1997 to finalise its work, after having operated by correspondence. External expertise was sought to run population trajectories and summarise genetic results before the meeting.

Discreteness of the stock of minke whales in the North Atlantic

The Scientific Committee reviewed available evidence for minke whale stock delineation in the North Atlantic based on studies on distribution, tagging, morphometrics and genetics.

Distributional evidence indicates that on a large-scale, distance and the topography of the ocean basin isolate some segments of the North Atlantic minke whale population. Tagging studies suggest a small probability of exchange between the Central and Northeast Atlantic stock areas, but neither distributional data nor the tagging studies give any resolution for fine scale delineations of minke whales in the North Atlantic.

Morphometric and genetic studies, including allozymes and nuclear DNA, support a splitting between West Greenland, Central and Northeastern Atlantic minke whales, whereas studies of mitochondrial DNA (mtDNA) failed to detect any differences between minke whales from West Greenland, coastal Iceland (Central stock area) and the Barents Sea (Northeast Atlantic stock area).

In conclusion, some regional delineations of North Atlantic minke whale stocks can be expected, but the present knowledge about movements, dispersal and genetic exchange is too limited, inconsistent or scattered to support a conceptual model for the dispersal and mixing of minke whales in the North Atlantic. On a finer scale, such as within the Central Stock Area, nothing supports a further delineation of the stock, however, available studies suffer from incomplete or biased sampling of the whales in the area or from deployment of inadequate techniques.

Population trajectories

The population model for projecting past exploitation levels through the recent population estimates from NASS 1987 and 1995 utilised the best available data on biological parameters for North Atlantic minke whales as well as a range of estimates of maximum sustainable yield rate (MSYR), although focusing on values around 2-3%. Population trajectories were run for two options of possible stock structure; one considering the Central stock area as a single discrete stock, and another considering the coastal waters of Iceland (CIC) as a discrete stock.

For the Central Stock Area, catch projections suggest that the stock is now close to its carrying capacity. Present removals and catches of 292 per year (corresponding to a mean of the catches between 1980-84) are sustainable. If catches of 451 whales per year (average for 1965-69) are projected to 2001, and if the lower range of the, albeit conservative, estimate of abundance is used in the projections, the harvesting rate is unsustainable.

Catches in the coastal Icelandic area (CIC) ceased in 1985 and catch projections suggest that the stock is now close to its pre-exploitation size. All projections to 2001 of 185 whales per year (average for 1961-85) are sustainable under parameter values considered appropriate.

Future research

There is evidently a great need to resolve the question of stock delineations of minke whales in the North Atlantic. No single or simple method alone seems to be able to answer these questions, and it is recommended that a variety of approaches should be attempted. However, it was also strongly felt that the studies deployed should be focused on testing hypotheses for the year-round mixing and dispersal of minke whales. There is also a need for monitoring of changes in abundance in both coastal Icelandic waters and the entire Central Stock Area, especially if the level of exploitation is increased.

v) *Narwhal and beluga*

At its 1997 meeting, the Council requested the Scientific Committee to examine the population status of narwhal and beluga in the North Atlantic.

In response to this request the Scientific Committee decided to establish a Working Group on the Population Status of Narwhal and Beluga in the North Atlantic, and to invite experts from Canada and Russia and other countries to contribute. The Working

Report of the Eight Meeting of the Council

Group would aim to meet prior to the next meeting of the Scientific Committee in 1999.

3.1.3 Data and administration

It had been noted by the Scientific Committee that detailed catch data, according to guidelines prepared by the Secretariat, were not being received by the Secretariat on a regular basis from all member countries.

Some members of the Committee were of the view that it would be better to compile relevant data in response to specific tasks generated by requests from the Council. It was agreed, however, that the question of procedures for the regular submission of data to the Secretariat should be referred to the Council.

In response to this matter, the Council **agreed** to instruct the Secretariat to prepare a report on the storage and handling of data in the Secretariat. This report should outline for the Council present procedures for data submission and handling, as well as analyse the implications of different types and extent of data storage in the Secretariat.

3.1.4 Publications

Gísli A. Víkingsson reported that the Scientific Committee had agreed that the title of the new NAMMCO series of scientific publications should be *NAMMCO Scientific Publications*, with volumes numbered.

The first volume in the series - *Ringed seals in the North Atlantic*, edited by Mads Peter Heide-Jørgensen and Christian Lydersen - was expected to be published in the autumn of 1998. Publication of the next two volumes (*The role of marine mammals in North Atlantic ecosystems* and *Sealworm Infestation*) is scheduled for 1999. No progress has been made on the planned volume intended to present the results from the NASS-95 survey. It was, however, indicated that these plans were still under way.

The Chairman of the Council noted the excellent progress made in establishing the Scientific Publication series. On behalf of the Council he commended in particular the efforts of former Scientific Secretary, Sidsel Grønvik, in co-ordinating the editing of the forthcoming first volume of the series.

The Chairman of the Council thanked Gísli A. Víkingsson for his comprehensive report to the Council on behalf of the Chairman of the Scientific Committee. Matters regarding scientific requests and advice from the Scientific Committee were forwarded to the Management Committee for further consideration (see under items 4.1 and 4.2 below), [and the Report of the Management Committee, which is contained in Section 2.1 of this volume].

3.2 Co-operation with ICES

The Council noted with appreciation that the final advice related to the request forwarded to ICES from NAMMCO on harp and hooded seals (NAMMCO/8/8) had been received from ICES.

Referring to discussions at the last meeting of the Council in 1997 with respect to the development of a Memorandum of Understanding between ICES and NAMMCO, the Secretariat reported that, due to time constraints in both organisations, further negotiations towards finalising such a memorandum had not yet been fully resumed.

The Council reiterated the views expressed at its last meeting (see *NAMMCO Annual Report 1997: 24*), and instructed the Secretary to continue a dialogue with the ICES General Secretary on this matter.

3.3 Other business

Under this item, 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.

Norway, Iceland and the Faroe Islands, endorsed this recommendation.

4. MANAGEMENT COMMITTEE

4.1 Report of the Management Committee

The Chairman of the Management Committee, Einar Lemche (Greenland) reported to the Council on the meeting of the Management Committee, which was held on 2 September in Oslo. A preliminary report, which was distributed as NAMMCO/8/7 – Draft, contained all matters of substance agreed by the Management Committee. [The final report of the Management Committee was adopted by correspondence after the meeting, and is contained in Section 2 of this volume.]

4.1.1. National Progress Reports

The Council expressed its appreciation to the Government of Canada for providing information to the Management Committee on catch levels and management strategies in Canada with respect to shared stocks of marine mammals.

[National Progress Reports on marine mammal research in member countries which were also submitted to the Management Committee are contained in Section 4 of this volume].

4.1.2. Management Committee Working Group on By-catch

The Council noted the points identified by the Management Committee Working Group on By-catch of marine mammals, as set out under item 5 of the Report of the Management Committee [see Section 2.1 of this volume]. The Council also took note of the decision that the Working Group should meet again prior to the next meeting of the Management Committee.

4.1.3 Proposals for conservation and management

Earlier proposals

Atlantic walrus

With reference to the Management Committee's earlier proposal related to the West Greenland stock of Atlantic walrus, the Council noted that Greenland had provided the Management Committee with updated information regarding the conservation and management of Atlantic walrus (see the Report of the Management Committee, item 6.1, [Section 2.1 of this volume]).

New proposals

Central North Atlantic minke whales

The Council noted the conclusion of the Management Committee 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 Council also noted the conservative nature of the advice from the Scientific Committee on which the conclusion of the Management Committee was based (see Report of the Scientific Committee, item 8.5 [Section 3.1 of this volume]).

Harp seals in the Northwest Atlantic

The Council noted the conclusion of the Management Committee that combined estimated annual 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 (see Report of the Scientific Committee, item 8.1 [Section 3.1 of this volume]).

Hooded seals in the Northwest Atlantic

The Council noted the conclusion of the Management Committee 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 (see Report of the Scientific Committee, item 8.2 [Section 3.1 of this volume]).

4.2 Requests for advice

The Council took note of the document NAMMCO/8/MC/4 which was an updated list of requests for scientific advice agreed to by the Council since 1992. [This list, which is updated to include additional requests agreed to at the present meeting (see under 4.2.2 below), is contained in Appendix 6 of this report].

4.2.1 Outstanding requests

Noting that a number of requests for advice previously forwarded to the Scientific Committee have yet to be completed, the Council **agreed** to draw attention in particular to the following:

i) NASS-95 / Monitoring stock levels and trends in stocks

The Council **agreed** to reiterate its previous request to the Scientific Committee to continue its work to monitor stock levels and trends in all stocks of marine mammals in the North Atlantic (see Appendix 6). 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 (see *NAMMCO Annual Report 1997*: 66).

ii) Harp seals in the Greenland Sea & White Sea/Barents Sea & hooded seals in the Greenland Sea

The Council noted that a forthcoming meeting of the Joint ICES/NAFO Working Group on Harp and Hooded Seals would be addressing in particular requests for advice on these stocks. The Council noted that the Management Committee had agreed to return to these matters when the report from this meeting had been reviewed by the Scientific Committee.

4.2.2 New requests

The Council **agreed** to forward the following new requests for advice to the Scientific Committee, as recommended by the Management Committee:

i) Economic aspects of marine mammal-fisheries interactions

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 versus no exploitation of minke whales?

ii) Stock structure of North Atlantic minke whales

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.

iii) Fin whales

The Scientific Committee is requested to undertake an assessment of the status of fin whales in the North Atlantic based on all available data.

iv) White-beaked and white-sided dolphins

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,

Report of the Eight Meeting of the Council

abundance and ecological interactions of white-beaked and white-sided dolphins in the North Atlantic area.

v) Feeding studies of harp and hooded seals

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

4.3 International Observation Scheme

The Council noted the Management Committee's review of the implementation of the International Observation Scheme in 1998 under the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals (see Report of the Management Committee, item 8 [Section 2.1 of this volume]). It was noted that only a preliminary report of the observation scheme had been available, as a NAMMCO observer was still in the field in Greenland at the time of the Council meeting.

The Council further noted the decision of the Management Committee to reactivate the Working Group on Inspection and Observation. The Working Group would meet before the end of the year in order to review in detail the implementation of the Observation Scheme in 1998 and to review a proposal for the scope and range of observation activities in 1999, as well as to examine other practical and administrative matters requiring further consideration and development, and to propose any amendments to the administrative guidelines to the Scheme which may be necessary.

4.4 Other business

The Council noted that Kaj P. Mortensen (Faroe Islands) was elected Chairman of the Management Committee for the next two years, and Halvard P. Johansen (Norway) was elected Vice Chairman for the next two years.

The Chairman of the Council thanked the outgoing Chairman of the Management Committee, Einar Lemche, for his report to the Council and for his chairmanship of the Management Committee over the past four years.

5. HUNTING METHODS

5.1 Report of the Committee on Hunting Methods

The Chairman of the Committee on Hunting Methods, Amalie Jessen (Greenland) presented the report of the Committee to the Council. The Committee met in Copenhagen on June 24, 1998, and had not previously met since January 1996. [The report of the Committee on Hunting Methods is contained in Section 1.2 of this volume].

5.1.1 Updates on hunting methods in member countries

The Council took note of the thorough, updated information on developments in hunting methods in the Faroe Islands, Norway and Greenland which had been presented to the Committee at its June meeting (see Report of the Committee on Hunting Methods, item 3 [Section 1.2 of this volume]).

The Council also noted the updated list of regulations and references on hunting methods in member countries developed by the Committee and appended to its Report [See Section 1.2, Appendices 1 & 2].

5.1.2 Workshop on Hunting Methods

The Council **agreed** to the recommendation of the Committee on Hunting Methods to hold a Workshop on Hunting Methods, preferably as early as possible in 1999 prior to the next meeting of the Council.

The Council **approved** the following terms of reference for the Workshop:

- to review existing marine mammal hunting methods in member countries, including technical developments with respect to equipment and methods, with the view to providing a technical evaluation of different methods of hunting (fin and minke whaling; hunting of small whales; seal and walrus hunting);
- to examine possibilities for technical innovation and further enhancement of efficiency and safety in hunting methods, with a view to providing recommendations for improvements, where relevant.

The Council noted that the Workshop should aim to provide a forum for the exchange of information between hunters, veterinary experts, and other relevant participants with first-hand experience and expertise related to the methodology and technology of marine mammal hunting.

It was further noted that the members of the Committee on Hunting Methods would be responsible for the further planning of the Workshop, in collaboration with the Secretariat.

In response to the Committee's request for guidance on whether experts from non-member countries should also be invited to participate in such a Workshop, the Council **agreed** that the participation of all relevant experts should be considered, within the terms of reference of the Workshop.

Finally, the Council also noted that extra funds had been included for meeting costs in the 1999 budget to allow for the anticipated additional practical costs in relation to the Workshop.

5.1.3 Rules of Procedure of the Committee on Hunting Methods

The Council **approved** the proposed amendments to the Rules of Procedure for the Committee on Hunting Methods, as explained under item 5 of the report of the Committee. The revised Rules of Procedure, as approved by the Council, are contained in Appendix 3 of the Report of the Committee on Hunting Methods [Section 1.2 of this volume.

5.1.4 Election of Officers

The Council noted that Jústines Olsen (Faroe Islands) was elected Chairman of the Committee on Hunting Methods for the next two years, and Egil Ole Øen (Norway)

Report of the Eight Meeting of the Council

was elected Vice Chairman.

The Chairman thanked Amalie Jessen for the report of the Committee. The Council applauded Amalie Jessen for her chairmanship of the Committee since its establishment in 1994.

5.2 Other business

Under this item, Norway used the opportunity to explain to the Council in more detail the background and present status of the project started last year in Norway to develop a new whaling grenade.

The project was initiated in order to address a number of technical factors associated with the pre-existing penthrite grenade for minke whales developed in 1983-85 which were in need of improvement. These factors included the expense of production of the current grenade, risks and costs associated with the self-destructing safety mechanism, and problems of balance on the harpoon gun due to the weight of the grenade.

A new grenade was designed and successfully tested on one boat in 1997. As the results from the field trials as well as the laboratory testing of this grenade were very promising, it was decided to conduct a large scale field trial in 1998 where all boats (33) were equipped with new grenades. So far 624 minke whales have been reported killed with the new grenade. Detailed reports have so far not been received, but the results from the 1998 season are very promising. Some minor, but important modifications have, however, to be made on this prototype, and plans are therefore under way to conduct a new field trial from some boats with the third prototype version of the grenade in the 1999 whaling season. If this new design proves to be successful then it will be introduced and distributed in full scale in the year 2000.

The Chairman thanked Norway for this information.

6. ENVIRONMENTAL QUESTIONS

The Chairman referred to the steps which the Council had agreed at its Seventh Meeting in Tórshavn in 1997 would be appropriate for NAMMCO to take in relation to concerns about contaminant levels in the marine environment. The Council had agreed that NAMMCO should:

- contact the Arctic Monitoring and Assessment Programme (AMAP), commending the work carried out and urging the continuation of such work in the future;
- communicate its concerns to the relevant international bodies responsible for dealing with pollution reduction (such as the Oslo and Paris Commissions), and request information on progress with respect to the reduction of emissions;
- seek an exchange of information and advice with the United Nations Food and Agriculture Organisation and the World Health Organisation with regard to the effects of marine pollution levels on food quality and human health.” (*NAMMCO Annual Report 1997: 29-30*)

NAMMCO Annual Report 1998

With reference to related documentation contained in NAMMCO/8/5, the Secretary informed the Council of action taken since the last meeting of the Council to follow up on these recommendations.

Firstly, in connection with the work of AMAP, the Secretary reported that a statement from NAMMCO was submitted to the Fourth Ministerial Conference on the Arctic Environmental Protection Strategy (AEPS) which was held in Alta, Norway in June 1997. The Arctic Monitoring and Assessment Programme was established under the AEPS and will continue its work under the newly established Arctic Council. The NAMMCO statement commended the comprehensive AMAP report on the State of the Arctic Environment, and drew attention to the desire of NAMMCO member countries for enhanced international co-operation aimed at strengthening measures to reduce pollution of the marine environment.

Secondly, with respect to communicating concerns to relevant international bodies responsible for dealing with pollution reduction, the Secretary reported that a letter had recently been sent to the Oslo and Paris Commission (OSPARCOM) explaining the concerns of NAMMCO member countries and requesting an active exchange of information with that Commission. In particular, information on any new decisions and measures taken as a result of the Ministerial Meeting of the OSPARCOM which was held in Portugal in July, was requested. No information had yet been received by the Secretariat directly from OSPARCOM.

Finally, the Secretary regretted that due to time constraints, no further action had yet been taken to establish an information exchange on these issues with the FAO and the World Health Organization (WHO), as suggested by the Council last year.

The Council instructed the Secretariat to continue to pursue these issues with the relevant international bodies and to report back to the Council at its next annual meeting.

The Faroe Islands informed the Council that revised dietary recommendations for the consumption of pilot whale meat and blubber were recently issued by health authorities in the Faroe Islands, based on the demonstrated effects of mercury exposure and a general assessment of polychlorinated biphenyls (PCBs). The meat of pilot whales is high in mercury and as such is one of the main sources of this in the Faroe Islands diet, while the blubber contains high levels of PCBs. Research on the toxicity and effects of PCBs in the diet is still being carried out. These revised regulations were a matter of considerable concern for Faroe Islands people, for whom pilot whale meat and blubber are an important, staple part of the diet and which otherwise have great nutritional value.

Norway expressed concern at this new information from the Faroe Islands and noted the importance of strengthening political efforts to address the problem of mercury and PCBs in the marine environment. States responsible for pollution should be urged to take all measures to halt production and eliminate release of these and other pollutants. It was further suggested that international bodies dealing with marine

Report of the Eight Meeting of the Council

pollution should be urged to intensify their work in this field, with a view to identifying the sources and eliminating emissions.

Iceland, Greenland and the Faroe Islands supported the comments of Norway.

7. THE NAMMCO FUND

7.1 Report of the NAMMCO Fund

The Chairman of the Board of the NAMMCO Fund, Ulla Wang (Faroe Islands), presented the report of the NAMMCO Fund, which met in Copenhagen on 24 June 1998. The report was contained in NAMMCO/8/10.

The Council noted the overview of funding and current status of projects supported by the Funds since 1994, as contained in Appendix 2 of the report.

7.1.1 Update on supported projects

Projects supported by the Fund and which had been completed since the Fund's last report to the Council included:

Marine Hunters: Whaling and Sealing in the North Atlantic - An information brochure by High North Alliance, which was finalised in October 1997 and published in English, German and Swedish.

The Anthropology of Community-Based Whaling in Greenland, edited by Marc G. Stevenson, Andrew Madsen and Elaine Maloney, Studies in Whaling No.4, Occasional Publication No. 42, Canadian Circumpolar Institute, University of Alberta, 1997: 277pp. This is a compilation of documents on whaling in Greenland, originally proposed in 1994 by Professor Milton Freeman of the Canadian Circumpolar Institute, Canada.

Of outstanding projects, the Faroe Islands text book on mammals in the North Atlantic, by Dr Dorete Bloch, to be published by Skúlabókagrunnurinn in Tórshavn was expected to be complete in August this year. The Secretariat had recently received a proof of the poster on whales in Norwegian waters by Tore Dillingøen, which would be completed within the next few weeks. The copy-edited manuscript of the publication by the Inuit Circumpolar Conference (ICC) entitled *Inuit, whaling and sustainability* had been returned to the publisher in Canada and the printing process was now under way. Finally, Knut Skoglund's documentary film on minke whaling in Norway was in the final editing stages, and Skoglund had informed the Secretariat that he hoped to launch it initially in whaling communities in Lofoten later this year, after which it would be submitted to a number of forthcoming film festivals. Rights to screen the film had so far also been purchased by the Norwegian state broadcasting company, NRK.

The Board noted that of the total remaining funds from 1997 of NOK 104,663, a sum of 50,000 was earmarked for Knut Skoglund's documentary film on minke whaling in Norway, leaving a carry-over total from 1997 of 54,663. Total funds presently available

for further project support, including the NOK 200,000 earmarked for the Fund in 1998, were therefore NOK 254,663.

7.2 Other business

The Council was informed of the Board's discussions concerning existing procedural arrangements for the review of projects and granting of support from the NAMMCO Fund. There was general agreement among Board members that should the Fund continue to fund information projects, then it would now be appropriate to develop formal arrangements for the advertising of the Fund and clear guidelines for applicants before further projects were considered.

The Council noted that the Board had **agreed** to postpone further support for any new proposals received until such administrative guidelines and formal requirements for applications to the Fund had been developed. These would require public advertising of the Fund with pre-defined deadlines for applications. It was suggested that this could be done on an annual basis and timed to coincide with annual meetings of the Council at which support for projects could be formally announced.

The Council further noted that the Board had **agreed** to instruct the Secretariat to develop a draft set of requirements for applicants and administrative guidelines for the Fund, which should be circulated to the Board for their review and comments. As a basis for these guidelines the Board identified a number of general requirements for projects, some of which had already been applied in practice, and which should be incorporated into formal guidelines:

- projects supported should have a general relevance to all member countries;
- the Fund provides no more than 50% of the total budget of any project;
- project applications should provide full details on the project and its timeframe, budget, full and confirmed funding from all sources, a main project leader and references ;
- projects are required to formally acknowledge support received from NAMMCO Fund;
- the Fund does not support the general day-to-day operations of other organisations;
- projects supported are required to provide NAMMCO with regular feedback and follow-up information on progress during their production, and information on distribution and reception of the project, as well as audited accounts, when completed.

8. SEALING CONFERENCE

8.1 Review of Conference

The Council reviewed the results of the NAMMCO International Conference and Exhibition – *Sealing the Future*, which was held in St John's, Newfoundland, Canada from 25 to 27 November 1997. Document NAMMCO/8/11 included the final press release from the Conference (see also *NAMMCO Annual Report 1997*, Section 5). Copies of the daily summaries of proceedings produced during the Conference were also available to the Council.

Report of the Eight Meeting of the Council

The Secretary reported on the arrangement in general, which had been organised by the Secretariat, in collaboration with the Inuit Circumpolar Conference, the Nordic Council of Ministers, the NORA and High North Alliance. A Conference programme committee and advisory group had been established at an early stage with representatives from these organisations and other experts to consult on the development of the Conference programme.

As reported at the last meeting of the Council, the Minister of Fisheries of the provincial government of Newfoundland and Labrador, Mr John Efford, invited NAMMCO to hold the event in St John's, and the provincial department of Fisheries and Aquaculture in St John's established a local organising committee to work with the Secretariat and assist with arrangements.

The Conference and Exhibition was attended by over 200 participants from across the circumpolar north, including Alaska, Canada, Greenland, Iceland, Faroe Islands, Norway, the Russian Federation, as well as from Latin America and southern Africa. The Conference programme included presentations and panel discussions under the general themes of sealing past and present, products and markets, and managing seals and sealing for the future. In addition, the Conference exhibition featured seal product displays from a wide range of producers, including seal skin and leather clothing and fashion items, meat and oil products as well as general information displays from a number of organisations.

Under the Conference session on products and markets, a panel of experts discussed barriers to international trade in seal products and agreed on a number of recommendations (see NAMMCO/8/11 and *NAMMCO Annual Report 1997*, Section 5). The Secretariat had subsequently forwarded these recommendations to the Director General of the World Trade Organisation (WTO), and had recently been informed that the recommendations had been made available to WTO member governments and had been discussed at the July 1998 meeting of the WTO Committee on Trade and Environment. Copies of the panel's recommendations and the Secretariat's correspondence with the WTO were contained in NAMMCO/8/11.

An International Seal Fashion Show organised by the provincial government of Newfoundland and Labrador was the highlight of the Conference Host Dinner, at which the premier of Newfoundland and Labrador, Mr Brian Tobin, addressed Conference participants. The Seal Fashion Show was the first time seal fashion designers from around the world had the opportunity to show their creations together. The event generated a great deal of interest and was covered by a wide range of media.

The Secretary concluded her report on the Conference by underlining that the event would not have been possible without the excellent support and assistance of the provincial authorities in St John's and their local organising committee, which included staff of the provincial Department of Fisheries and Aquaculture as well as the Canadian Sealer's Association.

Finally, it was reported that plans for a publication of articles drawing on presentations made at the Conference had been discussed informally, but no further steps had yet been taken to begin the production of such a publication.

The Chairman, on behalf of the Council, thanked the Secretary for her report on the Conference and applauded the efforts of the Secretariat in ensuring the success of the event. Finally, the Council noted with appreciation the financial support for the Conference which had been received from NORA (DKK 100,000) and Indigenous Survival International, Greenland (DKK 10,000).

The Secretary presented the Chairman with a framed photograph depicting his presentation during the Conference dinner to the Premier, Brian Tobin, of a painting by the Norwegian artist Dagfinn Bakke. The painting was presented to the Premier as a token of NAMMCO's appreciation to the Government of Newfoundland and Labrador for hosting the Conference.

The observer for the Inuit Circumpolar Conference, Aqqaluk Lyngø, briefly addressed the Council in order to thank NAMMCO, on behalf of ICC as a co-sponsor of the Conference, for a constructive collaboration and for providing such a unique opportunity for sealing interests world-wide to gather and exchange views. Mr Lyngø further outlined ICC's own work and plans in relation to related issues, in particular the inclusion of Inuit knowledge in management practices and ICC's work to promote a better understanding of sustainable use of natural resources by indigenous peoples, as well as environmental issues, in other international fora, such as the Arctic Council. Finally, Mr Lyngø expressed his organisation's appreciation to the Government of Newfoundland and Labrador and the other co-sponsoring organisations for their support with the Conference.

8.2 Recommendations of *ad hoc* sealing group

The Chairman referred to document NAMMCO/8/12, which was a set of recommendations to NAMMCO on "Sealing the Future". These recommendations were the result of discussions in an *ad hoc* group, which was established at the end of the final day of the Conference to discuss an international sealing strategy. The group had since corresponded on the further refinement of these recommendations, which had been forwarded to NAMMCO in April 1998.

The Council noted that a number of the recommendations of the group were outside the scope of NAMMCO as an intergovernmental body. These included recommendations for further collaborative work to address trade barriers, marketing strategies, research and development of seal products, networking, and public and political advocacy.

With respect to the recommendation concerning the need for greater international co-operation on management of seal stocks, the Council noted that this was indeed the remit of NAMMCO on a regional level in the North Atlantic. The Council further noted that the extension of this collaboration to include the active participation of

Report of the Eight Meeting of the Council

Canada and the Russian Federation would help to further strengthen international co-operation on the management of shared seal stocks, while also providing greater scope for future collaborative research and information projects.

The Council **agreed** that NAMMCO should respond constructively to the *ad hoc* group, commending the initiative taken by the group at the Conference to discuss strategies for the future and encouraging the group to follow up on these issues with the relevant governments and authorities. NAMMCO's response should nevertheless clearly distinguish between those areas related to the groups recommendations which are outside the scope of the Commission's work, and the management-related matters which NAMMCO was established to address.

Finally, the Council also **agreed** to encourage member governments and their relevant authorities and industries to consider in more detail the recommendations forwarded by the *ad hoc* group.

9. EXTERNAL RELATIONS

9.1 Co-operation with other international organisations

Under this agenda item, the Council reviewed relations with other international organisations, with which NAMMCO has established an exchange of observers and/or information, as well as other meetings of interest to the Commission.

IWC - International Whaling Commission

The Council noted that the Secretary had represented NAMMCO as observer at the two annual meetings of the IWC that had been held since the last meeting of the Council in 1997. These were the 49th and 50th annual meetings of IWC held in, respectively, Monaco in October 1997, and Oman in May 1998.

As is the usual practice, NAMMCO submitted on both occasions an opening statement to the IWC, providing updated information on the activities of the organisation. The NAMMCO statement submitted to IWC/50 in Oman, and the IWC press release from that meeting, were contained in NAMMCO/8/13.

In addition to this exchange of observers and information on the Council/Commission level between NAMMCO and the IWC, the Council also noted that the IWC Scientific Committee had recently suggested that it take a more active role in establishing co-operation with the NAMMCO Scientific Committee (IWC/50/4 Report of the Scientific Committee: 8, extract contained in NAMMCO/8/13). However, the Commission at its 50th meeting in Oman in May 1998 had declined to provide advice on this matter to the IWC Scientific Committee. It was also noted that prior to this, the IWC had appointed Nils Øien (Norway) as its observer at meetings of the NAMMCO Scientific Committee, although an exchange of observers between Scientific Committees had not at that time been formally agreed to by the NAMMCO Scientific Committee.

NAMMCO Annual Report 1998

The Council further noted that at its 1998 meeting, the NAMMCO Scientific Committee had agreed that it would be valuable in the future to exchange information through observers on a scientific level with the IWC.

The Council endorsed this view, noting the importance of reciprocity in such observer relations.

Canada/Greenland Joint Commission on the Conservation and Management of Narwhal and Beluga

The Chairman referred to document NAMMCO/8/13, which included the final press release and an extract from the report of the 6th Meeting of the Canada/Greenland Joint Commission on the Conservation and Management of Narwhal and Beluga. The Secretary represented NAMMCO at the meeting, which was held in Iqaluit, Canada from 28 November to 1 December 1997. It was noted that this was the first time NAMMCO had been represented by an observer at a meeting of the Joint Commission, and the opportunity was used to present participants with updated information on NAMMCO work plans and activities, including a briefing on the results of the NAMMCO International Conference on Sealing held in Newfoundland immediately prior to the Commission meeting. An invitation was also extended to Nunavut representatives attending the Commission meeting to attend the 1998 meeting of the NAMMCO Council. It was noted that the Commission had reiterated their agreement to continue to exchange reports with NAMMCO.

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

The Council noted that NAMMCO had been represented at the Second Meeting of the Parties to ASCOBANS, which was held in Bonn, Germany from 17-19 November 1997. The NAMMCO observer, Arne Bjørge (Norway) had submitted a written summary report of the meeting, which was contained in NAMMCO/8/13.

CITES – Convention on International Trade in Endangered Species of Wild Fauna and Flora

The Secretary reported on her attendance as NAMMCO observer at the 10th Conference of the Parties (COP 10) to CITES, which was held in Harare, Zimbabwe in June 1997.

As noted at the Seventh Meeting of the Council in 1997, NAMMCO had, upon request from the CITES Secretariat, provided scientific advice and views on the proposal from Norway to transfer the Northeast Atlantic and Central North Atlantic stocks of minke whale from Appendix I to Appendix II. Although the Norwegian proposal gained broad support, receiving a simple majority of 57 votes in favour to 51 against, transfers between lists in CITES require a two-thirds majority, so the proposal was not adopted.

The Council noted that, as well as the clear majority support for the Norwegian proposal on minke whale stocks, a number of other decisions at the COP 10 of CITES, such as the transfer of several southern African elephant populations from Appendix I to Appendix II, reflected the broad international support for science-based approaches

Report of the Eight Meeting of the Council

to wildlife conservation and management which take account of the rights and wishes of local communities to benefit from the sustainable use of their wild resources.

NEAFC - North-East Atlantic Fisheries Commission

Inger Lavik Opdahl (Norway) reported on the 1997 Annual Meeting of NEAFC, at which she had represented NAMMCO. The meeting was held in London 18-21 November 1997. NEAFC also held an extraordinary Annual Meeting 30 June to 1 July 1998.

In November 1997, NEAFC adopted a management arrangement for Atlanto Scandian (Norwegian Spring Spawning) herring for 1998. A working group for mackerel and herring was established. The annual meetings focused on the development of a comprehensive control system to be implemented for the fisheries regulated by NEAFC. The system for supervision and control was adopted at the extraordinary Annual Meeting last June.

In order to ensure that NEAFC would be prepared to meet the new administrative tasks imposed by the NEAFC control system, the Annual Meeting decided to establish a secretariat in London independent of the British Ministry of Agriculture, Fisheries and Food. The Secretariat will function from the first quarter of 1999.

NAFO – Northwest Atlantic Fisheries Organisation

The Chairman, Arnor Halldórson, reported on the 19th meeting of NAFO at which he had represented NAMMCO. The meeting was held in St John's, Canada from 15 to 19 September 1997. Mr Halldórsson reported in particular on intersessional meetings of four NAFO working groups, some of which were dealing with matters that could be of relevance to the work of NAMMCO. These were the Working Group on Transparency, the Working Group on Precautionary Approach, the Working Group on Dispute Settlement and the Working Group on Allocation of Fishing Rights to Contracting Parties of NAFO and Chartering of Vessels Between Contracting Parties.

FAO – UN Food and Agriculture Organisation

The Secretary referred to an invitation to NAMMCO (contained in NAMMCO/8/13) from the UN Food and Agriculture Organisation (FAO) to attend a meeting of FAO and non-FAO regional fishery bodies, planned for February 1998. The objective of the meeting was to exchange views and experiences with respect to common issues relating to fishery bodies and to discuss strategies for the promotion of the Code of Conduct for Responsible Fisheries and the recently adopted international agreements, as well as to explore the potential for institutional linkages between FAO and non-FAO fishery bodies. It was **agreed** that further information should be sought on this meeting from relevant representatives in member countries who are directly involved in such discussions through FAO before deciding on whether NAMMCO should be represented at this meeting.

Arctic Council

The Secretary reported on recent correspondence with the Secretariat of the Arctic Council in Canada enquiring about progress with NAMMCO's application for observer

status (see also *NAMMCO Annual Report 1997*: 35). No response had been received prior to the Council meeting, although the Secretariat had received a response from the Arctic Council in June to NAMMCO's invitation to the present Council meeting, regretting their inability to attend.

It was noted that the next meeting of Senior Arctic Officials, followed by the first Ministerial Meeting of the Arctic Council, would be held in Iqaluit, Canada from 14 to 18 September 1998.

9.2 Other matters

Canada and the Russian Federation – observers to the Scientific Committee

The Council noted with appreciation the continued participation of Canada and the Russian Federation as observers at annual meetings of the Council. It was further noted that Canadian and Russian scientists had made important contributions as invited experts to the work of the Scientific Committee in the assessments of specific shared stocks and other scientific issues of common interest, such as the interaction between marine mammals and fish.

Given the continued importance of Russian and Canadian contributions to the work going on within the Scientific Committee with respect to shared stocks of marine mammals, the Council **agreed** that Canada and the Russian Federation should be invited to send a scientific observer to meetings of the Scientific Committee on a permanent basis. The Secretariat was instructed to communicate this invitation in writing to the governments of Canada and the Russian Federation and to inform the Scientific Committee accordingly.

Discussions on regional initiatives for whaling management in the North Pacific

The observer from the Government of Japan, Shuji Ishida, informed the Council briefly of discussions which had taken place earlier in the year between the IWC Commissioners from China, South Korea, Russia and Japan regarding a framework for co-operation on regional management of whale resources in the western North Pacific. While no concrete decisions were made during these discussions, it was confirmed that co-operation was extremely important and should be commenced in the form of co-operation on scientific research.

Delegations expressed their appreciation for this information from the observer from Japan and wished them well in the further development of regional co-operation in the western North Pacific.

Regional management of small cetaceans in the Eastern Caribbean

The observer from the Government of Saint Lucia, Horace Walters, informed the Council of intentions in the Eastern Caribbean, also including Antigua and Barbuda, St. Kitts & Nevis, Dominica, St. Vincent and the Grenadines and Grenada, to establish a regional organisation for the management of small cetaceans. A draft agreement for circulation to the Governments involved was in the process of being developed and it was hoped that this could be formalised in the near future.

Report of the Eight Meeting of the Council

The island nations in the Eastern Caribbean depend heavily on the living resources of the sea, including cetaceans, for their daily sustenance. The Government of Saint Lucia hosted a training workshop in July this year, with support from the Government of Japan and with senior Japanese scientists as trainers in the scientific aspects of this resource. It is intended to establish research programmes in each island to develop databases, which would allow the islands in a sub-regional context to manage their small cetacean resources.

The observer for Saint Lucia concluded by expressing the hope that NAMMCO could provide necessary guidance and assistance in the further development of this Eastern Caribbean initiative for regional management of small cetaceans.

The Chairman thanked Horace Walters for this information and on behalf of member countries expressed support and encouragement for these developments in the Eastern Caribbean. He further stated that, with their own experiences of establishing a regional body for marine mammal management, NAMMCO member countries would be pleased to provide the Eastern Caribbean nations with advice and guidance in the further process of formalising this initiative.

World Conservation Union (IUCN) - European Sustainable Use Specialist Group

The observer for the European Bureau for Conservation and Development (EBCD), Despina Symons, informed the Council briefly of the ongoing work of the European Sustainable Use Specialist Group (ESUSG) under the IUCN. She explained that EBCD was providing the Secretariat for the Fisheries Working Group under the ESUSG, which was expected to have an important role to play in developing policy advice and information for use in both European and global environmental fora, where fisheries related -issues were being discussed.

10. INFORMATION

The Secretary informed the Council of work and plans related to the further development of information on NAMMCO for the general public.

The NAMMCO website had now been launched at www.nammco.no and so far contained general information about the Commission as well as news items and press releases related to the work of the Commission. The website would be further expanded in the near future, and would become an effective way of making information available on forthcoming meetings, NAMMCO documents, publications and other information. It was envisaged that the Status of Marine Mammals in the North Atlantic, to be further developed by the Secretariat in consultation with the Scientific Committee, would also be available for reference on the website.

The Council noted that information on projects supported by the NAMMCO Fund and their availability should also be included on the website.

Now that the NAMMCO general information brochure produced in 1995 was out of print, the Secretariat has produced NAMMCO information folders which were

NAMMCO Annual Report 1998

designed to be used for the distribution of various loose-leaf information such as fact sheets, press releases and information on publications, meetings and conferences.

Finally, the Secretary reported that editing of the first volume of *NAMMCO Scientific Publications - Ringed Seals in the North Atlantic* had now been finalised and the volume was ready for publication. A final proof of the volume was on display during the meeting (see also under 3.1.4. above).

11. ANY OTHER BUSINESS

The Secretary reported that the NAMMCO Agreement had been registered by Norway with the United Nations Secretariat in accordance with Article 102 of the Charter of the United Nations (no. 33321). The United Nations had issued a certificate confirming this registration on 10 October 1997.

The Chairman, on behalf of member countries, thanked the departing General Secretary, Kate Sanderson, for her vital contribution and leading role in the establishment of the Organisation as head of the Secretariat since its establishment in 1993 and wished her every success in her new position with the Department of Foreign Affairs in the Government of the Faroe Islands. As a token of appreciation, Egil Ole Øen (Norway) on behalf of the Council, presented the Secretary with a miniature brass whaling harpoon gun.

Kate Sanderson in turn thanked the Commission, through the Chairman, for the privilege and pleasure of serving the organisation for the past five years and of having had the opportunity to contribute to its establishment and development. She thanked delegates, observers and past and present Secretariat staff for the co-operation and friendship she had enjoyed during her term as Secretary, and wished the Commission all the best in its future work.

12. CLOSING ARRANGEMENTS

12.1 Next meeting

The next annual meeting, to be hosted by Iceland, would be held in the week beginning 4 October 1999.

12.2 Adoption of press release

A press release summarising the main decisions and discussions of the meetings, as contained in Appendix 7, was adopted.

LIST OF PARTICIPANTS

DELEGATES

Faroe Islands

Kaj P. Mortensen (C)

Jústines Olsen

Jógvan Ósá

Ulla Wang

Greenland

Amalie Jessen (Vice-Chairman)

Jesper Koldborg Jensen

Einar Lemche (C)

Peter A. Petersen

Iceland

Eiður Guðnasson

Sævar Gunnarsson

Arnór Halldórsson (Chairman)

Kristín Haraldsdóttir (C)

Gunnar Jóhannsson

Kristján Loftsson

Gísli A. Víkingsson

Norway

Steinar Bastesen

Rannveig Bøthun

Halvard P. Johansen (C)

Gunnar P. Kjønngøy

Jan Bjørn Kristiansen

Elling Lorentsen

Inger Lavik Opdahl

Lisbeth W. Plassa

Lars Walløe

Inger Winsnes

Egil Ole Øen

Scientific Committee

Tore Haug

OBSERVERS

Governments

Canada

Bjørn Petter Hernes

Denmark

Henrik Fischer

Japan

Gabriel Gómes Díaz

Hideo Inomata

Shuji Ishida

Russian Federation

Serguei Bogdanov

Saint Lucia

Horace Walters

Intergovernmental organisations:

International Whaling Commission

(IWC)

Henrik Fischer

Northwest Atlantic Fisheries

Organization

(NAFO)

Lisbeth W. Plassa

North-East Atlantic Fisheries

Commission

(NEAFC)

Inger Lavik Opdahl

Non-governmental organisations:

Africa Resources Trust

Juan Ovejero

NAMMCO Annual Report 1998

European Bureau for Conservation and
Development (EBCD)

Despina Symons

High North Alliance

Rune Frøvik

Sveinn Guðmundsson

Laila Jusnes

Geir Wulff Nilsen

Tor Are Vaskinn

International Wildlife Management
Consortium

Jaques Berney

Inuit Circumpolar Conference

Aqqaluk Lynge

Inuvialuit Game Council (Canada)

Larry Carpenter

Duane Smith

Norman B. Snow

Nunavut Wildlife Management Board
(Canada)

Daniel Pike

World Council of Whalers

Billy Day

Researcher

Steinar Andresen

SECRETARIAT

Augusta Jerimiassen (Greenland Home Rule)

Tine Richardsen

Kate Sanderson

C= Councillor

AGENDA

1. Opening procedures *
 - 1.1 Welcome address, Mr Peter Angelsen, Minister of Fisheries, Norway
 - 1.2 Opening statements
 - 1.3 Admission of observers
 - 1.4 Adoption of agenda
 - 1.5 Meeting arrangements
2. Administration and Finance
 - 2.1 Report of the Finance and Administration Committee
 - 2.2 Commission Budget 1999 & Forecast Budget 2000
 - 2.3 Rules of Procedure
 - 2.4 Other business
3. Scientific Committee
 - 3.1 Report of the Scientific Committee
 - 3.2 Co-operation with ICES
 - 3.3 Other business
4. Management Committee
 - 4.1 Report of the Management Committee
 - 4.2 Requests for advice
 - 4.3 International Observation Scheme
 - 4.4 Other business
5. Hunting Methods
 - 5.1 Report of the Committee on Hunting Methods
 - 5.2 Other business
6. Environmental questions
7. The NAMMCO Fund
 - 7.1 Report of the NAMMCO Fund
 - 7.2 Other business
8. Sealing Conference
9. External relations
 - 9.1 Co-operation with other international organisations
 - 9.2 Other business
10. Information
11. Any other business
12. Closing arrangements
 - 12.1 Next meeting
 - 12.2 Adoption of press release

* open to the press

LIST OF DOCUMENTS

NAMMCO/8/1	List of Participants
NAMMCO/8/2	Agenda
NAMMCO/8/3-rev 1	List of Documents
NAMMCO/8/4	Report of the Finance and Administration Committee
NAMMCO/8/4 – Annex 1-rev 1	Draft Budget 1999 and Forecast Budget 2000
NAMMCO/8/4 – Annex 2	Draft Rules of Procedure for the Council
NAMMCO/8/5	Environmental questions - documents related to agenda item no. 6.
NAMMCO/8/6	Report of the Scientific Committee, 1-5 March 1998
NAMMCO/8/7 - Draft	Report of the Management Committee, 2 Sept.1998
NAMMCO/8/8	Report of the ICES Advisory Committee on Fishery Management on Harp and Hooded Seals (advice from ICES to NAMMCO's request)
NAMMCO/8/9	Report of the Committee on Hunting Methods
NAMMCO/8/10	Report of the NAMMCO Fund
NAMMCO/8/11	Documents related to the NAMMCO International Conference and Exhibition <i>Sealing the Future</i> , St. John's, Newfoundland, Canada, 25-27 November 1997
NAMMCO/8/12	Recommendations to NAMMCO on <i>Sealing the Future</i> – a report from the <i>ad hoc</i> group on an international sealing strategy
NAMMCO/8/13	External relations – documents related to agenda item 9.

**ADDRESSES AND OPENING STATEMENTS TO THE COUNCIL
BY MEMBER DELEGATIONS AND OBSERVER GOVERNMENTS**

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NORWAY – ADDRESS OF WELCOME

The Minister of Fisheries of Norway, Peter Angelsen

Mr Chairman, Delegates, Observers and Guests, Dear Friends.

On behalf of the Norwegian Minister of Fisheries, Mr Peter Angelsen, I have the pleasure to welcome you to Norway and Oslo to the eighth meeting of the Council of NAMMCO.

Norway attaches great importance to the work of NAMMCO and the co-operation between the North Atlantic countries. Through the work of NAMMCO we defend the culture and the interests of the coastal people in our part of the world.

The North Atlantic countries have a common basis for the management of natural resources. This basis is the science. All our management decisions are based on scientific advice. Therefore, we spend a lot of money on research in order to make sure that our decisions are well founded.

The work of the Scientific Committee is therefore from our point of view of vital importance to NAMMCO. NAMMCO's credibility depends on it. We can be proud of the work done by the Scientific Committee. We therefore welcome the decision from last year to publish the results of the scientific work in a NAMMCO publication series.

We also look forward to see the results of the future work of the Scientific Committee on the economic aspects of the marine mammal – fish interactions.

NAMMCO has proved to be a forum for practical co-operation between countries that want to base their management of marine resources on scientific advises. This year you have taken a further step and implemented the NAMMCO International Observation Scheme.

NAMMCO is a young organisation, and we recognise that there are different views on certain questions. Norway is still of the opinion that NAMMCO should continue to focus on seals and small cetaceans, and less on the baleen whales. On the other hand we see the interactions between all marine stocks, and recommend that the Scientific Committee continues its work on updating all marine stocks.

NAMMCO Annual Report 1998

The question of a host agreement between Norway and NAMMCO has been discussed for a long time. We hope that a positive decision soon will be taken by the Norwegian Government.

We would also like to welcome the observers to the NAMMCO meeting. We appreciate the support you give us. I would like to extend a special welcome to the observer from Saint Lucia who is here for the first time.

We look forward to fruitful discussions and decisions in the Council and expect you to continue to build NAMMCO as an organisation that takes care of the needs of the coastal communities of the North Atlantic.

We wish you a successful meeting.

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THE FAROE ISLANDS – OPENING STATEMENT

Ms General Secretary, Mr Chairman, Distinguished Delegates, Observers, Ladies and Gentlemen.

It is a great pleasure to be here in Oslo at the 8th Annual Meeting of NAMMCO. My delegation would like to thank our Norwegian colleagues for hosting this meeting. It is always a pleasure to be here in Norway and many links have been made between the people of the Faroe Islands and the people of Norway.

This year it is also an opportunity to celebrate The Year of the Ocean. To the people of the Faroes Islands the ocean and its resources play a major role to our existence. Fisheries and sustainable use of all marine resources, including whales and seals, are very important to the people in my country. Thus the socioeconomic impacts from management decisions on fisheries are considerable.

However, this 8th Annual Meeting of NAMMCO is again a further step forward in our discussions between Parties and the possibilities of NAMMCO to strengthen regional co-operation in the North Atlantic.

In NAMMCO we also have the opportunity to raise our concerns on the real threats to marine mammals today. Of great concern are environmental matters such as pollution of the sea. Unfortunately, Faroese authorities have had to make a new diet recommendation on pilot whale meat and blubber. It has been more than nine years since the last diet recommendation was published in the Faroe Islands based on the effects of mercury exposure and on a general assessment of PCB's. We would like to stress the importance of co-operation in the North Atlantic to reduce the pollution from industrial centres and urge countries to raise this real threat to marine resources in appropriate organisations, rather than focussing on the limited and sustainable hunting of marine mammals.

Report of the Eight Meeting of the Council

The Government of the Faroe Islands appreciates the work done through NAMMCO on the conservation and management of marine mammals in the North Atlantic. It is of great importance that NAMMCO has concluded that the pilot whale hunt in the Faroe Islands is sustainable. The authorities continuously make progress to improve the hunting methods, and a revised regulation on pilot whale hunting have come in force.

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GREENLAND - OPENING STATEMENT

The Greenlandic delegation is very pleased to participate in this 8th meeting of the Council here in Oslo.

Greenland welcomes the interest in other parts of the world to establish regional bodies like NAMMCO for the purpose of scientific co-operation, conservation and management of marine mammals.

Greenland welcomes the possibilities of scientific co-operation as demonstrated in the comprehensive report of our Scientific Committee. Co-operation is also important with respect to sighting surveys which provide the data which forms the the basis for abundance estimates and quota modelling. We also find it essential that the knowledge of the hunters and users is taken into account in the scientific work.

Greenland also welcomes the implementation this year of the Joint NAMMCO Control Scheme, and looks forward to the continuation of the Working Group on Inspection and Observation as an important initiative.

Greenland anticipates the follow-up and careful consideration in Council of other NAMMCO initiatives such as the Sealing Conference in St. John's last year.

Over the next few months, the NAMMCO Secretariat enters a new phase in the evolution of NAMMCO as a professional organisation. It is our wish that the organisation will continue with a professional management, who can work and represent NAMMCO through a broad network of scientists and managers in governmental and non-governmental organisations from member and non-member countries.

Finally, we would like to thank the Government of Norway for the invitation and the hospitality we are enjoying.

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ICELAND - OPENING STATEMENT

The Icelandic delegation is pleased to participate in the 8th meeting of NAMMCO in Oslo, the capital city of the host country. We would like to take the opportunity to thank the Norwegian Government for the invitation to this important meeting.

NAMMCO Annual Report 1998

Iceland is pleased to note the international development towards greater acknowledgement of the sustainable use of natural resources. To accomplish further achievements, it is necessary to further strengthen ties with countries that share our interests and values. The results of the CITES meeting held in Harare in June 1997 demonstrate the significance of co-operation between countries that share interests in the sustainable utilisation of wildlife resources, whether fish, whales, elephants or other species. Therefore Iceland welcomes increased participation of countries with shared interests and values in NAMMCO's work.

At this eight annual meeting of the Commission there are several important issues that should be dealt with.

From early on in the short history of NAMMCO member countries have stressed the importance of multispecies approach to management. As noted at the last annual meeting, the effect of marine mammals on commercial fisheries is an important part thereof. A working group on economic aspects of marine mammal - fisheries interactions has started this important work. Since the economies of northern communities rely so much on the utilisation of the marine resources, it is urgent to develop this work further.

Since the last meeting of the Council, the Scientific Committee has assessed the status of the Central North Atlantic minke whale stock in light of new abundance estimates based on recent surveys. The Icelandic delegation is thankful for the work carried out by the Scientific Committee and looks forward to discussing the assessment in the Management Committee. Further, it is important that the Scientific Committee continues to monitor stock levels and trends of other marine mammals in the North Atlantic, not least those that were covered by NASS-95.

Apart from these issues related to science and management, we must ensure progress in building up the organisation. Development of Rules of Procedures is therefore welcomed, as well as discussion on ways and means to achieve progress in respect of a future Host Agreement for the organisation.

Mr Chairman, we have an important task ahead of us. The Icelandic delegation hopes that this meeting will be effective and successful.

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JAPAN - OPENING STATEMENT

Mr Shuji Ishida, Observer for the Government of Japan

Chairman, delegates, ladies and gentlemen. It is my pleasure to attend the 8th Meeting of NAMMCO in the beautiful surroundings of Oslo, and we wish to express our appreciation to the Government of Norway for their kind hospitality and efforts to make this meeting a success.

Report of the Eight Meeting of the Council

The policy of Japan on the management of marine mammals is based on the principle of sustainable utilisation of marine living resources, which is embodied in UNCED Agenda 21. For this purpose, constructive co-operation, including scientific contributions in the appropriate regional organisations, will be essential. Japan highly values NAMMCO's progress toward rational and sustainable utilisation of marine living resources, including marine mammals, based on the science.

As Mr Shima stated last year, diversifying the sources of food for the world is of the utmost priority, given that the population is expected to exceed 10 billion by the middle of the next century. New large scale development of farming land is difficult. For example, more than 3 million Ha of additional farm land would be necessary to produce enough corn to provide an additional one egg per year for 2.2 billion people, the combined population of India and China. This area is approximately half of all Japanese arable land. In this context, the sustainable use of marine food resources is necessary.

Whaling is not an environmental problem. Rather, whaling is an environmentally friendly activity. Whales consume 500 million metric tons of marine resources every year. This is more than five times the total annual world catch of the fish, which is around 80 million metric tons. Proper management of whales is indispensable for ocean ecosystem management.

Japan also stresses the social, cultural and economic importance of marine mammals and the marine mammal fishery to its coastal society. Japan is a country highly dependent upon the sea. We have very little arable land, and are highly dependent upon the food resources of the oceans. Whales, along with other living marine resources, are an integral part of our society, culture and economy, as well as of the multispecies ecology of the waters off our coasts.

In fact, we are annoyed by irresponsible anti-whaling activities. The anti-whaling force is not representing the majority opinion of any country. The result of opinion polls conducted in several major countries from 1997 to 1998 indicated that the majority of people supported harvesting of whales, as long as the level of the catch was sustainable. The opinion poll also found that the majority of people did not have correct information on whales. This indicates the importance of the proper dissemination of information related to whales.

Lastly, Japan would like to note the movement towards creating a new regional framework in the north-west Pacific for the proper management of marine mammals. We have started informal and frank discussions among several countries about strengthening scientific co-operation and information sharing on marine mammals in the region. We have to continue this sort of regional discussion in order to send a certain signal to the IWC,

Japan hopes the NAMMCO meeting will be successful and further strengthen the relationship between Japan and the NAMMCO member countries.

AUDITED ACCOUNTS FOR 1997**1. PROFIT AND LOSS ACCOUNT (NOK)**

Income	1997	1996
Contributions	2,730,000	2,730,000
Interest received (netto)	56,000	63,000
<i>Total Income</i>	2,786,000	2,793,000
Expenditure		
Secretariat costs	2,359,000	2,189,000
Meetings	50,000	40,000
Scientific Committee	415,000	309,000
Projects, NAMMCO Fund	215,000	0
Conference Sealing the Future	282,000	0
<i>Total operating expenses</i>	<u>3,321,000</u>	<u>2,538,000</u>
<u>Operating result</u>	-535,000	255,000

2. BALANCE SHEET 31 DECEMBER 1997

Current assets		
Bank deposits (restricted 123,594)	898,034	1,564,069
Outstanding claims	123,969	0
<i>Total assets</i>	<u>1,021,003</u>	<u>1,564,069</u>
Current liabilities		
Employees tax deduction & tax	59,538	86,918
Creditors	30,584	22,351
Other	11,000	0
<i>Total current liabilities</i>	<u>101,122</u>	<u>109,269</u>
Restricted equity		
Relocation fund	200,000	200,00
NAMMCO Fund	104,663	319,664
<i>Total restricted equity</i>	<u>304,663</u>	<u>519,664</u>
<i>Distributable equity (General reserve)</i>	615,215	935,136
Total equity	919,881	1,454,800
<i>Total liabilities and equity</i>	<u>1,021,003</u>	<u>1,564,069</u>

LIST OF REQUESTS FOR SCIENTIFIC ADVICE (1992-1997)

The following is a list of requests for scientific advice from the Council of NAMMCO since its formation in 1992. 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 also indicated as NAC/ICES. Unless otherwise indicated, all other requests are addressed directly to the NAMMCO Scientific Committee.

1. ROLE OF MARINE MAMMALS IN THE ECOSYSTEM

Marine mammal – fish interactions:

- 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 (NAC/ICES, NAMMCO/1, 1992).
- To assess the impact of marine mammals on the marine ecosystem, with special emphasis on the availability of economically important fish species (NAMMCO/2, 1993).
- In the multispecies 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;
 - 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 (NAC/ICES; NAMMCO/1, 1992).
- 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 (NAMMCO/6, 1996).
- 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 (NAMMCO/7, 1997).

Multispecies approaches to management:

- To consider whether multispecies models for management purposes can be established for the North Atlantic ecosystems and whether such models could

NAMMCO Annual Report 1998

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 (NAC/ICES; NAMMCO1, 1992);

- In relation to the importance of the further development of multispecies 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 (NAMMCO/5, 1995).

Sealworm infestation:

- 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 (NAMMCO Annual Report 1996, p. 173) - (NAMMCO/6, 1996).

Economic aspects of marine mammal-fisheries interactions:

- The Council requested that special attention be paid to studies related to competition and the economic aspects of marine mammal-fisheries interactions (NAMMCO/7, 1997).

2. ENVIRONMENTAL ISSUES

- 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 (NAC/ICES; NAMMCO/1, 1992).
- To review the contaminant burden (especially organochlorines) in marine mammals in the North Atlantic and evaluate the possible sources of these contaminants (NAC/ICES; NAMMCO/1, 1992).

3. MANAGEMENT PROCEDURES

- 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 (NAMMCO/2, 1993).
- Further development of RMP-like procedures (NAMMCO/4, 1994).

4. STOCKS/SPECIES

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

- To plan joint cetacean sighting surveys in the North Atlantic by co-ordinating national research programmes (NAMMCO/3, 1993).

- 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 (NAMMCO/5, 1995).

- 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 years request (NAMMCO/6, 1996).

- 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 (NAMMCO/7, 1997).

Central North Atlantic minke whales:

- 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. (*Intersessional NAMMCO request – March 1997*).

Northern bottlenose whales:

- To undertake an assessment of the status of the northern bottlenose whale (*Hyperoodon ampullatus*) stock in the North Atlantic (NAMMCO/2, 1993).

NAMMCO Annual Report 1998

- 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] (NAMMCO/4, 1994).

Killer whales:

- 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 (NAMMCO/2, 1993).

Long-finned pilot whales:

- 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 (NAC/ICES; NAMMCO/1, 1992);
- 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 (NAMMCO/2, 1993).

Narwhal and beluga:

- The Scientific Committee was requested to examine the population status of narwhal and beluga (white whales) throughout the North Atlantic (NAMMCO/7, 1997).

Harbour porpoises:

- 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 (NAMMCO/7, 1997).

Atlantic walrus:

- 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 (NAMMCO/2, 1993).

Harp and hooded seals:

- 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

Report of the Eight Meeting of the Council

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 (NAMMCO/2 to ICES & NAFO, 1993).

- With respect to the Council's earlier request for advice on harp and hooded seals (see *NAMMCO Annual Report 1996:132-33*), it was noted that at its 1996 meeting, the Scientific Committee had reviewed the latest information on the Northwest Atlantic stocks of these species (see also above under 3.1.2), but that a number of issues regarding the status of stocks of hooded seals in the Greenland Sea and harp seals in the Greenland, Barents and White Seas still remained to be addressed.

It was noted that at its Copenhagen meeting in August/September 1997, the Joint ICES/NAFO Working Group on harp and hooded seals will in particular address the status of the harp seals stock in the Greenland Sea and the Barents and White Seas and the hooded seal stock in the Greenland Sea. The ecological role of these stocks will also be discussed. Since aerial surveys have been carried out in 1997 to assess both the Greenland Sea hooded seal stock and the Barents/White Sea harp seal stock, updated abundance estimates for these two stocks are expected. An updated stock estimate for the Barents/White Sea stock of harp seals will make it possible to establish a more reliable estimate of the annual food consumption of this stock. Current knowledge about the feeding habits of harp and hooded seals in the Greenland Sea are, however, insufficient to facilitate calculation of food consumption of these stocks.

It was anticipated that the Scientific Committee would review this new research at its next meeting (NAMMCO/7, 1997).

Ringed seals:

- 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 (NAMMCO/5, 1995).

- 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 (NAMMCO/7, 1997).

Grey seals:

- 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 (NAMMCO/5, 1995).

Dolphin species:

- 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 (Recommendation to Member Countries - NAMMCO/7, 1997).

PRESS RELEASE

The North Atlantic Marine Mammal Commission (NAMMCO) held its Annual Meeting in Oslo, Norway from 1 to 4 September 1998. The meeting was attended by delegations from the member countries, Norway, Iceland, Greenland and the Faroe Islands, as well as observers from the governments of Canada, Denmark, Japan, the Russian Federation and Saint Lucia. A number of intergovernmental and non-governmental organisations also attended the meeting.

Scientific research

The role of marine mammals in the ecosystem is a major focus of NAMMCO. Based on research reviewed by the NAMMCO Scientific Committee, it was concluded last year that minke whales, harp seals and hooded seals in the North Atlantic may have substantial direct and/or indirect effects on commercially important fish stocks. Further studies of the feeding habits of these species will continue. NAMMCO has now also begun to examine the economic aspects of marine mammal – fisheries interactions. Further work has been requested to address specific questions such as what would be the economic consequences of not exploiting harp seals or minke whales compared with continued harvest.

Interactions between dolphins and fisheries have caused concern in NAMMCO member countries. NAMMCO has therefore requested an assessment of the distribution, stock identity, abundance and feeding habits of white-beaked and white-sided dolphins in the North Atlantic area.

Further scientific work also requested through NAMMCO includes an assessment of the status of fin whales in the North Atlantic and further investigation of the stock structure of minke whales in the North Atlantic.

Planning is underway through the NAMMCO Scientific Committee for an international symposium on harbour porpoises in the North Atlantic to be held in September 1999, and an assessment of the population status of narwhal and beluga in the North Atlantic will also be carried out next year.

In addition, NAMMCO has decided on concrete steps to provide for a more active dialogue between scientists and resource users.

Management conclusions

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 catches between 1980 and 1984) are sustainable. This was based on an assessment finalised by the NAMMCO Scientific Committee in March this year.

NAMMCO Annual Report 1998

The Management Committee also noted that combined estimated annual 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. It was also noted that catches 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.

International observation of whaling and sealing

The NAMMCO International Observation Scheme, under the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals adopted by the Council in 1996 has been implemented for the first time in 1998. Observation activities this year involved land-based observation of sealing and whaling in Norway and Greenland carried out by international observers appointed by NAMMCO.

It has been agreed that the scope of the Scheme will also cover other areas in 1999 and that on-board observation should also be considered.

Hunting Methods

NAMMCO will arrange a workshop on hunting methods for marine mammals in NAMMCO member countries next year to provide for an exchange of information between hunters, veterinarians and other experts. The aim of the workshop will be to provide an evaluation of different methods of hunting as well as to examine possibilities for further enhancement of efficiency and safety in hunting.

Environmental matters

NAMMCO noted that high levels of PCBs and heavy metals in the blubber and meat of pilot whales in the Faroe Islands are causing concern. NAMMCO urges those states responsible to take all measures to halt production and eliminate release of these and other pollutants. Further, international bodies dealing with marine pollution were urged to intensify their work in this field, with a view to identifying the sources and eliminating emissions.

Co-operation on marine mammals in the Northwest Pacific and Eastern Caribbean

Representatives from the governments of Japan and Saint Lucia informed NAMMCO of efforts presently being made to formalise regional co-operation on marine mammal conservation and management in the Northwest Pacific and the Eastern Caribbean. The Chairman of the Council of NAMMCO, Arnór Halldórsson, expressed the hope that these new regional initiatives could benefit from the experiences already gained by the work of NAMMCO.

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NAMMCO was established by an agreement signed in 1992 by Norway, Iceland, Greenland and the Faroe Islands. The objective of the Commission is to contribute through regional consultation and co-operation to the conservation management and study of marine mammals in the North Atlantic.

1.2 REPORT OF THE COMMITTEE ON HUNTING METHODS

Copenhagen, Denmark, 24 June 1998

The Committee met in the Copenhagen offices of the Greenland Home Rule Government on 24 June 1998. Attending the meeting were: Amalie Jessen, Greenland (Chairman); Jústines Olsen, Faroe Islands; Kristín Haraldsdóttir, Iceland; Kristján Loftsson, Iceland (on the telephone); Egil Ole Øen, Norway; and Kate Sanderson and Tine Richardsen from the Secretariat.

1. and 2. OPENING PROCEDURES

The Chairman of the Committee, Amalie Jessen, welcomed Committee members to the meeting. She noted that it had now been two years since the Committee had last met (in January 1996). It was noted that in 1997, Committee members had agreed to meet again prior to the next meeting of the Council in 1998. The present meeting was called in order both to deal with procedural matters, as well as to review updated information from member countries related to the development and regulation of hunting methods.

The draft agenda was adopted and the General Secretary, Kate Sanderson, functioned as rapporteur.

In connection with the agenda, the Secretary pointed out that in order to be consistent with its Rules of Procedure, the group should be referred to as the Committee on Hunting Methods, rather than the Working Group on Hunting Methods, as it has previously been called.

3. UPDATES ON HUNTING METHODS IN MEMBER COUNTRIES

The Chairman invited members of the Committee to provide updated information on developments with respect to hunting methods in their respective areas and types of hunting. An updated list of laws and regulations in member countries, as well as a list of references on hunting methods, were circulated as NAMMCO/HM/doc-1 and NAMMCO/HM/doc-2, and some additions to these were made during the meeting. Updated versions are contained in Appendices 1 and 2.

Faroe Islands

Olsen (Faroe Islands) reported that a new executive order on pilot whaling (no. 46 of 8 April 1998) had replaced the previous order no. 55 from 16 May 1995. The new executive order now also recognises the newly developed blunt hook for securing whales as official whaling equipment. Drive hunts of all small whale species in the Faroe Islands (with the exception of harbour porpoises) are now subject to regulations for the distribution of catches. In addition, the new order also allows district authorities to decide the most appropriate way of compiling lists of people to whom the resident shares of catches should be distributed. Traditionally, local distribution lists have been based on the registry of residents in the district concerned, while experience suggests that distribution

Report of the Committee on Hunting Methods

in some areas, such as the capital Tórshavn, may be more effective based on lists confined to those people who actively register themselves for shares of a catch.

Other than these formal amendments to the executive order on pilot whaling, Olsen also reported that plans are now under way to have the new blunt hook produced on a larger scale, either nation-wide, or in the individual municipalities.

Monitoring of times-to-death in pilot whaling continues, with times taken in most whale drives in 1997, from a total of 213 animals.

Olsen also informed the Committee that the methodology of the whale hunt is now a common part of instruction in many lower secondary schools in the Faroe Islands. Some schools have received whale carcasses from hunts with which to practice butchering methods, while the general biology of pilot whales and the killing methods used in the hunt are also commonly discussed at 9th or 10th grade level.

In connection with plans to attach satellite tags to pilot whales to monitor their distribution, a new executive order (no. 126 of 23 June 1997) has been implemented which bans the hunting of tagged animals, or schools in which tagged animals occur.

Norway

Øen (Norway) informed the Committee that there had been no major changes to regulations in Norway concerning the hunting of minke whales and seals.

The shooter's course is still a requirement each year for whalers, and all whaling vessels have inspectors on board. In addition, samples for genetic analysis are being collected this year from each whale caught.

A prototype of the so-called "black box"- the instrument for automatically recording hunting activities on board whaling vessels - is intended to be tested on two boats taking part in this year's minke whaling.

Øen also reported that a new penthrite grenade, which he developed in collaboration with the Norwegian Defence Research Institute (*Forsvarets Forskningsinstitutt*), is being used this year on all whaling vessels. Whalers and inspectors are required to fill out reports on the function of this new grenade, and conclusions on its efficacy in large-scale use await the review of these reports at the end of the whaling season.

The reasons for developing a new model are related to a number of factors. The pre-existing version is technically complicated and expensive to produce, probably costing between 5 and 6 thousand Norwegian kroner in future production, while the new version costs the whaler much less. Unlike the pre-existing version, which could not be fired more than once due to its security mechanism, the new version can be re-fired if the first shot misses the target. In addition, the weight of the new version has been reduced by approximately 40%, in order to improve the balance on the harpoon gun. The explosives in the new version are slightly increased in quantity (from 22g to 30 g) and concentrated to a approximately 2 cm area.

Iceland

Haraldsdóttir (Iceland) reported that no new regulations related to the hunting of marine mammals in Iceland had been introduced since the last meeting of the Committee.

Greenland

Jessen (Greenland) reported in detail on the recent developments in Greenland.

The most significant recent change has been the introduction of tighter controls on the inspection and use of the explosive grenade for the hunting of minke and fin whales. Hunters must now show proof of purchase and the serial number of grenades in connection with their hunting reports. Newly purchased harpoon guns shall also be checked by the vessel inspection agency (KIS) before being approved. In connection with the actual catch, hunters must also indicate on a figure where the animal was struck. If whales killed with explosive grenades have taken more than 30 minutes to die, hunters must report on this and provide an explanation.

In 1997, various technical and operational problems with harpoon guns purchased from Kongsberg Small Arms in Norway led to a number of cases of functional failure and in one instance an accident causing damages to people and property. As a result, the Greenland Home Rule Government implemented an executive order requiring all harpoon guns to be inspected by the vessel inspection agency (KIS) before being approved for hunting. This order is withdrawn as all harpoon guns have now been inspected. Some of them will require further renovation due to faulty handling.

All harpoon guns, with the exception of 8 in Disko Bay, have been overhauled, and no further technical problems have been reported. The Greenland Home Rule Government subsidises 2/3 of the cost of overhauling harpoons guns, and this support is available for the last time in 1998. From next year, hunters will have to bear all costs for the further maintenance of their equipment.

Jessen provided the Committee with some background information related to the use of the explosive grenade in 1997 and 1998. In 1990 the Greenland Home Rule Government purchased 100 grenades to introduce this new equipment. In 1991 it became obligatory by law to use the explosive grenade in the hunting of minke and fin whales (with the exception of the rifle hunt of minke whales). Since then, the regulations have also been tightened a number of times. Until 1997, hunters bore the full costs of the equipment, but in 1997 a government subsidy of 3,000 kroner per license was issued, whether or not a successful strike was made. In Greenland, an explosive grenade costs 6,450 kroner from the Greenland Trade Company (KNI Pilersuisoq).

Due to the high price of the grenade, it seems that some hunters had chosen to breach the regulations in 1997 and hunt large whales without using the explosive grenade. At least 7 criminal cases have been raised in connection with the use of illegal equipment.

KNAPK (the Greenland Hunters' and Fishermen's Organisation) has for several years been demanding economic support for the purchase of explosive grenades, although until 1997 these demands have not been met by the Government due to the fact that large

Report of the Committee on Hunting Methods

subsidies for equipment maintenance were already being provided. The Greenland Trade Company (KNI) is unwilling to lower the price of the grenade, which is approximately 7,000 kroner, due to their own expenses related to purchasing, transport and storage.

KNI reported that only 17 minke whale grenades were purchased in 1997 and 6 fin whale grenades. The exact number of explosive grenades actually used is not known, and some hunters claim they have had also used grenades left over from previous years.

As a result of these developments, and in order to stabilise the situation and ensure better use of explosive grenades, the Greenland Home Rule Government has increased its subsidy for the purchase of grenades from 3000 to 3400 kroner for each grenade used, upon the provision of proof of purchase and the serial number of each grenade used. New figures on numbers of grenades sold in 1998 show that more grenades were purchased in May this year than were purchased in 1997.

No training courses have been held since 1994, although 1 or 2 courses were planned for 1998 but had to be postponed. If the revised form of explosive grenade (as described by Øen) were to replace the type currently used in Greenland, this may require further training of hunters in its use. The authorities plan to hold courses in 1999 and in subsequent years.

With regard to the rifle hunt of minke whales, Jessen informed the Committee that the Greenland Home Rule Government has decided not to increase the level of this form of minke whaling. Rather, after the division of the higher total quota of minke whales (175 per year), the proportion of animals which can be killed by rifle (55) is lower than previously, when the total annual quota was 147, of which 52 could be hunted with rifles. The general policy is to continue to reduce the proportion of the total quota of minke whales hunted with rifles in Greenland.

Jessen concluded by noting that the authorities in Greenland recognised the need to maintain a balance between the implementation of measures designed to further improve the efficiency of hunting methods, and the practical and economic concerns of hunters.

Øen (Norway) thanked Jessen for her thorough presentation of developments in relation to the hunting of large whales in Greenland. He commended the efforts made by the Greenland authorities and by Jessen herself, over the past eight years to arrange for improvements in hunting methods in Greenland. He noted that measures were being taken to deal with the problems that had recently been experienced with regard to the use of explosive grenades, as well as to reduce the level of rifle hunting of minke whales. Despite the possible discrepancy between the numbers of grenades registered as purchased, and unused stock from previous years, Øen expressed his concern that illegal equipment was obviously being used to kill whales in Greenland.

Olsen (Faroe Islands) supported the comments and concerns expressed by Øen.

Haraldsdóttir (Iceland) agreed that it was regrettable to hear of illegal hunting methods being used, but stressed the need to understand the situation fully.

NAMMCO Annual Report 1998

Jessen requested advice on the calibre/type of ammunition for use in the wording of regulations in Greenland in relation to the hunting of marine mammals. The existing wording and references in the regulations have caused confusion among users and managers, and Greenland therefore sought advice on the issue.

Based on previous and on-going research in Norway, Øen recommended that only rifles with a calibre of 9.3mm or greater, with full-jacketed, round-nosed ammunition, should be used to hunt animals of the size of minke whales. Shots should be aimed at the brain, neck or, as a last resort, the heart. Rifle shots aimed at other parts of the body would not result in a quick death.

4. FUTURE WORK OF THE COMMITTEE

In considering plans for future work, the Committee discussed a suggestion by Øen (Norway) to arrange a workshop on hunting methods in NAMMCO member countries.

The Committee **agreed to recommend** to the Council that a NAMMCO Workshop on Hunting Methods should be held, preferably as early as possible in 1999 prior to the next meeting of the Council, with the following proposed terms of reference:

- to review existing marine mammal hunting methods in member countries, including technical developments with respect to equipment and methods, with the view to providing a technical evaluation of different methods of hunting (fin and minke whaling; hunting of small whales; seal and walrus hunting);
- to examine possibilities for technical innovation and further enhancement of efficiency and safety in hunting methods, with a view to providing recommendations for improvements, where relevant.

The Committee agreed that the Workshop should aim to provide a forum for the exchange of information between hunters, veterinary experts, and other relevant participants with first-hand experience and expertise related to the methodology and technology of marine mammal hunting.

It was envisaged that the members of the Committee on Hunting Methods would be responsible for the further planning of the Workshop, in collaboration with the Secretariat.

The Committee **agreed to seek guidance** from the Council on whether experts from non-member countries should also be invited to participate in such a Workshop.

5. RULES OF PROCEDURE

The Committee discussed a number of points in its Rules of Procedure which it felt required some minor adjustment. It was agreed to recommend to the Council the following amendments (deleted text shown as strikethrough; suggested new text in square brackets):

Article 4.1: The Committee shall meet ~~at least~~ once a year, preferably prior to the annual

Report of the Committee on Hunting Methods

meeting of the Council, unless otherwise decided by the Council. Additional meetings may be held when judged necessary by the Committee and approved by the Chairman of the Council.

Article 5.2: The report of the Committee on Hunting Methods shall be made available by the Secretariat to anyone who so wishes, according to guidelines ~~set by the Committee and subject to approval~~ [approved] by the Council.

The revised text of the Rules of Procedure, as amended by the Committee for the approval of the Council, is attached as Appendix 3.

6. ELECTION OF CHAIRMAN AND VICE-CHAIRMAN

Jústines Olsen (Faroe Islands) was elected chairman of the Committee for the next two years.

Egil Ole Øen (Norway) was elected Vice Chairman of the Committee for the next two years.

7. ANY OTHER BUSINESS

Øen (Norway), with the endorsement of Committee members from Iceland and the Faroe Islands, expressed sincere gratitude and appreciation to the outgoing Chairman, Amalie Jessen, for her dedicated and effective leadership of the Committee since its establishment in 1994.

8. ADOPTION OF REPORT

The final report of the meeting was adopted by correspondence.

**LIST OF LAWS & REGULATIONS FOR MARINE MAMMAL
HUNTING IN NAMMCO MEMBER COUNTRIES**

Faroe Islands

- Løgtingslóg nr 57 frá 5. juni 1984 um hvalaveiði
nr 54 frá 20. mai 1996 um broyting í løgtingslóg um hvalaveiði
Kunngerð nr 19 frá 1. mars 1996 um undantak fyri friðing av hvali
nr 126 frá 23. juni 1997 um friðing av hvali
nr 46 frá 8. april 1998 um grind

Greenland

- Landstingslov nr 15 af 6. november 1997 om fangst og jagt
Bekendtgørelse nr 26 af 9. september 1993 om betalingsjagt og -fiskeri
nr 20 af 11. maj 1994 om fangst af isbjørne i Grønland
nr 30 af 11. oktober 1995 om fangst af hvid- og narhvaler
nr 6 af 29. februar 1996 om ændring af bekendtgørelse
nr 26 af 24. oktober 1997 om ekstraordinær syn og godkendelse af harpuncanoner
nr 7 af 26. februar 1998 om fredning og fangst af hvalros ved Grønland
nr 13 af 3. april 1998 om rapportering ved fangst og anskydning af store hvaler
nr 12 af 3. april 1998 om fangst af store hvaler
Fangstregistreringsskema (1993)
nr 32 af 18. december 1997 om erhvervsjagtbeviser
nr 31 af 18. december 1997 om fritidsjagtbeviser
Landsrådsvedtægt af 31. august 1959, stadfestet den 12. februar 1960 om fredning af spraglet sæl

Iceland

- Whaling Act no 26, May 3, 1949
Regulation no 163, May 30, 1973 on whaling
Regulation no 304, May 9, 1983 on amendments to Regulation No. 163 of May 30, 1973 on whaling
Regulation 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.

Report of the Committee on Hunting Methods

Norway

Lov av 16. juni 1939 om fangst av hval

Lov av 3. juni 1983 nr 40 om saltvannsfiske mv.

Melding fra Fiskeridirektøren:

- J-45-89, 30.3.89. Forskrift om kontroll av utøvelse av selfangst
- J-35-98 (*J-17-98 utgår*), 6.3.98. Forskrift om endring av forskrift av 6.2.1998 om regulering av fangst av sel i vesterisen og østisen i 1998.
- J-34-98, 6.3.98. Forskrift om endring av forskrift av 20.2.1991 om utøvelse av selfangst i Vesterisen og Østisen.
- J-14-98 (*J-59-97 utgår*), 5.2.98. Forskrift om adgang til å delta i fangst av vågehval i 1998-05-07
- J-15-98 (*J-107-97 utgår*), 5.2.98. Forskrift om regulering av fangst av vågehval i 1998-05-07
- J-55-98 (*J-85-97 utgår*), 31.3.98. Forskrift om utøvelse av fangst av vågehval i 1998-05-07

Instruks for inspektører under vågehvalfangsten (25. maj 1993)

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- Comments from Greenland Home Rule Government regarding the Terms of Reference to the second Workshop on Whale Killing Methods. - Greenland Action Plan on Whale Hunting Methods, IWC/47/WK 4 rev
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- World Council of Whalers - 1998 General Assembly Report: Whaling and Whale Use Around the World- Greenland page 21
- Video - Hvalfangst i Grønland, 1998.
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RULES OF PROCEDURE FOR THE COMMITTEE ON HUNTING METHODS

(As adopted by the Council of the North Atlantic Marine Mammal Commission at its Fourth Meeting in Tromsø, 24-25 February 1994 and revised by the Committee on Hunting Methods at its meeting in Copenhagen 24 June 1998 – for approval by the Council)

1. Terms of Reference

- 1.1 The Committee shall, upon request from the Council or individual member countries, provide advice on hunting methods for those species of marine mammals relevant to NAMMCO member countries. The Committee shall ensure that such advice is based on the best available scientific findings, technological developments and traditional knowledge, with due consideration given to safety requirements and efficiency of utilisation.
- 1.2 Members of the Committee may raise specific questions for discussion during meetings of the Committee. The Committee may make proposals to the Council for specific tasks to undertake within its terms of reference.
- 1.3 Non-member governments with observer status in NAMMCO may request advice from the Committee through the Council.

2. Membership

- 2.1 Each NAMMCO member country shall be represented by up to two Committee members.
- 2.2 The Committee shall elect from among its members a Chairman and a Vice-Chairman, who shall each serve for two years, after which time they may be re-elected.
- 2.3 The Committee may also seek outside expertise when the Committee considers this to be necessary and appropriate.

3. Observers

- 3.1 Attendance of observers shall not be permitted at the meetings of the Committee on Hunting Methods unless otherwise decided by the majority of the Committee and approved by the Council.

4. Meetings

- 4.1 The Committee shall meet once a year, preferably prior to the annual meeting of the Council, unless otherwise decided by the Council. Additional meetings may be held when judged necessary by the Committee and approved by the Chairman of the Council.

Report of the Committee on Hunting Methods

- 4.2 A provisional agenda for the Committee shall be compiled by the Chairman and distributed to Committee members no later than 30 days prior to the meeting in question. Comments or suggestions for revision of the provisional agenda shall reach the Chairman no less than 10 days prior to that meeting.
- 4.3 The Chairman shall, in consultation with other members of the Committee and the Secretary of NAMMCO, seek to ensure that key documentation of relevance to the provisional agenda is available at the beginning of each meeting.
- 5. Report**
- 5.1 A draft report shall be presented for consideration before the end of the Committee meeting. The final report of each meeting shall be prepared by the Secretariat as required by the Committee and transmitted to all members of the Council as soon as possible after the meeting.
- 5.2 The report of the Committee on Hunting Methods shall be made available by the Secretariat to anyone who so wishes, according to guidelines approval by the Council.
- 6. Amendment of Rules**
- 6.1 Proposals for amendment of these Rules of Procedure shall reach the Chairman of the Council not less than 60 days prior to the Council meeting at which the matter is to be discussed. The Chairman of the Council shall transmit these proposals through the Secretariat to the Members of the Council not less than 30 days prior to that meeting

NAMMCO Annual Report 1998

71

71

Report of the Eight Meeting of the Council

NAMMCO Annual Report 1998

Report of the Eight Meeting of the Council

NAMMCO Annual Report 1998

71

Report of the Eight Meeting of the Council

NAMMCO Annual Report 1998

Report of the Committee on Hunting Methods

Report of the Management Committee

NAMMCO Annual Report 1998

71

Report of the Management Committee

NAMMCO Annual Report 1998

NAMMCO Annual Report 1998

SECTION 2 - MANAGEMENT COMMITTEE

2.1 Report of the Management Committee73

Appendix 1 Agenda80

Appendix 2 List of Documents81

Appendix 3 Working Group on By-Catch
Agenda and List of Participants82

Appendix 4 List of Proposals for Conservation and Management83

2.1
REPORT OF THE MANAGEMENT COMMITTEE

Oslo, Norway, 2 September 1998

1. – 3. OPENING PROCEDURES

The Chairman of the Management Committee, Einar Lemche, welcomed delegations and observers to the meeting. Participants were as listed in Appendix 1 of the Report of the Council. The agenda, as contained in Appendix 1, was adopted. Documents available to the meeting are listed in Appendix 2. The Secretary agreed to act as rapporteur.

4. NATIONAL PROGRESS REPORTS

The Management Committee **noted** that, in accordance with the decision at the last meeting of the Council, National Progress Reports on marine mammal research in member countries submitted to the Scientific Committee were now also available to the Management Committee. Reports from the Faroe Islands, Iceland and Norway for 1997 and for Greenland for 1996 were available to the meeting (see Appendix 2).

In addition, the Management Committee welcomed the information recently received from the Government of Canada in response to the Council's invitation to Canada to provide NAMMCO with information on catch levels and management strategies with respect to shared stocks of marine mammals. The Government of Canada had provided a number of recent documents and reports related to shared stocks which were listed in document NAMMCO/8/MC/6 and which are available to Contracting Parties through the Secretariat.

5. REPORT OF THE WORKING GROUP ON BY-CATCH

At its last meeting in 1997, the Management Committee decided to establish a Working Group on By-catch to "consider how the issue of by-catches of marine mammals could be addressed at its next meeting, noting the duties of States under article 61.4 of UNCLOS in this respect." The Working Group met in Oslo on 31 August and was attended by representatives from all member countries. Gísli A. Víkingsson (Iceland) was elected as Chairman. The Working Group agenda and list of participants are contained in Appendix 3.

The Chairman of the Working Group informed the Management Committee that the Group had decided not to prepare a written report, but had agreed to report to the Management Committee the following points resulting from its deliberations:

- 1) The Working Group studied the definitions, guidelines and rules of by-catch established in other international fora, agreements and other instruments such as UNCLOS, Agenda 21, FAO, ICES and ASCOBANS;

Report of the Management Committee

- 2) The Working Group pointed out that establishing the size of by-catch without access to other relevant parameters, such as abundance estimates and replacement yields, is of little help in answering the question of whether by-catch threatens a particular population;
- 3) All NAMMCO member countries have possibilities in their national catch reports or control schemes to have by-catches registered, including by-catch of marine mammals;
- 4) Member countries should assess available information regarding the level of by-catch compared to the status of the stock in question;
- 5) Member countries should inform NAMMCO of developments in regulations for managing or avoiding by-catch and developments in new technology for this purpose;
- 6) The NAMMCO Secretariat should gather information on tests, developments and use of new technology in fishing gear to avoid or reduce by-catch;
- 7) The Working Group recommends that it should meet prior to the next annual meeting of the Management Committee to discuss developments in this field.

The Management Committee **agreed** that the Working Group should meet again prior to the next meeting of the Management Committee. While noting that discussions in the Working Group had so far been of a preliminary nature, it was agreed that further discussion should focus on issues related to points 4 and 5, as suggested by the Working Group, and that additional specific tasks could be forwarded to the Working Group as appropriate.

6. PROPOSALS FOR CONSERVATION AND MANAGEMENT

6.1 Earlier proposals

The Chairman drew the attention of the meeting to the updated list of proposals for conservation and management decided by NAMMCO since its establishment, as contained in NAMMCO/8/MC/3. (This list of proposals was updated after the Oslo meeting to also include proposals for conservation and management agreed at this meeting, and is contained as such in Appendix 4). The Chairman invited information from Contracting Parties on developments with regard to earlier proposals.

Atlantic walrus

With respect to the proposal for conservation and management of Atlantic walrus agreed in 1995 (see Appendix 4, point 2), 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.

6.2 New proposals

6.2.1 *Advice from the Scientific Committee*

i) Central North Atlantic minke whales

The Management Committee **accepted** that for the Central Stock Area minke whales are close to their carrying capacity and that removals 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 (see NAMMCO/8/6, item 8.5).

ii) Harp seals in the Northwest Atlantic

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 (see NAMMCO/8/6, item 8.1).

iii) Hooded seals in the Northwest Atlantic

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 (see NAMMCO/8/6, item 8.2).

7. RECOMMENDATIONS FOR SCIENTIFIC RESEARCH

7.1 Requests for advice

7.1.1 *Former requests from the Council*

The Chairman drew the attention of the meeting to the updated list of requests for advice (1992-1997) which was available as NAMMCO/8/MC/4.

The Management Committee **noted** that scientific advice on a number of issues forwarded to the Scientific Committee had yet to be finalised due to on-going work in these areas. Of these, the following were noted in particular:

NASS-95

The Management Committee **agreed** to reiterate its previous recommendation to request the Scientific Committee to continue its work to monitor stock levels and trends in all stocks of marine mammals in the North Atlantic (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 (see *NAMMCO Annual Report 1997*: 66).

Harp seals in Greenland Sea and White Sea/Barents Sea and hooded seals in the Greenland Sea

The Management Committee **noted** that a forthcoming meeting of the Joint ICES/NAFO Working Group on Harp and Hooded Seals would be addressing in

Report of the Management Committee

particular requests for advice on these stocks. The Management Committee agreed to return to these matters when further information expected to result from this meeting had been reviewed by the Scientific Committee.

7.1.2 New requests for advice

Economic aspects of marine mammal-fisheries interactions

The Management Committee **noted** the Scientific Committee's decision to maintain the Working Group on the Economic Aspects of Marine Mammal-Fisheries Interactions and to seek further guidance on matters of particular interest.

The Management Committee **agreed to recommend** that the Scientific Committee be 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?

Stock structure of North Atlantic minke whales

In order to ascertain the stock structure of minke whales in the North Atlantic, the Management Committee **agreed to recommend** that the Scientific Committee be 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.

Fin whales

The Management Committee **agreed to recommend** that the Scientific Committee be requested to undertake an assessment of the status of fin whales in the North Atlantic based on all available data.

White-beaked and white-sided dolphins

The Management Committee has noted that ecological interactions between dolphin species of the *Lagenorhynchus* genus and fisheries have caused concern in NAMMCO countries. The Management Committee therefore **agreed to recommend** that the Scientific Committee be 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.

Feeding studies of harp and hooded seals

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

8. IMPLEMENTATION OF THE JOINT NAMMCO CONTROL SCHEME

8.1 NAMMCO International Observation Scheme 1998

The Chairman referred to NAMMCO/8/MC/5, which was a preliminary report by the Secretariat on the implementation of the International Observation Scheme in 1998 under the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals.

The Secretary explained that this report had been prepared in accordance with article B.2.5 of the Joint NAMMCO Control Scheme. It was, however, noted that the report was of a preliminary nature as one observer was still active in the field at the time of the present meeting.

The Management Committee noted that observation activities in 1998 had involved the following:

Sealing in Norway

Land-based observation of seal catches in Norwegian sealing operations conducted in the West Ice and East Ice in the spring of 1998 was carried out in April. A total of three vessels were boarded by a NAMMCO observer in connection with the landing of catches in Tromsø during the period 26 to 28 April 1998. National inspection reports were checked in all cases, and the delivery of catches to the purchaser, Rieber & Co in Tromsø, was also observed. No violations were reported. A final report of observation activities was submitted to the Secretariat.

Whaling in Norway

Land-based observation of catches of minke whales by Norwegian vessels was carried out at points of delivery in the Lofoten Islands during the period 2 to 8 June by a NAMMCO observer. The observer also took part in the course for national whaling inspectors in Bergen on 29 April prior to observation activities. A total of eight whaling vessels were boarded and the whaling logbooks were checked in all cases. On three of the eight vessels, national inspectors were not present when the observer arrived, but the captains of all vessels were present during observation. No violations were reported and a final report of activities was submitted to the Secretariat.

Whaling and sealing in Greenland

Land-based observation of whaling and sealing activities in Greenland is presently being carried out. The planned period of observation in Greenland is 27 August to 13 September, based in the Nuuk area with possible additional coverage in other locations, if appropriate, within this period. A final report of activities is expected to be submitted to the Secretariat before the end of September 1998.

Report of the Management Committee

In addition to providing an outline of observation activities, the preliminary report to the Management Committee also drew attention to some general matters related to the administration of the Scheme, which had been implemented for the first time in 1998.

With respect to planning, it was noted that the proposal for the scope of activities was developed by the Secretariat and approved by the Management Committee by correspondence on March 25. It was further agreed on 29 April to extend the plan to also include land-based observation of whaling operations in Norway. Each member country nominated two observer candidates, no reservations to any candidates were received, and the Management Committee appointed all eight observers on March 25. Based on the agreed proposal for scope, the Secretariat then developed specific plans for observation activities (as outlined above) in accordance with budgeted funds for these activities in 1998, and drawing on three of the eight appointed observers.

The Secretary noted that experiences so far in 1998 in implementing the Scheme revealed a number of administrative matters related to, for example, reporting, salaries and other rates, as well as deadlines for planning, for which the Secretariat requires further guidance and direction from the Management Committee. The Management Committee noted the recommendation of the Secretary that these matters be considered in more detail before the implementation of the Scheme in 1999.

8.2 NAMMCO International Observation Scheme 1999

With respect to the implementation of the Observation Scheme in 1999, the Chairman noted that according to paragraph 14 of the Guidelines to the Observation Scheme - "By October each year, the Secretariat develops a proposal for the Management Committee for the scope and range of observation activities during the following year in accordance with budgeted funds for these activities. The Management Committee shall approve this proposal and appoint the observers by 1 January" .

On the basis of comments from delegations, the Management Committee **agreed** as a starting point that pilot whaling activities in the Faroe Islands should be included in a general proposal for the scope of the Scheme in 1999, and that consideration should also be given to the possibility of on-board observation in other areas.

8.3 Working Group on Inspection and Observation

The Management Committee **agreed** to reactivate the Working Group on Inspection and Observation and Egil Ole Øen (Norway) agreed to resume chairmanship of the Working Group. Noting points raised under 8.1 and 8.2 above, the Management Committee **instructed** the Working Group to meet again prior to 1 December 1998 in order to review in detail the implementation of the Observation Scheme in 1998 and to review a proposal for the scope and range of observation activities in 1999, as well as to examine other practical and administrative matters requiring further consideration and development, and to propose any amendments to the administrative guidelines to the Scheme which may be necessary.

9. ELECTION OF OFFICERS

9.1 Election of Chairman

Kaj Mortensen (Faroe Islands) was elected Chairman of the Management Committee for the next two years.

9.2 Election of Vice-Chairman

Halvard P. Johansen (Norway) was elected as Vice-Chairman of the Management Committee for the next two years.

10. ANY OTHER BUSINESS

Arnór Halldórsson (Iceland) on behalf of all members of the Management Committee, expressed his gratitude and appreciation to Einar Lemche for his efficient handling of the business of the Committee during the two consecutive terms in which he had held the office of Chairman.

11. ADOPTION OF REPORT

A draft report of the meeting, containing all matters of substance agreed by the Management Committee, was reviewed and approved during the meeting. The final edition of the report was prepared after the meeting and adopted by correspondence.

AGENDA

1. Chairman's opening remarks
2. Adoption of agenda
3. Appointment of rapporteur
4. National Progress Reports
5. Report of the Working Group on By-catch

6. Proposals for conservation and management
 - 6.1 Earlier proposals
 - 6.2 New proposals
 - 6.2.1 Advice from the Scientific Committee
 - 6.2.2 Other proposals

7. Recommendations for scientific research
 - 7.1 Recommendations from the Scientific Committee
 - 7.2 Other recommendations
 - 7.2.1 Former requests from the Council
 - 7.2.2 New recommendations from Member Countries
 - 7.3 Establishment of drafting group for scientific recommendations

8. Implementation of the Joint NAMMCO Control Scheme
 - 8.1 NAMMCO International Observation Scheme 1998
 - 8.2 NAMMCO International Observation Scheme 1999
 - 8.3 Working Group on Inspection and Observation
 - 8.4 Other matters

9. Election of officers
 - 9.1 Election of Chairman
 - 9.2 Election of Vice-Chairman

10. Any other business
11. Adoption of report

LIST OF DOCUMENTS

NAMMCO/8/MC/1	List of documents
NAMMCO/8/MC/2	Agenda
NAMMCO/8/MC/3	List of proposals for conservation and management (up to and including NAMMCO/7)
NAMMCO/8/MC/4	Requests for scientific advice – 1992-1997
NAMMCO/8/MC/5	Preliminary report on implementation of the NAMMCO International Observation Scheme under the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals
NAMMCO/8/MC/6	Information on marine mammal research and management provided by the Government of Canada

National Progress Reports:

NAMMCO/SC/6/NPR-F	Faroe Islands - Progress Report on Marine Mammal Research in 1997
NAMMCO/SC/6/NPR-G	Greenland - Progress Report on Marine Mammal Research in 1996
NAMMCO/SC/6/NPR-I	Iceland - Progress Report on Marine Mammal Research in 1997
NAMMCO/SC/6/NPR-N	Norway - Progress Report on Marine Mammal Research in 1997

Council documents:

NAMMCO/8/6	Report of the Scientific Committee, 1-5 March 1998
NAMMCO/8/8	Report of the ICES Advisory Committee on Fishery Management on Harp and Hooded Seals (advice from ICES to NAMMCO's request).
NAMMCO/CS/1998	Provisions of the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals (as adopted by the Council of NAMMCO at its Sixth Meeting in Tromsø, Norway, March 1996)

**Management Committee Working Group on By-Catch,
Meeting 31 August 1998**

AGENDA

1. Election of Chairman
2. Adoption of agenda
3. Appointment of rapporteur
4. Definitions & standards related to By-catch
 - 4.1 International conservation standards and legal instruments (UNCLOS, FAO Code of Conduct for Responsible Fisheries etc)
 - 4.2 National conservation and management policies and regulations – e.g. extent and nature of legislation related to by-catch of marine mammals
5. Management approaches to by-catch
6. Evaluating the problem - Availability of data on by-catch for use in stock assessments
7. Development of technical measures for reducing/avoiding by-catch
8. Utilisation of by-catch – Unwanted or untargeted?
9. Addressing by-catch issues through NAMMCO
10. Adoption of report

LIST OF PARTICIPANTS

Faroe Islands

Kaj P. Mortensen

Greenland

Jesper K. Jensen

Amalie Jessen

Peter A. Petersen

Iceland

Arnór Halldórsson

Gísli Víkingsson (Chair)

Norway

Rannveig Bøthun

Elling Lorentsen

Lisbeth W. Plassa

LIST OF PROPOSALS FOR CONSERVATION AND MANAGEMENT

(Up to and including NAMMCO/8 - 1998)

PINNIPEDS

Atlantic walruses

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

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

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

Ringed seals

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 - see *NAMMCO Annual Report 1996*:149 (Fig.1)).

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 Annual Report 1996*: 81).

Harp seals in the Northwest Atlantic

1) The Management Committee noted that a new abundance estimate for Northwest Atlantic harp 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.

Report of the Management Committee

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 Annual Report 1996*: 81).

2) 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 (see NAMMCO/8/6, item 8.1) (*NAMMCO/8/7, item 6.2.1, ii*))

Hooded seals in the Northwest Atlantic

1) 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 Annual Report 1996*: 81-82).

2) 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 (see NAMMCO/8/6, item 8.2) (*NAMMCO/8/7, item 6.2.1, iii*)).

CETACEANS

Northern bottlenose whales

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 Annual Report 1995*: 48)

Long-finned pilot whales

The Faroe Islands informed the Management Committee of their wish to continue to utilise pilot whales in an opportunistic manner as has been done for centuries. Catches of pilot whales may vary from year to year and total allowable catches are not considered appropriate for this form of hunt. In some years catches may exceed 2,000 whales, and in other years they may be much smaller, while the average annual catch since 1971 (1971-96) has been c. 1,400.

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

NAMMCO Annual Report 1998

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 Annual Report 1997*: 64-65).

Central North Atlantic minke whales

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 (see NAMMCO/8/6, item 8.5) (*NAMMCO/8/7, item 6.2.1, i*))

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NAMMCO/8/6 – Scientific Committee. Report of the Sixth Meeting, Reykjavík, 1-5 March 1998
NAMMCO/8/7 - Report of the Management Committee, Oslo, 2 September 1998

SECTION 3 - SCIENTIFIC COMMITTEE

3.1	Report of the Sixth Meeting of the Scientific Committee	89
	Appendix 1 List of participants	104
	Appendix 2 Agenda	105
	Appendix 3 List of documents	106
	ANNEX 1 Report of the Working Group on Economic Aspects of Marine Mammal – Fisheries Interactions, Reykjavík 1-2 March 1998	107
	ANNEX 2 Report of the Working Group on Management Procedures, Copenhagen 13-14 October 1997	117

3.1

REPORT OF THE SIXTH MEETING OF THE SCIENTIFIC COMMITTEE

Reykjavík, Iceland, 1-5 March 1998

The Scientific Committee of NAMMCO met at the Marine Research Institute, Reykjavík, Iceland, from 1-5 March 1998. The meeting was attended by members of the Scientific Committee and a number of invited experts attended the Scientific Committee Working Group on Economic aspects of marine mammal – fisheries interactions. A full list of participants is contained in Appendix 1.

1-3. OPENING PROCEDURES

The Chairman, Mads Peter Heide-Jørgensen, welcomed members to Reykjavík and to the meeting. On behalf of the Committee, he welcomed in particular the new member of the Committee, Lars Witting, who replaced Pia Barner Neve as member for Greenland this year, and Sidsel Grønvik, the new Scientific Secretary in the NAMMCO Secretariat

The Agenda, as contained in Appendix 2, was adopted and Sidsel Grønvik was appointed as rapporteur.

4. REVIEW OF AVAILABLE DOCUMENTS

4.1 National Progress Reports

National Progress Reports for 1997 from the Faroe Islands, Iceland and Norway, and for 1996 from Greenland (SC/6/NPR - F,G,I & N) were submitted to the Committee.

4.2 Working Group reports and other documents

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

5. CO-OPERATION WITH OTHER ORGANISATIONS

5.1 ICES

It was noted that ICES had now provided its advice to NAMMCO on the request for an assessment of harp and hooded seals. This was based on the work of the Joint ICES/NAFO Working Group on Harp and Hooded Seals, which had met in Copenhagen 28 August – 3 September 1997 (see under item 8.1 –8.2), and was circulated to the Scientific Committee for information (NAMMCO/8/8).

The Secretary informed the Committee that negotiations were continuing with ICES to develop a formal Memorandum of Understanding between NAMMCO and ICES.

Tore Haug informed the Committee about the new structure of ICES. Two new formal Working Groups had been established under the Living Resources Committee, the Working Group on Marine Mammal Population Dynamics and Trophic Interactions

Report of the Scientific Committee

(WGMMPD) and the Working Group on Marine Mammal Habitats (WGMMHA) both of which were expected to be dealing with questions relevant to the work of NAMMCO. Several of the Committee members were also members of these ICES Working Groups, and the Committee agreed that an exchange of observers between the Scientific Committee and the ICES Working Groups would enhance the information flow on the relevant work being carried out.

5.2 ASCOBANS

The Council of NAMMCO has an agreement with ASCOBANS to exchange observers at the Council level, and reports are regularly exchanged between Secretariats. The Secretariat had received an observer's report from the Second Conference of the Parties, held in Bonn in November 1997, at which Arne Bjørge (Norway) had acted as observer for NAMMCO.

5.3 Canada/Greenland Joint Commission on the Conservation and Management of Narwhal & Beluga

The Secretary informed the Committee that reports were being exchanged on a regular basis with the Canada/Greenland Joint Commission on the Conservation and Management of Narwhal and Beluga, and that she had participated as observer at the Sixth meeting of the Commission, held in Iqaluit, Canada, 28 November to 1 December 1997. The report from that meeting as well as the report of the June 1997 meeting of the Scientific Working Group had been circulated to Committee members.

5.4 International Whaling Commission (IWC)

The Secretary noted that the IWC Scientific Committee at its 1997 meeting had agreed that Nils Øien should attend the NAMMCO Scientific Committee as observer on behalf of the IWC Scientific Committee. It was noted in this connection that the Scientific Committee has no arrangement with the IWC for an exchange of observers on a scientific level. In discussion it was agreed that, given the scientific issues of common interest, it would be valuable in the future to exchange information through observers on a scientific level. Nils Øien agreed to act as NAMMCO Scientific Committee observer in the IWC Scientific Committee.

6. UPDATE ON STATUS OF MARINE MAMMALS IN THE NORTH ATLANTIC

At its last meeting the Scientific Committee agreed that the List of Priority Species should be replaced by a new document - Status of Marine Mammals in the North Atlantic - covering all marine mammal species.

The Committee discussed the further development of this document. Sidsel Grønvik reported that due to other recent work priorities in the Secretariat, little progress had been made with the editing of the new document since last year, but that this would be given priority in 1998. A draft text for the section on pilot whales was distributed for information, also as an indication of the major topics which should be included for each species in the document.

NAMMCO Annual Report 1998

The Committee agreed that the information contained in the Status document should be presented in a concise, summary form for the easy reference of the Council, and should contain catch statistics from the last ten years and the recommendations for future research made by the Scientific Committee. Committee members would review the text of the document as it was developed by the Secretariat.

7. ROLE OF MARINE MAMMALS IN THE MARINE ECOSYSTEM

7.1 Economic aspects of marine mammal – fisheries interactions

The Chairman referred to the request from the Council to the Scientific Committee that special attention should be paid to studies related to competition and the economic aspects of marine mammal - fisheries interactions (NAMMCO Annual Report 1997).

To address this request, the Scientific Committee had agreed to establish a Working Group, under the chairmanship of Gunnar Stefánsson (Marine Research Institute, Iceland). The Working Group met from 1-2 March in Reykjavík at the Marine Research Institute, with the participation of, and contributions by members of the Committee and invited experts from Canada, Iceland and Norway. Stefánsson presented the report of the Working Group to the Committee, which was circulated as SC/6/5. The final report of the Working Group is contained in Annex 1.

Bioeconomic multispecies models for various areas and complexes in the North Atlantic were considered by the Working Group. It was noted that such analyses need to include not only profits from whaling or costs due to predation but also an entire economic analysis of consequences of management actions on various industries. The models ranged from those with complicated biological components and simple economic parts through simple biological models with more sophisticated economic parts to intermediate models at both levels.

It was noted that most of the analyses considered by the Working Group were of a preliminary nature. The indications are, however, that the overall costs to the fishing, whaling and sealing industries incurred by not whaling and/or not sealing can be quite considerable and the effects due to predation can be an important part of the overall picture.

The analyses to date have not included potential costs of whaling and sealing to industries such as tourism and whale watching nor potential benefits of whaling and sealing to the fishing industry due to a possible change in the frequency of parasites in fish. Some biological factors such as the effects of hooded seals are not at present included. These factors may be important and should be considered.

The Working Group concluded that many of the analyses were in a preliminary stage and should only be taken as first indications. It is clear, however, that some of the cost and benefit figures emerging from these models are quite high and warrant serious consideration.

Report of the Scientific Committee

The Scientific Committee agreed that other species need to be included and that the models presented were not readily applicable to areas like Greenland and the Faroe Islands. However, despite the complexity of the analyses involved, it was the view of the Scientific Committee that inclusion of economic considerations is a valuable addition to multispecies 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.

7.2 Other matters

It was noted that the Council encouraged scientific work that leads to a better understanding of interactions between marine mammals and commercially exploited marine resources, and had recommended at its last meeting in 1997 that the Scientific Committee periodically review and update available knowledge in the field.

New information on the changes in biological parameters due to environmental changes was made available from the ICES/NAFO Working Group on harp and hooded seals. Harp seals, sampled in coastal areas of northern Norway during a seal invasion in 1995, were in significantly poorer condition than comparable age groups of harp seals sampled in corresponding seasons in 1992 and 1993. This suggests that the seals may have experienced a food shortage during the winter 1994/1995. When capelin is abundant along the Murman and Finnmark coasts in late winter, it is an important prey for harp seals. The collapse of the Barents Sea capelin stock in 1992/1993 resulted in a reduced abundance of capelin in Norwegian coastal waters and a decrease in the importance of this species as prey for the harp seals. This decline in importance is supported by the dominance of codfishes in the diet in 1995 which was also observed during the major seal invasions in 1986–1988. A decreased abundance of immature herring in the southern Barents Sea during 1994 and 1995 may also have contributed to the seal invasions that winter. Harp seals are known to also feed on polar cod during late autumn and winter. The stock size of polar cod in the Barents Sea has increased and was estimated at nearly one million tons in 1992 and 1993. This may have been one of the reasons why the harp seal invasions in 1995 included only immature animals.

Variations in the inflow of warm Atlantic water into the Barents Sea can influence the distribution and abundance of fish species in this region. Low water temperatures may lead to changes in the distribution and availability of important prey species for the harp seals and may cause them to move into the western parts of the Barents Sea.

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

8.1 Harp seals (*Phoca groenlandica*)

NAMMCO Annual Report 1998

Based on a request forwarded by NAMMCO in May 1995, a meeting in the Joint ICES/NAFO Working Group on Harp and Hooded Seals was convened at the ICES Headquarters in Copenhagen, Denmark from 28 August to 3 September 1997. The intention of the meeting was to provide assessment advice on harp seals in the White Sea and Barents Sea, and harp and hooded seals in the Greenland Sea. The terms of references formulated by the Advisory Committee on Fisheries Management (ACFM) in response to this request and questions that arose from the 1993 meeting of the Working Group, were as follows:

- assess the stock size, distributions and pup production of White Sea / Barents Sea harp seals and harp and hooded seals in the Greenland Sea;
- subject to the availability of data, assess the sustainable yield at present stock sizes and provide catch options in the Barents and White Seas and in the Greenland Sea;
- review existing population models for harp seals in order to standardise the methodology used to estimate the numbers at age;
- assess current information on the effect of recent environmental changes or changes in the food supply on harp and hooded seals, and review available data on the possible interaction between these seal species and other living marine resources.

Stock Identity, Distribution and Migrations

Results of a study on the stock identity of harp seals using DNA analysis support previous analyses that indicate a separation between the western and eastern Atlantic groups.

Results from satellite tracking experiments were available both from the Northwest Atlantic and from the Barents Sea. Adult harp seals moulting in the Newfoundland area ranged from the northern Scotian Shelf and Grand Banks of Newfoundland in the spring and winter, north to Baffin Bay, south-eastern Greenland and Hudson Strait in the summer. Offshore waters of the Grand Banks and Davis Strait appeared to be important feeding areas during the winter and summer, respectively. The occurrence of seals on the southern Grand Banks, Flemish Cap and Scotian Shelf may indicate a southern shift in distribution in recent years.

Results of joint Norwegian/Russian telemetric studies in the White Sea showed feeding migrations out of the White Sea and westwards in the Barents Sea of adult females in the period between breeding and moult. Another group of adult harp seals was equipped with satellite-tags after moulting in the White Sea in early May 1996. The results confirm the general migration pattern of Barents Sea harp seals described in earlier studies. The seals migrated north-west into the Barents Sea after moult. In July and August they dispersed along the southern edge of the pack-ice belt from 5° W in the Norwegian Sea to 87° E in the north-eastern Kara Sea, occasionally as far north as 82° N. While the seals spent much of their time in close association with the pack-ice, frequent foraging trips were made into open waters of the Barents Sea. In

Report of the Scientific Committee

late autumn and early winter the seals moved south gradually with the expanding ice cover.

The Greenland Sea stock

Only Norway took catches of harp seals in the Greenland Sea pack-ice in 1996 and 1997, the total catches being 6,427 and 2,161 animals in 1996 and 1997, respectively. In 1996 half the quota, and in 1997 all the quota could be taken as weaned pups, one adult considered equal to two pups. The catches were well below the quota of 13,100 adults. Between 1990–1997 less than 60% of the quota was taken.

Updates of pup production estimates over the period 1977–1991 indicate an estimate of pup production in 1991 of 67,300 (95% C.I. 56,400–78,113). This is similar to the update presented in 1995, and is about 10% higher than the mean estimate used in the assessment carried out in 1993. No major event that could adversely affect the West Ice harp seal stock since the 1993 assessment could be identified. Since the new estimate of pup production falls within the range investigated at the 1993 meeting, no new catch options were calculated.

The White Sea and Barents Sea stock

Combined Russian and Norwegian catches of harp seals in the White and Barents Sea in 1995, 1996 and 1997 totalled 36,486, 41,049 and 36,399, respectively, i.e. at a level comparable to the catch during the years 1989 to 1994. The proportion of pups taken ranged between 81–86%.

A Russian aerial survey of harp seal pups in the White Sea was performed on 12 March 1997. Three methods yielded estimates of pup production, uncorrected for the distribution of births over time, of $68,700 \pm 10,800$ from a photographic survey, $76,300 \pm 19,900$ from a video survey and $89,300 \pm 23,400$ from an IR (infrared) survey. Adding the number of pups taken in commercial catches before the survey (31,319), point estimates from the three survey types ranged between 100,000 and 120,000 pups.

Another Russian aerial survey using strip transect methods was conducted on the whelping grounds in the White Sea from 17–20 March 1997. An estimate of 64,698 (95% C.I.: 61,862–67,533) was obtained. Due to rapid changes in the configuration of ice and pup distribution, the areas surveyed constituted only 41% of the total whelping area. Using an isoline method (adapted from fisheries research), an estimate of 161,442 (95% C.I.: 150,425–172,459) pups was obtained for the entire whelping grounds. Adding the quantity of pups taken by Russian sealers in the White Sea prior to the surveys in 1997 (31,319 whitecoats), point estimates of c.96,000 pups in the strip transect surveys, and c.193,000 pups using the isoline method, would be obtained. Results in selected areas where both methods could be applied, were similar. The appropriateness of using the isoline method to estimate pup production in areas not covered by the strip transect surveys could not be evaluated because additional information on estimation of densities was required. Thus it was concluded that the estimates obtained in the strip transect surveys were minimum estimates, and that the extent of underestimation was unknown.

NAMMCO Annual Report 1998

The strip transect estimates given from the 17-20 March surveys were similar to the estimates obtained in the 12 March survey. Due to the timing of the surveys some pups would have reached the ragged jacket stage by the time of the surveys. Pups at this stage are known to leave the ice occasionally to pursue prey, and therefore may not be counted. Thus, all given estimates are likely underestimates, and the pup production for the White Sea and Barents Sea stock of harp seals was probably at least 100,000 in 1997. Given a pup production of 100,000, an annual take of 40,000 may not be sustainable.

No catch options were provided and this awaits completion of the assessment.

The Northwest Atlantic stock

The Canadian commercial harp seal hunt has increased during the last two years; in 1996 the catch was 242,362 and in 1997 it was 261,043. These are approximately four times the average taken over the last ten years. There has also been a change in the age structure of the hunt with a significant increase in the proportion of pups taken (76% and 84% respectively).

After a period without catch figures for seals in Greenland (1988–92), a new system for collecting harvest data was introduced in October 1992. Catches of harp seals reported through this system for the years 1993–95 (53,642, 54,996 and 60,743, respectively) were significantly higher than the estimated catches in previous years. An examination of the official catch statistics for 1954 to 1987 suggests, however, that the figures reported previously for the period 1975–87 underestimated the true harvest level considerably.

Recaptures of tagged animals have demonstrated that harp seals from all breeding stocks do contribute to catches in Greenland, but it was agreed that when incorporating Greenland catches in population models, all harp seals taken in West Greenland should be considered as deriving from the Northwest Atlantic stock, harp seals taken in Northeast Greenland from the Greenland Sea stock, and harp seals taken in Southeast Greenland should be split equally between the two.

Combining the Canadian and Greenland estimated catches suggest that the current catches are in the order of 300,000. Considering the estimates of replacement yields it was noted that the recent catches of harp seals in the Northwest Atlantic are near, or at, the established replacement levels.

8.2 Hooded seals (*Cystophora cristata*)

The request for advice on hooded seals forwarded to ICES in May 1995 is given in the preamble to section 8.1.

Stock Identity, Distribution and Migrations

A Norwegian study on the seasonal distribution of hooded seals in the Greenland Sea, where nineteen animals were tagged with satellite transmitters, has revealed that the seals remained within the Greenland and Norwegian Sea for the majority of the year. Between July 1992 and March 1993, two of the seals remained near the coast of

Report of the Scientific Committee

Northeast Greenland while eight travelled to waters off the Faroe Islands, three to the continental shelf break south of Bear Island, and three to the Irminger Sea. Several seals spent extended periods at sea west of the British Isles, or in the Norwegian Sea between the breeding and moulting periods.

The Greenland Sea stock

Only Norway took catches of hooded seals in the Greenland Sea in 1996 and 1997, the total amount being 811 and 2,934, respectively. In 1996 half the quota, and in 1997 the entire quota, was allowed to be taken as weaned pups, one adult equal to two pups. The catches were well below the quota (9,000 adults). Between 1990–1997 about 25% of the quota has been taken.

In March 1997 a Norwegian survey found the largest patch of breeding hoods to the north-east of Jan Mayen, while a number of small patches, family groups, and solitary bluebacks were recorded to the north-east, west, and north-west. Six whelping patches were covered by photography, and the total point estimate for these was 25,300 pups (95% C.I. 18,200 to 35,100). For the main patch, visual surveys were also carried out, and they seemed to be in agreement with the photographic surveys. The estimate of 25,300 hooded seal pups produced in 1997 is not corrected for the temporal distribution of births or for scattered pups.

No catch options were provided and this awaits completion of the assessment.

The Northwest Atlantic stock

The most recent information on the catch of hooded seals in Greenland was compared with information gathered during the previous forty years. The figures for the catch of hooded seals in Greenland in 1993 and 1994 (6,906 and 7,330 respectively) are slightly higher than those estimated for the 1980s, but in line with the trend shown since the early 1950s. For most regions the present catch level is within the range estimated for previous decades, but in Southwest Greenland the level is higher. Catches of hooded seals during the 1980s were likely underestimated, but revised estimates are not available.

In 1996, a total of 25,754 hooded seals were taken in Canadian waters, which is more than three times the allowable quota. The majority of these were bluebacks taken prior to 28 March. Reasons for this large catch included favourable ice conditions and good prices for the blueback pelt. In 1997, the total number of hooded seals taken was 7,058, just under the allowable quota of 8,000. In contrast to the previous year, the catch was reported to be adults.

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.

The Davis Strait hooded seal whelping patch was located by survey aircraft on 17, 21 and 22 March 1997. The seals were first sighted at approximately 63°36'N 57°30'W along the edge of the pack ice; by March 21, they had drifted to the north-west

(64°00'N 59°00'W). Although the area could not be searched extensively, there appeared to be only one concentration of seals in the region.

8.3 Ringed seals (*Phoca hispida*)

In 1996 the Scientific Committee was asked to give advice on ringed seals:

“... to advise on stock identity 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.”

An *ad hoc* working group estimated total abundance in Baffin Bay and associated waters, by extrapolating published survey data to not surveyed areas with the same ice conditions. By these means a crude estimate of 1.3 million ringed seals was found for this area. The annual harvest in the order of 100,000 is therefore 7-8 % of the estimated abundance or close to published estimates of sustainable yield (see *NAMMCO Annual Report 1996*: 137-153).

Another calculation found that the annual kill by polar bears (140-170,000) and other predators (20% of what is taken by polar bears) together with the harvest (100,000) would need a standing population after pupping of 1.1 to 1.6 million ringed seals.

These rough estimates were included in the advice, but the main reasons for assuming a sustainable harvest from the Baffin Bay population were: a) that the present harvest level have been maintained for more than a century; b) that the harvest has a high proportion of males and young seals; and c) that the very wide and uniform distribution of the ringed seals buffers the species against wide-scale over-exploitation.

The harvest on the east coast of Greenland was found to be small and likely to be taken from a wide geographical area producing large numbers of ringed seals, so the removals did not raise concern for the status of the population.

In 1997 the Scientific Committee was asked “... to advise on what scientific studies need to be completed in order to evaluate the effects of changed levels of removals of ringed seals in west and east Greenland.”

First, it was noted that the exploitation level of ringed seals in Greenland has shown considerable variability over decades in this century. No effects on seal stocks of changed exploitation levels have been reported. This variability in exploitation is usually ascribed to climatic changes or changes in prices of products or hunting patterns. Therefore, when considering 'changed levels of exploitation' the Scientific Committee chose to focus on scenarios where exploitation is raised by more than twice the level reported in recent years.

It is furthermore assumed that the present hunting patterns with many hunters widely dispersed in Greenland, operating from dinghies or dog sledges, are maintained; i.e

Report of the Scientific Committee

essentially the hunting is restricted to coastal areas.

When reviewing the information about ringed seals and their exploitation in the North Atlantic in 1996 the Scientific Committee identified two major gaps in knowledge:

Monitoring of catches as well as studies of loss rates in different types of hunts, the extent of under-reporting, and changes in hunting effort and trade in seal products, should be undertaken in both Greenland and Canada;

Studies are required on the stock identity, productivity and abundance of pack-ice ringed seals, as these seals are believed to help sustain the catches in some areas and may be vulnerable to various human activities other than hunting which occur in the pack ice.

While reiterating its previous recommendations, the Scientific Committee identified the following items of particular importance for addressing the question:

Unexploited segments of the ringed seals populations inhabiting remote and inaccessible areas (e.g. the pack-ice and some fast ice areas in Baffin Bay and the Greenland Sea) are likely a major contributor to the seals that are hunted in coastal areas, but very little is known about the production and dispersal of these seals. Studies dedicated to these apparently unexploited ringed seals should include a variety of techniques; sampling of seals for studies of age structure, reproduction and genetic identity, surveys of birth lairs, tagging and tracking of pups and adult seals for descriptions of movements and dependence of ice habitats.

The proposed studies should lead to a better understanding of the dispersal and mixing of ringed seals from different areas which is critical to the understanding of their contributions to the hunted segments of the population. Having achieved that, it may be necessary to monitor population changes in certain areas of particular importance, such as breeding habitats with many adult seals.

8.4 Harbour porpoises (*Phocoena phocoena*)

At its Seventh Meeting in 1997, 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 requested the Scientific Committee to perform such an assessment, which might include distribution and abundance, stock identity, biological parameters, ecological interactions, pollutants, removals and sustainability of removals.

The Scientific Committee discussed a proposal for an international workshop/symposium on harbour porpoises, which should involve experts working on this species throughout its North Atlantic range. A preliminary agenda developed by Tore Haug in consultation with a number of other scientists was circulated for discussion. The framework for the agenda derived from the five main topics identified

NAMMCO Annual Report 1998

in the request (distribution, abundance and stock identity; biological parameters; ecological interactions; pollutants; removals and sustainability of removals).

The Scientific Committee agreed to entrust Tore Haug with the task of further developing plans for, and convening such a workshop/symposium on harbour porpoise, with the aim of holding it in the latter half of 1999 (e.g. September). In order to ensure the broadest possible participation, the Committee further recommended that invitations should be extended to ICES, ASCOBANS and the IWC. It was envisaged that a summary report from such a workshop/symposium would provide the Scientific Committee with the necessary basis for the requested assessment of this species.

The Secretary advised the Scientific Committee that a more detailed outline of plans for the workshop/symposium should be transmitted to the Council for its approval as soon as possible, in order to ensure adequate time for further planning.

8.5 Central North Atlantic minke whales (*Balaenoptera acutorostrata*)

In 1997 the Council requested the Scientific Committee to 'undertake an assessment of the status of the Central North Atlantic minke whale stock, including evaluating the long-term effects of past and present removal levels on the stock.'

The Scientific Committee decided to ask the Working Group on Management Procedures to address the request by examining the discreteness of the stock, the past history of exploitation under various assumptions of recent population sizes based on abundance estimates from NASS-87, -89 and -95 and to project a range of removal scenarios.

The Working Group on Management Procedures operated by correspondence and decided to contact relevant expertise to summarise genetic results and to run population trajectories. It was noted that abundance estimates from the recent NASS surveys were already available in a form suitable for the Working Group examinations (see NAMMCO Scientific Committee 1997: Annex 3). To finalise the report to the Scientific Committee, the Working Group met in Copenhagen on 13 and 14 October 1997. The final report from the Working Group is contained in Annex 2.

On the basis of the report from Working Group on Management Procedures, the Scientific Committee reviewed the major conclusions and research requirements related to the assessment of the status of Central North Atlantic minke whales under past and present removals.

i) Discreteness of the stock of minke whales in the North Atlantic

Minke whales in the eastern and western North Atlantic are, at least during summer, separated by the landmasses of Greenland and by the deep water of the mid-Atlantic. It thus seems reasonable to assume that on a large-scale distance and the topography of the ocean basin isolate some segments of the North Atlantic minke whale population. Within the central North Atlantic no hiatus in minke whale distribution could be found between coastal Iceland, East Greenland and Jan Mayen. Tagging studies suggest a small probability of exchange between the Central and Northeast

Report of the Scientific Committee

Atlantic, but neither distributional data nor the tagging studies give any resolution for fine scale delineations of minke whales in the North Atlantic.

Genetic studies, including allozymes and nuclear DNA, support a splitting between West Greenland, Central and Northeastern Atlantic minke whales, whereas no distinctions could be made for minke whales within the Northeastern area. Morphometric studies suggest a similar stock structure but the data were not conclusive on whether these stocks can be treated as completely isolated populations, as overlap was considerable.

Studies of mtDNA failed to detect any differences between minke whales from West Greenland, coastal Iceland and the Barents Sea, but this should not be interpreted as proof of a homogenous population structure.

In conclusion, some regional delineations of North Atlantic minke whale stocks can be expected, but the present knowledge about movements, dispersal and genetic exchange is too limited, inconsistent or scattered to support a conceptual model for the dispersal and mixing of minke whales in the North Atlantic. On a finer scale, e.g. within the Central Stock Area, nothing supports a further delineation of the stock, however, available studies suffer from incomplete or biased sampling of the whales in the area or from deployment of inadequate techniques.

ii) Population trajectories

The population model used for projecting past exploitation levels through the recent population estimates from NASS 1987 and 1995 utilised the best available data on biological parameters for North Atlantic minke whales as well as a range of estimates of MSYR, although focusing on values around 2-3%. Population trajectories were run for two options of possible stock structure; one considering the Central stock area as a discrete stock and another considering the coastal waters of Iceland (CIC) as a discrete stock.

For the Central Stock Area the minke whales are now close to their carrying capacity. Present removals and catches of 292 per year (corresponding to a mean of the catches between 1980-84) are sustainable. If catches of 451 whales per year (average for 1965-69) are projected to 2001 and if the lower range of the, albeit conservative, estimate of abundance is used in the projections, the harvesting rate is unsustainable.

Catches in the coastal Icelandic area (CIC) ceased in 1985 and catch projections suggest that the stock is now close to its pre-exploitation size. All projections to 2001 of 185 whales per year (average for 1961-85) are sustainable under parameter values considered appropriate.

iii) Future research

There is evidently a great need to resolve the question of stock delineations of minke whales in the North Atlantic. No single or simple method alone seems to be able to answer these questions, and it is recommended that a variety of approaches should be attempted. However, it was also strongly felt that the studies deployed should be

NAMMCO Annual Report 1998

focused on testing hypotheses for the year-round mixing and dispersal of minke whales. There is also a need for monitoring of changes in abundance in both coastal Icelandic waters and the entire Central Stock Area, especially if the level of exploitation is increased.

8.6 Narwhal (*Monodon monoceros*)

At its 1997 meeting, the Council recommended that the Scientific Committee should examine the population status of narwhal and beluga in the North Atlantic. Plans for how to proceed with this matter were discussed. Since narwhal and beluga inhabit the same areas, and the development of a status assessment for both species would draw upon the same expertise, it was decided to treat the two species together.

It was decided to establish a Working Group on the Population Status of Narwhal and Beluga in the North Atlantic, and to invite experts from Canada and Russia and other countries to contribute. The Working Group would aim to meet prior to the next meeting of the Scientific Committee in 1999.

8.7 Beluga (*Delphinapterus leucas*)

See under item 8.6 above.

9. DATA AND ADMINISTRATION

The Committee referred to discussions at its last meeting in 1997 related to the maintenance of a catch database in the Secretariat. A set of guidelines for the submission of catch data had been prepared by the Secretariat last year (NAMMCO/7/6, Appendix 4), the purpose of which was to establish permanent routines for the format and regular submission of catch data from member countries.

The Secretary noted that detailed catch data were not being received on a regular basis from all member countries. Clarification was sought from Scientific Committee members on the availability of more detailed catch data, as distinct from the summary catch statistics included in the National Progress Reports submitted to the Scientific Committee each year.

Some members of the Committee held the view that it would be better to compile relevant data in response to specific tasks generated by requests from the Council. It was agreed, however, that the question of procedures for the regular submission of data to the Secretariat should be referred to the Council.

10. PUBLICATIONS

The Committee agreed that the title of the new NAMMCO series of scientific publications should be *NAMMCO Scientific Publications*, with volumes numbered.

10.1 Volume 1 - Ringed seals in the North Atlantic

The Chairman who is co-editing the ringed seal volume together with Christian Lydersen of the Norwegian Polar Institute in Tromsø, informed the Committee of

Report of the Scientific Committee

progress with the editing. Most of the 13 papers had been received in their final revised versions. It was expected that the publication would be completed by the summer of 1998.

10.2 The role of marine mammals in North Atlantic ecosystems

Gísli A. Víkingsson who is co-editing the ecology volume together with Finn Kapel informed the Committee of the progress with this publication. It will contain 11 papers, eight of which had been received and sent to reviewers. Garry Stenson, Canada had agreed to write an introductory review paper. It was expected that the volume would be completed in 1999.

10.3 Other publications

Geneviève Desportes, who is co-editing the volume on sealworm together with Gary McClelland (Canada), reported that she was about to send out the invitations to authors that presented papers at the meeting of the Working Group on Sealworm Infestations. Assuming that a sufficient number of papers would be available for the volume and a production time of 18 months, the volume was scheduled to come out in 1999.

No progress has been made on the planned volume that should present the results from the NASS-95 survey, however, it was indicated that these plans were still under way and that the volume would be expanded to include an in-depth analysis and comparison of all the NASS surveys for all species with sufficient data. Nils Øien, in co-operation with Jóhann Sigurjónsson, was willing to pursue this plan.

In arranging future working groups and the planned workshop/symposium on harbour porpoises, the Scientific Committee noted the importance of ensuring a high standard of presentations in order to allow for possible publication in future volumes of *NAMMCO Scientific Publications*.

11. BUDGET

The Scientific Committee noted that the NAMMCO budget for 1998 included the same level of funding for the Scientific Committee as in previous years (i.e. NOK 435,00 for external expertise and projects). Based on previous experience it is expected that the planned activities in 1999 (see item 12 below) can be carried out within this same level of funding.

12. FUTURE WORK PLANS

12.1 Scientific Committee

Noting that the Scientific Committee has a tradition of rotating its meetings between member countries, it was agreed that next meeting should be held in Nuuk, Greenland, in 1999. It was agreed to aim at having the meeting in late April-early May.

12.2 Working Groups

It was noted that the request for an assessment of the Central North Atlantic Minke Whale stock had been dealt with by the Working Group on Management Procedures and that this work was completed. Future work for this Working Group would await further requests from the Council.

The Working Group on the Economic Aspects of Marine Mammal-Fisheries Interactions had its first meeting in March 1998. In reviewing the report and its conclusions, the Scientific Committee showed a continued interest in the subject and recommended that the Working Group meet again within a year to further develop its advice.

To deal with the request for a population status of narwhal and beluga, a Working Group on the Population Status of Narwhals and Belugas in the North Atlantic was established, and it was decided that the Scientific Committee Chairman should arrange for this to meet in 1999.

It was agreed that the Working Group on Abundance Estimates should continue to function in to prepare and edit the NASS surveys to appear as a volume of NAMMCO Scientific Publications.

12.3 Other matters

Preliminary plans for a workshop/symposium on harbour porpoise were discussed (see item 8.4).

13. ANY OTHER BUSINESS

On behalf of the Committee, the Chairman thanked the Marine Research Institute for their hospitality and the excellent facilities they provided, and the Secretariat for their assistance with practical arrangements and report editing.

On behalf of the Committee members, Tore Haug thanked the Chairman for efficiently leading the Committee through its agenda.

14. ADOPTION OF REPORT

The report was adopted on 5 March 1998.

15. REFERENCES

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LIST OF PARTICIPANTS

COMMITTEE MEMBERS:

Faroe Islands:

Dorete Bloch

Geneviève Desportes

Greenland:

Mads Peter Heide-Jørgensen

Aqqalu Rosing-Asvid

Lars Witting

Iceland:

Jóhann Sigurjónsson

Þorvaldur Gunnlaugsson

Gísli A. Víkingsson

Norway:

Tore Haug

Nils Øien

INVITED PARTICIPANTS:

Working Group on Economic Aspects of Marine Mammal – Fisheries Interactions (SC/6/EC)

Friðrik Már Baldursson (Iceland)

Bjarte Bogstad (Norway)

Ola Flaaten (Norway)

Erlingur Hauksson (Iceland)

Droplaug Ólafsdóttir (Iceland)

Gunnar Stefánsson (Iceland)

Ken Stollery (Canada)

AGENDA

1. Chairman's welcome and opening remarks
2. Adoption of Agenda
3. Appointment of Rapporteur
4. Review of available documents and reports
 - 4.1. National Progress Reports
 - 4.2. Working Group Reports
 - 4.3. Other reports and documents
5. Co-operation with other organisations
6. Update on Status of Marine Mammals in the North Atlantic
7. Role of marine mammals in the marine ecosystem
 - 7.1 Economic aspects of marine mammal-fisheries interactions
 - 7.2 Other matters
8. Marine mammal stocks -status and advice to the Council
 - 8.1 Harp seals
 - 8.1.1 Update on progress
 - 8.1.2 Future work
 - 8.2 Hooded seals
 - 8.2.1 Update on progress
 - 8.2.2 Future work
 - 8.3 Ringed seals
 - 8.3.1 Update on progress
 - 8.3.2 Future work
 - 8.4 Harbour porpoise
 - 8.4.1 Update on progress
 - 8.4.2 Future work
 - 8.5 Central North Atlantic minke whales
 - 8.5.1 Update on progress
 - 8.5.2 Future work
 - 8.6 Narwhal
 - 8.7 Beluga
9. Data and administration
10. Publications
 - 10.1 The ringed seal volume
 - 10.2 The role of marine mammals in the North Atlantic ecosystem
 - 10.3 Other publications
11. Budget
12. Future work plans
 - 12.1 Scientific Committee
 - 12.2 Working groups
 - 12.3 Other matters
13. Any other business

LIST OF DOCUMENTS

Committee documents:

- | | |
|------------|--|
| SC/6/1 | List of Participants |
| SC/6/2 | Agenda |
| SC/6/3 | List of Documents |
| SC/6/4 | Report of the Working Group on Management Procedures,
Copenhagen, 13–14 October 1997 |
| SC/6/5 | Report of the Working Group on Economic Aspects of Marine
Mammal-Fisheries Interactions, Reykjavík, 1 – 3 March 1998 |
| SC/6/6 | Report of the Joint ICES/NAFO Working Group on Harp and
Hooded Seals (NAFO SCS Doc. 97/17) |
| SC/6/7 | What kind of studies are needed to evaluate changed levels of
removals of ringed seal exploitation in Greenland. A proposal for
discussion prepared by Aqqalu Rosing-Asvid |
| SC/6/NPR-F | Faroe Islands - Progress Report on Marine Mammal Research in 1997 |
| SC/6/NPR-G | Greenland - Progress Report on Marine Mammal Research in 1996 |
| SC/6/NPR-I | Iceland - Progress Report on Marine Mammal Research in 1997 |
| SC/6/NPR-N | Norway - Progress Report on Marine Mammal Research in 1997 |

Council document:

NAMMCO/8/8 Report of the ICES Advisory Committee on Fishery Management on Harp and Hooded Seals (advice from ICES to NAMMCO's request).

**REPORT OF THE SCIENTIFIC COMMITTEE WORKING GROUP
ON THE ECONOMIC ASPECTS OF MARINE MAMMAL -
FISHERIES INTERACTIONS**

Reykjavík, Iceland, 1-2 March 1998

At its Seventh Meeting in Tórshavn in May 1997, the Council requested that special attention should be paid to studies related to competition and the economic aspects of marine mammal - fisheries interactions.

To address this request, the Scientific Committee agreed to establish a special Working Group, under the chairmanship of Gunnar Stefánsson (Marine Research Institute, Iceland). The Working Group met from 1-2 March in Reykjavík at the Marine Research Institute. Participants are listed in Appendix 1.

1-3. OPENING PROCEDURES

The Chairman of the Working Group, Gunnar Stefánsson, welcomed participants to the meeting. The agenda, as contained in Appendix 2, was adopted. Secretariat staff functioned as rapporteurs and it was agreed that relevant members of the group would also assist with the drafting of relevant sections of the report.

4. HISTORICAL BACKGROUND

The Working Group noted that the hunting of marine mammals has long been a part of the traditional economic use of marine resources across the North Atlantic. Lower levels of marine mammal utilisation in many areas in recent years compared with previous decades, combined with increasing pressure on fish stocks from fisheries, has introduced new factors into discussions related to the management of marine mammals, with an emphasis on the need to better understand the interactions of marine mammals and fish in the marine ecosystem. Such factors include, in particular, concerns in the fisheries sector about the potential effects of growing marine mammal populations on fish stocks. The Working Group further noted that in some sectors there were also concerns related to the possible effects of marine mammal utilisation on other economic activities, such as whale watching operations, although these were not directly related to either fisheries or whaling and sealing activities.

The Working Group agreed that an analysis of the economic aspects of marine mammal-fisheries interactions should encompass all aspects of the situation, including both potential losses in fish resources due to increases in marine mammal populations, as well as the estimated revenues from whaling and sealing weighed against the potential losses in other sectors.

5. MULTISPECIES MODELS FOR MARINE MAMMALS AND FISH

Several multispecies models have been developed to describe interactions between marine mammals and fisheries (NAMMCO Scientific Committee 1997:35-52). MULTSPEC (Bogstad *et al.* 1998) and Bormicon (Stefánsson and Pálsson 1998) are spatially disaggregated models containing a high level of detail. Aggregate models such as AGGMULT (Tjelmeland 1995) and the TSB-model (Flaaten 1988) have been developed for the Barents Sea, and similarly aggregated models have been developed and used for the Icelandic shelf and adjacent areas (Stefánsson *et al.* 1998; Daniélsson *et al.* 1998). MULTSPEC has been used to describe interactions between several species including marine mammals in the Barents Sea, but only aggregate models have been used for this purpose for Icelandic waters.

These models serve as a background for the present meeting, and it is a logical next step to use some of these with additional economic components.

In addition to these models, alternative economic models are described in section 6, where different underlying biological models are assumed. Such different approaches provide interesting possibilities in terms of comparing overall results.

6. BIOECONOMIC MULTISPECIES MODELLING FOR MARINE MAMMALS AND FISH

6.1 Background

An oral presentation based on Flaaten (1996) discussed some of the advantages and disadvantages of bioeconomic multispecies modelling, as well as the obstacles likely to be encountered in changing from single species to multispecies modelling and management. This was done by use of examples from North Atlantic fisheries, and use of basic bioeconomic theory.

All modelling of economic and biological systems is costly, especially data collection by research vessels. The initial contribution from economists in some cases should be simple cost-benefit analysis of marine research to get a rough idea whether it is likely or not that more complex and detailed models can improve management. However, if a biological multispecies model already exists, it is a good investment to let (resource) economists extend it into a bioeconomic multispecies model.

6.2 Putting a price on predation

Flaaten and Stollery (1996) developed a bioeconomic model to analyse the costs for the harvesters of prey species resulting from a permanent increase in the stock of a natural predator. The theoretical analysis showed that the economic losses depend critically on the type of management of the prey stock, although the measures are equal when the stock is managed at the maximum sustained economic yield from the prey species. The model was applied to the case of the Northeast Atlantic minke whale's consumption of fish. Using fish harvest costs and revenues derived from the Norwegian fisheries directorate, the estimates of average predation cost per minke

whale under three different assumptions about whale predation range from US\$ 1,780 to US\$ 2,370 or NOK 12,500 to NOK 16,600. A ten- percent increase in whale stocks was estimated to cause a loss of almost US\$ 19 million to the fisheries of the prey species. In discussion, these predation cost estimates were compared with those arising from the much more complex MULTSPEC model of Barents Sea fish and mammal interaction which derived predation costs per whale of NOK 5,600. They were reconciled in that the simpler bioeconomic model assumed predation over a wider area and over both summer and winter.

Paper SC/6/EC/4 extended the model of Flaaten and Stollery, which estimated the direct cost of predation for a fishery exploiting a prey species, to the case of a fishery competing for prey with a mammalian predator. An attempt was made to apply the model to the Northwest Atlantic harp seal predation on capelin in NAFO division 2J3KL, in competition with Atlantic cod, but the estimates of predation costs are very unreliable.

Preliminary results shown in SC/6/EC/8 indicate that predation costs of harp seals in the Barents Sea could be in the range of NOK 150-500 per seal. However, some of the biological and economic data used are rather uncertain and the paper requires more work.

6.3 Economic factors to be taken into consideration

The management of a marine mammal predator should ideally include all relevant economic factors such as:

- i) harvest revenues (fur, meat, blubber etc.)
- ii) harvest costs (vessel, crew, fuel etc.)
- iii) predation costs incurred by prey fisheries due to competition to these fisheries (needs costs and earnings data etc. for the prey fisheries to derive net value per unit prey in the sea)
- iv) costs incurred by prey fisheries production due to seal worms etc.
- v) the positive effects of fish stocks on growth, reproduction, etc of marine mammals
- vi) non-use values:
 - positive: seal/whale watching, existence value, precautionary value etc.
 - negative: predatory killing of non-use valued prey; for example walrus and killer whales killing seals.Methods of estimating non-use values exist, but should be used with great care (e.g. travel costs, and survey techniques such as contingent valuation methods and conjoint analysis).
- vii) Boycott and trade sanction costs to the fishing industry and other industries of the whaling and sealing nations or regions.

7. THE ECONOMICS OF UNCERTAINTY

Sources of uncertainty in predictions of economic yield range from the obvious uncertainty in recruitment to the various stocks through assessment uncertainty to uncertainty in market and cost aspects of the various predators.

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

Given some management regimes, a price can be attached to these various sources of uncertainty. For example, if fishing operations are limited so as to ensure that biomass of the fish stock is above B_{msy} with e.g. 95% probability, then a high degree of uncertainty will lead to an under-utilisation of the resource. In this case there is a cost associated with uncertainty and this cost can be evaluated in economic terms.

Including marine mammals in multispecies models has been seen not only to reduce the predicted yields from the fish resources but also to increase the degree of apparent uncertainty associated with these yield predictions. The change in economic yield due to the increased uncertainty has not been evaluated in conjunction with these economic models. In part this is due to the fact that it is not obvious at the outset how the uncertainty affects the management regimes. For example, in Icelandic waters the harvest control rule (HCR) for cod is simply to catch 25% of the biomass and for capelin it is to leave 400,000 tonnes for spawning.

In order to evaluate the cost of uncertainty the definition of the harvest control rules needs to be written out more explicitly. For cod in Icelandic waters the HCR was originally taken as “25% of available biomass but no less than 165,000 tonnes”, where the lower bound has not been used after the first year. The reason for this particular choice of lower bound was to ensure a very low probability of further decline in stock size (less than 1% in simulations with fish species only). In this case it is clear that a reduction in uncertainty might have led to a less severe reduction in initial catches. Similarly, if marine mammals are included, then this will lead to greater apparent uncertainty and thus a need for a further reduction given this criterion.

This approach may possibly lead to a method for estimating the cost associated with uncertainty in this particular ecosystem and should be investigated further, since this may eventually provide a relevant price to pay for collecting minke whale stomach content data in order to reduce uncertainty in yield predictions for cod.

8. AVAILABILITY OF RELEVANT COSTS AND EARNINGS DATA

8.1 Cost and earnings data for fisheries

Fisheries cost and earnings data exist at varying levels of detail. For some areas and fishing sectors these data are available down to the level of a vessel. When such data are available it is possible to estimate costs and earnings associated with the fishing operations in a very detailed manner.

In other areas it may be better to use overall estimates of income, such as the first-hand value per kg of fish or marine mammal and then use an overall estimate of current profits from the harvesting operations. This then yields estimates of current costs which can be scaled with respect to (inverse) stock size in forward predictions.

8.2 Costs and earnings data from whaling/sealing operations

In Norway, the average price of minke whale meat obtained in 1997 was 30 NOK/kg, and on average, about 1.5 tonnes of meat was obtained from each whale. The price obtained for blubber was 1.97 NOK/kg in 1997, compared to 0.10 NOK/kg in 1996 and 23.11 NOK/kg in 1995. For harp seals, the average price was 195 NOK for age 0 seals and 120 NOK for age 1 and older seals. This includes the value of skin, meat and blubber, but not of seal penises. The data on harvesting costs for minke whale show that they are much lower than the revenues. For harp seal, data on harvesting costs were not available, but the seal catch has been subsidised in recent years.

Icelandic fisheries and fishing industry organisations are promoting seal hunting by paying 11,550 ISK (155 US\$) for adult grey seals and 2,500 ISK for the skins of grey seal pups. There are other opportunities for selling seal products, and current relevant prices are as follows: skin of common seal pups: 2,000-3,000 ISK, depending on quality; seal meat for human consumption –200-250 ISK per kg; salted seal fat for human consumption – 200 ISK per kg.; seal penises - 500 ISK per penis.

8.3 Other relevant cost and earnings

In addition to obvious and tangible economic factors such as fish and marine mammal yields, there are other sources of costs and income which may vary and should be considered. These include whale watching for which economic data may exist. It should in principle be possible to include such an industry in an economic analysis. Somewhat more complex is the non-use value of the resource, i.e. the value placed on not utilising the resource. Such values have been evaluated through surveys, but a better method for obtaining the correct value would be through the utilisation of transferable quotas which could be bought by parties not interested in harvesting the resources.

9. CASE STUDIES

9.1 Combining MULTSPEC with simple economic models

The work presented in SC/6/EC/5 is based on simulation studies using the Institute of Marine Research (Bergen, Norway) multispecies model for the Barents Sea (MULTSPEC) (Bogstad et al. 1998, see also NAMMCO / SC 1997 etc). This model includes the species capelin, cod, herring, harp seal and minke whale. Harp seal, minke whale and cod are all predators on capelin, herring and cod, and herring is a predator on capelin larvae. The growth of cod is dependent on the abundance of herring and capelin, while the growth and reproduction of marine mammals are assumed to be constant.

The results of these simulations are combined with estimates of price and variable harvesting costs for each species valid for Norway. Price elasticities are assumed for cod, capelin and herring, while for harp seal and minke whale, the prices are assumed to be constant. The variable harvesting costs mainly consist of wages and fuel, and the income to the crew is assumed to depend upon the value of the catch. Different cost functions are used for different fleet groups. For harp seal, the harvesting costs are set equal to the price. The total gross and net revenue from the catch of all species is

compared for runs with different harvesting strategies for harp seal and minke whale (equilibrium catch or no catch). The initial values of the harp seal and minke whale stocks are 600,000 and 80,000 individuals, respectively. The population model used gives an equilibrium catch amounting to about 33,000 harp seals and 2,500 minke whales, while the population at the end of the 20-year simulation period, assuming no catch, is 1.1 million harp seals and 144,000 minke whales.

The loss in gross revenue resulting from no catch vs. equilibrium catch is approximately the same for harp seals as for minke whales (about NOK 190 million annually). The average annual loss in net revenue resulting from not catching minke whales is, however, considerably larger than the loss resulting from not catching harp seals (62 vs. 27 million NOK annually). When not catching minke whales, 61% of the loss of gross revenue and 79% of the loss of net revenue are due to the direct loss from no whale catch, while the rest of the loss is due to smaller catches of fish. The loss of revenues when not catching harp seals is only due to smaller catches of fish.

The revenues for each country (Norway, Russia, EU, the Faroe Islands, Iceland, Others) are also calculated using the present division of catches between countries according to bi- or multilateral agreements. Norway, as the only nation currently hunting minke whales on a commercial basis, suffers most of the loss of gross and net revenues from not catching minke whales, while the loss due to not catching harp seals is divided among the countries approximately proportionally to their share of both gross and net revenue.

9.2 Economic consequences of harvesting regimes for marine mammals in Icelandic waters

Some preliminary results on the effects of different harvesting regimes for marine mammals are given in Fridjónsson (1997) and in SC/6/EC/6. These indicate that the effects of different harvesting strategies for marine mammals can have considerable economic impacts, but these are to a large extent indirect, such as through increased economic yield from other resources (e.g. cod).

It is further noted in Fridjónsson (1997) that there may be a potential adverse effect of a resumption of Icelandic whaling on other industries such as tourism or fish exports such as through possible reductions in prices etc. The Norwegian experience, however, indicates that this is not likely.

The results to date are very preliminary and need to be examined to a much greater extent before firm conclusions can be drawn.

10. CONCLUSIONS

The group agreed that advice on management of marine mammal stocks should take into account as many economic and biological factors as possible. Analyses which only take into account parts of the economical effects, such as only the revenue side or only the profits from whaling, can be highly misleading in the overall picture.

NAMMCO Annual Report 1998

There is a need to continue the current work, and in particular the current biological and economic models need to be refined. Some of the models presented are still in a developmental stage but show promise and should be developed and tested further.

Comparative bioeconomic studies of the Northeast and the Northwest Atlantic are encouraged.

The different approaches to bioeconomic modelling should be encouraged in the future as the pursuit of different models provides the opportunity to compare results obtained using very different assumptions. Thus there is little need at the moment for standardisation of models.

It was noted that potentially important species such as hooded seals are at present not included in the models used. These may be important predators and cost factors that should be incorporated in future analyses.

Multispecies bioeconomic models have not been developed for the Faroe or Greenland areas. Such models would need to take into account any special considerations for those areas, possibly including social values placed on the hunting process.

11. ADOPTION OF REPORT

The report was adopted on 3 March 1998.

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Appendix 1 - **LIST OF PARTICIPANTS**

Friðrik Már Baldursson (Iceland)	Mads Peter Heide-Jørgensen (Denmark)
Dorete Bloch (Faroe Islands)	Droplaug Ólafsdóttir (Iceland)
Bjarte Bogstad (Norway)	Gunnar Stefánsson (Iceland)
Ola Flaaten (Norway)	Ken Stollery (Canada)
Þorvaldur Gunnlaugsson (Iceland)	Gísli A. Víkingsson (Iceland)
Tore Haug (Norway)	Lars Witting (Denmark)
Erlingur Hauksson (Iceland)	

Appendix 2 - **AGENDA**

1. Chairman's welcome and opening remarks
2. Adoption of Agenda
3. Appointment of Rapporteur
4. Historical background
5. Multispecies models for marine mammals and fish
6. Bioeconomic multispecies modelling for marine mammals and fish
 - 6.1 Background
 - 6.2 Putting a price on predation
 - 6.3 Economic factors to be taken into consideration
7. Uncertainty
8. Availability of relevant costs and earnings data
 - 8.1 Cost and earnings data for fisheries
 - 8.2 Cost and earnings data from whaling/sealing operations
 - 8.3 Other relevant costs and earnings data
9. Case studies
 - 9.1 Combining MULTSPEC with simple economic models
 - 9.2 Economic consequences of various harvesting regimes
10. Conclusions
11. Adoption of report

Appendix 3 - **LIST OF DOCUMENTS**

SC/6/EC/1	List of participants
SC/6/EC/2	Agenda
SC/6/EC/3	List of documents
SC/6/EC/4	Ken Stollery: The economic costs of predatory competition. Theory and application to the case of harp seal (<i>Phoca groenlandica</i>) predation on fish stocks in the North-West Atlantic
SC/6/EC/5	Bjarte Bogstad: Economic consequences of various harvesting regimes of the marine mammal and fish stocks in the Barents Sea
SC/6/EC/6	Gunnar Stefánsson and Friðrik Már Baldursson: The cost of not exploiting marine mammals.

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

- SC/6/EC/7 Erlingur Hauksson: The Icelandic promotional system for seal-
hunting
- SC/6/EC/8 Ola Flaaten and Siv Reithe: The predation costs of the Barents Sea
harp seal (*Phoca groenlandica*) - some preliminary findings.

REPORT OF THE SCIENTIFIC COMMITTEE WORKING GROUP ON MANAGEMENT PROCEDURES

Copenhagen, Denmark, 13 - 14 October 1997

1. OPENING REMARKS AND TERMS OF REFERENCE

The Chairman, N. Øien, welcomed the participants (Appendix 1), and M. P. Heide-Jørgensen explained the practical arrangements for the meeting which was held in the offices of the Greenland Institute of Natural Resources in Copenhagen.

The meeting was arranged to answer a request from the Council to the Scientific Committee, dated 4 March 1997, to provide scientific advice on the following matter prior to the next meeting of the Council: "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 an evaluation of the long-term effects of past and present removal levels on the stock."

Preparations for the meeting had been arranged by correspondence and included review of stock structure, biological parameters and abundance estimates of minke whales in the North Atlantic, as well as population modelling.

2. ADOPTION OF AGENDA

The agenda as adopted is given in Appendix 2.

3. APPOINTMENT OF RAPPORTEUR

M.P. Heide-Jørgensen was appointed to assist the Chairman as rapporteur.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

The Working Group had received several working papers, as listed in Appendix 3, to assist in discussions.

5. THE CENTRAL NORTH ATLANTIC MINKE WHALE STOCK

5.1 Stock structure

North Atlantic minke whales have been divided into four management stocks by the International Whaling Commission (Donovan 1991): (1) the Canadian East coast stock; (2) the West Greenland stock; (3) the Central stock and (4) the Northeastern stock. During the IWC Scientific Committee's development of the Revised Management Procedure these stock areas were considered medium areas and further divided into small areas (IWC 1994). The Central medium area was divided into an East Greenland coastal area (*CG*), a coastal Icelandic area (*CIC*), an area around Jan

Mayen (*CM*) and finally the waters south of Iceland (*CIP*). Most of the studies presented on North Atlantic minke whale stock structure refer to these divisions and these are therefore shown in Figure 1.

A. Daníelsdóttir presented her review of the population genetic structure of North Atlantic minke whales (*SC/6/MP1*). The review describes the results from various nuclear (n) and mitochondrial (mt) DNA methods used to study the genetic relationship of minke whales (*Balaenoptera acutorostrata*) from different geographical locations in the North Atlantic: The West Greenland area, the Central area (Iceland) and the Northeastern Atlantic area. The sampled areas are shown in Figure 2. The results from the studies are discussed and compared with genetic studies of minke whales from other locations. Daníelsdóttir concluded that when nonselective nDNA and/or mtDNA genes show significant differences between sample locations, then it is possible to conclude that there is restricted gene flow between them and they can be managed as separate populations. Concordant and nonconcordant results have been obtained using both nDNA and mtDNA on the same populations and samples in a number of species. It is more common that the mtDNA shows differentiation between populations and that the nDNA does not (e.g. dispersal of males, recent bottlenecks), but less differentiation in mtDNA than nDNA is also found (smaller genome size, founder effects, female biased breeding and/or migration ratio). There is a tendency for the mtDNA to show greater population differences, because of its lower effective population size and effective migration rate (maternal inheritance) which make the effect of genetic drift greater and therefore may lead to greater population differentiation. The gene diversity, however, at equilibrium between mutation and drift, is much lower for mtDNA than nDNA (assuming mutation rates are similar). The different evolutionary dynamics of nDNA and mtDNA can, if combined in a study, provide information on otherwise hidden behaviour and/or population structure. It should be emphasised that it can be misleading to conclude that there are similarities between samples, when the study considered is based on variation at a single gene or locus.

Daníelsdóttir concluded that, based on the genetic evidence available today: 1) Northeastern and Central Atlantic minke whales represent separate populations, and 2) Northeastern Atlantic and West Greenland minke whales represent separate populations.

In the discussions, the importance of comparing the same tissues between investigations when dealing with allozymes was pointed out. Temporal variations due to different sampling periods between areas must also be taken into account, as well as possible heterogeneity related to sex. As suggested in *SC/6/MP/4*, the analyses done so far have detected indications of certain structures among North Atlantic minke whales, but a satisfactory model which provides a coherent explanation compatible with most of the data has yet to be identified.

From the manager's point of view the basic question would be: How large are migration rates, and how do they affect management goals? Conclusions are also

NAMMCO Annual Report 1998

hampered by the fact that no internal comparisons have been made within the Central stock area, or between Jan Mayen and Icelandic coastal waters.

The review of the population genetics revealed an equivocal picture of the structure of the minke whale population in the North Atlantic. Two lines of evidence (allozymes and nuclear DNA) supported a splitting between West Greenland, Central and Northeastern Atlantic, whereas no distinctions could be made for minke whales within the Northeastern Atlantic. Other genetic studies based on mtDNA did not detect heterogeneity between these areas, but this should not be interpreted as proof of a homogenous population structure. Also, different weight should be given to different studies and it was specifically argued that studies based on a relatively limited part of the genome of mtDNA were unsuitable for detecting population delineation. Generally the genetic studies were conducted on a large scale, i.e. trans-Atlantic comparisons, where isolation by distance seems to be a reasonable hypothesis. On a finer scale it seems unlikely that genetic studies can establish management units.

To summarise, the available evidence in support of *population heterogeneity* in North Atlantic minke whales is:

- studies of allozymes and nuclear DNA support large-scale segregation in regions;
- mark-recapture analyses of minke whales around Iceland and in the Barents Sea (Northeastern Atlantic) show little chance of exchange of minke whales between these two areas (IWC 1991);
- Morphometric studies suggest that there is substantial heterogeneity between minke whales sampled from West Greenland, Central and Northeastern stocks, but the data were not conclusive on whether these stocks can be treated as completely isolated populations as overlap was considerable (Christensen et al. 1990);
- temporal differences in lengths and sex in some areas suggest segregation in the migrations of minke whales (IWC 1977).

Evidence for *population homogeneity* in North Atlantic minke whales is:

- mtDNA studies found no significant differences between widely separated areas such as West Greenland, Icelandic coastal waters and the Barents Sea;
- when the allozyme genotypes were tested for Hardy-Weinberg equilibrium for each of the small areas, no support for heterogeneity within small areas could be detected;
- during the summer minke whales are distributed in a continuum on the continental shelves in the North Atlantic. Only the deep slopes between Iceland and the Faroe Islands, between the Greenland Sea and the Norwegian Sea and south of Greenland, show disjunction in minke whale distributions. No hiatus in distribution is evident between coastal Iceland, East Greenland and Jan Mayen. Thus it seems unlikely that discrete subunits of minke whales persist in this area, considering the long-range migratory abilities of minke whales.

Minke whales in the eastern and western North Atlantic are, at least during summer, separated by the landmasses of Greenland and by the deep water of the mid-Atlantic. It thus seems reasonable to assume that on a large scale some segments of the North Atlantic have been isolated because of distance and topography. This is supported by some genetic studies. The tagging studies, albeit biased to hunted whales, indicate philopatry to the Central and Northeast Atlantic with little expected exchange, whereas distributional inference gives no indication of population structure on a finer scale than the Central, Northwest and the Northeast Atlantic.

In conclusion, some heterogeneity of the minke whale population may be expected, but at present the evidence is too limited, inconsistent or scattered to support a conceptual model for the dispersal and mixing of minke whales in the North Atlantic. On a finer scale, e.g. within the Central stock area, nothing supports a further delineation of the stock, however, the available studies suffer from incomplete or biased sampling of the whales in the area or from deployment of inadequate techniques.

Although nothing supports a delineation of minke whales between coastal Icelandic waters, East Greenland and the area between Iceland and Jan Mayen, a safe approach, in the light of inadequate research, would be to maintain the small areas as putative stock units.

5.2 Biological parameters

Víkingsson reviewed the available information on biological parameters (SC/6/MP/3). As part of the International Whaling Commission's work on the Comprehensive Assessment of minke whale stocks in the North Atlantic, a table of available data on biological parameters was prepared (Larsen 1991). Since then, no new information on the relevant biological parameters of minke whales in the North Atlantic appears to have been published. Víkingsson prepared Tables 5.2.1 and 5.2.2 based on the information given in Larsen (1991) and the parameter values used in the IWC's assessment in 1990 (IWC 1991). The Working Group decided to base their assessments on these data.

NAMMCO Annual Report 1998

Table 5.2.1. Biological parameters in Central North Atlantic minke whales.

Parameter	Value	Notes	Small area	Reference
Age at recruitment	5.5 11.5	50% recruited 95% recruited	CIC CIC	IWC 1991 IWC 1991
Age at sexual maturity (females)	6 6-7 5-6	Regression 50% mature Regression	CIC CIC CIC	Sigurjonsson 1988 Sigurjonsson 1988 Sigurjonsson et al. 1990
Sex ratios in catch	43% females 43.4% females		CG CIC	Larsen & Øien 1988 Sigurjonsson et al. 1990
Pregnancy rates	0.94		CIC	Sigurjonsson 1988
Natural mortality rates	0.10 (approx.)			Horwood 1990.

Table 5.2.2. Parameter values used in recent assessments of Central North Atlantic minke whales.

Parameter	% of Population	Value	Year	Reference
Age at recruitment	100	4	1988	IWC 1989
	50	5.5	1990	IWC 1991
	50	7.5	1990	IWC 1991
	50	3	1990	IWC 1991
	95	11.5	1990	IWC 1991
	95	13.5	1990	IWC 1991
	95	6	1990	IWC 1991
Age at first parturition	50	8	1990	IWC 1991
	95	13	1990	IWC 1991
Natural mortality rate		0.10	1988	IWC 1989
		0.09	1990	IWC 1991

5.3 Catch data

Catch data used in the assessments were compiled by Víkingsson and presented in Table 5.3.1. The CIC subarea comprises the coastal shelf of Iceland and the Central Medium Area is the union of small areas CIP, CG, CIC and CM; all these are defined in IWC (1994), and shown in Figure 5.1.1. The Central Medium Area catches include catches taken by Inuit at East Greenland, as supplied by Barner Neve.

Table 5.3.1. Catch data for minke whales in the Central Medium Area and CIC subarea.

Year	Central Medium Area		CIC subarea		Year	Central Medium Area		CIC subarea	
	Male	Female	Male	Female		Male	Female	Male	Female
1930	5	5	5	5	1964	208	114	114	48
1931	3	3	3	3	1965	194	206	80	62
1932	3	3	3	3	1966	181	173	87	77
1933	3	3	3	3	1967	315	159	135	87
1934	3	3	3	3	1968	386	350	219	206
1935	3	3	3	3	1969	171	120	93	66
1936	1	0	1	0	1970	203	159	112	81
1937	1	0	1	0	1971	172	131	121	98
1938	0	0	0	0	1972	204	166	115	87
1939	0	0	0	0	1973	250	127	78	64
1940	0	0	0	0	1974	143	109	61	63
1941	7	7	7	7	1975	180	221	89	80
1942	7	8	7	7	1976	175	110	114	87
1943	7	7	7	7	1977	107	88	106	88
1944	7	7	7	7	1978	146	162	85	114
1945	7	7	7	7	1979	166	118	111	87
1946	18	15	18	15	1980	198	120	121	81
1947	27	18	27	18	1981	129	117	119	82
1948	56	43	56	43	1982	212	109	127	85
1949	59	52	56	48	1983	164	125	117	87
1950	18	15	18	15	1984	136	149	100	78
1951	20	18	20	18	1985	113	123	94	51
1952	21	19	21	19	1986	6	46	0	0
1953	20	18	20	18	1987	12	42	0	0
1954	20	18	20	18	1988	4	1	0	0
1955	25	33	24	27	1989	1	0	0	0
1956	26	21	23	21	1990	5	0	0	0
1957	25	21	24	21	1991	5	2	0	0
1958	23	21	23	21	1992	8	0	0	0
1959	33	28	24	21	1993	7	8	0	0
1960	37	32	30	23	1994	8	38	0	0
1961	120	61	71	34	1995	6	38	0	0
1962	164	125	78	50	1996	12	40	0	0
1963	114	105	69	54					

5.4 Abundance estimates

The NAMMCO Scientific Committee Working Group on Abundance Estimates had at its meeting in February 1997 reviewed and analysed data collected during NASS-95, including presentation of synoptic distributional maps as well as abundance of minke whales in the Northeast Atlantic (NAMMCO/7/6). Estimates for the Central Medium Area and the CIC subarea are given in Table 5.4.1. The part of the estimate for the Central Medium Area based on Icelandic shipboard surveys is not corrected for whales missed on the track line ($g(0)$ assumed to equal 1). The Icelandic shipboard surveys were conducted with only one platform on each of two ships, thus no data could be collected to estimate the negative bias introduced by the assumption of $g(0) = 1$.

As can be seen from Table 5.4.1, the 1987 and the 1995 point estimates for the Icelandic coastal area CIC differ by a factor of about 2.8. A large part of the difference is due to the fact that the 1987 aerial survey covered a substantially smaller area than the aerial survey in 1995. Also, the continuity in distribution of minke whales from Icelandic coastal areas towards the ice edge at Greenland and Jan Mayen may allow substantial movements in and out of the aerial survey area. No conclusion can be reached on whether the difference is due to a change in abundance, local movements or methodological differences.

Table 5.4.1. Abundance estimates for minke whales in the Central Medium Area and the CIC subarea

Estimate, ref. year	c.v. of estimate	lower 95% c.l.	Upper 95% c.l.
<i>Central Medium Area</i>			
1995: 72,130	0.244	44,711	116,362
<i>CIC - Iceland coastal waters</i>			
1987: 20,096	0.20	13,579	29,741
1995: 55,922	0.31	30,458	102,674

5.5 Assessments

The Working Group had before it SC/6/MP/2 which contained a series of population trajectories produced by using the Hitting-with-fixed-MSYR model and with projections for 1997-2001 for different assumptions on annual catch options. The catch options investigated were:

- (a) 0 catches;
- (b) 35, which is the average for the most recent 5-year period in the Central stock area;
- (c) 185, which is the annual average catch over the period 1961-85 within Icelandic coastal waters (CIC);

Report of the Scientific Committee Working Group on Management Procedures

- (d) 292, which is the average over the period 1980-84 in the Central stock area;
- (e) 451, which is the average over the Central stock area's most intensive catching period 1965-1969.

The MSYR assumption of 0 was run only to show the effect of accumulated catches on the population trajectories. A recent paper by Schweder and Hjort (1997) had investigated the population dynamics of minke whales in the Barents Sea by a likelihood synthesis of a relative abundance series and two abundance estimates combined through a population dynamics model. They found a point estimate of MSYR of 1.7% with a 95% likelihood contour of 0.2% - 3%. This estimate relates to the 1+ population, while the MSYRs used in SC/6/MP/2 refers to the mature stock, which implies that MSYRs are proportionally higher. The Working Group subsequently focused on runs based on MSYRs of 2% and 3%.

The total Central stock is at present close to its carrying capacity as judged from the population modelling conducted. The total stock estimate from the 1995 surveys includes a shipboard component from the Icelandic vessel survey not corrected for $g(0)$ (that is, animals missed on the trackline), and thus considered to be conservative. For the MSYR values considered by the group as the most probable (2% and 3% of mature stock), present removal levels are of no concern. The highest past removal level projected, that is an annual catch of 451 whales, would cause concern if the total abundance is at the lower range of its estimated 95% confidence interval (i.e. 44,751 minke whales). The Working Group therefore concluded that the total Central stock is now close to its carrying capacity, and that present as well as past catch levels with the exception of the highest catch level projected, will not adversely affect this stock.

The group then decided to consider the coastal waters of Iceland, CIC, as a unit with all the projected catches taken within that area. The lower 95% confidence limit for the CIC 1995 point estimate of 55,922 minke whales, that is 30,458 whales, was considered as a conservative approach in evaluating the status of the stock. This lower 95% estimate is consistent with the 1987 estimate when the limited coverage in 1987 is accounted for (Borchers et al. 1997). All projections showed that the stock in 2001 would not be adversely affected by past or present removal levels at parameter values considered to be appropriate by the group. However, the group considered the catch level of 451 in the CIC area, corresponding to the highest catch levels taken from the total Central stock, as too high and unsustainable in the long run. Also the catch projection based on an annual catch of 292 whales may be unsustainable. The Working Group concluded that the feeding stock of minke whales in Icelandic coastal waters (CIC) is presently close to its carrying capacity, and that present as well as past catch levels with the exception of the two highest catch levels (annual catches of 292 and 451 whales) projected, will not adversely affect this stock. Summary statistics for Hitting-with-fixed-MSYR calculations including five-year projections are given for a selection of options in Table 5.5.1. Some example trajectories for a range of MSYRs of 0-6% hitting the 1995 point estimate of 55,922 minke whales and its 95% confidence limits within the Icelandic coastal area CIC, and projected annual catches of 185 whales (the annual average over the period 1961-1985 within CIC) over the period 1997-2001, are shown in Figure 3.

NAMMCO Annual Report 1998

Table 5.5.1. Summary statistics for a selection of Hitting-with-fixed-MSYR calculations. MSY is the maximum sustainable yield in terms of harvesting of the recruited component of the population; K^e is the pre-exploitation size of the recruited component of the population; N_{97}^e is the size of the recruited component of the population at the start of 1997; N_{02}^e / K^e is the ratio of the size of the recruited component of the population at the start of 2002 to the corresponding pre-exploitation level - results are shown for this statistic for each of the five levels of future catches.

MSY R, %	MSY	K^e	N_{97}^e	N_{97}^e / K^e	N_{02}^e / K^e				
					Annual catch 1997-2001				
					0	35	185	292	451
<i>1995 abundance estimate Central Medium Area</i>									
Point estimate 72,130									
2	589	49103	46973	0.96	0.97	0.96	0.95	0.94	0.93
3	867	48151	46975	0.98	0.99	0.98	0.97	0.96	0.95
Lower 95% confidence limit 44,711									
2	375	31265	28987	0.93	0.94	0.94	0.92	0.91	0.89
3	545	30284	28979	0.96	0.97	0.97	0.95	0.94	0.92
Upper 95% confidence limit 116,362									
2	936	78029	75991	0.97	0.98	0.98	0.97	0.97	0.96
3	1388	77098	76000	0.99	0.99	0.99	0.98	0.98	0.97
<i>1995 abundance estimate CIC, Icelandic coastal waters</i>									
Point estimate 55,922									
2	452	37671	36537	0.97	0.98	0.97	0.96	0.95	0.93
3	668	37129	36542	0.98	0.99	0.99	0.97	0.96	0.94
Lower 95% confidence limit 30,458									
2	253	21053	19832	0.94	0.96	0.95	0.92	0.90	0.87
3	369	20492	19831	0.97	0.98	0.97	0.95	0.93	0.90
Upper 95% confidence limit 102,674									
2	820	68295	67209	0.98	0.99	0.99	0.98	0.97	0.96
3	1220	67765	67217	0.99	1.00	0.99	0.98	0.98	0.97

5.6 Recommendations for future research

Based on the discussions above, the Working Group considered that future research should primarily focus on resolving the questions on stock structure and population monitoring.

Stock structure

While recognising that there is some evidence of population heterogeneity in North Atlantic minke whales, it is evident that no conceptual model of dispersal and mixing of the whales can be proposed on the basis of present knowledge. Specifically such a model should

- (i) identify segregation on breeding/wintering grounds, if any;
- (ii) estimate the level of exchange between segregations;
- (iii) estimate the mixing of putative stocks on feeding grounds and in areas with harvesting; and
- (iv) identify philopatry of subunits of minke whales.

The research needed to elucidate these components of the population structure model should include a variety of techniques ranging from genetic studies, telemetric tracking of individual whales and isotope techniques to studies of levels and compositions of persistent pollutants. Some of these studies are in progress, while others will depend on the further development of techniques that are at present still in their infancy. Most research conducted so far has relied upon sampling of the whales from the harvest or at the harvesting grounds. Understanding of the population structure of North Atlantic minke whales will, however, require sampling on the wintering grounds and in areas without harvesting, in addition to sampling from the harvest.

Population monitoring

Sighting surveys are fundamental for the calculation of sustainable harvest levels and they need to be repeated at frequent intervals in areas where harvesting takes place. The abundance of minke whales in coastal areas of Iceland (area CIC) seems to have increased between 1989 and 1995 but the results are not conclusive due to the variability associated with the surveys. It would, however, be important to follow the changes in abundance in that area more closely to reveal whether the changes are due to a general increase in abundance or to temporal variability in the distribution of the whales and to possible problems in abundance estimation methodology. Likewise a comparison should be made between shipboard and aerial surveys.

6. OTHER BUSINESS

There was no other business.

7. ADOPTION OF REPORT

The report was adopted by correspondence on 15 December 1997.

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Figure 1. Map showing the IWC small areas. ES, EB, EC and EN constitute together a medium area which taken together is the Northeastern stock area, while CM, CIC, CG and CIP constitute the Central medium area.

Figure 2. Map showing the approximate locations of samples used in the genetics studies reviewed.

Figure 3. Population trajectories hitting the 1995 point estimate, as well as lower and upper 95% confidence limits, for the Icelandic coastal area CIC, and projecting the population for annual catches of 185 whales over the period 1997-2001. Trajectories are given for a range of MSY rates of 0-6%.

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Appendix 2 - **AGENDA**

1. Opening remarks and terms of reference
2. Adoption of agenda
3. Appointment of rapporteur
4. Review of available documents and reports
5. The Central North Atlantic minke whale stock
 - 5.1 Stock structure
 - 5.2 Biological parameters
 - 5.3 Catch data
 - 5.4 Abundance estimates
 - 5.5 Assessments
 - 5.6 Recommendations for future research
6. Other business
7. Adoption of report

Appendix 3 – **LIST OF DOCUMENTS**

- | | |
|-----------|--|
| SC/6/MP/1 | Daniélsdóttir, A.K. 1997. Review on the population genetic structure of North Atlantic minke whales (<i>Balaenoptera acutorostrata</i>). |
| SC/6/MP/2 | Punt, A. 1997. Implications of various levels of future catches on the dynamics of population of minke whales in the Central North Atlantic. |
| SC/6/MP/3 | Víkingsson, G.A. 1997. Biological parameters of Central North Atlantic minke whales. |
| SC/6/MP/4 | Palsbøll, P.J. 1997. Review for NAMMCO of manuscript by Anna Daniélsdóttir, entitled; “Review on the population genetic structure of North Atlantic minke whales (<i>Balaenoptera acutorostrata</i>)”. |

SECTION 4 – NATIONAL PROGRESS REPORTS

4.1	Faroe Islands	Progress Report on Marine Mammal Research 1997	135
4.2	Greenland	Progress Report on Marine Mammal Research 1996	139
4.3	Iceland	Progress Report on Marine Mammal research 1997	141
4.4	Norway	Progress Report on Marine Mammal Research 1997	147

4.1
FAROE ISLANDS -
PROGRESS REPORT ON MARINE MAMMAL RESEARCH IN
1997

Dorete Bloch and Jústines Olsen

1. INTRODUCTION

This report summarises the Faroese research on cetaceans and pinnipeds conducted in 1997. 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 and by veterinarians, with some assistance from the Faroese Fisheries Laboratory.

2. RESEARCH

2.1 Species and stocks studied

Pinnipeds

- * Grey seals (*Halichoerus grypus*) - coastal waters of the Faroes

Cetaceans

- * Sperm Whale (*Physteter macrocephalus*) - dead stranded animal
- * Bottlenose Whale (*Hyperoodon ampullatus*) - dead stranded animal
- * Sowerby's beaked whale (*Mesoplodon bidens*) - fresh dead stranded animal
- * Pilot whales (*Globicephala melas*) - landed animals
- * White-sided Dolphin (*Lagenorhynchus acutus*) - landed animals

2.2 Fieldwork

Pinnipeds

No further field activities have been conducted in 1997.

Cetaceans

Opportunistic sightings of whales were reported to the Museum of Natural History by the Faroese Fisheries Inspection Services, the Danish Fisheries Inspection Services, the Faroese Fisheries Research Vessel, local ferries between the islands in the Faroes, the weekly ferry between the Faroes and Aberdeen, Scotland and the Faroes and Stavanger, Norway, as well as numerous local sources.

Sex, *skin* values and total body length in cm have been recorded from all pilot whales and some white-sided dolphins caught in 1997 with kind assistance from the *sýslumen* and *grindamen*.

During pilot whaling, further investigations of the time used to kill the whales, and the use of the ball-pointed hook were conducted.

In 1997, special samples were collected from stranded pilot whales and white-sided dolphins for examinations of the eyes (Menquela, Spain) and the skin (Braun,

Germany).

Samples were taken by the Faroese Environmental Institute in the pilot whaling to compare the levels of heavy metals examined in the 1986-88 with the today's levels. Samples were also taken for further examinations by Caurant, France.

One immature male of Sowerby's beaked whale stranded freshly dead 28 March in Sandvík, and the museum conducted extensive sampling, including of the skeleton. This animal was the ninth of this species known to have stranded in the Faroes since 1825, and the fourth in Sandvík, all from unpublished records.

On 6 April the Danish Fisheries Inspection observed a dead sperm whale floating on the surface at 60°40'N 04°50'W. On 8 May, an approximately twelve meter long rotten male sperm stranded at Argir. The teeth were taken for age determination.

One approximately seven meter long rotten carcass of a female bottlenose whale stranded at Hvítanes on 30 April. The jaw was taken to the museum for age determination.

2.3 Laboratory work

Pinnipeds

The material from the 68 grey seals sampled in the period 1993-1995 has been examined and compiled into a thesis to be presented in 1998 (Mikkelsen 1998).

Cetaceans

The skeleton of the stranded Sowerby's beaked whale has been prepared to be archived at the Museum of Natural History.

Teeth from the stranded sperm whale, the stranded bottlenose whale and the stranded Sowerby's beaked whale are under preparation for age determination.

Samples were taken from the data bank of samples for further examination of heavy metal contamination (Caurant, France)

2.4 Other studies

Pinnipeds

No further studies have been conducted on Pinnipeds.

Cetaceans

The analysis of historical data, stored at the National Archives in Tórshavn, has been continued.

2.5 Research results

Pinnipeds

The examination of the material of grey seals sampled in the period 1993-1995 is finished and compiled to a thesis to be presented in 1998 (Mikkelsen 1998).

NAMMCO Annual Report 1998

Cetaceans

A simultaneous severing of the spinal cord and blood supply to the brain by using the traditional Faroese pilot whale knife has been found to be the quickest, safest and most practical method for dispatching smaller whales. A ball-pointed hook has been developed, which is inserted in either of the vestibular air sacs lateral to the blowhole. This hook has been tested and the total killing time was 29.2 ± 4.15 s; range 6-211 s; 50% dispatched in 19.0 s (N=52). When using the traditional hook the total killing time was 54.9 ± 2.71 s; range 8-202 s; 50% dispatched in 45.3 s (N=148).

3. CATCH DATA

Sealing

A number of grey seals are shot every year in connection with salmon farming to prevent the seals from eating the salmon, but there is no systematic reporting of these removals.

Whaling

Table 1: Pilot whale drives in the Faroe Islands, 1997.		
Date	Locality	Number of whales
7 May	Hvalba	31
16 August	Vágur	108
24 August	Klaksvík	6
26 August	Sandavágur	165
28 August	Bøur	36
1 September	Hvannasund	60
2 September	Húsavík	39
5 September	Tórshavn	39
6 September	Bøur	35
13 September	Leynar	5
14 September	Miðvágur	154
20 September	Bøur	172
24 September	Tórshavn	157
13 November	Tórshavn	81
2 December	Leynar	74
Total	15 grinds	1162

Date	Locality	Number	Species
21 August	Klaksvík	158	<i>L. acutus</i>
28 August	Sýðrugøta	22	<i>L. acutus</i>
29 August	Funningsfjørður	65	<i>L. acutus</i>
5 September	Nólsoy	12	<i>L. acutus</i>
26 September	Gøtasandur	16	<i>L. acutus</i>
30 September	Hvannasund	7	<i>L. acutus</i>
14 October	Streymnes, 1	19	<i>L. acutus</i>
14 October	Streymnes, 2	24	<i>L. acutus</i>
14 October	Tórshavn	21	<i>L. acutus</i>
23 October	Klaksvík	6	<i>L. acutus</i>
Total	10 grinds	350	

5. PUBLICATIONS AND DOCUMENTS

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4.2
GREENLAND -
PROGRESS REPORT ON MARINE MAMMAL RESEARCH IN
1996

1. INTRODUCTION

This report summarises Greenlandic research on pinnipeds and cetaceans done in 1996. Most of the research was conducted by The Greenland Institute of Natural Resources, but some projects also involved the Department of Fisheries and Oceans, Canada (DFO), The National Environmental Research Institute, Department of Arctic Environment, Denmark, and The Norwegian Polar Institute in Oslo/Tromsø.

2. RESEARCH

2.1 Species and stocks studied

Pinnipeds

* Ringed seals *Phoca hispida* – North West Greenland

Cetaceans

* Minke Whale *Balaenoptera acutorostrata* - West Greenland

* Beluga *Delphinapterus leucas* - Northeast Canada/West Greenland

* Harbour Porpoise *Phocoena phocoena* - Central West Greenland

2.2 Fieldwork

Pinnipeds

Eight Ringed seals were equipped with satellite-linked transmitters in Inglefield Bredning, Avanersuaq, Northwest Greenland, in order to learn more about their use of the North Water.

Cetaceans

Nine belugas were equipped with satellite-linked transmitters in Croker Bay (Northeast Canada), in order to monitor their fall-migration.

A study on the diving pattern of minke whales was conducted out of Nuuk.

2.3 Laboratory work

Nothing to report.

2.4 Other work

Pinnipeds

Genetic studies to determine population boundaries of Atlantic walrus were continued in 1996.

Cetaceans

A reanalysis of the 1993 aerial survey for large cetaceans off West Greenland has been initialised.

2.5 Research results

Pinnipeds

The transmitters on ringed seals in Inglefield Bredning worked for approximately five months. Six young seals stayed in the open water close to the tagging area, one old seal went north to the Humbolt Glacier and one young seal went all the way to southern Baffin Island.

Cetaceans

Like the six belugas equipped with satellite-transmitters in Northeast Canada in 1995, all nine belugas tagged in 1996 stayed in the North water, and did not migrate along the west coast of Greenland.

3. CATCH DATA

Catch data for 1996 has not yet been released from the Ministry of Fishery.

4. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

None

5. PUBLICATIONS AND DOCUMENTS

- Born E.W. 1996. How many ringed seals are needed to sustain all the polar bears ?. Paper to the Scientific Committee meeting NAMMCO, Faroe Islands, February 1996: 9 pp.
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4.3
ICELAND –
PROGRESS REPORT ON MARINE MAMMAL RESEARCH IN
1997

G. A. Víkingsson, E. Hauksson, D. Ólafsdóttir and V. Bogason.

1 INTRODUCTION

The following reports concern studies conducted by or in co-operation with the Marine Research Institute (MRI) and the Research Committee for Biological Seafood Quality (RCBSQ), Reykjavík, Iceland.

2. RESEARCH

2.1 Species and stocks studied

Pinnipeds

The main research emphasis was on studies of the local Icelandic stocks of common seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*). Little work was done on the vagrant species such as hooded seals (*Cystophora cristata*), harp seals (*Phoca groenlandica*), ringed seals (*Phoca hispida*) and bearded seals (*Erignathus barbatus*).

Cetaceans

In 1997, research on cetaceans conducted by the MRI and cooperating institutions concentrated on the recently exploited minke (*Balaenoptera acutorostrata*), fin (*B. physalus*) and sei (*B. borealis*) whales. Special research projects were also continued on blue (*B. musculus*), humpback (*Megaptera novaeangliae*) and killer (*Orcinus orca*) whales, white-beaked dolphins (*Lagenorhynchus albirostris*) and harbour porpoises (*Phocoena phocoena*).

2.2 Fieldwork

Pinnipeds

Some new and old grey seal haul-out sites were visited to monitor the dispersal, time of breeding and moulting of grey seals.

Cetaceans

Sampling of incidentally caught cetaceans continued in 1997. Emphasis was placed on sampling harbour porpoises off north and west Iceland, where sample sizes are small from previous years. In 1997, post-mortem examinations were conducted on 82 harbour porpoises and 2 minke whales incidentally caught in Icelandic waters. Information on stranded and beached cetaceans at the Icelandic coast in 1997 was collected by the MRI and the Icelandic Institute of Natural History. Such incidents included:

- 6 sperm whales (*Physeter macrocephalus*) in 6 different locations in west and north Iceland during April-November.
- 1 minke whale, in August in north Iceland.

- 1 humpback whale in October in north Iceland
- 2 white-beaked dolphins in Southwest and east Iceland in October and December.
- 1 common dolphin (*Delphinus delphis*) in November in Southeast Iceland.
- 1 Cuvier's beaked whale (*Ziphius cavirostris*) in December in north Iceland.

A long-term photo-identification study on killer whales was continued. In 1997, photos were collected during the summer around the Vestmannaeyjar Islands for comparison with the Icelandic catalogue, which is mainly derived from photos taken on the herring (*Clupea harengus*) grounds east and south-east of Iceland during the autumn.

A new project on stock identification, migration and possible hybridisation of blue whales was initiated in co-operation with Richard Sears and co-workers at Mingan Island Cetacean Study, Inc., Canada. The study involves comparison of blue whales from Icelandic and Canadian waters using photo-id and genetic techniques. From 7-21 July 1997, 12 biopsies from blue whales were collected off west Iceland, and photographs of sufficient quality were obtained from approximately 25 individuals.

2.3 Laboratory work

Pinnipeds

Work on age determination from growth annuli in seal teeth from the catch of 1996 and 1997 was concluded.

Preliminary morphological work on adult male and female *Pseudoterranova decipiens* nematodes from Icelandic grey and common seals was carried out in co-operation with Dr H.-P. Fagerholm, Institute for Parasitology, Department of Biology, BioCity, Åbo, Finland.

Cetaceans

Analysis of data collected during the NASS-95 sightings survey continued in co-operation with scientists from the Mathematical Institute, University of St. Andrews, Scotland. Abundance estimates of fin, sei, minke and long-finned pilot whales (*Globicephala melas*) were derived by the NAMMCO Working Group on Abundance Estimates and presented at the fifth meeting of the Scientific Committee.

Analysis of data obtained as a part of the YONAH project (years of the North Atlantic humpback whale, 1992-1993) was continued in co-operation with other participating countries.

Analysis of MRI's photo-id catalogue of killer whales was continued. The catalogue now contains around 400 individuals.

Laboratory work and validation of the data on stomach contents, age and reproduction of harbour porpoises and white-beaked dolphins continued. Analysis of samples collected during 1991-1996 has been completed and work on samples collected during 1997 is at a final stage.

Research on genetic variation in baleen whales was continued. The main objective of these studies is to investigate the population structure of fin, sei and minke whales in Icelandic and adjacent waters.

2.4 Other studies

A simple model of seasonal changes in the abundance of sealworm in the stomach of the grey seal in Icelandic waters is under construction. It incorporates the grey seal as the main final host and the sculpin (*Myoxocephalus scorpius*) as the main intermediate host for the sealworm. The objective of this model is to describe adequately the main seasonal and geographical differences in abundance of sealworm in grey seals off the coast of Iceland. The results will be published in 1998.

A study on the dynamic interactions between five marine mammal species and some fish species in Icelandic and adjacent waters using a simulation model was continued. Work continued on feeding and energetics of fin and sei whales, based on data collected during 1986-1989. In co-operation with the National Economic Institute of Iceland, work was continued on the development of management models for whaling.

2.5 Research results

Pinnipeds

Vital and population parameters of common and grey seals.

Age distribution in the catch indicates higher longevity for females than males in both common and grey seal populations. The asymptotic weight of grey seal females is 165 kg, while that for the common seal females is 90 kg. Asymptotic weights for male grey and common seals are 276 kg and 104 kg respectively. Data on reproduction and sexual maturity, based on inspection of ovaries and the mass of testes, indicate that most common and grey seal females mature at 4 years of age and give birth one year later. The testes grow rapidly in young males, but growth slows down at 5 years of age in common seals and at 6 years of age in grey seals. This is assumed to be the age of maturity in males.

Food of grey seals.

Grey seal stomachs were fullest in January and June to August, but empty stomachs were most common during the breeding period in the autumn. The mean weight of stomach contents in August was 2 kg in males and 0.6 kg in females. Cod (*Gadus morhua*), sand eel (*Ammodytes* sp.), catfish (*Anarhichas lupus*), sculpin, saithe (*Pollachius virens*), and lumpsucker (*Cyclopterus lumpus*) are the most important food species by weight. Grey seals fed mainly on sand eels off the Icelandic south coast throughout the year. In other coastal areas, cod, lumpsucker, catfish and flatfishes were more prominent food items during the period from January through September. During breeding, grey seals fed mainly on bull-rout, cod and flatfishes. Only adult lumpsuckers were consumed. Cod consumed by grey seals consisted mainly of 30-50 cm, 2-4 year old fishes. Similar length and weight data for other species consumed was as follows: haddock 20-40 cm and 2-4 years; saithe 10-60 cm and 2-6 years; bull-rout 15-25 cm and 4-6 years; herring 25-35 cm and 1-4 years; capelin (*Mallotus villosus*) 10-15 cm and 1-3 years. Sand eels in the diet were 15-35 cm in length, catfishes 10-90 cm, flatfishes 15-40 cm and red fishes 20-30 cm. Estimated total

consumption of a grey seal population of 9000 in 1992 was 30,000 tons of seafood, including about 7,200 tons of cod, 6,600 tons of sand eels and 3,400 tons of catfish.

Feeding of hooded and harp seals on commercially important fish in Icelandic waters. Visits of hooded and harp seals to Icelandic waters date as far back as the seventeenth century. No scientific sampling of these seals was done until 1974, but since then occurrence of vagrant seals in Icelandic waters have been systematically noted. Samples of teeth, stomachs and sex-organs have also been collected. Most of the records of hooded and harp seals are from the north coast of Iceland, in the summertime. The majority of the hooded seals were mature males, but most of the harp seals were young animals of both sexes.

The majority (76%) of the hooded seal stomachs had food remains. Redfish was the most dominant food item, followed by cod, haddock, saithe and, long rough dab (*Hippoglossoides platessoides*). The mean length of redfish was 32 cm (range 23-43 cm), similar to that taken by Icelandic trawlers in 1992 and 1993. Cod eaten were mostly of aged 3-5 years, as compared to 3-7 years for the cod-fishery. It is estimated that the hooded seal stock in the Northeast Atlantic spends about 13.7 million seal days annually in Icelandic waters, consuming 71 thousand tons of redfish and about 19 thousand tons of cod. Elimination of this predation would result in a maximum yield increase to fisheries of about 38.5% for redfish and 7% for cod.

The most important food items for harp seals were sand eel, herring, sculpin, cod, saithe, haddock and catfish. The fish taken were generally small and young. The majority of cod taken were one year old, with a mean length of 15.9 cm (range 3-49 cm). The mean length of herring in the diet was 30.7 cm (range 23-36 cm). Harp seals are therefore not in direct competition with fisheries, except for the herring fishery. It was estimated that the harp seal stock, breeding in the West-Ice, spends about 16 million seal days in Icelandic waters each year, consuming about 10,500 tons of herring. Elimination of this predation would result in a maximum increase in yield to the herring fishery of 9.7% in 1992.

The diet of common seals around Iceland.

The stomach contents of 772 common seals, of which 493 had food remains, were analysed. Stomachs were collected around Iceland in 1992 and the first half of 1993. The main prey species was cod, contributing about 48% wet mass to the diet. The proportions of redfish, sandeel and saithe were about 8% each. Other important species in the diet were herring, catfish, capelin and various flatfishes. Some seasonal changes in diet composition were found, with sandeel and saithe being more common in the diet in spring and summer than in autumn and winter, when capelin and herring were more common. Sandeel was the dominant prey off the south coast of Iceland, while saithe was more frequently found in the south-west, redfish off the north coast and catfish off the north-west and the north coasts. Cod was the dominant preys in all seasons and regions with the exception of the south coast. The average daily energy requirement was calculated as 5.192 kcal per seal, which corresponds to about 4.9 kg of food per seal per day, depending on the diet composition. With a stock size of 16 thousand animals the estimated annual consumption of the common seals around

NAMMCO Annual Report 1998

Iceland was 28,500 tonnes. Divided between the main prey species, the consumption of cod was 11,900 t, 3,900 t of sandeel, 2,200 t of saithe, 2,100 t of redfish and 2,100 t of capelin. The effect of common seals on cod mortality was greatest on 2 and 3 year olds, accounting for about 20% of the annual mortality in these year classes.

A review of present knowledge of sealworm infections in Icelandic common and grey seals and their fish prey was presented to the NAMMCO SC Working Group On Sealworm Infection in March 1997 (Ólafsdóttir, 1997).

Cetaceans

Studies have demonstrated that the body condition of fin whales off Iceland has shown large variability due to reproductive condition. Thus, calculations on the deposition of energy reserves in the body throughout the summer range from around 30% in immatures to 80% of spring values in pregnant females (Víkingsson 1997). Rough calculations on the feeding rates required to deposit these energy reserves range from around 700 kgs/day (1.8% of body weight) to 1,300 kgs/day (2.8% of body weight) depending on reproductive class. Investigations on the stomach contents of fin whales have shown a pronounced diurnal variation in feeding, with highest rates during the night and early morning (Víkingsson 1997). These studies indicate a mean evacuation rate of the forestomach of around once every 3 hours and a feeding rate of around 1,300 kgs/day for adult fin whales.

Preliminary results from the analysis of the stomach content of harbour porpoises in coastal Icelandic waters indicate that capelin (*Mallotus villosus*) is the predominant prey species, followed by sandeel (*Ammodytidae* sp.) and then gadoids and cephalopods. There was considerable seasonal variation in the diet. Capelin was dominant in late winter and spring and sandeel during the summer and through early winter (Víkingsson and Sigurjónsson 1997).

Genetic analysis of biopsies from humpback whales has resulted in ten matches between Iceland and the West Indies (Pallsboll et al. 1997).

An analysis of interactions between three species of baleen whales and some fishery resources indicates that predation by whales may have significant effect on the development of the cod stock, but there is a high degree of uncertainty associated with the estimate (Stefánsson, et al. , 1997).

3. CATCH DATA

Pinnipeds

Preliminary catch figures for 1997 are 1,254 grey seals, 689 common seals and 9 of other species.

Cetaceans

No directed catch of cetaceans took place in Icelandic waters in 1997.

4. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

No whaling permits were issued in 1997. A precautionary TAC of 100 fin whales and 200 minke whales was recommended by the MRI for the 1998 season. No special management measures were taken regarding seals.

5. PUBLICATIONS AND DOCUMENTS

(MRI, RCBSQ and co-operating institutions)

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- Víkingsson, G.A. and Sigurjónsson, J. 1997. Fæðunám hnísu (*Phocoena phocoena*) við strendur Íslands. *Hafrannsóknastofnun Fjölrit nr. 57:343-352*. (In Icelandic).

4.4 NORWAY - PROGRESS REPORT ON MARINE MAMMAL RESEARCH IN 1997

Tore Haug and Nils Øien

1. INTRODUCTION

This report summarises the Norwegian research on pinnipeds and cetaceans conducted in 1997. The research on marine mammals described in this report was conducted at the University of Tromsø: the Department of Arctic Biology (UITØ-AAB) and the Norwegian College of Fishery Science (UITØ-NFH), at the Norwegian University of Science and Technology, Trondheim (NTNU), at the Norwegian College of Veterinary Medicine, Department of Arctic Veterinary Medicine in Tromsø (NVH-IAV), at the National Veterinary Institute, Oslo (VI), at the Institute of Marine Research in Bergen (IMR), at the Norwegian Institute for Fisheries and Aquaculture in Tromsø (NIFA), at the Norwegian Institute for Nature Research in Oslo and Trondheim (NINA), at Akvaplan-NIVA in Tromsø (ANIVA), at the Polar Institute in Oslo/Tromsø (NP) and at the University Studies at Svalbard (UNIS).

2. RESEARCH

2.1 Species and stocks studied

Pinnipeds

- * Harp seals *Phoca groenlandica* - Greenland and Barents Seas
- * Hooded seals *Cystophora cristata* - Greenland Sea
- * Common seals *Phoca vitulina* - Svalbard, Norwegian coastal waters
- * Grey seals *Halichoerus grypus* - Coastal waters of Norway, Estonia, Canada
- * Ringed seals *Phoca hispida* - Barents Sea, Svalbard
- * Bearded seals *Erignathus barbatus* - Svalbard
- * Antarctic fur seals *Arctocephalus gazella* - Bouvet Island (Antarctic)
- * Weddell seals *Leptonychotes weddelli* - Weddell Sea (Antarctic)
- * Crabeater seals *Lobodon carcinophagus* - Weddell Sea (Antarctic)
- * Ross seals *Ommatophoca rossi* - Weddell Sea (Antarctic)

Cetaceans

- * Minke whales *Balaenoptera acutorostrata* - Northeast Atlantic, northwest Pacific
- * Humpback whales *Megaptera novaeangliae* - North Atlantic
- * Killer whales *Orchinus orca* - Norwegian coastal waters
- * White whales *Delphinapterus leucas* - Svalbard
- * Harbour porpoise *Phocoena phocoena* - North Sea, Norwegian coastal waters
- * Sowerby's beaked whale *Mesoplodon bidens* - Norwegian Sea

2.2 Fieldwork

Pinnipeds

Studies of age- and sex composition, body condition and feeding ecology were performed on harp seals invading the coast of North Norway in March/April. (NIFA)

The ecology of seal pups (growth, changes in condition and diets) through the initial stages of their independent life, i.e. from weaning until they have started to feed independently, was studied during commercial seal hunting in the Barents Sea (East Ice) and Greenland Sea (West Ice) in March-May. The pup ecology project includes both harp and hooded seals. Additional data on body condition were collected from adult harp seals. (NIFA)

Age material and other biological material was collected from harp seals during commercial sealing in the East and West Ice. (IMR)

A survey for hooded seals was carried out in the West Ice during the breeding season in 1997. A ship with a helicopter and two aircraft participated in the operation which covered areas of potential hooded seal breeding lairs quite successfully. The main whelping patch was found north-east of Jan Mayen, but several smaller concentrations were also found and photographed. Additional data to assess the birth distribution were collected. A preliminary estimate, which does not account for the birth curve, is 25,300 pups (95% confidence interval 18,200-35,100). (IMR)

In connection with the hooded seal survey, biological materials were also collected from harp and hooded seals to study reproduction, physiology, anatomy and pollutants. Ninety-two bluebacks and one whitecoat were tagged with Dalton Rototags. (IMR)

Fieldwork for various physiological studies was conducted in the West Ice in March and April, 1997. Total blood volume was determined in 7 adult hooded seals and two bluebacks, in association with continued studies of spleen function in seals. A total of 7 adult hooded seals and 2 adult harp seals were killed and dissected for various anatomical measurements of the digestive system for studies of the correlations between diving habit and digestive system anatomy. (UITØ-AAB)

Tissue samples of the kidneys of 45 adult harp seals, which were killed for other purposes by the Institute of Marine Research, were collected for studies of the excretory function of the harp seal kidneys (NTNU, UITØ-AAB).

Five harp seal pups were collected and transported back alive to the University of Tromsø for further *in vitro* studies of the electromechanical and metabolic functions of the seal heart (UITØ-AAB).

During June 1997 a cruise was performed using R/V "Jan Mayen" to the Greenland Sea (West Ice) to tag 10 harp seals with satellite transmitters, in order to study their distribution and dive behaviour after moulting and through the coming months. Due to difficult ice conditions, this objective of the expedition was not accomplished. During the same expedition, a total of 5 harp seals and 2 hooded seals were killed for detailed

NAMMCO Annual Report 1998

anatomical studies of the extradural intravertebral vein, in association with studies of the circulatory function of the vein during diving. (UITØ-AAB)

Studies of Barents Sea harp seal feeding ecology were continued with capture of seals for condition and stomach analyses and concurrent estimates of prey abundance using trawling and acoustic methods in August. During the survey, some ringed seals were also captured in order to assess their ecological position in the drift ice belt. (NIFA, UITØ-NFH)

Studies of bearded seals were conducted in Kongsfjorden, Svalbard, in May. A total of 6 adult females and 21 pups were live-captured, weighed, tagged and some instrumented with time-depth-recorders. (NP, UNIS, ANIVA)

Studies of interactions between common seals and migrating salmon at the outer Trondheimsfjord were initiated. At Møre, the mobility and diving capability of common seal pups during lactation, weaning and the first post weaning periods were studied. The movements of two mother-pup pairs and six additional pups were monitored using small VHF radio tags. At-sea female-pup interactions, habitat use and preference for foraging areas for recently weaned pups were studied. Thirteen additional pups were flipper tagged. (NINA)

Studies of the effects of persistent organic pollutants on grey seals were conducted in Estonia (March) and in Norway (October). Blood samples and blubber samples are taken for analyses of thyroid hormones, steroid hormones, and immunotoxicological studies. One dr.scient. student is working on the project, and in 1997, three cand. scient. students finished their theses using material from the project. (NTNU, NVH-IAV, VI).

Aerial photographic surveys of coastal seals were conducted off northern Norway (Trøndelag-Nordland) in August-October 1997. The surveys were conducted during moulting (common seals) and breeding (grey seals) seasons. (IMR)

Incidental observations of marine mammals have been collected from research vessels, some whalers and coastguard vessels. Data collected include date, position, species and numbers. (IMR-NIFA)

Fieldwork on Antarctic fur seals was conducted in December 1996 - February 1997. About 700 animals were captured and tagged. VHF-transmitters were deployed on 45 nursing mothers for study of attendance behaviour. In addition 3 were equipped with time-depth recorders for monitoring diving activity. Blood and milk samples were collected for studies of pollutants. (NP)

In February 1997, during NARE 96/97, ten crabeater, two Ross, one Weddell and one leopard seal were captured within the Weddell Sea and equipped with satellite linked dive recorders (SLDR's) to provide information on distribution and dive behaviour of the Antarctic pack ice seal species. In January and February, during the same expedition extensive aerial surveys were performed to count numbers of seals in the

Weddell Sea and King Haakon VII Sea. The surveys are co-ordinated within the APIS (Antarctic Pack Ice Seals) program of SCAR, with the objective to obtain revised total population estimates for the Antarctic seal species. In order to investigate whether the intestinal anatomy is related to the diving habit of seals, specimens of Ross seals, Weddell seals, crabeater seals and leopard seal were killed for detailed dissections and measurements of intestinal area, length and volume and electron microscopic examination of the microanatomy of the digestive system. (UITØ-AAB)

Cetaceans

During the commercial whaling season (May-June), stomach samples, body condition data and biological material for studies of demography, reproduction and stock identity were collected from minke whales by scientific personnel on 4 of the participating vessels. Additionally, tissue materials for studies of stock identity were collected by governmental inspectors from all whales taken by the other vessels participating in the Norwegian small type whaling. (NIFA)

During the whaling season, a newly developed penthrite grenade for minke whales was tested onboard one vessel. Seventeen minke whales were shot with the new grenade with good results. Based on these results the new grenade will be produced for a large-scale field trial in 1998. (NVH-IAV)

During the summer 1997 a sighting survey was conducted in the western parts of the Norwegian Sea and in the areas between Iceland, Jan Mayen and Greenland. This was the second year of a six-year program to cover the Northeastern Atlantic to ensure a new abundance estimate of minke whales every six-year as part of the management scheme established for this species. (IMR)

Killer whale surveys were performed during late autumn in North Norway in order to study behaviour, ecology and problems concerning photoidentification of the animals. (UITØ-NFH)

In the Sognefjord, recordings on video and acoustic tapes of harbour porpoise movements and vocalisation during transit, foraging and resting continued in 1997. Nets with "pingers" were experimentally deployed at the transit routes, resting and foraging sites to test porpoise avoidance behaviour. This experiment will be continued in 1998. (NINA)

Fieldwork on white whales was conducted in the Bellsund area, Svalbard during August. A total of 7 whales were live-captured. Material was collected for studies of pollution, diet, and vocalisation. In addition 3 whales were equipped with satellite tags for studies of migration routes and diving habits. (NP, UNIS, UITØ-NFH, ANIVA)

2.3 Laboratory work

Pinnipeds

Age readings from teeth have been conducted on harp seals taken during the sealing operations in the East Ice. Photographs taken during aerial surveys of hooded seals and coastal seals have been interpreted in the laboratory as a basis for survey estimates. (IMR)

NAMMCO Annual Report 1998

Age readings from teeth have been conducted on harp seals taken during seal invasions and on their feeding grounds in the Barents Sea. Furthermore, data on body condition of adult harp seals (taken during the invasions and in the Barents Sea) and of harp and hooded seal pups (from breeding grounds) have been analysed. (NIFA)

Stomach and intestine content samples taken from harp seals during invasions and on their feeding areas in the Barents Sea and from harp and hooded seal pups in the breeding areas have been analysed using traditional methods, where the original biomass of prey items is reconstructed based on remaining hard parts in the stomach contents. Stomach contents data collected on the feeding grounds are compared with data from concurrent estimates of prey abundances. (NIFA)

Organochlorines and pesticides have been studied in harp seals from the East Ice and harp and hooded seals from the West Ice. (VI)

Various physiological studies of captive harp and hooded seals were carried out: Studies were continued for measurements of the basal metabolic rate of harp seals at various stages of fatness to determine to what extent the metabolism of fat contributes to the basal metabolic rate; Sea water drinking in harp seals was further studied in early 1997, to investigate how the harp seal kidney handles the intake of sea water, and whether harp seals may have a net gain of water from drinking this potential source of water; The gastrointestinal transit time of capelin was determined in juvenile harp and hooded seals by use of x-ray and radio opaque polyethylene rings (solid phase of digesta) and Cr-EDTA (liquid phase of digesta). Experiments were also performed in juvenile harp seals to investigate whether the gastrointestinal transit time is affected by experimental diving; The direction and velocity of blood flow in the extradural vein of harp and hooded seals was further studied by use of Doppler ultrasound measurements, before, during and after experimental dives. (UITØ-AAB)

Analysis for regional variation in vocalisation of common seal males recorded during breeding season in Norwegian and UK coastal waters continued in 1997. Analysis of dive duration, swim speed, descent and ascent angles of common seals were completed in 1997. (NINA)

Analysis of satellite transmitted behavioural data from adult grey seals were initiated in 1997 for studies of migrations and depth ranges of foraging dives. (NINA)

Analyses of thyroid hormones, steroid hormones and immunological variables and persistent organic pollutants in blood and blubber samples of grey seal pups collected from Estonia and Norway. (NTNU, NVH-IAV, VI)

Age, condition and stomach contents data from ringed seals (from the Barents Sea drift ice) and common seals (from the Norwegian coast) have been analysed. (NIFA, UITØ-NFH)

Cetaceans

Stomach content samples from minke whales have been analysed using traditional methods, where the original biomass of prey items are reconstructed based on remaining hard parts in the contents. (NIFA)

Tissues sampled for stock identity studies of minke whales have been analysed using DNA techniques. (NIFA)

Age determination of bullae from minke whales has been continued. A study on reproduction in minke whales comparing data from several geographic areas has been finished. (IMR)

Recapture information and databases containing incidental observations of marine mammals have been updated. (IMR)

A study on population structure of North Atlantic harbour porpoises by means of morphology, genetics and tagging, is going on based on material collected in recent years from strandings and by-catches. (IMR)

2.4 Other work

Pinnipeds

A review of possible interactions between pinnipeds and commercial fisheries in the Barents Sea region has been produced. Furthermore, anatomical and feeding data from Barents Sea / East Ice harp seals, collected in the period 1990-1996, have been prepared for publication/presentation. Results from analyses of ecological data collected from harp and hooded seal pups in the East and West Ice have also been presented. (NIFA)

Results from ecological studies of harbour seals in Norwegian coastal areas, and of ringed seals in Barents Sea drift ice areas, have been analysed and presented. (NIFA, UITØ-NFH)

Cetaceans

Data on the body condition and feeding ecology of Northeast Atlantic minke whales, based on material collected in special permit catches in 1992-1994 and in commercial catches in 1995 and 1996, have been analysed and prepared for presentation/publication. (NIFA, UITØ-NFH)

In co-operation with Japanese scientists, data on the feeding ecology of North Pacific minke whales have been analysed and presented. (NIFA)

Data from studies of killer whale behaviour and ecology, collected in 1990-1993, have been analysed and prepared for publication. (UITØ-NFH)

2.5 Research results

Pinnipeds

The analyses of the age material from the catches of moulting harp seals in the East Ice show that the 1987-1991 cohorts are weakly represented, and that the recruitment in the East Ice probably has been reduced in recent years. (IMR)

NAMMCO Annual Report 1998

During the catch for scientific purposes in the West Ice, one hooded seal tagged in 1986, two harp seals tagged in 1989 and one harp seal tagged in 1983 were recaptured. (IMR)

Mark-recapture estimates of harp seal pup production in the Greenland Sea have been updated. For most cohorts, the results are similar to previous ones, but for the 1991 cohort the estimates based on recent data indicate a higher pup production than previously thought; the estimate, 67,300 pups (95% confidence interval 56,400-78,100), is about 10% higher. (IMR)

Biological data collected in the Svalbard area during summer in 1996 and 1997 seems to indicate that harp seal consumption during this important feeding period is particularly characterised by krill, and to some extent also by polar cod. Later, in autumn and early winter, these seals are known to shift from crustaceans to a menu dominated by fish. Quantification of possible prey preferences, using statistical analyses on collected seal diet and prey abundance data, is now in progress. (NIFA)

Studies of body condition of adult Barents Sea harp seals have revealed that the animals are generally in poor condition in spring and early summer (May-June). Their condition improved during the course of summer, and the seals were in good condition in September-October. The energy stores built up during summer and autumn were maintained until February, after which the seals became thinner as the stores of blubber decreased rapidly during the breeding season (late February-March). A slight increase in blubber was observed in the short period between breeding and moult (late March-early April), but the stores of blubber decreased further during moult (late April-May) to a minimum in mid-June. (NIFA)

Using harp seal diet data, collected in the Barents Sea in 1990-1996, in combination with information on the energy density of various prey species and abundance and demography data on the seals, it was possible, under certain assumptions, to estimate the total consumption of various prey items required by the seals to cover their energy demands. The total consumption of the Barents Sea / East Ice stock was estimated as 1.1 - 1.7 million tons depending on the choice of input parameters in the model. Assuming a variable basal metabolic rate (BMR) throughout the year and a field metabolic rate of 2*BMR the estimated annual consumption by harp seals was estimated as 428,000 tons crustaceans, 258 200 tons capelin (in years of high capelin abundance), 212,500 tons polar cod, 69,600 tons herring and 32,200 tons cod. In years of low capelin abundance, capelin consumption seemed to be replaced by other fish species, notably polar cod. (NIFA, UITØ-AAB)

Satellite telemetry monitoring of Barents Sea harp seals was continued until early March 1997, for studies of distribution and dive behaviour in order to improve the understanding of predator-prey interactions in the Barents Sea. The studies have shown that individual Barents Sea harp seals may migrate over vast areas, including most of the Barents Sea, the Greenland Sea (5°W) and far east in to the Kara Sea (84° E) and to waters around Franz Josefs Land (82°N). The seals spend considerable time both along the ice edge and pelagically, in open water. While most dives are shallower

than 100 m, harp seals may occasionally dive to 400 m and deeper. Seasonal changes in dive depth suggest seasonal changes in their diet. Analyses are currently being made to correlate the geographical, vertical and temporal distribution of harp seals with potential prey. (UITØ-AAB)

Results of various physiological studies of harp seals include: Measurements of basal metabolic rate of fat and lean harp seals suggest that fat (blubber) contributes little to the basal energy expenditure. These data thus suggest some caution against using general allometric equations to predict BMR in harp seals; Experiments with oral administrations of seawater, show that fasting harp seals may handle a bolus of 1500 ml of seawater without disruption of homeostasis. The experiments do not prove, however, that harp seals may obtain a net gain of water from drinking seawater; Studies of blood flow measurements of the intravertebral extradural vein of harp seals before, during and after diving, do not support a previous hypothesis that the blood flow in this vein is reversed during the diving situation, in order to prevent mixing of oxygen poor blood from the brain with oxygen rich blood "stored" in other venous systems. Instead, it is concluded that seals are not able to separate oxygen poor from oxygen rich blood in the central venous system during diving. (UITØ-AAB)

Studies using different types of markers to measure the gastrointestinal transit time (GIT) of a meal in harp and hooded seals indicate a large difference between the GIT of the water phase (1 hour) and the solid phase (11-15 hours) of digesta. The studies moreover did not reveal any correlation between the maximum dive duration and the small intestinal length or area, suggesting that restricted blood supply to the gastrointestinal system during diving is not compensated by an increased small intestinal absorptive area. Studies of passage time of digesta in harp and hooded seals subjected to prolonged periods of experimental diving, indicate that the passage time does not increase when the seal is diving frequently. (UITØ-AAB)

Studies of the feeding habits of harp and hooded seals during spring and early summer in the West Ice indicated heterogeneity between the two species. The harp seal diet was totally dominated by pelagic amphipods, to some extent also by krill and polar cod. The hooded seals had fed mainly on squid, and to a much lesser extent on polar cod. (NIFA)

In May 1996, new rules for management of coastal seals were introduced. The management shall be based on sustainable use, and this requires a survey program to be established. In 1997, photographic surveys in moulting lairs of common seals and in breeding areas of grey seals in northern Norway were conducted. These data have not yet been finally analysed. (IMR)

Ecological studies of common seals in North Norway have revealed a diet dominated by saithe, but with considerable inclusion also of herring, cod and sand eels. Methodological studies indicate that the use of faeces samples in quantitative analyses is questionable. The common seals appear to feed little during summer (breeding, moulting), but feed sufficiently during autumn and winter to increase their blubber layer significantly. (NIFA, UITØ-NFH)

NAMMCO Annual Report 1998

Tracking radio tagged common seal pups showed that they developed capacity for long dives during the four-week lactation period. Time-at-surface between dives decreased significantly during the same period. At the time of weaning, a dive duration of about four minutes was frequently recorded. When at sea during the lactation period, pups remained in sheltered waters in between haul out rocks. However, shortly after weaning the pups commenced activities where haul out bouts alternated with off shore foraging trips. Duration of foraging trips ranged from a few hours to more than 24 hours. (NINA)

Grey seal pups from Estonia have significantly higher body burdens of persistent organic pollutants as compared to their Norwegian relatives. This higher body burden is also reflected in some of the measured biomarkers. (NTNU, NVH-IAV, VI)

Ecological studies of ringed seals in the northern drift ice areas of the Barents Sea indicate that the species feeds mainly on crustaceans (krill and *Themisto libellula*) and polar cod, and that some competition for food exist between ringed and harp seals in the areas studied. (NIFA, UITØ-NFH)

Studies of Antarctic pack ice seal distribution and dive behaviour indicate that crabeater seals may migrate over large distances from February until August, while one Weddell seal remained stationary within solid pack ice within the Weddell Sea after tagging. A Ross seal left the pack ice after tagging and remained pelagic for 85% of the days of tracking, performing long northward excursions, reaching as far north as Bouvet Island (half way to South Africa). Detailed analysis are currently being performed to relate seal movements to ice distribution, prevailing currents, pack ice coverage and bottom topography, while dive depths and water temperature recordings during diving are analysed with regard to predator-prey interactions. Preliminary analysis of the aerial surveys suggests an average density of pack ice seals within the Weddell Sea and in King Haakon VII Sea of one seal pr. km² pack ice, when counts are uncorrected for haul-out behaviour. (UITØ-AAB)

Cetaceans

The methods for analysing minke whale sightings survey data have been further developed to simplify the extremely complicated calculations involved in the analyses of the 1995 survey data. An alternative method has been suggested and is under evaluation by the IWC Scientific Committee. (IMR)

Results from analyses of minke whales, taken in scientific whaling operations in 1992-1994, indicate that the contents from the forestomach sufficiently describe the diet of the species. Information on the energy requirements, diet composition and stock size of minke whales in north-eastern Atlantic waters have been combined to estimate the consumption of various prey species by this stock. A total of 85,000 minke whales that feed in coastal waters off northern Norway, in the Barents Sea and around Spitzbergen, were estimated to consume more than 1.8 million tons of prey biomass during the six months from mid-April to mid-October. The consumed biomass was composed of 602,000 tons of krill, 633,000 tons of herring, 142,000 tons of capelin, 256,000 tons of cod, 128,000 tons of haddock, and 55,000 tons of other fish species. (NIFA, UITØ-AAB)

It has also been observed that minke whale diets in the Barents Sea are subject to year-to-year variations due to changes in the resource base in different feeding areas. Variations in abundance of herring and capelin have particularly been demonstrated to cause changes in minke whale diets. Thus, relative distribution of consumption of different prey items is highly dynamic. (NIFA)

Analyses of anatomical measurements of north-eastern Atlantic minke whales reveal a seasonal weight increase due to increase in blubber weight. Blubber thickness increases during the feeding season (i.e., from spring to autumn) both on the ventral and dorsal side of the whales. Visceral fat shows the same seasonal increase. Results from biochemical analyses indicate that variable amounts of lipids are stored in different muscular groups throughout the feeding season. Generally there is a seasonal increase in lipid, but the analysis showed that there is a clear increase in lipid stored in the muscular group behind the dorsal fin. (NIFA, UITØ-NFH)

Stock identity studies using DNA-techniques have revealed relatively clear differences between minke whales from the north-eastern Atlantic and the north-western Pacific. Using material collected in 1996 and 1997, the question of possible sub-structuring within the Northeastern Atlantic stock area is now being addressed. (NIFA)

Studies of feeding habits of north Pacific minke whales reveal that the species is almost as euryphagous in this area as in the north-eastern Atlantic, feeding mainly on pelagic shoaling fish species and krill. (NIFA)

Genetic analyses of biopsy samples from humpback whales in the North Atlantic have been used to estimate population size; approximately 8,000 animals. These samples also demonstrate the migration of humpbacks between the breeding areas in the West Indies and feeding areas in the Barents Sea. (IMR)

Killer whales have been shown to occur in different coastal areas of North Norway throughout the year, these areas coinciding with the distributional areas of the Norwegian spring spawning herring. Herring seems to be the main type of killer whale prey both during fall-winter and summer, although predation upon saithe, mackerel, little auks, eider ducks, northern fulmars and jellyfishes have been observed. The dynamic nature of the seasonal migration patterns of Norwegian spring spawning herring clearly has consequences for the seasonal occurrence and habitat use of killer whales. (UITØ-NFH)

Elevated concentrations of butyl tins (TBT, BBT and MBT) were recorded in harbour porpoises incidentally caught in gill nets off North Norway. Liver, kidney, muscle blubber and skin were analysed. Particularly high concentrations were recorded in hepatic tissues. There was a positive correlation between butyl tin concentrations and age of the porpoises. (NINA , ANIVA)

During the large-scale 1995 whale sightings survey an observation was made of Sowerby's beaked whale in northern Norwegian Sea. This turns out to represent a new northern range of this species. (IMR)

3. CATCH DATA

3.1 Sealing

Norwegian sealing in 1997 included two vessels, one each in the West Ice (the Greenland Sea) and one in the East Ice (the south-eastern Barents Sea). Up to half the quotas allocated were allowed to be taken as weaned pups. The following table gives the Norwegian catches of harp and hooded seals in 1997.

Table III.1. Norwegian catches of harp and hooded seals in 1997. 1+ means one year or older seals.

Catching area:	The West Ice ¹⁾			The East Ice ²⁾		
	Pups	1+	Total	Pups	1+	Total
Harp seals	1,962	199	2,161	15	5,004	5,019
Hooded seals	2,765	169	2,934			

¹⁾ Including 234 harp seals (62 pups and 172 1+) and 67 hooded seals (32 pups and 35 1+) taken for research purposes.

²⁾ Including 17 harps seals aged 1+ taken for research purposes.

3.2 Whaling

After a temporary halt in the traditional Norwegian minke whaling, commercial minke whaling was again allowed in 1993 and quotas established based on the Revised Management Procedure (RMP) developed by the International Whaling Commission's (IWC) Scientific Committee. The RMP allocates catch quotas to specific management areas. There are five such management areas within the region of interest to Norwegian whalers. These are (1) the Svalbard-Bear Island area (abbreviated ES); (2) the eastern Norwegian Sea and central and north-eastern Barents Sea (EB); (3) the Lofoten area (EC); (4) the North Sea (EN) and (5) the western Norwegian Sea/ Jan Mayen area (CM). Table III.2 shows the number of minke whales taken during the traditional small-type whaling during the 1997 season.

Table III.2. Catches of minke whales in 1997 by management area as defined in RMP.

1997	Management area					
	EB	EN	ES	EC	CM	Total
Small-type whaling	281	56	128	17	20	502

4. ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

4.1 Sealing

Advice on management of harp and hooded seals is based on the deliberations in the ICES/NAFO Working Group on harp and hooded seals. In 1993, pup production in 1991 for harp seals in the West Ice was estimated both from mark-recapture experiments and visual and photographic surveys and found to be 57,800 (95% confidence interval 46,000-69,000) and 55,300 (95% confidence interval 44,500-68,500), respectively. These findings were used to model the population to evaluate the impact of several catch scenarios still considered valid by the Working Group. Updates of the mark-recapture estimates indicate that the 1991 harp seal pup production in the West Ice might have been higher; the most recent estimate is 67,300 pups (95% confidence interval 56,400-78,100). Russia has studied the East Ice harp seal population by conducting photographic surveys in the breeding lairs in the White Sea. Preliminary analyses of the most recent surveys conducted in 1997, were presented to the ICES/NAFO Working Group on harp and hooded seals who concluded that at least 100,000 pups were born in the White Sea that season.

Preliminary estimates of hooded seal pup production in the West Ice based on the 1997 breeding lair survey were presented to the ICES/NAFO Working Group on harp and hooded seals. The total estimate of 25,300 pups (95% confidence interval 18,200-35,100) did not incorporate a correction for the birth distribution.

The 1997 TACs were 13,100 harp seals in the West Ice, 40,000 harp seals in the East Ice and 9,000 hooded seals in the West Ice, all quotas given as 1+ equivalents. Russia and Norway both take part in the sealing operations in the West Ice and the East Ice and therefore allocate quotas on a bilateral basis. The Norwegian quotas in 1997 were 13,100 harp seals and 9,000 hooded seals in the West Ice and 5,000 harp seals 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. For the 1998 season the same total allowable quotas as in 1997 has been set for harp seals, but the hooded seal quota in the West Ice has been reduced to 5,000 1+ equivalents. The Norwegian shares of the 1998 quotas will be 10,600 harp seals and 2,200 hooded seals in the West Ice and 5,000 harp seals in the East Ice.

In 1996, new regulations for sustainable hunting of coastal seals as well as compulsory catch reporting were introduced. Quotas were set for 1997 based on available information on abundance and allocated along the coast according to abundance within counties (common seals) or regions (grey seals). The total 1997 quotas were 230 common seals and 260 grey seals, of which only about 20% were reported as taken. Similar quotas for coastal seals have been set for 1998.

4.2 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 not

NAMMCO Annual Report 1998

implemented it. 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 in 1997 for the north-eastern Atlantic and the Jan Mayen area was set to 580 minke whales based on the new estimates from the 1995 survey and the revised estimates for 1989. The catch quotas are set for each of five management areas, and allocated on a per vessel basis, in 1997 13-20 whales per vessel for the 31 vessels which participated. The basic catching season was from 2 May to 31 July. All the participating vessels had inspectors on board to survey the whaling activity. The quota for 1998 will be 671 minke whales.

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SECTION 5 - ADDRESSES

5.1	Delegates and Observers to the Eight Meeting of the Council	167
5.2	Management Committee Members in 1998	173
5.3	Scientific Committee Members in 1998	175
5.4	Finance and Administration Committee Members 1998	177
5.5	Working Group on Economic Aspects of Marine Mammal – Fisheries Interaction	179
5.6	Secretariat	181

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181

181