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Report of the Sixth Meeting of the Council

North Atlantic Marine Mammal Commission

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PREFACE

The North Atlantic Marine Mammal Commission was established in 1992 by an Agreement signed in Nuuk, Greenland on the 9th of April between the Faroe Islands, Greenland, Iceland and Norway. The objective of the Commission, as stated in the Agreement, is to "... contribute through regional consultation and cooperation, to the conservation, rational management and study of marine mammals in the North Atlantic."

The Council, which is the decision-making body of the Commission, held its inaugural meeting in Tórshavn, Faroe Islands, 10-11 September 1992 (NAMMCO/1), and has convened five times since: in Tromsø, Norway 19-20 January 1993 (NAMMCO/2); Reykjavik, Iceland, 1-2 July 1993 (NAMMCO/3); Tromsø, Norway 24-25 February 1994 (NAMMCO/4); Nuuk, Greenland, 21-23 February 1995 (NAMMCO/5); and most recently in Tromsø, Norway 27-28 February 1996 (NAMMCO/6).

The present volume contains proceedings from NAMMCO/6 - the Sixth Meeting of the Council - which was held at the Radisson SAS Hotel in Tromsø. Norway, 27-29 March 1996 (Section 1), as well as the reports of the 1996 meetings of the Management Committee (Section 2) and the Scientific Committee (Section 3), which presented their conclusions to the Council at its Sixth Meeting. Section 3 also contains Scientific Committee Working Group reports which were presented to the 4th meeting of the Scientific Committee in Tórshavn, 5-9 February 1996, while annual National Progress Reports on marine research in memebr countries are contained in Section 4.

The reports contained in this volume are presented here in their final edited form and thereby replace any preliminary versions which have been circulated prior to this publication.

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Members of the Commission		**Heads of delegations**
Faroe Islands	(F)	Kaj Mortensen
Greenland	(G)	Einar Lemche
Iceland	(I)	Arnór Halldórsson
Norway	(N)	Halvard P. Johansen

Council
Chairman 1995-97: Halvard P. Johansen (N)
NAMMCO/6 - Sixth Meeting of the Council - 27-28 March 1996, Radisson SAS Hotel, Tromsø

Management Committee
Chairman 1995-1997 Einar Lemche (G)
Fifth Meeting of the Management Committee - 28 March 1996, Radisson SAS Hotel, Tromsø

Management Committee Working Group on Inspection and Observation
Chairman Egil Ole Øen (N)
Third Meeting of the Working Group - 3 Nov. 1995, Greenland Home Rule, Copenhagen
Fourth Meeting of the Working Group - 23 Jan. 1996, Greenland Home Rule, Copenhagen

Working Group on Hunting Methods
Chairman Amalie Jessen (G)
Third Meeting of the Working Group - 23 Jan. 1996, Greenland Home Rule, Copenhagen

Scientific Committee
Chairman Tore Haug (N)
Vice-Chairman Mads Peter Heide-Jørgensen (G)
Fourth Meeting of the Scientific Committee - 5 - 9 Feb. 1996, Nordic House, Tórshavn

Scientific Committee *ad hoc* Working Group on Ringed Seals
Convener Mads Peter Heide-Jørgensen (G)

Scientific Committee *ad hoc* Working Group on Grey Seals
Convener Arne Bjørge (N)

The NAMMCO Fund
Chairman of the Board Einar Lemche (G)
Meetings of the Board of the NAMMCO Fund - 3 Nov. 1995 (Copenhagen); 26 March 1996 (Tromsø)

SECTION 1 - COUNCIL

1.1 REPORT OF THE SIXTH MEETING OF THE COUNCIL

Radisson SAS Hotel, Tromsø, Norway, 27-29 March 1996

The Sixth Meeting of the Council of NAMMCO was held at the Radisson SAS Hotel in Tromsø from 27 to 29 March. The meeting was attended by delegations from the member countries - the Faroe Islands, Greenland, Iceland and Norway - as well as observers from the Governments of Canada, Denmark, Japan, Namibia and the Russian Federation. The Ministers of Fisheries of the Faroe Islands, Greenland, Iceland, Norway and the Russian Federation also attended the opening session of the meeting. In addition, a number of inter-governmental and non-governmental organisations were represented by observers to the meeting. Participants are listed in Appendix 1.

1. OPENING PROCEDURES

1.1 Address of welcome

The Chairman of the Council, Halvard P. Johansen (Norway) convened the meeting and introduced the Minister of Fisheries of Norway, Jan Henry T. Olsen, who gave an address of welcome to the Council. Mr Olsen's address is contained in Appendix 3.

1.2 Invited presentation

The Chairman welcomed Dr Jan Jurgens, Permanent Secretary of the Ministry of Fisheries and Marine Resources, Namibia, to the Council of NAMMCO as observer for the Government of the Republic of Namibia. Dr Jurgens was invited by the Council to give a presentation on Namibia's policies and experiences in conserving and managing marine living resources, including marine mammals. A summary of Dr Jurgens' presentation is contained in Appendix 4.

1.3 Opening statements

On behalf of the Council, the Chairman announced to the meeting that member countries of NAMMCO wished to reiterate their invitation to the Governments of Canada and the Russian Federation to sign the NAMMCO Agreement. In addition, the Chairman announced that Council members had agreed to offer an arrangement whereby the payment of membership contributions to NAMMCO by Canada and the Russian Federation would be on a voluntary basis for 5 years.

Opening statements were made by the Ministers of Fisheries of the Faroes, Greenland, Iceland and the Russian Federation, as well as by the observer for the Government of Japan. These statements are contained in Appendix 3.

1.4 Admission of observers

The Chairman welcomed all observers from governments, inter-governmental and non-governmental organisations to the meeting, and noted the high level of attendance at the meeting, which, in addition to the Fisheries Ministers from NAMMCO member countries

and the Russian Federation, also included executive officials from a number of international organisations. The Chairman welcomed in particular the participation for the first time of observers from the newly-formed Nordic-Atlantic Cooperation (NORA), as well as from the North-East Atlantic Fisheries Commission (NEAFC) (see Appendix 1).

1.5 Adoption of Agenda

The Agenda, as contained in Appendix 2, was adopted.

1.6 Meeting arrangements

The Secretary outlined the practical and social arrangements for the meeting, which included invitations to all participants to a reception hosted by the Regional Authority of Northern Norway on Wednesday 27 March, as well as to a reception hosted by the Tromsø City Council on Thursday evening, 28 March.

2. ADMINISTRATION AND FINANCE

2.1 Secretary's Report

The Secretary presented a report to the Council on the activities of the Secretariat since the Fifth Meeting of the Council in 1995 (NAMMCO/6/3; see 2.2 below).

2.2 Report of the Finance and Administration Group

The Chairman of the Finance and Administration Group, Arnór Halldórsson (Iceland), presented the report of the Group, which met in Tromsø on 26 March. As a basis for reviewing financial and administrative matters, the Group reviewed the Secretary's report to the Council, as well as the audited accounts for 1995 and the draft 1996 and forecast 1997 budgets.

2.2.1 Staffing

The Secretary reported that the Secretariat had advertised the position of permanent office assistant in September 1995 and had offered the position to Margot Bertelsen, who began in October, taking over from Elisabeth Vileid who had been employed full-time on a contract basis from March to October 1995. The position of office assistant encompasses a wide range of duties related to the practical organisation and work of the Secretariat, including book-keeping, filing, general communications, word processing and meeting arrangements.

During 1995 the Secretariat had also engaged consultants on a contract basis, both in connection with the International Conference on Marine Mammals and the Marine Environment in Shetland in April, as well as in relation to the establishment of a marine mammal database in the Secretariat (see also under 2.2).

It was also noted that the four-year contracts for the Secretary and Assistant Secretary, who both began their terms of employment in 1993, expire on 31 July and 30 September 1997 respectively.

The Finance and Administration Group had noted reference made at last year's Council meeting to the possible need for scientific expertise in the Secretariat, depending also on further decisions made by the Council. The Secretary gave a preliminary overview of the kinds of tasks for which a scientific assistant in the Secretariat could be responsible, such as the servicing of the Scientific Committee, editing of Scientific Committee reports and follow-up of Scientific Committee meetings, including, for example, updating the List of Priority Species, further development and maintenance of the database, as well as editorial assistance in connection with the possible expansion of publication activities on the part of the Secretariat. It was noted that the appointment of professional positions in the Secretariat was a matter for the Council.

While noting that it was too early to make a decision on the creation of additional professional positions in the Secretariat, the Council **endorsed** the recommendation from the Finance and Administration Group that the Secretary prepare an overview of present staffing arrangements and the division of tasks among staff members, as well as an assessment of the need for additional expertise in relation to further activities and tasks which may be assigned to the Secretariat by the Council.

2.2.2 Headquarters & administration

As reported at the Fifth Meeting of the Council, the Secretariat moved into new, permanent accommodation at Søndre Tollbugate 9 in downtown Tromsø in early February 1995. The Secretary informed the Council in her report that most of the necessary furniture for the offices has now been purchased, although some further enhancement of the office set-up is still required. The Secretary also reported that a small "housewarming" reception had been held in May, which was attended by representatives from local research institutes as well as the Tromsø City Council.

Priorities in office administration in 1996 would be to update and systematise the internal filing system and establish an effective cataloguing system for the Secretariat's library of internal references, as well other general information work as outlined under 2.2.5 below.

2.2.3 Host Agreement

The Secretary reported that after a meeting was held between representatives of the legal department of the Norwegian Ministry of Foreign Affairs and the Chairman, Secretary and Assistant Secretary of NAMMCO in Oslo, 15 February 1996. The Secretariat subsequently prepared a draft text for a Host Agreement between Norway and NAMMCO for use as a starting point from which to negotiate the concrete details of an Agreement. In correspondence with the Ministry of Foreign Affairs, the importance of clarifying NAMMCO's status as an international organisation in Norway was stressed, as well as Norway's role as host country. It was foreseen that questions concerning NAMMCO's financial status and the conditions the organisation is able to provide the Secretariat and its staff would also be clarified in a Host Agreement.

Further to progress outlined by the Secretary, the Finance and Administration Group was also informed of a recent letter to the Secretariat from the Norwegian Ministry of Foreign

Affairs informing NAMMCO of plans for a meeting to be held in April 1996 between the Ministry of Foreign Affairs and the Ministry of Finance to discuss the question of agreements for international organisations located in Norway.

It was the view of the Finance and Administration Group that these were positive developments, but it was also stressed that there was a need to resolve the details of an agreement as soon as possible, both with regard to clarifying the legal status of the organisation, as well as the financial implications for the organisation and its staff.

In addition, it was noted that the calculations made by the Secretariat concerning income, employers' and sales tax paid through NAMMCO to Norway (NAMMCO/6/FA/5) amount to significantly more than the extra annual contribution of NOK 250,000 paid by Norway. It was also noted that these were conservative calculations based on the 1995 accounts, and could be expected to increase in line with increased activities of the Secretariat.

The Council **endorsed** the recommendation from the Finance and Administration Group that the Secretariat should continue negotiations with the Norwegian authorities and that a draft agreement should be considered by member countries once details have been further developed.

2.2.4 Database

The Secretary reported that the basic framework for the database of marine mammals has now been established in the Secretariat (see also item 11 of the Scientific Committee Report). The major sources of catch and other data on marine mammals of relevance to NAMMCO in member countries and elsewhere have been identified, and some data has already been received and stored. Standardised routines for submitting data to the Secretariat have not yet been established, but in this connection the Scientific Committee has agreed to establish a Data Group to liaise with the Secretariat on data questions in general, as well as the further development of the database.

Progress had also been made on a database of references to papers and publications of relevant biological material, which already contains 6-7,000 titles. Titles would also be included from other fields, such as the historical, sociological and political sciences related to marine mammal management and utilisation.

With respect to continued data compilation (including historical catch data still to be compiled) and future maintenance of the database, the Secretary pointed out that it will be necessary for existing staff to be properly trained in the use of the database and data validation methods if it is to be further developed within existing staffing arrangements. Further contract-based assistant is possible within the budget for 1996. Depending on future developments, however, the Secretary noted that it may be more appropriate to hire extra staff with expertise in data storage and handling (see also under 2.1.1).

The Finance and Administration Group noted that in relation to completing the basic structure of the database and further compilation of up-to-date catch data, the budget for

1996 and 1997 included an amount of 200,000 earmarked for contract expertise, which was also the basis on which initial assistance to begin work with the database had been hired in 1995. It was noted that this could be drawn upon to contract further expertise to complete the outstanding work in 1996.

The Finance and Administration Group also underlined that the Scientific Committee Rules of Procedure make it quite clear that no data compiled from national institutes in the Secretariat will be made available to any other parties without the express approval of the owners of the data.

2.2.5 Information

The Secretary reported to the Council on recent information and publications produced by the Secretariat. These included a general information brochure on NAMMCO, and the *NAMMCO 1995 Annual Report*, which is a compilation of the proceedings of the Council and its Committees in 1995. The Secretariat plans to continue to publish Commission proceedings on an annual basis in this format, the costs of which are included under the budget item for information.

The Secretary also reported that NAMMCO had supported the production of the final edited report of the walrus expert group in published form. This was published in late 1995 as E.W. Born, I. Gjertz and R.R. Reeves, *Population assessment of Atlantic walrus (Odobenus rosmarus rosmarus)*, Norsk Polarinstittut Meddelelser 138. The production of this publication was funded over the Secretariat's general information budget and NAMMCO's logo was included on the title page of the publication. A total of 1000 copies were printed, of which the Secretariat has received 100 from the publishers, the Norwegian Polar Institute. The Institute has a wide international distribution network as well as exchange agreements with many other research institutes. The Secretariat will therefore give priority to distributing its limited copies to contacts not already covered by the Norwegian Polar Institute.

The Secretary also reported that the Secretariat is now connected to Internet and has begun to investigate the possibilities of establishing a home page for general information on NAMMCO as soon as possible, which would also provide links to other relevant sites on the Web. The Secretariat is linked to the University of Tromsø's server for an annual fee, and the University data centre also provides advice and expertise on internet-related matters. E-mail has become an increasingly valuable tool in the daily communications of the Secretariat, and a growing number of general enquiries from the public are being received though this medium.

Plans for future information were also outlined by the Secretary, such as the production of a regular newsletter, and a NAMMCO directory. Possibilities for further NAMMCO publications were outlined briefly in a separate note prepared for the Finance and Administration Group (NAMMCO/6/FA/4).

In line with the report of the Finance and Administration Group, the Council commended the quality and usefulness of the publications produced by the Secretariat in 1995/96 and noted the importance of using funds for such publications in order to enhance the professional image of the organisation. The planned establishment of a NAMMCO Web site was considered an excellent means of enhancing the distribution of information, including NAMMCO documents.

With regard to the contents of the Annual Report, it was agreed that the main principle should be that any Working Group documents presented formally to the Council should be included in future published Annual Reports.

An *ad hoc* Working Group on Publications, which was established by the Council during its meeting to discuss the feasibility of a NAMMCO scientific series (see under 3.1.4), also discussed the need for NAMMCO to produce more general factual information on its work for the general public.

The Council **endorsed** the recommendation of the *ad hoc* Working Group that, in addition to a scientific review series, the Secretariat should produce fact-sheets on a regular basis in order to make known to the public important conclusions from the work of the Scientific Committee, as well as other relevant information on marine mammals available through NAMMCO.

2.2.6 Meetings

The Secretary's report presented an overview of meetings serviced by the Secretariat since the last meeting of the Council. These included the International Conference on Marine Mammals and the Marine Environment in Shetland in April 1995 (see also under item 5.), as well as meetings of the Working Groups on Inspection and Observation and Hunting Methods, the Board of the NAMMCO Fund, and the fourth meeting of the Scientific Committee in Tórshavn in February 1996.

The Secretary also reported briefly on a number of meetings attended in Norway in 1995 by members of the Secretariat. These included a seminar entitled "Managing marine mammals: local responses to global issues" at the meeting of the International Association for the Study of Common Property in Bodø in May, the Environment Northern Seas Conference in Stavanger in August, and the Annual Meeting of the Norwegian Minke Whalers' Association in Svolvær in November, at which the Secretary gave a presentation on the latest work of NAMMCO.

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The Chairman thanked the Secretary and the Chairman of the Finance and Administration Group for their reports to the Council.

2.3 Audited accounts 1995

The Council **approved** the audited accounts for 1995, which had been fully reviewed by the Finance and Administration Group (Appendix 6).

2.4 Budget 1996 and forecast budget 1997

The Council **adopted** the proposed budget for 1996, as reviewed and revised by the Finance and Administration Group. The forecast 1997 budget was adopted provisionally, pending final review and adoption by the Council at the end of the 1996 financial year.

In adopting the budget for 1996, the Council noted that in the future there should not be a discrepancy between the budgeted expenses and the sum of annual contributions and interest.

The Council also noted the Finance and Administration Group's conclusions that the future implementation of a NAMMCO Control Scheme would have financial implications for the forecast 1997 budget and beyond. It was also noted that the existing and forecast 1997 levels of surplus funds could allow increased activities in relation to new membership of the Commission.

3. SCIENTIFIC COMMITTEE

3.1 Report of the Scientific Committee

The Vice-Chairman of the Scientific Committee, Mads Peter Heide-Jørgensen, presented the Report of the Fifth Meeting of the Scientific Committee, which was held in Tórshavn, Faroe Islands, 5-9 February 1996 and chaired by Tore Haug (Norway). The full report, including Working Group reports, is contained in Section 3 of this volume.

National Progress Reports for 1995 from Norway, Iceland and the Faroes, and for 1994 from Greenland were submitted to the Scientific Committee, and these are contained in Section 4 of this volume.

Heide-Jørgensen reported that the Scientific Committee's planned update of the List of Priority Species had not been completed for its last meeting, but would be revised prior to the 1997 meeting. A considerable amount of new data was now available for many of the priority species, including those which had been the subject of recent comprehensive assessments by the Scientific Committee.

It was further reported that the Scientific Committee had agreed to establish a Data Liaison Group to advise the Secretariat on the standards for submission of data and Scientific Committee requirements for the further development of the database in the Secretariat (see also under 2.2.4 above).

3.1.1 Role of marine mammals in the marine ecosystem

The Scientific Committee had noted the growing research focus on the role of marine mammals in the ecosystem in recent years, and the availability of a considerable amount of new information and publications in this area. These included the published proceedings of the 1994 International Symposium on the Biology of Marine Mammals in the Northeast Atlantic (Blix et al. 1995), which contains a number of papers related to research on, for

example, the feeding ecology of marine mammals. As well, the 1995 ICES/NAFO Symposium on the Role of Marine Mammals in the Ecosystem provided a very useful forum for scientific discussions in this area, and papers presented would eventually be published in the *Journal of Northwest Atlantic Fishery Science*.

It was the view of the Scientific Committee that the role of marine mammals in the ecosystem was a vast area of research, and that in the future it may be preferable for the Scientific Committee to address more specific aspects related to this field.

3.1.2 Marine mammal stocks - Status and advice to the Council

i) Long-finned pilot whales

The Council was informed that the ICES Study Group on Long-finned Pilot Whales, which was dealing with matters related to NAMMCO's request for advice on this species, had postponed its scheduled 1995 meeting until April 1996 in Cambridge, UK (see also under item 3.2, *Cooperation with ICES*, below).

The Council endorsed the view of the Scientific Committee that NAMMCO should, if required, finance the travel costs to this meeting for certain scientists whose participation was identified by the Scientific Committee as being important to the successful completion of the Study Group's work. In addition, **the Council endorsed** the Scientific Committee's recommendation to NAMMCO member governments to ensure that the necessary scientific expertise is available to the ICES Study Group on Long-finned Pilot Whales.

It was noted that the next meeting of the ICES Study Group was expected to be its last, and that the Scientific Committee would return to the matter at its next meeting.

ii) Killer whales

The Council was informed that no further advice could be provided on this species until the results of ongoing research were available and data from the most recent sightings surveys had been analysed. further progress on killer whales would be reviewed by the Scientific Committee at its next meeting.

iii) Harp seals

The Council was informed of the Scientific Committee's review of the latest information on harp seals in the Northwest Atlantic, Greenland Sea and Barents and White Seas, which was based on the report of the ICES/NAFO Joint Working Group on Harp and Hooded Seals (for full details, see item 8.3 of the Report of the Scientific Committee in Section 3.1 of this volume).

With respect to stock sizes and trends, it was reported that the total population of harp seals in the *Northwest Atlantic* in 1994 was estimated to be 4.8 million individuals when pup mortality was set equal to the mortality of seals older than 1 year, and 4.5 million harp seals when a pup mortality three times that of older seals was applied. Since 1990 the population has been growing at c. 5% per year. Using the most recent catch (1994) as a basis for the harvesting regime and a pup mortality equal to that of seals older than 1 year, a replacement

yield of 287,000 harp seals was calculated, and the 1996 population was estimated to be 5.1 million.

For the *Greenland Sea* stock, it was reported that mark-recapture updates of pup production for ten cohorts over the period 1977-1991 were similar to those presented earlier with the exception that the 1991 estimate was increased by about 10% to 65,100 (95% conf. interval 53,600-76,800). Since the revised estimate was within the range of values investigated at the 1993 meeting of the Joint Working Group, it was not felt that the findings would make any change to the 1993 assessments.

For the *Barents and White Seas* stock, no new information on stock size was available. Several factors indicated that there had been poor recruitment to the White and Barents Seas stock in the late 1980s, which may be related to over all trends in availability of food resources in the area.

With respect to ecological considerations, the Scientific Committee reviewed available information on diet composition of harp seals in the Northwest Atlantic and the Barents and White Seas. No new information was available concerning the feeding ecology of the *Greenland Sea* stock.

For the *Northwest Atlantic* stock, preliminary estimates of the consumption by harp seals of Atlantic cod, capelin and polar cod indicated that a stock of 4.8 million harp seals consumed 6.9 million tons of fish, 46% of which were estimated to come from Arctic waters, 40% from waters off eastern Newfoundland and the remaining 14% from the Gulf of St Lawrence. The Scientific Committee noted that these estimates were preliminary and should be used with caution (see Report of the Scientific Committee, item 8.3.1.1 in Section 3.1).

For the *Barents and White Seas* stock, changes in the ecosystem over the past 30 years were emphasised. The collapse of two important stocks of potential prey species (Norwegian spring spawning herring in the early 1970s and Barents Sea capelin in the mid-1980s) is particularly likely to have had an impact on the feeding habits of harp seals (see Report of the Scientific Committee, item 8.3.1.3 in Section 3.1).

The Council endorsed the Scientific Committee's recommendations for further research on harp seals, as referred to under item 8.3.2 in the Report of the Scientific Committee (Section 3.1).

iv) Hooded seals

Heide-Jørgensen informed the Council of the Scientific Committee's review of the latest information on hooded seals in the Northwest Atlantic and Greenland Sea, which was also based on the report of the ICES/NAFO Joint Working Group on Harp and Hooded Seals (for full details, see item 8.4 of the Report of the Scientific Committee in Section 3.1 of this volume).

With respect to stock sizes and trends, it was reported that for the *Northwest Atlantic*, a minimum pup production estimate of 84,000 was available. A replacement yield of 22,900 was calculated for a harvest regime of pups only, and 11,800 for a harvest regime of 1 year and older animals. The Scientific Committee reported that these replacement yields were illustrative and should therefore be used with caution. For the *Greenland Sea*, no estimate of stock size or pup production is available.

With respect to ecological considerations, it was reported that information on hooded seal diet in the *Northwest Atlantic* is limited, although preliminary analysis in the Gulf of St Lawrence indicated that the role of hooded seals as predators on some commercially important fish species such as Greenland halibut may be important. No information is currently available on the feeding ecology of hooded seals in the *Greenland Sea*.

The Council endorsed the Scientific Committee's recommendations for future work on hooded seals, as referred to under item 8.4.2 of the Scientific Committee Report, in particular the need for an abundance estimate of the Greenland Sea hooded seal stock, as well as further studies on ecology.

v) Ringed seals

It was reported that the Scientific Committee had established a special *ad hoc* Working Group on Ringed Seals, under the chairmanship of M.P. Heide-Jørgensen which had met during the Committee's meeting to address the Council's request for advice on this species (see *NAMMCO Annual Report 1995*, p. 23). The Scientific Committee's response to the Council's request was therefore based on the report of this Working Group, to which external experts from Canada, Denmark, Norway and the Russian Federation had been invited by the Scientific Committee to contribute to its work (see item 8.5 and Section 3.2 of this volume).

With respect to stock identity, the Scientific Committee identified three provisional geographical areas for assessing the status of ringed seals: *Area 1* defined as Baffin Bay, Davis Strait, eastern Hudson Strait, Labrador Sea, Lancaster, Jones and Smith sounds; *Area 2* defined as Greenland Sea, east coast of Greenland, west coast of Svalbard; *Area 3* defined as Barents and Kara Seas (see Figure 1, Section 3.2 of this volume).

With respect to abundance in each stock area, although estimates were only available for small parts of *Area 1*, the Scientific Committee nevertheless found it useful to extrapolate densities of hauled-out ringed seals for different ice types/habitats to the overall distribution of these ice types. The abundance estimates were further corrected for seals missed during the surveys. A crude estimate of 1,300,000 ringed seals was thus derived for *Area 1*. No quantitative data on ringed seal abundance could be applied to *Areas 2 or 3*. Another approach, based on calculations of polar bear predation combined with removals by humans suggested a total ringed seal abundance in Area 1 of 1.1 and 1.6 million (see Report of the Scientific Committee, item 8.5.2, ii) and Figure 2 in Section 3.2 of this volume).

With respect to long-term effects on stocks by removals in each stock area, the Scientific Committee applied an over all catch figure of 100,000 ringed seals in Area 1 (i.e. combined annual removals in Greenland and Canada), roughly 6-9% of the estimated abundance. Based on three lines of evidence (see Report of the Scientific Committee, item 8.5.2, iii)), it was concluded that catches in Area 1 are probably sustainable, although the large harvest in Area 1 warrants further monitoring.

Concerning the effects of recent environmental changes (i.e. disturbance, pollution), there was little evidence of effects of disturbances at the population levels in ringed seals. It was also noted that further information on chemical pollution in ringed seals and other components of the Arctic ecosystem would be available through global assessments currently being undertaken by other organisations, in particular the Arctic Monitoring and Assessment Programme (AMAP).

The Scientific Committee further reported that no information was available on the effects of changes in the food supply of ringed seals. With regard to interactions with other marine living resources, the Scientific Committee reported that the most obvious interaction was the predation by polar bears on ringed seals (see also on abundance in each stock area, above).

The Council noted the conclusion of the Scientific Committee that the assessment of ringed seals in the North Atlantic had taken into account all relevant information currently available and that no further advice on ringed seals would be possible at this stage.

The Council endorsed the recommendations of the Scientific Committee for further work on ringed seals, including the monitoring of ringed seal catches in Greenland and Canada, studies of loss rates in different types of hunts, the extent of under-reporting and changes in hunting efforts and trade in seal products, as well as further studies on stock identity and abundance of pack-ice ringed seals.

Greenland expressed it appreciation for the work carried out by the Scientific Committe and was pleased to note that present catch levels of ringed seals appear to be sustainable.

Greenland also noted that it would not be realistic to expect hunters to be responsible for monitoring catches or undertaking studies of loss rates and other information, but that such information should be gathered by especially appointed experts.

vi) Grey seals

Heide-Jørgensen reported that the Scientific Committee had established a special *ad hoc* Working Group on Grey Seals, under the chairmanship of A. Bjørge, which had met during the Committee's meeting to address the Council's request for advice on this species (see *NAMMCO Annual Report 1995*, p. 23). The Scientific Committee's response to the Council's request was therefore based on the report of this Working Group, to which external experts from Canada, Iceland, the UK had been invited by the Scientific Committee to contribute to its work (see item 8.6 and Section 3.3 of this volume).

With respect to abundance and stock levels in the North Atlantic, it was reported that in the *Northwest Atlantic* the total population estimate in 1993 was c.143,000; around *Iceland* the population was estimated at 8,000; no population estimate was available for the *Faroes*; around 40% of the world population of grey seals breeds around the *British Isles*, with a 1994 total population estimate of 108,500; in *northwest Europe* (including *Norway and Russia*) figures of pup production are available for all known breeding sites, although these are mostly based on single counts and do not allow for the establishment of confidence intervals.

Noting the comments of the Scientific Committee that direct and indirect removals of grey seals were generally poorly documented, **the Council endorsed** the Scientific Committee's recommendation for a system for recording catch statistics for the hunting of grey seals in Norway, and for the recording of statistics of grey seals killed at fish farms and in fishing gear in all NAMMCO member countries (see also Report of the Management Committee in Section 2.1, item 4.2).

With respect to the role of the grey seal in the marine ecosystem, information on diet was available from Canada, Iceland, the Faroe Islands, UK and Norway. Assessments of consumption of fish by grey seals in the *Northwest Atlantic* have been carried out on the Scotian shelf and the Gulf of St Lawrence, which indicated increases in cod consumption from 1970 to 1993, although the impact of this increased consumption on the recovery of Northwest Atlantic cod stocks was difficult to assess. Fish consumption by grey seals in the *North Sea* has also been examined and compared with the commercial fish catch. A direct comparison shows that grey seal fish consumption is typically around two orders of magnitude less than stock biomass for any species. Although annual removals of fish biomass by seals are small on a North Sea-wide scale, there may be local areas where seal predation is more significant.

The Chairman of the Council requested clarification from the Vice-Chairman of the Scientific Committee concerning recent reports in the popular press which suggested a direct correlation between increased abundance of seals and increased abundance of cod. Heide-Jørgensen stated that such correlations were difficult to address, as the situation was likely to be far more complicated. He stated that harp seals are, however, a more significant predator of Atlantic cod (c. 142,000 t/yr) than grey seals (c. 40,000 t/yr).

With respect to grey seals as a source of nematodal infestation in fish, it was reported that the codworm or sealworm *Pseudoterranova decipiens* is abundant in grey seals

in many areas, and greatly reduces the commercial value of fish fillets. The cost of removing larvae from cod fillets alone was estimated to be in excess of $29 million in Atlantic Canada in 1982. In the *Northwest Atlantic*, surveys to determine nematode abundance in grey seals have shown that mean burdens have increased from 158-700 nematodes per seals between 1948-1956 to more than 1,000 in 1990. Observed increases in sealworm burdens in fish in Nova Scotia and the Gulf of St Lawrence are believed to be linked to increases in the grey seal population since the 1970s. High infestation of sealworm was also reported from *Iceland* and *Norway*.

The Council endorsed the Scientific Committee's recommendations for further work on grey seals (as outlined under item 8.6.4 of the Report of the Scientific Committee - Section 3.1), with respect to both abundance and stock levels, the role of grey seals in the marine ecosystem, as well as further studies on the life cycle and population dynamics of the sealworm (see also under 4.2 below).

3.1.3 Review of NASS-95

Heide-Jørgensen reported that the Scientific Committee had reviewed information from Committee members on the conduct and available results of the respective national surveys carried out under NASS-95 by Norway, the Faroe Islands and Iceland. Summary reports of these surveys are contained in item 9 of the Report of the Scientific Committee in Section 3.1 of this volume.

With respect to the Council's request to the Scientific Committee to review the results of NASS-95 in the light of recent assessments of North Atlantic whale stocks, it was reported that the Scientific Committee had agreed to establish a Working on Abundance Estimates with its basis in the previous Working Group to plan NASS-95. The task of the Working Group would be to review analyses and where relevant also analyse data from NASS-95 to ensure its compatibility, both between NASS-95 survey areas, as well as with data from other sightings surveys, in order to provide a basis for calculating abundance estimates for the relevant cetacean stocks in the North Atlantic (see also under 4.2 below).

The Council also noted that the funds allotted to the NASS-95 fund in 1995 had been divided between the Faroe Islands and Iceland to help cover the costs of undertaking their respective survey coverage for NASS-95.

Norway informed the Council that data on minke whales from the Norwegian survey under NASS-95 would be analysed through

the IWC Scientific Committee's Abundance Estimates Working Group.

Iceland commended the Scientific Committee's decision to establish a Working Group on Abundance Estimates to review and analyse data from NASS-95, including data on minke whales from the Icelandic surveys.

3.1.4 Monitoring of marine mammal stocks

Heide-Jørgensen reported that in relation to the Council's request to the Scientific Committee to monitor stock levels and trends in stocks of all marine mammals in the North Atlantic, it was clarified that the purpose of this request was to ensure that data on marine mammals was available for input into multi-species models for management. The Scientific Committee agreed that the production of a table showing stock levels and trends in stock levels of marine mammals in the North Atlantic should be coordinated through the Working Group on Abundance Estimates, with the addition of available data on pinniped stocks.

3.1.5 Publications

At its meeting, the Scientific Committee had noted the extent to which NAMMCO had initiated and supported the work which formed the basis of the Committee's assessments of ringed seals and grey seals, as had also been the case with the work on the Atlantic walrus at the last meeting. The Scientific Committee agreed that this work should be published and that NAMMCO's role should be duly recognised in the context of the publication.

However, the Scientific Committee sought guidance from the Council on the preferred manner in which to publish the work generated by the Scientific Committee, while stressing the importance of making such work readily available in published form, and ensuring that NAMMCO's role in generating these reviews is sufficiently visible.

The Council agreed to a proposal from Greenland to establish an *ad hoc* Working Group on Publications to review the questions raised by the Scientific Committee. Members appointed to the Working Group were Dorete Bloch (Faroes), Jan Frederik Danielsen (Norway), Johann Sigurjónsson (Iceland) Pia Barner Neve and Henrik Nielsen (Greenland), the Vice-Chairman of the Scientific Committee and the Secretary.

The *ad hoc* Working Group convened during Council proceedings in Tromsø, and Nielsen (Greenland) reported to the Council on behalf of the Group. The Working Group considered the scientific value and status of publications produced through existing channels as opposed to establishing NAMMCO's own publication series, and noted that the Scientific Committee had indicated a preference for any future NAMMCO publication series to focus on review volumes for a general readership, along the lines of the walrus publication (Born el al.

1995). The editing, production and distribution requirements for a NAMMCO series were also discussed by the Group.

The Council endorsed the conclusions of the *ad hoc* Working Group on Publications that, while special effort would be required to make a NAMMCO publication series widely know, there was value in publishing a NAMMCO series in order to enhance the credibility of the organisation and make the work of the Scientific Committee available to a wider readership. This should be undertaken in the first instance with respect to the Scientific Committee's recent work on ringed seals and grey seals (see also under 2.2.5).

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The Chairman thanked the Vice-Chairman of the Scientific Committee for his presentation of the Report of the Scientific Committee.

Norway commended the scope and quality of the Scientific Committee's work in providing assessments of the status of relevant marine mammal stocks, and stressed that such work should be better publicised. Three areas of activity for the future work of the Scientific Committee were highlighted: marine mammals in the ecosystem - an area of growing interest in which cooperation with ICES would be of particular importance; the need to gain a better overview of levels of by-catch of marine mammals; and the urgent need for more information on sealworm infestation in fish, given the significant consequences this has for the fisheries sector.

Iceland thanked the Scientific Committe for its report, and welcomed the Scientific Committee's approach to the follow-up review and analysis of data from NASS-95. Iceland further noted the need for a more specific focus in addressing the multi-species aspects of advice.

3.2 Cooperation with ICES

Under this agenda item, the Chairman welcomed Mr Alain Maucorps, President of the International Council for the Exploration of the Sea (ICES), who gave a presentation to the Council outlining the present status of requests forwarded to ICES from NAMMCO, in particular on long-finned pilot whales, which was being dealt with through the Study Group (see under 3.1.2, *i)* above) and harp and hooded seals, which had been forwarded to the Joint ICES/NAFO Working Group on Harp and Hooded Seals (see also under item 3.1.2, *iii)* and *iv)* above).

Mr Maucorps informed the Council that an ICES Policy on Marine Mammals had been adopted at the 1994 ICES Annual Science Conference, and this policy would form the guidelines for ICES to further develop a sound relationship with both NAMMCO and the International Whaling Commission. He further pointed out that the ICES Marine Mammals Committee, the Advisory Committee on Fishery Management and the Advisory Committee on the Marine Environment were the main fora within ICES for co-ordinating and reviewing work of the two Working Groups and one Study Group concerned with marine mammal issues.

The President of ICES also outlined other ICES work and activities of interest and relevance to NAMMCO, including the work of the Study Group on Seals and Small Cetaceans in European Seas and the Multispecies Assessment Working Group, as well as the expansion of the ICES Environmental Data Bank to include data submissions on contaminant concentrations in marine mammals. ICES also passed a resolution at its 1994 Annual Science Conference urging its member countries to record all by-catches of marine mammals in the ICES area and to report these figures to the ICES Secretariat on an annual basis.

The full text of Mr Maucorp's statement is contained in Appendix 5. Reference is also made to Appendix 3 of the Report of the Scientific Committee (Section 3.1), which contains a list of requests for advice from NAC/NAMMCO, including those requests which have been forwarded to ICES.

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The Chairman thanked the President of ICES for his useful and informative presentation.

Greenland welcomed the first-hand update from ICES on progress in addressing NAMMCO's requests for advice, and stressed the importance for NAMMCO of continued cooperation with ICES.

Norway noted the increased focus within ICES on marine mammal issues, and suggested that the Secretariat initiate a dialogue with ICES towards the formalisation of relations.

Iceland also expressed its appreciation for the presentation from ICES and agreed that there was a need to consider how to establish more formal relations between ICES and NAMMCO. Iceland also stated that it looked forward to the results of the ICES Study Group on Long-finned Pilot Whales.

The Council agreed that the form and terms of an appropriate formal agreement between NAMMCO and ICES should be negotiated between respective Secretariats.

4. MANAGEMENT COMMITTEE

4.1 Report of the Management Committee

The Chairman of the Management Committee, Einar Lemche (Greenland), reported on the meeting of the Management Committee which was held in Tromsø on 28 March. A preliminary report of the main conclusions and recommendations was presented to the Council. (The full report of the Management Committee was adopted later by correspondence and is contained in Section 2.1 of this volume.).

4.1.1 Matters arising from the Scientific Committee

i) By-catch data

The Management Committee, noting that the Scientific Committee had identified the need for data on by-catches of marine mammals for population assessment, endorsed the Scientific Committee's recommendation for member countries to establish a system for recording data on by-catches of marine mammals.

The Council agreed to this recommendation and further **endorsed** the recommendation from the Management Committee that the Secretariat be entrusted to investigate the requirements for a standard system for reporting such data, in liaison with the Data Group established by the Scientific Committee.

(Recommendations on grey seal catch and by-catch data were dealt with by the Council under item 3.1.2, *iv) grey seals*, above).

ii) North Atlantic Sightings Survey - NASS-95

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

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

iii) Harbour porpoise

It was reported that the Management Committee had endorsed the Scientific Committee's recommendation to include the harbour porpoise on its agenda in the future.

While **agreeing** to this recommendation, **the Council noted** that further discussion was required on the need to define clearly the order of priority for tasks assigned to the Scientific Committee.

4.1.2 Proposals for conservation and management

i) Atlantic walrus

As a follow up to the recommendation from the Management Committee at its last meeting for Greenland to take appropriate steps to arrest the decline of walrus along its west coast (*NAMMCO Annual Report 1995*, p. 49), **the Council welcomed** the information provided to the Management Committee by Greenland on recent measures taken in response to this recommendation (See item 5.1 of the Report of the Management Committee in Section 2.1 of this volume).

ii) Ringed seal

Recognising the necessity for further monitoring of ringed seal removals in Area 1, the Council noted the conclusion of the Management Committee that present removals of ringed seals in Area 1 can be considered sustainable.

iii) Harp seals in the Northwest Atlantic

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

The Council noted the conclusion of the Management Committee that catch levels of harp seals in Greenland and Canada from 1990 to 1995 were well below the calculated replacement yields in this period.

iv) Hooded seals in the Northwest Atlantic

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 Council noted the conclusion of the Management Committee 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.

4.2 Requests for advice

The Council endorsed the following requests to the Scientific Committee for advice, as recommended by the Management Commitree:

i) Role of marine mammals in the ecosystem

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.

ii) 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 (see Section 3.3).

4.3 Inspection and Observation Scheme

The Chairman of the Management Committee presented for the consideration of the Council the Provisions for the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals, which were developed by the Management Committee's Working Group on Inspection and Observation, under the chairmanship of Egil Ole Øen (Norway).

As a result of the mandate of the Working Group on Inspection and Observation (to pursue the development of a common inspection scheme for minke whaling in the North Atlantic,

to formulate a common inspection checklist, as well as to consider the details of, and further develop, a reciprocal observer scheme between NAMMCO member countries), the Provisions for the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals were developed by the Working Group through a series of meetings in 1995 and 1996, and were presented to the Management Committee at its meeting in Tromsø.

The main aim of the Working Group was to establish a scheme that is both practical and relaible. The purpose of the Joint Control Scheme is to ensure a certain standard in the control systems of member countries and to give NAMMCO the opportunity of monitoring the extent to which national regulations for the management of marine mammals are upheld in member countries. The Control Scheme contains three main sections: A - Common elements for national inspection schemes for coastal whaling in NAMMCO member countries; B - International Obervaton Scheme; and C - Implementation.

The Chairman of the Management Committee explained that the draft Provisions had been fully discussed by the Management Committee and a number of amendments made to the text. Specific explanations of particular aspects of the Scheme, as well as comments by members of the Management Committee, are contained in item 7.2 of the Report of the Management Committee (Section 2.1 of this volume).

The Chairman of the Management Commitree drew the attention of the Council to the need to develop two kinds of standard checklists as appendices to the Scheme: a hunter's checklist to be submitted to national authorities; and an inspector's checklist. In this connection it was also stressed that the development of common checklists would not imply any level of inspection, and that the inspector's checklist would only be used to the extent that inspection is actually carried out.

The Council adopted the Provisions for the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals, as reviewed and amended by the Management Committee (Section 1.4), and noting the reservation made by Greenland to Article A.2.2, points i) and iii). The Council noted that in adopting the Scheme, it was the intention of NAMMCO member countries to implement the Scheme or parts thereof at the beginning of the 1997 hunting season. It was also noted that further necessary guidelines related to the administration of the International Observation Scheme would be developed by the Management Committee.

In addition, **the Council endorsed** the recommendation from the Management Committee that the Secretariat be requested to define clearly the respective duties, in relation to the Control Scheme, of: 1) the national authorities; 2) the hunters; and 3) the Secretariat.

The Council agreed to the suggestion from Norway that a copy of the Joint NAMMCO Control Scheme, as adopted, should be forwarded to the International Whaling Commission prior to its forthcoming annual meeting for information in its work towards completing the outstanding aspects of a Revised Management Scheme.

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The Chairman of the Council thanked the Chairman of the Management Committee for his report to the Council, and for the work carried out through the Working Group on Inspection and Observation in dealing so efficiently with the matters forwarded to it. In addition it was noted that the Management Committee had reelected Einar Lemche (Greenland) as Chairman for the next two years, and that Kaj Mortensen (Faroe Islands) was elected Vice-Chairman.

5. ENVIRONMENTAL QUESTIONS

5.1 International Conference on Marine Mammals and the Marine Environment

The Secretary reported on the proceedings of the NAMMCO International Conference on Marine Mammals and the Marine Environment, which was held at the Shetland Hotel, Lerwick, Shetland (UK) 20-21 April 1995. The Conference, which received financial support from the Norwegian Ministry of the Environment, was attended by more than 60 people from 15 countries, and a total of 20 presentations were made by scientists and other experts under the four main theme sessions of the programme: 1) Impacts and management approaches; 2) Contaminants in marine mammals - sources, levels and effects; 3) Coastal communities and marine pollution - social, economic and health considerations, and 4) Addressing the questions - problems and future needs. A summary report of proceedings was published in the *NAMMCO Annual Report 1995* (pp.175-178).

The Secretary informed the Council that a collection of papers presented at the Conference had been submitted for publication as a Special Issue of the international scientific journal *The Science of the Total Environment*, which was due to appear in June or July 1996. The volume was edited by the Secretary, Kate Sanderson, with the assistance of Dr Geir Gabrielsen of the Norwegian Polar Institute in Tromsø.[1] The Secretary reported that, when finally published, the NAMMCO Conference proceedings would be as widely advertised as possible.

The Chairman commended the Secretariat for the successful arrangement of the Conference, and for the subsequent work in editing the proceedings for publication. It was noted that the collection of papers would provide a valuable addition to the published literature in this area, not least for its combination of disciplines, and that the Conference itself had generated a great deal of interest internationally. This indicated that there was a need for further international exchange of views and research findings on issues of marine pollution and its possible short and long-term effects on marine mammals, the marine ecosystem, and, not

[1] This is now published as: Sanderson, K. and G. Gabrielsen (eds), Marine Mammals and the Marine Environment, Special Issue, *The Science of the Total Environment*, Vol.186, Nos 1, 2, Elsevier, 16 July 1996.

least, the people of coastal communities who rely on marine resources as a primary and staple source of food.

It was also noted, as reported to the Scientific Committee (see item 5.1 of the Scientific Committee Report), that ICES would be assisting a Working Group on Concentrations, Trends and Effects of Substances in the Marine Environment (SIME) under the Oslo Paris Conventions (OSPAR), in addressing the question of whether high concentrations of PCBs in marine mammals disturb enzyme systems. In this connection, SIME had identified the outcome of NAMMCO's International Conference as a source of data on concentrations as well as the development of assessment criteria.

5.2 Other business

The Council noted the Scientific Committee's reference to the fact that ringed seals and other components of the Arctic ecosystem are subject to a global assessment that will be available within the next one to two years. **The Council endorsed** the recommendation from the Scientific Committee that NAMMCO should exchange information with organisations that are presently assessing the status of the Arctic environment, such as the Arctic Monitoring and Assessment Program (AMAP). The Secretary reported that contact had already been established with the AMAP Secretariat in Oslo, but that this and other contacts would be further pursued and strengthened.

Finally, the Secretary reported on her attendance at the IWC Scientific Committee Workshop on Chemical Pollution and Cetaceans, held in Bergen in March 1995, the report of which provided a useful reference document and up-to-date overview of research in the field.

6. HUNTING METHODS

6.1 Report of the Working Group on Hunting Methods

The Chairman of the Working Group on Hunting Methods, Amalie Jessen (Greenland) presented the report of the Working Group which had met on 23 January 1996 in Copenhagen. The full report of the Working Group is contained in Section 1.2.

The Working Group reviewed updated information from member countries on developments in hunting methods and equipment in their respective hunting activities. It was also noted that there had been constructive developments in all member countries with active whaling operations (i.e. Faroes, Norway and Greenland), both with respect to regulations, as well as in the development of new or standardized hunting equipment.

To aid its deliberations, the Working Group had compiled a list of references on hunting methods in member countries, which is contained as an appendix to the Report of the

Working Group (see Section 1.2, Appendix 1). Additional references would be forwarded to the Secretariat as they become available.

It was noted that the Working Group had so far mainly functioned as a forum for the exchange of information. With regard to the possible expansion of the Working Group's function, its was suggested that the Group could discuss possible standards of equipment in connection with similar forms of hunting of marine mammals that occur in two or more member countries. It was agreed to recommend that the Secretariat compile a list of existing rules on equipment, hunting and hunters in member countries as a basis for which to consider potential coordination initiatives, as well as to enhance mutual knowledge of respective hunting methods in member countries.

The Working Group also reviewed discussions in other international fora, such as the IWC and International Standards Organization (ISO), on criteria and standards for humane killing. It was suggested that the Secretariat should monitor developments in such fora. It was also suggested that members of the Working Group should distribute to other members or through the Secretariat any other information of relevance and interest to the Working Group.

Finally, it was reported that Jústines Olsen (Faroe Islands) was elected Vice-Chairman for the next two years, and that a new Chairman would be elected in 1997.The Working Group would meet again prior to the Seventh Meeting of the Council.

The Council endorsed the recommendations of the Working Group on Hunting Methods for how to proceed in its work. The Chairman of the Council thanked the Working Group Chairman for her report.

7. THE NAMMCO FUND

7.1 Annual Report of the NAMMCO Fund

The Chairman of the Board of the NAMMCO Fund, Einar Lemche (Greenland) presented the Annual Report of the Fund, which met in Copenhagen, 3 November 1995, and again in Tromsø, 26 March to finalise its annual report prior to the Council meeting. The full report is contained in Section 1.3.

Projects for which the Fund decided to grant support in 1995 were related to the Board's decision in 1994 to support one specific project in each NAMMCO member country. This was an exception to the general rule that projects with relevance to all member countries should be given priority. Projects for which support was granted in 1995 included an edition of papers on the socio-economic aspects of whaling in Greenland, a poster of whales in Norwegian waters, and a multi-lingual collection of cartoons on pilot whaling in the Faroe

Islands. The Board of the Fund also reviewed an overview of other projects still under way which had earlier been earmarked for support from the Fund.

It was noted that there should be a closer follow-up by the Secretariat of projects supported by the Fund, such as information on the extent of distribution of publications.

Finally, it was reported that Maria Andreassen (Faroe Islands) would chair the Board in 1996.

The Council endorsed the view of the Board that the NAMMCO Fund was a valuable means of assisting projects which enhance the understanding of the rational utilisation of marine mammals, and in order for this to continue, appropriate provisions should be made for the Fund in the annual budget. **The Council agreed**, therefore, to the recommendation from the Board of the NAMMCO Fund that NOK 200,000 should be earmarked for the Fund for 1996, and a corresponding amount for 1997 (see also under item 2.4 above).

7.2 The NAMMCO Fund in 1996

The Council noted that the North Atlantic Fisheries Ministers meeting in Canada in 1995 had discussed the need for increased public information to draw attention to the conservation of seals and their role in the ecosystem. With this in mind, **the Council endorsed** the decision of the Board that funds for 1996 should be used to focus on seals, sealing and the interaction between seals and fisheries. In so doing, the Board of the Fund would seek cooperation with other relevant funding sources in order to initiate one single project on a larger basis than has so far been the case, or to support an already existing project. In the case that no such project could be developed, it was agreed that other projects could be supported instead.

8. EXTERNAL RELATIONS

8.1 Cooperation with other international organisations

The Secretary presented an overview of meetings of international organisations at which NAMMCO was represented by an observer since the last meeting of the Council. A compilation of observers' reports and opening statements was circulated as a meeting document (NAMMCO/6/11).

International Whaling Commission (IWC)

The Secretary attended the 47th Annual Meeting of the International Whaling Commission in Dublin, 29 May-2 June 1995 at which an opening statement from NAMMCO was distributed, together with the summary of proceedings of the International Conference on Marine Mammals and the Marine Environment.

Northwest Atlantic Fisheries Organization (NAFO)

The Council agreed in 1995 to delegate its observer status at the Northwest Atlantic Fisheries Organisation (NAFO) to Iceland, and Arnór Halldórsson was observer for NAMMCO at the 17th Annual Meeting in Dartmouth, Canada in September 1995. An

opening statement by NAMMCO was presented, which emphasised NAMMCO's focus on strengthening the basis for multi-species management of marine resources, and the request for advice on harp and hooded seals, which is being dealt with the through the Joint ICES/NAFO Working Group on Harp and Hooded Seals.

North-East Atlantic Fisheries Commission (NEAFC)
The Secretary reported that the 14th Annual Meeting of the North-East Atlantic Fisheries Commission had considered the renewed approach from NAMMCO to establish reciprocal observer relations, and that NEAFC had agreed that the interests of the two organisations were sufficiently similar to make an exchange of observers desirable. The Council noted its earlier decision that NAMMCO's observer status in NEAFC should be delegated to Norway. The 15th Annual Meeting of NEAFC would be held in London, 20-22 November 1996.

Canada/Greenland Joint Commission on the Conservation and Management of Beluga and Narwhal
Following a recommendation at the last meeting of the Council, the Secretary reported that an agreement to exchange information and reports had now been established through correspondence with the Commissioners of the Canada/Greenland Joint Commission on the Conservation and Management of Beluga and Narwhal. The report of the 1995 meeting of the Scientific Working Group had been forwarded to the Secretariat.

Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS)
The Secretary of ASCOBANS, Dr Christina Lockyer, gave a presentation to the Council on recent developments in ASCOBANS, referring also to written information which was circulated to the meeting. She informed the Council that meetings to date of the Advisory Committee of ASCOBANS had focussed on matters related to the Conservation and Management Action Plan of the Agreement, such as fisheries interactions involving by-catches of small cetaceans, criteria for protected areas, disturbance and the effects of pollution. In particular, Dr Lockyer pointed out that ASCOBANS was seeking cooperation and exchange of information with other organisations such as NAMMCO on issues such as distribution and abundance of small cetaceans, pollution, population structure and by-catches (see also the Report of the Scientific Committee, item 5.4).

Dr Lockyer also drew the attention of the Council to the development of the Mediterranean/Black Sea Cetacean Agreement under the auspices of the Convention on the Conservation of Migratory Species of Wild Animals (CMS, or Bonn Convention). A negotiation meeting had been held in September 1995 between representatives from Mediterranean and Black Sea range states, to discuss the text of the agreement, including a detailed conservation plan. The agreement would extend to all cetaceans frequenting the Mediterranean and Black Seas, and would oblige parties to prohibit and eliminate the deliberate taking of cetaceans as well as create and maintain a network of protected areas.

The Chairman thanked the Secretary of ASCOBANS for her presentation and welcomed the continuation of an active exchange of information which had already been established between ASCOBANS and NAMMCO.

Norway informed the Council of its recent decision not to become a signatory to ASCOBANS and pointed out that there were two principle aspects of the ASCOBANS Agreement upon which this decision had been based. Firstly, the obligation of Parties to prohibit all directed takes of small cetaceans, regardless of their conservation status, was in opposition to the principle of the sustainable use of resources. Secondly, the Agreement's prohibitions against lethal research methods were not acceptable to Norway. It was however underlined that Norway would continue to participate as an observer, and encouraged future cooperation between NAMMCO and ASCOBANS.

International Union for the Conservation of Nature (IUCN)
The Secretary reported on her correspondence with the Secretariat of IUCN requesting clarification of IUCN's general policies with regard to whaling, which appeared to have influenced the IUCN Council's decision in 1994 not to pursue formal reciprocal observer relations with NAMMCO. A response from IUCN was still awaited, and the Secretary would endeavour to follow up on the matter. As well, technical working links with the Species Conservation Unit of the IUCN Secretariat and the Chairs of the IUCN Cetacean and Seal Specialist Groups of the Species Survival Commission, which the IUCN Council had agreed should be established with NAMMCO, would also be further pursued by the Secretariat.

It was noted that the General Assembly of the IUCN would convene in Montreal in October 1996 in the context of an IUCN World Conservation Congress.

Kyoto Conference on the Sustainable Contribution of Fisheries to Food Security
NAMMCO was invited by the Government of Japan to attend the International Conference on the Sustainable Contribution of Fisheries to Food Security, which was hosted by the Government of Japan in collaboration with the UN Food and Agriculture Organization (FAO) in Kyoto from 4-9 December 1995.The Secretary attended the Conference on behalf of NAMMCO, and presented a statement to the Plenary Session. The Conference was attended by delegations from 95 countries as well as observers from 10 inter-governmental and 9 international non-governmental organisations.

The purpose of the Conference was to "provide an opportunity to improve international understanding of economic, social and cultural reasons for differences in appreciation towards the use of marine resources and hence the possibilities to maintain and enhance the contribution of fisheries to food security." After discussions in Technical and Drafting Committees, the Conference adopted "The Kyoto Declaration and Plan of Action on the Sustainable Contribution of Fisheries to Food Security". Aspects of the Declaration of relevance to marine mammals include operative paragraph 6, which calls for an increase in respect and understanding of social, economic and cultural differences in the use of aquatic resources, especially cultural diversity in dietary habits, while operative paragraph 14 calls for consideration of harvesting at multiple trophic levels in a manner consistent with the

sustainable development of marine resources. The Kyoto Declaration and Action Plan was subsequently forwarded by the Government of Japan to NAMMCO for consideration and endorsement.

The Council agreed to endorse the Kyoto Declaration and Plan of Action on the Sustainable Contribution of Fisheries to Food Security.

Second Conference of Parliamentarians of the Arctic Region
The Secretary reported on her attendance as observer for NAMMCO at the Second Conference of Parliamentarians of the Arctic Region, which was held in Yellowknife, Canada, 13-14 March 1996. All Arctic nations were represented at the Conference with the exception of the US. The final Conference statement urged the establishment of the Arctic Council, as well as the inclusion of the Standing Committee of Parliamentarians of the Arctic region as a component of the structure of international cooperation within the Arctic Council. The statement, which was adopted by consensus, also included a recommendation for "the sustainable and rational utilization of the living resources of the sea, including marine mammals."

The Secretary also drew the attention of the Council to the Inuvik Declaration on Environmental Protection and Sustainable Development in the Arctic, which had been adopted by the Third Ministerial Conference of the Arctic Environmental Protection Strategy (AEPS) held in Inuvik, NWT Canada in March 1996. The Declaration, which was circulated to participants for their information, had been provided to the meeting by observers from Inuvialuit Game Council.
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The Council agreed that, unless already specified, NAMMCO observer participation at relevant international meetings in 1996/97 would be decided through consultation between the Chairman and the Secretary.

8.2 Other matters
Under this agenda item, the observer for the European Bureau for Conservation and Development (EBCD), Despina Symons, informed the Council of recent developments in Brussels, in particular the creation of a Parliamentary Intergroup on Conservation and Sustainable Development, for which EBCD provides the secretariat, and which had held meetings to discuss issues such as marine resource management related to fisheries, and biological impacts on fisheries and fishing gear. Ms Symons also referred to the recently established European Sustainable Use Specialist Network under the IUCN, which would focus on issues related to agriculture, forestry, fishing, wildlife use and tourism.

9. ELECTION OF VICE-CHAIRMAN

The Council elected Arnór Halldórsson (Iceland) as Vice Chairman of the Council. The office of Chairman would be open for election at the Seventh Meeting of the Council in 1997.

10. ANY OTHER BUSINESS

Greenland expressed the view that there was a need for greater discussion at future meetings with regard to which criteria should be used to make priority lists as the basis for the work of the Scientific Committee; ie. whether these should be based on the level of utilization of species/stocks, or whether the emphasis should be on the stock situation for species as such.

11. CLOSING ARRANGEMENTS

11.1 Next meeting

On behalf of the Government of the Faroe Islands, the head of the Faroese delegation, Kaj Mortensen, extended an invitation to the Council to hold its Seventh Annual Meeting in Tórshavn in 1997. May was suggested as a suitable time, but final dates would be confirmed later by correspondence through the Secretariat.

11.2 Press release

A press release, as contained in Apendix 7, was adopted.

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1.1 - APPENDIX 1

LIST OF PARTICIPANTS

MEMBER DELEGATIONS:

Faroe Islands
Maria Róin (Andreassen)
Dorete Bloch
Hans Jacob Hermansen
Ivan Johanessen (Minister of Fisheries)
Kaj Mortensen (H)
Jústines Olsen

Greenland
John Biilmann
Pâviâraq Heilmann (Minister of Fisheries)
Amalie Jessen
Hansi Kreutzmann (I)
Einar Lemche (H)
Pia Barner Neve
Henrik Nielsen
Bjørn Rosing
Anthon Siegstad

Iceland
Konráð Eggertsson
Guðmundur Eiriksson
Sævar Gunnarsson
Arnór Halldórsson (AH)
Árni Kollbeinsson
Lára Konráðsdóttir (I)
Kristján Loftsson
Þorsteinn Pálsson (H - Minister of Fisheries)
Jóhann Sigurjónsson

Norway
Bente Angell-Hansen
Steinar Bastesen
Arnoldus Schytte Blix
Kåre Bryn (AH)
Russian Federation

Norway cont.
Jan Frederik Danielsen
Alf Håkon Hoel
Halvard P. Johansen (Chairman)
Elling Lorentsen
Helge Lorentsen
Jan Henry T. Olsen (Minister of Fisheries)
Lisbeth W. Plassa
Lars Walløe
Egil Ole Øen

Vice-Chairman of the Scientific Committee

Mads Peter Heide-Jørgensen

OBSERVERS

Governments:

Canada
Bob Applebaum
Dan Goodman
Richard Hegan

Denmark
Henrik Fischer

Japan
Noriyoshi Hattori
Toshiya Kishiro
Takanori Ohashi
Kazuo Shima

Namibia
Jan Jurgens
Vladimir Korelsky (Minister

of Fisheries)
Georgy Luka
Vadim Nikolaev
Vladimir Potelov
Valeri Tikhontchouk
Evgeniy Zhgilyov

Intergovernmental organisations:

Agreement on the Conservation of Small Cetaceans of the Baltic & North Seas (ASCOBANS) / Bonn Convention(CMS)
Christina Lockyer

International Council for the Exploration of the Sea (ICES)
Chris Hopkins
Alain Maucorps

International Whaling Commission (IWC)
Henrik Fischer

Nordic-Atlantic Cooperation
Kjartan Hoydal

Nordic Council of Ministers
Jesper Heldbo

North-East Atlantic Fisheries Commission (NEAFC)
Bente Angell-Hansen

Northwest Atlantic Fisheries Organization (NAFO)
Lisbeth Plassa

Non-governmental organisations:

Canadian Sealers' Association
Jim Woodworth

European Bureau for Conservation and Development (EBCD)
Despina Symons

High North Alliance
Georg Blichfeldt
Jan Odin Olavsen

International Wildlife Management Consortium (IWMC)
Eugène Lapointe

Inuvialuit Game Council
Larry Carpenter
Billy Day
Don Dowler
Norman Snow
Duane Smith

Regional Authority of Northern Norway
Jostein Angell

Independent researchers:
Steinar Andresen,
Fridtjof Nansen Insititute, Oslo

Robert Friedheim,
University of Southern California

H - *Head of delegation*
AH - *Acting head of delegation*
I - *Interpreter*

1.1 - APPENDIX 2

AGENDA

1. Opening procedures
   - 1.1 Welcome address by Mr Jan Henry T. Olsen, Minister of Fisheries, Norway
   - 1.2 Invited presentation - Dr Jan Jurgens, Permanent Secretary, Ministry of Fisheries and Marine Resources, Namibia
   - 1.3 Opening statements by member delegations
   - 1.4 Admission of observers
   - 1.5 Adoption of agenda
   - 1.6 Meeting arrangements

2. Administration and finance
   - 2.1 Secretary's Report
   - 2.2 Report of the Finance and Administration Group
   - 2.3 Audited accounts 1995
   - 2.4 Budget 1996 and forecast budget 1997

3. Scientific Committee
   - 3.1 Report of the Scientific Committee
   - 3.2 Cooperation with ICES
   - 3.3 Other business

4. Management Committee
   - 4.1 Report of the Management Committee
   - 4.2 Requests for advice
   - 4.3 Other business

5. Environmental questions
   - 5.1 Proceedings of the Conference on Marine Mammals and the Marine Environment
   - 5.2 Other business

6. Hunting Methods
   - 6.1 Report of the Working Group on Hunting Methods
   - 6.2 Other business

7. The NAMMCO Fund
   - 7.1 Annual Report of the NAMMCO Fund
   - 7.2 Other business

8. External relations

8.1 Observers' reports
8.2 Cooperation with other international organisations
8.3 Other matters

9. Election of Vice Chairman

10. Any other business

11. Closing arrangements
11.1 Next meeting
11.2 Adoption of press release

ADDRESSES & OPENING STATEMENTS TO THE COUNCIL

ADDRESS OF WELCOME

by

Mr. Jan Henry T. Olsen, Minister of Fisheries, Norway

Mr. Chairman, Ministers, Delegates, Observers, and Guests, Dear Friends,
I would like to welcome all of you to my home town Tromsø, gateway to the Arctic and the city at the top of the world. Tromsø has a long history of harvesting marine resources. This makes our city a natural setting for an organization like NAMMCO and for deliberations on the important subject of rational use of marine resources, especially marine mammals.

It is a great pleasure for me to see that my friends and colleagues, the ministers of fisheries from the NAMMCO member countries, are present here today. Your participation gives an added weight to the NAMMCO Council meeting, and shows the importance we attach to developing NAMMCO as a regional organization for the management of marine mammals. Also, I am particularly pleased to welcome my Russian colleague to this meeting, as well as the distinguished observers from Canada and Japan. It is to be hoped that Canada and Russia will join forces with us and become members of NAMMCO.

I would like to extend a special welcome to our guest speaker from Namibia, a country that I will be visiting later this year. We are looking forward to your presentation on the management of living marine resources in Namibian waters. I am also glad to note that the delegations from the observer organisations are represented at a very high-ranking level. This clearly indicates the growing importance of NAMMCO's role.

I am very pleased to note that the NAMMCO Secretariat is now well established here in Tromsø, and that the organization is operating well. I know that the framework establishing Norway's formal role as host nation to the Secretariat is not fully settled. However, I hope that these questions will be resolved in the near future. We are indeed proud to act as host nation to this organization.

There have been settlements along the coast of the North Norway for more than 10,000 years. They were not founded as farming communities: the very basis for their existence were the rich supplies of fish and marine mammals in the waters off the coast. Our long traditions of harvesting living marine resources and other mammals in the Arctic can be traced right back to our earliest history.

Report of the Sixth Meeting of the Council

When Ottar, a North Norwegian chieftain some 1100 years ago, went to serve King Alfred of England he told of a journey he had previously made to Russia. According to the World History written by the Roman priest Orosius around the 400 AC he said:

"I first sailed north for three days, then east for four days before I went south again, following the coast line. All the way I met hunters and fishermen. I saw huge stocks of whales and walruses, which for me had greater value than my cows, my pigs or my sheep, yes even greater value than my horses which I use for plowing."

To demonstrate the value of resources in this region, he presented King Alfred with a walrus tusk, as described in a poem by Henry W. Longfellow:

"Othere (Ottar), *the old sea captain,*
who dwelt in Helgoland,
to king Alfred the lover of truth,
brought a snow white walrus tooth
which he held in his brown hand."

We are proud of our ties to the sea here in the North. Our whalers and sealers are not the barbarians that some people call them. They do not kill marine mammals for sport; they are following a tradition which is several thousand years old. In our modern world, such activities have also proved to be a necessary part of a multispecies approach to the management of living marine resources. Is anyone in a position to tell hunters that their traditions no longer have any value, and that hunting and harvesting certain marine resources is illegal?

As you know, the climate and weather conditions in our part of the world do not permit the cultivation of cereals; indeed, sometimes it is difficult enough to grow grass for our cattle. We are therefore dependent on imports of cereals, vegetables and fruit. People in other regions must understand and accept that the livelihood for Arctic populations is based on traditional ways of harvesting living marine resources.

NAMMCO was established with the objective of contributing to the conservation, rational management and study of marine mammals in the North Atlantic. Its work is progressing satisfactorily, which augurs well for the future of the organization. I hope that other countries with a genuine interest in the management of all marine mammals will join NAMMCO.

I think that we can be proud of the work done by NAMMCO´s Scientific Committee. Our countries can boast some of the best qualified marine scientists in the world. The quality of the work carried out by the Scientific Committee is of vital important for NAMMCO´s reputation. Equally important are our efforts to promote the idea of rational utilization of all living marine resources through NAMMCO. Providing information and educating the general public on this subject is also of crucial importance. Let us therefore continue to pool our efforts in this field.

The Working Group on Inspection and Observation has made considerable progress in developing a draft scheme for inspection and observation of the sealing and whaling operations carried out by our various countries. This work demonstrates clearly the practical approach of the Working Group to the task it was assigned by the Council last year. I would like to congratulate the members of the Working Group on their dedication, effort and efficiency. I am looking forward to the outcome of the debate on this topic during the Council Meeting.

Let me close by wishing you all a constructive, a successful meeting and a pleasant stay here in Tromsø.

OPENING STATEMENT BY THE FAROE ISLANDS

The Faroese delegation is very pleased to participate in the 6th meeting of NAMMCO here in Tromsø. We see this meeting as a further step forward in the fruitful discussions between our countries and the possibilities of NAMMCO to strengthen regional cooperation in the North Atlantic and the study and management of marine mammals.

In addition we would like to stress our right to hunt and sustainably utilize the stocks based upon the best scientific advice presented to this Commission.

Last year we brought up the question of the bottlenose whale and it was established that the population in the North Atlantic could sustain the coastal drive hunt in the Faroe Islands,and that removals of fewer than 300 bottlenose whales a year would not lead to a decline in this stock.

The Faroe Islands saw the possibility to begin this whale hunt within the limits of the scientific advice and the question was raised in the Faroese Parliament. No decision has been made, however, to allow such hunting for bottlenose whales and the ban still exists. There is no exemption from the general ban on commercial whaling in the Faroese Fisheries Zone.

Pilot whaling in the Faroe Islands has for many years been the subject of protest campaigns organized by a number of animal protection groups. New attempts are currently being made to organize a widespread international boycott campaign against Faroese whaling. Pictures of the Faroese whale hunt are available on Internet and in media showing footage of the actual killing of whales out of context. This gives an impression of the old story that Faroese whaling is some kind of bloodsport. What they always fail to mention is the fact that pilot whales are killed for food and have always been an important part of the diet of Faroe Islanders.

In NAMMCO we have the responsibility to raise our concerns and to do our best to cooperate on the rational management, conservation and optimum utilization of the living resources of the sea according to the UN Convention on the Law of the Sea, and to develop

management procedures which take into account the relationship between marine mammals and other living stocks.

We are looking forward to hearing and discussing views which may give inspiration to solutions for the rational utilization of marine mammal resources in the North Atlantic and solutions for sustainable coastal whaling.

OPENING STATEMENT BY GREENLAND

Ministers, distinguished delegates, ladies and gentlemen,

We also would like to register how pleased we are to participate in the 6th meeting of NAMMCO, and register that the interest in NAMMCO is increasing. We very much look forward to our discussions in the various productive NAMMCO fora over the next few days.

We have, as usual, the good feeling of being welcome to Tromsø - the hometown of the NAMMCO Secretariat, and look forward to very fruitful work.

One could say that NAMMCO perfers “walking instead of talking”. Walking in the sense of moving forward and making the necessary decisions, in contrast to certain other organisations. In this connection, the work of the Working Group on Inspection and Observation has in particular made a significant step in the right direction. It is also with great appreciation that we again note the very important work by the Scientific Committée in front of us.

ICELAND - OPENING STATEMENT

by

Mr Þorsteinn Pálsson, Minister of Fisheries of Iceland

The Icelandic delegation is pleased to participate in the 6th meeting of NAMMCO held here in Tromsø. Iceland appreciates the commitment shown by the other countries represented here by sending to this meeting such distinguished delegations.

The infrastructure developed and the tasks that were identified when NAMMCO was established have been shown to fulfil the needs of northern communities highly dependent on the utilization of marine resources, including marine mammals. The many marine mammal species and stocks under the NAMMCO umbrella can now be managed rationally within a strong international body that meets the criteria set in international law.

At the beginning of our work we started developing priorities for cooperation in the scientific area. The high quality work on a large number of scientific issues on which the Scientific Committee has reported shows the necessity of scientific work for the successful future management of the stocks of seals and cetaceans in the North Atlantic.

The Icelandic delegation has followed with appreciation the important contribution made by Canadian and Russian scientists who have joined our scientists in conducting comprehensive reviews of selected species of seals and whales across the North Atlantic Ocean. I hope to see full NAMMCO membership of Canada and the Russian Federation in the near future.

One of the main reasons for the establishment of NAMMCO was the need for a more comprehensive view of the ecosystem and utilization of all its components. As a member country of the organization Iceland was therefore particularly pleased with the initiative of Japan to convene the Kyoto Conference last December that adressed these issues.

Before I conclude, may I commend the NAMMCO Secretariat for excellent and professional work that has helped us very much to get where we are.

And finally, I should thank the Norwegian Government for creating an excellent environment for this meeting and for providing the home of the NAMMCO Secretariat.

JAPAN - OPENING STATEMENT

by

Mr Kazuo Shima, Observer for the Government of Japan

Thank you Mr. Chairman, distinguished ministers, members and observers, ladies and gentlemen. On behalf of the Japanese participants as observers, I would like to say a few words.

I am very pleased to be here at the 6th meeting in Tromsø, the home town of NAMMCO. This is the second time I have come to Tromsø. I was one of the first to welcome the birth of NAMMCO. I am particularly pleased to be here, both to see many of my old friends and to observe the development of NAMMCO.

Some of you, I believe, were in Kyoto just a few months ago to remind the world of the vital importance to food security of the world's living marine and aquatic resources. Our government, in collaboration with the FAO, hosted a conference to ensure that the sustainable utilization of food from the sea would continue to nurture future generations, particularly in view of the needs of a growing world population.

That conference, the International Conference on the Sustainable Utilization of Fisheries for Food Security, resulted in the adoption of the Kyoto Declaration and Action Plan. This document calls upon the nations of the world to adopt sound, scientifically-based measures to manage fisheries in a sustainable manner, reduce waste, assist developing countries, and protect the ecosystem.

The Declaration also endorsed some important principles, including:

1. Recognition of cultural diversity, along with respect for the social, cultural and economic differences among states and regions in the use of living aquatic resources; and

2. Consideration of harvest at multiple tropic levels, and promotion of studies on multi-species management.

Clearly, the Declaration implicitly expresses respect for the consumption of whale meat in the traditional food cultures of various regions and countries, as well as the sustainable utilization of marine mammals. No aquatic food resource can be considered untouchable if it is robust and can be sustainably utilized without harming the ecosystem. In a world of growing food shortages, let us affirm that sustainable utilization of aquatic food resources, including marine mammals, under responsible and balanced ecosystem management, is vital to ensure the world's food security.

Unfortunately, there are those who would turn the oceans into a vast ecological cathedral, filled with sacred objects. Three years ago they designated 13 million square miles, an area

that would extend from the North Pole to Lisbon, as a Southern Ocean Sanctuary. This was done without any scientific justification, without the approval of the IWC Scientific Committee, CCAMLR, or any other scientific body responsible for Antarctic conservation, and without even consulting most of the nations bordering those waters. It also was done in contravention of the purpose, principles and provisions of the International Convention for the Regulation of Whaling.

The Southern Ocean Sanctuary is the antithesis of sustainable utilization and responsible management. It is an insult to all who develop or use sound conservation measures to improve the health of our environment. We urge NAMMCO to unconditionally oppose this "sanctuary" and others like it that may be proposed in the future.

A number of NAMMCO member countries are as frustrated as we by efforts to turn minke whales, pilot whales, seals and other marine mammals into sacred animals, despite their proven abundance and improved scientifically-based management methods. Minke whales are among the most abundant and fastest reproducing whale species in the world, particularly in Antarctic waters where they number over three-quarters of a million animals. The IWC's revised management procedures can provide for their sustainable utilization without risk of depletion. It should be implemented without further delay.

Japan has no intention of monopolizing the whale resources in the Antarctic. We believe that whaling there should be transparent and conducted for the benefit of the international community. We ask NAMMCO to support the sustainable utilization of non-endangered whale resources in the Antarctic, as well as in those areas of the high seas that are not vital breeding areas.

I also would like to draw your attention to increasing efforts within the IWC to extend its jurisdiction to small cetaceans. It is clear that the management of small cetaceans is not within the competence of the IWC. The management of local marine resouces, such as small cetaceans, can only be conducted on a local or regional level, taking account of human rights and needs. The Government of Japan therefore strongly supports the activities of NAMMCO and looks forward to its fruitful development. We are actively planning the establishment of a regional organization like NAMMCO to manage marine mammals, including small cetaceans, in the North Pacific. The exchange of information with NAMMCO provides the basis for cooperation and will serve to enhance the development of a similar regional management organization in the North Pacific.

I am looking forward to fruitful discussions here, and to the further strengthening of NAMMCO and its commitment to promote the needs of coastal communities in the North Atlantic. I want to express our sincere thanks to the Norwegian Gowernment and the NAMMCO Secretariat as our hosts for this meeting. Thank you very much for your attention.

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RUSSIAN FEDERATION - ADDRESS TO THE COUNCIL

by

Mr V.F. Korelsky, Chairman of the Fisheries Committee of the Russian Federation

Ladies and Gentlemen,

I am very pleased to have the opportunity to personally address the members of the sixth session of the Council here today. I am very grateful for this invitation by the Council of NAMMCO and for the assistance of my good friend and colleague, the Norwegian Minister of Fisheries Mr. Jan Henry T. Olsen, for making this opportunity possible.

I particularly appreciate this honour because it takes place in Tromsø and secondly, it is the session of the Council of the newly established North Atlantic Marine Mammal Commission. It is symbolic that the Commission's headquarters are located in Tromsø, because Tromsø is known as the central harbour of whalers and sealers.

Tromsø's location is favourable to the development of such activities as fishing, aquaculture, marine biotechnology, scientific exploration and administration of the Arctic region. Tromsø and Murmansk are ideal for such activities because they have a regular air service, many Russian ships call at Tromsø harbour, and an intensive trade in fish and fish products has been established between Tromsø and northwest Russia. It is appropriate that the University of Tromsø, the most northern university of the world, hosts the Commission's Secretariat. The University has a remarkable college where about 500 students from Norway and other countries study fisheries sciences. It is noteworthy that the Secretariat of NAMMCO was first located in the building of the Department of Arctic Biology. This fact again emphasises how Tromsø was the natural choice of location for the headquarters of the Commission.

The agreement to establish NAMMCO, signed in 1992, created an international organisation for cooperation in management, conservation and long-term rational sustainable exploitation of marine mammal stocks in the North Atlantic. The agreement emphasises a modern approach to the study of marine ecological systems as a whole and the role of marine mammals in them. Because, besides fishing and pollution of the environment, marine mammals themselves, as fish consumers, are a significant factor influencing fish stocks. Seal hunting in the North Atlantic, for instance, is one of the elements of a multi-species management of the resources in this region.

The establishment of NAMMCO was to some extent a forced response of the North Atlantic countries to decisions of the International Whaling Commission (IWC), which are based more on emotions than scientific data. Unfortunately these kinds of decisions have been characteristic of the IWC in recent years.

Most of the IWC member countries use the voting mechanism to prevent the organization from enacting rational regulations for whaling as laid down in the IWC Convention. Objectivity is replaced by politically motivated resolutions to prolong the full moratorium

for commercial whaling for all whale species of the world's oceans, despite the reality of the state of specific whale stocks. Politically motivated resolutions are followed by boycott campaigns by certain groups against products made of natural fur, including seal. These groups exert influence upon public opinion to condemn supposedly "inhumane" methods of whaling and sealing, although these methods are no more brutal than big game hunting methods used all over the world.

Above all, so-called "pure" ecologists completely forget not only the simple consumers of whaling products but also the coastal communities whose main food and income sources have been connected with marine mammal hunting for generations. Whaling and sealing is not primarily a commercial activity, considered in an historical sense, because the main goal of whaling and sealing is to provide a livelihood for the inhabitants of coastal settlements.

It is precisely this balanced combination of protection and rational use of nature and its resources that makes the scientific work and activities undertaken by NAMMCO so important. The common efforts of the North Atlantic countries within the framework of NAMMCO can create a genuine system for the conservation and long-term rational, sustainable exploitation of marine mammal stocks.

With the deepest sincerity I wish NAMMCO every success in its work.

1.1 - APPENDIX 4

NAMIBIA: MANAGEMENT OF RENEWABLE MARINE RESOURCES, WITH SPECIAL REFERENCE TO THE MANAGEMENT OF MARINE MAMMALS

Dr Jan Jurgens, Permanent Secretary
Ministry of Fisheries and Marine Resources, Namibia

The Republic of Namibia is a large country (830 000 km²) with a small population (1,4 million) on the south-western shores of the African continent. Blessed with high primary production in the Benguela marine ecosystem, the annual landings of marine fish, come to 450-500 kg *per capita.* The annual consumption is about 8 kg *per capita* and therefore fish exports are a major foreign currency earner. The fishing industry is, along with tourism, the third (sometimes fourth) largest contributor to the Namibian economy after mining, mainly diamonds, and agriculture.

Namibia gained its independence in 1990 and having had to draft a new constitution, the opportunity was used to provide for the novel approach to include sustainable utilization of natural resources in the constitution. Ever since, Namibia has lived by its constitution and the Government's responsible handling and managing of the renewable marine resources have been recognized worldwide by many important critics.

It is the Governments's policy that generally, if and when a natural resource is not endangered and there is private sector interest for commercial utilization of that resource, and if the status of the resource warrants such utilization without damage to the ecological balance within the ecosystem, no reason exists to refuse and prohibit utilization of such a resource. Consequently, it is the policy and firm belief of the Namibian Government that its seal resource may and shall be utilized on a sustainable and responsible basis.

The Cape fur seal (*Arctocephalus pusillus*) is distributed mainly along the southwestern coast of Africa, reaching from the southern tip of Africa to the southern part of Angola. The population consists of approximately 2 million individuals, shared roughly 50:50 between South Africa and Namibia.

Sealing from Namibian and South African bases on this population goes back to the previous century, but was ceased on the South African part of the population around 1990. In the case of Namibia, the right to seal is in the hands of two concessionaires: one in the south at Lüderitz and the other in the north at Cape Cross. In each case the exploration right limits them to harvesting from large on-land breeding colonies and the annual season for harvesting is from August to when mating starts in mid-November.

It is of paramount importance that the Government's policy is one of utilizing a natural resource for its direct commercial value and therefore sealing is not aimed at the protection

of the fish resources, nor to rectify an imbalance in the ecosystem. Realizing the difficulties in quantifying the interspecific relationships in natural systems and specifically the impact of seals on commercial fish resources, the Namibian scientists currently find it difficult to recommend seal quotas on a basis of fish protection. Therefore, quotas are recommended on the dynamics of the seal population as such and the utilization is termed harvesting as opposed to culling.

However, it should be stressed that if and when there is a sufficient confidence level in quantifying interspecific parameters and should the need to protect fish resources arise, the Government will revert to necessary measures. Indeed, a few years ago, when it was realized that the population size exceeded the carrying capacity of the Benguela system, it was decided to decrease the foraging population off the Namibian coast from its about 700 000 individuals to approximately 500 000. Implementation of such a culling never took place because Mother Nature took care of the situation and some 150 000 to 200 000 seals died of starvation. Intensive laboratory analyses and tests confirmed that the mortality was due to starvation and not a virus or any disease.

Harvesting is under the supervision of fisheries inspectors, is controlled by legislation and the methods are in line with Council Directive 93/119/EC of the European Union. Bulls are shot, whilst pups are clubbed and then knifed. Small numbers of pups are herded off and individually clubbed by a well-trained team of clubbers. *Post mortem* investigations confirmed that the heavy blows to the paper-thin skulls and the damage to the brain ensure instantaneous death. In spite of this, and in addition, after the blow to the head, the heart must be pierced with a knife.

Bulls are shot, using a rifle and sub-sonic ammunition. In this way the disturbance factor of super-sonic ammunition is avoided. The loud sound of the latter type of ammunition without exception results in a stampede from the beach to the water, causing injury to pups and probably also a degree of stress.

Well-trained marksmen are used to stalk bulls which are shot through the brain at distances varying between 10 and 15 metres. A second marksman with a bigger calibre rifle is on standby to deliver a fatal shot in case the first shot was not successful - which is almost never the case. The sound level of sub-sonic bullets is so low that other animals even within one or two metres from the harvested bull, do not move away.

One of the conditions under which the rights to harvest is granted, compels the concessionaires to utilize the entire carcass. Hides are marketed overseas, whilst locally in Namibia, although on a small scale, coats, hats and shoes are manufactured. Meat and skeletons are processed into carcass meal and the blubber is used *inter alia* for manufacturing of medicinal oil. Teeth, dried skulls and *vibrissae* are used for all kinds of ornaments, bought by the thousands of tourists visiting the colony annually. Since the Canadian culling started, the marked for bull genitals from Namibia was negatively affected by the over-supply.

In conclusion, Namibia has no intention to stop sealing because of pressure from anti-sealing groups internationally or locally. Such groups are almost non-existent in Namibia. In a developing country where sealing is done on a commercial basis within a free market system, creating income and especially jobs and where unemployment can be as high as 30 to 40%, a government would be extremely irresponsible to prohibit sealing because of an outcry coming from fat cats in developed countries, and/or coming from emotionally driven judgements, ignoring the plight of the jobless, hungry and desolate people in the third world countries.

1.1 - APPENDIX 5

INTERNATIONAL COUNCIL FOR THE EXPLORATION OF THE SEA (ICES)

Statement to the Council by Mr Alain Maucorps, President of ICES

Mr Chairman, Distinguished Representatives, Ladies and Gentlemen,
On behalf of the International Council for the Exploration of the Sea, I wish to thank the North Atlantic Marine Mammal Commission (NAMMCO) for having invited ICES to be represented at this Sixth Meeting of the Council of NAMMCO. It is a pleasure for me to represent ICES at this meeting.

At the 1994 ICES Annual Science Conference, the Council adopted an ICES Policy on Marine Mammals (Doc. C.M. 1994/Del:8) aimed at the handling of marine mammal issues, with regard to both science and advice, within the ICES structure. This policy will form the guidelines for ICES to further develop an equitable relationship with both NAMMCO and the International Whaling Commission (IWC).

Within ICES, the Marine Mammals Committee, the Advisory Committee on Fishery Management, and the Advisory Committee on the Marine Environment are the main forums for co-ordinating and reviewing work of the two Working Groups and one Study Group concerned with marine mammal issues.

A number of requests for advice have been made to ICES by NAMMCO. To address these requests ICES has taken a number of steps. In relation to pilot whales, ICES established a Study Group on Long-finned Pilot Whales. After review by the Advisory Committees, the reports of this group will be used as the basis of information which will be prepared for NAMMCO later this year.

A request for advice on harp and hooded seals was considered by ICES in 1993 and it was agreed to limit what ICES would address to geographical areas within the jurisdiction of NAMMCO Contracting Parties. Considering that a similar request for advice for the Greenland Sea (Jan Mayen) had also been received from the Government of Norway, the advice from ICES for this area, based on the Report of the Joint ICES/NAFO Working Group on Harp and Hooded Seals, was published as a report to the Government of Norway in the 1993 Report of the Advisory Committee on Fishery Management (*ICES Cooperative Research Report* No. 196). By agreement with the North-West Atlantic Fisheries Organization (NAFO), information on harp and hooded seals in the north-west Atlantic was reviewed by the NAFO Scientific Council in 1995. In relation to the NAMMCO request for advice dated 18 April 1995 (which was a repeat of that sent in 1993), the Working Group on Harp and Hooded Seals recommended, through its parent the Advisory Committee on Fishery Management (ACFM), that as important information required to carry out its terms of reference is currently lacking, its next meeting should be scheduled for 1997.

In addition to the above studies on marine mammals directly related to requests from NAMMCO, ICES has also established a Study Group on Seals and Small Cetaceans in European Seas which met in December 1995 to *inter alia* address matters concerning: the status of small cetacean populations in the North Sea and information on by-catches; the status of the three seal populations in the Baltic Sea and information on by-catches; information and planned research on possible acoustic disturbance on marine mammal populations; the use of biological effects techniques for identifying the extent to which PCBs in marine mammals generate effects at species/population levels; plans for reviewing contaminant levels in marine mammal populations and their possible effects, and identifying data sets on contaminants in marine mammals suitable for inclusion in the ICES Environmental Data Bank; identifying and reviewing data required for evaluating the impacts of different fisheries in the Baltic on marine mammal populations.

Several aspects of ICES fishery work are also likely to be of interest to NAMMCO. These include the work of the Multispecies Assessment Working Group which, at its meeting in 1995, focused attention on modelling species interactions in boreal ecosystems. While not dealing directly with interactions between marine mammals and fish, these studies have clear implications for work on marine mammal ecology and population dynamics. Additional studies are also being carried out on specific forage fish and invertebrate species, including capelin, herring, blue whiting and cephalopods (squid), by a number of ICES groups including the Northern Pelagic and Blue Whiting Fisheries Working Group and the Working Group on Cephalopod Fisheries and Life History. The resulting assessments and descriptions of distribution are also relevant to an understanding of the population dynamics and migrations of marine mammals.

ICES has expanded its Environmental Data Bank to include data submissions on contaminant concentrations in marine mammals and is very interested in obtaining reliable, quality-assured data on as many species of marine mammals from the North Atlantic as possible. This portion of the data bank was originally established at the request of the Arctic Monitoring and Assessment Programme (AMAP), but ICES has expanded the coverage to include its entire geographical area. The Oslo and Paris Commissions (OSPAR) have also become interested in the collection of information on concentrations of contaminants and their effects on marine mammals for inclusion in the five regional Quality Status Reports that are being prepared for the Northeast Atlantic by the year 1999. They have requested ICES to assist in obtaining this material and also in contacting organisations dealing with marine mammals to determine whether there is an interest in collaborating in the possible development of assessment criteria for contaminants, particularly chlorinated biphenyls, in marine mammals.

At the 1994 ICES Annual Science Conference, the Council adopted C.Res. 1994/4:8 which urged Member Countries to record all by-catches of marine mammals in the ICES area and report these figures to the ICES Secretariat on an annual basis. Reports have been received from several countries so far. When more complete information has been received, the data

submitted will be reviewed by the Marine Mammals Committee in association with relevant fisheries Committees or Working Groups.

A Symposium co-sponsored by NAFO and ICES on "The Role of Marine Mammals in the Ecosystem" (Co-Convenors: J. Sigurjónsson, Iceland and G. Stenson, Canada) was held in Dartmouth, NS, Canada from 6-8 September 1995. Approximately 200 persons were registered as participants for the Symposium, and 30 papers and 23 posters were presented. Selected papers from the Symposium will be published in the *Journal of Northwest Atlantic Fishery Science*.

In late 1997, ICES will hold a Symposium on "The Role of Physical and Biological Processes in the Recruitment Dynamics of Marine Populations". This will be held in conjunction with the 1997 ICES Annual Science Conference, and the UN's Food and Agriculture Organization (FAO), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the US National Science Foundation (NSF), the US Office of Naval Research (ONR), the North Pacific Marine Science Organization (PICES), the Scientific Committee on Oceanic Research (SCOR) and the Global Ecosystem Dynamics Programme (GLOBEC) have been invited to co-sponsor it. In endorsing this Symposium, the Council noted that substantial progress is currently being made towards integrating physical and biological observations in models coupling population dynamics with ocean physics. It also noted that interactions between the physical and biological environment and various forms of anthropogenic stress must be considered in the assessment and management of marine populations. Thus, an important objective of this Symposium will be to provide a synthesis of progress to date in the development of approaches which explicitly link environmental factors with population dynamics to provide an integrative view of recruitment processes in marine populations. In recognition of related topics treated at recent and planned Symposia focusing on lower trophic levels, contributions on the dynamics of higher invertebrates, fish, as well as marine mammals will be emphasised and encouraged.

Since late 1994, ICES has been gradually developing its presence on the World Wide Web. The site has now expanded to include up-to-date information on most ICES activities, including ICES Annual Science Conferences and Symposia, as well as information about, and access to, some of its databases. The site includes links to other sites of relevance to ICES, including a multitude of "home pages" concerned with marine mammals. The URL for the ICES site is http://www.ices.dk.

AUDITED ACCOUNTS FOR 1995

PROFIT AND LOSS ACCOUNT 1995 (NOK)

Income	***1995***	***1994***
Contributions	2,480,825	2,457,116
Interest received (netto)	103,743	73,113
Total income	2,584,568	2,530,229
Expenditure		
Secretariat costs	2,118,450	1,622,745
Meetings	6,694	71,759
Scientific Committee	199,162	0
Projects, NAMMCO Fund	77,917 0	
NASS-95	800,000	0
Conference	283,705	0
Total operating expenses	3,485,928	1,694,504
Operating result	-1,005,103	762,612

BALANCE SHEET 31 DECEMBER 1995 (NOK)

Current assets		
Bank deposits (restricted: 64,371)	1,371,408	2,319,785
Pre-payment, office rent	36,750	0
Total assets	1,408,158	2,319,785
Current liabilities		
Employees tax deduction and employers tax	53,940	49,475
Creditors	35,687	50,418
Total current liabilities	89,627	99,893
Restricted equity		
Relocation fund	200,000	200,000
The Scientific Committee	0	698,593
NAMMCO Fund	238,722	316,639
Total restricted equity	438,722	1,215,232
Distributable equity (General reserve)	879,809	1,004,660
Total equity	1,318,531	2,219,892
Total liabilities and equity	1,408,158	2,319,785

1.1 - APPENDIX 7

PRESS RELEASE

The Sixth Meeting of the Council of NAMMCO was held in Tromsø from 27 to 29 March 1996. The meeting was attended by delegations from the member countries - the Faroes, Greenland, Iceland and Norway, as well as observers from the Governments of Canada, Denmark, Japan, Namibia and the Russian Federation. The Ministers of Fisheries from all NAMMCO member countries also attended the meeting, as did the Chairman of the Fisheries Committee of the Russian Federation. A number of inter-governmental and non-governmental organisations were also represented by observers at the meeting.

In his opening address, the Norwegian Minister of Fisheries, Jan Henry T. Olsen, expressed his hope for Canada and the Russian Federation to help further strengthen regional cooperation on marine mammal conservation and management by joining NAMMCO. Dr. Jan Jurgens, Permanent Secretray of the Ministry of Fisheries and Marine Resources of Namibia, gave a presentation on the management of seals in Namibia and expressed his desire for close cooperation between all countries with interests in ensuring the sustainable utilisation of marine mammals.

Among major items dealt with by the Council was the report of the Scientific Committee. Based on recent work carried out by the Scientific Committee, the Council agreed to the following conclusions presented by the Management Committee:

- It was confirmed that present removals of ringed seals in West Greenland and Canada are sustainable.
- Current combined catches of harp and hooded seals in Greenland and Canada are below estimates of replacement yields.

The Council was informed that work had begun in the Scientific Committee on the revision of abundance estimates in the light of results from the comprehensive North Atlantic Sightings Survey for cetaceans (NASS 95) carried out last summer. NASS-95 was planned and organised by the Scientific Committee of NAMMCO.

The Council adopted the joint NAMMCO Control Scheme for the Hunting of Marine Mammals, which includes both common elements for national inspection of coastal whaling, as well as an international observation scheme for the hunting of all marine mammals. It is the intention of NAMMCO member countries to implement the Scheme or parts thereof by the 1997 hunting season.

The Council decided further to request the Scientific Committee to focus its attention on the food consumption of the minke whale, harp seal and hooded seal in the North Atlantic, with an emphasis on the study of the potential implications for commercially important fish stocks. As a follow-up to its recent assessment of the grey seal in the North Atlantic, the Scientific Committee was also requested to review the current state of knowledge of sealworm infestation, and to consider the need for comparative studies in the western, central and eastern North Atlantic coastal areas.

Report of the Sixth Meeting of the Council

The Council identified the importance of accessible and reliable information on marine mammals. In this connection, it was agreed that in 1996 the NAMMCO Fund should be used for the development of a major information project on seals and sealing. It was also agreed that NAMMCO should publish the results of work generated through the Scientific Committee in the form of its own publication series.

The Council endorsed the Kyoto Declaration and Plan of Action on the Sustainable Contribution of Fisheries to Food Security.

The Council elected Arnór Halldórsson from Iceland as Vice Chairman. The Faroe Islands offered to host the next annual meeting of the Council in Tórshavn in 1997.

1.2 REPORT OF THE WORKING GROUP ON HUNTING METHODS

Fourth Meeting, Copenhagen, 23 January 1996

The Working Group met at the offices of the Greenland Home Rule Government, Copenhagen on 23 January 1996. The meeting was chaired by Amalie Jessen (Greenland) and also attended by Jústines Olsen (Faroe Islands), Kristján Loftsson and Arnór Halldórsson (Iceland) and Egil Ole Øen (Norway). The Working Group accepted the attendance of Steinar Bastesen (The Norwegian Minke Whalers' Association) and Hansi Kreutzmann (The Association of Hunters and Fishermen in Greenland).

Jens Paulsen (Assistant Secretary) acted as Rapporteur.

1-2. OPENING PROCEDURES

The Chairman welcomed the members of the Working Group to its fourth meeting. The draft agenda was adopted.

3. ELECTION OF VICE-CHAIRMAN

This item was included on the Agenda with reference to the Rules of Procedure for the Working Group, Article II, Paragraph 2. Olsen (Faroes) was unanimously elected as Vice-Chairman for the next two years. It was noted that a new Chairman will be elected in 1997.

4. REVIEW OF THE THIRD WORKING GROUP REPORT

The Chairman reviewed the report of the Third Meeting of the Working Group. The question of wastage of meat with use of the penthrite grenade in Greenland was raised. It was noted that the question had been discussed at the Third Meeting of the Working Group, and it was also noted that the Working Group on Inspection and Observation had discussed the matter at its third meeting (see NAMMCO/6/MC/3: 2-3).

It was agreed that the relevant section of the report of that meeting should be circulated to the members of the Working Group on Hunting Methods.

5. UPDATE OF REFERENCE LIST

The Assistant Secretary briefly reviewed the "References on Hunting Methods", compiled in connection with the Second Meeting of the Working Group. The Chairman requested the members of the group to inform the Secretariat of further relevant articles which should be added to the list. An updated reference list is included as Appendix 2

Olsen submitted the unpublished paper, "Note on the pilot whale killing method" that had been prepared for the meeting by Jústines Olsen and Dorete Bloch (see also Agenda Item 6). Olsen also mentioned that a paper on the influence of abiotic factors prior to drives, drive techniques and humane killing of pilot whales was under preparation.

6. UPDATE ON HUNTING METHODS IN MEMBER COUNTRIES

The Faroes

Olsen presented a note in Danish on developments in the Faroes on killing methods. Olsen informed the Working Group about a new regulation on Grind (No 55 of 16 May 1995), of which the Secretariat has received a Faroese and a Danish version. Olsen confirmed that an English version was under preparation and would also be sent to the Secretariat.

The new regulations are more specific in defining the rules governing the pilot whale drive. Furthermore, rules on the killing methods have been amended according to results from research carried out by Olsen. The above mentioned research is described in the paper, "Note on the pilot whale killing method", which Olsen discussed, also circulating photographs from the research at the meeting.

Olsen also explained the function of a new gaff that is under construction and which allows the hunters to secure pilot whales without wounding them by inserting a blunt hook into the blowhole of the animal. Olsen informed the Group that the gaff has been tested in a few cases, and that experiences thus far have been positive.

Olsen further explained that research has shown that as the blood supply to the brain in pilot whales is not through the carotids, as in terrestrial mammals, but through large arteries encircling the spinal cord that enter the cranial cavity, the most efficient way to kill the whales is to make a deep cut behind the blowhole and sever the spinal cord. The whale will be paralysed and die of anoxia within 5-10 seconds.

Furthermore, Olsen mentioned that monitoring times-to-death has been undertaken in connection with three pilot whale drives.

Norway

Øen (Norway) informed the Working Group of the following:

- *Norwegian Defence Research Establishment* now produces penthrite grenades. The institute will produce a new batch of grenades during spring 1996.
- Minke whale gunners must pass a course every year, including a shooting test for harpoon guns and for rifles. The regulations for the harpoon test were changed in 1994 while those governing the rifle test were changed in 1995.
- New regulations are under preparation related to hygiene standards on board whaling vessels.
- Other regulations that will be presented at a later stage include rules on maintenance of harpoon guns. A checklist for maintenance of harpoon guns has been drawn up in this connection.

- New sights for the harpoon guns are under consideration with the intention of increasing the precision of shooting.
- A fully standardized propellant charge has been developed in 1995 for the 60 mm harpoon gun. It will be tested on land-based proving grounds in 1996 before being certified for hunting.
- In 1995 an informal reference group with four whalers and Øen was established by the Norwegian Minke Whalers' Association as a forum for discussions of technical issues related to hunting equipment.

Iceland

There was nothing new to report from Iceland at this meeting on developments in hunting methods.

Greenland

Jessen informed the Working Group about the implementation of the reparation program for the 63 harpoons in use. The program is described in detail in the Report of the Third Meeting of the Working Group (NAMMCO/5/8). The Greenland Home Rule Government covers 2/3 of the costs involved, while the hunters cover 1/3. A total of 63 harpoon guns are under reparation, 8 of which have been sent to the manufacturer, Kongsberg, in Norway.

Furthermore, it was reported that a maintenance manual is now being prepared and that the Home Rule Government is considering producing a video tape as a supplement to the manual.

The Home Rule Government, KNAPK (the Hunters' and Fishermen's Association) and KANUKOKA (The Association of Municipalities in Greenland) are in the process of establishing a model for reducing the rifle hunt in line with the completion of the reparation program.

Jessen informed the Working Group that the Home Rule Government is preparing a document describing the improvements that have been made in Greenland regarding whaling equipment. The document is expected to be presented at the 1997 meeting of the IWC.

Øen commended the work done in Greenland to improve the standard of the harpoon guns. Øen considered that expenditures in connection with the use of penthrite grenades in Greenland were rather large, and questioned whether it would be possible to reduce potentially unnecessary links in the distribution chain.

Jessen informed the Working Group that 25% of the price goes to the agent (KNI) in Greenland and that transportation costs are added on top of this. The result is a dramatic increase in the total price of the grenades, compared with the price in Norway.

7. POSSIBLE TASKS OF THE WORKING GROUP

The Chairman noted that until this stage the Working Group had mainly functioned as forum for the exchange of information. She raised the question as to whether the function of the group should be expanded according to the purpose of the Working Group.

Halldórsson (Iceland) responded that it could be a relevant task for the Group to discuss possible standards of equipment in connection with similar forms of hunting of marine mammals that occur in two or more member countries.

Øen mentioned the possibility of compiling a list of hunting equipment and methods used in member countries as a basis for which to consider potential coordination initiatives.

It was agreed that the Secretariat should compile a list of existing rules on equipment, hunting and hunters. The list would then be used as the basis for a discussion in the Working Group to create a greater degree of mutual knowledge which would be an important improvement. The discussions might then lead to coordination initiatives, potentially including sealing as well as hunting of fin, minke and pilot whales.

8. OUTCOME OF 1995 IWC WORKSHOP ON WHALE KILLING METHODS

The Working Group discussed the IWC Workshop on Whale Killing Methods that was held in Dublin, 23-25 May 1995.

Jessen reported that Greenland had taken steps to improve its documentation of developments on hunting equipment. The documentation mentioned above under item 6 was initiated on this basis.

Øen informed the Working Group that the IWC Workshop on Whale Killing Methods had recognized and agreed that the criteria used to indicate death in whales were incomplete and under some circumstances misleading. The Workshop identified the need for better criteria for determining the time of onset of permanent insensibility in whales. The Workshop also recommended continued cooperation between scientists from the member countries of Norway and Japan to refine the design of penthrite grenades as far as possible. USA and Denmark are also involved with this work.

In this connection it was suggested that the Secretariat should monitor developments of this kind in international fora, and that circulation of material would be appreciated.

Jessen furthermore informed the Working Group that the Home Rule Government, in co-operation with a Danish standardisation institute (*Dansk Standard*) and an animal protection group (*Dyrenes Beskyttelse i Danmark*), has implemented scientific research on seals caught in nets. The aim of the research is to clarify the physiological cause of death.

9. ANY OTHER BUSINESS

Jessen informed the Working Group that Working Group members had been participating in the meetings of the International Organisation for Standardisation (ISO). The question of trapping of semi-aquatic animals is under consideration in Technical Committee 191. A technical Working Group has been established to consider testing standards of traps.

It was agreed that members of the Working Group should distribute information of interest to the Working Group to other members and/or the Secretariat.

10. NEXT MEETING

It was agreed that the next meeting of the Working Group should be held prior to the Seventh Meeting of the Council - allowing sufficient time to prepare a report to the Council.

11. ADOPTION OF REPORT

The final report was adopted by correspondence.

1.2 - APPENDIX 1

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1.3 1995 ANNUAL REPORT OF THE NAMMCO FUND

1. INTRODUCTION

The NAMMCO Fund was established by the Council at its Third Meeting in Reykjavik, 1-2 July 1993, with the purpose of supporting projects which "contribute to the knowledge and understanding of the rational utilisation of marine mammals" (Article 1 of the Fund Statutes).

This Report covers the period from 21 March 1995 - 26 March 1996.

Einar Lemche, Greenland, is Chairman of the Board and other Board members are Anna Maria Fossá (the Faroes), Arnór Halldórsson (Iceland) and Halvard P. Johansen (Norway).

2. OVERVIEW OF BOARD ACTIVITIES AND PROJECTS IN 1995

The Board met twice in 1995: In Nuuk 20 February and in Copenhagen on 3 November. The meeting in Nuuk was also attended by Jan Frederik Danielsen (Norway), and at the meeting in Copenhagen Snorri Runar Palmason (Iceland) replaced Arnór Halldórsson.

In 1994, the Board decided to support one specific project from each member country. This was an exception from the general rule that projects with general relevance to member countries should have priority. In 1995 four national projects were identified for support. As the Icelandic project, the University of Iceland's Centre for International Studies had already received NOK 30,000 in 1994 in support for the publication *Science, Sanctions and Cetaceans* by Jóhann Ívarsson.

Other national projects supported by the Fund are mentioned under 3.

3. SPECIFIC PROJECTS SUPPORTED IN 1995

The Fund decided to support the following projects in 1995. These have either already received support, or have funds earmarked, pending further information and developments from the applicants:

3.1 The Board agreed to support the publication of an edited collection of socio-economic papers on whaling in Greenland which have been presented to the IWC through the years with NOK 35,000.

3.2 A project for a poster on whales in Norwegian waters developed by Tore Dillingøen: NOK 35,000.

3.3 The Board supported the production of the collection of cartoons, *The Daily Grind*, on pilot whaling and the whaling debate by Óli Petersen with up to DKK 50,000. The collection was published by the Faroese newspaper, *Sosialurin*, in six languages.

4. SUMMARY OF GENERAL POLICY DISCUSSIONS AND BUDGET

The Board agreed that the Secretariat should follow up on projects that have been supported, so that for instance the extent of distribution of publications would be known to the Board. It should also be a part of the preconditions for supporting projects that this information is provided.

The Board noted that the North Atlantic Fisheries Ministers have met in Canada at a meeting focussing on seals/sealing and the influence of seals on fisheries. In line with this the Board **agreed** that the mentioned items should be given priority in 1996. In doing so, the Board will seek cooperation with other relevant fund sources in order to initiate one single project on a larger basis than has been the case up till now - or to support an already initiated project. In the case that no such project can be developed on this basis, the Board agreed that other projects can be supported instead.

In reviewing funds used to support projects in 1995, it was noted that the remaining balance of the Fund has been earmarked/used. It was also noted that NOK 200,000 for the Fund have been included in the 1996 forecast budget. All present applications for funding have been dealt with.

The Board agreed that the existence of the Fund is of great value as a means of creating better knowledge of the rational utilisation of marine mammals, and that it should therefore continue as such. The precondition for this is, however, that funds are included on the general budget every year.

The Board **recommends** that NOK 200,000 are earmarked for the Fund for 1996 and a corresponding amount for 1997.

1.4 PROVISIONS FOR THE JOINT NAMMCO CONTROL SCHEME FOR THE HUNTING OF MARINE MAMMALS

The Scheme contains the following sections:

Section A Common elements for national inspection schemes for coastal whaling in NAMMCO member countries; this part of the scheme concerns hunting of whales from vessels with a harpoon gun on board, and

Section B An international observation scheme with the participation of NAMMCO member countries; this part of the scheme relates, in principle, to all hunting of marine mammals.

Section C Implementation

Appendix 1 Items for inclusion in whaling logbooks

Section B is administered by the NAMMCO Secretariat, hereafter called "the Secretariat".

SECTION A

COMMON ELEMENTS FOR NATIONAL INSPECTION SCHEMES FOR COASTAL WHALING IN NAMMCO MEMBER COUNTRIES

A.1 Introduction

The national inspection schemes include national inspectors who either

i) remain permanently on board whaling vessels or at landing/receiving places during the hunting season, or
ii) carry out random control of hunting vessels and landing/receiving places,

or a combination of i) and ii).

The aim of these regulations is to establish a standard of common elements which shall be a minimum requirement in the random control included in national inspection schemes. In addition to these elements, the individual member countries may include new elements as considered appropriate in relation to national laws and regulations for their specific whaling activities.

The national authorities decide the extent of inspection within their own jurisdiction.

A.2 Near-coast whaling operations

A.2.0 In these provisions, "near-coast whaling operations" is defined as whaling from vessels which bring their catch fresh to land.

A.2.1 The relevant authorities in each NAMMCO member country (hereafter called "the national authorities") design and publish a whaling logbook. The captain on board vessels equipped to carry out whaling must keep the logbook continually updated during the hunting season. A minimum requirement for the whaling logbook is that it includes the information listed in Appendix 1- *Items for inclusion in whaling logbooks*.

A.2.2 The national authorities develop and implement regulations for the electronic transmission of information to enable the controlling authorities to ascertain the vessel's position etc.

The regulations shall require the following types of reports:

i) *Report of commencement of activity* - report on time and place when leaving port or when weighing anchor
ii) *Report of catch* - report on the time and position of the catch and subsequent treatment of catch (i.e. flensing).
iii) *Report of termination of activity* - report on time and place when arriving at port or when anchoring

A.2.3 The national authorities implement an arrangement whereby national inspectors carry out random checks on whaling vessels and at landing/receiving places. The national authorities compile a set of provisions for this arrangement which specify requirements for the inspectors' qualifications and competence, duties, rights, etc.

A.2.4 One of the duties of the inspectors, as required by the national authorities, (cf. item A.2.3), shall be to examine the whaling logbook in order to check whether it has been filled in correctly, and in general to control that national regulations have been followed.

Inspectors shall

i) draw attention to violations of regulations on board whaling vessels or at landing/receiving places, and in these instances demand changes according to the regulations in effect;
ii) collect samples and record data in accordance with national and international requirements;
iii) report to their national authorities, and
iv) have access to the logbooks of the vessel and the right to communicate with the national authorities through the communication equipment of the vessel.

The national authorities develop a reporting form for use by the inspectors.

A.2.5 The national authorities develop and implement regulations for storage of the catch on board a vessel. Meat, blubber and mattak (hide, including a thin layer of blubber) from individual animals caught must be stored on board separately from other catches. Separation of these parts shall occur within a minimum of six hours after the catch report is made.

A.3 Off-coast whaling operations

A.3.0 In these provisions, "off-coast whaling operations" is defined as whaling where the whale is flensed on board vessels which are equipped to handle and store meat and blubber either frozen or chilled with ice, or preserved by other means, in connection with transport/storage.

A.3.1 The requirements referred to under A.2.1 and A.2.3 - A.2.5 also apply to off-coast whaling operations.

A.3.2 The national authorities develop and implement regulations for the electronic transmission of information to enable the controlling authorities to ascertain the vessel's position etc.

The regulations shall require the following types of reports:

i) *Report of commencement of activity* - report on time and place when leaving port or when weighing anchor
ii) *Report of position* - regular daily report on position.
iii) *Report of catch* - report on the time and position of the catch, and subsequent treatment of catch (i.e. flensing).
iv) *Report of termination of activity* - report on time and place when arriving at port or when anchoring

A.3.3 On board all vessels conducting off-coast whaling operations, an instrument must be installed for recording the specific activities during whaling, which can then be monitored after the return to port.

SECTION B
INTERNATIONAL OBSERVATION SCHEME

B.1 Introduction

The purpose of establishing an international observation scheme among NAMMCO member countries is to provide a mechanism for NAMMCO to monitor whether decisions made by the Commission are respected. For this purpose, NAMMCO appoints observers who oversee hunting and inspection activities in NAMMCO member countries.

B.2 Duties and competence

B.2.1 Observers are responsible for overseeing hunting activities and for observing whether or not these are carried out in accordance with decisions made through NAMMCO and national regulations. The observers are required to make a report of their observations to NAMMCO. Observers have no authority of jurisdiction, and consequently cannot intervene in the hunting, or other activities connected with the hunting.

Observations can take place on board a vessel, or on shore, in connection with flensing, storage and landing/delivering of the catch.

B.2.2 The observer shall be allowed to check licences and relevant certificates, logbooks/whaling logbooks, all rooms on board or on land, hunting equipment, and communication equipment, etc., which are relevant for his/her work.

B.2.3 The observer shall report any violation of the regulations in a given area, and as soon as possible, send a report of such to the Secretariat, with a copy to the authorities in the country in question, as well as to the owners of the vessel. The captain, those in possession of the licence, and, if present, the inspector, shall be given the opportunity in a special paragraph of the report, to record their comments.

B.2.4 The observer shall prepare a report of the observations made, and send it to the Secretariat, with a copy to the authorities of the country in which the observations have taken place.

B.2.5 The Secretariat prepares an annual report of the observation scheme, in which the implementation of the scheme is described, for the review of the Management Committee. The document shall include reports of any violations, as well as other relevant comments.

B.2.6 The observer shall carry out his/her duties on the basis of guidelines adopted by the Management Committee.

B.2.7 The observers are responsible to NAMMCO, and can neither seek nor receive instructions from any other person or authority.

B.2.8 An observer shall only in exceptional circumstances be appointed to observe in the country - or on a vessel registered in the country - of which he or she is resident (see item B.3).

B.3 Appointment of observers

B.3.1 Observers are appointed by the Management Committee for one year at a time. Appointments are made through a procedure that ensures member countries the opportunity both to nominate candidates as well as to oppose the appointment of candidates. NAMMCO can invite non-member countries to nominate candidates. The Management Committee draws up specific guidelines for appointing observers and for making reservations.

B.3.2 Neither the owner or the captain of a vessel, nor the owner or the manager of a landing/receiving place that is to be observed, can oppose observation by a person appointed by NAMMCO according to guidelines referred to in B.3.1.

B.4 Qualifications, etc.

B.4.1 The Management Committee compiles guidelines for requirements for the competence, training, etc., of observers.

B.4.2 As a general rule, observers must have at least the same level of professional competence as that required of inspectors in the country where the observations are to take place. In special circumstances, exemption from this requirement can be given.

B.4.3 For safety reasons, the language competency of observers must be taken into consideration. An observer on board a hunting vessel must be able to communicate spontaneously with the crew. For communication on land, a translator may be used.

B.5 Scope of activities

B.5.1 The Management Committee identifies annually priorities for the scope of observation activities for the coming year, within the budget adopted by the Council. The Secretariat is responsible for the practical administration and coordination of these activities.

B.5.2 The International Observeration Scheme is administered by the Secretariat, in accordance with guidelines set down by the Management Committee.

B.6 Integrity

The authorities in the country where observations take place shall take appropriate measures to ensure the safety, freedom and dignity of the observer, and shall, in

addition, be of assistance in both word and deed, so that the duties of the observer can be carried out properly and efficiently.

B.7 Costs

Costs in connection with the activities of NAMMCO observers are covered by the NAMMCO budget in cases where different arrangements have not been agreed by NAMMCO and the country which sends the observer. The Management Committee may give guidelines for such arrangements.

SECTION C

IMPLEMENTATION

It is the intention of the member countries of NAMMCO to implement the Scheme or parts thereof at the beginning of the hunting season in 1997. For this purpose further work will be undertaken by the Management Committee on necessary guidelines. Item A.3.3 will be put into effect when the instrument referred to is tested and approved by the national authorities concerned.

1.4 - APPENDIX 1

ITEMS FOR INCLUSION IN WHALING LOGBOOKS

I Vessel, whaling equipment and formalities

1 Registration number of the vessel
2 Call sign.
3 Name of captain/licence holder
4 Name(s) of gunner(s)
5 Number of licence
6 Caliber of harpoon gun
7 Type of grenade used
8 Caliber of rifle
9 Number of grenades and propellant charges (and their serial numbers) on board at end of last whaling trip
10 Number of grenades and propellant charges (and their serial numbers) taken on board in connection with present whaling trip
11 Number of grenades and propellant charges (and their serial numbers) on board at end of present whaling trip

II Activities

1 Port of departure
2 Date and time of departure from port or weighing anchor
3 Port of landing or position of anchoring
4 Time catch landed
5 Location catch landed

III The hunt

1 Species hunted
2 No. of whales caught in the season
3 Time hunt commenced (species to be reported)
4 Time first harpoon fired
5 Number of harpoons fired
6 Number of hits
7 Time of catch
8 Position of catch
9 Caught/lost
10 Location of flensing (flensing site)

IV Research data

1 Estimated time-to-death
2 Length
3 Sex
4 Foetus
5 Time search started
6 Time of first sighting of whale (species to be reported)
7 Position of sighting
8 Number of whales and groups of whales sighted (species to be reported)
9 Samples taken

V Other

1 Comments
2 Date and signature (captain)

ANNUAL REPORT
1996

Report of the Management Committee

North Atlantic Marine Mammal Commission

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PREFACE

The North Atlantic Marine Mammal Commission was established in 1992 by an Agreement signed in Nuuk, Greenland on the 9th of April between the Faroe Islands, Greenland, Iceland and Norway. The objective of the Commission, as stated in the Agreement, is to "... contribute through regional consultation and cooperation, to the conservation, rational management and study of marine mammals in the North Atlantic."

The Council, which is the decision-making body of the Commission, held its inaugural meeting in Tórshavn, Faroe Islands, 10-11 September 1992 (NAMMCO/1), and has convened five times since: in Tromsø, Norway 19-20 January 1993 (NAMMCO/2); Reykjavik, Iceland, 1-2 July 1993 (NAMMCO/3); Tromsø, Norway 24-25 February 1994 (NAMMCO/4); Nuuk, Greenland, 21-23 February 1995 (NAMMCO/5); and most recently in Tromsø, Norway 27-28 February 1996 (NAMMCO/6).

The present volume contains proceedings from NAMMCO/6 - the Sixth Meeting of the Council - which was held at the Radisson SAS Hotel in Tromsø. Norway, 27-29 March 1996 (Section 1), as well as the reports of the 1996 meetings of the Management Committee (Section 2) and the Scientific Committee (Section 3), which presented their conclusions to the Council at its Sixth Meeting. Section 3 also contains Scientific Committee Working Group reports which were presented to the 4th meeting of the Scientific Committee in Tórshavn, 5-9 February 1996, while annual National Progress Reports on marine research in memebr countries are contained in Section 4.

The reports contained in this volume are presented here in their final edited form and thereby replace any preliminary versions which have been circulated prior to this publication.

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CONTENTS

3.1 REPORT OF THE MANAGEMENT COMMITTEE

Tromsø, 28 March 1996

1-3. OPENING PROCEDURES

The Management Committee met at the Radisson SAS Hotel in Tromsø on 28 March, 1996. The meeting was convened by the Committee's Chairman, Einar Lemche (Greenland) and attended by delegations from all member countries. In addition, the Management Committee decided to admit to its meeting all observers who were also attending the Sixth Meeting of the Council. A full list of participants is contained in Appendix 1 of the Report of the Sixth Meeting of the Council (Section 1.1).

The draft agenda for the meeting, as contained in Appendix 1, was adopted, and the Secretary, Kate Sanderson, was appointed as rapporteur.

4. MATTERS ARISING FROM THE SCIENTIFIC COMMITTEE

The Chairman referred to the decisions and recommendations summarised in NAMMCO/6/6 - Report of the Scientific Committee (pp.1- 4).

The Management Committee noted the decisions made by the Scientific Committee for further work to address outstanding requests for advice from the Council. These included the establishment of a Working Group on Abundance Estimates as a follow-up to NASS-95, which would also coordinate the production of a table showing stock levels and trends in stock levels of marine mammals in the North Atlantic.

The Management Committee also noted the establishment by the Scientific Committee of a Data Group to liaise with the Secretariat on the further development of the database and standards for data submission, storage and handling.

The Management Committee **endorsed** the recommendations for further research on harp seals, hooded seals, ringed seals and grey seals identified by the Scientific Committee, and which are summarised in NAMMCO/6/6, pages 3-4.

4.1 By-catch data

The Management Committee noted that the Scientific Committee had identified the need for data on by-catches of marine mammals for population assessment, and had recommended to member countries to establish a system for reporting data on by-catches.

4.2 Grey seal catch statistics

The Management Committee further noted the Scientific Committee recommendation for a system for recording catch statistics, both specifically for the hunting of grey seals in Norway, as well as for grey seals killed at fish farms and in fishing gear in all NAMMCO member countries.

The Management Committee **endorsed** the recommendations under 4.1 & 4.2, and **recommended** that the Secretariat be entrusted to investigate the requirements for a standard system for reporting such data, in liaison with the Data Group recently established by the Scientific Committee.

4.3 North Atlantic Sightings Survey - NASS-95

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. It was suggested that this be drawn to the attention of the Scientific Committee to secure a follow-up to last year's request.

4.4 Harbour porpoise

The Management Committee **endorsed** the Scientific Committee's recommendation to include harbour porpoise on its agenda in the future.

5. PROPOSALS FOR CONSERVATION AND MANAGEMENT

5.1 Earlier proposals

Atlantic walrus

At its last meeting in Nuuk in 1995, the Management Committee recommended: "[W]hile recognizing the over all priority of further work to clarify and confirm the delineation and abundance of walrus stocks in the North Atlantic area, ...that Greenland take appropriate steps to arrest the decline of walrus along its west coast."(NAMMCO Annual Report, p. 49).

Greenland reported that the Home Rule Government had implemented new legislation in 1994 limiting the number of people permitted to hunt walruses in Greenland. Only full-time hunters were permitted to hunt walruses, and only from vessels under 40 gross tons. All catches must be reported to the authorities. It is also forbidden to catch walruses in certain areas of Greenland. Greenland authorities were also considering how to further limit the take of walruses.

Greenland further informed the Management Committee that the question of Atlantic walrus was raised at the last meeting of the Joint Commission on Conservation and Management of Narwhal and Beluga to consider management in cooperation between Canada and Greenland on the stock of Atlantic walrus in the Davis Strait and nearby areas.
It was also reported that a scientific project on DNA analysis of walrus stocks in West and East Greenland was planned for the summer of 1996, and DNA analyses would be exchanged with Canadian scientists.

5.2 New proposals

Ringed seal
At its last meeting in Nuuk in February 1995, the Council agreed to the Management Committee's recommendation for Scientific Committee to:

> "advise on stock identity [of ringed seals] 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."

The Management Committee noted the conclusions of the Scientific Committee on the subsequent assessment of ringed seals in the North Atlantic, which had been carried out through the Scientific Committee Working Group on Ringed Seals (NAMMCO/6/6, pp. 14-17 & Annex 1). 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/6/6-Annex 1, Figure 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.

Harp and hooded seals
The Management Committee noted the Scientific Committee's review of updated findings on harp seals and hooded seals in the North Atlantic (NAMMCO/6/6, pp. 10-14).

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

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

ii) Hooded seals in the Northwest Atlantic
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.

6. RESEARCH RECOMMENDATIONS

6.1 Role of marine mammals in the ecosystem

The Management Committee noted the general conclusion of the Scientific Committee during its deliberations on the role of marine mammals in the marine ecosystem (NAMMCO/6/6, pp. 8-9). The Scientific Committee had noted that this was a vast field of science, and that in the future it would be preferable to consider more specific questions related to this field.

The Management Committee therefore **recommended** that the Scientific Committee 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.

6.2 Sealworm infestation

Aware that the population dynamics of the sealworm (*Pseudoterranova. decipiens*) may be influenced by sea temperature, bathymetry, invertebrate and fish fauna, the Management Committee **recommended** that the Scientific Committee 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/6/6, pp.17-21).

7. INSPECTION AND OBSERVATION

7.1 Report of the Third Meeting of the Working Group on Inspection and Observation (NAMMCO/6/MC/3)

The Chairman of the Working Group on Inspection and Observation, Egil Ole Øen (Norway) presented document NAMMCO/6/MC/3, the Report of the Third Meeting of the Working Group on Inspection and Observation, which met in Copenhagen in November 1995.

Øen pointed out that the Working Group on Inspection and Observation had been requested in 1994 to pursue the development of a common inspection scheme for minke whaling in the North Atlantic, and was subsequently requested in 1995 to continue its work on the formulation of a common checklist for inspectors, based on the list of common elements for national inspection schemes which had been identified by the Working Group at its meeting in 1994. The Working Group on Inspection and Observation had also been requested to consider the details of a reciprocal observer scheme between NAMMCO member countries and to further develop these (NAMMCO Annual Report 1995, p. 59).

At its Third Meeting, the Working Group reviewed updated information from member countries on national regulations for the hunting of marine mammals.
The Working Group's detailed deliberations on the formulation of an inspector's checklist, as well as the development of the details a reciprocal observer scheme between NAMMCO member countries, resulted in a draft proposal for Provisions for the Joint NAMMCO

Control Scheme for the Hunting of Marine Mammals (NAMMCO/6/MC/4 - see under 7.2). Conclusions of the detailed discussions in the Working Group related to specific elements of inspection and observation are reflected in the explanatory notes attached to the draft Provisions as presented to the Management Committee.

In addition to this, Øen pointed out that the Working Group had agreed at its Third Meeting that two checklists should be developed: a hunter's checklist to be submitted to national authorities; and an inspector's checklist. It was stressed that the development of common checklists would not imply any level of inspection. The inspector's checklist would be used only to the extent inspection is actually carried out.

Øen also drew the attention of the Management Committee to the Working Group's discussions concerning financing of the International Observer Scheme. The Working Group had agreed that the costs of observers should not be paid by the flag state (see also below under 7.2).

7.2 Proposal for a NAMMCO Control Scheme for the Hunting of Marine Mammals (NAMMCO/6/MC/4)

Øen further presented document NAMMCO/6/MC/4 - Draft Provisions for the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals.

Øen informed the Management Committee that the main aim of the Working Group had been to establish a scheme that is both practical and reliable. The purpose of the Joint Control Scheme was to ensure a certain standard in the control systems of member countries and to give NAMMCO the opportunity of monitoring the extent to which national regulations for the management of marine mammals were upheld in member countries. The Working Group agreed that there was a good basis for the coordination of control schemes in NAMMCO member countries.

Ensuring dialogue with, and input from, the relevant hunter's associations in the work of the Group had also been an important consideration. Representatives from a number of national hunters' organisations had taken part in the January 1996 meeting of the Working Group at which the provisions for the Joint NAMMCO Control Scheme had been further developed.

The proposed Control Scheme contained three main sections: A. Common elements for national inspection schemes for coastal whaling in NAMMCO member countries; B. International Observation Scheme; and C. Implementation.

Section A on inspection relates specifically to hunting of whales from vessels equipped with harpoon guns. According to the Scheme, the definition of whaling operations also includes landing and receiving of whales and whale products. Further, two distinct forms of whaling operations were specified in the Provisions, referred to in the Danish/Norwegian in which the Provisions were developed as "hjemmefangst"(literally "home whaling") - whaling from vessels which bring their catch fresh to land, and "utefangst"("out whaling") - whaling where the whale is flensed on board vessels which are equipped to handle and store the meat and

blubber either frozen or chilled with ice, or preserved by other means, in connection with transport/storage.

Øen pointed out that the Working Group had not reached full agreement on the question of the transfer of electronic information from whaling vessels to national authorities, in particular the requirements for report of activity and termination of activity during the whaling season, although it was agreed that it would be possible to find solutions to these requirements in the proposed Scheme.

Section B - the International Observation Scheme - would encompass the hunting of all species mofarine mammals in the NAMMCO area. The Scheme provides for the exchange of observers between member countries, according to guidelines determined by the Management Committee, and administered by the Secretariat. Observers, who report on their observations to other member countries through the NAMMCO Secretariat, shall not have any authority to interfere in any way with the observed activities in the applicable areas.

Section C of the proposed Scheme concerns implementation. The Working Group considered that the Scheme could be implemented by the hunting season of 1997. Before then, however, the Scheme or parts of it could be implemented on a trial basis, which might also reveal any necessary adjustments before its final implementation.

The Working Group identified two outstanding questions in connection with the development of the Control Scheme: 1) clarification of the type of electronic reports to be included in the common elements for national inspection schemes, and 2) the development of further guidelines in accordance with the provisions of the Scheme. Finally, the Working Group recommended that the necessary steps be taken to finalise and implement the Joint Control Scheme for the Hunting of Marine Mammals.

.....

The Chairman of the Management Committee thanked Øen for his presentation and commended the Working Group and the Secretariat for their effective work in the preparation of the proposed Control Scheme. General comments were invited from member countries.

Iceland expressed its support for the Scheme and commended the Chairman of the Working Group for his work. Further, Iceland pointed out that the Working Group on Finance and Administration had noted that a Joint Control Scheme administered through NAMMCO would likely have budgetary implications for the organisation, although it was noted that this had not been taken into account in the 1997 forecast budget.

Norway commended the rapid progress and substantive results made by the Working Group on Inspection and Observation, in contrast to the difficulties and delays experienced with similar questions elsewhere. The importance of taking the practical realities of hunting operations as a starting point was stressed.

The Faroes welcomed the report and work of the Working Group, and expressed support for both sections of the proposed Scheme, the common elements of inspection for coastal whaling as well as the International Observation Scheme for all marine mammals. The need for further guidelines was noted, and the Faroes expressed their willingness to continue with the work in 1996 to further develop these.

Greenland also expressed its gratitude to the Working Group and Secretariat for the progress made in developing the Joint Control Scheme, and otherwise supported the comments by Norway. It was further stressed that Greenland could support the Scheme in principle, but that there were some practical problems associated with it which had been discussed in Greenland.

In particular, Greenland informed the Management Committee of its reservation to the requirement for the report of commencement of activity and report of termination of activity, as specified in article A.2.2, points i) and iii) of the Provisions for a Joint NAMMCO Control Scheme. As Greenlandic whaling vessels are usually equipped with hunting gear all year round, due to the fact that the small individual whaling quotas for each vessel may be taken at almost any time of the year, the requirement for report of commencement and termination of activities was considered to be impractical in relation to the scope of activities of these vessels. Whaling vessels in Greenland will, however, be subject to inspection at all times when the vessel is equipped with a harpoon gun, in accordance with the Joint Control Scheme, during which period the logbook must be kept updated.

A number of specific amendments to the draft Provisions as presented in NAMMCO/6/MC/4 were agreed upon by the Management Committee. These were incorporated into the text of the revised set of Provisions (NAMMCO/6/MC/5), and the rationale for these amendments is subsequently reflected in the explanatory notes to the revised provisions.

The Management Committee **agreed to recommend** to the Council that the Provisions for the Joint Control Scheme for the Hunting of Marine Mammals, as revised by the Management Committee and contained in NAMMCO/6/MC/5, be adopted, noting the reservation by Greenland to article A.2.2, points i) and iii) (see Section 1.4 of this volume).

7.3 Other matters

Greenland requested the Secretariat to define clearly the respective duties, in relation to the Control Scheme, of: 1) the national authorities; 2) the hunters; and 3) the Secretariat.

8. ELECTION OF OFFICIALS

Einar Lemche (Greenland) was re-elected Chairman of the Management Committee for the next two years. Kaj Mortensen (Faroe Islands) was elected as Vice-Chairman.

9. CLOSING ARRANGEMENTS

Norway thanked the Chairman of the Management Committee for his excellent work in chairing the meeting.

A preliminary report from the Management Committee was prepared for immediate presentation to the Council. The Management Committee agreed that the full report of the meeting should be circulated for review and adoption through correspondence. This process was completed on 6 May 1996.

LIST OF DOCUMENTS

NAMMCO/6/6	Scientific Committee - Report of the Fourth Meeting
NAMMCO/6/MC/3	Report of the Third Meeting of the Working Group on Inspection and Observation
NAMMCO/6/MC/4	Draft provisions for the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals
NAMMCO/6/MC/5	Provisions for the Joint NAMMCO Control Scheme for the Hunting of Marine Mammals (as revised by the Management Committee and adopted by the Council)

REFERENCES

NAMMCO Annual Report 1995, North Atlantic Marine Mammal Commission, Tromsø.

AGENDA

1. Chairman's opening remarks
2. Adoption of agenda
3. Appointment of rapporteur
4. Matters arising from the Scientific Committee (NAMMCO/6/6)
5. Proposals for conservation and management
   - 5.1 Earlier proposals
   - 5.2 New proposals
6. Research recommendations
7. Inspection and Observation
   - 7.1 Report of the Third Meeting of the Working Group on Inspection and Observation (NAMMCO/6/MC/3)
   - 7.2 Proposal for a NAMMCO Control Scheme for the Hunting of Marine Mammals (NAMMCO/6/MC/4)
   - 7.3 Other matters
8. Election of officials
   - 8.1 Election of Chairman
   - 8.2 Election of Vice-Chairman
9. Any other business
10. Adoption of report

3.2 REPORT OF THE WORKING GROUP ON INSPECTION AND OBSERVATION

Copenhagen, 3 November 1995

The Working Group met in the offices of the Greenland Home Rule Government, Copenhagen, 3 November 1995. The meeting was attended by Einar Lemche (Greenland), Anna Maria Fossá (Faroe Islands), Snorri Rúnar Pálmason and Kristján Loftsson (Iceland), Halvard P. Johansen (retiring Chairman, Norway) and Egil Ole Øen (new Chairman, Norway). Halvard P. Johansen attended the first two items on the agenda. The Assistant Secretary was rapporteur.

1. ADOPTION OF AGENDA

The Agenda was adopted.

2. ELECTION OF CHAIRMAN

The Chairman, Halvard P. Johansen, Norway, retired from the Chair due to the fact that he is now Chairman of the Council, and on his suggestion Egil Ole Øen (Norway) was elected new Chairman of the Working Group. In this connection the value of spreading official responsibilities among persons in the organization was noted.

In handing over the Chair, the retiring Chairman thanked the Working Group for its support during his chairmanship. The new Chairman thanked the Working Group for its confidence in him and he especially thanked the retiring Chairman for the very efficient job he had done during his term of office.

3. UPDATE ON NATIONAL REGULATIONS

The Chairman suggested that the members update the Working Group on whaling regulations in their respective countries.

a) Norway

Øen reported that only hunting of minke whales is allowed in Norway. Licences are issued on a one-year basis to hunters who have carried out whaling over the past 3 years. The licence holder must own at least 50% of the boat for which the licence is issued (unless the boat is owned by a company), and is not allowed to possess more than one boat. In 1995 the number of vessels hunting minke whales was 33 with one or two gunners on board each.

A number of minke whales (between five and twelve) are allocated to each vessel. The whales are flensed on board the vessel.

The following conditions must be met to obtain a licence for hunting minke whales:

- There must be an inspector on board every vessel.

- Gunners must pass a yearly official course and a shooting test with harpoon cannon and rifle.

Steps have been taken to ensure that harpoon cannons and harpoons are checked and approved every year. Furthermore, on land the catch is occasionally checked by weighing the meat and comparing it with the logbooks. For veterinary reasons it has been suggested that all meat should be weighed.

b) Iceland

In Iceland no commercial whaling has been carried out since 1989. The regulations which applied to whaling were introduced in 1949 (*Whaling Act, No. 26, May 3, 1949*) when Iceland became a member of the IWC. Iceland resigned from the IWC with effect from July 1992.

The representatives of Iceland stated that the use of penthrite grenades will inevitably be required when Iceland resumes whaling.

Minke whaling was carried out from small vessels that transported whales to land, where they were flensed. In the case of larger whales, one land station had a licence to carry out whaling from a maximum of four vessels.

c) Greenland

The system of recording hunting in general was changed in 1993. Until then, the registration system required a local hunter from every municipality to send in information on catches to central authorities. Now all hunters - professional or otherwise - must record their own catches and send the records once a year to the Home Rule Authorities in order to obtain a *hunters licence*, without which hunting is not permitted. Licences are issued for two categories of hunters, professional and recreational.

Only professional hunters are issued a licence for hunting minke and fin whales. One licence is issued per whale, and when the whale is caught, the hunter is authorised by the municipal office, which dates and signs the licence, to sell the meat from the whale. When the meat is sold, the seller must be in possession of this authorised licence.

Under this item the Working Group discussed the amount of meat being destroyed by the penthrite grenade. Greenlandic hunters claim the loss to be larger using the grenade than it was when they used the cold harpoon. In the view of Øen this is a question of hunting and shooting techniques. The penthrite grenade is designed to explode c. 60 cm inside the whale. The meat penetrated by the harpoon after the explosion will be somewhat affected by penthrite gasses. The smaller the angle from which the whale is struck, the larger is the quantity of meat affected, as the explosion will more frequently occur in the muscle or blubber, and the harpoon will travel farther through these tissues after the strike than with a perpendicular strike. Two extremes are illustrated in Figure 1: Perpendicular strikes (A) will give the best chance of an instant kill, while angled shots (B) are more likely to result in a longer time-to-death, and thereby poorer quality and more damaged meat. (See also Section 1.2, item 3.1).

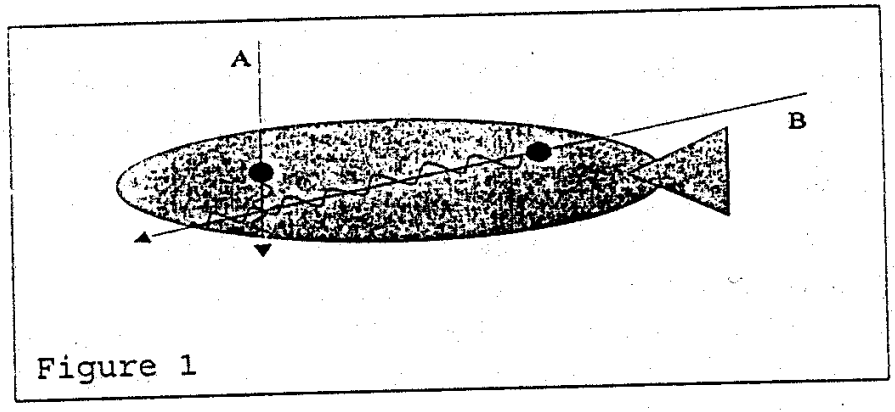

Figure 1

Furthermore, in order to minimize uncertainty regarding the precision of the shots, the weight of harpoons should be standardised as they are in the Norwegian hunt.

Øen stressed the importance of training hunters in patience as well as accuracy of shooting.

d) Faroe Islands

In the Faroes a limited-scale drive hunt of Northern bottlenose whales has been conducted for centuries and some off shore catches occured earlier this century. All in all c. 1.5 Northern bottlenose whales have been caught a year on average since 1584.

The local police - in some places the fire brigade - supervise the hunt of pilot whales. Every hunt is a public event and therefore quite transparent, from an inspection point of view.

The hunt of pilot whales is led by four *grind foremen* (and two substitutes) in each whaling bay. The local chief of police sends a report describing the details of the hunt to the Government.

The Working Group concluded item 3 by agreeing that the Secretariat should be provided with copies of legislation and the latest changes in specific regulations for whaling and sealing operations in member countries.

4. INSPECTION CHECKLIST

It was noted that the elements of the checklist had been approved by the Council.

The Working Group agreed that of cooperation in this area could be based on either: 1) the national checklists in which certain common elements should be included, or 2) a common list, to which other, national elements could be added to the extent the members find it appropriate.
It was agreed that a common list would be preferable as long as it could be created without being complicated by too many specific elements related to individual countries.

The Working Group decided that two checklists should be developed: a hunter's checklist to send to the authorities, and an inspector's checklist. It was agreed that the development of common checklists would not imply any level of inspection - the inspector's checklist would be used only to the extent inspection is actually carried out in each country.

Iceland provided a suggestion for concrete elements to be included in the hunter's checklist *(WG-IO/3/2)* and the IWC inspection checklist was also distributed at the meeting. At the second meeting of the Working Group the *Logbook for minke whaling in Norway* as well as the Greenland record form used by whalers *(Rapport om fangst af hval)* had been provided by Norway and Greenland respectively, and are contained in the Report of the 2nd Meeting of the Working Group (NAMMCO Annual Report 1995 - pp 55-65). The material was reviewed and the Working Group agreed that biological data should also be included in the lists. In this connection it was stressed that especially the hunter's checklist should be user-friendly.

It was further agreed that the Secretariat should prepare the draft lists, which would be reviewed by the Chairman and then distributed to the Working Group members and possibly discussed at a telephone meeting.

The question was raised of using genetic fingerprints as a means of monitoring whether meat that has been sold derives from a registered whale catch. The general feeling was that the techniques are not sufficiently developed to produce fingerprints that are reliable for monitoring.

It was noted that the checklists could only apply to offshore whaling with harpoon guns.

In conclusion, the Working Group agreed

- to compose two checklists - one for the license holder and one for inspectors;
- that the lists should contain at least the relevant elements required by the IWC Schedule; if elements are included in the IWC Schedule but left out of the NAMMCO checklist the reason should be explained;
- that the list provided by Iceland as well as the Greenlandic and Norwegian recording forms should provide the basis for the work of the Secretariat;
- that data relevant for scientific use should be included on the lists, and that therefore the checklists should be submitted to the Scientific Committee for additional comments.

5. DEVELOPMENT OF A RECIPROCAL OBSERVER'S SCHEME

At its 5th Meeting, the Council agreed to the recommendation from the Management Committee to request the Working Group "to consider the details of a reciprocal observer scheme between NAMMCO member countries and further develop these". The basis for the discussion in the Management Committee was the recommendation from the report of the Working Group's meeting in Copenhagen, 8 November 1994.

Iceland distributed WG-IO and also provided WG-IO/3/4.

Iceland pointed out that the draft agreement was not put forward as a proposal but merely as a basis for discussion.

Greenland distributed NAFO/FC Doc. 95/17 and NAFO/FC Doc. 95/19. Greenland noted that NAMMCO measures should not be less stringent than those agreed on in NAFO.

The Working Group reviewed the material and discussed the Icelandic draft in detail. The following comments were made:

ad Art. 1
It was agreed that the agreement should also cover vessels on which whales are not flensed.

ad Art. 2
It was agreed that either the "observer state" should decide which vessels are to be observed, or that the appointment of observers to vessels should be organized through the NAMMCO Secretariat.

The question of financing the scheme was raised again, and it was agreed that the costs of observers should not be paid by the flag state. The observer must remain independent of the flag state. The question was also raised as to whether NAMMCO should finance the scheme or whether the observing country should cover the costs for the individual observer, and further, whether a system by which NAMMCO finances the scheme would result in a situation where the observer and the observed vessel were of the same nationality. No conclusions were reached at the meeting on either question.

It was also noted that when using international observers a communication problem might arise from the fact that not all of NAMMCO member citizens speak and understand more than one other Nordic language or English very well.

The Working Group agreed that it would be up to the individual member country to determine the extent of its participation in the scheme.

The question was raised whether the flag state, the owner of the vessel/the captain on board or neither should have the option to reject specific persons as observers. The question was not resolved, but it was noted that the scheme would be weakened if this option existed.

ad Art. 3
Greenland suggested that the task of the observer should be to oversee that the national regulations of the flag state in question are followed. The Secretariat should be able to provide observers with guidance on national regulations and to give other forms of support. The Working Group agreed that the Secretariat should prepare a proposal for a common observer scheme including details of the role and function of international observers. The proposal should be based on the Icelandic draft (Appendix 4), and the NAFO, IWC and national regulations should also be taken into consideration.

6. ANY OTHER BUSINESS

Øen corrected the wording of a sentence in the Report of the 2nd Meeting of the Working Group in Copenhagen, 8 November 1994. The first sentence of the 8th paragraph under item 4.1 should read as follows: *"In summing up ... in Greenland it was obligatory to have harpoon guns checked, ..."*.

7. ADOPTION OF REPORT

The Working Group agreed that the draft report of the meeting should be circulated. It was adopted at the Fourth Meeting of the Working Group, 22 January 1996.

LIST OF DOCUMENTS

WG-IO/3/1	Agenda
WG-IO/3/2	Comments for the Working Group Meeting on Inspection and Observation to be held in Copenhagen on 3rd November 1995 - By Iceland.
WG-IO/3/3	Agreement between the Governments of the Republic of Iceland and of the Kingdom of Spain concerning an international observer scheme for land-based whaling stations in the North Atlantic area.
WG-IO/3/4	WG-IO Working Paper on a reciprocal NAMMCO Observer's Scheme.

REFERENCES

Government of Iceland, 1949. *Whaling Act, No. 26, May 3, 1949.*

International Whaling Commission, 1991. *International Convention for the Regulation of Whaling - Schedule, Chapter VI.*

Northwest Atlantic Fisheries Organization, 1995. Pilot Project for Observers and Satellite Tracking, *NAFO/FC Doc. 95/17.*

Northwest Atlantic Fisheries Organization, 1995. Infringements, *NAFO/FC Doc. 95/19.*

North Atlantic Marine Mammal Commission, 1995. Report of the Fourth Meeting of the Management Committee, Nuuk, February 22 1995, Annex 1, Appendix 3. In: *NAMMCO Annual Report 1995*.

ANNUAL REPORT
1996

Report of the Scientific Committee

North Atlantic Marine Mammal Commission

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PREFACE

The North Atlantic Marine Mammal Commission was established in 1992 by an Agreement signed in Nuuk, Greenland on the 9th of April between the Faroe Islands, Greenland, Iceland and Norway. The objective of the Commission, as stated in the Agreement, is to "... contribute through regional consultation and cooperation, to the conservation, rational management and study of marine mammals in the North Atlantic."

The Council, which is the decision-making body of the Commission, held its inaugural meeting in Tórshavn, Faroe Islands, 10-11 September 1992 (NAMMCO/1), and has convened five times since: in Tromsø, Norway 19-20 January 1993 (NAMMCO/2); Reykjavik, Iceland, 1-2 July 1993 (NAMMCO/3); Tromsø, Norway 24-25 February 1994 (NAMMCO/4); Nuuk, Greenland, 21-23 February 1995 (NAMMCO/5); and most recently in Tromsø, Norway 27-28 February 1996 (NAMMCO/6).

The present volume contains proceedings from NAMMCO/6 - the Sixth Meeting of the Council - which was held at the Radisson SAS Hotel in Tromsø. Norway, 27-29 March 1996 (Section 1), as well as the reports of the 1996 meetings of the Management Committee (Section 2) and the Scientific Committee (Section 3), which presented their conclusions to the Council at its Sixth Meeting. Section 3 also contains Scientific Committee Working Group reports which were presented to the 4th meeting of the Scientific Committee in Tórshavn, 5-9 February 1996, while annual National Progress Reports on marine research in memebr countries are contained in Section 4.

The reports contained in this volume are presented here in their final edited form and thereby replace any preliminary versions which have been circulated prior to this publication.

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CONTENTS

3.1 REPORT OF THE SCIENTIFIC COMMITTEE

Fourth Meeting. Tórshavn, Faroe Islands, 5-9 February 1996

The Scientific Committee of NAMMCO met in the Nordic House, Tórshavn, Faroe Islands from 5 to 9 February 1996. The meeting was attended by members of the Scientific Committee as well as a number of invited experts. A list of participants is contained in Appendix 1.

1-3 OPENING PROCEDURES

The Chairman, Tore Haug, welcomed members and the invited participants to the meeting, including the new member for Norway, Arne Bjørge, who replaced Arnoldus Schytte Blix. The Chairman asked for clarification of current membership from other member countries. Heide-Jørgensen explained that a request had been made to the Greenland authorities to replace Finn Larsen, who was no longer in a position to continue as a member of the Committee. Bloch reported that a third member for the Faroes would soon be appointed. Iceland was represented at the present meeting by two of the three members, all of whom remained as originally appointed.

The Chairman referred to the most recent requests for advice forwarded from the Council which would be the main focus of the present meeting, in particular the requests for review and assessment of ringed seals (*Phoca hispida*) and grey seals (*Halichoerus grypus*). The Chairman welcomed the participation of eight external experts who had been invited by the Scientific Committee to assist in the work of the Committee on these matters. The Committee agreed to establish two separate *ad hoc* Working Groups under the chairmanship of M.P.Heide-Jørgensen (Greenland) for ringed seals and A.Bjørge (Norway) for grey seals, which met simultaneously during the Committee meeting (see below under 8.5 and 8.6).

The Committee was informed of the practical arrangements for the meeting, which included a reception hosted by the Nordic House and a dinner at the National Art Gallery of the Faroes in Tórshavn hosted by the Faroese Museum of Natural History.

The revised Agenda, as contained in Appendix 2, was adopted. The Secretary, Kate Sanderson, was appointed as rapporteur.

4. REVIEW OF AVAILABLE DOCUMENTS

Documents presented to the meeting, as listed under item 15, were reviewed. These included National Progress Reports for 1995 from the Faroes, Iceland and Norway, and for 1994 from Greenland (SC/4/NPR - F,G,I & N).

5. COOPERATION WITH OTHER ORGANISATIONS

5.1 ICES

The Chairman referred to document SC/4/14, which listed the requests for advice which have been forwarded by the Council to ICES (a full list of requests for scientific advice, including those forwarded to ICES, is contained in Appendix 3). It was noted that no final answers were yet available from ICES, as these requests were still being addressed in the relevant ICES Study or Working Groups. The Chairman further noted the broad scope of some of these requests and the associated long-term research requirements required to provide comprehensive responses to questions, in particular those regarding contaminants in marine mammals and multi-species approaches.

The Secretary informed the Committee of her recent meeting at ICES headquarters, where information was exchanged and NAMMCO/ICES relations were discussed with the ICES General Secretary, Fisheries Secretary and Environment Secretary. Although formal NAMMCO/ICES relations were normally conducted at Council level, some points had been discussed which were also of interest to the Scientific Committee.

Amongst these was the question of the availability of reports from ICES Working and Study Groups. According to ICES procedure, such reports were not normally available until they had been vetted by the appropriate ICES Advisory Committee. The Scientific Committee noted, however, the importance of having reports from ICES marine mammal-related Study and Working Groups available for information and reference in its own work, and that it should be possible to include such an arrangement for prior availability of these reports in any future formal agreement between NAMMCO and ICES.

With respect to work on developing multi-species models, it was noted that the inclusion of marine mammals in multi-species models was relatively new. It was suggested that greater input from scientists working on marine mammals should be encouraged in the ICES Multi-Species Working Group, where significant work had already been conducted on fish species, such as Atlantic herring and capelin, which were also prey items for certain marine mammal stocks.

The Secretary also reported to the Committee on information received from the ICES Environment Secretary regarding recent ICES involvement in a Working Group on Concentrations, Trends and Effects of Substances in the Marine Environment (SIME) under the Oslo Paris Conventions (OSPAR). ICES would be assisting in addressing the question of whether high concentrations of PCBs in marine mammals disturb enzyme systems. In this connection, the Working Group had identified the outcome of NAMMCO's International Conference on Marine Mammals and the Marine Environment as a source of data on concentrations as well as the development of assessment criteria (see also below under item 14).

5.2 NAFO

Relations with NAFO were largely associated with the request forwarded to both ICES and NAFO on harp and hooded seals, and the ongoing work of the Joint ICES/NAFO Working Group on these species (see below under 8.3 and 8.4).

NAFO and ICES co-sponsored the Symposium on the Role of Marine Mammals in the Ecosystem which was held in Dartmouth, Canada, 6-8 September 1995 (see also below under item 7). The symposium was co-convened by Jóhann Sigurjónsson from Iceland and G.B. Stenson from Canada, and had also been attended by a number of other NAMMCO Scientific Committee members as well as the Secretary.

5.3 IWC

The Secretary informed the Committee of a request received from the Secretary of the IWC on behalf of the IWC Scientific Committee for a copy of the Report of the Working Group on Northern Bottlenose Whales, which met in Copenhagen during the third meeting of the Scientific Committee in a joint session with the Working Group on Management Procedures. The report of the Working Group was contained as an annex to the report of the Scientific Committee, and this was recently published in the NAMMCO Annual Report for 1995. The Annual Report has now been distributed to inter-governmental organisations with whom NAMMCO regularly exchanges information, including the IWC.

5.4 ASCOBANS

The Chairman referred to a letter received from the Secretary of ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas) requesting cooperation between NAMMCO and ASCOBANS on exchange of survey data, such as was now available from the 1994 SCANS survey, and future cooperation in survey planning, as well as scientific collaboration on a project to determine the population structure of harbour porpoise in the North Atlantic. It was further suggested that pooling of information on by-catch reporting would also be useful. The letter, together with a copy of the proposal for the harbour porpoise project, were circulated as SC/4/5.

Bjørge, who is a co-author of the harbour porpoise research proposal, informed the Committee that the harbour porpoise population structure project had been endorsed by both the IWC Scientific Committee and ICES. The project was motivated by the fact that harbour porpoises were vulnerable to by-catches in many areas, but there was a need to facilitate greater collaboration in the exchange of data, in particular in the collection of tissue samples, in order to be able to take the project further.

There was general agreement in the Scientific Committee that such collaboration with ASCOBANS would be a positive development. The Scientific Committee noted that considerable data on harbour porpoise was available in Greenland, Iceland and the Faroe Islands, including tissue samples and information on distribution. Sightings data for harbour porpoise were also available from NASS surveys, including NASS-95.

The Scientific Committee agreed to **recommend** work on the harbour porpoise under NAMMCO (see further under item 13.1 - Future work plans - Scientific Committee).

The Scientific Committee noted the importance of obtaining data on the level of by-catches for population assessments, and agreed to **recommend** to member countries to establish a system for reporting data on by-catches.

5.5 Other

In response to an enquiry regarding last year's recommendation to establish formal relations with the Canada-Greenland Joint Commission for the Conservation and Management of Narwhal and Beluga, the Secretary reported that official contact had now been established, initially as an agreement between Commissions to exchange reports, including the reports of the Commissions' respective scientific groups.

With respect to the establishment of technical working links with IUCN through its Species Conservation Unit and the Chairs of the Cetacean and Seal Specialist Groups, as reported at the last meeting, the Secretary informed the Committee that these relations had yet to be further developed, but were a priority. In this connection it was also noted that some members of the Scientific Committee were also members of the Cetacean Specialist Group of the IUCN Species Survival Commission.

6. UPDATE OF LIST OF PRIORITY SPECIES

At the last meeting of the Scientific Committee, it was agreed that a process of revision and update of the List of Priority Species should be undertaken prior to the present meeting, coordinated through the Secretariat in consultation with the Chairman, with particular attention to updating and screening catch figures for inclusion in a revised List.

The Chairman noted that this work had not yet been undertaken and urged that the List of Priority Species be updated in time for the next meeting of the Scientific Committee in 1997. It was noted that a considerable amount of new data was now available for most of the priority species, including those which have been the subject of recent comprehensive assessments by the Scientific Committee. The results of NASS-95 would also provide updated abundance estimates for several cetacean stocks, which should also be incorporated into a revised List.

The Chairman would propose a division of species among the relevant Scientific Committee members, who would then be responsible for updating information for the List in time for the next meeting. This work would be initiated and coordinated by correspondence through the Secretariat.

7. ROLE OF MARINE MAMMALS IN THE MARINE ECOSYSTEM

7.1 Update on progress

The Chairman noted that there had been a growing research focus on the role of marine mammals in the ecosystem in recent years. In particular since its last meeting, a considerable amount of new information and published papers had become available.

These included the published proceedings of the International Symposium on the Biology of Marine Mammals in the Northeast Atlantic (Blix et al. 1995). The Chairman noted that many of the papers in this volume had resulted from the Norwegian marine mammal research programme and reflected the major focus on research such as feeding ecology related to the role of marine mammals in the ecosystem.

Sigurjónsson reported on the NAFO/ICES Symposium on the Role of Marine Mammals in the Ecosystem, held in Dartmouth, Canada, 6-8 September 1995 with G.B. Stenson (Canada) and himself as co-convenors. The conveners' report was distributed as document SC/4/6. The symposium was attended by 113 scientists from 16 countries and a total of 30 oral and 21 poster contributions were presented. The three day symposium was divided into four theme sessions that dealt with: 1) Environmental, spatial and temporal influences of life histories; 2) Foraging strategies and energetic considerations in the diet; 3) Marine mammal-fisheries interactions; and 4) Theoretical considerations on the role of apex predators and multi species models.

A variety of studies related to the main themes of the conference and the discussions which followed centred around modelling of the marine mammal component of the ecosystem and new techniques recently developed that may prove important in the future to improve the understanding of the role of marine mammals in the ecosystem. It was emphasized that it was necessary to include scientists from various disciplines to study a variety of biological and physical components of importance to marine mammals. The temporal/spatial scale at which marine mammals are investigated is not always compatible with the scale at which information from other disciplines is available. This is a matter of concern and it is therefore important that studies on marine mammals are planned in cooperation with studies in other disciplines. Finally, it was noted that in many cases it may not be possible to quantify the interactions precisely. Models incorporating uncertainties in input parameters must therefore be robust but sensitive enough to identify the magnitude and direction of competitive interactions within the system.

Although the symposium fell short in resolving all the complicated questions scientists are facing on the role of marine mammals, it provided a very fruitful forum for exchanges of views. Some of the results reported to the conference are reflected under items 8.3 and 8.4 of this report, while others will contribute to future deliberations of the Scientific Committee on aspects related to the ecological role of marine mammals, including their interactions with fisheries.

7.2 Future work

The Chairman noted that the question of the role of marine mammals in the ecosystem was a vast field of science. He suggested that if this item was to continue to be included on the agenda of the Scientific Committee in the future, then it may be preferable to consider more specific aspects related to the field.

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

8.1 Long-finned pilot whales

8.1.1 Update on progress

It was reported that the ICES Study Group on Long-finned Pilot Whales, which was dealing with matters related to NAMMCO's request for advice on this species, had postponed its scheduled 1995 meeting until 22 - 26 April 1996 in Cambridge.

Desportes and Bloch informed the Committee of progress in finalising the outstanding work required for the Study Group's assessments, as had been identified at the last meeting of the Study Group in Copenhagen in September 1993. It was noted that new sightings data from NASS-95 would also be analysed in time for the Study Group meeting.

The Committee discussed at some length matters related to participation in the ICES Study Group on Long-finned Pilot Whales, in particular the question of funding such participation. After informal discussions with the Chairman of the Scientific Committee and the Chairman of the ICES Study Group in September concerning the importance of ensuring full participation in the next meeting of the Study Group, the Secretary had informed Bloch in writing that travel funding for some Study Group participants would be possible through NAMMCO.

Heide-Jørgensen noted that the Committee must be careful not to set a precedent in the case of the ICES Study Group for funding of nationally-appointed scientists to attend Working Group meetings.

In this connection it was also noted that at its 5th meeting in Nuuk in February 1995, the Council had agreed to the general principle that scientists appointed by member countries as members of Scientific Committee Working Groups should be funded by their respective governments.

Øien noted that although this was meant as a general rule, it was important for the ICES Study Group to finish its work, and that it should be possible for NAMMCO to fund the participation of Study Group members who were not associated with research projects otherwise funded by NAMMCO member countries. Desportes pointed out that all members of ICES Study and Working Groups, regardless of their national affiliations, must be appointed by national delegates of ICES, and that this could not be regarded as equivalent to national members of NAMMCO Scientific Committee Working Groups.

Sigurjónsson suggested that three forms of participation could be defined: 1) Scientific Committee members; 2) Working Group members appointed by member governments to

Working Groups; and 3) Working Group members agreed upon by the NAMMCO Scientific Committee.

The Committee agreed that participants in categories 1) and 2) above should not be funded through NAMMCO.

Based on this, the Scientific Committee **agreed** that NAMMCO should, if required, finance the travel costs to the April meeting of the ICES Study Group on Long-finned Pilot Whales for certain scientists whose participation was identified by the Scientific Committee as being important to the successful completion of the Study Group's work.

Further, the Scientific Committee also agreed to **recommend** to all NAMMCO member governments to ensure that the necessary scientific expertise is available to the ICES Study Group on Long-finned Pilot Whales.

8.1.2 Future work

The Scientific Committee expressed its hope that the forthcoming meeting of the ICES Study Group on Long-finned Pilot Whales would be its final meeting, and that its report would subsequently provide an adequate basis for addressing the Council's request for advice on this species. The Scientific Committee would return to this again at its next meeting.

8.2 Killer whales

8.2.1 Update on progress

Haug reported that studies were continuing in Norway on killer whale feeding ecology as well as work on sound patterns and photo-identification There was no final data available at present as these studies were still not complete.

Sigurjónsson reported that long-term photo-identification studies of killer whales off Iceland were continuing, and that there were plans to conduct satellite tracking in late 1996.

New sightings data had also been obtained from sightings surveys in the summer of 1995 (NASS-95).

8.2.2 Future work

The Committee noted that no advice could be provided until results from ongoing research on this species were available and data from the most recent sightings surveys had been analysed. The Committee agreed to review further progress on killer whales at its next meeting.

8.3 Harp seals

8.3.1 Update on progress

Øien reported that the Joint ICES/NAFO Working Group on Harp and Hooded Seals had met in Dartmouth, Canada, 5-9 June 1995. The terms of reference as suggested by NAFO were to assess the harp and hooded seal stocks in the Northwest Atlantic as well as the impact of environmental changes and ecological interactions for all Atlantic stocks. NAMMCO's request for assessment advice on harp seals in the White and Barents Seas, and of harp and hooded seals in the Greenland Sea was reiterated to ICES in May and the Working Group also reviewed available information on these stocks.

Satellite tagging data have provided new details on distribution and migration of harp seals, and DNA studies suggest that east and west Atlantic stocks can be discerned. These data do not, however, provide any reason for changing current stock boundaries for harp seals.

At its first meeting in January 1993, the NAMMCO Management Committee recommended to the Council that the Scientific Committee assess the effects of recent environmental changes or changes in the food supply and possible interactions with other living marine resources of harp seals in the White and Barents Seas, and harp and hooded seals in the Greenland Sea and the Northwest Atlantic (NAMMCO, 1993, p. 64). The Scientific Committee noted that the Joint ICES/NAFO Working Group on Harp and Hooded Seals, at its meeting in Dartmouth, Canada, in June 1995, had discussed questions concerning the ecology of seal stocks (SC/4/7a). Further discussions of harp and hooded seal ecology were held during a special meeting following the ICES/NAFO Symposium on the Role of Marine Mammals in the Marine Ecosystem in Dartmouth, Canada, in September 1995 (SC/4/7b).

8.3.1.1 Northwest Atlantic

Stock sizes and trends

As an illustration of the catch levels in the North Atlantic since 1990, harp seal catches in 1994 were (rounded numbers): Landsmen's catches in the southeastern Canada - 61,000; Greenland catches - 45-55,000; the Greenland Sea stock - 8,000; the White and Barents Seas stock - 42,000.

Total harp seal pup production in the Northwest Atlantic was estimated to a total of 702,900 (SE= 63,600) in 1994 using a combination of photographic and visual aerial surveys. This estimate is significantly higher than the 1990 estimate of 578,000 (SE= 38,000) obtained by using similar survey techniques. A population model using a series of pup production estimates, catch-at-age data and age-specific pregnancy rates, was fitted. The model estimated the total population in 1994 to be 4.8 million individuals when pup mortality was set equal to seals older than 1 year, and 4.5 million harp seals when a pup mortality three times that of older seals was applied. Since 1990 the population has been growing at approximately 5% per year. The Working Group accepted the population model as the best available at the time, and based its replacement yield calculations on that model. Using the most recent catch (1994) as basis for the harvesting regime and a pup mortality equal to seals older than 1 year, a replacement yield of 287,000 harp seals was calculated, and the 1996 population was estimated to be 5.1 million.

Ecological considerations

The seasonal distribution and abundance of northwest Atlantic harp seals is not fully known, and it has been necessary to use assumptions to scale diet composition data in order to estimate food consumption in specific areas. It was noted that the species composition and seasonal variations in the diet of the seals is fairly well known in some areas (coastal areas of Newfoundland and West Greenland), not as well documented in others (Gulf of St. Lawrence, offshore Newfoundland, Arctic Canada), and virtually unknown for offshore areas of Davis Strait-Baffin Bay.

The dominant fish species in the food of northwest Atlantic harp seals are capelin and polar cod. A number of other fish species (e.g. Atlantic cod, herring and redfish) and invertebrates (squid, shrimps and pelagic crustaceans) have been found in seal stomachs, but they appear to play a minor role in the overall diet. The majority of fish consumed are 10-20 cm in length.

It was noted that consumption of Atlantic cod, capelin and polar cod had been estimated using a simple energetics model. The total estimated prey consumed by 4.8 million harp seals in the northwest Atlantic in 1994 was 6.9 million tons. Almost half (46%) of the prey consumed were estimated to come from Arctic waters while 40% came from waters off eastern Newfoundland and the remaining 14% from the Gulf of St. Lawrence. Using a diet derived from the average of different diet estimates between 1982 and 1993, the annual estimated consumption by harp seal was 1.2 million tons (95% CI 750,000-1.7 million) of polar cod, 620,000 tons (95% CI 288,000-1.0 million) of capelin and 88,000 tons (95% CI 45,000-140,000) of Atlantic cod in eastern Newfoundland waters. In the Gulf of St. Lawrence they consumed 445,000 tons (95% CI 208,000-727,000) of capelin and 54,000 tons (95% CI 14,000-102,000) of Atlantic cod. These estimates should therefore be considered as preliminary and used with caution.

It was noted that a change had occurred in the seasonal distribution of northwest Atlantic harp seals since the late 1980s. In recent years seals have been arriving in Newfoundland waters earlier, and staying for a longer period of time. In addition, higher numbers have been sighted in offshore areas and in areas not traditionally used. There is also evidence that seals are remaining longer in Greenland waters. Concurrent with these changes, there has been a decline in the reproductive potential and body condition of the harp seals. The latter observations are likely related to the increase in abundance of seals and/or changes in prey availability. The changes in distribution may be due directly to the extensive ice cover observed during the early 1990s, increases in range associated with larger populations, or indirectly due to changes in prey availability. It was noted that the distribution and abundance of capelin and polar cod had changed markedly since the mid 1980s. During the same period, changes in relative importance of the two species in the seal diet were observed. Decreases in water temperatures may have contributed to the changes in prey distribution.

8.3.1.2 Greenland Sea

Stock sizes and trends

Mark-recapture updates of pup production in the Greenland Sea harp seal stock for ten cohorts over the period 1977-1991 were similar to those presented earlier with the exception that the 1991 estimate was increased by about 10% to 65,100 (95% conf. interval 53,600-76,800). Since the revised estimate was within the range of values investigated at the 1993 meeting of the Joint Working Group, it was not felt that the findings would make any change to the 1993 assessments.

Ecological considerations

No information is available concerning the feeding ecology of Greenland Sea harp seals.

8.3.1.3 Barents and White Sea

Stock sizes and trends

For the Barents and White Sea stock there was no new information on stock size. Harp seals tagged as pups in the White Sea have been recaptured in the northern Barents Sea, the Greenland Sea moulting patches, the eastern and southern coasts of Greenland and along the Norwegian coast from Finnmark in the north to Rogaland in the south. The age composition in Norwegian catches of moulting harp seals in the Barents Sea continues to show an under-representation of the year classes 1986, 1987 and 1988.

There seems to have been poor recruitment to the White and Barents Seas stock of harp seals in the late 1980s. This is evident both from the absence of certain year classes in the commercial catches, reduced individual growth rates, increased age at maturity and reduced female fecundity. It was acknowledged that these findings may be related to overall trends in the availability of food resources in the area.

Ecological considerations

Also with reference to the White and Barents Sea harp seal stock, substantial changes that had occurred in this ecosystem during the past 30 years were emphasised. The collapse of two important stocks of potential prey species (Norwegian spring spawning herring in the early 1970s and Barents Sea capelin in the mid-1980s) is particularly likely to have had an impact on the feeding habits of harp seals.

The observed seasonal variations in the condition of adult seals indicate that late summer and autumn, when the stock is usually abundant in the northern parts of the Barents Sea area, are the most intensive feeding periods. The pelagic amphipod *Parathemisto libellula* appears to be the dominant prey from September to mid October when a shift to fish seems to occur. Capelin, to a lesser extent polar cod, are major prey during the autumn. In winter and spring the harp seal stock is usually concentrated in the southeastern Barents Sea and the White Sea. Herring has been found to be the main harp seal prey in these areas in late winter (February). During breeding (March) and moult (April-May) the stores of blubber decrease rapidly, indicating restricted food intake at this time.

Changes in White and Barents Sea harp seal migration patterns have resulted in invasions of seals to coastal areas of northern Norway. These invasions have persisted throughout the period 1978-1995, but with variable intensity. Harp seals sampled in the most intensive invasion years (1987 and 1988) were in poorer condition than harp seals taken in the same

period in more normal years. The collapse of the Barents Sea capelin occurred in the mid 1980s. Given the fact that capelin is reported as an important harp seal food item during late autumn and winter, it was considered likely that the seals might have faced a food shortage in late autumn and early winter. The low stock sizes of capelin as well as the herring in the Barents Sea in the mid 1980s, combined with increasing numbers of seals within the population, may have been important factors underlying the particularly large seal invasions in 1986-1988. Observations of effects that could indicate density-dependent responses within the population may also support the hypothesis that food shortage has been a factor contributing to the seal invasions.

8.3.2 Future work

The Scientific Committee noted the recommendations for future work given by the Joint ICES/NAFO Working Group and **endorsed** these. The Scientific Committee points especially to the need for detailed information on design and techniques used for aerial surveys of harp seals in the White Sea in order to fully evaluate the status of that stock. It is important that age samples are collected from moulting seal catches from the southeastern Barents Sea. These samples are necessary to be able to utilise recaptures of tagged animals for estimating harp seal pup production in the White and Barents Seas based on a mark-recapture estimator. Given the present lack of data, the Scientific Committee pointed to the need for ecological studies of Greenland Sea harp seals.

8.4 Hooded seals

8.4.1 Update on progress

Øien reported that the Joint ICES/NAFO Working Group on Harp and Hooded Seal had reviewed information on three recaptures of hooded seals in the Russian moulting catches north of Jan Mayen, which had been tagged at the Front and in the Davis Strait. The recaptured hoods were 7-9 years old. This might indicate that some hooded seals from the western stock migrate to a moulting region which was previously thought to be used by Greenland Sea hoods only. Despite this, it was concluded that present evidence suggests that the majority of Northwest Atlantic hooded seals moult in the Denmark Strait.

As an illustration of catch levels in the North Atlantic since 1990, hooded seal catches in 1994 were: In southeastern Canada 221; in Greenland around 7,000; the Greenland Sea stock 4,744.

8.4.1.1 Northwest Atlantic

Stock sizes and trends

A minimum pup production estimate of 84,000 (SE= 12,600) for the Northwest Atlantic stock based on a survey conducted in 1990 was available. Illustrative replacement yields were calculated from a Leslie matrix model, but these replacement yields are heavily dependent on choices of natural mortality (both for pups and 1 year and older) and harvest regimes and should therefore be used with caution. For the point estimate of 84,000 pups born, a natural mortality of 0.13 and a pup mortality three times that of 1 year and older seals, the replacement yield for a harvest regime of pups only is 22,900 and for a harvest regime of 1 year and older only, 11,800 animals.

The general distribution and migration patterns of northwest Atlantic hooded seals is reasonably well known, while seasonal abundance in specific geographic areas is not known.

Ecological considerations

It was acknowledged that information about hooded seal diet is rather restricted. The limited information available suggests that some demersal and benthic species, such as Greenland halibut, redfish, Atlantic cod, wolffish and pandalid shrimps, may be important components of the diet in some seasons and/or areas. A preliminary analysis of the consumption by hooded seals in the Gulf of St. Lawrence indicated that their role as predators on some commercially important fish species (e.g. Greenland halibut) may be important.

8.4.1.2 Greenland Sea

For the Greenland Sea stock of hooded seals, no estimate of stock size nor pup production is available. Nor is information available concerning the feeding ecology of Greenland Sea hooded seals.

8.4.2 Future work

The Scientific Committee noted the recommendations for future work given by the Joint ICES/NAFO Working Group and **endorsed** these. The Scientific Committee points especially to the need for an abundance estimate of the Greenland Sea hooded seal stock, as well as further studies on ecology.

8.5 Ringed seals

8.5.1 Review of status

The Chairman referred to the Council's request for advice on ringed seals which had been forwarded from the Management Committee at the Fifth Meeting of the Council in Nuuk, February 1995. The Scientific Committee had been requested to provide:

> "...advice 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" (*NAMMCO Annual Report 1995*, p.23).

The Scientific Committee had contracted relevant expertise in Canada, Greenland, Norway and Russia to ensure that a proper response to these questions could be provided. An *ad hoc* Working Group on Ringed Seals was convened under the Chairmanship of Mads Peter Heide-Jørgensen (Greenland), who presented the Working Group's report to the Scientific Committee. The full report of the Working Group is contained in Section 3.2.

8.5.2. Advice on:

i) Stock identity

The ringed seal has a circumpolar distribution in Arctic waters. No genetic studies have been conducted and there is no conclusive evidence of different stocks in the Arctic. However two lines of evidence for stock identity were discussed:

a) Tagging studies in Greenland suggest a large scale mixing of especially young female ringed seals within the Baffin Bay;
b) Various studies indicate that the pack ice habitats in Baffin Bay, Greenland Sea, Barents Sea and western Kara Sea are inhabited by large numbers of ringed seals and that some breeding probably takes place in these areas. However, the discreteness of these pack ice seals was uncertain.

Based mainly on the probability of regular exchange of ringed seals, three provisional geographical areas for assessing the status of ringed seals were identified (see Section 3.2, Figure 1):

Area 1: Baffin Bay, Davis Strait, eastern Hudson Strait, Labrador Sea, Lancaster, Jones and Smith sounds.
Area 2: Greenland Sea, east coast of Greenland, west coast of Svalbard.
Area 3: Barents and Kara seas.

ii) Abundance in each stock area

Abundance estimates are only available for small parts of Area 1. The Scientific Committee nevertheless found it useful to extrapolate densities of hauled-out ringed seals for different ice types/habitats to the overall distribution of these ice types. The abundance estimates were further corrected for seals missed during the surveys. A crude estimate of 1,300,000 ringed seals was thus derived for Area 1. No quantitative data on ringed seal abundance could be applied to the two other areas.

Another approach based on polar bear predation on ringed seals was attempted in Area 1 (Section 3.2, Figure 2). In this area an estimate of 4,650 polar bears is available and different studies suggest that each polar bear needs the energy equivalent of 40 ringed seals per year. Acknowledging that bears eat other species in addition to ringed seals, it was assumed that 30-36 ringed seals are taken annually by each bear and that other predators take one fifth as many ringed seals as are taken by the polar bears. Available estimates of survival and mortality rates in a stationary population of ringed seals suggest that a standing ringed seal population needed to sustain the predation would be between 700,000 and 1,070,000. Removals by humans would require an additional 420,000 to 530,000 ringed seals for the population to remain stable. This exercise suggested a total ringed seal abundance of between 1.1 and 1.6 million.

iii) Effects on stocks of present removals in each stock area

Compilations of reported catches from Canada, Greenland and Russia were examined. It was agreed that the low catches known from East Greenland, Svalbard and Russia would not raise concerns for the status of the seal populations in Areas 2 and 3, since they were likely to be taken from a wide geographical area producing large numbers of ringed seals.

The catches in Area 1 needed to be corrected for losses in different types of hunting and for under-reporting. A crudely corrected estimate of removals in Greenland based on published loss rates and information on the distribution of hunting methods was provided. The revised estimate for West Greenland was 63,311 seals on average per year. To this should be added

some amount for under-reporting and an estimate of Canadian removals. No rigorous catch statistics were available from Canada, but it was estimated that approximately 20,000 - 30,000 ringed seals were taken annually in the Canadian settlements in Area 1. Thus, an overall annual catch figure of roughly 100,000 ringed seals in Area 1 was applied. This is roughly 6-9% of the estimated abundance which is close to the published estimates of sustainable yield (SY). Three lines of evidence reinforce the conclusion that catches are probably sustainable:

1) The annual removals of 60-70,000 ringed seals in West Greenland have been maintained for more than a century. Also, much higher catches were made in Canada during the 1960s - early 1980s than have been made in recent years, and the subsequent decline was apparently due to the collapse of the sealskin market.

2) Published estimates of SY all assume catch compositions that are proportional to the distribution of age and sex classes in the population. Catches in West Greenland and Canada consistently have a high proportion of young seals and male seals. This should increase the SY.

3) The very wide and uniform distribution of ringed seals, set against the hunting which is at present conducted on a local level, tends to protect the species against wide-scale over-exploitation.

Even though the present removals are thought to be sustainable, the large harvest in Area 1 warrants further monitoring of removals (including losses) as well as the monitoring of developments in hunting effort and the trade in hunting products.

iv) Effects of recent environmental changes (i.e. disturbance, pollution)

Although human activities are increasing in the Arctic, there was little evidence of effects of disturbances at the population level. The most significant effects may come from collisions by ice-breaking vessels operating in areas with ringed seal birth lairs.

Regarding chemical pollution and ringed seals the Scientific Committee was aware of some available information, almost all of it on pollutant levels in body tissues. Except for some inconclusive experimental work on the effects of exposure to oil, no studies of the effects of chemical contamination on ringed seals have been published. Since ringed seals and other components of the Arctic ecosystem are subject to a global assessment that will be available within the next 1-2 years, it was recommended that NAMMCO should exchange information with organisations that are presently assessing the status of the Arctic environment, such as the Arctic Monitoring and Assessment Program (AMAP).

v) Effects of changes in food supply

No information was available about the effects of changes in food supply on ringed seal populations. The effects of fisheries were considered, but since ringed seals mainly feed on species that are not presently subject to commercial exploitation, no direct conflict was identified.

vi) Effects of interactions with other living marine resources

The most obvious interaction with other marine living resources is the predation by polar bears on ringed seals. It was calculated that a polar bear would require the energy equivalent of approximately 40 ringed seals per year. Ringed seals are, however, not the only prey of polar bears, and information on the year-round diet composition of polar bears is far from complete in most areas. Nevertheless, for Area 1, an attempt was made to calculate the predation by polar bears on ringed seals (see item *ii* above).

8.5.3. Future work

The Scientific Committee agreed that the assessment of the status of ringed seals in the North Atlantic has taken into account all relevant information that is presently available, and that no further advice on ringed seals would be possible at this stage. In view of some major gaps in knowledge about ringed seals and their exploitation, the Scientific Committee made the following **recommendations**:

i) 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.

ii) 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.

8.6 Grey seals

The Chairman referred to the Council's request to the Scientific Committee made at its Fifth Meeting in Nuuk, February 1995 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 Annual Report 1995*, p. 23).

The Scientific Committee agreed to establish an *ad hoc* Working Group on Grey Seals, under the Chairmanship of Arne Bjørge (Norway), to address this request. External experts from Canada, Iceland and the UK were invited to assist with the review and assessment of this species. The full report of the *ad hoc* Working Group on Grey Seals is contained in Section 3.3.

8.6.1 Review and assessment

i) Abundance and stock levels in the North Atlantic

Grey seals were at one time abundant and widely distributed along the Canadian east coast. Extensive hunting by Europeans resulted in the depletion of the grey seal population by the mid-1800s. By the early 1900s grey seals were still considered to be widely distributed, but there was no particular hunt for them owing to their small numbers. During the 1950s the grey seal in eastern Canada was considered to be uncommon.

Grey seal pup production on Sable Island has been determined by complete enumeration between 1977 and 1990. Counts on Sable Island indicate that pup production has increased from 2,181 pups in 1977 to 9,712 in 1989 at an exponential rate of increase of 12.6% per year. Non-Sable Island pup production estimates have been determined from mark-recapture experiments conducted between 1984 and 1990. Using the best estimates, pup production increased from between 5,200 and 6,700 animals during the mid 1980s to between 8,300 and 10,700 during 1989-90 for an annual rate of increase of 8.8%. In 1993 the total population was estimated at approximately 143,000 seals.

In Iceland there is a directed hunt of grey seals. Grey seals were also hunted in earlier times, but before 1982 records of number of seals killed were unreliable. In 1982 organizations of the fishing industry and fisheries in Iceland started promoting seal hunting, and since that time reliable information on catches is available. Grey seals were first counted in Iceland 1982. In the period 1982 to 1990 the population seems to have been stable or slightly increasing, but since 1992 the population has been declining. The abundance of the grey seal around Iceland is now about 8,000 animals. In 1982 the population was estimated as 12,500 (9,550 - 14,400) animals.

Historical and anecdotal information indicates that grey seals breed in caves around the Faroe Islands. The population size was unknown, but grey seals were subjected to harvesting in former times, as well as a bounty system between 1963 and 1967. A total of 970 seals was reported killed during this period. There is at present no estimate for pup production in the Faroe Islands.

Approximately 40% of the world population of the grey seal breeds around the British Isles. The total population estimate was 108,500 for British grey seals in 1994. In Orkney pup production increased by around 9-10% p.a. between 1984 and 1994. In the Outer Hebrides between 1984 and 1994 pup production has increased by around 5-6% between 1984 and 1994, although in the last two years the increase has been only around 2% a year. In the Inner Hebrides pup production increased by 7.6% a year between 1984 and 1994. The North-East English/South-East Scottish population has increased at 7% p.a.. Pup production has not increased uniformly at all colonies and it would be misleading to extrapolate population size to future years using historical trends.

Figures of pup production are available for all known breeding sites along the mainland coast of northwest Europe, However, most figures are based on single counts. No confidence limits are therefore established for these figures. In most cases in Norway and Russia there are no time series available to evaluate trends in populations. Actual counts provide minimum figures of pup production and the most recent counts of pup production are: 358 for Russia; 473 in Norway; 9 in German; 25 in the Dutch Wadden Sea; and 2 in France.

In Norway there is a hunting season from 1 December to 30 April in areas north of approximately 62°N. Although hunting is known to occur, no system has been established to record effort or catches in this hunt.

In several countries grey seals may be killed legally if they approach fish farms. Numbers of seals shot in order to protect fish farms or standing fishing gear are in some areas believed to be significant, but levels of such kills are virtually unknown. By-catches of grey seals in fishing gear are known to occur. Return of tags indicates that seals less than one year of age are particularly vulnerable to entrapment in fishing gear. Levels of by-catches for grey seals, and for marine mammals in general, are poorly documented.

With reference to the hunting season for grey seals in Norway, the Scientific Committee **recommends** that a system for recording catch statistics is established as soon as possible, and all NAMMCO member countries are requested to record statistics of grey seals killed at fish farms and in fishing gear.

The Scientific Committee further **recommends** that all countries with fishing operations within the range of the grey seal establish a system for obtaining and reporting by-catches of grey seals (and other marine mammals).

Observer schemes are regarded as the most reliable method to obtain by-catch information. Observer schemes, however, are expensive and difficult in practice in fisheries where a large number of small units are operating. The method for obtaining by-catch statistics should therefore be modified to suit the respective fisheries. However, it is important that methods used to obtain by-catch estimates are well-documented so that the statistical properties of by-catch estimates can be explored.

8.6.2 The role of the grey seal in the marine ecosystem

Information on grey seal diet is available from Canada, Iceland, Faroe Islands, UK, and Norway. However, in order to estimate total fish consumption, information is required on the size, structure and dynamics of the seal population, the geographical and temporal distribution of animals, individual energy requirements, and diet composition.

Consumption of Atlantic cod by the Northwest Atlantic grey seal has recently been examined for the Scotian shelf and Gulf of St Lawrence. Depending on model assumptions, particularly assumptions concerning the seasonal distribution of the grey seal population in Atlantic Canada, cod consumption has increased from less than 4,000 tons in the Gulf of St Lawrence and 1,500 tons on the Scotian Shelf in 1970 to nearly 40,000 tons in 1993, including 17,000 tons in the Gulf of St Lawrence and 17,000 tons on the Scotian Shelf and 4,000 tons in other areas throughout Atlantic Canada. Owing to low biomass estimates, the cod fishery in Atlantic Canada has been closed since 1992. Thus in relative terms the consumption of 40,000 tons of cod by grey seals is significant compared to current harvests by the industry. The impact of this consumption on the recovery of Northwest Atlantic cod stocks is difficult to assess, since more than 80% of this consumption would be pre-recruits to the commercial fishery and it is likely that some compensatory mortality occurs which would reduce the magnitude of this impact.

An assessment has been carried out of the annual consumption of fish by the North Sea grey seal population, which has been compared with the commercial catch. A direct comparison shows that grey seal fish consumption is typically around two orders of magnitude less than

stock biomass for any species. In the most extreme case, the upper 95% confidence limit of grey seal consumption of cod is about 6% of the lowest estimate of cod stock biomass in the last decade.

Although annual removals of fish biomass by seals are small on a North Sea wide scale, there may be local areas where seal predation is more significant. The concentration of seal foraging in small areas supports this suggestion.

8.6.3 Grey seals as a source of nematodal infestation in fish

Four genera of anisakine nematodes with fish as intermediate host occur in the stomach or intestine of grey seals. The genera *Pseudoterranova*, *Anisakis*, *Contracoecum* occur in the stomach cavity while the genus *Phocascaris* occurs in the pyloric caeca close to the junction to the stomach. The codworm *Pseudoterranova decipiens* (often also called sealworm) is abundant in grey seals in many areas and larval stages of *P. decipiens* penetrate the intestines of fish and infest the muscle. The easily visible, up to c. 50 mm long worm greatly reduces the commercial value of fish fillets, which is a significant problem for the fish industry in areas where infestation is high. The cost of removing larvae from cod fillets alone was estimated to be in excess of $29 million in Atlantic Canada in 1982.

Although there are four species of pinnipeds found throughout Atlantic Canada, the grey seal is the most important as a vector for the nematode *P. decipiens*. Sexually mature worms have been found in grey seals as young as 3-4 months of age. Worm burdens are linked to size, with males carrying heavier burdens than females, owing to their larger size. Seasonal changes in sealworm burdens have been observed, with declines observed during the breeding season, probably as a result of animals fasting and a second decline observed in late summer. This decline may be linked to a change in diet as grey seals switch to prey with lower infestation levels.

In the 1950s sealworm was found in the fillets of groundfish throughout Atlantic Canada, but the heaviest infections were limited to cod from the southern Gulf of St Lawrence, and inshore areas of southwestern Newfoundland, Nova Scotia and the Bay of Fundy. Surveys conducted during the mid 1980s indicated that sealworm levels had increased in many regions throughout the Gulf of St Lawrence and Nova Scotia. Further increases in worm burdens have been observed in the Gulf of St Lawrence between 1983 and 1990. These increases are believed to be linked to increases in the grey seal population that has been observed since the 1970s. However, high geographical and temporal variability in sealworm levels may be linked not only to the distribution of definitive hosts such as seals, but also to other factors such as variability in water temperature. Surveys to determine nematode abundance in grey seals have shown that mean burdens have increased from 158-700 nematodes per seal between 1948-1956 to more than 1,000 in 1990.

High infestation of sealworm is also reported from Iceland and Norway. In Iceland, geographical and temporal changes in abundance of *P. decipiens* in grey seals seem to be related to changes in diet. A temporal change in grey seal diet from less infested groundfish to the highly infested sculpins results in a tenfold increase in abundance of codworm in seals.

8.6.4 Future work

i) Abundance and stock levels in the North Atlantic

For proper assessment of abundance and stock levels it is important to have further data on stock identity. The Scientific Committee appreciated the recent information on stock identity made available by analyses of mt DNA and encouraged further sampling for genetic analysis. Further, the Scientific Committee **recommends** exchange of samples between laboratories on both sides of the Atlantic.

Most abundance estimates are obtained from pup counts. The Scientific Committee **recommends** full descriptions of the methods used to obtain these estimates, of the statistical properties of the estimates and of actual and potential bias in the estimates. When possible, the Scientific Committee **recommends** multiple surveys and the establishment of confidence limits with the estimates of pup production. When multiple surveys within years are not possible, the Scientific Committee advises that well defined and described surveys may be used to establish an index of trend in pup production. When surveys are not possible, the Scientific Committee **recommends** the use of photo-identification techniques.

Population models show that seal populations in general are more sensitive to changes in mortality than to changes in fecundity rates. Changes in adult mortality have the largest impact on populations. Hunting mortality may be established from catch statistics, but such statistics are not always available, e.g. catches in the hunting season in northern Norway. The Scientific Committee **recommends** further studies to investigate pup mortality, juvenile mortality, adult mortality, fecundity, age at first reproduction and growth parameters.

The grey seal hunt in Iceland is well documented and provides an example of an annual hunt which seems to have had a significant and clearly detectable impact on the population size and trend. The Scientific Committee **recommends** that the age distribution of this population is further studied if age samples become available, and that the effect of harvest on demography and population size is documented.

ii) Role in the marine ecosystem

The distribution in space and time of foraging activity is essential for further understanding of the impact of grey seals on marine resources and the marine ecosystem. Such information can be obtained by pelage recognition programmes and satellite tracking of free ranging seals. Where there are by-catches of grey seals in fishing operations, conventional flipper tags may also contribute to this knowledge. The Scientific Committee **recommends** the use of satellite linked tags for further studies of distribution of grey seals at sea.

Where possible, telemetry studies on foraging grey seals should be combined with studies of diet and food availability. The Scientific Committee further **recommends** that when diet studies are based entirely on either shot samples or faecal samples, attempts should be made to calibrate the method by comparing ingestion and excretion of identifiable prey in captive seals. The Scientific Committee noted the limited data on population size, diet and foraging behaviour of grey seals in Norway and the Faroe Islands, and **recommends** that studies of these aspects be undertaken.

iii) Nematodal infestation in fish

The complex life cycle of sealworm will complicate any attempt to control infestation levels in fish. The Scientific Committee **recommends** further studies on the life cycle and population dynamics of the sealworm (*Pseudoterranova decipiens*).

9. NORTH ATLANTIC SIGHTINGS SURVEY - NASS-95

9.1 Review of results

The Chairman noted that at its 5th meeting in Nuuk (February, 1995), the Council had agreed to the following:

> "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."

The Chairman requested information from the relevant Committee members on the conduct and results of their respective surveys in 1995.

Norway:

Øien reported that the Norwegian survey (*"NILS 95" - Norwegian Independent Line-Transect Survey* - which was a part of NASS-95) was conducted over the period 5 July to 8 August 1995. Immediately prior to the survey departure, a pre-cruise meeting was held with the participation of cruise leaders to establish procedures to be followed on the ships. The target species for the survey was the minke whale and the survey was therefore especially designed to accommodate analyses developed for that purpose. This involved two independent platforms on each vessel and specific tracking procedures for minke whales. Included in the survey were also distance and angle estimation experiments.

The total survey area covered by Norwegian vessels comprised the northeast part of the North Atlantic north and east of a line approximately from south of Jan Mayen to north of Scotland (see Appendix 5). This area was divided into 18 blocks which were covered by eleven vessels. Each vessel had three or four teams of observers, dependent on available space. Four-team vessels worked around the clock on a 24 hour schedule, while arrangements on the three-team vessels varied according to available light conditions, and alternations between using both or only one platform. The watches were usually based on 6-hour periods.

About 13,500 nautical miles were searched in primary searching mode, i.e. on predetermined track lines under acceptable weather and sighting conditions. In addition, considerable effort was conducted in transits and also on tracklines under conditions which did not fulfill the requirements, most notably reduced visibility due to fog. Except for the blocks in the eastern Barents Sea which received less than 50% of planned coverage, the coverage was generally as planned or better.

The distribution of minke whale sightings from the 1995 survey seems to be somewhat different from that of the 1989 survey. Of particular note were the relatively few sightings made off Kola, which in earlier surveys have had high densities of minke whales. It should however be mentioned that the Kola block received only about 40% of the planned coverage. Further east in the Barents Sea there were apparently more minke whales. There seemed to be generally more minke whales, as well as other large whales, west of Spitsbergen and in the northern part of the Norwegian Sea in 1995 than in 1988-89, while the density around Jan Mayen was low in 1995.

Reports of sightings during the survey were read onto tape in order to obtain a time signal necessary for timing accuracy for the duplicate analysis of the tracked minke whales. All tapes were re-listened and transcribed after the survey and these data as well as covariate data (observer shifts, weather, activity) have been computerized. The analyses of the data are being undertaken by an "Abundance Estimation Group" established under the IWC Scientific Committee with the aim of working towards an agreed estimate of minke whale abundance during the spring 1996. All other whale species sighted during the survey will also be analysed for the potential use in estimating abundances, and this data will be presented in due time.

Faroe Islands:
Desportes reported on the Faroese survey (SC/4/16), which took place from July 3 - August 7, with one vessel surveying an area between southeastern Iceland and western Ireland (see Appendix 5). The target species for the survey was the pilot whale, and the survey was designed to estimate a g(o) value that would be robust to any responsive movement occurring within the observation range, to investigate the existence of "super schools" and to obtain more precise estimates of school size.

The design was based on adoption of passing mode and on using two independent observation platforms, a primary platform and a tracker platform. On the primary platform, observers searched with the naked eye and concentrated their effort to within 1000m of the vessel. On the tracker platform, the trackers searched with binoculars and concentrated beyond 1000m ahead of the vessel, searching the area from which animals could enter the observation zone of the primary platform. They attempted to track the animals via multiple sightings until they had either passed abeam or had been detected by the primary observers. To obtain reliable angle and distance data, the binoculars were equipped with reticles and mounted on rotating monopods passing through an angle board.

When a school of pilot whales was encountered, sub-groups were recorded separately. A delayed closing procedure was used on a random sample of schools to obtain precise school-size estimates. After closing, a 360° scan was performed to detect the presence of other schools and new schools were closed on.

The tracker platform was specially designed for this survey in order to reduce as much as possible the effect of vessel vibration at cruising speed. The new design resulted in a great improvement in data collection.

The vessel completed 1,630 nautical miles of effective searching effort, of which 64% was covered in Beaufort 3 or 4 (see Appendix 5). About 40% of the available research time was spent on effort.

A total of 458 groups, including 12 identified cetacean species, were observed. The most frequently encountered species were common and white-sided dolphins, pilot and bottlenose whales. The special pilot whale procedure revealed in most cases the presence of other schools in the vicinity of the initial sighting. This may shed some light on the discrepancy between average school size previously observed at sea vs. average size of schools landed in the Faroes.

The pilot whale data, including Faroese, Icelandic and Norwegian data, are being analysed by D. Borchers and colleagues at the School of Mathematical and Computational Sciences, University of St. Andrews, Scotland. They will be presented to the ICES Study Group on Long-finned Pilot Whales.

Iceland:
Sigurjónsson presented paper SC/4/17 which reported on the Icelandic aerial survey conducted in July 1995 from one aircraft allocated by Iceland to the joint 1995 North Atlantic Sightings Survey (NASS-95 - see also Appendix 5). While the general aim of the Icelandic NASS-95 shipboard and aerial survey was to estimate the abundance of fin and minke whales, the aerial component focussed on minke whales in coastal waters. The total number of minke whale primary sightings was 223. Compared to the 1987 aerial survey, the 1995 results indicate an overall, but not statistically significant increase in sightings rate and a possible increase in population size in the area. The paper reported a clear increase in sightings rate in coastal N Icelandic waters, where the rate rose from 1.96 animals/hr in the 1987 survey to 3.46 animals/hr in 1995 (statistically different at 95% level). This is one of the main traditional minke whaling areas in Icelandic coastal waters. It was noted that past aerial surveys have shown a consistent distribution pattern of minke whales, despite great differences in densities between areas.

Based on the number of sightings made by block, assumed mean surfacing rate of 53 exposures per whale per hour, and the estimated effective search area, the total abundance of minke whales in the 1995 survey area has been calculated as 18,783 with the associated CV of 0.10. The CV does not incorporate variance estimate in surfacing rate. The authors suggested further exploration of the data, particularly with respect to effects of different weather conditions on sightings rates and stressed the need for more information on surfacing rates of minke whales.

Víkingsson presented paper SC/4/18, a cruise report from the Icelandic shipboard survey conducted in the summer of 1995 (NASS-95). The design (area coverage and timing) of the shipboard survey took account of the main target species: fin and minke whales. Area coverage was thus similar to the NASS-87 survey with a more northerly distribution than the NASS-89 survey, when sei whales were the main target species (see Appendix 5). 14 species were encountered in a total of 1,514 sightings (5,246 animals) including a single right whale. The fin whale was the most numerous large whale species, followed by humpback whales,

which were seen in considerably larger numbers that in the earlier NASS surveys, despite less total effort in 1995.

.....

The Chairman thanked the respective members from Norway, the Faroes and Iceland for their presentations on the successful completion of NASS-95 and the current status of data analysis.

The Chairman also noted that the NASS-95 Fund Allocation Group had agreed in April 1995 that the NASS-95 Fund, which had been established by the Council after a recommendation from the Scientific Committee at its last meeting, should be divided between the Faroe Islands (NOK 600,000) and Iceland (NOK 200,000) to assist with the financing of their respective national surveys under NASS-95.

9.2 Future work

The Chairman noted that national surveys under NASS-95 had been successfully carried out and that data analysis from all areas was now under way.

The Scientific Committee **agreed to establish** a Working Group on Abundance Estimates, under the Chairmanship of Sigurjónsson (Iceland), with its basis in the previous Working Group to plan NASS-95. The task of the Working Group on Abundance Estimates would be to review analyses and where relevant also analyse data from NASS-95 to ensure its compatibility, both between NASS-95 survey areas, as well as with data from other sightings surveys, in order to provide a basis for calculating abundance estimates for the relevant cetacean stocks in the North Atlantic (see also below under 10.2). The work would be initiated by the Working Group Chairman through correspondence, beginning with a preliminary work plan to be circulated to Scientific Committee members in the near future.

10. MULTI-SPECIES APPROACHES

10.1 Monitoring of stock levels and trends in stock levels of marine mammals in the North Atlantic

The Chairman noted that at its 5th meeting in Nuuk (February 1995), the Council agreed to the following:

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

It was clarified that the purpose of this request was to ensure that data on marine mammals was available for input into multi-species models for management. The Management Committee had suggested that the Scientific Committee present this information annually in the form of a table (*NAMMCO Annual Report 1995*, p. 47).

It was also noted that requirements for monitoring trends in stock levels involved more than just a comparison of abundance estimates from year to year, and would therefore require more detailed consideration.

10.2 Future work

In discussing how best to deal with this request, the Chairman referred to the Committee's decision to establish a Working Group on Abundance Estimates to review the results of NASS-95 (see 9.2 above), as well as plans for a comprehensive update of the List of Priority Species over the coming year (see 6. above). It was noted that this planned work would provide much of the available data necessary for the production of the requested table of stock levels and trends for both cetaceans and pinnipeds.

The Scientific Committee **agreed** that the production of a table showing stock levels and trends in stock levels of marine mammals in the North Atlantic should be coordinated through the Working Group on Abundance Estimates. The table, which would also include pinnipeds, could then be included as an Annex to the List of Priority Species, which should be revised in time for the next Scientific Committee meeting. The table could thereafter be updated at regular intervals in line with the regular revision of general summaries for each species/stock contained in the List of Priority Species.

11. DATA AND ADMINISTRATION

11.1 Establishment of database

The Committee reviewed document SC/4/10, a report on the establishment of a database in the Secretariat.

The Secretary explained that a fisheries biology student with field and data experience from cetacean research, Atli Konráðsson, had been contracted to assist with the establishment of a database, and that this work had been undertaken since the summer of 1995. The target species for the work were the species currently relevant to the work of the Committee, namely pilot whales, killer whales, northern bottlenose whales, Atlantic walruses, harp seals, hooded seals, ringed seals and grey seals.

As a tool for assessment and management advice for the relevant marine mammal stocks, the report noted that the quality of the contents of the database must be evaluated carefully from a methodological point of view and thoroughly cross-checked technically. The database should contain historical catch statistics and biological data and be updated annually. Routines for submitting data to the Secretariat had not yet been established and were thus open for discussion. Furthermore, data from sightings surveys could serve as indicators of variations in abundance in specific areas and their collection should therefore also be considered. It was also reported that a database of references to papers and publications of relevant biological material had been established in the Secretariat. The report discussed the possibility of establishing a similar database of references to anthropological and sociological literature regarding utilisation of marine mammals.

The report also contained a table summarising the status of catch statistics and biological data in the database by species and country.

Although the basic structure, necessary software and an overview of available data for the database were now in place, there were some outstanding tasks to be completed before the database could be considered fully functional. Particular questions were raised in SC/4/10 for which the Secretariat required further clarification from the Scientific Committee (see below under 11.2). The Secretary asked the Scientific Committee to advise in general on the foreseen function of the database in the future work of the Committee.

The Scientific Committee commended the progress made so far in establishing the database, and encouraged the Secretariat to complete the outstanding work. It was noted that comprehensive data for relevant North Atlantic stocks of marine mammals compiled in the Secretariat would be useful in modelling exercises, such as had been carried out on the northern bottlenose whale stock at the last meeting of the Scientific Committee. In further developing the database, it was noted that particular attention should be paid in the first instance to incorporating all available catch statistics for the relevant species in the North Atlantic, including data from Canada and Russia.

11.2 Data storage and handling

With regard to specific questions raised in SC/4/10 concerning standards for submitting data to the Secretariat and the national institutes responsible for the data, the Scientific Committee **agreed** to appoint one Committee member from each member country to a Data Group. The Data Group would function as the Secretariat's point of contact for clarification and advice on specific requirements for the further development of the database, as well as questions concerning the standards for data submission, storage and handling. Members appointed to the Data Group are: Aqqalu Rosing-Asvid (Greenland); Dorete Bloch (Faroes); Gísli Víkingsson (Iceland); and Nils Øien (Norway).

11.3 Requirements for National Progress Reports

The Chairman pointed out that the Guidelines for the Content and Format of National Progress Reports, a draft of which had been reviewed by the Committee at its last meeting, had now been slightly revised in line with the Council's preference for a more summarised annual presentation of research from member countries. This new version had been circulated as SC/4/4, and is contained in Appendix 4. The Chairman noted that these guidelines were a useful practical tool for preparing National Progress Reports for submission to the Scientific Committee. No further amendments were suggested.

It was, however, **agreed** that references to relevant "grey literature" (ie references not otherwise readily identified through standard catalogues and other reference source), should also be included in the list of references in each National Progress Report.

11.4 Other matters

The Scientific Committee considered an enquiry from the recent meeting of the Management Committee’s Working Group on Inspection and Observation, requesting the Scientific Committee to:

> "... advise whether the elements included on the draft checklist [for inspection] are relevant for scientific purposes, whether any other data of scientific relevance could be added which whalers would be responsible for recording, and to identify the methods of data collection in order to ensure the compatibility of the data recorded." (SC/4/15)

The Scientific Committee noted that the elements previously identified as minimum data requirements (ie position and date of catch, and length and sex of animal) were all included on the proposed draft checklist, and confirmed that these were particularly relevant for scientific purposes.

The Scientific Committee also reiterated its previous response to the question of data collected during whaling operations, which stressed the importance of having more information on the management framework for each species/stock and on the actual procedure for generating advice in order to define specific scientific data requirements.

However, with regard to the question of possible further elements of scientific relevance which could be added to a standard checklist, the Scientific Committee agreed that the collection of skin and tissue samples from each animal would also be useful for scientific purposes, and should be possible in most coastal whaling operations. The collection of other material such as sexual organs and stomach samples, as well as data on body condition, was also identified as relevant.

In addition, it was noted that information included on the checklist under items II & III of the Working Group's draft checklist for recording data on operational activities would also be of scientific relevance with respect to assessments of catch effort.

12. BUDGET

12.1 Review of funds 1995

The Secretary referred to document SC/4/13 which was an overview of Scientific Committee funding in 1995 and projected expenses in 1996. It was noted that a total of NOK 199,413 had been used in 1995 for invited experts and projects, largely in connection with the walrus report prepared for the Third Meeting of the Scientific Committee in Copenhagen in early 1995.

12.2 Budgeted funds 1996

The Secretary informed the Scientific Committee that the forecast 1996 budget adopted by the Council in Nuuk in 1995 (NAMMCO Annual Report 1995, p. 41) contained the same level of total funding for the Scientific Committee (invited expertise and projects) as in previous years. The Secretariat had produced a rough estimate of NOK 300,000 for the projected total costs of invited expertise and projects in connection with work on the ringed seal and grey seal for the present meeting.

With respect to a question raised about the level of fees paid to invited experts for their reports, the Scientific Committee noted that its members were responsible for estimating the amount of time and work required for specific projects, and that this should be considered carefully when agreeing to contract experts to prepare reports for use by the Committee.

13. FUTURE WORK PLANS

13.1 Scientific Committee

It was noted that items for the future work of the Scientific Committee would include matters related to outstanding requests for advice from the Council on long-finned pilot whales, killer whales, and some aspects of the request for advice on harp and hooded seals. Other work related to the role of marine mammals in the ecosystem was still being dealt with in other contexts, but it was suggested that it might be possible to focus on specific aspects related to this field at the next meeting.

Noting that the Management Committee, at its first meeting in Tromsø (January 1993) had indicated a long-term interest in the harbour porpoise, the Scientific Committee agreed to **recommend** to the Council that the harbour porpoise be included on the agenda for its next meeting in 1997, with the view to undertaking a comprehensive review, with input from external expertise, in the near future.

The Chairman suggested that the next meeting of the Scientific Committee be held in Tromsø, Norway in 1997 at the offices of the Secretariat. The timing of the meeting was discussed, and although it would also depend on the timing of next year's Council meeting, it was agreed that late February/early March would be a suitable time to convene in Tromsø.

13.2 Working Groups

The Chairman noted that the work of the *ad hoc* Working Groups on ringed seals and grey seals was now complete, and these Working Groups were therefore dissolved.

He further noted that a new Working Group on Abundance Estimates had been formed (see 9.2 & 10.2 above), with its point of departure in the former Working Group to plan NASS-95, which was now formally dissolved. The Working Group on Abundance Estimates would aim to hold a meeting prior to the next meeting of the Scientific Committee.

It was also noted that a Data Group had been established, the members of which would liaise with the Secretariat through correspondence to advise on the further development of the database and other matters related to data submission and storage.

13.3 Other matters

The Chairman noted the comprehensive work which was the basis for the *ad hoc* Working Groups' reviews of the ringed seal and grey seal at the present meeting, and asked for feedback from Committee members as to the possibilities of publishing this material.

The Scientific Committee noted the extent to which NAMMCO had initiated and supported the work which formed the basis of the Working Groups' deliberations, as had also been the case with the work on the Atlantic walrus at the last meeting. It was **agreed** that this work should be published and that NAMMCO's role should be duly recognised in the context of the publication.

It was suggested that one option could be for NAMMCO to publish the work under its own name by launching its own publication series, which would also be of interest to the public at large. Another option would be to publish in existing journals which have pre-established subscribers and distribution networks.

With reference to these options, the Scientific Committee **agreed** to seek guidance from the Council on the preferred manner in which to publish the work generated by the Scientific Committee, while stressing the importance of making such work readily available in published form, and ensuring that NAMMCO's role in generating these reviews is sufficiently visible. It was also suggested that in order to aid the Council in its deliberations, the Secretariat could prepare a preliminary analysis of the cost of undertaking a NAMMCO publication series.

14. ANY OTHER BUSINESS

The Secretary drew the Committee's attention to SC/4/11, a summary report of the International Conference on Marine Mammals and the Marine Environment, which had been organised and hosted by NAMMCO and held in Lerwick, Shetland, 20-21 April 1995. She further informed the Committee that the proceedings of the Conference, co-edited by herself and Geir W. Gabrielsen of the Norwegian Polar Institute in Tromsø, had now been submitted for publication as a special issue of *The Science of the Total Environment*, and would appear as Volume 187/1 in the early summer of 1996.

The Chairman concluded the meeting by commending in particular the Working Group Chairmen, invited participants and Committee members for their valuable contribution to the work carried out in the *ad hoc* Working Groups on ringed seals and grey seals. The Secretariat was also thanked for the organisation and running of the meeting.

Finally, the Chairman, on behalf of all participants, extended his sincere thanks to the Faroese hosts for providing such congenial working conditions and social arrangements for the meeting.

The Chairman closed the meeting of the Scientific Committee at 1930 on Friday 9 February. The final draft of the Report was adopted by correspondence on 1 March 1996.

15. LIST OF DOCUMENTS

SC/4/1 List of participants
SC/4/2 Agenda
SC/4/3 List of documents

SC/4/4 Guidelines for National Progress Reports (Update 1995)
SC/4/5 Request from ASCOBANS for cooperation
SC/4/6 Conveners' Report - ICES/NAFO Joint Symposium on the Role of Marine Mammals in the Ecosystem, Dartmouth 6-8 September 1995
SC/4/7a Report of the ICES/NAFO Joint Working Group on Harp and Hooded Seals, Dartmouth 5-9 June 1995
SC/4/7b Extract of report of the NAFO Scientific Council Meeting, 9-15 Sept.1995 - VI/8 - Analyses with Respect to the Interaction Between Seals and Commercial Fish Stocks.
SC/4/8 Report of the NAMMCO/SC/WG on ringed seals
SC/4/9 Report of the NAMMCO/SC/WG on grey seals
SC/4/10 Report on establishment of the database in the Secretariat
SC/4/11 International Conference on Marine Mammals and the Marine Environment (Shetland 20-21 April 1995) - Summary of Proceedings
SC/4/12 NASS-95 Fund Allocation Group (minutes of meeting 27.4.95)
SC/4/13 Scientific Committee funding in 1995 and projected expenses in 1996
SC/4/14 List of requests for advice forwarded to ICES
SC/4/15 Request from the Working Group on Inspection and Observation on elements to be included in the Hunter's Checklist
SC/4/16 NASS-95. Preliminary report from the Faroese cruise
SC/4/17 North Atlantic Sightings Survey (NASS-95): Aerial survey in coastal Icelandic waters, July 1995.
SC/4/18 North Atlantic Sightings Survey (NASS-95): Shipboard surveys in Icelandic and adjacent waters June/July 1995 - cruise report

SC/4/NPR-F National Progress Report 1995 - Faroes
SC/4/NPR-G National Progress Report 1994 - Greenland
SC/4/NPR-I National Progress Report 1995 - Iceland
SC/4/NPR-N National Progress Report 1995 - Norway

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3.1 - APPENDIX 1

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3.1 - APPENDIX 2

AGENDA

1. Chairman's welcome and opening remarks
2. Adoption of Agenda
3. Appointment of Rapporteur
4. Review of available documents and reports
   - 4.1 National Progress Reports
   - 4.2 Working Group reports
   - 4.3 Other reports and documents
5. Cooperation with other organisations
   - 5.1 ICES
   - 5.2 NAFO
   - 5.3 IWC
   - 5.4 ASCOBANS
   - 5.5 Other
6. Update of List of Priority Species
7. Role of marine mammals in the marine ecosystem
8. Marine mammal stocks - status and advice to the Council
   - 8.1 Long-finned pilot whales
     - 8.1.1 Update on progress
     - 8.1.2 Future work
   - 8.2 Killer whales
     - 8.2.1 Update on progress
     - 8.2.2 Future work
   - 8.3 Harp seals
     - 8.3.1 Update on progress
     - 8.3.2 Future work
   - 8.4 Hooded seals
     - 8.4.1 Update on progress
     - 8.4.2 Future work
   - 8.5 Ringed seals

8.5.1 Review of status
8.5.2 Advice on: i) stock identity; ii) abundance in each stock area; iii) long-term effects on stocks by present removals in each stock area; iv) effects of recent environmental changes (ie disturbance, pollution); v) effects of changes in food supply; vi) effects of interactions with other marine living resources.
8.5.3 Future work

8.6 Grey seals
8.6.1 Review and assessment of : i) abundance and stock levels in the North Atlantic; ii) role in the marine ecosystem; iii) significance as a source of nematodal infestations.
8.6.4 Future work

9. North Atlantic Sightings Survey - NASS-95
9.1 Review of results
9.2 Future work

10. Multi-species approaches
10.1 Monitoring of stock levels and trends in stock levels of marine mammals in the North Atlantic
10.2 Future work

11. Data and administration
11.1 Establishment of database
11.2 Data storage and handling
11.3 Requirements for National Progress Reports
11.4 Other matters

12. Budget
12.1 Review of funds 1995
12.2 Budgeted funds 1996

13. Future work plans
13.1 Scientific Committee
13.2 Working Groups
13.3 Other matters

14. Any other business

LIST OF REQUESTS FOR SCIENTIFIC ADVICE FROM NAC/NAMMCO

The following is a list of requests for scientific advice, both from the former North Atlantic Committee for Cooperation on research on Marine Mammals in the North Atlantic (NAC, 1990-1992) and from the Council of NAMMCO since its formation in 1992. Requests which have been forwarded to other bodies (ie ICES and NAFO) are indicated as such.

1. GENERAL

Marine mammals and the marine ecosystem:

- 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 to ICES)

- To assess the impact of marine mammals on the marine ecosystem, with special emphasis on the availability of economically important fish species (NAMMCO/2).

Multi-species approaches:

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

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

- In relation to the importance of the further development of multi-species approaches to the management of marine resources, the Scientific Committee was requested to monitor stock levels and trends in stocks of all marine mammals in the North Atlantic (NAMMCO/5).

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 to ICES).

- To review the contaminant burden (especially organochlorines) in marine mammals in the North Atlantic and evaluate the possible sources of these contaminants (NAC to ICES).

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).

- Further development of RMP-like procedures (NAMMCO/4).

North Atlantic Sightings Surveys (NASS)

- To plan joint cetacean sighting surveys in the North Atlantic by coordinating national research programmes (NAMMCO/3)

- 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).

2. SPECIES/STOCKS

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 to ICES);

- 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 utilization (NAMMCO/2).

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 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).

Northern bottlenose whales:

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

- 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).

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 (ie disturbance, pollution) and changes in the food supply (NAMMCO/2).

Killer whale:

- 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).

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 (ie disturbance, pollution) and changes in the food supply, and interactions with other marine living resources (NAMMCO/5).

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).

Other - Long-term interest

- Greenland has also indicated a long-term interest in the following species: Harbour seal, harbour porpoise, beluga and narwhal (NAMMCO/2).

ANNOTATED GUIDELINES FOR THE CONTENTS AND FORMAT OF NATIONAL PROGRESS REPORTS

(Revised December 1995)

CONTENTS:

ANNOTATIONS:

The National Progress Reports should cover the calendar year preceding the annual meeting. A separate Report should be provided for each calendar year. Section I (INTRODUCTION) should indicate which institutions are involved or reported on. Under section II (RESEARCH), items listed under a and b should be addressed. CATCH DATA (III), including number of animals taken should be indicated and tabulated. Under section IV (ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN) the idea is to have reported what kind of management advice (scientific) of relevance for the NAMMCO Council and the Scientific Committee has been provided to the authorities in respective member countries, and, similarly, what management measures have been taken. Section IV (PUBLICATIONS AND DOCUMENTS) should include titles of publications, reports and documents that are likely to be of interest to the work of the Scientific Committee.

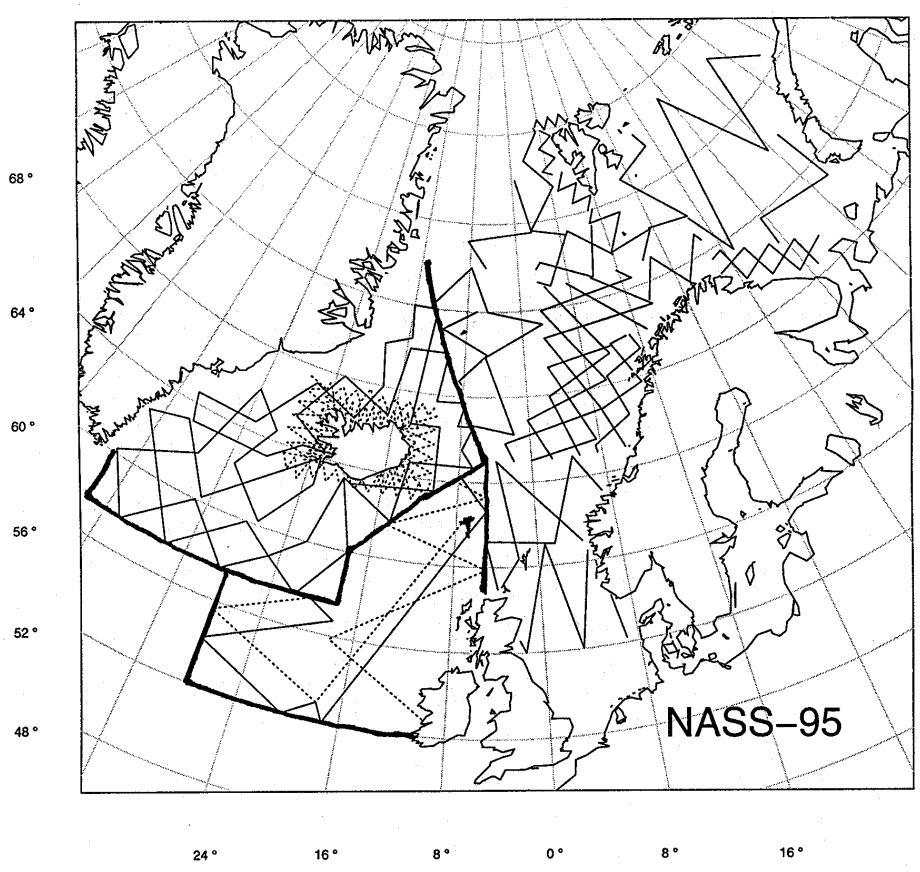
Format:

The font should be "Times New Roman", the size in general 12 pt., the introduction 10 pt. and notes connected with tables 10pt.

3.1 - APPENDIX 5

NORTH ATLANTIC SIGHTINGS SURVEY (NASS) 1995

Scheduled survey track lines: Faroes, Iceland and Norway*



* The map shows the scheduled track lines for NASS-95. The solid bold lines represent the boundaries between the national survey areas (Faroes, Iceland, Norway). The dashed lines around the Icelandic coast show the aerial survey lines (SC/4/17, see also SC/4/18). The dashed lines in the Faroese area show the "secondary cruise track lines" as defined in SC/4/16.

3.2 REPORT OF THE NAMMCO SCIENTIFIC COMMITTEE *AD HOC* WORKING GROUP ON RINGED SEALS

Torshavn 5-8 February 1996

The *ad hoc* Working Group on Ringed Seals met at the Nordic House in Torshavn from 5 to 8 February 1996. The Working Group was convened and chaired by Mads Peter Heide-Jørgensen. Randall Reeves acted as rapporteur. A list of participants is contained in Appendix 1.

The Working Group referred to the Council's request for advice on ringed seals (*Phoca hispida*) which was as follows:

> "...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."

1. IDENTITY OF RINGED SEAL STOCKS IN THE NORTH ATLANTIC AND ADJACENT WATERS

The ringed seal has a circumpolar distribution in arctic marine waters, with disjunct populations in the Okhotsk and Baltic seas and in several freshwater lake systems (SC/4/RS/3). No zoogeographical barriers are known to prevent marine ringed seals from being panmictic. Focussed research on questions related to stock identity of ringed seals has not been done, and no firm evidence of different stocks is available.

Kingsley (SC/4/RS/7) offered a conceptual model for the structuring of the aggregate world population of ringed seals. This model rests on a dichotomy between 'producing' areas and 'consuming' areas. Annual fast ice with good snow cover is prime breeding habitat. Subadults tend to be excluded from the breeding ice by aggressive adults. This means that the subadults mainly inhabit ice edges, polynyas and loose ice areas. Polar bears tend to prefer ice edges and moving (pack) ice for hunting, which means that a high proportion of the seals killed by polar bears are subadult ringed seals (mostly <2 yr old; Stirling & Øritsland 1995). Producing areas provide surpluses of young ringed seals which are consumed by polar bears in what are thus called consuming areas. Kingsley's model is in most respects consistent with McLaren's (1958a) idea that coastline complexity is a major determinant of variability in ringed seal production.

In the absence of conclusive evidence for stock definition, the Working Group reviewed available tag-recapture data as well as the scant, inconclusive evidence of morphological, behavioural and ecological differences in ringed seals from different areas.

a) Tag returns

A tagging program in the eastern Beaufort Sea and Amundsen Gulf, Canada, during the early 1970s resulted in a very low tag recovery rate (1.7%) but generally corroborated the opinion of hunters that young seals disperse westward across the Beaufort Sea to at least as far as Northeast Russia (Smith 1987). Maximal distance from the site of tagging to the site of recapture was 1334 km (Smith 1987). Five tagging experiments have been carried out in Greenland since the mid 1970s (SC/4/RS/6). The tag recovery rates were much higher (43% overall) than in the western Canadian study. Young ringed seals (< 5 yr of age) were shown to travel among North, Northwest and Central West Greenland and between NW Greenland (Upernavik) and NE Baffin Island (Clyde River), but most of those that were recaptured were found within 200 km of the tagging site. Satellite tracking of three young males tagged in the fast ice of Wolstenholme Fjord, NW Greenland, in June-July 1988 showed that they moved later in the summer and autumn both northward to Kane Basin and southward into Baffin Bay (Heide-Jørgensen et al. 1992). In addition, a time-depth recorder that had been attached to a ringed seal near Resolute in the Canadian High Arctic (74°30'N, 94°00W) in April-June 1991 was recovered (opportunistically) in March 1992 in Southwest Greenland (Narsalik, 61°30'N, 49°30'W) (SC/4/RS/6). This seal had travelled at least 2272 km, having crossed Davis Strait, during the intervening 9-11 months.

On balance, the limited data from tag-recapture indicate that some young ringed seals from W Greenland disperse over substantial distances but also that many of the young seals either remain within or return to W Greenland. Among the tagged animals, females seemed to disperse more widely than males.

A distinctively marked adult male was resighted in the same locality in SE Baffin Island in successive years (Smith & Hammill 1981), and another adult male that was tagged in the fast ice of Kongsfjorden, Svalbard, was killed in the same area three years later (Lydersen pers. comm.).

b) 'Pack ice' and 'fast ice' populations in Baffin Bay

Finley et al. (1983) considered that seals in the pack ice (=drift ice in Russian nomenclature) of Baffin Bay were 'reproductively isolated' from fast ice seals, based mainly on two lines of evidence:

i) Inuit in N and E Baffin Island recognize two distinct types of ringed seal - one that originates in the fast ice (called *tuvamiutaaq*) and one that enters the fjords after break-up and moves offshore during freeze-up (*pulajuraaq* or *pulaniit*) (Finley et al. 1983). The offshore (pack ice) seals are smaller than the coastal (fast ice) seals. Similar size differences have been noted in other areas including NW Greenland (Vibe 1950), Jones Sound (Rosing-Asvid pers. comm.) and the Okhotsk Sea (Fedoseev 1975).

ii) 'Pack ice' seals were less heavily infected with gastric nematodes than were 'fast ice' seals. Finley et al. (1983) inferred that this difference reflected different diets, with seals in the pack ice preying mainly on pelagic amphipods and seals in the fast ice eating mainly arctic cod.

The other evidence evaluated by Finley et al. (1983) was inconclusive. Several members of the Working Group noted that the observations cited by Finley et al. (1983) were open to differing interpretations. Lydersen, for example, reported that small, weaned ringed seal pups (5-10 kg) found in the loose ice in Kongsfjorden are probably animals that were born in the fast ice but were weaned prematurely. The case for a 'distinctive' or 'reproductively isolated' pack ice population in Baffin Bay remained unproven. Although it was recognized that substantial production of ringed seals could occur in the stable pack ice of Baffin Bay, as it could, for example, in the pack ice of the Greenland Sea (Dietz et al. 1985) and Beaufort Sea (Lentfer 1972), the implications for stock identity were not sufficiently clear.

Based mainly on the probability of regular exchange by ringed seals, the group identified three geographic areas for discussion (Figure 1). Area 1 is centered in Baffin Bay and Davis Strait and includes eastern Hudson Strait and the Labrador Sea to the south, and Lancaster, Jones and Smith sounds to the north. Area 2 is centered in the Greenland Sea and includes the east coast of Greenland and the west coast of Svalbard. Area 3 is centered in the Barents and Kara seas. The relatively low biological productivity of the Laptev and East Siberian seas, as well as the ice massif in the central East Siberian Sea, probably limit the amount of movement by ringed seals across northern Russia (Belikov pers. comm.). There may, however, be some exchange via polar routes as ringed seals and polar bears are present year-round as far north as the pole (Durner & Amstrup 1995; M. Ramsay pers. comm. cited in SC/4/RS/3; Belikov pers. comm.).

2. ESTIMATES OF ABUNDANCE

Most surveys of ringed seals have been designed with the idea of estimating densities for studies of seal ecology rather than for population assessment. The only portion of the North Atlantic where extensive surveys of ringed seals have been conducted is the Canadian Arctic (SC/4/RS/3 and 7). Of particular interest in the present context are aerial strip surveys conducted by LGL (Miller et al. 1982) during the late 1970s. Finley et al. (1983) used density estimates for different ice types (pack ice: 1.39 seals/km^2; shelf fast ice: 1.31/km^2; fjord fast ice: 1.72/km^2) from these surveys, along with estimates of the respective amounts of ice area, to make uncorrected estimates of 67,000 ringed seals in the fast ice bordering the east coast of Baffin Island and 417,000 in the Baffin Bay pack ice during late June-early July 1979. After correction factors for availability and detection bias were applied, the pack ice estimate was corrected to 787,000 seals. Using the same method (including the density estimates and correction factors from W Baffin Bay), Miller et al. (1982) estimated that at least 185,000 additional ringed seals inhabited the fast ice along the west coast of Greenland.

Rough calculations were made using information from the literature on seal densities and ice areas in Area 1 (Table 1). These calculations suggest a total standing population in the order of 1.3 million ringed seals in Area 1. Many uncertainties were associated with this approach, and the total figure should be regarded as only a very crude approximation. The ice areas were taken from several different sources, with all fast ice allocated to one of two types - fjord and shelf. It was assumed that the estimated densities for the fast ice were of breeding adults and young of the year, even though it was recognized that due to the timing

of the surveys some subadults may have been counted. It was assumed that surveys in the pack ice sampled all age classes. The densities of 1.7 seals/km^2 for all fjord fast ice, 1.3 for all shelf ice except that in western Jones Sound and Kane Basin and 1.3 for all pack ice are based on observed densities in late June/early July 1978-79 in NW Baffin Bay (Finley et al. 1983, their Table 1). The considerably lower density of 0.33 seal/km^2 for western Jones Sound and Kane Basin is a mean value for late June 1980-82 (Kingsley et al. 1985, their Table 13, stratum 1). It should be noted that the inclusion of Ungava Bay pack ice is entirely speculative; no survey data from this area was examined. The raw estimates in the last column of Table 1 were corrected by assuming that, on average, one seal was missed for every one sighted during surveys (see Stirling & Øritsland 1995 for a discussion and rationale).

In evaluating the sensitivity of these calculations, it was noted that the contribution by pack ice is roughly two thirds of the total. Thus the uncertainties associated with the estimated area, seal density and correction factor for the pack ice are particularly critical. The correction factor is, by itself, critical because it is applied to all areas and density estimates, and a relatively small change in it would substantially increase or decrease the abundance estimate. The total abundance estimate obviously refers to the annual post-pupping peak.

Smith & Lydersen (1991) extrapolated observed densities of birth lairs in two types of breeding habitat, 2.6/km^2 near glacier fronts and 0.98/km^2 on flat fjord ice, to the respective total estimated areas of these two habitat types throughout the archipelago, to estimate annual production of 19,500 pups in Svalbard. The dispersal pattern of these seals is not known, but they would presumably represent a total population of about 100,000 seals.

In western Russia, the only quantitative data on ringed seal numbers is derived from work by Lukin in the White Sea. Based on his observed densities of birth lairs in a portion of the White Sea, an extrapolation to the fast ice area considered suitable for breeding gave an estimate of 9000-10,000 adult females between the White Sea and Vaigach Island (Belikov pers. comm.). This would suggest a total population in the order of 50,000 seals. No data were available for Novaya Zemlya, Franz Joseph Land or the Kara Sea.

Several authors have attempted to obtain rough estimates of ringed seal population size by reference to polar bear population size. Kingsley (1990), for example, estimated that each of 15,000-20,000 bears in the Canadian Arctic needed 40 ringed seals for annual maintenance and growth, leading him to suggest that some 4 million ringed seals would be needed to sustain both the bears and human hunters in Canada. He also concluded that polar bears consumed approximately 10 times as many ringed seals as were caught by Canadian Inuit. Stirling & Øritsland (1995) examined a series of bear and seal population estimates from Canada and concluded that the correlation was sufficiently robust to allow the prediction of one by reference to the other. They also investigated more closely the energetics approach used earlier by Kingsley and concluded that each bear, on average, required 43 ringed seals per year. Born (SC/4/RS/5) re-examined the data and approach used by Stirling & Øritsland. He called attention to the fact that predators in addition to bears and people contribute to ringed seal mortality and to the fact that polar bears prey upon other species in addition to ringed seals (these uncertainties were also recognized by Stirling &

Øritsland). Born also noted that the slope of the regression line chosen by Stirling & Øritsland (1995) suggested that a population of 222 bears would be sustained by zero ringed seals, which is implausible. Rosing-Asvid pointed out that new estimates of polar bear populations (provided by fax from Born), not available to Stirling & Øritsland, would have severely affected their conclusions.

In Svalbard at least, other seal species like bearded and harp seals are taken regularly by polar bears (Lønø 1970; Lydersen pers. comm.). Thus, Lydersen made some calculations of the energy value of a bearded seal in comparison to a ringed seal. He concluded that a polar bear could be maintained for a year from the fat of only 4.4 adult bearded seals. This means that even if a bear took only one or two bearded seals per year, its requirement for ringed seals would be dramatically less than assumed by Kingsley and by Stirling & Øritsland.

No practical value was seen in attempting to make global estimates of ringed seal populations by reference to polar bear populations. In view of the known heavy reliance of polar bears on ringed seals throughout much of Area 1 (Stirling & Øritsland 1995), however, the group thought that it would be worthwhile to explore a model based on polar bear energy requirements, however fraught with uncertainty such a model might be (Figure 2). This exercise provided an estimate of ringed seal abundance in the same order of magnitude as that obtained from survey data and estimates of ice areas (Table 1).

3. REVIEW OF REPRODUCTION, MORTALITY AND RECRUITMENT RATES

Reproductive rates (defined as annual pup production as a percentage of the total population) in the literature are generally in the range of 16-24% although there can be wide variation between years (SC/4/RS/3). Estimates of total mortality summarized by Miller et al. (1982) were in the range of 8-20%. Most estimates of sustainable yield (SY) in the literature are in the range of 7-9% (SC/4/RS/3). The group regarded 8% as a reasonable estimate of SY, based on work in eastern Canada.

Kingsley noted the importance of knowing more about how often and for what cause(s) reproductive failures occur in ringed seal populations, e.g. those documented in the early to mid 1970s and again in the late 1980s in the eastern Beaufort Sea/Amundsen Gulf region (Smith 1987; Kingsley & Byers 1990; Harwood & Stirling 1992). In this connection, Kingsley called attention to the apparent plasticity of the ringed seal's reproductive capability. The average age at first reproduction seems to vary by as much as 3 years (4-5 yr to 7-8 yr), judging by evidence from the Beaufort Sea and Amundsen Gulf. This variability presumably indicates an immediate response to annual changes in biological production related to ice conditions (Kingsley, pers. comm.).

Teilmann called attention to the high proportion of males in the ringed seal catches in Greenland (59% overall), which seems to apply to all age classes, all areas and all hunting methods (SC/4/RS/6). He suggested that this subject be investigated further by analyzing the

large sample of ringed seal material available (from some 8000 animals) and also by evaluating catch compositions in other areas.

4. PAST AND PRESENT REMOVALS IN GREENLAND, CANADA, SVALBARD AND RUSSIA

Statistics on catches of ringed seals in Greenland are available as far back as 1862. No proper validation of the statistics has been conducted. However, the correlation is reasonably close between reported catches and the fur trade statistics, and trends in the catches from adjacent areas are generally consistent. These observations can be taken as evidence that the catch statistics are reliable (SC/4/RS/6). During recent decades catches seem to have fluctuated synchronously in different areas, suggesting that the reported values reflect overall trends. Despite the usefulness of the statistics it is evident that some underreporting can be expected and that the reporting efficiency has changed and the system has periodically been less reliable. During the 1980s the system deteriorated severely. Although the new reporting scheme established in 1992 is believed to be working well, its comparability with the old system is not clear.

The overall mean of catches in Greenland between 1954 and 1994 was 63,250 ringed seals/year, of which 46,500 were in West Greenland (SC/4/RS/6). There has been an overall increasing trend during this period, with a peak in the late 1970s followed by a decline. The apparent decline during the 1980s and 1990s may be real, but it could also be the result of reduced efficiency of the catch reporting system. For comparison, Teilmann pointed out that an annual total catch of 51,000 ringed seals per year was estimated for West Greenland (not including Avanersuaq area) during the 1850s (Rink 1852-57).

In Greenland ringed seals are shot in open water in summer and fall or from the ice edge in spring, netted in open water in fall or in ice in winter, or shot when hauled out on the ice in spring (SC/4/RS/6). Some information is available from Upernavik from the mid 1970s on the distribution of catches made using different types of hunting methods (51% netted, 19% shot in open water, 11% shot at the ice edge and 19% shot while hauled out on fast ice). Loss rates varied according to the hunting method, so catches should be corrected according to how the catch is allocated to different hunting methods. Ideally, correction factors should also be made by area to account for geographic differences. Information on losses in Greenland and Canada were reviewed by Miller et al. (1982), and average values from their review were used here to correct the catch in Greenland (from SC/4/RS/6; Table 2). The catches in NW Greenland (i.e. Upernavik and Uummannaq) constitute 54% of all catches in West Greenland. No information was available on the proportions of the catches made by different methods in N Greenland (Avanersuaq), CW Greenland (Disko Bay area) or the two regions in East Greenland, so loss rates from NW Greenland were applied to these areas in the same ratio as that for NW Greenland. In SW Greenland ringed seals are shot almost exclusively in open water, so the loss rate for this method was applied to the entire SW Greenland catch.

Average loss rates were 30.6% for shooting in open water, 31.7% for shooting at the ice edge and 12.2% for shooting seals hauled out on fast ice. No information was available on

loss rates for netting, but very little loss is likely to be associated with this method so the loss rate for netting was assumed to be zero.

The total average annual removals in West Greenland between 1980 and 1994, adjusted for hunting loss in the manner described above, are estimated to be 63,311 ringed seals (Table 2).

No sustained system for recording catches of ringed seals exists in Canada. Short-term regional 'harvesting studies' and series of official trade and fur export records provide some insight into the catches of ringed seals in the past few decades (SC/4/RS/3 and 7). The average figure per settlement on Baffin Island is probably around 2,000 ringed seals per year, which adds up to 20-30,000 in total for the settlements judged to be taking Area 1 seals. No trends in catches are evident from the statistics except that a major decline in the hunting of ringed seals occurred after the sealskin market crash in the early 1980s (Stewart et al. 1986). A substantial but uncertain proportion of the Canadian hunt is conducted during the open water season, when large losses are expected. However, no rigorous estimates of loss rates are available from Canada. Little or no netting of seals is done in the Canadian Arctic today.

Combining the estimated removals in West Greenland with the crudely estimated annual catch in eastern Canada gives a total annual removal of 83,000-93,000. Some allowance must be made for under-reporting and for undocumented and unestimated losses associated with Canadian catches. A provisional estimate of the total annual removals from Area 1 is thus in the magnitude of 100,000 ringed seals.

The average catch for East Greenland is about 13,500 per year, including the loss rates (Table 2).

Recent catches at Svalbard are in the low hundreds (Lydersen pers. comm.) but no proper statistics are collected.

In the Kara Sea ringed seals are shot in spring at the ice at several settlements along the coast primarily for dog food and human consumption. Only limited numbers of ringed seals have been traded commercially in recent years (SC/4/RS/6). Most of the ringed seal catch reported from the White and Barents seas nowadays consists of seals taken as a by-catch in the net fishery for navaga (saffron cod) in the autumn. Only a small portion are shot. The present level of reported catches in the western Russian Arctic totals less than 5000 ringed seals per year. The mean annual reported catch in the White Sea has declined progressively from 6126 during 1903-31, to 2868 during 1960-78 and to 802 during 1985-94. The catch in the Kara and Barents seas has declined from 3305 during 1960-78 to 386 during 1985-92 (SC/4/RS/6). These trends are probably due both to a real decline in catches and to a deteriorating catch reporting system.

5. PREDATION BY POLAR BEARS AND OTHER MORTALITY FACTORS

Polar bears are by far the most important predators of ringed seals. It is generally agreed that 40-50 ringed seal equivalents are required to feed one polar bear per year and that ringed seals comprise a high proportion of the polar bear's diet in most regions. With a world-wide polar bear population of 20-40,000 bears, this means that ringed seal mortality caused by polar bears is significant. It is important to recognize, however, that ringed seals are not the only prey of polar bears, and the actual magnitude of polar bear predation on ringed seals should be estimated on an area basis.

Other predators on ringed seal pups include arctic foxes, wolves, glaucous gulls, red foxes, dogs, ravens and wolverines, of which arctic foxes are the most important (see Smith 1976). Walruses, killer whales and Greenland sharks prey on older seals as well as pups. Walruses are known to take many ringed seals in certain deep water areas (Lowry & Fay 1984). Data are insufficient for quantifying the importance of any of these predators.

A rabid ringed seal, presumably infected by an arctic fox, has been found in Svalbard (Ødegaard & Krogsrud 1981). Other areas have rabid foxes as well but no other reports exist of rabies in arctic ringed seals.

Antibodies to Phocine Distemper Virus have been found in 4 (2 weak reactions) out of 90 ringed seals in Greenland, but no signs of the disease have been reported (Dietz et al. 1989). There is little risk of viral epizootics like rabies and PDV becoming major mortality factors in ringed seals. Their generally solitary behaviour makes lateral dispersal of disease unlikely.

Ringed seals are hosts for a number of parasites, primarily gastric nematodes, nematodes in the respiratory tract and trematodes in the gall bladder; Trichinella has been detected once in E Greenland. There are no published reports of parasites contributing to mortality in ringed seals, but lungworms may be an important mortality factor for pups (Hammill pers. comm.).

6. IMPACT OF PRESENT REMOVALS ON STOCKS

For Area 1 the best estimate of ringed seal abundance is 1.3 million seals (Table 1). An overall figure for annual removals is in the order of 100,000 (Table 1), or roughly 7-8% of the estimated abundance. Although this percentage is very close to the published estimates of sustainable yield (SY), three lines of evidence can be used to suggest that the catches are sustainable:

i) Annual removals in the order of 60-70,000 have been maintained in West Greenland for more than a century (SC/4/RS/6). Similarly high catches were made in Canada (all areas, including the western Canadian Arctic, Hudson Bay etc.) during the 1960s-early 1980s, after which catches apparently declined in all areas due to the collapse of the sealskin market (SC/4/RS/3 and 7).

ii) Published estimates of SY assume that catch composition is proportional to the population age and sex structure, whereas catches in Greenland and eastern Canada

consistently have a higher proportion of young seals and a preponderance of males. This catch composition should have the effect of increasing the SY.

iii) The ringed seal's very wide and rather uniform distribution, set against the fact that hunting is limited to particular areas near Inuit settlements, can be seen as tending to buffer the species against wide-scale overexploitation.

On the other hand, it is important to bear in mind that random mixing of ringed seals throughout the region has been assumed but not proven, so the possibility of local overexploitation cannot be ruled out. Even though present removals are probably sustainable, the large harvests in parts of Area 1 warrant further monitoring of removals (including losses) as well as the monitoring of developments in hunting effort and of the trade in hunting products.

Present levels of removals in East Greenland, Svalbard and Russia raise no concern for the status of seal populations, since catches are small and likely to be taken from a wide geographical area producing large numbers of ringed seals.

7. ANTHROPOGENIC IMPACTS OTHER THAN HUNTING (I.E. DISTURBANCE, POLLUTION, FISHERIES)

The Working Group considered the possible impact of fisheries on ringed seals but found limited evidence of direct competition between ringed seals and fisheries. This is due to the fact that ringed seals feed mainly on species that are not commercially exploited at present (e.g. amphipods and ice-associated cods). In the western Russian Arctic competition may exist between ringed seals and commercial fisheries for navaga (saffron cod), herring and Atlantic salmon (Popov 1982), and there is a by-catch of ringed seals in the navaga fishery (Belikov and Boltunov pers. comm.). These potential problems have not been investigated recently.

Human activities are generally increasing throughout the Arctic and many of these activities potentially disturb ringed seals. These include helicopter traffic, ice-breaking marine traffic, seismic surveys, hydrocarbon exploration and production, trawling, snowmobiles (skidoos) and low-flying aircraft. The working group was aware of several studies addressing questions about the effects of disturbance on individual seals (SC/4/RS/3), but these disturbance studies have not demonstrated population-level effects. The most significant impact may come from collisions by vessels operating in the same ice that is used by ringed seals for birth lairs. Seismic surveys and exploratory drilling have taken place in Svalbard during the past ten years (Lydersen pers. comm.) and similar work is planned in the Pechora Sea (Belikov pers. comm.). In the latter area, there is concern that the hydrocarbon exploration and development will be in one of Siberia's most productive areas for ringed seals (SC/4/RS/8). Also of concern is the opening of the Northern Sea Route to year-round industrial and commercial traffic, which in winter and spring will follow the edge of the fast ice (Boltunov pers. comm.).

Levels of pollutants (organochlorines, heavy metals and radionuclides) have been measured in ringed seals in Canada, Greenland and Svalbard (SC/4/RS/3), but the Working Group was not aware of any studies of physiological effects of pollutants (other than oil) on arctic ringed seals. In view of the large human consumption of ringed seal products in hunting districts, more thorough and comparable investigations are desirable. Some of these are underway. The Arctic Monitoring and Assessment Program (AMAP) will, within the next one or two years, provide results from a large-scale circumpolar study of contaminant levels in ringed seals and other organisms as well as a survey of past measurements. Several Norwegian/Russian projects are in the process of being developed for studying pollutant levels and pathways in biota, sediments and water along the western Siberian coast where river outlets deliver pollutants from industrial and mining activities into the Arctic Basin. The Working Group considered it unwise to attempt an assessment of ringed seals and pollutants until the results of these large-scale studies were available. The Working Group urged NAMMCO to obtain reports from AMAP and other studies dealing with ringed seals and pollutants in the Arctic.

8. RECOMMENDATIONS

i) In the light of the magnitude of present catches in West Greenland and Canada and the uncertainty about their sustainability, it is **strongly recommended** that systems be initiated, maintained or improved for collecting detailed, complete and compatible catch statistics and information on effort from all areas. In addition to reports of landed catches of ringed seals, effort should be made to correct these figures for losses according to the different types of harvesting situations. Where appropriate, compilations of catch and loss should be further corrected for under-reporting.

ii) A major unknown factor regarding ringed seal biology is the importance of pack ice breeding. Since the seals breeding in the pack ice of Baffin Bay, the Greenland Sea and the Barents and western Kara seas are thought to contribute substantially to ringed seal production in these three regions, it is **recommended** that further studies of stock identity, productivity and abundance of pack-ice ringed seals be conducted.

9. ADOPTION OF REPORT

The report was adopted at 14.00 on 8 February 1996.

LIST OF DOCUMENTS

SC/4/RS/1	List of participants
SC/4/RS/2	Agenda
SC/4/RS/3	R.R. Reeves, World Review of Distribution, Abundance and Biology of the Ringed Seal (*Phoca hispida*).
SC/4/RS/4	C. Lydersen, Status and biology of ringed seals from Svalbard.
SC/4/RS/5	E.W.Born. How many ringed seals are needed to sustain all the polar bears ?

SC/4/RS/6 J. Teilmann and F.O. Kapel. Exploitation and status of the ringed seals (*Phoca hispida*) in Greenland.
SC/4/RS/7 M. Kingsley. Ringed seals in Canada.
SC/4/RS/8 A. Boltunov and S. Belikov. The ringed seal (*Phoca hispida*) in the West of the Russian Arctic.

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Figure 1. Delimitation of areas of ringed seal distribution as used in assessing abundance and exploitation - Areas 1, 2 and 3.

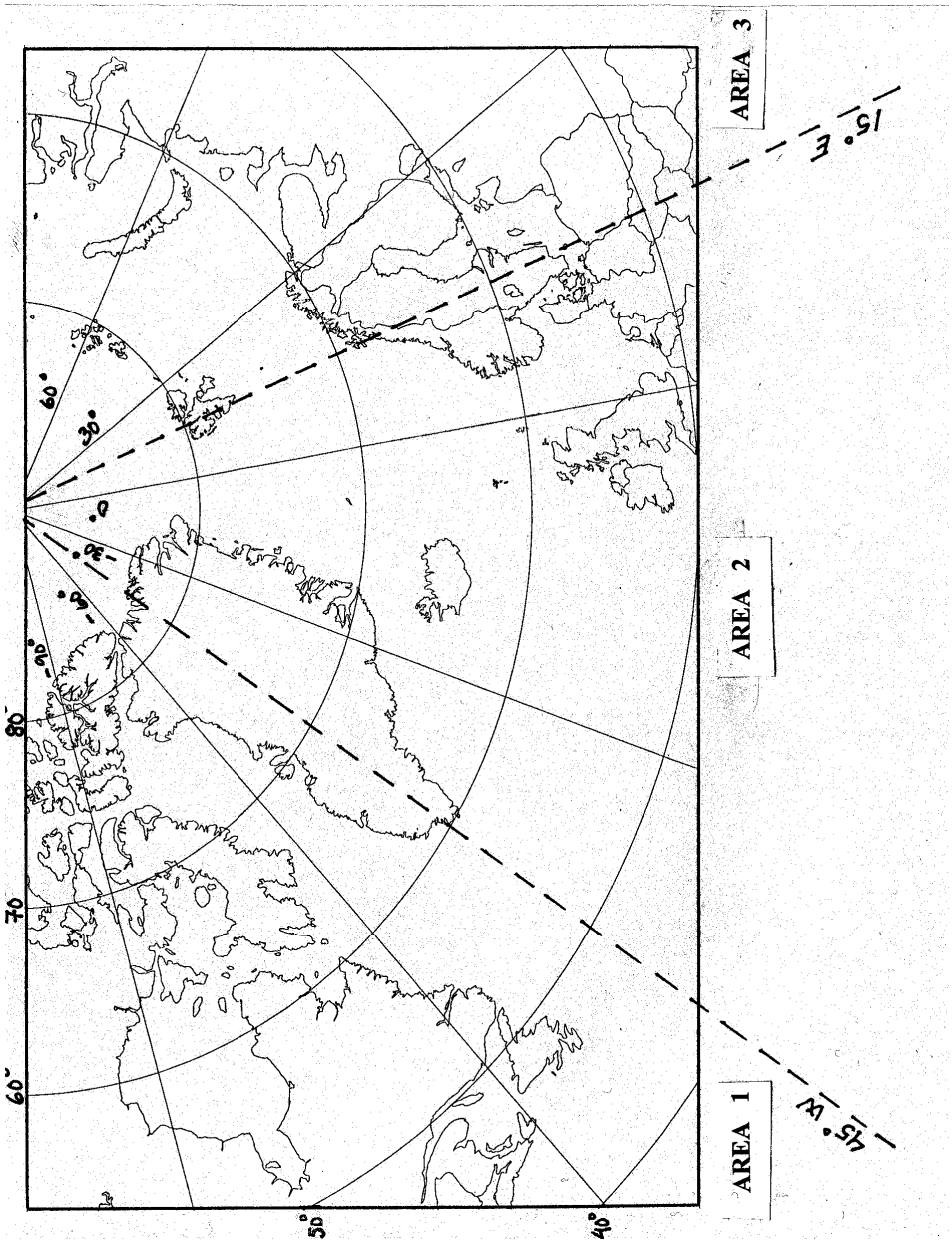

Figure 2. Estimation of polar bear predation on ringed seals

Estimation of ringed seals in area 1 from take by predators

I Polar bear energetics. **a) Assume** that the average polar bear needs the energy equivalent of 40 ringed seals per year; **b) assume** that ringed seals are 75 to 90% of intake; i.e. 30 to 36 seals per year

c) Polar bear populations	Baffin Bay	Davis Strait	Kane Basin	Lancaster Sound	Total
	2200	1400	200	1700/2=850	4650

d) From **a)**, **b)**, and **c)**, polar bear kill is 140 to 170 thousand ringed seals per year

II Ringed seal population model. Extreme life history statistics for stationary populations, maximum age 30

Age	0	1	2	3	4	5	6	7	8+
Birth rate (F/F, %)	0	0	0	0	20	30	40	42	45
e) high juvenile survival (%)	70	75	80	85			86.4		
f) low juvenile survival (%)	40	55	70	85			96.7		

For **e)**, production is 24% of after-pupping population, for f) it is 19%. Standing population of ringed seals to supply polar bear predation range within (140 to 170 thousand)/(0.19 to 0.24) = (580 to 890 thousand)

III Other predators. **g) Assume** other predators take 20% of polar bear take. Standing population becomes (580 to 890)x1.2 = (700 to 1070) thousand

IV Human hunters: **h) Assume** hunters take 100 thousand per year. Standing population to support this is (420 to 530 thousand)

V Total standing population after pupping is then: (1120 to 1600) thousand i.e. 1.1 to 1.6 million

Table 1. Ringed seal numbers in Baffin Bay and associated waters estimated from survey data

Region name	Fjord fast ice			Shelf fast ice			Stable pack ice			Total pop.
	Area	Density	Pop.	Area	Density	Pop.	Area	Density	Pop.	
Jones Sound			0	35.7	0.33	11.9			0	11.9
Kane Basin				18.5	0.33	6.16				6.16
East Lancaster Sound	1.4	1.7	2.38			0			0	2.38
Eclipse Sound & assoc. waters	8	1.7	13.6			0			0	13.6
West Greenland	40.6	1.7	69.02	10	1.3	13			0	82
West Baffin Bay	16.1	1.7	27.37	20	1.3	26	301	1.3	391.3	445
South Baffin Island	25.2	1.7	42.84			0			0	42.8
Ungava Bay	6.4	1.7	10.88			0	25.1	1.3	32.63	43.5
					Total surveyable population					647
					Survey correction factor					2.0
					Estimated total population					1294

Notes:
Areas are in thousands of sq. km; densities are surveyable seals per sq. km; estimated populations are in thousands.
Size of areas are taken from Miller et al.(1982); Finley et al. (1983); McLaren (1958b); Stirling and Øritsland (1995); and in the case of Ungava Bay pack ice and Kane Basin shelf fast ice are eye balled from small scale maps.
The estimates of densities are taken from, or informed by, Kingsley et al. 1985 and from Finley et al. 1983;
survey correction factor are from review by Stirling and Øritland (1995).

Table 2. Average catch 1980-94 (some years missing) according to the catch statistics distributed on hunting methods (SC/4/RS/6) and multiplied by average loss rates from Miller et al. (1982).

Region name	Average annual catch 1980-94	Shot in open water incl. 30.6% loss	Shot at ice edge incl. 31.7% loss	Shot on fast ice incl. 12.2 % loss	Netted incl. 0% loss	Total incl. loss
Northwest Greenland	31.639	7.851 (19% of the catch)	4.584 (11% of the catch)	6.745 (19% of the catch)	16.136 (51% of the catch)	35.316
North Greenland	13.485	3.346 (19%)	1.954 (11%)	2.875 (19%)	6.877 (51%)	15.052
Central West Greenland	4.895	1.215 (19%)	709 (11%)	1.044 (19%)	2.496 (51%)	5.464
Southwest Greenland	3.420	4.467 (100%)	0	0	0	4.467
South Greenland	2.306	3.012 (100%)	0	0	0	3.012
All West Greenland	**55.745**	**19.891**	**7.247**	**10.664**	**25.509**	**63.311**
Southeast Greenland	8.935	2.217 (19%)	1.294 (11%)	1.905 (19%)	4.557 (51%)	9.973
Northeast Greenland	3.204	795 (19%)	464 (11%)	683 (19%)	1.634 (51%)	3.576
All East Greenland	**12.139**	**3.012**	**1.758**	**2.588**	**6.191**	**13.549**

3.2 - APPENDIX 1

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3.3 REPORT OF THE SCIENTIFIC COMMITTEE *AD HOC* WORKING GROUP ON GREY SEALS

Tórshavn 5-8 February 1996

1-3. OPENING PROCEDURES

The *ad hoc* Working Group on Grey Seals met at the Nordic House in Tórshavn, Faroe Islands, 5-8 February 1996. The Chairman, Arne Bjørge, welcomed participants (listed in Appendix 1).

The Working Group had as its terms of reference the Council's request for advice on grey seals (*Halichoerus grypus*) which was 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."

The Working Group adopted the agenda and decided to review the available working papers area by area (see List of Documents). For the general discussion, conclusions and recommendations, the Working Group decided to discuss all areas by topic.

Invited experts D.Thompson (UK) and M. Hammill (Canada) assisted the Chairman as rapporteurs.

4. REVIEW OF GREY SEAL STOCKS

4.1 Stock Identity and Breeding Distribution

The grey seal (*Halichoerus grypus*) is a medium sized phocid found throughout the temperate waters of the North Atlantic. Three distinct populations are recognized: the western North Atlantic; the eastern North Atlantic; and the Baltic Sea grey seals. An examination of mitochondrial DNA variation in samples from Canada, Norway and the Baltic Sea found no shared haplotypes between the eastern and western Atlantic (Boskovic *et al.* submitted). According to this study, the distances between these two populations suggest that they diverged 1.0-1.2 million years ago. Nucleotide divergence between Baltic Sea and Norwegian grey seals, estimated to be around 0.7%, suggests that separation of Baltic and Northeast Atlantic grey seals took place around 350 thousand years ago based on standard divergence measures (Boskovic *et al*. submitted). The Working Group commented that if the separation of Northeast Atlantic and Baltic grey seals was established by the formation of the semi-enclosed Baltic Sea, the separation may be a more recent phenomenon due to the postglacial history of the Baltic Sea basin.

In the Northwest Atlantic two major groups of grey seals are recognized, based on the location of their whelping patches. The largest group breeds on Sable Island, a 40 km long

sand bar located approximately 150 km to the east of Nova Scotia. The second group, known as the non-Sable Island grey seals, is made up of animals that breed on the small islands along the eastern shore of Nova Scotia and animals that whelp on the drifting pack ice in the Gulf of St Lawrence (Mansfield and Beck 1977). Recently a new breeding site was established at the Cape Cod Peninsula in USA. Although animals from both groups show strong philopatry to their whelping sites, considerable overlap occurs between the two groups in their distribution outside of the breeding season (Stobo *et al.* 1990; Lavigueur and Hammill 1993). An analysis of the mitochondrial DNA indicates that the two groups likely form a common stock (Boskovic *et al.* submitted).

The Northeast Atlantic grey seals are distributed from Iceland, Faroe Islands, British Isles and along the northwest coasts of mainland Europe. In Iceland the distribution is divided into two main areas (SC/4/GS/5). The majority of the population breed on the west and northwest coast, fewer at the southeast coast. Recently, grey seals established a new breeding colony in northeast Iceland. Historically, the distribution of the Icelandic grey seals has been changing. During the last 50 years it has dispersed from the west coast to the northwest and north coasts and now to the northeast coast. A few grey seals tagged in the UK have been found in Icelandic waters (E. Hauksson, pers. comm.). Thus, there is some evidence of mixing of Icelandic grey seals with other grey seal stocks in the North Atlantic, but the degree of mixing is unknown.

In the Faroe Islands, grey seals are frequently seen, and may be counted in hundreds at haul out sites, in particular at Mykineshólmur and Sumbiarbjørgini (D. Bloch, pers. comm.). No information is available on the distribution of grey seals in Faroe Islands. One grey seal tagged as a pup at North Rona, UK, in 1993 was shot in the Faroe Islands in the summer of 1994. Recently, grey seals tagged with satellite linked transmitters have migrated to the Faroe Islands. Historical and anecdotal information indicate that grey seals breed in caves on the Faroe Islands (SC/4/GS/6).

In the UK grey seal breeding colonies are found in Shetland, Orkney, North Rona, Outer and Inner Hebrides, on the north and northeast coasts of the Scottish mainland and on Isle of May, Farne Islands and Donna Nook on the North Sea coast. Smaller colonies are located in Wales and at the Scilly Islands in southwest Britain (SC/4/GS/8).

Grey seal breeding sites are located along the mainland coast of Europe from the Kola Peninsula, northern Russia, along the Norwegian coast, the German and Dutch Wadden Sea to France. The largest breeding groups are reported from Kola, Russia, and Froan in Central Norway (Anon. 1996).

In the Baltic Sea, grey seals normally breed on ice during late winter. There are large year to year differences in ice conditions and coverage, and the location of breeding varies between years. Due to mild winters, in Estonia the pups have been born on shore in recent years. Grey seals are still absent from most of their former range in the southern Baltic Sea (Anon. 1996).

In the Northeast Atlantic most grey seals breed in autumn from September to December, and the breeding season of Northeast Atlantic grey seals is therefore quite distinct from the late winter breeding of Baltic grey seals.

4.2 Distribution and movements outside breeding season

Knowledge on the distribution and movements of grey seals is available from anecdotal information, sightings, recovery of tags from bycaught or shot animals, or animals found dead on shore, and more recently from information provided by telemetry and pelage recognition programmes.

4.2.1 Distribution patterns

In the Northwest Atlantic, grey seals are found as far north as Cape Chidley in northern Labrador, throughout the Gulf of St Lawrence and along the Atlantic coast as far south as Virginia in the United States (Katona et al . 1993).

Sable Island animals appear to have a postbreeding pelagic phase (January-April) during which time they disperse from the island. This is followed by a spring moulting phase (May-June), then by a summer dispersal away from the island (July-September). At this time animals disperse towards the Nova Scotia, Maine and Newfoundland coasts and into the Gulf of St Lawrence. This is followed by a return to Sable Island during the fall and early winter (October-December) (Stobo *et al*. 1990).

This general movement pattern is also true for non Sable Island grey seals. The largest concentration of non-Sable Island grey seals is found in the Gulf of St Lawrence, where whelping occurs on the drifting pack ice in the southern Gulf during January-February. Tag returns and satellite telemetry indicate that after breeding adult grey seals move out of the Gulf onto the Scotian shelf (Lavigueur and Hammill 1993; Goulet, Barrette and Hammill unpublished data; Hammill, Lydersen and Kovacs unpublished data), where they remain offshore until the spring moult. The pups tend to remain with the pack ice as it drifts around the west side of the Cape Breton Coast into the Atlantic. However, in some years ice drift is slow, or there is little ice available which breaks up early in the season. When this occurs, many animals move ashore, where mortality may be high along the north coast of Nova Scotia and the west coast of Cape Breton Island. During May-June, both adults and juveniles move ashore to moult. Although some animals moult throughout the Gulf, most appear to move into the northern Gulf, around Anticosti Island and along the north shore (Clay and Nielsen 1985). After the moult, animals disperse, with many animals moving into the St Lawrence estuary (Lavigueur and Hammill 1993). During the fall, grey seals in the Gulf return to the southern Gulf for the breeding season, but this movement occurs slowly and late in the year (Goulet, Barrette and Hammill unpubl.data).

Between 1988 and 1993 SMRU (Sea Mammal Research Unit, UK) carried out a series of helicopter-based thermal image surveys around Scotland, and annual surveys of the Wash in south-east England during the common seal moult in August. The numbers of grey seals seen were also recorded. All sections of the Scottish coast were surveyed at least once over the six year period. Grey seals were found in groups throughout the Western Isles, along the west and north coasts of Scotland, throughout the Orkney and Shetland Isles and at various

points down the east coast as far as the Wash. Concentrations of grey seals in summer were closely associated with breeding sites, with additional large haul outs in the estuaries of the Wash, the River Tay and the inner Moray Firth (SC/4/GS/8). There do not appear to be large scale shifts in population distribution as seen in Canada.

Recoveries of grey seals tagged in the UK suggest that there is a general dispersal of pups away from their natal sites, with recoveries from the entire North Sea basin as far as 67° on the coast of Norway. Migration rates between areas indicated that most 0+ age class seals remain within the sea area closest to their natal site, but that extensive movements occur between adjacent areas, with consequent mixing of pups from different breeding sites (SC/4/GS/8).

Swimming tracks of adult seals obtained from satellite and real time acoustic tracking showed large scale movements of up to 2,100 km and demonstrated frequent interchange between major haul-out areas. However, most seals spent most of their time on short (mean 2.7 days) and local (mean 47 km from haul-out site) foraging trips. For example, Farne Islands' seals spent 78% of their time within 50km of the islands. Foraging 'hotspots' could be identified. These were visited repeatedly by several seals and seemed to be associated with particular seabed sediment types (SC/4/GS/8).

4.2.2 Tagging and Telemetry Programmes

Conventional flipper tagging programmes have been conducted on grey seals in Canada since the 1970s. On Sable Island all pups were tagged between 1977 and 1990 (Stobo *et al.* 1990). For the non-Sable Island component of the population, tagging has been more sporadic. Approximately 2000 pups were tagged in each of 1984 ,85, 86, 89, 90, 94 and 96 on the pack ice in the Gulf of St. Lawrence. Smaller numbers (<1000) have been tagged on small islands along the eastern shore of Nova Scotia between 1984 and 1996. Tag recoveries have been used to estimate pup production of the non-Sable Island component (Hammill *et al.* 1990; Lavigne and Hammill 1993) and to examine the seasonal distribution of grey seals (Stobo *et al.* 1990; Lavigne and Hammill 1993).

In Britain flipper tags have been used extensively on grey seals since the 1960s. Early results from studies on the east coast showed a wide dispersal of pups. The last major tagging effort was in 1980 in the Hebrides, Orkney and Farne Islands. Most recoveries were from the 0+ age class. Recovery patterns were used to derive recapture effort and migration rate estimates between sea areas centered on the major breeding areas.

A flipper tagging programme began in central Norway in 1977 and more recently in Finnmark and at the Kola Peninsula.

In the UK VHF radio transmitters have been used to study movements of grey seals between the Farne Islands and Isle of May between November 1988 and December 1990. Automatic receiving stations (Nicholas *et al.* 1992) were placed at five sites along the coast. Movements between haul-out sites and activity patterns of 19 grey seals were recorded. In addition, the movements, dive behaviour and physiology of 11 grey seals were monitored using VHF and acoustic-telemetry. Seals were tracked from small boats and were recorded

making extensive movements between haul-out areas and making foraging trips up to 80km offshore.

In the UK, satellite transmitters interfaced with depth and swim speed data loggers, have been deployed on 23 adult grey seals in the North Sea and approximately 15 in the Hebrides. In 1995 new miniaturized transmitters were deployed on weaned grey seal pups in the Outer Hebrides. Further deployments are planned for 1996. The same devices have been deployed on 5 grey seals in central Norway (Bjørge 1995) and on eight grey seals in the Baltic Sea (Sjøberg *et al*. 1993; SC/4/GS/8).

A total of 13 satellite tags have been deployed on grey seals in the Gulf of St. Lawrence. During October 1995 four satellite tags were deployed on grey seals on Sable Island. There are plans to deploy eight more on animals at Sable Island and five in the southern Gulf of St. Lawrence during the summer of 1996 (M. Hammill, pers. comm.).

4.2.3 Mark Recapture Techniques

Local population estimates, rates of movement between haul-outs and survival rates can be estimated using mark recapture techniques. Historically, plastic or metal tags were used to mark seals. These provide limited information due to tag loss, low rates of tag recovery and the fact that recoveries are often from dead animals.

Automated photo-identification techniques have recently been developed which use natural marks on seal pelage to identify individuals.Photographs of the side of the head are digitised and a standard sample of the pattern is extracted. Specially developed image processing software compensates for view point and seal posture. Images of the same seal produce a high similarity index when compared by a computer program. Pairs of photographs with high similarity measures are then compared by eye to confirm matches. Once entered into the database, each image is compared with all other entries to develop a capture history for each seal (Hiby 1995; SC/4/GS/8).

In a three year study in the North Sea, over 10,000 images were obtained giving 4,050 identifications, of which 2,400 were classed as well **as** marked. The study provided local summer population estimates and migration rates between haul-out areas. The catalogue is being maintained and expanded and is producing estimates of survival rates and updated population estimates. Comparisons between summer haul-out and breeding season catalogues will yield estimates of reproductive rates.

4.3 Population size and status

Grey seals were at one time very abundant and widely distributed along the Canadian east coast and in the Gulf of St Lawrence, where they were first hunted by Amerindians. Extensive hunting by Europeans, particularly after the disappearance of the walrus in the Gulf and on Sable Island, resulted in the depletion of the grey seal population by the mid-1800s (Lavigueur and Hammill 1993). By the early 1900s grey seals were still considered to be widely distributed, but there was no particular hunt for them owing to their

small numbers. During the 1950s the grey seal in eastern Canada was considered to be uncommon or rare.

Grey seal pup production on Sable Island has been determined by complete enumeration between 1977 and 1990. Counts on Sable Island indicate that pup production has increased from 2,181 pups in 1977 to 9,712 in 1989 at an exponential rate of increase of 12.6% per year (Stobo and Zwanenburg 1990). Non Sable Island pup production estimates have been determined from mark-recapture experiments conducted between 1984 and 1990, where the pups were marked on the whelping patch and later shot during scientific collection programmes or by recapturing the animals live on Sable Island 3-10 months later. Using the best estimates, pup production increased from between 5,200 and 6,700 animals during the mid 1980s to between 8,300 and 10,700 during 1989-90 at an annual rate of increase of 8.8% (Hammill et al submitted). It is evident that the Sable Island and non Sable Island components of the population have undergone very different trajectories since the 1970s. During the 1970s, roughly 69% of the population was of non-Sable Island origin comprised mostly of animals in the Gulf of St Lawrence. However, by 1993 less than 43% of the total population of approximately 143,000 animals was of Gulf origin. Differences in the trajectories of the two groups likely result from the effects of the government sponsored cull of non Sable Island animals in the whelping areas, as well as higher probable mortality rates for pups born on the unstable pack ice in the Gulf of St Lawrence (Hammill *et al.* 1995).

Grey seals were first counted in Iceland in 1982. In the period 1982 to 1990 the population seems to have been stable or slightly increasing, but since 1992 and after that time the population appears to have been declining. The abundance of the grey seal around Iceland is now about 8,000 animals. In 1982 the population was estimated as 12,500 (9,550-14,400) animals (SC/4/GS/5).

Historical (Landt 1800) and anecdotal information indicate that grey seals breed in caves on the Faroe Islands. The population size was unknown, but supported a harvest (Johannessen 1967) and a bounty system between 1963 and 1967. A total of 970 seals was reported killed during this system (Reinert 1982). There is at present no estimate available for pup production in the Faroe Islands.

Approximately 40% of the world population of the grey seal breeds on 37 widely dispersed sites around the British Isles. The total number of births at all the major breeding sites in northern Britain has been monitored by aerial photographic surveys since the 1960s (SMRU). Pup productions at other sites at South Ronaldsay in Orkney, at the Farne Islands and in the Humber Estuary have also been estimated annually, from ground counts conducted by staff from Scottish Natural Heritage, the National Trust and Lincolnshire Trust for Nature conservation. Pup production estimates for Shetland and Wales are based on occasional surveys by SMRU and Dyfed wildlife trust (SC/4/GS/8).

Details of the aerial survey and photo-analysis techniques have been described fully by Hiby *et al.* (1988). The essential features are: a minimum of four flights are conducted over each site each year to trace the rise and fall in pup numbers ashore; the photographs provide complete coverage of the breeding site; the quality of the images is sufficient to allow pups

to be distinguished from similar shaped and sized objects such as sheep and rocks, and allows pups to be classified into one of two developmental stages. Since 1985 colour transparency film has been used, facilitated by the development of an image motion compensation system (Hiby *et al*. 1987). This system provides a spatial resolution of about 5 cm on the ground and allows a proportion of moulted pups to be distinguished from whitecoats.

Since 1991 each site has been photographed at least four times at 10-day intervals. However, the timing and number of flights in previous years has been more variable.

Because the length of time pups remain ashore is short relative to the spread of birth dates, there is no time at which all the pups born are present. The number present at any time is a function of the birth rate up to that time and the rate of disappearance. Birth rate is estimated by fitting the count series to an underlying statistical model of the way in which the number of pups ashore varies through the season. (Rothery and McCann 1987, Hiby *et al.* 1988). An estimation procedure which produces maximum likelihood estimates of pup production for each site is fully described by Hiby *et al.* (submitted).

Population size is estimated by fitting a demographic model to the entire series of pup production estimates obtained since 1984. The size of the British grey seal population is defined as the number of seals born at a British breeding site which are alive at the start of the breeding season. The population is estimated as a whole because at present there is no objective basis for partitioning this geographically defined unit into biologically meaningful sub-units. The demographic model has been described fully by Hiby *et al.* (submitted).

The number of females in the population is estimated from the entire time series of pup production estimates. The size of the male component is then inferred from the female population estimate and information on relative survival values. The aim of this exercise is to derive an estimate of absolute abundance each year. These can be viewed as a time series, but being a long lived, annually breeding species the total population estimates provide a heavily damped indicator of changes in the population. The time series of pup production estimates provides a much more sensitive indicator of changes in numbers and distribution (SC/4/GS/8).

The demographic model is applied to all sites which are monitored annually, i.e. Inner and Outer Hebrides, North Rona, Orkney, the Isle of May and Farne Islands. Together these sites account for almost 90% of the pup production in Britain. The total population estimate for the annually monitored sites was 96,577 in 1994. By adding the most recent available estimates from all other breeding sites and multiplying by the total population:pup production ratio estimated from the model, an estimate of 108,500 for the total British grey seal population in 1994 is obtained. Of these, 99,300 seals are associated with breeding sites in Scotland and 9200 with sites in England and Wales.

Ninety-five percent confidence intervals on the pup production figures at each location are estimated to be within 14% of the point estimate. Ninety-five percent confidence intervals on the overall population estimate have been derived for the Farnes population. These were

within 23% below and 38% above the point estimates. In Orkney pup production increased by approximately 4% p.a. between 1964 and 1982. Between 1970 and 1982 an average of 950 moulted pups were killed annually in a commercial hunt. Between 1984 and 1994 pup production increased by around 9-10% p.a.. In the Outer Hebrides pup production increased by approximately 6% p.a. between 1961 and 1982. The commercial hunt was less intensive and of shorter duration than in Orkney, with an average take of 515 p.a. between 1973 and 1979. Between 1984 and 1994 pup production has increased by around 5-6%, although in the last two years the increase has been only around 2% p.a.. In the Inner Hebrides pup production increased by 7.6% p.a. between 1984 and 1994. This area was not surveyed regularly before 1984. Coincident with the lower rate of increase in the Outer Hebrides, pup production in the Inner Hebrides in 1994 was lower than the 1992 value. The North-East English/South-East Scottish population was initially restricted to the Farne Islands. Between 1956 and 1971 pup production increased by 7% p.a., reaching a peak of 2,041. A series of control measures were carried out between 1971 and 1982 to reduce this population. Pup production was reduced to 1,238 p.a., but the measures had the effect of moving a proportion of the Farnes seals to the Isle of May, approximately 90km to the north. Since 1983 the combined population has continued to increase at 7% p.a (SC/4/GS/8).

Pup production has not increased uniformly at all colonies. For example, in the Outer Hebrides the Monach Isles have accounted for most of the increase since 1984. In Orkney, sites which produced a third of the total in 1987 have not increased at all while the total production increased at 10% p.a.. The patterns of variable growth rates at colonies within small geographical areas mean that it is not possible to monitor the pup production by counting only a few sites. Nor is it adequate to monitor just the current breeding sites, as newly colonised sites can increase rapidly in size. Calf of Eday and Copinsay in Orkney were not used for breeding before 1990, but by 1993 they contributed 7.5% of the total production. If a new colony is not included until it has grown to a significant size the estimated rate of increase will be over-estimated.

A discontinuity in the Orkney time series between 1982 and 1984 was probably due to improvements in photographic techniques. There is some indication of a similar effect in the Outer Hebrides although this could be the result of a decrease in pup production due to a cull of adult females in 1977. The immediate effect of the 1977 cull on pup production is obvious and is larger than would be expected purely as a result of the number of females killed (SC/4/GS/8).

Total pup production fell in 1988 and recovered by 1992. This is coincident with the phocine distemper epidemic which killed around 17,000 harbour seals (*Phoca vitulina*) in Europe. There was no evident increase in grey seal mortality at the time, but these figures suggest that there was an effect on fecundity or recruitment into the breeding population.

The reduced growth rate in the last two seasons in the Western Isles suggests that there may have been a decrease in fecundity. If fecundity has declined it would be misleading to extrapolate population size to future years using historical trends.

Figures of pup production are available for all known breeding sites along the mainland coast of northwest Europe, However, most figures are based on single counts. No confidence limits are therefore established for these figures. In most cases in Norway and Russia there are no time series available to evaluate trends in populations. The most recent counts, and therefore minimum figures for pup production are: 358 in Russia (Haug *et al.* 1994); 473 in Norway; 9 in Germany; 25 in the Dutch Wadden Sea; and 2 in France (Anon. 1995).

4.4 Life history

In the Northwest Atlantic, whelping begins in late December and continues into late January on the small islands of Amet Island, and Deadman Island in the Gulf of St Lawrence, along the Nova Scotia Eastern Shore and on Sable Island (Mansfield and Beck 1977). Whelping also occurs on the drifting pack ice in the southern Gulf of St Lawrence, beginning in early to mid January and continues into early February (Hammill, unpublished data). Lactation lasts for approximately 15-16 days (Iverson *et al.* 1993; Baker *et al.* 1995). At birth the pups weigh 15-17 kg, gain 2.4-3.0 kg/d and are weaned at a mass of 51-56 kg (Bowen *et al.* 1992; Iverson *et al.* 1993; Baker *et al.* 1995). Males have been observed to be heavier at birth, grow faster and to be weaned at a greater mass (Baker *et al.* 1995), but this has not been observed in all studies (Bowen *et al.* 1992; Iverson *et al.* 1993).

In the Northwest Atlantic mean age for females giving birth for the first time is 5.5 y (sd=0.12). Reproductive rates for female grey seals using the presence or absence of a fetus are 0.18, 0.86 and 0.88 for females aged 4+, 5+ and > 6+ y. Among males a marked increase in testes weight is observed at age 3+ y. The mean age of physical sexual maturity is 5.6 y, and by age 7 virtually all males are sexually mature (Hammill and Gosselin, in press). However, animals do not appear to be able to hold tenure in the whelping patch until the age of 11-12 y (Godsell 1991).

Harwood and Prime (1978) reported from UK waters that 17% of grey seal females became pregnant at age four, 60% at age five, and the pregnancy rate was 90% for age six and older females. Grey seals examined by Harwood and Prime were sampled at the Farne Islands between 1972 and 1975. Boyd (1985) found that grey seal females in 1978-81 had their first pregnancy, on average, one year earlier. Boyd indicated that there may have been a decline in age at first pregnancy, alternatively that the difference between methods used by him and by Harwood and Prime (1978) have resulted in different estimates.

Little information was available on life history parameters from Iceland, the Faroe Islands and Norway.

4.5 Exploitation

Beginning in 1927, the Canadian government paid fishermen a bounty upon receipt of a harbour seal snout. In 1949, the system was changed to require presentation of the lower jaw before payment of the bounty. Since it is possible to identify the species by the lower jaw it became apparent that grey seals had been submitted in small numbers (Mansfield and Beck 1977). Between 1967 and 1984, the Department of Fisheries and Oceans conducted an annual cull at breeding colonies in the Gulf of St Lawrence and along the Nova Scotia eastern shore (Zwanenburg and Bowen 1990). From 1978 until 1990, a bounty was paid to

licenced fishermen who submitted lower jaws from grey seals and information on date and location of capture. A total of 4,379 individuals were taken under the bounty program throughout its duration. Captures were initially quite high following introduction of the bounty program, but with the exception of a large number of returns in 1987 (753), declined steadily until 1990, when only 79 returns were received (Lavigueur and Hammill 1993).

In Iceland there is a directed hunt of grey seals. At earlier times grey seals were hunted, especially the pups for their skin, but also for their meat. Skins from grey seals have not been very valuable in Iceland in recent years, and hardly ever exported. Before 1982 records of number of seals killed were unreliable (SC/4/GS/5). In 1982 organizations of the fishing industry and fisheries in Iceland started promoting seal hunting, and since that time reliable information on catches is available (Anon. 1994).

Since 1982 shot grey seals have been utilized in food mixtures for fur-animals. The skin has been used in leather and garments. Some of the meat is also used for human consumption (SC/4/GS/5).

In UK waters a total catch of 16,501 and 4,527 grey seals were reported for the decades 1970-79 and 1980-89, respectively. Since 1990 a total of 45 has been reported taken (Anon. 1995). In Norway there is a hunting season from 1 December to 30 April in areas north of approximately 62°N. Hunting is known to occur (Haug *et al.* 1994), although no system is established to record effort or catch statistics in this hunt.

In the Faroe Islands fish-farmers are permitted to shoot seals near fish farms. According to Mikkelsen *et al.* (SC/4/GS/6) the number killed may be significant, and may have prevented the Faroese grey seal population from increasing over the last decade. Also in several other countries grey seals may be killed legally if they approach fish farms. Although numbers of seals shot in order to protect fish farms or standing fishing gear are believed to be significant in some areas, levels of such kills are virtually unknown. By-catches of grey seals in fishing gear are known to occur. Return of tags indicates that seals less than one year of age are particularly vulnerable to entrapment in fishing gear (Bjørge and McConnell 1986). A total by-catch of 300 grey seals in 1994 is reported from the Baltic Sea population (Anon. 1995). In general, levels of by-catches of grey seals, and of other marine mammals species, are poorly documented.

4.6 Conclusions and Recommendations

Outside the breeding season there is extensive overlap in distribution of grey seals from different breeding colonies. There is evidence of inter-annual site fidelity of sexually mature grey seals (Wiig and Øien 1988; McConnell *et al.* 1992; Pomeroy *et al.* 1994; Twiss *et al.* 1994). However, the degree of exchange of animals and genetic flow between breeding groups within the three populations of grey seal is not well studied, but some mixing between groups has been reported (Harwood *et al.* 1976). The Working Group appreciated the recent information on stock identity made available by analyses of mt DNA. The Working Group encouraged further sampling for genetic analysis and noted that frozen blood or skin samples are relevant for such analyses.

The Working Group **recommended** that samples are taken when live capture seals and shot samples or bycatches are available and advised a sample size of 20-30 animals from each breeding unit. Further, the Working Group **recommended** exchange of samples between laboratories on both sides of the Atlantic.

The distribution in space and time of foraging activity is essential for further understanding of the impact of grey seal on marine resources and the marine ecosystem. Such information can be obtained by pelage recognition programmes (Hiby 1995) and satellite tracking of free ranging seals. Where there are by-catches of grey seals in fishing operation, conventional flipper tags may also contribute to this knowledge. The Working Group **recommended** the use of satellite linked tags for further studies of distribution of grey seals at sea. The costs of satellite tags often limits the number of seals monitored. The Working Group therefore encourages any development of new, less expensive tags for long range telemetry.

Most abundance estimates are obtained from pup counts. The Working Group underlined the need for full descriptions of the methods used to obtain these estimates, of the statistical properties of the estimates and of actual and potential bias in the estimates. The Working Group **recommended** when possible multiple surveys and establishment of confidence limits with the estimates of pup production. When multiple surveys within years are not possible, the Working Group **advised** that well defined and described surveys may be used to establish an index of trend in pup production. The Working Group recognized the potential for photo-identification techniques to provide population estimates when or where pup production estimates cannot be estimated.

Population models show that seal populations in general are more sensitive to changes in mortality than to changes in fecundity rates. Changes in adult mortality have the largest impact on populations. Hunting mortality may be established from catch statistics, but such statistics are not always available, e.g. catches in the hunting season in northern Norway. The Working Group **recommended** further studies to investigate pup mortality, juvenile mortality, adult mortality, fecundity, age at first reproduction and growth parameters.

The Working Group refers to the hunting season for grey seals in Norway and **recommended** that a system for recording catch statistics is established as soon as possible. The Working Group further **recommended** that all countries having fishing operations within the range of the grey seal establish a system for obtaining and reporting by-catches of grey seals (and other marine mammals). Observer schemes are regarded as the most reliable method to obtain by-catch information. Observer schemes, however, are expensive and difficult in practical terms in fisheries where a large number of small units are operating. The method for obtaining by-catch statistics should therefore be modified to match the respective fisheries. From a scientific point of view, it is important that methods used are well documented so that the statistical properties of by-catch estimates may be explored.

The grey seal hunt in Iceland is well documented. Since the fishing industry started their programme to augment the harvest in 1982, about half the pup production and an additional hunt of one year old and older seals are taken each year. Estimates of pup production and age samples of one year old and older seals are also available. This is an example where the

annual hunt seems to have a significant and clearly detectable impact on the population size and trend. The Working Group **recommended** that the age distribution of this population is further studied if age samples become available, and that the effect of harvest on demography and population size is documented.

5. THE ROLE OF THE GREY SEAL IN THE MARINE ECOSYSTEM

5.1 Food preference and consumption

5.1.1 Canadian waters

Over 40 different prey including many commercially important fish species have been identified in the diet of Northwest Atlantic grey seals (Benoit and Bowen 1990a). Like most pinnipeds, strong regional and seasonal changes in grey seal diet composition have been observed. In the northern Gulf of St Lawrence capelin (*Mallotus villosus*) lumpfish (*Cyclopterus lumpus*), herring (*Clupea harengus*), and cod (*Gadus morhua*) are the most important prey species accounting for over 60% of the diet by frequency of occurrence (Benoit and Bowen 1990b; Murie and Lavigne 1992; Proust 1996). Seasonal changes in diet are evident with capelin and lumpfish being important prey during the period May to July, with cod and herring becoming the dominant prey species during August and September (Benoit and Bowen 1990b; Proust 1996). In the southern Gulf of St Lawrence cod, herring and flatfish were the most important prey (Benoit and Bowen 1990a). In grey seals collected from the Atlantic side of Nova Scotia and Sable Island consumed cod, herring, hake (*Merluccius bilinearis*), sand lance (*Ammodytes dubius*) and flatfish (*Pleuronectiformes*) formed the most important prey (Bowen *et al.* 1993; Bowen and Harrison 1994). Near Sable Island sand lance, although an important component of the diet throughout the year, account for a greater percentage of the diet by weight during the winter than during summer. Cod and silver hake were consumed primarily during the late summer when these species move into the shallower water over the offshore banks surrounding Sable Island (Bowen and Harrison 1994). Some differences between nearshore diets and the offshore diets of animals from around Sable Island have also been noticed (Bowen and Harrison 1994). In grey seals collected from the Eastern Shore of Nova Scotia, herring and mackerel (*Scomber scombrus*) (Bowen *et al.* 1993) replaced sand lance and flatfishes as important foods.

Several studies have observed that grey seals feed primarily on fish <40 cm in length, which for most species represent size ranges too small for the commercial fishery (Benoit and Bowen 1990b; Murie and Lavigne 1992; Bowen *et al.* 1993; Bowen and Harrison 1994; Proust 1996). Some notable differences have been observed between studies or within studies between years. For example Bowen *et al*. (1994) observed that grey seals consumed larger herring during the fall on the Scotian shelf (mean length=34.5 cm) than did grey seals feeding on herring during summer in the northern Gulf (mean length=24.9)(Benoit and Bowen 1990b). More recently Proust (1996) observed that grey seals feeding on cod in a sample obtained in 1988 had a mean length of 32.1 cm, while cod consumed in a sample obtained in 1992 had a mean length of 39.6 cm. These differences in the length-frequency distributions of prey consumed may be related to the relative abundance of particular year classes in the population (Proust 1996).

The possibility of competition between marine mammals and fisheries often generates considerable controversy with fishers on one side of the debate and environmental groups on the other (Hammill *et al.* 1995). Historically, this competition has been of limited importance because many species of marine mammals were harvested for food or other commercial purposes. However, during the last 20 years, there has been a marked shift in public attitudes towards harvesting of marine mammals, resulting in a dramatic decline in the demand for their products. Consequently, harvests have declined, and many populations appear to be increasing. Also, since both fishers and marine mammals often "forage" in the same area, marine mammals are perceived as having a negative impact on commercial fisheries (Hammill *et al.* 1995).

In order to estimate total fish consumption, information is required on the size, structure and dynamics of the seal population, the geographical and temporal distribution of animals, individual energy requirements, and diet composition. Consumption of Atlantic cod by the Northwest Atlantic grey seal has recently been examined for the Scotian shelf and Gulf of St Lawrence (Mohn and Bowen 1994; Hammill *et al.* 1995). Depending on model assumptions (Hammill *et al.* 1995), particularly assumptions concerning the seasonal distribution of the grey seal population in Atlantic Canada, cod consumption has increased from less than 4,000 tons in the Gulf of St Lawrence and 1,500 tons on the Scotian Shelf in 1970 to nearly 40,000 tons in 1993, including 17,000 tons in the Gulf of St Lawrence and 17,000 tons on the Scotian Shelf and 4,000 tons in other areas throughout Atlantic Canada (Hammill and Mohn 1994; Hammill *et al.* 1995). Owing to low biomass estimates, the cod fishery in Atlantic Canada has been closed since 1992.

Thus in relative terms the consumption of 40,000 t of cod by grey seals is significant compared to current harvests by the industry. The impact of this consumption on the recovery of Northwest Atlantic cod stocks is difficult to assess, since >80% of this consumption would be prerecruits to the commercial fishery and it is likely that some compensatory mortality occurs which would reduce the magnitude of this impact. Recently, Mohn and Bowen (1994) have attempted to assess the impact of grey seal consumption of cod on the Scotian shelf, but these efforts have been hampered by the lack of information on natural mortality rates of juvenile cod.

5.1.2 Icelandic waters

The most prominent (% occurrence) prey species found in the stomach of grey seals in Icelandic coastal waters are lumpsucker, the common spider crab (*Hyas sp*), catfish, cod, the hermit crabs (*Eupagurus sp*.) and bull-rout, but several other fish species were recorded. During the feeding season from January-September, grey seals feed mostly on cod, lumpsucker, sand eel and catfish. Sand eel is the dominant species at the south coast while lumpsucker, cod and catfish dominate in all other areas of Icelandic coastal waters (SC/4/GS/5).

In the breeding season, sand eel still dominates at the south coast, while bull-rout, spider crabs, sand eel and cod are important in northwest, and cod dominates in the northeast (SC/4/GS/5).

5.1.3 Faroese waters

Mikkelsen *et al.* (SC/4/GS/6) reported that diet composition varied between sampling sites in the Faroe Islands. At Svínoy (n=13) in the northeast cod dominated the diet and other gadid species were frequent. At Sandoy (n=14), wolffish (*Anarchicas lupus*) was the most frequent species, closely followed by lemon sole (*Microstomus kitt*). Off Mykines (n=13) at the western point of the Faroe Islands, sandeel dominated the diet.

5.1.4 UK waters

The Sea Mammal Research Unit has studied the diet of grey seals around the UK coast for over 10 years by analysis of hard remains in faecal sample found on haul-out sites. During the last three years studies have concentrated on the assessment of diet at the Farne Islands, in the North Sea, during the summer months. The following descriptions of the diet and food consumption patterns are extracted from SMR, cited in SC/4/GS/9.

Grey seal faeces were collected from haul-out sites in the Inner and Outer Hebrides, Orkney Islands, Fair Isle, Loch Erribol and Helmsdale on the northern Scottish mainland, Isle of May and Farne Islands and at Donna Nook on the English east coast. Stomach and large intestine samples were collected by stomach lavaging and rectal enema at the Farne Islands during summer 1992.

The methods of processing and analysis of the faecal samples and the subsequent estimation of the proportion of each species in the diet have been fully described in Prime and Hammond (1987; 1990). Hard parts were extracted by passing the samples through 0.4 mm sieves under running water. All fish otoliths and cephalopod beaks were identified to species (except sandeels (Ammodytidae) which were simply identified as such) using an extensive reference collection and identification guide (Härkönen 1986). Thickness, length and width of each otolith were measured to 0.01 mm. Thickness only was used for sandeels.

Species specific digestion coefficients obtained from a series of feeding trials (Prime & Hammond 1987) were used to estimate undigested otolith size. Fish weights were estimated using empirical fish weight to otolith dimension relationships (Prime & Hammond 1987). Digestion coefficients and fish length/weight to otolith thickness relationships for all species examined are given in Prime & Hammond (1990) and Hammond *et al.* 1994 (cited in SC/4/GS/9).

In Orkney and north-eastern Scotland sandeels were the most important item in the diet, accounting for almost half the fish consumed by weight except in the east of the region in February. The rest of the diet comprised mainly larger gadid species (particularly cod (*Gadus morhua*) and ling (*Molva molva*)) and flatfish (particularly plaice (*Pleuronectes platessa*)). Sandeels were more prevalent in February and in the summer than in November. No significant regional or seasonal differences were found in the number of cod, haddock (*Melanogrammus aeglefinus*) or saithe (*Pollachius virens*) consumed. Whiting (*Merlangius merlangus*) were important in November in the south of the region and ling were the dominant gadid in the north and west in February and in the west and east in November.

In the Inner and Outer Hebrides gadids predominated in the diet. They contributed approximately 40% or more of the diet by weight. The most abundant gadid species were ling, cod and whiting. The dominant gadid species varied by area and season. E.g. in the Monach Isles ling were important in January and June, cod were important in June and November, and whiting were important in August and November.

Flatfish were a major part of the diet, especially in the Outer Hebrides. Again the dominant species varied between areas and seasons. Sandeels were less important in the western isles than in any other region of the UK. Interestingly, pelagic schooling fish including mackerel (*Scomber scomberus*), herring (*Clupea harengus*) and horse mackerel (*Trachurus trachurus*) were more important than in other regions.

At the Isle of May the samples were restricted to the pupping season and February. Again cod and sandeels dominated the diet, accounting for over 70% of the prey consumed. Cod was the most important component of the diet, accounting for 35-64% of the November/December diet each year. There were large between year fluctuations in the importance of sandeels, from 0.6 to 40%.

At the Farne Islands the diet during the pupping season was also dominated by sandeels (mean=54.1%) and cod (29.9%). Unlike at the Isle of May there was little variation in the percentage of sandeels or cod between years. During the spring there was more variability, with sandeels (20%) and cod (34%) again being important, but whiting (23%) being the dominant species in 1983.

The summer diet at the Farne Islands has been assessed from gut contents of seals shot in 1981 and stomach and large intestine washout samples collected in 1992. Again sandeels and gadids were the predominant constituents of the diet, accounting for over 90% in both years. The large intestine samples in the two years were similar, 67-69% sandeels and 27-29% gadids.

In the south of the grey seal range in the North Sea, represented by samples from Donna Nook, the diet consisted mainly of sandeels (26.4%), gadids (particularly cod (17.6%)) and flatfish (particularly Dover sole (12.2%)).

The relative importance of each prey species varied through the year. Initially roundfish, especially cod and sandeels, predominated. During the spring flatfish were the dominant food items accounting for around 60% of the diet. During the summer and autumn sandeels dominated, with flatfish in early summer and roundfish in late summer-autumn. By December sandeels had disappeared and the diet was 70% flatfish.

These data show that a small number of species form the core of the diet of grey seals in British waters. In all areas sandeels and large gadids accounted for over 70% of the diet by weight, except at Donna Nook where they made up only 50%. At all the major grey seal concentrations a reduction in the sandeel percentage was compensated by an increase in the gadoid percentage. The dominant gadoid was cod except in the Hebrides where ling were important.

Hammond, Hall and Rothery (1995 - cited in SC/4/GS/9) carried out an assessment of the annual consumption of fish by the North Sea grey seal population and compared this to the commercial catch. Because the diet varies both geographically and seasonally it is appropriate to stratify estimates of consumption by area and season and to sum across seasons to estimate annual consumption for each area. For each area data on the percentage by weight of each prey species were combined with seasonal estimates of seal numbers, seal energy requirements and fish energy densities to estimate annual consumption of each major prey species.

Grey seals consume a wide range of prey sizes, including many small fish, so it is appropriate to consider consumption in relation to total stock biomass. A direct comparison shows that typically grey seals' consumption is around two orders of magnitude less than stock biomass for any species. In the worst case cod consumption upper 95% confidence limit is around 6% of the lowest cod stock biomass estimate in the last decade. Sandeels and cod are the two most important species by mass in the grey seal diet. The consumption over biomass (average biomass between 1983-92) was 36,130 tons/2,050,000 tons and 10,464 tons/428,000 tons for sandeel and cod, respectively.

Although annual removals of fish biomass by seals are small on a North Sea wide scale, there may be local areas where fish consumption by seals is more important. The concentration of seal foraging in small areas supports this suggestion (McConnell *et al.* 1992).

5.2 Recommendations

The Working Group underlined the significance of information on distribution of foraging activity in space and time when the role of marine mammals in the ecosystem is to be evaluated. In order to monitor the movements, the Working Group **recommended** further studies using satellite tags on grey seal. Where possible these should be combined with studies of diet and food availability. The Working Group further **recommended** that when diet studies are based entirely on either shot samples or fecal samples, attempts should be made to calibrate the method by comparing ingestion and excretion of identifiable prey in captive seals. The Working Group noted the limited data on population size, diet and foraging behaviour of grey seals in Norway and **recommended** that such studies be undertaken.

6. GREY SEALS AS A SOURCE OF NEMATODAL INFESTATION IN FISH

6.1 Review of parasitic nematodes transferred from seals to fish

Four species of anisakine nematodes with fish as intermediate hosts occur in the stomach or intestine of grey seals (e.g. Scott and Fisher 1958; Templeman 1990; SC/4/GS/5). The most abundant is *Pseudoterranova decipiens*, the cod worm, but *Anisakis simplex*, *Contracoecum osculatum*, *Phocascaris cystophora* are common in several areas. The three first species occur in the stomach cavity while *P. cystophorae* occurs in the pyloric caeca close to the junction to the stomach.

Recently, enzyme electrophoresis and other methods of molecular taxonomy have show that *A. simplex* is composed of two sibling species, *P. decipiens* of three and *C. osculatum* of three sibling species (Berland and Fagerholm 1994). The sibling species A of *P. decipiens* dominates in the Northwest Atlantic. In the Northeast Atlantic sibling species B dominates in grey seals while A dominates in harbour seals.

The larval stages of *P. decipiens* penetrate the intestine and infest the muscle of the fish. The easily visible, up to c. 50mm long worm strongly reduces the commercial value of fish fillets, is an important problem to fish industry in areas where infestation is high (e.g. Bjørge *et al.* 1981; Templeman 1990). The *P. decipiens* is therefore discussed in more detail below.

6.2 Population biology of the Pseudoterranova decipiens

The *Pseudoterranova decipiens* attain sexual maturity in the stomach of seals and in particular in grey seals (e.g. Templeman 1990; McClelland *et al.* 1990; Bjørge *et al.* 1981). The partly embryonated ova are passed with faeces into sea water. The embryonated ova have a slightly negative buoyancy and the freshly hatched, still ensheated small larvae adhere to the substrate by a caudal extremity. In the next step the small larvae are found in haemocoel of benthic copepods and in e.g. amphipods and isopods. Still small larvae then occur in body cavities and musculature of of benthophagus fish. Larger larvae occur in the body cavities and musculature of benthic piscivore fish. The final larval stage of the parasite then enters into the stomach of the final host i.e. piscivore mammals and the *P. decipiens* matures and completes the life cycle (Bjørge 1979; McClelland 1990; McClelland *et al.* 1990).

6.3 Abundance of Pseudoterranova decipiens in grey seals and other mammals

Although there are four species of pinnipeds found throughout Atlantic Canada, the grey seal is the most important as a vector for the nematode *P. decipiens*, known also as codworm or sealworm (Mansfield and Beck 1977). Sexually mature worms have been found in grey seals as young as 3-4 months of age. Worm burdens are linked to size with males carrying heavier burdens than females owing to their larger size (Stobo *et al.* 1990). Seasonal changes in sealworm burdens have been observed, with declines observed during the breeding season, probably as a result of animals fasting and a second decline observed in late summer. This decline may be linked to a change in diet as grey seals switch to prey with lower infection levels (Stobo *et al.* 1990).

In Iceland, the prevalence of *P. decipiens* in grey seals was 100% in all areas and seasons, but the mean abundance varied from 160 worms (n=15, se=57) at the south coast in October, to 3,972 worms (n=24, se=974) at the northwest coast in October. At the northwest coast the abundance of codworm in summer numbers some hundred worms per seal, and the increase in abundance in October may be linked to a change in diet. During the breeding season in October the grey seals feed on heavily infested sculpins (38% frequency of occurrence) (SC/4/GS/5).

6.4 Abundance and prevalence of Pseudoterranova decipiens in fish

Although codworm is considered to be mildly pathogenic if consumed in raw or poorly cooked fish, the major impact is considered to be a cosmetic one, with high infections

rendering fish unappealing to consumers. The cost of removing larvae from cod fillets alone were estimated to be in excess of $29 million in Atlantic Canada in 1982 (Bowen 1990).

Surveys conducted during the 1950s indicated that sealworm was found in the fillets of groundfish throughout Atlantic Canada, but the heaviest infections were limited to cod from the southern Gulf of St Lawrence, and inshore areas of southwestern Newfoundland, Nova Scotia and the Bay of Fundy (McClelland *et al.* 1985). Surveys conducted during the mid 1980s indicated that sealworm levels had increased in many regions throughout the Gulf of St Lawrence and Nova Scotia, particularly in the Miramichi area of the Gulf of St Lawrence and the Sable Island area of the Scotian Shelf (McClelland *et al.* 1985). Further increases in worm burdens have been observed in the Gulf of St Lawrence between the 1983 samples from McClelland *et al.* (1985) and samples collected in 1990 (Boily and Marcogliese 1995). These increases are believed to be linked to increases in the grey seal population that has been observed since the 1970s. However, high geographical and temporal variability in sealworm levels may be linked not only to the distribution of definitive hosts such as seals, but also to other factors such as variability in water temperatures (Boily and Marcogliese 1995). Surveys completed to determine nematode abundance among grey seals have shown that mean burdens have increased from 158-700
nematodes per seal between 1948-1956 (Scott and Fisher 1958 in Marcogliese and Boily submitted) to >1000 in 1990 (Marcogliese and Boily submitted). However, a decline in sealworm abundance and an increase in the abundance of the nematode *Contracaecum osculatum* have been observed in samples collected in the Gulf between 1988 and 1992 and it has been suggested that the recent cooling in the cold intermediate layer of the Gulf of St Lawrence may have had a positive effect on the abundance of *C. osculatum* at the expense of sealworm (Marcogliese and Boily submitted).

No significant change has been observed in *P. decipiens* abundance in cod from coastal waters of Iceland between 1980 and 1990 (SC/4/GS/5). The highest abundance of *P. decipiens* was recorded in sculpins at the west coast (n=71, 95.2 worms per fish, range 9-448). In this sample there were an average of 34 worms per 100 g fish (SC/4/GS/5).

In Norway, however, considerable variations between areas and years were observed for *P. decipiens* burden in cod (Haug *et al.* 1991). The abundance ranged from 0 to 70 parasites per fish. Close to a major grey seal haul-out mean abundance of 21 worms per fish was recorded (n=43, sd=18.6).

6.5 Recommendations

The complex life cycle of sealworm will complicate any attempt to control infestation levels in fish. Seven major areas requiring further research have been identified (Marcogliese and McClelland 1994). Based on this list and further discussions in the Working Group, the Working Group **recommended** that the following topics be given priority:

1) Establish time series of data on seal diet and levels of sealworm infestation in fish populations in the same areas;
2) Determine whether worm size and/or worm fecundity in seals are dependent on parasite densities;

3) Determine the importance of small benthophagus fish in the life cycle of the parasite, with special emphasis on sculpins;
4) Determine the longevity of sealworm and host response in important seal prey species;
5) Determine distribution and abundance of the sealworm in the macro invertebrate hosts;
6) Investigate further the role of temperature on sealworm transmission and development;
7) Determine whether infection of sealworm in fish produces behavioural modifications which facilitate transmission to seals.

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SC/4/GS/5	E. Hauksson, Studies on the Icelandic grey seal; population status, food preference, interactions with fisheries and a source for nematode infection in fish
SC/4/GS/6	B. Mikkelsen, Summer diet of grey seals (*Halichoerus grypus*) in the Faroe Islands
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SC/4/GS/8	D. Thompson. Size and status of the British grey seal population
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3.3 - APPENDIX 1

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SECTION 4 - NATIONAL PROGRESS REPORTS

4.1 FAROE ISLANDS - PROGRESS REPORT ON MARINE MAMMAL RESEARCH 1995

Dorete Bloch, Geneviève Desportes and Jústines Olsen

I INTRODUCTION

This report summarises Faroese research on cetaceans and pinnipeds conducted in 1995. From 1984-1994, the main bulk of research on marine mammals in the Faroes was conducted by the Zoological Department of the Faroese Museum of Natural History. In 1995, the Faroese Fisheries Laboratory also conducted research on marine mammals.

II RESEARCH

a) Species and stocks studied

Pinnipeds

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

Cetaceans

* Bottlenose whales (*Hyperoodon ampullatus*) - stranded specimens
* Pilot whales (*Globicephala melas*) - landed specimens
* White-sided dolphins (*Lagenorhyncus acutus*) - landed specimens

b) Field work

Pinnipeds

The grey seal project which began in 1993 was completed in 1995. In all, data were obtained from 68 grey seals shot in Faroese coastal waters for the project. Full samples were taken for subsequent examinations (SC/4/GS/6). A total of 25 grey seals were taken in 1995 for examination.

Cetaceans

Opportunistic sightings of whales were reported to the Museum of Natural History by the Faroese Fisheries Inspection Services, the Faroese fisheries research vessel, local ferries, the weekly ferries between the Faroes and Aberdeen (Scotland) and the Faroes and Stavanger (Norway), as well as numerous local sources.

In 1995, humpback and sei whales were observed several times in Faroese waters for the first time in 15 years. One humpback whale was also observed close to shore for a fortnight in June.

Sex and *skinn* values have been recorded from all pilot whales caught in 1995. The length of all pilot whales in one catch (13.7.95; 15 animals) was recorded. From the same catch, external samples were taken to test the possible occurrence of *Staphylococcus* for use in a

case study conducted by the Danish Veterinary Serum Laboratory (Statens Veterinære Serumlaboratorium).

Samples have been collected from stranded whales, including bottlenose whales and a humpback whale drowned in a salmon ring 28 April (see Table 4).

The Faroe Islands took part in the NASS-95 survey with one vessel surveying mainly southwest of the Faroes from 8 July to 6 August. A special sighting platform was constructed to reduce the vibrations at cruising speed. The whale survey was combined with a bird survey which was organised by the Joint Nature Conservation Committee of Aberdeen (Sea Birds and Cetaceans Branch). Most data were obtained for pilot whales, bottlenose whales, white-sided dolphins, and common dolphins (SC/4/16).

Data on times-to-death in the pilot whale hunt were recorded at two whale drives in 1995. Such data is now available from a total of three pilot whale drives.

c) Laboratory work

Pinnipeds

Teeth slides of grey seals have been prepared for age determination. The stomach contents are being examined (SC/4/GS/6).

Cetaceans

Teeth slides of bottlenose whales and striped dolphins have been prepared for age determination by the NINA Laboratory in Trondheim.

d) Other studies

Cetaceans

Historical data from the national archives in Tórshavn were analysed to investigate the influence of climatic changes on the biology of pilot whales (Bloch and Lastein, 1995).

e) Research results

Pinnipeds

The examination of stomach contents of Faroese grey seals showed local differences in diet. Interactions with the cod fishery and the transmission of sealworm were also examined (SC/4/GS/6).

Cetaceans

In years with a high number of whales caught, modelling work on the data from the pilot whaling statistics from 1832-1995 shows that pilot whale pods caught in the Faroes are composed of more males and immatures than in years with a lower number (Bloch and Lastein, 1995).

III CATCH DATA

Sealing

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

Whaling

Table 1. Pilot whale drives in the Faroe Islands, 1995

Date	Locality	Number of whales
13 July	Tórshavn*	15
16 September	Vágur*	57
18 September	Tórshavn	44
20 October	Miðvágur	4
6 November	Vágur	108
Total	**5 grinds**	**228**

* This grind was part of a bigger school.

Table 2. Drives and strandings of species other than *G. melas* in the Faroe Islands, 1995

Date	Locality	Number	Species	Comments
28 January	Nes, Hvalba	1	*G. melas*	Biological data
1 August	Hvalvík	3	*L. acutus*	Samples of 1 sp.
19 August	Hvalba	2	*H. ampullatus*	Samples
20 August	Fuglafjørður	110	*L. acutus*	
26 August	Hvannasund	41	*L. acutus*	Samples
4 Sept.	Hvalvík	3	*L. acutus*	Samples of 1 sp.
15 Sept.	Sandvík	3	*H. ampullatus*	Samples

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4.2 GREENLAND - PROGRESS REPORT ON MARINE MAMMAL RESEARCH 1994

I INTRODUCTION

This report refers to work involving : Okapi Wildlife Associates, 27 Chandler Lane, Hudson, Quebec, JOP 1HO Canada; Sea Mammal Research Unit, c/o British Antarctic Survey, High Cross, Madingley Road, Cambrigde, CB3 0ET, United Kingdom; Zoo Duisburg AG, Mulheimer Strasse 273, W-4100 Duisburg 1, Germany; IUCN/SSC Cetacean Specialist Group, c/o Ocean Park, Conservation Foundation, Ocean Park Corporation, Aberdeen, Hong Kong; Clinical Institute, Section of reproduction. The Royal Veterinary and Agricultural University. 13 Bulowsvej, DK-1870 Frederiksberg C, Denmark; Freshwater Institute, Department of Fisheries and Oceans, 501 University Crescent, Winnipeq, Manitoba, R3T 2N6 Canada; Greenland Environmental Research Institute Tagensvej 135, 2200 Copenhagen N, Denmark; Greenland Institute of Natural Resources Tagensvej 135, 2200 Copenhagen N, Denmark; Greenland Institute of Natural Resources Box 570 3900 Nuuk Greenland

II RESEARCH

a) Pinnipeds

Atlantic walrus *(Odobenus rosmarus)*

Satellite transmitters were mounted on two male walruses on Sandøen in Young Sound N.E Greenland 26-29 August 1994.

b) Cetaceans

Beluga *(Delphinapterus leucas)*

An areal survey for belugas was conducted along the west coast from Disko to Maniitsoq in March 1994. This survey supports the results from similar surveys from 1991 and 1993 which indicate a dramatic reduction in the population since the early 1980s

Narwhal *(Monodon monoceros)*

Satellite transmitters were mounted on 3 female and one male narwhal in the Melville Bay August 1994. The females stayed in Melville Bay until the transmitters stopped transmission in September. The male left Melville Bay mid-October and, like the animals tagged in 1993, it headed toward deep water in Baffin Bay where it frequently dived down to 1000 metres. In the beginning of December it was located approximately 200 km west of the Disko.

III CATCH DATA

In Greenland, hunters report their catches in a booklet known as *Piniarneq*, which also functions as an official hunting licence. It is reissued once a year upon submission of the completed records from the previous year.

The only cetaceans listed in 1994 were Habour Porpoise, Beluga and Narwhal, but from 1 October 1995 killer whales and long-finned pilot whales have been included. Although some incorrect reporting has occurred (e.g. ringed seals reported as habour seals), the reliability of the data has not been systematically validated. For 1994 there are no available data on catches of white-beaked dolphin, Atlantic white-sided dolphin, killer whale, long-finned pilot whale, northern bottlenose whale or bottlenose dolphin in Greenland.

Fin whales and minke whales must be reported separately to the Ministry of Fisheries.

a) Pinnipeds

Total catches for 1994 were: 484 walruses; 278 harbour seals; 1,927 bearded seals; 7,959 hooded seals; 55,576 harp seals; and 70,971 ringed seals.

b) Cetaceans

Catches in 1994 were: 100 minke whales; 20 fin whales; 1,716 harbour porpoises; 488 beluga; and 847 narwhals.

IV ADVICE & MANAGEMENT MEASURES

The Joint Commission on the Conservation and Management of Narwhal and Beluga concluded that the present harvest of belugas is not sustainable, and recommended that management measures be implemented on an urgent basis.

Since 17 October 1995 the catch of narwhal and beluga from larger vessels has been restricted, so that vessels from 25 to 50 GRT only are allowed to catch these whales for their own consumption and not for sale. Vessels from 50 to 79.9 GRT are only allowed to take 2 narwhal or beluga a year. Furthermore, the drive hunt (which is a significant factor in the total catch of beluga) has been prohibited.

V PUBLICATIONS & DOCUMENTS

a) Publications

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b) Documents

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4.3 ICELAND - PROGRESS REPORT ON MARINE MAMMAL RESEARCH IN 1995

G.A. Víkingsson and J. Sigurjónsson

I INTRODUCTION

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

II RESEARCH

a) Species /stocks studied

Pinnipeds

Main emphasis was on studying the local Icelandic seal stocks, common seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*). Little work was done on the vagrant species: hooded seals (*Cystophora cristata*) harp (*Phoca groenlandica*), ringed (*Phoca hispida*) and bearded seals (*Erignathus barbatus*).

Cetaceans

In 1995 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 humpback (*Megaptera novaeangliae*) and killer whales (*Orcinus orca*), white-beaked dolphins (*Lagenorhynchus albirostris*) and harbour porpoises (*Phocoena phocoena*).

In addition, distribution and abundance of all Icelandic cetacean species was studied during a large scale sighting survey (NASS-95).

b) Field work

Pinnipeds

Some new and old grey seal haul-out sites were visited, for studying dispersal of grey seals, and time of breeding and moulting. Aerial censuses of both grey seals and common seals were undertaken, for investigating the status of the stocks.

Cetaceans

In cooperation with the Faroe Islands and Norway, Iceland took part in the large scale North Atlantic Sightings Survey (NASS-95), partly sponsored by NAMMCO. Two vessels and one aircraft were employed in the Icelandic part of the survey, covering Icelandic and adjacent areas. MRI's research vessel *R/S Árni Friðriksson* operated during 4 July - 1 August and the chartered vessel *Strákur* during 22 June - 4 August. The specially equipped aircraft (Partenavia Observer P-68) was in operation during the period 3-26 July and covered Icelandic coastal areas (within 600-1,000m depth).

In 1995 special whale observers were onboard MRI's research vessels during capelin (*Mallotus villosus*) survey in January and 0-group surveys in August.

Long-term photo-id studies on killer whales on the herring (*Clupea harengus*) fishing grounds off East and Southeast Iceland were continued. These studies (initiated in 1984) aim at determining population size and structure, social behaviour of killer whales, and their predation on the local herring stock off Iceland. As in 1994, a designated cruise for collection of killer whale photographs was conducted on the herring grounds during 8-30 November 1995.

Sampling from incidentally caught harbour porpoises and white-beaked dolphins continued in 1995. This project is a part of MRI's intensified research on multi-species interactions, initiated in the winter 1991/1992. In 1995 post-mortem examinations were conducted on 17 harbour porpoises and 8 white-beaked dolphins.

The MRI staff investigated or received information on whales that beached or stranded at the Icelandic coast in 1995. These included:

- 4 sperm whales (*Physeter macrocephalus*), at two different locations in NE-Iceland in June.
- 1 minke whale, September in SW-Iceland.
- 3 killer whales (*Orcinus orca*), October in NE-Iceland.

c) Laboratory work

Pinnipeds

Work on age determination from teeth and the estimation of sexual maturation from reproductive organs collected earlier, were concluded. Examinations of available material on stomach content of grey seals, hooded seals, harp seals, ringed seals, bearded seals and common seals were completed. Preliminary investigations on otolith-size/fish-length relationship of the major prey species were continued.

Cetaceans

All data collected during the NASS-95 sightings survey have been computerized, and preliminary results from the aerial survey will be presented at this meeting. Data from the shipboard survey are at a final stage of validation and new estimates of abundance will be available in the first few months of 1996.

Identification of photographs and laboratory work on skin biopsies, obtained as a part of the YONAH project (years of the North Atlantic humpback whale, 1992-1993), was continued in cooperation with other participating countries.

Analysis of the killer whale photographs collected in 1994, with reference to the older collection, was continued and work on the 1995 photos was initiated. The catalogue now contains more than 300 individuals.

Laboratory work on stomach contents, age and reproduction of harbour porpoises and white-beaked dolphins, collected in 1991-1995, was nearly completed in 1995. Experiments were made using an image analyser for measuring and counting otoliths with good results.

Research on genetic variation in minke whales off Norway were continued. The aim was to study population structure of Northeastern Atlantic minke whales and to compare with previous genetic data on minke whales from Iceland and Greenland waters (Daníelsdóttir et. al., 1992). Norwegian minke whale gonad samples (n=149) that were collected from three different areas: Barent's Sea, Spitsbergen and Coastal area in 1992 and 1993, were analysed in 1995. The project was funded in part by the Norwegian Marine Mammal Programme.

d) Other studies

Work continued on feeding and energetics of fin and sei whales, based on data collected during 1986-1989 (Víkingsson 1995a, 1995b), and estimation of the total consumption by cetaceans in Icelandic and adjacent waters was made (Sigurjónsson and Víkingsson 1995). A study on dynamic interactions between three cetaceans species and some fish resources in Icelandic and adjacent waters was performed using a simulation model (Stefánsson et al., 1995).

In cooperation with the National Economic Institute of Iceland, work was continued on the development of management models for whaling.

e) Research results

Pinnipeds

The breeding distribution of grey seals is limited to the Southeast and Northwest part of the coast. Only recently did grey seals begin breeding in the north-eastern part of the country. Historically, the distribution of the Icelandic grey seals, has been changing. During the last 50 years it has dispersed from the West-coasts to the Northwest- and North-coast and now the Northeast-coast. In 1982 the first grey seal census was conducted in Iceland. From repeated census in the period 1982 to 1990, the population seems to be stable or slightly increasing, but after 1990 the population apparently has been declining. The preliminary estimate of the pup-production in 1995 is 1,900 (1,550-2,250) and preliminary estimate of the stock size of the grey seal around Iceland is about 8,000 animals (95% CI 6,500-9,500).

A revised estimate of the population size in 1982 is 12,500 (9,550-14,400) animals, so the grey seal population appears to have declined significantly during this period.

Cetaceans

Two independent methods for analysing feeding rates in fin whales, carcass analysis and stomach content analysis, gave similar results, i.e. summer feeding rates of 1,000-1,500 kgs/day for adult fin whales (Víkingsson 1995a, 1995b). Energy deposition is closely linked to reproductive condition and is highest in pregnant females, which increase in body weight by nearly 30% and in total energy content of the body by around 80% during the 4 summer feeding season (Víkingsson 1995a).

An estimation of total consumption by cetaceans in Icelandic waters was made using all available data on stock sizes, migratory behaviour, consumption rates and prey selection (Sigurjónsson and Víkingsson, 1995). According to this analysis cetaceans consume approximately 4.6M metric tons in a smaller area defined as Icelandic and adjacent waters, and 6.2M tons in the larger area north of 60°N. Crustaceans comprise around 50% of this estimate, while finfish and cephalopods comprise around 25% each.

The results from the simulations on multispecies interactions indicate that minke and humpback whales may have significant direct impact of on the status of the capelin stock, while the impact fin whales seems less significant. The effects of the three baleen whale species on the development of the cod stock is less certain, but may be considerable (Stefánsson et al., 1995).

Preliminary statistical analysis of Norwegian minke whale liver samples that were analysed earlier (1994) (Danielsdottir et al. 1995), indicate no heterogeneity between Norwegian sub-areas (ES, EB, EC and EN) of samples taken in the same year, but between samples taken in the years 1988 (small sample size) and 1992-94, respectively, heterogeneity was observed. Further statistical analysis that corrects for small sample size needs to be carried out for the Norwegian sub-areas and the samples from 1988.

The results from the analysis of gonad samples show that the minke whales off Norway had less genetic variability than the whales off Iceland and these two areas represent separate breeding populations.

III CATCH DATA

a) Pinnipeds

Preliminary catch figures for 1995 are: 1,268 grey seals, 856 common seals and 10 seals of other species.

b) Cetaceans

No directed catch of cetaceans took place in Icelandic waters in 1995.

IV ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

No whaling permits were issued in 1995. A precautionary TAC of 100 fin whales and 200 minke whales was recommended by the MRI for the 1996 season. No special management measures were taken regarding seals.

V PUBLICATIONS AND DOCUMENTS (MRI, RCBSQ and cooperating institutions)

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4.4 NORWAY - PROGRESS REPORT ON MARINE MAMMAL RESEARCH IN 1995

Sidsel Grønvik, Tore Haug & Nils Øien

I INTRODUCTION

This report summarises the Norwegian research on pinnipeds and cetaceans conducted in 1995. The major part of the research on marine mammals in Norway in the period 1989 to 1994 was organised through the national Marine Mammal Research Programme funded by governmental grants through the Research Council of Norway. The main results of the programme, which was concluded in 1994, were presented at the International Symposium on the Biology of Marine Mammals in the Northeast Atlantic, held in Tromsø 29 November-1 December 1994. The proceedings of the Symposium were published in 1995 in *Developments in Marine Biology, 4: Whales, Seals, Fish and Man*, edited by A.S. Blix, L. Walløe and Ø. Ulltang.

Norwegian research on marine mammals in 1995 described in this report was conducted at the University of Tromsø: the Department of Arctic Biology (UITØ-AAB) and the Norwegian College of Fishery Research (UITØ-NFH), at the Norwegian College of Veterinary Medicine (NVH) and their Department of Arctic Veterinary Medicine in Tromsø (NVH-IAV), at the National Veterinary Institute, Oslo (NVI), at the Institute of Marine Research in Bergen (IMR), at the Norwegian Institute for Fisheries and Aquaculture in Tromsø (NIFA), at the Norwegian Computing Center in Oslo (NCC), at the Norwegian Institute for Nature Research in Oslo and Trondheim (NINA) and at the Norwegian Polar Institute in Oslo/Tromsø (NP).

II RESEARCH

a) Species and stocks studied

Pinnipeds

* Walrus *Odobaenus rosmarus* - Barents Sea
* Bearded seals *Erignatus barabatus* - Svalbard
* Ringed seals *Phoca hispida* - Svalbard
* Harp seals *Phoca groenlandica* - NW Atlantic, Greenland and Barents Seas
* Hooded seals *Cystophora cristata* - NW Atlantic and Greenland Sea
* Common seals *Phoca vitulina* - Svalbard and Norwegian coastal waters
* Grey seals *Halichoerus grypus* - NW Atlantic, coastal waters of Norway and Russia

Cetaceans

* Minke whales *Balaenoptera acutorostrata* - northeastern and central Atlantic waters.
* Harbour porpoises *Phocoena phocoena* - Norwegian coastal waters
* Killer whales *Orcinus orca* - off northern Norway
* Belugas *Delphinapterus leucas* - Svalbard

b) Field work

Pinnipeds

Studies of age and sex composition, body condition and feeding ecology were performed on **harp seals** invading the coast of North Norway in January/February and in 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, were studied 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 and tissues for studies of pollutants were collected from adult **harp seals** (NIFA).

Killing methods for seal pups were also studied during the same research catch for seal pups in the West Ice in spring 1995. Registration was conducted during the hunting of scattered seals using rifles in order to find out whether the ammunition commonly used (normal) to day is adequate or whether a more powerful (enhanced) ammunition would give a better result, and whether it would be advisable to extend the use of rifles to the hunting of seal pups. Each animal was examined shortly after it had been shot and samples were taken for further analyses in the laboratory(NVH).

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 October. During the survey, prey specimens and blubber profiles from the seals were also collected for later analyses of fatty acid composition. (NIFA)

Between 27 February and 4 March 1995, 8 female White Sea **harp seals** were equipped with head-mounted 0.5 W satellite-linked dive recorders (Wildlife Computers, Redmond, WA) to study the distribution and dive behaviour between breeding and moulting (UITØ-AAB).

Five female **harp seals** were collected for experimental studies of environmental pollutants in fasting female harp seals (NP, UITØ-AAB).

Tagging of **grey seal** pups was carried out on the coasts of North Norway and Russia (NIFA).

Sampling of biological material for studies of stock identities, breeding biology, food habits, body condition and pollution was performed for **common seals** in Norwegian waters and for **grey seals** in Faroese waters (NIFA; see also Faroe Islands Progress Report in this volume).

An aerial photographic survey of **common seals** was conducted off Sogn and Fjordane county (southern Norway) in August 1995. The survey was conducted during the moulting season and was considered successful. The results are comparable with those obtained during field work in 1985-86 (IMR).
The use of dive profiles to characterise the behaviour and ecology of **common seals** was further explored in 1995. A pilot project to monitor the movements of radiotagged common seals was carried out at Møre, Central Norway. Two fully automated directional VHF radio stations were tested over a period of three months, preparing for a study of home range and site fidelity in common seals scheduled for 1996 (NINA).

Field work on **bearded seals** was conducted in Kongsfjorden, Svalbard in May. The work was a cooperation between the Norwegian Polar Institute and the University of Waterloo, Canada. The field work consisted of catching mothers and pups, weighing and tagging them and equipping them with time depth recorders. A total of 19 seals were caught and tagged in 1995. This study is part of an ongoing project on the ecology and energetics of bearded seals.

Field work on **ringed seals** was conducted from late June to early July along the west coast of Spitsbergen.. The work was a cooperation between the Norwegian Polar Institute, the University of Oslo and the University of Waterloo, Canada. The fieldwork consisted of catching adult ringed seals after moulting was finished, and equipping them with satellite-linked radio transmitters. A total of 8 seals were caught, but none were suitable for transmitters. The object of the study is to determine where the ringed seals go when they leave the fjords in summer.

Blood and tissue samples from 150 **harp seals**, 50 **ringed seals** and 13 **bearded seals** were collected during several scientific catches arranged by the Norwegian Polar Institute and Norwegian Institute of Fisheries and Aquaculture to study Brucellosis on sea mammals Samples were also taken during the Norwegian commercial catch during spring 1995 (NVH-IAV).

During all seal and whale expeditions conducted in 1995, observations of pinnipeds were systematically recorded by species and position (NIFA).

Age material and biological material have been collected on board catching vessels both during sealing (harp seals) and whaling (minke whale) operations (IMR).

Cetaceans

During summer 1995 a sighting survey was conducted in the northeastern Atlantic. The target species was the **minke whale**, and the survey as such was especially designed to address problems associated with the diving behaviour of minkes. Eleven vessels participated and some 140 people were involved as observers and teamleaders on board the vessels. The analyses of the data collected will be conducted within a special abundance estimation group under the Scientific Committee of the IWC. Results are expected in late March 1996 (IMR).

During the commercial whaling season (May-June), stomach samples, body condition data and biological material for studies of demography, reproduction, stock identity and pollutants were collected from **minke** whales by scientific personnel on 6 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 Norwegian minke whaling (NIFA). Times to death and several other data relevant to studies of the effectiveness of the killing process were also recorded (NVH).

A 5-day research cruise was performed to tag **minke whales** with VHF-tags in order to provide data on dive frequency (UITØ-AAB).

Killer whale surveys were carried out during late autumn in northern Norway in order to study behaviour, sounds and problems concerning photoidentification of the animals (UITØ-NFH).

Beluga field work was conducted during the first week of July in Van Mijenfjorden, Spitsbergen. Four belugas were equipped with satellite-linked radio transmitters to study seasonal movements and distribution pattern (NP, UITØ-AAB in cooperation with the Sea Mammal Research Unit, Cambridge and the University of Waterloo, Canada).

c) Laboratory work

Pinnipeds

DNA analysis of Northeast Atlantic **walruses** is being conducted in cooperation with the University of Lund, Sweden (NP).

Analysis of pollutants in **common seal** blood from Svalbard has been conducted (NP, NVI).

Analysis of pollutants in **ringed seal** blubber and blood from Svalbard has been conducted (NP, NVI).

Analysis of **common seal** blood from Svalbard with regard to the presence of morbillivirus is being conducted in cooperation with Ontario Veterinary College, Canada (NP).

A study of pollutants in captive **harp seals** is being conducted (NP, UITØ-AAB).

Investigations of the volume capacity and physiological control of the spleen of **hooded seals** and **harp seals** have been carried out in order to assess the function of the spleen in relation to diving. The studies were carried out on animals caught in the Greenland Sea in April 1995, and involve morphometric measurements of newly killed animals, as well as *in vitro* experiments on organ preparations or tissue samples (UITØ-AAB).

Saltwater drinking was studied by use of tritiated water injections in three **harp seal** pups and three **hooded seal** pups collected for experimental studies (UITØ-AAB).

Studies of the energetics of marine mammals often involve measurements of their metabolic rates. For large marine mammals there exists no practical method to obtain reliable metabolic data, and metabolic rates have therefore often been predicted by use of various heat loss models. Such heat loss models are based on various assumptions, and the reliability of various models has not been thoroughly tested. In studies carried out at the University of Tromsø **harp seals** have been used as model animals to test the validity of four different heat loss models, and also to check whether some of the basic assumptions for use of the models hold true. The studies were conducted by collecting morphometric data from newly killed seals, and also, by performing studies on live seals in captivity, which were subjected to various water temperatures while their rate of heat loss, as well as their metabolic rate, was

continuously monitored. The results have been presented in abstract form, one manuscript was recently submitted for publication, while another manuscript is currently being prepared (UITØ-AAB).

A study of Brucellosis, a zoonotic disease which can cause reproduction failure in several domestic and wild animal species, is being carried out on **harp seals, ringed seals** and bearded seals. A serologic survey for antibodies capable of recognising Brucella sp. is being conducted by an ELISA-test. Tissue samples from serum positive animals are being checked for the presence of Brucella by direct cultivation and by Polymerase Chain Reaction (PCR) (NVH-IA in cooperation with Institut National De Recherches Veterinaires, Brussels, Belgium).

Age readings from **harp seal** teeth have been conducted (NIFA, IMR). 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 are reconstructed based on remaining hard parts in the contents. Stomach contents data collected on the feeding grounds are compared with data from concurrent estimates of prey abundance (NIFA).

Cetaceans

Age determinations of bullae from minke whales have been continued (IMR). Recapture information and databases containing incidental observations of marine mammals have been updated (IMR).

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

Material collected from the **minke whales** for studies of temporal and regional variations in condition include girth and blubber measurements, meat and blubber masses and meat samples to be used in total lipid and protein content analyses. The analyses of this material are still in progress (NIFA-NFH).

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

Baleens have been used in studies of food preferences of Northeast Atlantic **minke whales.** The sulphur content of hard keratin (like baleens) seems to be altered substantially by changes in the dietary sulphur content. Selective feeding on a high-sulphur-diet (like krill) or a low-sulphur-diet (like fish) would therefore be reflected in the baleens. The baleens are metabolically inactive after formation and grow continuously, which also gives the opportunity to retrieve measurable sulphur profiles along the length of the baleen, reflecting potential yearly variations in feeding habits. The main purpose of this study is, by sulphur

analysis of minke whale baleens, to establish whether there exists a selective fish or krill-feeding strategy among individuals of the Northeast Atlantic minke whale population (UITØ-AAB in cooperation with the Institute of Oral Biology, University of Oslo).

Porpoises are distributed throughout Norwegian coastal waters. However, a hiatus in offshore distribution in summer indicates a potential separation of porpoises in the North Sea region from porpoises in the North Norway-Barents Sea region. A comparison of morphometric data from porpoises by-caught in these two regions was initiated. Further, an analysis of the distribution of organochlorines in different organs and types of tissue of by-caught harbour porpoises was initiated in 1995 (NINA).

d) Other work

Pinnipeds

Historical and recent data on reproduction and recent data on feeding and body condition of Barents Sea **harp seals** have been prepared for publication. Furthermore, possible ecological implications of the **harp seal** invasions to coastal waters of North Norway have been reviewed (NIFA).

Data on distribution of **walrus** in the southeastern Barents Sea have been analysed and prepared for publication (NIFA).

Cetaceans

Feeding data from **minke whales**, collected in special permit catches in 1992-1994, have been analysed and prepared for presentation/publication (NIFA).

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

Historical data on distribution and reproduction of Barents Sea **harp seals** have been made available and are now analysed in conjunction with more recent data. Cooperation with Russian scientists (from SevPINRO, Archangelsk) has been essential (NIFA-IMR).

e) Research results

Pinnipeds

Analyses of recent ecological data (collected in 1990-1994) have shown that Barents Sea **harp seals** habitually migrate to northern areas of the Barents Sea to feed in open waters and along the drifting pack-ice during summer and autumn (July-October). They return to the southeastern areas of the Barents Sea and the White Sea in early winter (November) and stay in these southern areas (where breeding and moult occurs) during winter and spring. Late summer and autumn are the most intensive feeding periods. Crustaceans, in particular the pelagic amphipod *Parathemisto libellula*, dominate the diet from September to mid-October, whereafter a shift to fish seems to occur. Capelin, to some extent also polar cod, are the major prey during late autumn, while in winter the herring seems to be of great importance. Energy reserves (blubber) stored during summer and autumn are maintained until February, whereas during breeding (March) and moult (April-June) the stores of blubber decrease rapidly (NIFA).

Observed age compositions suggest a very poor recruitment to the Barents Sea stock of **harp seals** in the late 1980s. Historical and recent data also indicate a reduced growth rate and increased age at maturity for the stock during the past 30 years. A previous increase in population size and depletion of potential prey organisms may have contributed to these possible density-dependent reactions (NIFA).

Food shortage, particularly the two important prey species capelin and herring, may have contributed to the invasions of **harp seals** that have occurred on the coast of North Norway in recent years. Investigations in 1995 revealed a first mid-winter (December-February) invasion wave of young (mainly one year old) animals to most coastal areas of North Norway. Many tags from the East Ice were recovered, and the diet of the young animals was generally dominated by small gadoids, particularly saithe. A second invasion wave of adult females occurred (post weaning) in the northernmost coastal areas of North Norway (Finnmark) in April. These animals were feeding in particular on cod and haddock (NIFA).

Preliminary results from the ecological studies of **harp** and **hooded seal** pups seem to indicate that both species are capable of finding prey and feeding independently rather quickly after weaning. The first food of harp seal pups seems to be restricted to crustaceans both in the East and West Ice, whereas the hooded seal pups in the West Ice also feed on other prey groups such as fish and cephalopods. Body condition data from harp seal pups taken in the East Ice seems to indicate that the pups are not able to consume sufficient prey to meet energy requirements during the period from weaning (mid March) to mid June (NIFA).

The results from a study of killing methods for seal pups showed that out of 349 animals examined 343 (98.3%) were recorded as instantaneously dead or unconscious. Six animals (1.7%) were still conscious at the time of examination. For 21 animals (6%) involuntary "swimming movements" were registered for several minutes after they were dead. In one of these cases it was observed that the scull was completely empty of brain tissue. It was further noted that for the hunting of scattered animals "normal" and "enhanced" ammunition were equally effective. Further registrations are planned for weaned pups in the breeding grounds and finally a comparison will be made between this method of hunting and the use of the hakapik (NVH).

In a study of saltwater drinking in **harp and hooded seal pups** using tritiated water injections, it was found that a considerable portion of total water influx is by way of marioposia, saltwater drinking. This has important implications for the use of single-labelled water methods to estimate food intake of free-ranging harp and hooded seals (UITØ-AAB).

Marine mammals have a core body temperature of about 37°C and feed mainly on poikilothermic animals. Food intake will therefore lead to cooling of the stomach. An experiment on two captive **common seals** showed that temperature profiles in the stomach following a meal may be used to estimate meal size when meal temperature is known. The seals were given a set of meal sizes at various temperatures. The temperature drop was not

significantly related to the meal size or temperature. However, both the time taken to regain core body temperature after a temperature minimum following food ingestion (the recovery time), and the total time of the temperature depression (from body core temperature before the meal to core body temperature again was reached after a meal) showed significant linear relationships with both meal size and meal temperature. The recovery time was considered the best indicator of meal size when meal temperature was known and the food ingestion was completed during a short period of time. The stomach temperature was monitored by a temperature sensor and an ultrasonic transmitter lowered into the seal stomach. Temperature data were received by a hydrophone. The same method may be applied to free ranging seals and temperature profiles in experiments on captive seals may serve as calibration for field data (NINA).

Several **walruses**, including many cow/calf pairs, were observed in the southeastern Barents Sea during a cruise performed in February 1993. This confirms these areas as wintering and nursery grounds for the species (NIFA).

Preliminary results from a study of Brucellosis in several seal species indicate that some of the animals have been exposed to Brucella-bacteria. However, these results have yet to be confirmed by cultivation and PCR (NVH-IAV).

Cetaceans

Results from forestomach analyses of **minke whales**, taken in scientific whaling operations in 1992-1994, indicate a diet dominated by fish. Considerable heterogeneity occurred in prey species composition both between geographical areas, sampling periods and sampling years. Gadoid fish species generally dominated the spring diet. During summer in 1992, capelin dominated the whale diets in the two northernmost study areas (Spitsbergen/Bear Island), while in summer and autumn in 1993 and 1994 krill was the most important food item in these areas, with the addition of only small amounts of capelin. The latter is consistent with a recent increase in krill and severe decrease in capelin availability in the area. In coastal areas of northern Norway and Russia the minke whales had been feeding mostly on herring, to a lesser extent on gadoid fish (particularly during summer). Statistical analyses seem to indicate a preference for herring and capelin. Given the opportunity to choose, it appears that minke whales will generally prefer these two prey species to other species such as krill and gadoid fish. Even though a considerable number of forestomachs contained a mixture of several prey species (up to 5), it is acknowledged that minke whales are able to pursue single species aggregations of prey (particularly krill, herring and capelin). Small and large whales seems to exploit the same food resources within an area, and it appears that feeding usually occurs during long and well defined feeding bouts separated by non-feeding periods. Available data may indicate that the feeding activity of minke whales is relatively low during night (NIFA).

Killer whales have been shown to occur in different coastal areas of North Norway throughout the year; areas which coincide 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 jellyfish has been observed. The dynamic nature of the seasonal

migration patterns of the Norwegian spring-spawning herring clearly has consequences for the seasonal occurrence and habitat use of killer whales. Underwater videos taken of killer whales feeding on herring schools has been used to investigate herring anti-predator behaviour (UITØ-NFH).

III CATCH DATA

Sealing

Norwegian sealing in 1995 included three vessels, two of which operated in the West Ice (the Greenland Sea) while the third made two consecutive trips to the East Ice (the southeastern Barents Sea). The Norwegian ban on catching pups was still in force during the 1995 season, but a small catch of weaned pups was permitted for research purposes. Table 1 gives the Norwegian catches of harp and hooded seals in 1995.

Table 1. Norwegian catches of harp and hooded seals in 1995, including catches of weaned pups for scientific purposes. 1+ means one year old or older seals.

	West Ice			East Ice		
	Pups	1+	Total	Pups	1+	Total
Harp seals	317	7889	8206	260	6582	6842
Hooded seals	368	565	933			

A temporary hault in Norwegian minke whaling was introduced after the 1987 season, and with the exception of research catches, no catches were allowed during the period 1988-1992. In 1993, commercial minke whaling was again allowed and quotas established based on the Revised Management Procedure (RMP) developed by the Scientific Committee of the International Whaling Commission (IWC). A part of the quota was allocated as research catches which were conducted during the period 1992-1994 to study feeding ecology of minke whales.

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 northeastern Barents Sea (EB); (3) the Lofoten area (EC); (4) the North Sea (EN) and (5) the western Norwegian Sea/ Jan Mayen area (CM). During the years 1993-1994 the EC area has been open for scientific whaling only. Table 2 shows the number of minke whales taken during the 1995 season.

Table 2 Catches of minke whales in 1995 by management area as defined in RMP

Management areas:	EB	EN	ES	EC	CM	**Total**
Minke whale catches 1995	126	3	46	0	42	**217**

IV ADVICE GIVEN AND MANAGEMENT MEASURES TAKEN

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. For harp seals in the West Ice, pup production in 1991 has been 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. Russia has studied the East Ice harp seal population by conducting photographic surveys in the breeding lairs in the White Sea and their most recent analyses indicate that the pup production in 1991 was approximately 140,000, but the status of this stock is uncertain due to apparent recruitment failure since the late 1980ies. A survey to estimate hooded seal pup production in the West Ice in 1994 failed to meet its goal due to bad weather and ice conditions and the status of this stock is still poorly known.

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 1995 were 10,140 harp seals and 1,235 hooded seals in the West Ice and 8,750 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 maintained also for the 1995 seasons, with the exception of a small scientific catch of weaned pups.

Whaling

At the IWC Annual Meeting in 1992 Norway stated that it intended to resume minke whaling in 1993. So far, the IWC has accepted the RMP developed by its Scientific Committee as a basis for future management decisions but has not implemented it. The Norwegian Government therefore decided to set quotas for the 1993 and following seasons based on the 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 abundance estimate of Northeast Atlantic minke whales was however revised several times during the spring of 1995 with a final estimate presented to the IWC/SC of 76,500 (95% conf. interv. of 52,000-101,000). The total quota in 1995 for the Northeast Atlantic and the Jan Mayen area was set to 232 minke whales. The catch quotas have been set for each of five management areas, of which the Lofoten area (EC) has been closed to commercial whaling.

The catch quotas for commercial whaling have been allocated on a per vessel basis, usually 5-9 whales per vessel. 33 vessels participated in 1995. The catching season was from 2 May to 23 June, but some extensions were provided. All the participating vessels had inspectors on board to survey the whaling activity.

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5.2 SCIENTIFIC COMMITTEE MEMBERS AND INVITED EXPERTS TO THE SCIENTIFIC COMMITTEE IN 1996

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