Report of the Third Meeting of the Scientific Committee[1]

Copenhagen 31 January - 3 February 1995

[1] The report of the NAMMCO Scientific Committee should not be quoted without prior consultation with the Secretary of NAMMCO.

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The Scientific Committee of NAMMCO met at the Greenland Fisheries Research Institute in Copenhagen, Denmark from 31 January to 3 February. The meeting was attended by members of the Scientific Committee and a number of invited experts. A list of participants is contained in Appendix 1.

1-3. Opening procedures

The Chairman, Jóhann Sigurjónsson, welcomed members and the invited participants to the meeting, in particular the new member for the Faroes, Eyðfinnur Magnussen, who replaced Jógvan M. Grástein. The Chairman extended a special welcome to Janet Pawlak, ICES Environment Secretary, who had offered to inform the Committee of relevant work being carried out within ICES, in particular in relation to the establishment of databanks. The Chairman commended the serious work already undertaken by the Committee, and noted that further important work was anticipated as a result of the present meeting.

The Agenda, as contained in Appendix 2, was adopted. The Secretary, Kate Sanderson, was appointed as rapporteur. Practical arrangements for the meeting were clarified, and these included a dinner invitation to all participants from the Greenland Fisheries Research Institute.

The Chairman outlined the order of business for the meeting. In relation to Agenda item 9.6 on the Atlantic walrus, the Committee agreed to establish an *ad hoc* Working Group on Atlantic Walrus, to be convened by Erik Born, which would report to the Committee on its deliberations at the present meeting (see under 9.6 below).

4. Review of available documents

Documents presented to the meeting, as listed in Appendix 3, were reviewed. These included National Progress Reports for 1993 and 1994 from the Faroes, Iceland and Norway, and for 1993 from Greenland (SC/3/3 + country).

5. Cooperation with other organisations

5.1 ICES

The Chairman referred to the various requests for advice which had been forwarded by the Council to ICES, and which were still being dealt with in the relevant ICES Study or Working Groups. He further noted that at its last statutory meeting, ICES had adopted a proposal for a specific policy on marine mammals (see Appendix 4), which emphasised ecological approaches to the study of marine mammals and the importance of assessing interactions with fisheries.

Janet Pawlak from ICES outlined briefly the ongoing work within ICES in response to questions forwarded from NAMMCO. She informed the Committee that the ICES Pilot Whale Study Group had agreed to meet in Cambridge (UK) from 15-17 November 1995 to address the outstanding matters in their work (see also 9.1.2 below).

The Joint ICES/NAFO Working Group on Harp and Hooded Seals was meeting again in Dartmouth, 5-9 June 1995, and would in particular be addressing questions related to stocks in the Northwest Atlantic (NAFO) area.

The ICES Study Group on Seals and Small Cetaceans in European Seas would be meeting again 5-8 December 1995 and would be reviewing the results of the 1994 SCANS survey.

Pawlak informed the Committee that a recent development within ICES is the requirement for the reporting of all by-catches of marine mammals on an annual basis. June 1 was set as the date for the submission of data to ICES from the previous year, although work was still under way, in collaboration with the Chairman of the ICES Marine Mammal Committee, to develop a formal system for reporting by-catches.

Pawlak also reported on the establishment by the ICES Secretariat of a thematic data centre for AMAP (the Arctic Monitoring and Assessment Programme) on contaminants in marine mammals. Pawlak noted that the potential existed for expanding this databank beyond the Arctic to also incorporate data on levels of contaminants in marine mammals in the ICES (Northeast Atlantic) area as well, and that this might be of interest to NAMMCO.

The Chairman thanked Dr Pawlak for providing the Committee with this information on ICES work and its relevance for NAMMCO, including updates on the progress of work on pilot whales, and harp and hooded seals. These would be discussed further under subsequent agenda items (see 9.1, 9.4 & 9.5 below). It was also noted that ICES had officially appointed Arne Bjørge to present a paper on the work of ICES on marine mammals at the forthcoming International Conference on Marine Mammals and the Marine Environment to be held in Shetland 20-21 April 1995.

5.2 IWC

In line with the Committee's decision at its last meeting to seek an exchange of information with the Scientific Committee of the International Whaling Commission, the Secretary pointed out that the IWC Secretariat had been informed of the present meeting of the Scientific Committee. It was noted that this was not an invitation to the IWC Scientific Committee to attend the present meeting in an observer capacity, as NAMMCO and the IWC had only agreed to an exchange of observers at Council/Commission level. The Secretary pointed out that it was now standard procedure to circulate the reports of the Council and Scientific Committee to other organisations, including the IWC.

The Committee also noted that the IWC Scientific Committee had been approached directly at its meeting in Mexico in May 1994 by the Chairman of the NAMMCO Scientific Committee and the Chairman of the NASS-95 Working Group with an invitation to IWC

Scientific Committee members to take part in the planning and implementation of NASS-95. A further invitation was extended in November to IWC Scientific Committee members to attend the meeting of the NASS-95 Working Group held in Tromsø, 2 December 1994.

5.3 NAFO

There was nothing further to report on relations between NAFO and the Scientific Committee, other than NAMMCO's standing request for advice on harp and hooded seals which had been passed on to the ICES/NAFO Joint Working Group on Harp and Hooded seals. The NAFO Secretariat had been informed of the present meeting of the Scientific Committee.

5.4 Other organisations

The Committee agreed to suggest to the Council that working relations be established between NAMMCO and the Canada-Greenland Joint Commission for the Conservation and Management of Narwhal and Beluga.

The Secretary drew the Committee's attention to the Report of the First Meeting of the Parties to ASCOBANS (the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas) which she had attended as observer in Stockholm in September 1994. Although this meeting would be reported on to the Council, the ASCOBANS report was made available to Committee members for their information.

The Secretary also explained that inquiries had been made concerning the possible establishment of some kind of working relationship between NAMMCO and the IUCN (the World Conservation Union). In a recent response from the Director General of IUCN, it was explained that, although the IUCN Council had not agreed to formal observer status for NAMMCO, the IUCN Council had decided that technical working links between IUCN and NAMMCO should be established through the Species Conservation Unit at IUCN and the Chairs of the Cetacean and Seal Specialist Groups of the Species Survival Commission. These contacts had yet to be made, but the Committee would be informed of any further developments when the nature of such links had been fully explored.

6. Update of List of Priority Species

The List of Priority Species had been circulated to members prior to the meeting as a separate document for easier reference (SC/3/4). Reference was made to the decision at the last meeting of the Committee that the List of Priority Species should be updated every second year in the context of Committee meetings. It was clarified that the text need not therefore be reviewed in detail until the next meeting.

Larsen noted, however, that there could already be a close review of available information on beluga and narwhal stocks for incorporation into the List, which would better reflect the most recent work of the Scientific Working Group of the Canada/Greenland Joint Commission on Conservation and Management of Beluga and Narwhal.

It was agreed that a process of revision and update of the List of Priority Species should be undertaken prior to the next meeting, and that this would be coordinated by the Secretariat in consultation with the Chairman. The Chairman noted that particular attention should be made to updating and screening catch figures for inclusion in a revised List.

Haug asked whether any progress had been made on the idea put forward at the last meeting of producing the List in several languages for wider use. The Secretary reported that there were still plans for this kind of production, although there had as yet been no opportunity on the part of the Secretariat to develop them further.

7. Impacts of marine mammals on the marine ecosystem

7.1 Update on progress

The Chairman referred to the Council's request for advice on the impacts of marine mammals on the marine ecosystem, noting that this was being dealt with in, among others, the ICES Multi-Species Working Group.

7.2 Future work

Haug suggested that these questions be more fully addressed at the next meeting of the Scientific Committee, with reference to the work which was being carried out in the area. A number of related papers had recently been presented at the International Marine Mammal Symposium in Tromsø, November/December 1994. This research, as well as the forthcoming ICES/NAFO Symposium on the role of marine mammals in the marine ecosystem (Dartmouth, Canada, September 1995) would provide a good basis for substantive discussion and review by the Committee. The Committee agreed to deal more fully with this agenda item at its next meeting.

8. Development of management procedures

8.1 Report of the Working Group on Management Procedures

In their joint session, the Working Group on Northern Bottlenose Whales and the Working Group on Management Procedures addressed the specific request formulated by the Management Committee and forwarded to the Scientific Committee by the Council at its fourth meeting:

"It was noted that the RMP could be an appropriate starting point in some future management cases. Therefore, taking into account the discussion in the Working Group (on Management Procedures) and the Scientific Committee, further development of RMP-like systems should be carried out" (NAMMCO/4 - *Report* (Appendix 12), 105).

The Chairman of the Working Group on Management Procedures, Nils Øien, presented the report of joint meeting of the Working Groups to the Committee (see also under 9.2 below). The report is contained in Annex 1.

At last year's meeting of the Scientific Committee it was agreed that there was a need for more guidance on management objectives before any concrete work could be started on developing appropriate management procedures. It was also concluded that these were likely to be case specific. Responses to this request (SC/3/12, SC/3/15 and SC/3/18 rev 1) were discussed at the joint meeting of the Working Groups.

The responses from Greenland and Iceland referred to the principles of MSY (maximum sustainable yield), while Norway and Iceland expressed a wish for a multi-species aimed approach, also taking into account fisheries interactions. Iceland further referred to the MSY principle in relation both to biology and economy. Additionally, Greenland noted as a management objective that present distributions of harvested species should be maintained.

The Scientific Committee welcomed these contributions, but felt that they only partly addressed the need for further clarification of objectives. Defining objectives implies that weight is given to different goals for management, e.g., how much relative importance is given to biological and economical factors. Although the general views on management objectives received from Council members were of interest to the Committee, a more pragmatic approach on an area and species/case-specific basis would be desirable for the development of specific management procedures. It was therefore decided to suggest that requests for advice from the Council be accompanied by specific objectives defined for the case in question.

8.2 Future work

In light of the above comments, it was noted that a general discussion of management objectives at Council level may provide further input for the continued work of the Scientific Committee. As a possible aid to such a discussion, particular reference was made to the paper: "Management and conservation of marine mammals and their environment", in *Mammals in the Sea, Volume I.* Report of the FAO Advisory Committee on Marine Resources Research, Working Party on Marine Mammals, FAO Fisheries Series 1(5), 1978, 162-180.

In the future development of management procedures, the Committee saw no immediate reason to initiate further work until stocks and objectives had been identified for such work.

9. Marine mammal stocks - status and advice to the Council

9.1 Long-finned pilot whales

9.1.1 Update on progress

As mentioned by Pawlak (see under 5.1 above), the ICES Study Group on Pilot Whales would be meeting again in November in Cambridge, at which time it was expected that the main part of their work would be completed. The Committee noted that until that time, no

new information was available to report to the Council on this species. Little progress had in fact been made since the last meeting of the Scientific Committee, as no formal meeting of the Study Group had been held in 1994.

9.1.2 Future work

The Committee noted the list of items for further work on the pilot whale which had been identified at its last meeting, based on the report of the ICES Study Group on Pilot Whales from Copenhagen, September 1993. These had also been reviewed by an informal meeting of the Pilot Whale Study Group in Tromsø in late November, and remained just as relevant now as they had been over a year before. They related to problems associated with estimates of population dynamics parameters, population size, population identity, multispecies interactions and modelling

9.2 Northern bottlenose whale

9.2.1. Report of the Joint Meeting of the Working Group on Northern Bottlenose Whales and the Working Group on Management Procedures

At last year's meeting of the Scientific Committee, information on several aspects of abundance and status of the northern bottlenose whale was examined. Some further time was needed for completion of work requested by the Council.

A joint session was held of the Working Group on Northern Bottlenose Whales and the Working Group on Management Procedures in order to consider the request from the Council to undertake the necessary modelling of the population using catch series and abundance estimates.

The Chairman of the Working Group on Management Procedures, Nils Øien, presented the report of the joint session to the Committee (Annex 1 and item 8.1 above).

Following on from last year's work, and in order to provide the requested advice on the status of the northern bottlenose whale (*Hyperoodon ampullatus*) in the North Atlantic, modelling was carried out. The basis for the modelling was available catch series, abundance estimates and biological parameters, where alternative target stock sizes and MSY rates were explored with respect to the available catch history.

The available abundance estimates obtained by the Icelandic and Faroese NASS-87 and NASS-89 surveys, covering the area from Cape Farewell in the west to the British isles in the east, were used. In the absence of indications to the contrary, the Committee chose to regard the North Atlantic bottlenose whales in this area as belonging to a single stock. Alternative MSY rates considered were 0-5%, and an uncorrected surface estimate of 8,827 whales, as well as a tentatively corrected estimate of 40,000 whales, were used as alternative target stock sizes.

9.2.2 Advice on status

The population trajectories generally show the same trends, independent of assumptions (Annex 1, Figure 1, a-c). The average catches of northern bottlenose whales in the Faroese removals was 1.2 whale per year prior to 1877 and from 1974 onwards. During these periods this fishery has been the only harvesting of these whales, and even at an MSY rate as low as 1%, these catches have not had any detrimental effect on the stock. During periods with heavy exploitation, the population trajectories show a decline in the stock (see Annex 1).

9.3 Killer whales

9.3.1 Update on progress

The Chairman of the Working Group on Northern Bottlenose and Killer Whales, Tore Haug, reported that further research on killer whales in Norway is still in progress. It was not, therefore, possible to offer any further information on the status of this species until analysis of the most recent research data has been completed. Sigurjónsson reported that research continues on killer whales off Iceland, which involves photo-identification work, work on energetics and satellite tracking. It was noted that such research was a time-consuming task for those working in the field, but that some results were expected within the next 12 months, and some new information might therefore be available by the next meeting of the Committee.

9.3.2 Future work

The items identified at the last meeting of Scientific Committee were reiterated as the priorities for ongoing research on killer whales (NAMMCO/4 - *Report* (Appendix 11-Scientific Committee report), 53).

9.4 Harp seals

9.4.1 Update on progress

The Committee noted that no new information in response to the Council's request was available at the present time. The Joint ICES/NAFO Working Group on Harp and Hooded Seals will be meeting again in Dartmouth (Canada) in June. It will be concentrating its attention on Northwest Atlantic stocks, but would also address issues related to ecosytem impacts, in preparation for the ICES/NAFO Symposium in September (see 7.1 above). The most recent stock estimate for the West Ice is based on aerial and visual surveys as well as mark-recapture data from 1991. As for the East Ice, the Russian data was not comprehensive and reliable stock estimates were not yet available.

Haug reported on recent developments along the coast of Norway, where relatively large numbers of juvenile harp seals have been reported in interactions with fisheries, as far south as the northern part of southern Norway. In contrast to the large numbers of harp

seals which occurred along the Norwegian coast in the late 1980's, the present incidence largely involved young animals. The occurrence of animals further south was, however, also a feature of the seal invasions of the late 1980's.

Although coastal occurrence of harp seals is not uncommon, the relatively large numbers of juvenile harp seals recorded along the Norwegian coast this year would seem to indicate a larger number of young seals in the system, which would in turn be directly related to the known success of recruitment of the stocks in the early 1990's (compared with the poor recruitment years in the late 1980's). Some animals had been retrieved for analyses of stomach contents and general body condition. Haug also reported that recaptures of tagged animals indicated that the young animals belong to the East Ice/Barents Sea stock.

9.4.2 Future work

The Committee recommended that future work should be identified when the report of the next meeting of the Joint ICES/NAFO Working Group on Harp and Hooded Seals was available.

9.5 Hooded seals

9.5.1 Update on progress

Øien reported that attempts had been made in 1994 to conduct an aerial survey for hooded seals over the West Ice using two aeroplanes and one helicopter. However, bad weather and ice conditions prevented adequate coverage of hooded seal breeding patches, so no new estimate of the hooded seal population of the West Ice would be forthcoming this year.

9.5.2 Future work

No other progress was reported, and discussions on this species were also deferred until the subsequent report of the Joint ICES/NAFO Working Group on Harp and Hooded seals was available.

9.6 Atlantic walruses

The Chairman referred to the Council's request for advice on Atlantic walruses which had been forwarded from the Management Committee at the second meeting of the Council in Tromsø, January 1993. For the Atlantic walrus, the Council requested the Scientific Committee 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 - *Report,* 64).

At its last meeting in Reykjavik in November 1993, the Scientific Committee had agreed that it was not in a position to offer advice on this species due to the lack of available information. The Committee had aimed to review the report of the Walrus International Technical and Scientific Committee (WITS) which had met in January 1993, but this was not available at the time of that Scientific Committee meeting. When finally obtained, the WITS report was circulated to Committee members as SC/3/6.

It was subsequently decided in late 1994 to request Erik Born of the Greenland Fisheries Research Institute in Copenhagen to coordinate the compilation of a status report on the Atlantic walrus in time for the present Scientific Committee meeting, drawing on the assistance of other relevant walrus experts from Canada, Norway and Russia. Other experts who contributed to the work were Randall Reeves and Robert Stewart from Canada and Ian Gjertz and Øystein Wiig from Norway. The Russian scientist, Stanislav Belikov, had also been approached, but was unable to take part in the work of the group.

The result of this collaboration was the draft report, E.W. Born, I. Gjertz and R.R. Reeves, "Population assessment of Atlantic walrus (*Odobenus rosmarus rosmarus*)", a final draft version of which was distributed to the Scientific Committee (SC/3/13). Born summarised the report of the three experts for the Committee.

9.6.1 Review of status

A meeting of the *ad hoc* Working Group, which had subsequently been established (see under 1-3 Opening Procedures above), was convened by Born, who then presented the Working Group report to the Committee. The report of the *ad hoc* Working Group is contained in Annex 2. Based on this report, the Scientific Committee considered the specific aspects of the Council's request for advice on the Atlantic walrus.

9.6.2 Advice on:

i) Stock identity

The Committee welcomed the conceptual model and related alternative hypotheses developed by the Working Group as a way of understanding stock separation in walruses. The eight groups of Atlantic walruses tentatively identified by the Working Group as population units of some kind are illustrated in Annex 2, Figure 1. It is important to emphasize that these units have been defined on the basis of very limited information. The number of units recognized and the configuration of the boundaries between units are likely to change substantially as new data become available. Of the identified units or stocks, all but the Foxe Basin stock and possibly the South and East Hudson Bay stock may cross international boundaries.

It is also important to note the distinction made by the Working Group between genetic stocks and "functional" stocks. Some of the tentative stocks proposed by the Working Group may prove to be genetic stocks, but all are viewed as functional stocks in the context of both the Working Group report and this report of the Scientific Committee. Within this

report, reference to "stock" is understood to mean functional stock (population units that are regarded as convenient for management purposes, eg in relation to the monitoring of catches or abundance), and not necessarily genetic stock.

ii) Abundance by area

Abundance estimates were available for only three of the eight stocks of Atlantic walruses. Even for these stocks, the available estimates are uncorrected and/or incomplete. The Scientific Committee expressed concern about the lack of rigorous abundance estimates for all stocks.

iii) Long-term effects of present levels of removals on stocks

Although the Working Group did not have time to address the question of stock status, its report did provide the Scientific Committee with the information necessary for doing so (Annex 6, Table 1). The Working Group report provided estimates of annual current removals, by stock, and noted the inadequacy of catch data from all areas. These estimates were used to make projections of the stock sizes needed to sustain removals, assuming a range of net recruitment rates of 2-5%.

The Scientific Committee compared the stock sizes required for sustainability with the abundance estimates and made the following conclusions about the status of the stocks:

1. The southern subunit of the Central West Greenland stock (which is probably "shared" with Canada via southeastern Baffin Island) is being over-exploited.

2. The Baffin Bay (North Water) stock (understood to probably include the northern subunit of the Central West Greenland stock) is probably also being over-exploited. Although no direct estimate of abundance for this stock was available, the information provided in SC/3/13 made it appear unlikely that the 7,600-19,000 walruses that are needed to sustain current catch levels are available within the stock's range.

3. The Scientific Committee expressed concern about the situations of the South and East Hudson Bay stock and the North Hudson Bay-Hudson Strait-SE Baffin Island-Labrador stock. The lack of complete abundance estimates and reliable information on removals for these stocks precluded any assessment of their status.

4. It was agreed that the exploitation rate of the Foxe Basin stock may be close to a sustainable level. The East Greenland and Svalbard-Franz Joseph Land stocks are either stable or increasing. The Kara Sea-South Barents Sea stock is at a low level, although signs of increase have been noted.

iv) Effects of environmental changes (ie disturbance, pollution)

The Scientific Committee noted that further research is required in relation to the long-term effects of environmental factors on walrus stocks. These factors included the possible negative effects of disturbance by maritime and other activities, such as petroleum exploration.

With respect to the effects of chemical pollution, little direct research has been carried out on the effects of oil pollution on walruses. They may be particularly vulnerable to this kind of pollution given their social behaviour, habitat preferences, and the fact that they are benthic feeders.

Like other marine mammals, walruses are also vulnerable to the potentially toxic effects of heavy metals and chlorinated hydrocarbons (CHCs), as well as radioactive contamination in the marine environment as a result of incidents such as weapons testing and accidents. Few specific studies have, however, been carried out on walruses.

The Committee concluded that there was no documented evidence that environmental factors had contributed to recent changes in walrus populations. In relation to the issue of contaminants in general, more work is required to document and characterise the effects of pollutants on many marine mammals. There are some indications that increased shipping and nuclear testing have been detrimental to walruses in Russia (see Annex 6).

v) Effects of changes in food supply

Although the direct and indirect effects of fisheries on Atlantic walruses are unknown, some effects are likely. Bottom-draggers have destroyed potential walrus feeding habitat at Svalbard. The noise from fisheries in or near walrus habitat and the disturbance of the sea floor caused by trawling may have contributed to the continued depletion of the stock of walruses off Central West Greenland.

9.6.3 Future work

The Scientific Committee concluded that the assessment at this meeting had taken into account all relevant information presently available, and that no further advice on Atlantic walruses would be possible until research has addressed some key questions. In view of the situation described above for the walrus stocks in West Greenland and Canada, the Scientific Committee made the following recommendations:

i) West Greenland stocks

Highest priority should be given to studies of stock identity, trends in abundance and catch levels of walruses in the Central West Greenland and Baffin Bay (North Water) stocks.

ii) Other stocks

As a second priority, similar studies should be carried out on the other walrus stocks that have been heavily hunted, and for which available data are inadequate to evaluate current status. These are the South and East Hudson Bay stock and the North Hudson Bay-Hudson Strait-Southeast Baffin-Labrador stock, one or both of which may have a connection with the Central West Greenland stock.

On behalf of the Committee, the Chairman expressed his gratitude to the *ad hoc* Working Group, and to the invited participants in particular, for their efforts in producing their report and presenting their findings to the Committee.

10. Planning of the North Atlantic Sightings Survey

10.1 Update on progress

The report of the Third Meeting of the Scientific Committee Working Group to plan the 1995 North Atlantic Sightings Survey was presented by the Chairman, Finn Larsen (Annex 3). The Scientific Committee was pleased to note the good progress that had been made in planning this important joint research, in which the Faroes (1 vessel), Iceland (3 vessels and 1 aircraft) and Norway (11 vessels) had decided to participate. It was noted that Greenland had decided not to conduct surveys as part of these joint efforts. Nor had efforts to increase the coverage of NASS-95 been successful, despite various approaches to governments and laboratories in several countries. The possibility of Canadian participation is not, however, completely ruled out, and it seems also that a nearshore vessel survey of the US coast will be carried out.

10.2 Survey funding

In light of the importance the Council and the Scientific Committee have attached to the NASS-95, the Committee agreed to recommend that a special fund of NOK 800,000 be established from the NAMMCO budget for use in financing various aspects of NASS-95, where required. It was recommended that one scientist from each member country should be appointed to a steering group which would be responsible for allocating funds in an equitable manner to national research groups.

10.3 Future work

The Scientific Committee noted that there was no need for extra meeting activities of the NASS-95 Working group unless new parties became involved.

11. Budget

The Committee noted the level of funding allocated to it by the Council as a part of the overall NAMMCO budget. This remained at the originally agreed level of NOK c. 430,000 (for invited participants and projects). The Committee also noted the comments by the

Council at its last meeting that any unused Scientific Committee funds from previous years should not necessarily be regarded separately from the main budget, while acknowledging the presumed extra budget requirements for NASS-95.

The Committee stressed the importance of having sufficient funds to allocate for contract work and invited expertise in order to further the work of the Committee. There was, however, some discussion of the extent to which funds earmarked for external expertise should also be used to support the participation and work of scientists working within NAMMCO member countries. It was agreed to seek more guidance from the Council on these questions.

An informal proposal to fund certain research projects related to some of the outstanding work of the ICES Pilot Whale Study Group was discussed briefly in relation to the general principles of Scientific Committee fund allocation, as discussed above. It was agreed that more details of the nature of the work requiring support would have to be presented before the Committee could further consider such a proposal.

12. Data and administration

12.1 Establishment of database

In relation to discussions at the last meeting, and consultations between the Chairman and the Secretariat, the Committee agreed that work should proceed in the Secretariat in establishing a database, in particular for those species currently relevant to the work of the Committee, namely: pilot whales, killer whales, northern bottlenose whales, Atlantic walruses and harp and hooded seals.

The Secretary informed the Committee of plans to hire an extra member of staff on a temporary, 12-month basis to assist with the establishment of a database in the Secretariat. This would preferably be a person with some background in biological studies and data handling who could also assist in identifying possible future methods and needs in relation to data collation and storage. After a 12-month period, the requirement for further assistance of this kind in the Secretariat could then be reviewed, based on experiences gained in the interim. The Committee endorsed this suggestion.

12.2 Requirements for National Progress Reports

The Committee discussed the Annotated Draft Guidelines for the Content and Format of National Progress Reports, which had been distributed to members prior to the meeting (SC/3/5) as a result of discussions on the matter at its last meeting. SC/3/5 is included as Appendix 5.

A question was raised concerning the inclusion of official catch statistics in the National Progress Reports. It was noted that in relation to the discussion on data requirement, the Committee had decided at its last meeting that catch data should, for the time being, be included in National Progress Reports. The Committee agreed to seek guidance from the

Council as to the preferred form in which any catch statistics to be compiled by the Secretariat should be submitted.

The Committee also agreed in principle that the National Progress Report should be appended to the main Scientific Committee report. It was noted in this connection that it was the practice of the Secretariat to circulate the Scientific Committee report widely to other relevant organisations and bodies, and that the Council had also agreed that it was important to make the work of the Scientific Committee widely available.

13. Future work plans

13.1 Scientific Committee

The future tasks of the Scientific Committee were briefly discussed. Referring to the seven items for which the Management Committee, through the Council, had requested advice (NAMMCO/2 - Report, 63-64), most of these were being dealt with or had already been dealt with by ICES working/study groups, by the Joint ICES/NAFO Working Group on Harp and Hooded Seals or by the NAMMCO Scientific Committee itself.

The Committee felt that priorities need to be identified for future work, but felt that impacts of marine mammals on the marine ecosystem should be considered in some depth at its next meeting.

Mention was also made of environmental aspects as an area relevant for the Committee's future consideration. It was further noted that the forthcoming NAMMCO Conference on Marine Mammals and the Marine Environment in Shetland (20-21 April 1995) would provide an important source of information for future discussions in this area.

The Committee received with appreciation an invitation from the Faroes to hold its next meeting in Tórshavn in February 1996.

13.2 Working Groups

In light of the progress made with respect to killer whales and northern bottlenose whales, the Committee decided there was no further need for designated working groups for these species. The Committee therefore decided to dissolve that working group, and thanked its Chairman, Tore Haug, and its members for their valuable contribution.

14. Election of officers

14.1 Election of Chairman

Tore Haug, Norway, was elected as new Chairman of the Scientific Committee for the next two years.

14.2 Election of Vice Chairman

Mads Peter Heide-Jørgensen (Greenland) was elected as new Vice Chairman of the Scientific Committee for the next two years.

15. Any other business

The Chairman thanked the members of the Committee for their support during his term of office, since the first establishment of the Committee, and expressed his gratitude to the Secretariat for the professional handling of the work of the Committee. He also extended his thanks to the Greenland Fisheries Research Institute for their generous hosting of the meeting and for providing back-up support during the meeting.

On behalf of the Committee, Larsen thanked the outgoing Chairman for his valuable efforts in getting the work of the Scientific Committee off the ground. He also extended a thanks to the Secretariat for the efficient running of proceedings.

16. References

Anon., 1978, "Management and conservation of marine mammals and their environment", in *Mammals in the Sea, Volume I.* Report of the FAO Advisory Committee on Marine Resources Research, Working Party on Marine Mammals, FAO Fisheries Series 1(5): 162-180.

NAMMCO/2 - Report - *Report of the Second Meeting of the Council of NAMMCO*, Tromsø 19-20 January 1993.

NAMMCO/4 - Report - *Report of the Fourth Meeting of the Council of NAMMCO*, Tromsø, 24--25 February 1994.

17. List of Appendices

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18. List of Annexes

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Annex 2	Report of the *ad hoc* Working Group on Atlantic walrus, Copenhagen, 2 February 1995
Annex 3	Report of the third meeting of the Working Group to plan NASS-95, Copenhagen, 2 February 1995

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SC/3/3 - Faroes	Progress Report on Marine Mammal Research 1994
SC/3/3 - Greenland 1993	Progress Report on Activities in 1993
SC/3/3 - Iceland 1993	Progress Report on Marine Mammal Research in 1993
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SC/3/3 - Norway	Progress Report 1993 and 1994
SC/3/4	List of Priority Species (updated SC/2 - 1993)
SC/3/5	Annotated Draft Guidelines for the Content and Format of National Progress Reports
SC/3/6	Report of the 2nd Walrus International Technical and Scientific (WITS) Workshop, 11-15 January 1993, Winnipeg, Manitoba, Canada (eds. R.E.A. Stewart, P.R. Richard & B.E. Stewart)
SC/3/7	NASS-95 Working Group Report, Tromsø, 2 Dec. 1994 (+ Appendix 3)
SC/3/8	T. Haug & K. T. Nilssen, "Observations of Walrus *Odobaenus Rosmarus* in the Southeastern Barents Sea in February 1993".
SC/3/9	NASS-95 Working Group Report, Tromsø, 25 February 1994
SC/3/11	Letter from Secretary to Council members requesting information on management objectives (24 November 1994)
SC/3/12	Response from Norway on management objectives (9 January 1995)
SC/3/13	E.W. Born, I. Gjertz and R.R. Reeves, Population assessement of Atlantic walrus (*Odobenus rosmarus rosmarus*).
SC/3/15	Response from Greenland on management objectives (30 January 1995)
SC/3/16	M.P. Heide-Jørgensen and E.W. Born, Monitoring walrus abundance off West Greenland.
SC/3/17	D. Bloch, G. Desportes, M. Zachariassen and I. Christensen, The Northern Bottlenose Whale in the Faroe Islands, 1584-1993.
SC/3/18 rev 1	Management objectives for marine mammals in Iceland, A. Halldórsson, Ministry of Fisheries, Reykjavik, 31 January 1995.

International Council for the Exploration of the Sea

Proposal for an ICES Policy on Marine Mammals

C.M.1994/Del:8

Following C.Res.1993/2:2, the *Ad Hoc* Group on ICES Marine Mammal Policy met at ICES Headquarters on 11 and 12 April 1994 under the chairmanship of the Chairman of the Consultative Committee, Dr R.C.A. Bannister to:

a) develop a comprehensive policy on the handling of marine mammal issues within the ICES structure.

b) prepare an appropriate document to be considered at the 1994 mid-term meetings of the Consultative Committee and the Bureau.

The Group comprised Mr D. de G. Griffith (President), M A. Maucorps (First Vice-President), Dr A. Bjørge (Chairman of the Marine Mammals Committee), Dr M.P. Sissenwine (USA), the Fisheries Secretary (representing the Chairman of ACFM, Mr E. Kirkegaard), and the Environment Secretary (representing the Chairman of ACME, Dr K. Richardson).

Following review by the Consultative Committee, and including further amendments by the Bureau, the following Policy Statement is proposed for the consideration of the Delegates.

ICES POLICY ON MARINE MAMMALS ISSUES

1. The General Role of ICES

1.1 ICES policy on marine mammal issues derives from its constitutional role as an independent intergovernmental organisation, established in 1902 with the task of carrying out a programme of international investigation of the sea. The ICES Convention, which came into force in 1968, established the general responsibilities of ICES, as follows (Article 1):

"a) to promote and encourage research and investigations for the study of the sea, particularly related to the living resources thereof;

b) to draw up programmes required for this purpose and to organise, in agreement with the Contracting Parties, such research and investigations as may appear necessary;

c) to publish or otherwise disseminate the results of research and investigations carried out under its auspices or to encourage the publication thereof."

1.2 The geographic scope of these activities is defined in Article 2:

"The Council shall be concerned with the Atlantic Ocean and its adjacent seas and primarily concerned with the North Atlantic."

1.3 Both during the period 1902 - 1968, and subsequently, ICES has always maintained close working relationships with other international marine scientific bodies and with relevant regulatory agencies, as laid down in Article 4:

"The Council shall seek to establish and maintain working arrangements with other international organisations which have related objectives and cooperate, as far as possible, with them, in particular in the supply of scientific information requested."

1.4 In all matters ICES is dependent on its Member Governments as the primary source of basic scientific data, as identified in Article 5:

"The Contracting Parties undertake to furnish to the Council information which will contribute to the purpose of this Convention and can reasonably be made available and, wherever possible, to assist in carrying out the programmes of research co-ordination by the Council."

2. ICES Marine Mammal Interests

2.1 Marine mammal research is important in a number of areas of marine science, and some priority examples are given below:

2.1.1 Marine mammals are important components of marine foodwebs. They feed at several trophic levels, and predate on fishery resources. To assess the impact of marine mammals on their prey communities, and of the fisheries on marine mammal carrying capacity, research on the two-way trophic relationships between marine mammals and fisheries is necessary.

2.1.2 Marine mammals are vulnerable to incidental mortality in fishing operations, and some stocks are harvested directly. Knowledge on the status and dynamics of marine mammal populations is therefore also needed for assessing these aspects.

2.1.3 Marine mammals are exposed to contaminants through their foodwebs. A description of mammal foraging habits is essential for understanding contaminant flow in the ecosystem. The bioaccumulation of organic lipophilic contaminants in marine mammal tissues can serve as an indicator of those contaminants present in the marine ecosystem at levels high enough to cause accumulation. Such contaminants may affect the health and immune systems of marine mammals, as well as marine mammal reproduction. Information on habitat requirements, foraging, contaminant accumulation and its biological effects, are therefore all essential to ensure that appropriate scientific advice can be given on the management of marine mammal habitats, and the probability of their being degraded physically or chemically.

2.1.4 Marine mammals suffer from epizootic diseases, and are vectors for the transmission of parasites, and require investigation accordingly.

2.2 ICES will therefore promote and facilitate marine mammal research important to a scientific understanding of the marine environment and marine living resources.

2.3 Marine mammals are components of different trophic levels of the marine ecosystems of the North Atlantic, and ICES will pursue scientific work on marine mammals in the ICES area from an ecosystem perspective.

2.4 It shall be the policy of ICES to provide a scientific understanding of the functional role of marine mammals in the marine ecosystem, and to develop an ability to detect or predict threats that jeopardise this role.

3. Constraints

3.1 Scientific studies under ICES auspices will be carried out with the agreement of the Delegates, usually on the basis of recommendations which come through the Consultative Committee from the Marine Mammals Committee, other standing committees or from the Advisory Committees. These studies will be carried out in such a way as not to compromise the independence, credibility or scientific integrity of ICES.

3.2 Investigations will be pursued and vetted within the normal ICES working arrangements and results will be widely available through the normal reporting, validation and publication procedures. Only on the basis of a written agreement with the Council will they be directed to specific end-users.

3.3 ICES investigations which produce findings likely to be used for management advice will be vetted by the appropriate ICES Advisory Committee.

3.4 ICES will respond to requests for scientific information or advice on management from regulatory agencies having management competency for the areas or species in question, or from ICES Contracting Parties, subject to the terms of clause 3.5.

3.5 ICES will not ordinarily undertake marine mammal investigations which duplicate research or assessment activities already being conducted by or in support of regulatory bodies. On the other hand, ICES sees scientific benefits from establishing a more effective dialogue with such bodies in order to promote realistic collaboration and an effective allocation of resources and tasks. As part of this collaboration, and to avoid duplication, ICES will where practicable approach such bodies to solicit information on, for example, the dynamics and status of marine mammal populations.

Draft Annotated Guidelines
for the Contents and Format of National Progress Reports

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, where appropriate, number of animals taken, dates and catch positions, should be indicated and tabulated, as well as length and sex data. 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.

Report of the Joint Meeting of the Scientific Committee Working Groups on Northern Bottlenose and Killer Whales and Management Procedures

Copenhagen, 2 February 1995

1. Chairman's welcome and opening remarks

The Chairman, Nils Øien, welcomed participants (listed in Appendix 1) and gave a brief account of the rationale for the joint meeting of the two Working Groups:

The Working Groups had been given the task of modelling the northern bottlenose whale *(Hyperoodon ampullatus)* population, and results from preliminary work were to be presented and discussed.

At the last meeting of the Scientific Committee, it was agreed that there was a need for more guidance on management objectives before any concrete work could be started on developing appropriate management procedures. It was also concluded that these were likely to be case specific. Responses to this request were to be discussed at this joint meeting of the Scientific Committee Working Groups.

2. Adoption of agenda and appointment of rapporteur

The draft agenda was adopted and Tore Haug was appointed rapporteur.

3. Review of available documents and reports

The Chairman briefly reviewed the titles and reference numbers of the available documents. The list of documents is contained in Appendix 2.

4. Northern bottlenose whales; modelling and management implications

4.1 Catch history

The catch history of the northern bottlenose whale was comprehensively reviewed by the Working Group on Northern Bottlenose and Killer Whales during the last meeting of the Scientific Committee (NAMMCO/4 - Report, pp. 83-104).

There has been no local hunting of bottlenose whales in Greenland this century. A total of five animals were taken by whaling vessels in 1950 and 1958. This might reflect low abundance but also the low esteem in which bottlenose products are held in Greenland.

There has been no organised, commercial hunting of bottlenose whales by Iceland. Catch history data exist for Norway and the Faroes, although they are not of the same kind in both areas.

In the Faroes, both a limited-scale drive fishery and a limited-scale commercial offshore whaling have been conducted (SC/3/17). Reports exist of offshore catches between 1894 and 1935. Catches were maximum 11 animals per year, totalling 92 animals, and occurred mostly between May and July. Reports of drive fishery catches and strandings exist mainly from 1709 to the present. The annual catch increased from 1820 and peaked in 1890, whereafter it declined and reached its lowest concurrently with the decline of the Norwegian catches. Drive fishery catches peaked at the end of August and during the first half of September. A total of 646 bottlenose whales have been caught in the Faroes from 1584 up to and including 1994.

Scottish sealers and bowhead whalers took a total of approximately 1961 bottlenose whales from 1856 to 1970, including catches in both the Davis Strait and the Greenland Sea. Of these, 1,787 were taken in the period 1877-1892. At Scottish land stations a total number of 26 bottlenose whales were landed during the period 1909-1925 (Thompson 1928).

Northern bottlenose whales have been hunted by Norwegian whalers in the North Atlantic over two separate periods. During the first period, which lasted from 1882 to the late 1920's, a total of about 60,000 bottlenose whales were caught. The second period started with modern Norwegian whaling for smaller whales (mainly directed at minke whales) and commenced around 1930. Some bottlenose whales were included in the catches, and when the second period stopped in 1973, approximately 5,800 bottlenose whales had been caught in total.

4.2 Estimation of abundance

At the last meeting of the Scientific Committee, the Working Group on Northern Bottlenose and Killer Whales was unable to reach a conclusion on stock identity, i.e. to decide on the existence of one or more stocks of bottlenose whales in the North Atlantic. In the present modelling exercise, the population was treated as one single stock where reference was made only to data from the areas to the east of Cape Farewell (the southern tip of Greenland). The migratory nature of this species may support the one-stock hypothesis: the the peak in catches at Svalbard used to be in early spring, while the peak in the Faroese drive fishery is in September. Furthermore, sightings of whales west of Iceland are more frequent in early summer. If there is more than one stock, the degree of depletion in potential substocks may have been more adverse than that observed in the pooled stock.

A direct estimate of abundance comes from analysis of the Icelandic and Faroese data from the 1987 NASS survey (Gunnlaugsson & Sigurjónsson 1990). Most of the sightings recorded on board Icelandic vessels (59 of 86, i.e. 69%, representing 141 animals of 221 in total) were sighted between 4 and 20 July in the eastern part of the area, from Jan Mayen Ridge in the north, southward along the continental shelf edge east of Iceland towards the Iceland-Faroe Islands ridge to the Faroes in the South (i.e. in the area bounded by 70°N-58°N and 7-20°W) (Sigurjónsson, unpubl.). A surface estimate (no correction for submerged animals) of abundance gave 4,925 (CV=0.16) whales for the Icelandic survey vessels. An estimate for the Faroese survey vessel was 902 (CV=0.46) animals (Gunnlaugsson & Sigurjónsson 1990). From the 1989 NASS survey, an estimate for the southern blocks (south of 60°N) not covered in 1987 was obtained based on 8 sightings of 26 animals. This estimate is 3,006 (CV=0.4) south of 60°N. A total estimate of 8,827 (CV=0.32) was then obtained (WG-MP/2/4).

The Norwegian vessels made very few sightings of bottlenose whales during the NASS-1987 (Øien 1989), the Norwegian 1988 (Øien 1990) and the NASS-1989 (Øien 1991) surveys. This might reflect the fact that at the time of the survey, i.e. in July-August, the bottlenose whales have already left the area surveyed by Norwegian vessels. The Working Group noted that a southward migration out of the Norwegian Sea in mid summer could be inferred from historical catch data. No sightings were made from Spanish vessels.

The sightings estimate is undoubtedly biased downwards due to the long dive time of this species. Based on measurements from ten individuals given by Benjaminsen & Christensen (1979), an average of 33 minutes can be calculated.

The median perpendicular sighting distance on the Icelandic vessels in 1987 and 1989 was 0.32 nm and 0.34 nm, respectively. Considering only the sightings observed within the median perpendicular distance (i.e., half the sightings), the median forward distance is 0.5 nm. If the effective forward sighting distance is 1 nm (twice the median), which these vessels would traverse in about 8 minutes, a correction factor of 5 was derived, as explained in Gunnlaugsson & Sigurjonsson (1990). For an accurate correction factor to be obtained, the data needs to be recorded in more detail; e.g., if the deep diving is used as the cue, the distances should refer to that point (negative bias) and the animals not seen deep-diving before abeam should not be included (positive bias). Also, a larger number of dive time observations are needed, as well as other behavioural observations, which could resolve the question of whether group size is frequently underestimated or two groups believed to be one. Use of the correction factors derived above leads to an estimate of around 40,000 animals.

4.3 Population modelling

It was decided to try to model the development of the northern bottlenose whale population in the North Atlantic by using the catch series and the abundance estimates as presented above in the so-called "Hitter" model (Punt & Butterworth 1991). Thus, the runs with the uncorrected estimate of 8,827 and the corrected estimate of 40,000 as scenarios were considered. The group also decided to look at an intermediate value of 20,000 for the total stock size. Runs were made with natural mortality rates of 0.05 and 0.07. The results differed only slightly, and the group decided to represent only the results from the 0.07 runs. Other input parameters were female minimum age at maturity (7 years) and age at 50% and 95% maturity (9 years), male and female minimum age at recruitment (1 year) and age at 50% and 95% recruitment (3 years). Simulations were performed over the period 1856-1993 using MSY rates ranging from 0% to 10% (WG-MP/2/5).

During the NASS surveys there were no sightings of Northern bottlenose whales in the western part of the survey area (30°W - 42°W). Also due to the lack of an estimate west of the 42°W line the group decided to do runs for the area surveyed in the NASS surveys and catches there. The catch series used in the simulation is given in Appendix 3, Table 1.

All the runs show generally the same features (Appendix 3, Figure 1). For instance, with an MSY rate of 3% the initial stock is in all cases close to 43,000 and declines to a minimum of around 5,000 animals in the 1920s. With an MSY rate of 1%, the stock would not have

declined to such low levels, and the lowest level in the 1920's is about three times higher than that for an MSY rate of 3%, and the stock would not have increased significantly from that point. This appears be contrary to the observations made in paper SC/3/17 that drives were very few during the period of greatest depletion, and also the observations made on board Icelandic vessels west of Iceland, which show an apparent recent increase in sighting frequency (Sigurjonsson & Gunnlaugsson 1990). The group noted that the average annual catch of northern bottlenose whales in the Faroese drive fishery was 1.2 whales prior to 1877 and from 1974 onwards. During these periods the drive fishery has been the only harvesting of these whales, and even at an MSY rate as low as 1%, these catches have not had any detrimental effect on the stock. The modelling also shows the population as increasing in the period 1921-1960, when average annual catches were 66. This is in contrast to the stock trajectories for the periods 1877-1920 and 1961-1973, when average annual catches were 1,335 and 308 respectively.

5. Management objectives

At the last meeting of the Scientific Committee, it was agreed that there was a need for more guidance on management objectives before any concrete work could be initiated. On request from the Secretary on such guidance (SC/3/11), answers were received from Greenland (SC/3/15), Iceland (SC/3/18 rev 1) and Norway (SC/3/12).

The responses from Greenland and Iceland both mention the principle of maximum sustainable use (MSY), while Norway and Iceland expressed a wish for a multispecies approach, also taking into account interactions with fisheries. Iceland discussed the MSY principle in relation both to biology and economy. Additionally, Greenland noted as a management objective that present distributions of harvested species should be maintained.

Although the group appreciated these contributions, it felt that they did not answer the request for management objectives *per se*. Defining objectives implies that value is given to the different goals for management, e.g., how much relative importance is given to biological and economical factors. The group felt that although the general views on management objectives received from Council members were of interest, a more pragmatic approach on an area and species/case-specific basis would be desirable for the development of specific management procedures. It was therefore decided to suggest that requests for advice from the Council be accompanied by specific objectives defined for the case in question.

In light of the above comments, it was noted that a general discussion of management objectives at Council level may provide further input for the continued work of the group. The Working Groups identified examples and references which could aid such a discussion:

1) a list of management objectives given in Anon 1978;
2) possible questions about the goals of management such as those given in the response from Greenland (SC/3/15); and
3) examples of management objectives such as minimizing risk or maximizing yield on an economic or biological basis.

A paper on the application of the Revised Management Procedure (RMP) by Friðrik M. Baldursson (WG-MP/2/3) was also submitted, but there was no time available to discuss it.

6. Future work and requirements

During the assessments of the northern bottlenose whale it was evident that several uncertainties exist around this species in the North Atlantic. This has hampered the Working Group's ability to give precise advice on the stock. It is therefore relevant to refer to the research needs identified during the meeting of the Working Group on Northern Bottlenose and Killer Whales at the last meeting of the Scientific Committee in Reykjavik, November 1993 (see NAMMCO/4 - Report, pp. 83 - 104).

With regard to future management requirements, reference is made to item 5 above.

7. Adoption of report

The report was adopted on 2 February 1995.

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List of documents

WG-MP/2/3	F. Baldursson, Application of the RMP to East-Greenland/Iceland fin whale.
WG-MP/2/4	Þ. Gunnlaugsson, A note on the rationale fro abundance estimates of northern bottlenose whales used in Hitter/Fitter runs
SC/3/12	Response from Norway on management objectives (9 January 1995)
SC/3/15	Response from Greenland on management objectives (30 January 1995)
SC/3/18 rev 1	Management objectives for marine mammals in Iceland, A. Halldórsson, Ministry of Fisheries, Reykjavik, 31 January 1995.

Table 1

Catch series (from 1856 to 1993) used in the Hitter runs of northern bottlenose whales. Males in the left column, females in the right; where sexual composition was unknown, the catches were split in two halves.

1856	18.	17.
1857	3.	2.
1858	3.	3.
1859	2.	1.
1860	5.	4.
1861	6.	6.
1862	3.	3.
1863	4.	4.
1864	7.	6.
1865	1.	1.
1866	0.	0.
1867	1.	1.
1868	5.	5.
1869	3.	3.
1870	3.	3.
1871	4.	3.
1872	6.	6.
1873	1.	1.
1874	8.	8.
1875	1.	1.
1876	5.	4.
1877	8.	9.
1878	6.	6.
1879	8.	9.
1880	22.	21.
1881	59.	59.
1882	220.	219.
1883	314.	314.
1884	273.	273.
1885	489.	489.
1886	924.	923.
1887	930.	931.
1888	769.	769.
1889	883.	883.
1890	1470.	1470.
1891	1646.	1647.
1892	1621.	1621.
1893	1394.	1393.
1894	1458.	1457.
1895	1343.	1343.
1896	1660.	1660.
1897	1187.	1187.
1898	938.	939.
1899	1122.	1121.
1900	1098.	1098.
1901	983.	983.
1902	886.	886.
1903	820.	820.
1904	636.	635.
1905	658.	658.
1906	600.	599.
1907	694.	695.
1908	672.	671.
1909	750.	750.
1910	609.	609.
1911	462.	463.
1912	355.	355.
1913	372.	373.
1914	174.	175.
1915	139.	139.
1916	2.	1.
1917	200.	200.
1918	221.	221.
1919	152.	153.
1920	146.	147.
1921	16.	17.
1922	40.	40.
1923	67.	67.
1924	76.	76.
1925	50.	51.
1926	32.	31.
1927	13.	13.
1928	1.	1.
1929	4.	4.
1930	12.	11.
1931	2.	2.
1932	0.	0.
1933	0.	0.
1934	0.	1.
1935	2.	2.
1936	0.	0.
1937	24.	25.
1938	27.	46.
1939	20.	25.
1940	8.	7.
1941	11.	10.
1942	6.	4.
1943	16.	20.
1944	16.	24.
1945	10.	11.
1946	10.	14.
1947	47.	64.
1948	35.	31.
1949	75.	146.
1950	21.	31.
1951	26.	51.
1952	5.	12.
1953	25.	26.
1954	34.	38.
1955	68.	57.
1956	130.	136.
1957	73.	90.
1958	84.	65.
1959	47.	47.
1960	107.	86.
1961	33.	54.
1962	115.	246.
1963	109.	186.
1964	67.	252.
1965	197.	494.
1966	117.	227.
1967	88.	185.
1968	149.	234.
1969	189.	296.
1970	169.	368.
1971	88.	125.
1972	9.	8.
1973	2.	1.
1974	2.	2.
1975	0.	0.
1976	0.	0.
1977	0.	0.
1978	1.	1.
1979	0.	0.
1980	0.	0.
1981	2.	1.
1982	2.	1.
1983	0.	0.
1984	0.	0.
1985	0.	0.
1986	0.	0.
1987	0.	0.
1988	2.	1.
1989	1.	1.
1990	0.	0.
1991	0.	0.
1992	1.	1.
1993	2.	3.

Figure 1 (a)

Hitter runs for northern bottlenose whale target stock estimates in 1988 of 8,827.

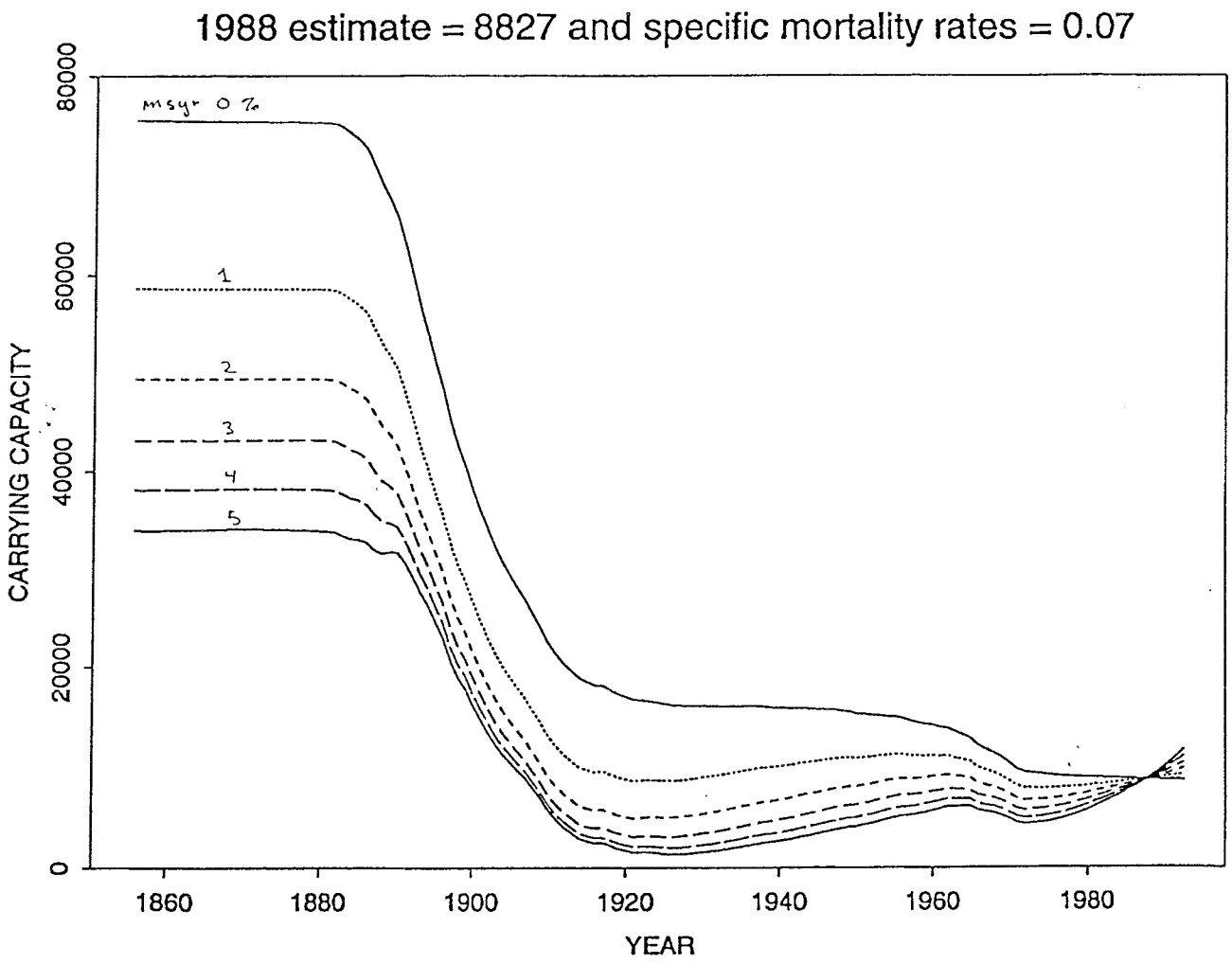


Figure 1 (b)

Hitter runs for northern bottlenose whale target stock estimates in 1988 of 20,000.

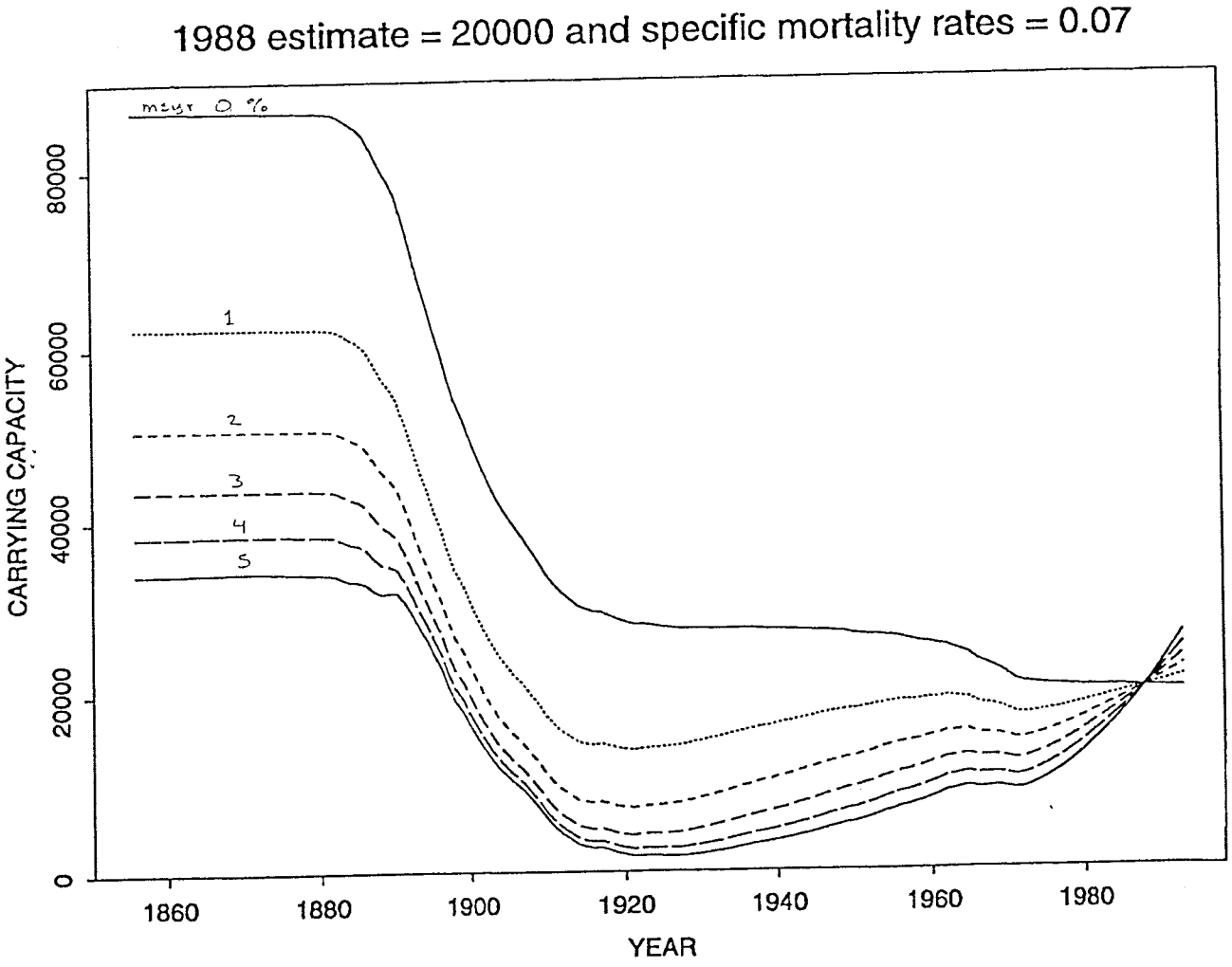
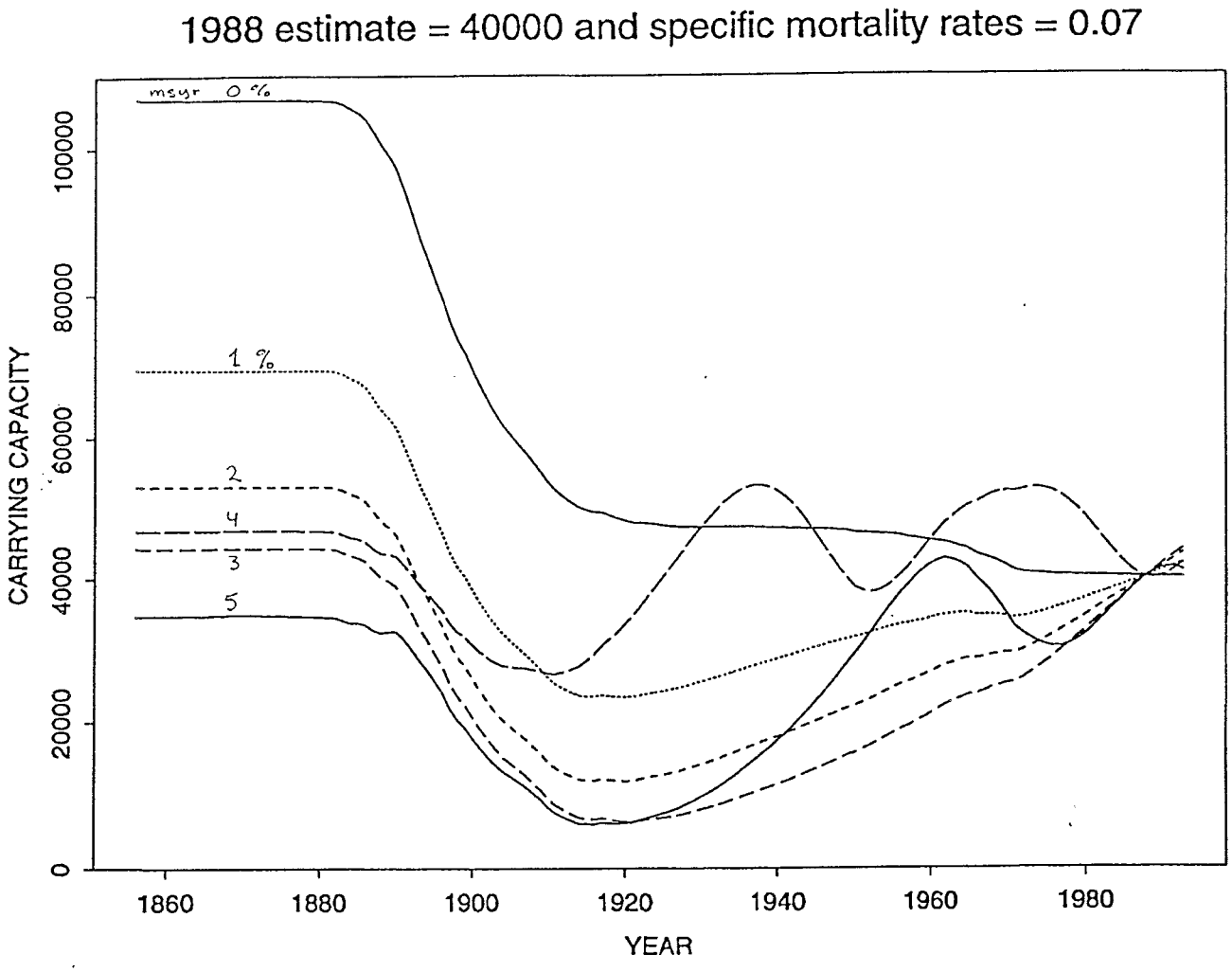


Figure 1 (c)

Hitter runs for northern bottlenose whale target stock estimates in 1988 of 40,000.



Report of the *ad hoc* Working Group on Atlantic Walrus

Copenhagen, 31 January - 3 February 1995

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Report of the *ad hoc* Working Group on the Atlantic Walrus

Copenhagen, 31 January - 2 February, 1995

The *ad hoc* Working Group on the Atlantic walrus met at the Greenland Fisheries Research Institute in Copenhagen from 31 January to 2 February 1995. The Working Group was convened by Erik Born. A list of participants is contained in Appendix 1.

The Working Group referred to the Council's request for advice on the Atlantic walrus (*Odobenus rosmarus rosmarus*), which was as follows:

> "[to]... advise on stock identity for management purposes; to assess abundance in each stock area; to assess long-term effects on stocks by present removals in each stock area; to assess effects of recent environmental changes (i.e. disturbance, pollution), and changes in the food supply" (NAMMCO/2 - *Report,* 64).

The Working Group addressed each of the elements of the request in turn, basing deliberations on all available data on the Atlantic walrus.

1. Stock identity

It was acknowledged from the outset that although Atlantic walruses are generally understood to exist in a number of separate stocks, few studies have been done explicitly addressing questions of genetic relatedness of different groups.

In a preliminary discussion, the Working Group attempted to develop a conceptual model of the distribution and movements of Atlantic walruses, with the following considerations:

a) Walruses breed in winter (February to April) when there is extensive ice coverage. Therefore, stock separation may be driven by discontinuity in the availability of reliable open-water areas in winter. The distribution of polynyas, persistent shore leads, and loose pack ice may dictate to a major extent the opportunities for genetic exchange among walrus groups.

b) Although Atlantic walruses have been characterized as more "sedentary" than the strongly migratory Pacific walruses (Mansfield 1973), they are also known to swim long distances in short periods (Wiig pers. comm.). Several authors (Freuchen 1935, Dunbar 1956, Currie 1968), citing as evidence primarily the observations by walrus hunters and the consistent timing of the arrival and departure of walruses in particular areas, have described migratory routes and schedules involving annual long-distance movements.

c) Aggregations of walruses at traditional haul-out sites on land have often been characterized as "herds", with the implicit assumption that they are social units of some kind. Although the evidence is not as strong for Atlantic walruses as for Pacific walruses, segregation, e.g. all-male groups at some haul-out sites, has been observed in Atlantic walruses during the summer and autumn. Since no mating occurs in summer and autumn, when the terrestrial

haul-out sites are occupied, it is possible that animals from different breeding areas share the same haul-out sites.

d) The abandonment of some terrestrial haul-out sites has been observed in Canada, Greenland and Svalbard. Such abandonment may be taken as evidence that the group of animals using the site was either extirpated or driven away by disturbance. It has sometimes not been possible to decide which of these causes was involved.

The Working Group attempted to use the above model in assessing the likely discreteness of groups of walruses in different areas. Two alternative hypotheses were considered, namely:

1. Wintering concentrations represent genetically separate stocks that migrate in summer to areas where walruses from different stocks mingle.
2. Summering concentrations, often involving a complex of traditionally occupied haul-out sites and often separated by large areas where walruses are absent or present only in very low density, represent stocks that are relatively sedentary, with animals moving away from the area only as far as necessary for access to food and open water in winter.

Very little evidence was available to support or refute either of these hypotheses, and it was agreed that both alternatives should be considered in our discussions of stock relations.

The Working Group agreed that it was useful to make a distinction between biological stocks which are genetically isolated, vs. management units, or functional stocks. The latter may include animals from more than one genetic stock, or alternatively be only a subunit of a genetic stock. The basis for defining management stocks may be practical (e.g. for purposes of catch monitoring or allocation, feasibility of designing and executing regular surveys to monitor abundance) or biological/behavioral (e.g. aimed at maintaining the traditional use by walruses of particular feeding, haul-out, or breeding sites).

The stocks proposed in SC/3/13 were reviewed and evaluated by the Working group, as follows (Figure 1, p.15):

1.1 Foxe Basin

Walruses are distributed mainly in the northern half of Foxe Basin where they are present in relatively high density all the year-round. Evidence from morphometric studies in the 1950s indicated that Foxe Basin walruses are larger than those in northern Hudson Bay (Mansfield 1958). No new data are available for northern Hudson Bay, but analyses of new material from Foxe Basin essentially agree with those of Mansfield in the 1950s (Garlich-Miller 1994).

Evidence on walrus distribution and movements, provided both by hunters and by scientists, is consistent with the view that the Foxe Basin group of walruses is largely isolated from other groups to the north (via Fury and Hecla Strait) and south (western Hudson Strait and Southampton Island area).

The Working Group concluded that there was sufficient evidence to regard the Foxe Basin walruses as a separate management unit, and that there is a high probability that it is also a genetic stock.

1.2 Southern and Eastern Hudson Bay

The large gap in walrus distribution, year-round, along the west coast of Hudson Bay (approximately from Dawson Inlet south to Cape Henrietta Maria) provides a basis for separating the walruses in southern and eastern Hudson Bay from those in northwestern Hudson Bay. However on the east side of the bay the distribution of walruses appears to have been continuous historically from the Belcher Islands northward to the mouth of Hudson Strait. The apparent decline in numbers and reduced range of walruses in eastern Hudson Bay, with no obvious corresponding changes in northwestern Hudson Bay and western Hudson Strait, suggests that there is limited exchange between eastern Hudson Bay and these areas.

There is no basis for evaluating the relationships among the groups of walruses that haul out in summer on shoals and islands in southern and eastern Hudson Bay. It was noted that there is some open water in parts of James Bay and eastern Hudson Bay during winter, so some overwintering by walruses is possible. No direct evidence was available, however, of overwintering by walruses in this region.

The Working Group concluded that there may be reason to regard the southern and eastern Hudson Bay walruses as a separate management unit, but that there is no basis for viewing them as a separate genetic stock.

1. 3 Northern Hudson Bay - Hudson Strait - Northern Labrador - Southeast Baffin Island

Walruses are present all the year round in portions of this area, and they also migrate through Hudson Strait. Their distribution is essentially continuous from the Keewatin coast of northwestern Hudson Bay, throughout the Southampton Island, Coats Island, Foxe Peninsula, and Hudson Strait regions, and from the eastern entrance of Hudson Strait southward along the northern Labrador coast and northward along the southeastern Baffin Island coast. On the other hand, it was noted that densities are particularly high at specific localities, both in winter/spring (e.g. south of Akpatok Island, at the western end of Hudson Strait and in the leads along the north and south shores of Hudson Strait (McLaren and Davis 1982) and summer/autumn (e.g. terrestrial haul-out sites at Southampton and Coats Islands, Lady Franklin Island group, western and northern shores of Foxe Peninsula - MacLaren-Marex 1980, Richard and Campbell 1988, Mansfield and St. Aubin 1991).

In the absence of any direct evidence for stock differentiation (e.g. genetic analyses, tagging, morphometry), the Working Group inferred from the evidence on distribution and movements that the walruses in this area may belong to one genetic stock. It wished to emphasize, however, that considerable risk could be associated with treating them as a single management unit. There is a strong possibility that walrus groups have a high degree of fidelity to geographically separate breeding and haul-out sites. If they do, overhunting or disturbance could prevent the continued use

by walruses of some parts of this large area. It was noted that the people living at settlements along the north and south shores of Hudson Strait must make long boat trips to offshore islands for walruses, whereas in the past they were able to catch walruses regularly along shore and at near-shore islands.

1.4 Central West Greenland

Walruses overwinter in two discrete areas over shallow banks off central West Greenland (Born *et al.* 1994). These walruses leave the waters off West Greenland in spring and do not return until autumn. It has been suggested that some of them, particularly those in the southern group, move west to the east coast of Baffin Island. Others may move north to Upernavik and Avanersuaq municipalities. The deep water between the two banks has a very low density of walruses (Born *et al.* 1994; Heide-Jørgensen and Born 1995).

Mitochondrial genetic analyses have shown that the walruses wintering in the southern area off central West Greenland have different haplotypes that could indicate mixing (Cronin *et al.* 1994). However, due to the small sample size, the genetic evidence was judged to be inconclusive for purposes of identifying genetic discreteness.

On the basis of the hiatus in distribution between the two groups of wintering walruses, their differing responses to recent exploitation, and the fact that their status with regard to catches and population trends has been monitored separately (Born *et al* 1994; Heide-Jørgensen and Born 1995), the Working group concluded that these should be treated as separate management units, the southern group designated as the "Sisimiut group" and the northern one as the "Disko group". It was noted that a connection between the Sisimiut group and the southeast Baffin Island etc. group (*1.3* above), is likely.

1.5 North Water (Baffin Bay)

Walruses overwinter off Northwest Greenland and in the eastern Canadian Arctic in what appear to be several discontinuous aggregations (e.g. in the North Water polynya and polynyas in Wellington Channel and Cardigan Strait (Kiliaan and Stirling 1978, Finley and Renaud 1980, Born *et al.* 1995)). Summering grounds for these walruses are primarily in the eastern Canadian Arctic at terrestrial haul-out sites along the coasts of Ellesmere, Devon and Bathurst Islands (Koski and Davis 1979, Riewe 1992). Migrations through Lancaster and Jones Sounds, westward in spring and eastward in autumn, are well documented (e.g. Davis *et al.* 1978). One of ten walruses tagged in August 1993 at Bathurst Island was killed by Inuit off the north coast of Bylot Island in June 1994 (Stewart, unpubl.). Published reports referred to Greenlandic bullets being found in the bodies of walruses taken in the eastern Canadian Arctic (Freuchen 1921, Vibe 1950). Substantial northward migration into the North Water area in spring, along either Greenland or the Baffin Island coast, has not been documented in recent years (Koski 1980, Born *et al.*1994).

MtDNA analyses showed that walruses in the North Water area, hunted during the spring by Inuit in Avanersuaq municipality, are monomorphic (Cronin *et al.* 1994). There is a hiatus in walrus distribution off the northeast coast of Baffin Island (cf. Mansfield 1958, Koski and Davis 1979) that may be a secondary effect of overhunting.

The Working group concluded that the walruses centred in northern Baffin Bay, ranging from Avanersuaq municipality (N.W. Greenland) westward to Peel Sound in the eastern Canadian Arctic, probably comprise a separate genetic stock. Whether they are a genetic stock or not, this group should be considered a separate management unit. As was indicated for the Central West Greenland group, it may prove appropriate to subdivide this group further, for example on the basis of particular haul-out (summering) or overwintering (breeding) sites.

1.6 East Greenland

The walruses present all the year-round in Northeast Greenland are geographically and genetically isolated from those in Northwest Greenland (Cronin *et al.* 1994). Some coastwise movement southward to South Greenland (mainly emigration) is possible. Movement across Fram Strait from East Greenland to Svalbard has been documented (Born and Gjertz 1993), but such movement is considered infrequent.

The Working Group agreed that the East Greenland walruses may be a separategenetic stock and that they should be considered a separate management unit.

1.7 Svalbard - Franz Joseph Land

Recent studies have demonstrated that the walruses in Svalbard and Franz Joseph Land belong to a common population that uses shore haul-out sites in summer and polynyas near both archipelagoes in winter (Gjertz and Wiig 1993). The possibility of a connection between these walruses and those that traditionally hauled out in summer on northern Novaya Zemlya deserves further investigation.

No genetic data are available for these walruses. It was agreed, however, that they should be treated as a separate management unit.

1.8 Kara Sea - Southern Barents Sea - Novaya Zemlya

Walruses definitely overwinter in the Pechora and White seas (e.g. Haug and Nilssen 1995), and there is reason to believe that some movement occurs through the Kara Entrance. The situation of walruses in the Kara Sea is entirely unknown, and any conclusion about their stock affinities would be speculation. For convenience, the Working group agreed to tentatively regard the walruses in the Kara Sea and southern Barents Sea and using Novaya Zemlya as a management stock, pending better information on them.

2. Estimates of walrus abundance

No dedicated walrus surveys that fully address questions of bias have been conducted in any of the areas in the North Atlantic where walruses occur. In some areas, densities obtained from aerial surveys can be used for extrapolation, but no information is available on submergence factors and haul-out patterns that are likely to affect the survey results. In other areas, counts at terrestrial haul-out sites provide information on a segment of the population, but do not correct for animals that were at sea during the survey and, for most areas, do not give complete simultaneous coverage of all haul-out sites that are likely to be used by the walrus stock. Finally, in some areas, figures on abundance are so old or poorly documented that they are no longer considered valid.

2.1 Foxe Basin

The best available information on present abundance of walruses in Foxe Basin are visual systematic strip-transect aerial surveys conducted in August 1988 (Mean 5200 95% CI 900-30500) and in August 1989 (Mean 5500 95% CI 2700-11200) (Cosens et al. 1993). The results of these surveys, which are considered as reference or index points for future surveys, are not corrected for animals that were submerged during the survey. Also, some potential walrus habitats were not surveyed in either year.

2.2 Southern and Eastern Hudson Bay

Virtually nothing is known about historical or current sizes of walrus populations in this area. A group of walruses was counted in October 1978 at the terrestrial haul-out site at Cape Henrietta Maria. The Working Group was not able to assess the number of walruses in southern and eastern Hudson Bay.

2.3 Northern Hudson Bay - Hudson Strait - Northern Labrador - Southeast Baffin Island

Surveys were conducted using different methods in different years in parts of the range of this proposed stock. Aerial surveys in northern Hudson Bay revealed a count of about 2400 walruses in the summers of 1976-77 (Mansfield & St Aubin 1991). Richard (1990) reported sightings of about 1800 walruses from aerial surveys in parts of northern Hudson Bay and western Hudson Strait in 1988. Aerial survey counts of 600-700 were reported for an island off southeast Baffin Island in August 1978 (MacLaren Marex 1980), and Richard and Campbell (1988) estimated a summer population in southeast Baffin Island of about 1000 in the late 1970's, based in part on the count of 600-700 reported by MacLaren Marex (1980). Aerial surveys conducted during March 1981 gave uncorrected estimates of 223 walruses in southwestern Davis Strait and 850 in Hudson Strait (McLaren and Davis 1982).

The various counts and estimates reported above cannot simply be added. The Working Group was unable to produce an estimate for this stock from the data available.

2.4 *Central West Greenland*

The main wintering grounds have been surveyed from aircraft six times since 1981. The uncorrected abundance estimates indicate that 200-300 walruses are found in these areas during winter. There are recent indications of a decline in walrus abundance in the southern stratum. i.e. in the Sisimiut group (Heide-Jørgensen and Born 1995).

2.5 *North Water (Baffin Island)*

No complete population estimates are available, but surveys of the North Water in the late winter of 1979 indicated that around 700 walruses were present along the ice edge between Jones Sound and Talbot Inlet (Finley and Renaud 1980). Summer surveys indicate that 500-800 walruses move west into the eastern Canadian Arctic in spring (Davis *et al* 1978).

2.6 *East Greenland*

The only count covering a large area in East Greenland is from 1984, when two sport kayakers counted some 329 walruses from Nordostrundingen (c. 81°N) to Scoresby Sound (c.70°30'N).

2.7 *Svalbard-Franz Joseph Land*

An estimate has been made from a count of about 750 male walruses at haul-out sites in Svalbard. To account for an equal number of non-calf females, 750 was multiplied by two and 500 added arbitrarily to derive a rough minimum estimate of total population size of about 2000 for the Svalbard-Franz Joseph Land region (Gjertz and Wiig submitted). The estimation procedure was questioned, as no experiments were conducted to simultaneously estimate sex ratio in the population, and because other male aggregations may have been overlooked.

2.8 *Kara Sea - Southern Barents Sea - Novaya Zemlya*

No population estimate is available. A total of 138 walruses, including females and calves, were counted in 1994 in the Pechora Sea (Haug and Nilssen 1995). Russian literature suggests that the population numbers a few hundred.

3. Catch statistics and recruitment rates

3.1 Current catches

The most recent catch statistics for each stock were reviewed and summarized (Table 1, p 16). Under-reporting continues to be a problem in all areas and most estimates are subject to reporting errors. Department of Fisheries and Oceans (DFO; Canada) records indicate "data quality" by identifying the percentage by which the reported catch may under or over estimate the true catch (e.g. 50 $\pm$ 50% indicates the estimated harvest was 50 but may have been 25 to 75). For the present status review, data with quality ratings greater than 100% were not used. All catch estimates have been rounded to help reflect their imprecision. There are no recent data for some stocks.

Walruses are killed but not retrieved in all stocks but loss rates have been estimated for only a few hunting situations. They range from 0 to 50% (Freeman 1970; Smith and Taylor 1977) but cannot be broadly applied because they vary with location, season, hunting methods, and hunter skill. Orr *et al.* (1986) concluded that 32% of shot walruses were killed but not retrieved during summer hunts in Foxe Basin. This figure has been used to correct the Foxe Basin reported catch although the proportion of the catch made and the loss rates during the winter hunt are unknown.

Born and Kristensen (1981) recorded the outcome of 34 walrus hunts in the Thule District in the 1980s. They found that 15% of shot walruses were not retrieved. Orphaned calves and severely wounded animals were presumed to have died, making the killed but not retrieved estimate 25%. This figure has been applied to the reported catch for Thule but not to catches in other areas where this stock is hunted.

The loss rate in east Greenland has been estimated at 23% (Born *et al.* 1995). This figure has been applied to the reported and estimated catches there.

3.2 Net recruitment rate

In the absence of data specific to the Atlantic walrus, the Working Group accepted a range of net recruitment rates of 2-5%, indicated from a simulation of a hypothetical population of Pacific walruses (DeMaster 1984).

3.3 Estimates of sustainable removals

Catch statistics and net recruitment rates were used to estimate the probable range of population sizes required to sustain current removals. Two sets of estimates were used - the estimated hunting mortality from Table 1 (p.16) which is adjusted for loss rates where these are available; and a conditional estimate of hunting mortality which assumes a 30% loss rate for stocks lacking specific loss rate estimates. Population sizes are calculated using 2 and 5% net recruitment rates (Table 2, p.17).

4. Anthropogenic effects other than hunting

In Working Paper SC/3/13 information on the anthropogenic effects on walruses other than hunting was summarised and evaluated. The Working Group addressed the questions raised by the Council on potential effects on walruses of recent environmental changes (e.g. disturbance, pollution), and changes in food supply. The Working Group considered the potential effects on walrus populations of the following:

- Disturbance from various types of noise (e.g, that caused by aircraft and shipping, offshore exploration and operational activities, military activity);
- Pollution (e.g. spilled oil, heavy metals, organochlorine compounds, radioactivity, nuclear activity);
- Changes in food availability and interactions with fisheries;

4.1 Disturbance from various types of noise

The Working Group discussed the potential effects on walruses of noise from aircraft, ships and offshore exploration and operational activities.

4.1.1 Aircraft and shipping

Walruses react to the noise of aircraft. Although their reactions are variable, they usually escape into the water when the aircraft gets close. In some cases this can lead to stampeding with the result that calves are crushed to death. The long-term effects of repeated and continued disturbance from aircraft noise, however, cannot be evaluated easily. The Working Group could not rule out the possibility that walruses, like many other species, habituate to noise and other forms of disturbance that are not associated with other types of impact. Cases in which walruses have permanently abandoned uglit (e.g. western and eastern Greenland) have involved factors in addition to noise disturbance, such as hunting and smell of humans, dogs, offal etc., that could have been as, or more, significant.

Walruses also react to noise from boats and ships and they usually exhibit an escape response if the vessel gets too close. However, the degree of responsiveness is highly influenced by the type of noise and its source level, the social and behavioral situation of the walruses, and their previous experience with ship noise, especially whether it was associated with more drastic effects such as hunting. The Working Group did not feel that it was in a position to evaluate whether walruses, like many other species, habituate to noise from ships and boats, nor was the available information sufficient for evaluating the long-term effects of ship and boat traffic on walrus populations.

Because most walrus populations have been subjected to hunting pressure, in many cases intensive and over many years, and because various other human activities have modified walrus habitat through time, it will be very difficult to demonstrate long-term effects, at the population level, caused specifically by exposure to noise.

4.1.2 Offshore exploration and operational activities

Activities associated with oil and gas exploration are now occurring in many areas inhabited by Atlantic walruses. In some areas these activities are large-scale. For example, in the Svalbard area there has been extensive offshore explorations for oil since the early 1980s, and exploratory drilling is presently under way a little south of Bear Island. The feasibility of exploitation on Spitsbergen Bank between Bear Island and the island of Hopen is being evaluated, and exploitation is expected to be initiated before the end of this century. The world's largest field of liquified natural gas, the Stockmann field, is found in the Barents Sea.

In the western Russian Arctic, large oil and gas fields exist in the southern Barents Sea from the White Sea northeast to southern Novaya Zemlya, and along the west coast of Novaya Zemlya. Furthermore, large fields in the Kara Sea stretch eastward to the Yamal Peninsula. Seismic surveys started in 1971, and exploratory drilling in 1981. Several drilling platforms are present along western Novaya Zemlya and in the Kara and Pechora Seas, and oil is now produced on Kolgujev Island. These oil fields overlap with the summer distribution of walruses and therefore large-scale petroleum activities pose a potential threat to walruses in these areas.

At present, there is no exploitation of non-renewable resources in Greenland. Since 1991, however, marine seismic activity related to oil exploration has occurred along the coasts north to 79°N in eastern Greenland and 77°N in western Greenland.

The Working Group was not aware of any offshore petroleum development activity presently occurring in the eastern Canadian Arctic in areas currently occupied by walruses.

In a study of the effects on Pacific walruses of offshore drilling, the animals were found to exhibit only weak short-term behavioral responses to the drilling activities *per se*. They reacted, however, to the ice-breaking activities associated with these operations by moving away for a short time.

The Working Group was not aware of any studies which allowed it to make any conclusions about long-term effects of various exploration and operational activities on walruses.

4.1.3 Military activity

The Working Group was not able to evaluate the extent to which military activity (e.g. rocket launching, explosions) in different areas (e.g. southern Barents Sea) may adversely affect walruses.

4.2 Pollution

4.2.1 Oil spills

The Working Group was not aware of any studies that specifically addressed the direct or indirect effects of oil on walruses.

Studies of seals have shown that surface contact with oil causes stress, and temporarily irritates the eyes and skin. Some studies have indicated that ingestion of oil leads to physiological and chemical changes, possibly including effects on reproduction. Most evidence of internal organ and tissue damage from oil ingestion by seals is inconclusive for walruses. Inhalation of aromatic hydrocarbons from an oil spill caused mental debilitation in spotted seals. Walruses exposed to an oil spill are likely to show some of these reactions. However, walruses depend almost entirely on blubber to minimize heat loss. Their sparse pelage presumably is of little value as insulation, and their skin is thick and very tough. It is therefore unlikely that exposure of the skin to oil would have any appreciable thermal effect except in newborn walruses. Perhaps the oiling of newborns that have not yet accumulated a thick insulating blubber layer would affect their ability to keep warm. Consequently, oil spills during the walrus calving season (late May-early June) in areas where females and young are present could, theoretically, have a greater adverse impact than spills at other times and in other areas.

It was the opinion of the Working Group that some features in the ecology of walruses make them more vulnerable to the harmful effects of spilled oil than are many other marine mammals:

i) Due to the high level of gregariousness in walruses, an oil spill that affects one would be likely to affect at least several individuals. Furthermore, an oil spill in one area may be transferred by individuals to other walruses on clean sites (for example oil-fouled walruses will rub oil onto the skin or into the eyes of other individuals during haul out).

ii) Walruses tend to inhabit coastal areas and areas of relatively loose pack ice. Spilled oil is likely to accumulate in such areas. Walruses therefore have a high risk of being fouled not only in the water but also when they haul out on rocks or land.

iii) Because they are benthic feeders, walruses may be more likely to ingest petroleum hydrocarbons than are most other pinnipeds. Benthic invertebrates are known to accumulate petroleum hydrocarbons from food, sediments and the surrounding water. The implications for walruses may be serious since contaminants in their food are certain to build up in their own tissue. In addition, oil contamination may reduce the biomass or productivity of the invertebrate communities that sustain walruses. Walruses would then be forced to seek alternative food or feeding areas. In such a situation, it cannot be assumed that alternative types of food or feeding areas are actually available, however, so such a scenario could prove detrimental to the walruses.

The Working Group was not able to evaluate the effects of a recent major oil spill on land in northwestern Russia. It noted, however, that the massive contamination could eventually reach marine waters and affect walruses in some way, especially the small population in the Pechora Sea region.

4.2.2 Heavy metals and chlorinated hydrocarbons (CHCs)

The Working Group considered the potential effects on walruses of two classes of pollutants that have given particular cause for concern in marine mammals: heavy metals and chlorinated hydrocarbons (CHCs). Few studies, however, have been made of these pollutants in walruses.

The three metals which give greatest cause for concern are mercury (Hg), cadmium (Cd) and lead (Pb). The levels of heavy metals in Pacific walruses have been found to be very high. In certain organs these levels exceeded those considered safe for human consumption. Levels in Atlantic walruses, however, have been found to be less than in Pacific walruses. Certain metals have been found in relatively high concentrations in walruses from Foxe Basin (Cd), southern Hudson Bay (Pb and Hg) and northwest Greenland (Hg).

CHCs are anthropogenic chemicals which accumulate mainly in blubber and are of concern because of their potentially harmful effects on walrus reproduction, the walrus immune and hormone systems, and human health through consumption of contaminated walrus tissue. Walruses have generally low concentrations of CHCs. Especially high concentrations have, however, been found in Eastern Hudson Bay compared to other areas where this has been studied (i.e. other parts of Canada, West Greenland and Alaska). It is speculated that the high concentrations might be related to the significant consumption of ringed seals by these individuals.

The Working Group was concerned about the findings of comparatively high levels of CHCs in some walruses. It was, however, unable to reach a conclusion about what these findings mean to the walruses or to the people who consume them.

4.2.3 Radioactivity and nuclear activity

The Working Group noted that only few studies have been made on radioactive elements in walruses.

In connection with an airplane crash in the Avanersuaq area (Thule area, northwestern Greenland) plutonium was released from nuclear bombs to the surroundings. Analyses of plutonium in sediment, bivalves (including walrus food items) and other benthic organisms collected at the crash site showed values to be elevated from background levels. A study concluded, however, that in this area the plutonium levels in the animals at higher trophic levels such as birds, seals, and walruses were hardly significantly different from the fall-out background. Recent analyses gave the same results.

In general, nuclear weapon tests in different parts of the world caused a widespread fall-out of plutonium. However, the levels of this element, and other radionuclides such as Cs^{137}, reported so far from analyses of marine mammals are not considered high enough to pose a health risk to the animals.

No information is available about the effects on walruses of the nuclear activities in the Novaya Zemlya region and the Working Group could not evaluate the potential effects. Second-hand information, however, from Russian sources indicates that certain walrus haul-out sites in Novaya Zemlya were deserted in the 1960s due to nuclear testing on this island.

4.3 Changes in food availability and interactions with fisheries

The Working Group considered the potential effects on walruses of changes in food supply and direct and indirect effects of interactions with fisheries.

Changes in the density and availability of food will obviously influence the size of walrus stocks. Fluctuations in stocks of walrus prey might be caused by changes in both abiotic and biotic conditions driven, for example, by predator-prey relationships or anthropogenic factors. However, there is no information available to determine whether or to what extent such changes have influenced the stocks of Atlantic walruses. The Working Group noted, however, that mere abundance of walrus prey does not necessarily trigger or sustain population growth. Despite the fact that walrus food must have been abundant in the Svalbard region for a long time, and that walruses have been completely protected there since 1952, walruses have only recently moved back into the area. This could mean that in the case of a walrus population which has been seriously reduced by hunting, factors other than prey density and availability govern the animal's ability or willingness to exploit a food resource. Walruses are highly conservative in choice of food and selection of habitat. So factors such as need to learn or a lack of experience may have played a role in the evident failure of the walruses at Svalbard to take full advantage of the rich feeding areas potentially available to them.

The Working Group concluded that although the direct and indirect effects of fisheries on Atlantic walruses are basically unknown, some effects very likely do occur. Fisheries using bottom-draggers have destroyed potential walrus feeding habitat at Svalbard. The noise from fisheries in or near walrus habitat and the disturbance of the sea floor caused by trawling have probably contributed, perhaps synergistically, to the continued depletion of the stock of walruses wintering off central West Greenland.

Intensive fisheries along the coasts of Svalbard and in the Barents Sea also may have prevented walruses from repopulating areas that, from a purely trophic perspective, still appear to be suitable walrus habitat.

5. Recommendations

The Working Group identified many information gaps. They are listed here with possible research approaches. This listing does not preclude the investigation and application of other methods. Items are not listed in any order of priority because priorities will vary according to stock and management objectives.

1. Determine stock identity, especially for international, hunted stocks (e.g. using mtDNA, nuclear DNA, morphometrics, tagging, contaminants, etc.).

2. Determine stock size and/or trend, especially of hunted stocks (e.g. using aerial surveys, haul-out monitoring, biological sampling), as suits management objectives.

3. Evaluate effects of industrial activities including disruption of behaviour and contaminant pathways and effects (e.g. experimentation, feeding habits, physiology).

4. Improve catch statistics and expand to include information on (at least) sex, age, location and loss rates (e.g. biological sampling).

5. Evaluate behaviour related to within-population segregation (e.g. haul-out monitoring, attachment of satellite-linked radio transmitters (PTTs));

6. Assess critical habitat with respect to fisheries interactions and industrial activity (e.g. using PTTs).

6. List of documents

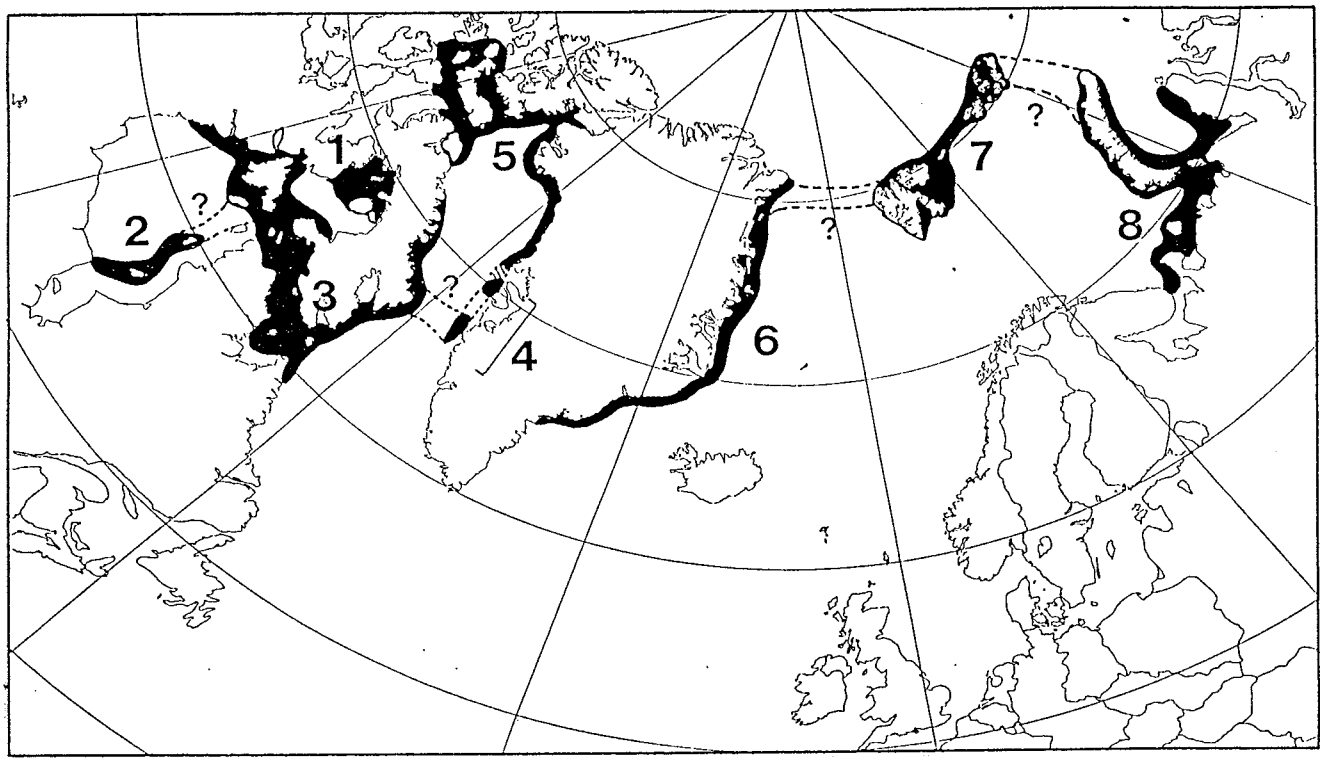
SC/3/6 Report of the 2nd Walrus International Technical and Scientific (WITS) Workshop, 11-15 January 1993, Winnipeg, Manitoba, Canada (eds. R.E.A. Stewart, P.R. Richard & B.E. Stewart)

SC/3/8 T. Haug & K. T. Nilssen, "Observations of Walrus *Odobaenus Rosmarus* in the Southeastern Barents Sea in February 1993".

SC/3/13 E.W. Born, I. Gjertz and R.R. Reeves, Population assessement of Atlantic walrus (*Odobenus rosmarus rosmarus*).

SC/3/16 M.P. Heide-Jørgensen and E.W. Born, Monitoring walrus abundance off West Greenland.

Figure 1. **Delineation of possible sub-groups used in review of the status of Atlantic walrus**



1. *Foxe Basin*
2. *Southern and Eastern Hudson Bay*
3. *North Hudson Bay - Hudson Strait - North Labrador - Southeast Baffin Island*
4. *Central West Greenland*
5. *North Water (Baffin Bay)*
6. *East Greenland*
7. *Svalbard - Franz Joseph Land*
8. *Kara Sea - South Barents Sea - Novaya Zemlya*

Table 1 Estimated removals of Atlantic walrus by stock area

Stock	Year	Reported average annual catch (ref)	Year	Estim. loss rate (ref)	Estim. total removal	References & comments
Foxe Basin	1988/89 to 1992/93	200 (1)	1980s	32% (2)	300	(1) DFO, 1991...94 (2) Orr *et al.* 1986
S. & E. Hudson Bay		35 (3)		nd	35+	(3) Richard & Campbell 1988 (estimates out-dated and of poor reliability)
N. Hudson Bay - Hudson Strait - N. Labrador - S.E. Baffin Island	1988-89 to 1992-93 1972-85	160 (1) 70 (3)		nd	230+	(1) DFO, 1991...94 (3) Richard & Campbell 1988 (estimates out-dated and of poor reliability)
Central West Greenland *- Disko Group* *- Sisimiut Group*	 '80-'87 '80-'87	 10(5) 40(5)		 nd nd	 10+ 40+	(5) 10 from Upernavik, Born *et al* 1994
North Water (Baffin Bay)	1988-89 to 1992-93 1970-80 1980-87	20 (1) 250 (4) 10 (5)	1980s	nd 25% (6)	360+	(1) DFO, 1991...94 (4) Born (1987) estimated for Thule only. (5) 10 from Upernavik, Born *et al* 1994 (6) Born & Kristensen 1981
East Greenland	'80 to '87	16 (7) or 20 (8)	1980s	23% (8)	20 to 25	(7) SC/3/13 - reported catch is an underestimate (8) Born - estimated from interviews (SC/3/13)
Svalbard - Franz Joseph Land		protected			+ (9)	(9) Small unreported kill at Franz Joseph Land (SC/3/13). From 1989-93 there were 4 killed during scientific studies
Kara Sea - S. Barents Sea - Novaya Zemlya		protected			+ (9)	(9) Small unreported kill (SC/3/13)

Table 2 **Calculations of size of various Atlantic walrus stocks necessary to sustain estimated current removals**

Stock	Reported annual average catch (from Table 1)	Required Population assumng NRR* of 0.05	Required Population assumng NRR of 0.02	Estimated total annual removal (from Table 1)	Required population assuming NRR of 0.05	Required population assuming NRR of 0.02	Abundance Estimate	Probable trend [1]
Foxe Basin	200	4000	10000	300	6000	15000	5500 (95% CI 2700-11200)	stable?
S. & E. Hudson Bay	35	700	1750	50¤	1000	2500	no data	unknown
N.Hudson Bay - Hudson Strait - N. Labrador - S.E. Baffin Isl.	230	4600	11500	330¤	6600	16500	no data	unknown
North Water (Baffin Bay)	280	5600	14000	380¤¤	7600	19000	no data	declining?
Central West Greenland. *- Disko group* *- Sisimiut grp.*	10 40	200 800	500 2000	15¤ 60¤	300 1200	750 3000	no data	declining
E. Greenland	20	400	1000	25	500	1250	no data	stable/ increasing?
Svalbard-Franz Joseph Land	protected			+			2000	increasing
Kara Sea - S. Barents Sea - Novaya Zemlya	protected			+			no data	increasing?

* NRR = Net Recruitment Rate

[1] Derived from full Scientific Committee discussions

¤ where no stock-specific data were available, 30% was used

¤¤ 25% for Thule, 30% for Canada and Upernavik

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Report of the Scientific Committee Working Group to plan NASS-95

Copenhagen, 2 February 1995

1 - 3. Opening procedures

The Chairman, Finn Larsen, welcomed the participants (Appendix 1) to the third meeting of the Working Group. The agenda as adopted is given in Appendix 2. The Chairman acted as rapporteur.

4. Review of available documents

Papers of relevance to the Working Group were SC/3/7, SC/3/9 and SC/NASS-95 WG/WP1. The latter is attached as Appendix 3.

5. Identification of priority species

After some discussion on whether the earlier pilot whale abundance estimates could be improved without carrying out a new survey, it was decided to keep pilot whales on the list of priority species.

6. Area coverage

6.1 Areas planned to be covered by national research programmes

Faroe Islands	-	As given in SC/3/7.
Greenland	-	Due to other commitments, there will be no Greenlandic participation in NASS-95.
Iceland	-	As given in SC/3/7.
Norway	-	As given in SC/3/7

6.2. Other areas of interest

The Working Group noted that for fin and pilot whales, present survey plans do not cover important areas in the southeastern part of the area covered by earlier NASS surveys, *i.e.* along the British Isles and the Iberian Peninsula. It was also noted that for these species there will be an important lack of coverage in the Northwestern Atlantic, *i.e.* along West Greenland and Northern North America. The Working Group further noted that for minke whales, present plans do not cover important areas, such as around the British Isles and around Greenland.

6.3 Coordination of survey effort

The Working Group agreed that the practical coordination of survey effort would be done by correspondence.

7. Methodology

7.1 Platform

As given in SC/3/7

7.2 Data collection and analysis

The Working Group recommends continuous I/O effort in passing or delayed closing mode. If the track line is left for species identification or mapping of sightings, the original line should be reentered in such a way that the likelihood of animals on the searchline being overlooked is small, and the analysis of these sightings should be relative to the original searchline. For this purpose, good positioning equipment is needed. The Working Group recognises the importance of closing on sightings which are suspected to be of unexpected species.

The Working Group recommends that sufficient time and effort should be given to mapping out sightings of pilot whales into subgroups, at least those close to the searchline (<0.5 nm), using high precision positioning systems such as GPS. The use of high-power binoculars for species identification and group size counts is also recommended.

Cues for all observations should be recorded; in particular surfacings for baleen whales and deep dives should be identified when possible. For sperm whales and northern bottlenose whales, the most important cue is the deep dive, and this point or the point where the animal is last seen at the surface should be recorded, at least up to the point where the animal is abeam of the vessel or for a time period at least as long as it would have taken the vessel to come abeam of the sighting in case the vessel slows down or diverts from the searchline.

The Working Group furthermore urges the Faroes to consider how to improve the sampling procedure for pilot whale sightings.

7.3. Problems with defining group size in pilot whale surveys

See item 7.2 above.

7.4. The use of US Navy Integrated Undersea Surveillance System data

There was nothing new to report under this item.

7.5. Improvements in present methods and new techniques for data collection

Larsen will distribute a description of the GPS-based data recording system used by Greenland Fisheries Research Institute.

Larsen will also obtain and distribute information on the high-power binoculars on poles used during the SCANS surveys.

7.6 Survey mode considerations

See 7.2. above

7.7. Collection of behavioural and ancillary data

There was nothing new to report under this item.

8. External expertise

No need for external expertise was noted.

9. Increasing the coverage of NASS-95: update on progress

The Working Group was informed that Canada has been approached by Iceland about participating in NASS-95. Canada expressed a serious interest in the surveys, but no commitment has so far been forthcoming.

It was noted by the Working Group that Canada is considering establishing an incidental sightings program for marine mammals on board vessels of opportunity.

10. Co-operation with other projects

10.1. Whale abundance in relation to environmental factors

There was nothing new to report under this item.

11. Funding

The Working Group noted that it may be possible to use part of the Scientific Committee budget to fund selected parts of NASS-95. It was also noted that the budget may be used for buying equipment that could be used during the surveys.

12. Other business

The Working Group agreed that there was no need for further meetings unless new parties become involved in the surveys

13. Adoption of report

The report was adopted on Friday, 3 February 1995.

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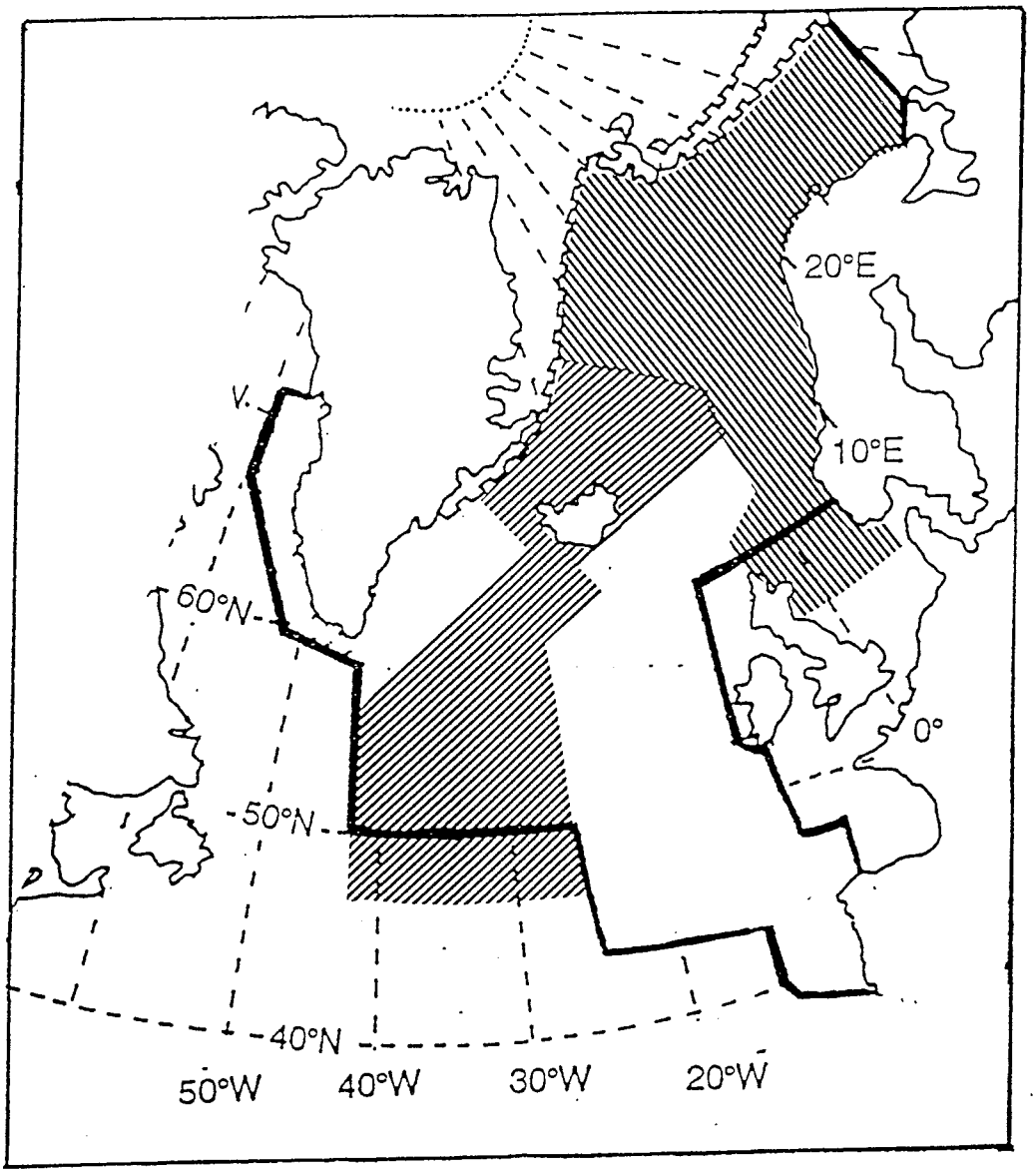
Agenda

1. Chairman's welcome and opening remarks
2. Adoption of agenda
3. Appointment of rapporteur
4. Review of available documents
5. Identification of priority species
6. Area coverage
   - 6.1. Areas planned to be covered by national research programmes
   - 6.2. Other areas of interest
   - 6.3. Coordination of survey effort
7. Methodology
   - 7.1. Platforms
   - 7.2. Data collection and analysis
   - 7.3. Problems with defining group size in pilot whale surveys
   - 7.4. The use of US Navy Integrated Undersea Surveillance System data
   - 7.5. Improvements in present methods and new techniques for data collection
   - 7.6. Survey mode considerations
   - 7.7. Collection of behavioural and ancillary data
8. External expertise
9. Increasing the coverage of NASS-95: update on progress
10. Co-operation with other projects
    - 10.1. Whale abundance in relation to environmental factors
11. Funding
12. Other business
13. Adoption of the report



The thick solid line represents the approximate area covered by the NASS-87 and NASS-89.

: The area to be covered by Norwegian vessels in 1995

: The area to be covered by Icelandic vessels in 1995

: The approximate ice-edge