3.1
REPORT OF THE FIFTEENTH MEETING OF THE NAMMCO SCIENTIFIC COMMITTEE

EXECUTIVE SUMMARY

The 15th Annual Meeting of the NAMMCO Scientific Committee (SC) was held in Qeqertarsuaq, Greenland, 11-14 April 2008. There were observers from Japan and the Russian Federation.

The following are summaries by agenda point as used in the main report.

6. ROLE OF MARINE MAMMALS IN THE MARINE ECOSYSTEM

6.1 Update on the Dartmouth conference (Sep/Oct 2008)
An update was given on the upcoming conference co-sponsored by NAMMCO (20,000 NOK) on "The Role of Marine Mammals in the Ecosystem in the 21st Century" in Dartmouth (Canada) 29 September – 1 October.

6.2 Update on progress on modelling
The report of the NAMMCO observer on the FAO workshop on Ecosystem Approach to Fisheries was presen ted. Some definitions of best practice were outlined which NAMMCO may choose to include in its ecosystem model work.

6.3 Working Group on Marine Mammal – Fisheries Interactions
The NAMMCO SC **recommended** reviving the Working Group (WG) on Marine Mammals and Fisheries interactions in view of recent progress in the field. In light of the new survey results, the SC **recommended** that the WG expand its terms of reference to include all areas under NAMMCO jurisdiction and investigate dynamic changes in spatial distribution due to ecosystem changes and functional responses. The SC **recommended** that this WG hold a meeting before March 2009 and that work includes a review of the Icelandic programme on the feeding ecology of minke whales and multi-species modelling.

6.4 Icelandic programme on the feeding ecology of minke whales
Iceland presented preliminary results from the research programme on the feeding ecology of minke whales which significantly correct the prey composition data input to the model presented to ICES.

6.6 Other matters
Norway and Russia have expressed concerns over the current size of the Atlantic harp seal populations and their predation on fish stocks. A project on the ecology of this species has been initiated and adopted by the Joint Norwegian-Russian Fisheries Commission. However, the Russian authorities have so far refused permission to deploy satellite tags in the White Sea. The SC **highly recommended** that the Russian Federation issues permits for this tag deployment, which should deliver the key information for assessing the ecological role of harp seals.

7. SEALS AND WALRUSES STOCKS - STATUS AND ADVICE TO THE COUNCIL

7.1 Harp seal

- Results from aerial surveys carried out in spring 2007 to estimate abundance and pup production for harp and hooded seals in the Greenland Sea are being analysed. Only scattered hooded seal whelping was observed while both patch and scattered harp seal whelping were observed. Meanwhile a concentration of white coat harp seals were observed for the first time in southwest Greenland. The question was whether changing in ice condition might have triggered behavioural changes such as some relocation of breeding. This would have implication for future research and management.
- The historical Barents Sea/White Sea population has been assessed to up to 6 million in 1875. Aeroplane surveys conducted by the Russian Federation in 2004 and 2005 indicate a decrease in pup production confirmed by similar surveys conducted in 2006 and 2007. A temporal and geographical reduction in ice cover in these two periods might be accounted for this decline.
- The Committee **recommended** an investigation of the possible presence of whelping patches in "untraditional" areas, to continue the sampling for biological parameters, and the characterization of stock identity.
- With regards to the question of how a projected decrease in the total population of Northwest Atlantic harp seals might affect the proportion of animals summering in Greenland, the Committee **reiterated its recommendation** that the ICES-NAFO Working Group be asked to address this request. The Committee urges Greenland to forward the request as soon as possible, so it could be dealt with at the next meeting in late August 2008.

7.2 Hooded seal

- Satellite tagging of seals in the Greenland Sea in 2007 and 2008 shows extensive use of all of the North Atlantic. Similar tagging off Southeast Greenland in 2007 shows movement to the Davis Strait and the Labrador Newfoundland coast.
- The Committee recommended in 2006 that catches in the Greenland Sea be restricted to necessary scientific catches and to satisfy local needs at roughly current levels. This should be accompanied by a monitoring programme. This recommendation was to be revisited after the results from the 2007 survey became available. These results were not available yet, it was noted, however, that no whelping concentrations were detected but only scattered whelping. This would increase the uncertainty of the pup production estimate. The question of possible alternative whelping patches (see under 7.1) was also crucial.
- With regards to the possible reasons for the apparent decline of Greenland Sea stock of hooded seals, and the assessment of the status of the stock on basis of the results from the 2007 survey, the Committee **recommended** that the ICES-NAFO Working Group be asked to address this request and was informed that Norway had already forwarded the request.

7.3 Ringed seal

The Committee **reiterated its recommendation** for initiating studies for addressing the importance of pack-ice breeding seals, especially in the present context of changes in ice condition.

7.4 Grey seal

- Abundance estimates for the Norwegian coast will be available in 2008 and will be complemented by a survey of the breeding colonies of the Murman Coast.
- Preliminary results from a Norwegian genetic study of all the North Atlantic areas have identified subdivisions with very little overlap that confirm data from conventional tagging experiments.
- The SC noted again that Norwegian quota levels were not sustainable and **recommended** that the Norwegian management plan be submitted to NAMMCO for evaluation.
- The SC **reiterated its recommendation** that the Faroes undertaken immediate efforts to determine the impact of the takes and to identify breeding areas.
- A survey is planned for 2008 in Iceland. The SC **recommended** Iceland provide data on the age composition of the catch.
- The SC **recommended** that a grey seal WG meeting be held in 2009.

7.5 Harbour seal

- Greenland has started implemented the monitoring programme recommended in 2006 and has implemented an improved reporting system leading to more realistic catches of under 100 animals a year.
- The SC commended the implementation of the monitoring programme but **reiterated the recommendation** for a total ban on this hunt in Greenland.
- A survey in Iceland in 2006 confirmed the 2003 estimate. Catches have declined, but there is insufficient information on by-catch. The SC **reiterated the recommendation** for the establishement of management objectives in Iceland and the collection of information on by-catch and age composition of the catch.
- Norway has implemented a system for assessment of coastal species, including harbour seals, (with regular surveys), and is working on a management plan for these. By-catch information are gathered under the new by-catch monitoring system.
- With regards to conducting an assessment of the species in Norway and Iceland, the Committee **recommended** waiting until the 2010 Norwegian abundance estimate. This time frame would ensure adequate time to gather reliable information on by-catch and age distribution of the catch in both areas and for Norway to develop multipliers for transforming minimum count
- to total abundance estimate.

7.6 Walrus

- There has been no progress with regards to advice on the effects of human disturbance on distribution, behaviour and conservation status in West Greenland. However, cameras have been deployed at haul-outs in Svalbard to investigate the influence of tourism, which could provide some answers.
- The old Greenlandic catch series for takes, up to 2006, have not been revised as recommended. New abundance estimates are available for 2006 for West Greenland and for 2006 and 2007 for South East Baffin Islands, and satellite tags were deployed in 2006 in Central West Greenland (CWG). A new survey is planned for the North Water area in 2009.
- New abundance estimates and historical sex ratio are available for the Svalbard area.
- Satellite tagging in CWG and individual recognition of hauled-out animals confirm the hypothesis of a common stock between Greenland and Canada.
- With regards to conducting an assessment of walruses and providing estimates of sustainable yields of the North Water and West Greenland stocks of walrus, the Committee **recommends** an assessment meeting for the West and North Greenland stock as soon as possible while an assessment for the East Greenland should await the results of the 2009 survey in East Greenland.

8. TRANS NORTH ATLANTIC SIGHTINGS SURVEY

8.1 Reports from meetings

Planning

The third planning meeting was held in St. Andrews, Scotland, 30 March - 1 April 2007. Agreement was reached upon a) the general strategy for coverage and the survey general design (boundaries, stratification, effort allocation), b) the survey protocols (survey mode & procedure) for the aerial surveys and the shipboard surveys (Iceland/Faroes, Greenland, T-NASS extension) as well as the rules for adapting these protocols if needed, c) the training required for cruise leaders and observers especially for shipboard surveys (new procedures for Iceland/Faroes), d) the task to be completed and the responsible actors, e) the necessity and means of contact and coordination during the survey (between the platforms and with the Secretariat), f) a strategy for dissemination of information.

Evaluation

- T-NASS coordination during planning provided many advantages over uncoordinated or less coordinated national surveys, and is expected to provide similar advantages in the analysis of large scale data.
- Such a large scale synoptic coverage provides a useful snapshot overview of the spatial distribution and abundance of species.
- Cooperation with CODA and SNESSA had been very positive.
- The WG concluded that coordination had been successful and had led to both the first trans-Atlantic survey and also the first complete synoptic coverage of the northern North Atlantic. It recommended continued cooperation in coordinating the output from the T-NASS project.

Working group on Abundance Estimate

- Preliminary analyses were presented and discussed for fin, minke and humpback whales. Preliminary results were reported for pilot whales and harbour porpoises, as well as some other non-target species and plans were made for analysis. Specific results would be considered under the relevant stock.
- A strategy for coordinated analysis and publication of the results with CODA and SNESSA was discussed. In particular it was agreed that the three surveys would publish as a priority a joint primary publication pertaining to the general distribution of all cetaceans species throughout the entire survey area, under the leadership of the T-NASS coordinator and the NAMMCO Secretariat.
- The need for a proper archival of T-NASS data, was underlined.

9. CETACEANS STOCKS - STATUS AND ADVICE TO THE COUNCIL

9.1 Fin whale

- **Stock delineation:** older and newer genetic analyses support the lack of genetic divergence for fin whales across the North Atlantic. The Committee urged rapid completion of the genetic analysis of the Faroese biopsy samples, said to be genetically different, with techniques compatible with those used on Icelandic samples.
- **Relatedness:** work is in progress with this newer more sensitive analysis method.
- **Estimates from T-NASS:** the 2007 figure of 20,644 (95% CI:15,053-26,540) from the Icelandic shipboard survey is not significantly different from that in 2001, however this figure was still preliminary and needed to be revised. The Greenlandic figure of 4,660 (95% CI: 1,890-11,500) was higher then the 2005 estimate. The Norwegian estimate will be available in the course of the year.
- **Russian Federation:** there has been an increase in the frequency of sightings in the Barents Sea in August-September.
- **Faroes:** a catch statistics database for the North Atlantic is under compilation and will be deposited at the NAMMCO Secretariat.
- **New requests and future work:** the Committee **recommended** that recent changes in distribution be taken into account in the design of new surveys. It **recommended** that the assessment of Northeast Atlantic stocks, including the central stock, be initiated as soon as the 2007 estimates are finalised and before the next SC meeting.

9.2 Humpback whale

- **Revised Greenlandic 2005 estimate:** this estimate was not presented in a NAMMCO forum and therefore not discussed.
- **New estimates from T-NASS:** the 2007 estimate was still considered preliminary.
- **Review of the advice on catch limit for West Greenland given in 2006:** although preliminary, the 2007 estimate was higher than the 2005 estimate,

and there is no immediate indication of a population decrease. The SC did not see any reason to reconsider the 2006 interim advice until a proper assessment is conducted.

- **New requests and future work:** with regard to an assessment of North Atlantic stocks, the Committee recommended that biopsies and photo-id data from all areas should be analyzed before such an assessment. The SC agreed that a joint assessment with the IWC was not helpful, and **recommended** as a first step, that the fin whale assessment group evaluates the data available.

9.3 Sei whale

- **New estimates from T-NASS:** a new estimate would present a large confidence interval due to the paucity of sightings. The Committee **recommended** that T-NASS sightings be pooled with CODA's for a joint analysis.
- **Update on research in NAMMCO countries:** the 2005 Greenlandic estimate was not formally accepted. The estimates from NASS gave a minimum figure.
- **New requests and future work:** with regards to a status in East and West Greenland waters, the SC **recommended** making all sei whale data available to the fin whale assessment group for evaluating the available information and providing a state of the art estimate.

9.4 Minke whale

- **Update on stock delineation and relatedness:** Norwegian and Icelandic genetic studies show very little genetic differences across the North Atlantic.
- **New estimates:**
  - Iceland from 2007: 10,680 (95% CI: 5,873-17,121) from the original blocks including all observers; 15,055 (95% CI: 6,357-27,278) including only experienced minke whale observers. The point estimate shows a decline of 24% since 2001. There is no evident reason for this decline. Natural mortality of such a scale was unlikely, and catches were too small to account for the decrease. The most likely explanation was ecological, with the whales being elsewhere at the time of the survey. There have been significant shifts in prey distribution around Iceland in recent years.
  - Norway: evidence of large annual changes in distribution in the period 1952-1980.
  - Comparison of SCANS surveys 1994 with 2005 also reveals significant changes in spatial distribution.
- **Update on progress:** the Icelandic research programme was completed in 2007 and samples are being analysed. Results are expected in 2010.
- **Future work:** the Committee **recommended** several analyses for a understanding the situation:
  - Sighting rate from T-NASS Extension surveys in the Norwegian Sea (not covered by a dedicated survey) should be calculated and compared with other T-NASS areas and previous estimates.

- A spatial analysis of both the historical and present surveys, including the Norwegian mosaic survey, should be undertaken, to identify parameters that could explain/predict spatial distribution.
- The analysis of remaining T-NASS minke data should be given priority: Greenlandic (both aerial and shipboard), Extension and Icelandic/Faroese shipboard.
- Potential changes in the ecosystem should be investigated within the framework of the WG on Marine Mammals and Fisheries Interaction.

9.5 Narwhal &
9.6 Beluga

- **Update on 4-year Greenlandic research programme and other progress:**
  - New survey results existed or were on their way for 2006 and 2007, incl. for the Melville Bay and Inglefield Bredning areas, but where not presented. The plan for the 2007 survey had not been reviewed by the SC or the T-NASS Planning Group, despite the request of the Commission to do so.
  - 10 narwhal were satellite tagged in 2007 in North and West Greenland.
  - An aerial survey was planned in summer 2008 in East Greenland.
  - Tagging of beluga was planned in West Greenland in 2009.
  - In the north Water area surveys for narwhal, beluga and walrus are planned for 2009.
  - A genetic study indicates clear separation between the Greenland and Svalbard belugas.
  - With regards to the assessment of narwhal and beluga, the SC considered that there were enough new data to warrant an update of the assessments and recommended a meeting of the Joint JCNB/NAMMCO WG before March 2009 to allow the use of the assessment in setting the new quota series.
- **Future work:**
  - An age determination workshop is needed and the Joint WG was asked to consider its organisation.
  - The SC recommended that the joint Norwegian-Russian genetics and satellite tracking study be funded.
  - The Greenlandic quotas for narwhal and beluga were reviewed. The Committee noted that these are still much above the levels it recommended of 100 belugas (2000 & 2001) and 135 narwhals (2003) for West Greenland and expresses continued concern about the quota level. At the same time the SC recognizes that new preliminary abundance estimates are higher than previous estimates. The Committee stresses the importance for Greenland to submit fully corrected estimates from 2006, 2007 and 2008 surveys to the next Joint WG meeting.

9.5 Bottlenose whale

- **Update on progress:** There has been little progress made, but some distribution data may come from T-NASS and CODA.

- **Future work:** The Committee **recommended** that Icelandic and Faroese data on feeding be published as soon as possible.

9.6 Killer whale

Although changes in distribution have been noted in several areas, and a few sightings made during T-NASS, data are still too sparse, especially in the West Greenland-Eastern Canada area, to warrant an assessment.

9.7 Pilot whales

- **New estimates from T-NASS and CODA:** data from both the shipboard and aerial surveys should be included in the analysis.
- **Monitoring programme for the Faroes:** a WG meeting was held prior to the SC meeting defining the main terms of the programme. A second WG meeting is scheduled to take place in July 2008 to define the details of the programme.
- **New requests and future work:**
  - Calculation of new abundance estimates from T-NASS and CODA data.
  - Presentation of all survey plans, assessment, data analyses and catch and biological studies should be routinely presented to the SC.
  - Establishment of a standing WG.

9.10 White-beaked, white-sided dolphins and bottlenose dolphin

- **Update on progress:** T-NASS and CODA may generate an abundance estimate for white beaked and white sided. However an assessment is not warranted for any of the species yet, due to the slow or absent progress in most areas.
- **Future work:**
  - T-NASS data should be analysed, incl. from Greenlandic aerial and Norwegian surveys .
  - Satellite tagging of white-sided dolphins is planned in the Faroes.
  - The Faroese programme on the biology of white-sided dolphins is in the analysis stage.

9.11 Harbour porpoise

Estimates from T-NASS:

- Iceland as well as Greenland to a lesser extent, have implemented modifications in their survey designs to accommodate this species, as requested by the Council. This will lead to the first reliable abundance of harbour porpoises in Icelandic coastal area.
- The Committee recommends that Iceland and Greenland coordinate the analysis of these data.

- **Future work:**
  - Satellite tagging and a dedicated survey is planned in the Faroes in the next years.
  - The Committee **recommended** that this survey be designed to be compatible with SCANS II and other harbour porpoise surveys.

- With regards to conducting an assessment, estimates of abundance and removals are still needed in all areas. T-NASS will generate an estimate for the coastal area around Iceland and maybe Greenland, but will not do so for other areas.

10. BY-CATCH OF MARINE MAMMALS

Update on monitoring progress

- **Iceland and Faroes:** no progress since the last meeting.
- **Norway:** a new monitoring system had been implemented in 2006. It is under evaluation and validation, especially the extrapolation of recorded to total by-catches.
- **Greenland:** no system for reporting by-catches is in place. They should be counted as catches, although this is not mandatory.

New requests and future work

- As a first step to handle by-catch issues, the SC **recommends** the organisation of a workshop to review the use, applicability and validity of by-catch monitoring systems, including the Norwegian monitoring system.
- The Committee **recommends** that Iceland proceeds in implementing a monitoring programme for its fleet.

11. PUBLICATIONS

- **NSP 6 – Grey seals:** published and distributed in 2007.
- **NSP 7 – NASS:** ready for publication later in 2008.
- **NSP 8 – Harbour seals:** about 30 papers are expected, with June 30, 2008, as deadline for submission. Publication is expected early 2009.
- **Other publications:** a unified publication of T-NASS results, together with CODA and SNESSA has been welcomed by the participants to the projects. IWC has already proposed its Journal. The SC **recommended** investigating the possibility of a joint Journal of Cetacean Research and Management-NAMMCO publication.

13. FUTURE WORK PLANS

13.1 Scientific Committee

The next meeting will be in the Faroes at a location to be decided. The dates will depend on those of the next Council meeting, late April – early May or fall 2009.

13.2 Working Group meetings planned

1. Monitoring of pilot whales – summer 2008
2. Abundance Estimates – before the Assessment of whales
3. Assessment of fin whale – before spring 2009 (before next SC meeting)
4. Assessment of minke whales – 2008-2009

5. Assessment of humpback/sei whales – the first step together with Assessment of fin whales
6. Marine Mammals and Fisheries Interactions – between October 2008 and March 2009
7. Beluga and narwhal – before March 2009
8. By-catch monitoring – first half of 2009
9. Walruses – 2008-2009.

14. ANY OTHER BUSINESS

14.5 Election of Officers

- The SC recommends a change of the Rules of Procedure to extend the terms of office to 3 yr, and recommended a standard 3-yr term of office as Chair and Vice-Chair.
- The SC meanwhile, re-elected Desportes as Chair and Lars Witting as Vice-Chair. Desportes agreed to continue in office for a full 3-yr term (or through the next SC meeting and subsequent Council meeting) before transferring over to the current Vice-Chair, Witting.

15. MEETING CLOSURE

15.1 Acceptance of report

A draft version of the Report, containing all items that were agreed upon, was accepted on 14 April 2008. The final version was accepted by correspondence on 1 June 2008.

15.2 Closing remarks

The Chair noted that many studies which were referred to during the meeting, were not tabled at the meeting, including papers which should be presented shortly after at the IWC SC. The Committee agreed that these documents be available as 'other publications'.

REPORT OF THE FIFTEENTH MEETING OF THE NAMMCO SCIENTIFIC COMMITTEE

1. CHAIRPERSON'S WELCOME AND OPENING REMARKS

Chairperson Desportes welcomed the members of the Scientific Committee (SC) to their 15th meeting (Section 5), held at the Arctic Station of the University of Copenhagen in Qeqertarsuaq, Greenland, 11-14 April 2008. She welcomed the Observers Zabavnikov and Kishiro from the Russian Federation and from Japan respectively, and expressed the Committee's regret that no Observer from Canada could be present at this meeting. She finally mentioned that Born (Greenland), Walløe (Norway) and Gunnlaugsson (Iceland) unfortunately would not take part in the meeting due to other engagements.

2. ADOPTION OF AGENDA

The Draft Agenda (Appendix 1) was adopted with minor changes. Points 15.2, 15.3 and 15.4 were added.

3. APPOINTMENT OF RAPPORTEUR

Acquarone, Scientific Secretary of NAMMCO was appointed as Rapporteur. The Delegates were requested to provide summaries of any paper or presentation discussed during this meeting.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

The list of available documents and reports is provided in Appendix 2.

4.1 National Progress Reports

National Progress Reports for 2006 and 2007 from the Faroes, Greenland, Iceland and Norway were presented to the Scientific Committee. In addition, the Committee was pleased to receive the progress reports from the Russian Federation and for the first time from Japan. The Scientific Committee welcomed these presentations from the representatives of Japan and the Russian Federation.

4.2 Working Group Reports

The four Working Group Reports available to the meeting were the following:

- T-NASS (2)
- Abundance Estimates
- Pilot whales

4.3 Other reports and documents

Several other reports and documents were presented to the meeting.

5. COOPERATION WITH OTHER ORGANISATIONS

5.1 IWC

The 59th meeting of the Scientific Committee (SC) of the International Whaling Commission was held in Anchorage, Alaska from 7-18 April 2007. Lockyer attended as observer for the NAMMCO Scientific Committee. It was noted with regret that no IWC observer is present at this meeting. Lockyer reported the following items that were considered of interest to NAMMCO.

The SC again considered mechanisms for the implementation of the RMP, which cannot be concluded until work on MSYR has been completed. There were a number of recommendations with respect to N. Atlantic fin whales to be considered at the First Intersessional Workshop (has since been held in April 2008 prior to the NAMMCO SC): regarding matching various photo-identification catalogues and holdings throughout the N.Atlantic and Mediterranean; making available catch series and genetic analyses; starting implementation procedures now that priority Bryde's whales have been completed. Regarding Central and Northeastern Atlantic minke whales, the implementation review might be completed in 2008 or 2009, and a steering group was set up to prepare for the review.

The SC reported on by-catch monitoring schemes required by the EU starting in 2006, although it was unclear if all national reports had been submitted. Such reports would be considered by the EU in late 2007 followed by an ICES review. The SC noted the CMS initiative - Strategic Implementation Plan 2006-2011 - aimed at reviewing impacts and threats through global commercial and artisanal fisheries on migratory species. The SC recommended close coordination between IWC and CMS.

Under Aboriginal Subsistence Whaling Management Procedure (AWMP), new information from the Greenland Research Programme came under scrutiny. The SC stated the importance of these research efforts in developing AWMP *Strike Limit Algorithms (SLAs)*. Regarding abundance and trends, the SC accepted the bias-corrected cue-counting abundance estimate for W. Greenland minke whales of 10,800 (.95 CI: 3,600-32,400) in 2005, which could be used for assessment purposes. The bias-corrected line-transect abundance estimate of W. Greenland fin whales of 3,200 (.95 CI: 1,400-7,200) was acceptable and considered well above MSYL and could be used for assessment. A new assessment for fin whales was available in 2007, and was accepted for providing interim management advice. The SC recommended assessments be made for W.Greenland minke whales at an intersessional workshop so that a final assessment could be accepted at the 2008 IWC meeting.

The SC strongly recommended that the IWC adopt the Aboriginal Subsistence Whaling Scheme (AWS) that covered a number of practical issues relating to survey intervals, carryover and guidelines for surveys. The SC welcomed further aerial and shipboard surveys to be undertaken off W.Greenland as part of T-NASS, and anticipated new abundance estimates in 2008.

The SC included a consideration of a request from Denmark for management advice on other large whales off W. Greenland, notably bowhead and humpback whales. However, it was unable to endorse any assessment on humpback whales although the

abundance estimate available was considered an under-estimate, and no management advice was provided at this time. As for bowhead whales, the SC recognised a single Eastern Canada – W. Greenland shared stock in the eastern Arctic, based largely on satellite tracking results in 2005 and 2006. It accepted an agreed estimate of abundance of 1,230 (.945 CI: 500-2,940) for over-wintering bowheads off W. Greenland. The SC urged that there be a new assessment of this species at the 2008 IWC meeting.

The SC noted the Norwegian report of bowhead sightings in the Fram Strait between Svalbard and Greenland, and recommended a continuation of surveys to increase knowledge of these animals.

With respect to environmental concerns, the SC reported an increased occurrence of the effects of harmful algal blooms (HABs) on cetaceans. The SC recommended the establishment of a Cetacean Emerging and Resurging Diseases (CERD) WG which should report to the 2008 meeting. The SC reviewed a report from the POLLUTION 2000+ project, which recommended a second phase. This was endorsed, and this second phase will address an integrated modelling framework for examining the effects of pollution in cetaceans, and develop a protocol for validating biopsy samples in pollution-related studies.

The SC considered and endorsed a plan for an Intersessional Workshop on Climate Change, and set up a steering group in preparation.

Although small cetaceans are not a subject for management advice in the IWC, the SC nevertheless undertook a worldwide review of killer whales in 2007. Sightings information (1970 - 2007) from the northeast Atlantic indicated a relatively even summer distribution across the north-eastern Atlantic. A range of estimates of abundance (4,413 - 26,774) were derived from NASS surveys in different years, and an abundance estimate of 606 (.95 CI: 460-800) was available from 2003 for coastal northern Norway, based on photo-identification. It was noted that genetic analyses on stock structure are currently underway in the UK and Norway. Finally, a new method for determining age (with accuracy $\pm$3.8yr) was reported, using specific fatty acid profiles in outer blubber of killer whales. This method may well be useful in examining age in other species where age methods are as yet uncertain.

The SC noted annual takes of 15 – 34 killer whales between 2005 and 2006 off W. Greenland. In addition, annual takes of harbour porpoises (2,568 in 2005) and long-finned pilot whales (91 in 2005) raised concerns about sustainability off W. Greenland, and the SC recommended formal assessments for these species and stocks.

Progress on the Icelandic Research Programme for minke whales was reviewed under Scientific Permits.

In summary, SC priorities for 2008 include implementation procedures for N.Atlantic Fin and minke whales, and work under the AWMP for development of *SLAs* for Greenlandic whales.

5.2 ASCOBANS

There was no official observer either at the 14th or the 15th meeting (just held in April 2008). Ongoing conservation of harbour porpoises in the Baltic and the North seas, where up to 50% strandings were catch related. There is presently no harmonized reporting system. ASCOBANS is considering to come under the umbrella of ICES for by-catch reporting. The use of "pingers" to mitigate by-catch has become mandatory in the EU in certain fisheries. Trials of different type of nets to make them visible to porpoises were reported with mixed success. A draft guideline for use in reporting fisheries effort in relation to by-catch was drafted by ASCOBANS. Pollution, underwater sounds and disturbance were reported upon, and incidents of collision with high speed ferries. Work is ongoing into problems with cetacean hearing pathologies and fatalities related to military operations and munitions. Concern was expressed over controls on oil production pipeline construction as in the Russian pipeline in the Baltic. It was noted however that OSPAR already has guidelines for construction of these structures. A westward extension of the Agreement area to the west of Biscay and to the western side of the UK in the North Atlantic was in the process of ratification in 2007. The Secretariat will endeavour to find out if this has since been fully ratified[1].

5.3 ICES and NAFO

Haug reported the activities of ICES in 2007. The ICES Working Group on Marine Mammal Ecology (WGMME) met 27-30 March 2007 in Vilm, Germany, to review any new information on population sizes, by-catches and mitigation measures for fisheries that have a significant impact on small cetaceans and other marine mammals. Additionally, so far as it was possible, the working group summarized the planned observations to meet requirements of EU Regulation 812/2004 (implementation of onboard monitoring schemes and observers to monitor and estimate the scale of by-catch of marine mammals in certain fisheries) by ICES area member state for 2007. The working group also reviewed and reported on the preliminary results of the SCAN II project, for which new surveys were carried out in 2005. In addition to contribute to the development of survey methodology, the project provided the first comprehensive estimates of abundance of small cetaceans in the whole west European Atlantic continental shelf region. Also, SCANS II is relevant with respect to the development of a framework for management of by-catches. Furthermore, WGMME summarized the current status of the planning of a workshop on marine mammal health - the workshop is intended to be held in Liége, Belgium, in 2008. Finally, WGMME assessed information on how changes in hydrodynamics and sea temperature affect changes in the distribution, population abundance and condition of marine mammals, the main conclusion being that pagophilic species such as polar bears and ice breeding seals will be the most likely species to be impacted by an increase in sea temperature.

The 2007 ICES Annual Science Conference (ASC) was held in Helsinki, Finland, 17-21 September 2007. Several ICES committees (e.g., Living Resource Committee and Marine Habitat Committee) deals with marine mammal issues. Thus, both present and

[1] This has now been ratified.

future theme sessions at the ASC are designed with marine mammals included as an integral part. Relevant sessions at the 2007 ASC were:

- Theme session D ("Comparative marine ecosystem structure and function: Descriptors and characteristics"): The variable role of important marine mammal species was assessed in several presentations aimed to give integrated characterizations and comparisons of different ecosystems of the northern hemisphere.
- In theme session I ("Effects of hazardous substances on ecosystem health in coastal and brackish-water ecosystems: Present research, monitoring strategies, and future requirements"), results were presented from impact studies of white whales (beluga) and harbour seals.
- Theme session L addressed the issue "Stock identification – applications for aquaculture and fisheries management". Work was presented that addressed questions related to minke whale and grey seal stock structure using genetic (DNA) analyses.
- Both theme sessions O ("Flying outside the ICES assessment WG paradigm – alternative approaches to providing fisheries management advice") and R ("The ecosystem approach: What's the impact on marine science, science-based advice, and management of marine ecosystems") included presentations relevant to the management of marine mammals.

Upcoming theme sessions, relevant to marine mammal issues, intended for the ASC, 22-26 September 2008 in Halifax, Canada, include, but may not be restricted to: "Role of sea ice in polar ecosystems", "Comparative dynamics of populations in the Baltic Sea and Gulf of St. Lawrence ecosystems" and "New methodology for tracking fish, mammal and sea bird behaviour and migrations".

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

Witting reported that there have been no meetings of the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB) in 2006 and 2007. Presently no meetings are planned. Chairpersons of the NAMMCO/JCNB Joint Working group are Rod Hobbs for NAMMCO and Steve Ferguson for JCNB.

6. ROLE OF MARINE MAMMALS IN THE MARINE ECOSYSTEM

6.1 Update on the upcoming Dartmouth conference (September/October 2008)

Haug informed the Committee about the symposium on "The Role of Marine Mammals in the Ecosystem in the 21st Century" which will take place in Dartmouth, Canada, 29 September – 1 October 2008. This symposium will revisit the issues that formed the base for the 1995 symposium by the same name and chart progress in this field. Furthermore he mentioned that the ICES Annual Science Conference which will take place in Halifax, Canada, immediately before the above mentioned symposium,

noting that the session "The role of sea ice in polar ecosystems" could have particular interest for the Delegates (see 5.3).
Stenson (NAFO) and Haug (ICES) act as co-conveners while Hammill, Hammond, Thompson are the members of the Scientific Steering Committee. Víkingsson was appointed as special NAMMCO liaison officer.

There will be four conference sessions:

1) "Biological and environmental factors affecting life history traits" with key note speaker Mark Hindell (University of Tasmania, Tasmania, Australia)
2) "Foraging strategies and energetic requirements" key note speaker Dan Costa (University of California Santa Cruz, California, USA)
3) "Theoretical considerations on apex predators and multi-species models" key note speakers Andrew Trites (University of British Columbia, British Columbia, Canada)
4) "Marine Mammals and Fisheries interactions" key note speaker John Harwood (University of St. Andrews, Scotland, United Kingdom).

The proceedings of the symposium will be published in the NAFO publication "Journal of North West Atlantic Fisheries Sciences". Funding from NAMMCO amounts to 20,000 NOK, which will be transferred to NAFO for reception and speaker costs. Víkingsson agreed to report about this symposium to the next SC meeting. The Chair recommended to the scientist from NAMMCO countries to submit their work to this event.

6.2 Update on progress on modelling

Lockyer referred to the report by Gunnar Stefansson as NAMMCO observer to the workshop on Ecosystem Approach to Fisheries (EAF) coordinated by FAO and held 2-6 July 2007 in Tivoli, Italy. The purpose of this workshop was to define "best practice" standards for developing, testing and applying ecosystem models in relation to an EAF. A direct benefit of an EAF relies on the possibility of addressing issues, which were impossible to be dealt with using a single-species approach.

Participants in the workshop included modelling experts from all continents, with expertise in a variety of modelling approaches applied to ecosystems in all major regions of the world.

The overall goal of an EAF as defined by Garcia *et al* (2003):

> "…. strives to balance diverse societal objectives, by taking account of the knowledge and uncertainties of biotic, abiotic and human components of ecosystems and their interactions and applying an integrated approach to fisheries within ecologically meaningful boundaries",

has led to a growing awareness and recognition of the need for fisheries management to consider the broader impact of fisheries on the ecosystem as a whole and the impact of the ecosystem, and other users of the ecosystem, on fisheries. The recognition of broader economic and social interests under an EAF implies that the setting of management objectives will need a broader consideration of ecological values and constraints than is currently the case. This will require a broader stakeholder base, increased participation and improved linkages of fisheries management with coastal/ocean planning and integrated costal zone management activities. It follows that there is an immediate need to take a look at current models and modelling frameworks and see how these fit into an EAF. The term "ecosystem models" has traditionally been used quite broadly and these can potentially range from simple analyses of species interactions (regressions) through minimally realistic models describing a few species to models which describe tens of interacting species, multiple fleets and anthropogenic effects such as pollutants.

The work of Plaganyi (2007) which extensively reviewed existing multispecies and ecosystem modelling work formed a good basis for the workshop. One conclusion from that paper was that the Gadget framework is promising for Minimally Realistic Models (MRM), i.e. models that attempt to capture the essence of species interactions of interest without becoming overwhelmingly large or all encompassing. On the other hand, it was noted that larger ecosystem models such as EwE or Atlantis are good candidates for understanding structure, exploratory analyses and have potential as an operating model (OM) for an MSE evaluation (Fulton *et al.* 2005). It is, however, quite clear that these all-encompassing models cannot be evaluated using the MSE approach because they include too many parameters which have to be assumed and are at present far too unwieldy to be evaluated as a part of a large simulation exercise.

The currently considered models/approaches vary widely and it follows that standards need to be set so that management can rely on best practice having been followed when models are going to be used in an EAF. The workshop defined a large number of issues or model attributes and specified which protocols should be applied during model development, starting from a conceptual model up through evaluating and testing the model. It was also considered best practice to include a variety of error assumptions in these evaluations. Many of these issues need to be addressed before any computer programmes are written or formulae are put on paper. NAMMCO should carefully consider these definitions of best practice to evaluate which can reasonably be implemented in ecosystem model work planned by NAMMCO.

6.3 Working Group on Marine Mammal-Fisheries Interactions

Desportes reported that Walløe, who is chairman of this WG, had shortly corresponded with the Secretariat before the meeting. He had been to a meeting in Japan in connection with IWC work and that he noticed that Japanese scientists are using ECOPATH for modelling. He commented that the new developments in Japan and Norway justified the revival of the Working Group on Ecosystem Approach and he suggested holding a meeting in the early part of the next year or back to back with the SC meeting. Walløe is willing to chair the meeting if the SC so wishes.

Víkingsson reported on the Icelandic plan to hire a modelling specialist to work on their energetics and ecosystem data. He mentioned that regrettably progress is very slow not only because of delays in the headhunting process, but also because of delays in gathering the necessary data. The time frame for employment of the expert ideally aims at hiring a modeller before a Working Group meeting which could take place in the early spring 2009.

The Committee recommends the revival of the Working Group, as there are sufficient new developments in the field to justify such an action. In light of the new survey results, the SC recommends that the WG to expand its terms of reference to include all areas under NAMMCO jurisdiction and investigate dynamic changes in spatial distribution due to ecosystem changes and functional responses (ref. to T-NASS item). Gunnar Stefansson would be a good contributor to this meeting as well as Japanese ecosystem modellers.

6.4 Icelandic programme on the feeding ecology of minke whales

Iceland presented some preliminary results to the NAMMCO Council meeting in 2006. Since then, new material has become available from the sampling undertaken in 2006 and 2007. From a study based on limited sampling during 1977-1997 the diet consisted mainly of krill, sand-eel and capelin. Preliminary findings from the present study show much less proportions of krill and capelin and more sand-eel and large bony fishes (cod and other gadoids). On a rough scale (% frequency as dominant species), about one quarter of the diet is composed of large bony fishes, mainly cod and haddock. This is much more than the model presented to the ICES, which assumes that cod represents 3% of the diet. It seems that the diet used in the original model developed by Stefansson (2003) has changed significantly. While sand-eel is still a major component of the diet, its importance decreased over the study period. This is in accordance with other studies showing a decrease in sand-eel abundance in Icelandic waters and decrease in breeding success of seabirds typically feeding on sand-eels in recent years. Results from this research are expected to be presented to the next SC meeting as well as at the next meeting of the Working Group on Marine Mammal Fishery Interactions and the ICES/NAFO/NAMMCO symposium (see 6.1 and 6.3).

6.5 New request and future work

Regarding the new request of reviewing the results of the Icelandic programme on the feeding ecology of minke whales and multi-species modelling as soon as these become available, the Committee recommended a revival of the Working Group on Marine Mammals and Fisheries Interactions (see 6.3). Besides reviewing progress on multi-species modelling, this group would review the Icelandic Programme on feeding ecology of minke whales. The Committee recommended that this group hold a meeting before March 2009 and after the Dartmouth Symposium.

6.6 Other matters

Both Norway and Russia have expressed concerns over the current size of the Northeast Atlantic harp seal populations and their predation on fish stocks, in particular in the Barents Sea. To be able to assess the ecological role of harp seals by estimation of the relative contribution of various prey items to their total food

consumption, a Joint Norwegian-Russian Research Programme on Harp Seal Ecology has been initiated. The focus of this programme will be to:

- assess the spatial distribution of harp seals throughout the year (experiments with satellite-based tags)
- assess and quantify overlap between harp seals and potential prey organisms (ecosystem surveys)
- identify relative composition of harp seal diets in areas and periods of particular intensive feeding (seal diet studies in selected areas)
- secure the availability of data necessary for abundance estimation
- estimate the total consumption by harp seals in the Barents Sea (modelling)
- implement harp seal predation in assessment models for other relevant resources (modelling).

The programme was adopted by the Joint Norwegian-Russian Fisheries Commission and supported by the NAMMCO SC in 2006. However, although both ecosystem surveys and abundance estimation of harp seals are in progress, the core activities of the programme have not yet been properly started, the reason being that Russian authorities refused to permit deployment of satellite tags on harp seals in the White Sea in May, both in 2007 and 2008.

To ensure that tagging will take place in 2009, Norway and Russia have agreed to organize a research cruise in late May / early June in 2009, to deploy satellite tags on harp seals on ice in the Hopen area southeast of Spitsbergen. The cruise will be part of the joint harp seal programme, involving both Norwegian and Russian scientists. However, tagging seals in the White Sea is still the most preferable approach, as it ensures that only seals from the White Sea stock are tagged, and because tagging of different sex and age groups can easily be balanced. Therefore, the Russian part will apply for permission to tag seals in the White Sea also in 2009. The Norwegian part will provide all necessary technical information about the tags and the operation, if necessary modifying the equipment used. It is the Federal Technical Committee (FTC) that has forbidden all satellite tagging in Russian waters.

The NAMMCO SC strongly regrets the decision made by the Russian FTC and **recommends** that Russia permits Norwegian and Russian scientists to conduct this important tagging experiment with harp seals in the White and Barents seas according to the original plans.

7. SEALS AND WALRUSES STOCKS - STATUS AND ADVICE TO THE COUNCIL

7.1 Harp seals and 7.2 Hooded seals

7.1.1 and 7.2.1 Update on progress

The 2007 aerial surveys in the Greenland Sea

Harp seal pup production was assessed in the Greenland Sea in 2002 (Haug *et al*. 2006), hooded seals in 2005 (Salberg *et al*. 2008). Preferably, abundance estimates of hunted seal stocks should be obtained no less than every 5 years, and surveys and

associated data that are more than 8 years old are too old to be considered recent. Therefore, the plan was to conduct new surveys to obtain data necessary for estimation of the abundance of harp seals of the Greenland Sea stock in 2007. However, the low pup production estimate obtained for hooded seals in the area in the 2005 survey caused so serious concerns that ICES and NAMMCO had advised Norway to stop the hooded seal catch from 2007 on, and recommended that a new hooded seal survey be carried out already in 2007. Besides revisiting all areas historically used by hooded seals for breeding purposes in the Greenland Sea, new areas to the north and south of these areas were covered with reconnaissance flights during the survey. In addition to the abundance estimation using aerial surveys, also a number of animals of various ages were killed for scientific biological sampling to obtain updated information on reproductive rates and health status of hooded seals.

If possible, a secondary goal was also to obtain a new abundance estimate for harp seals in the area during the same survey. Evidently, given the available logistical resources and the priority of hooded seals, obtaining a harp seal pup production estimate would require that harp seal breeding occurred within the same main areas as the hooded seal breeding. During the survey, it proved possible to obtain data on the pup production of both harp and hooded seals in the Greenland Sea in 2007.

The aerial surveys were performed in the period 14 March to 3 April 2007 (Haug *et al*. 2007). Two fixed-wing twin-engine aircrafts, stationed in Constable Pynt (East-Greenland), Akureyri (Iceland), and the Jan Mayen island, were used for reconnaissance flights and photographic surveys along transects over the whelping areas. A helicopter, operated from the applied expedition vessel (M/V "Nordsyssel") also flew reconnaissance flights, and was subsequently used for other purposes, such as monitoring the distribution of seal patches and age-staging of the pups.

The reconnaissance surveys were flown by the helicopter (14 – 24 March) and the fixed-wing aircrafts (21 March – 3 April) in an area along the eastern ice edge between 66° 55'and 75° 30'N. Obviously, the ice cover was narrow and the edge close to the Greenland coast in 2007, and all surveyed areas were overlaying the continental shelf (300 - 400 m depth). The reconnaissance surveys were adapted to the actual ice configuration, usually flown at altitudes ranging from 160 - 300 m. Repeated systematic east-west transects spacing 10 nm (sometimes 5 nm apart) were flown from the eastern ice edge and usually 20-30 nautical miles (sometimes longer) over the drift ice to the west. The reconnaissance surveys detected no apparent hooded seal whelping concentrations, only scattered hooded seal families and, subsequently, solitary bluebacks over a relatively large area ranging from 72º 00'N and 73º 51'N. Scattered harp seal whelping was observed in the same area, whereas a more concentrated harp seal whelping patch was observed to the east of the scattered hooded seals between 73º 00'N and 73º 40'N.

One aircraft was equipped with a Leica RC 30 camera with a motion compensation mechanism shooting AGFA Pan 400 black-and-white film. The second aircraft was fitted with a Vexcel Ultra Cam D digital camera, which provided multi-channel images (Red Green Blue Infrared).

On 27 March, a total of 19 photo transects, spacing 5 nautical miles, were flown using both aircrafts in the area between 72º 00'N / 18º 35' - 16º 49' W and 73º 30'N / 15º 40' - 13º W. The survey covered the entire area of scattered whelping hooded seals, including also scattered whelping harp seals in the northern parts of the covered area. The survey was conducted with low-density photographic effort where two photos were shot per 1 nm along each line, resulting in a total of 1,136 photos.

On 29 March, the area between 73º 03'N / 15º 42' - 14º 42' W and 73º 33'N / 15º 20' - 13º 50' W was covered using both aircrafts simultaneously in a high-density coverage of the concentrated patch of whelping harp seals. A total of 16 photo transects, spacing 2 nm, were flown with cameras operated to ensure about 80-90 % coverage of the area along each transect line, resulting in a total of 1987 photos shot.

A second, smaller harp seal whelping concentration was covered in another high-density coverage on 3 April in the area between 71º 22'N / 17º 40' - 18º W and 71º 30'N / 17º 27' - 17º 46' W. Five photo transects, spacing 2 nm, were run with 80-90 % coverage of the area along each transect line, resulting in a total of 264 photos shot.

Only very few whelping hooded and harp seals were observed outside the surveyed whelping areas. The results from the aerial surveys will be used to estimate the 2007 hooded and harp seal pup production in the West Ice. Subsequently, the status of the stocks will be assessed by fitting population models to the pup production estimates.

In previous hooded seal surveys, the surveyed areas have traditionally consisted of two strata types: (1) whelping concentrations where both visual and photographic surveys were conducted with high-density coverage, and (2) scattered pups outside the whelping concentrations, which were covered with low-density photographic surveys only. In 2005, Greenland Sea survey hooded seal whelping occurred in three well-defined concentrations, but it was not possible to run an additional low-density coverage survey of scattered pups outside these whelping concentrations. Owing to this, the total estimate presented is slightly negatively biased. In 2007, all pupping of hooded seals occurred scattered with no major patches of concentrated breeding. This will increase the uncertainty in the estimate obtained – it remains to see how the new estimate compares with the 2005 estimate.

Reconnaissance of possible new harp and hooded seal breeding patches in the Greenland Sea

In southwest Greenland in April 2007, a concentration of at least 1,000 white coat harp seal pups arrived with the drift ice from East Greenland. These seals must have been born close to the tip of Greenland. This is the first time such an event has been observed.

A reduction in extent and concentration of drift ice has occurred in the Greenland Sea between Greenland and the Jan Mayen Island. These changes must have resulted in substantial changes in breeding habitat for the Greenland Sea populations of harp and hooded seals. Could these changes in ice-conditions have triggered behavioural changes of such a magnitude as a relocation of breeding for at least parts of the

populations? Recent low pup production in hooded seals, and new (2007) discoveries of breeding harp seals in areas outside those used historically by the species could both be indicative of such changes. The NAMMCO SC recommends that this is examined further by using aerial surveys to investigate whether a southward relocation of breeding has occurred for parts of the harp and hooded seal populations in the Greenland Sea. If new breeding patches are observed, this will have considerable implications for future research, management and hunting activities in the area.

Abundance estimation of harp seals of the Barents Sea / White Sea population

In a historical assessment of the Barents Sea / White Sea population of harp seals, Skaug *et al*. (2007) suggested that this population might have numbered as much as 6 million animals in 1875. The estimate was obtained by fitting a population dynamics model to all available (up to 2003) sources of data, but because of a lack of information about several key parameters in the model, the uncertainty associated with the estimate is large. A sensitivity study involving three different mechanisms for density-dependence results in a range estimate of 3-7 million seals in 1875.

Russian aeroplane surveys of White Sea harp seal pups were conducted in March 2004 and 2005 using traditional strip transect methodology and multiple sensors. The results obtained may indicate a reduction in pup production as compared with the results obtained in similar surveys in 1998-2003. Surveys flown with helicopters in March 2006 and fixed-wing aircraft in March 2007 apparently confirm the possible reductions in pup production. Severe reductions in both period and extension of ice cover in the White Sea in recent years may have contributed to the possible reductions in pup production in the area. Zabavnikov informed that new aerial surveys had been conducted in the area in 2008 to investigate whether this possible reduction in pup production still prevailed. In addition, any possible relocation of breeding were assessed by reconnaissance flights to areas both in the White Sea and in the south-eastern Barents Sea (e.g., around the Kolgujev island, in the Pechora Sea). No breeding was observed outside the White Sea, and the ice conditions in the White Sea seemed somewhat more favourable for harp seal breeding in 2008 than in 2004-2007. Aerial photographs taken of the breeding patches in the White Sea are now being analysed. Incidentally, walruses with pups were observed during the surveys in the Pechora Sea. The first results of harp seal White Sea – Barents Sea pup productions from aerial surveys for 2008 will be presented in the joint ICES-NAFO WG in August 2008 in Tromsø.

Monitoring of biological parameters in harp and hooded seals

Selected life history parameters are used in models designed to convert pup production into population size. Data used to estimate these parameters must be updated at regular time intervals (5-8 years) for all exploited populations. In the Greenland Sea in 2008, hooded seal biological samples to assess life history parameters will be obtained from seals sampled for scientific purposes in a dedicated research cruise in June/July, if possible also from local Greenland hunters. Sampling from harp seals will be collected from the commercial Norwegian hunt in the Greenland Sea. Russian scientists will collect material from the Russian hunt on one vessel operating in the White Sea and during coastal research activities (using land-based inflatable boats) on the Murman

coast. Norwegian and Russian scientists will coordinate both sampling and subsequent analyses of the collected material.

7.1.2 Future work

In 2005, the Council requested an evaluation on how a projected decrease in the total population of Northwest Atlantic harp seals might affect the population of animals summering in Greenland. The Committee responded that:

- The abundance of Northwest Atlantic harp seals may be stabilizing after a period of rapid increase (2004 survey).
- The numbers summering off West Greenland would also be expected to stabilize.
- However, the proportion of animals migrating to Greenland may not be constant and may change in response to environmental conditions.
- The age structure of the population will change as it stabilizes, and this may also affect the numbers summering in Greenland.
- Detailed information on harp seal migratory patterns are required to assess this.

The Committee recommended in 2005 that:

- ICES-NAFO Working Group be asked to address this request and recommended that Greenland forward this request to ICES.
- If that was not possible, to organize a special working group, with active participation by Canada, to address this issue.

The Committee reiterates its recommendation that the ICES-NAFO Working Group be asked to address this request, as a first step. The Committee urges Greenland to forward this request to the ICES-NAFO Working Group on Hooded and Harp seals as soon as possible, so this matter could be dealt with at the next meeting in late August 2008.

The Committee recommends flying reconnaissance surveys (e.g. south of 67°N in East Greenland) to investigate the possible presence of whelping patches in "non-traditional" areas, to continue the sampling for biological parameters, and the characterization of stock identity.

7.2 Hooded seals

Lydersen reported on the International Polar Year programme "Marine Mammals Exploring the Oceans Pole to Pole (MEOP)". In this programme, animals that exhibit spectacular movements and diving behaviour are equipped with oceanographic data recording satellite tags (Sea Mammal Research Unit -SMRU tags) with the intention of gathering physical data on zones of difficult access at a minimal cost. Within this framework, in the July 2007 three hooded seals captured on the ice after moulting were equipped with such tags and released. These animals performed extensive travel across the whole North Atlantic relaying excellent oceanographic data on temperature and salinity. With the intention to repeat and improve the previous year's success a new attempt was made in March 2008. On this occasion, 17 tags were set out in only

four days' work. These tags are expected to have a more limited operational life than the previous ones as they will be shed during moulting. However, the instrumented bluebacks are expected to carry the instruments for 16 months after attachment. Preliminary information indicates that the animals tagged in 2008 follow the same movement patterns as those instrumented in 2007.

Seven adult hooded seals were also tagged off southeast Greenland in 2007. Like previously tagged adult hooded seals, these seals went to feeding grounds in Davis Strait/Baffin Bay and from there down to the whelping ground off the Labrador/Newfoundland coast where they are at present (April 2008).

7.2.1 Update on progress

See above.

7.2.2 Review of SC recommendation from 2006

The Committee recommended in 2006 that catches in the Greenland Sea be restricted to necessary scientific catches and to satisfy local needs at roughly current levels. This should be accompanied by a monitoring programme. This recommendation was to be revisited after the results from the 2007 survey became available. These results were not yet available, and it was noted, however, that no whelping concentrations were detected but only scattered whelping. This latter would increase the uncertainty of the pup production estimate. The question of possible alternative whelping patches (see under 7.1.2) was also crucial.

7.2.2 New Requests and future work

Council requested that the SC investigate possible reasons for the apparent decline of Greenland Sea stock of hooded seals and assess the status of the stock on the basis of the results from the planned survey in 2007. This request has already been forwarded to the ICES-NAFO WG, which meets in Tromsø in August 2008.

7.3 Ringed seal

7.3.1 Update on progress

Very little is known about this species. Lydersen presented some progress made on behaviour.

Tryland et al (2006), reported that the GPS positions of ringed seals shot by hunters have been related to sex and body size. It appears that older male seals have a larger and better territory and access to a higher number of females.

Studies on ringed seal tagging and genetics in Alaska showed that this species exhibits a high site fidelity and that both sexes return to the same area on consecutive years (unpublished interim project report by Brendan Kelly, 2008 – Lydersen pers.comm.).

The separation though is not universal as demonstrated by a study on animals from Svalbard (Freitas *et al,* 2008) where some individuals are stationary, by the glacier front throughout the year while others migrate to and from the area according to the

season. This behaviour could indicate a reaction to the reduction in habitat due to climatic changes that forces the surplus seals to perform seasonal migrations.

The spatial distribution of various age- and sex groups of ringed seals (N = 94; 19 adult males, 33 adult females and 42 sub-adults) was studied in their fast-ice breeding habitat in Kongsfjorden, Svalbard, during May 2004 by Krafft *et al* (2007). Adult females occupied the inner, most stable ice area, while sub-adults were found predominantly in the outer parts of the fast-ice where the ice conditions are more unstable. Adult males were scattered across these two areas; some were intermingled with breeding females while others were found further out towards the ice edge in areas mainly dominated by sub-adults. This pattern suggests territorial behaviour with competitive exclusion of the sub-adults and adult males that cannot compete for territories in the prime breeding areas. The size of adult males was correlated with their testosterone levels, but it was not necessarily the largest males that had the most adult female neighbours. The adult males that had the most adult female neighbours were however significantly older than the adult males with fewer female neighbours (18 ± 1 vs 12 ± 1 years). This suggests that experience (age) likely plays a strong role in achieving reproductive success for male ringed seals. A male:female sex ratio of 1:2.4 was found in the prime breeding area, which suggests a slightly polygynous mating system.

Freitas *et al* (2008) noted that intra-specific and intra-population variation in movement tactics have been observed in many species, sometimes in association with alternative foraging techniques or large-scale habitat selection. However, whether animals adjust their small-scale habitat selection according to their large-scale tactics has rarely been studied. This study identified two large-scale movement tactics in ringed seals (*Phoca hispida*) during their non-breeding, post-moulting period. First-passage times (FPT) were used to explore these large-scale patterns. Subsequently, habitat selection was quantified by modelling the FPTs as a function of habitat attributes using Cox proportional hazards models. Some seals moved far offshore into areas preferentially containing 40-80% ice coverage, while other individuals spread along the coasts of Svalbard concentrating their time near glacier fronts. Both tactics resulted in ringed seals being in highly productive areas where they had access to ice-platforms to rest. When offshore, habitat selection was influenced mainly by sea ice concentration and season. Late in the season (autumn), increased risk of leaving an area was identified, even when ice conditions were still favourable, reflecting their need to return to over-wintering/breeding areas before the fjords of the archipelago freeze. For ringed seals that remained inshore, habitat use intensities were influenced mainly by the distance to glacier fronts and season. These animals were already close to their over-wintering habitat and hence their risk of leaving an area decreased as winter approached. This study of ringed seals habitat selection reveals how they fulfil their biological requirements in this dynamic, heterogeneous habitat. Individuals within the same population employed two distinct large-scale movement tactics, adjusting their decisions for small-scale habitat selection accordingly. This flexibility in ringed seal spatial ecology during summer and fall is expected to result in increased population viability in this high arctic environment.

7.3.2 Future work

A new kind of tag attached to the hind flippers has given promising results in Alaska, and will in the future make it easier to study movements of this seal species.

The Committee reiterates its recommendation for initiating studies on ringed seals on sea ice in offshore areas, and for addressing importance of pack-ice breeding, especially in the present context of climatic changes and subsequent changes in ice condition and cover.

7.4 Grey seal

7.4.1 Update on the Norwegian 2006 and 2007 surveys and effect of harvest levels

Grey seal abundance estimates along the Norwegian coast were obtained in 1996-1998 and in 2001-2003 (Nilssen and Haug 2007). Haug reported that a new estimate, based on field work carried out in 2006-2008, will be available by the end of this year. Norway and Russia has agreed that the Russian grey seal breeding colonies at the Murman Coast should be covered during the same period. Zabavnikov informed the NAMMCO SC that this would be done, presumably using helicopter, in November-December 2008. Zabavnikov further reported that the last Russian survey was carried out in 1994. This species is not hunted in Russia and apparently there is no by-catch.

A major genetic study covering all North Atlantic areas, has been initiated by Norway. Haug presented SC/15/21 that reported some preliminary results from analyses of mitochondrial control region sequences. No overlap was found in haplotype distributions between samples from the three main distribution areas in Canada, the Northeast Atlantic, and the Baltic Sea. Within the Northeast Atlantic, analyses of molecular variance (AMOVA) identified 5 main subdivisions consisting of 1) Iceland, 2) Scotland and southern Norway, 3) Central Norway, 4) Northern Norway, and 5) North-eastern Norway and Russia. Based on exact tests of haplotype frequency distributions, all sampling localities were significantly differentiated from one another. The latter results are consistent with data on dispersal distance derived from conventional tagging experiments in Norway and suggest that two or more demographically independent units are likely to be present within the current Norwegian grey seal management units.

Quotas in previous years have been set to 25% of the population estimate. The removals have however, been at the scientifically recommended level (5% of abundance). A management plan for coastal seals in Norway is in progress and is due for completion this autumn. At that time it will probably be submitted for endorsement to the NAMMCO Scientific Committee.

The SC reiterates its recommendation on the quota level in Norway, estimated non-sustainable, but commended that the management plan was on its way and **recommended** that it should be presented to NAMMCO for evaluation.

7.4.2 Update on the Faroese satellite tagging programme and catch levels

Mikkelsen explained that knowledge of breeding of these seals in the Faroes is absent. There are very few catches and mostly as defensive measures in relation to fish farms. Effort is being planned to locate breeding areas, which in the Faroes are situated in caves. Four satellite tags have been deployed on juvenile seals in June 2007 and one of the tags transmitted until February 2008. In 2008 six tags are planned to be deployed preferably on adult females.

The SC commended the effort made by the Faroes to obtain better information on the population of grey seals (by means of satellite tagging) but reiterates its recommendation that immediate effort be made to obtain better information on the nature and impact on the take in the Faroes, and to obtain information on breeding sites.

7.4.3. Update on other progress

There is no new information available about Icelandic grey seals. The last survey on grey seals was in 2005, and a new survey is planned in 2008. Routine age monitoring of 112 grey seals (and one harbour seal) was performed in 2006. The management advice provided is similar to the previous years as there are no indications of change in the population.

The Committee recommends Iceland to provide new data on age composition of the catch.

7.4.4 Future work

Zabavnikov mentioned that the Russian Federation has plans to initiate aerial survey activities for grey seals.

The SC considered that it was timely to hold a Working Group meeting on grey seals in 2009. By that time there will be new Icelandic and Norwegian abundance estimates. This will coincide with the endorsement of the Norwegian management plan.

7.5 Harbour seal

7.5.1 Update on progress

7.5.1.1 Greenland: update on the recommended research programme

There are advanced plans to monitor both size and distribution of the population in South Greenland. The cameras necessary for monitoring the haul-outs were not ready by September 2007 but will be installed in June 2008 when there will also be an aerial survey for haul-out sites conducted.

Interestingly, even if it was thought that harbour seals had left central Greenland, a small population has been found upstream in some rivers that flow from the inland ice by Maniitsoq. This phenomenon will be further investigated in future years.

The area on the far south of Greenland interests oil companies. The Greenland Institute of Natural Resources (GINR) and the Danish National Environmental Research Institute (NERI) have submitted common proposals for baseline investigations in the area.

Most of the reported Greenlandic catches of harbour seal during 1993-2005 included reporting errors, with statistics reporting catches of up to 700-800 per year. After a new, improved reporting system was put in place, the catches have been stable at a more realistic level under 100 per year.

The SC complimented Greenland for having started the implementation of the Research Programme recommended by the SC in 2006 in such timely manner. However, the SC **reiterates** its conclusion on the need for enforcement of a total ban on hunting for this species.

7.5.1.2 Icelandic historical catch series and by-catch monitoring programme

Ólafsdóttir reported that a survey in 2006 estimated the population at 12,000 individuals. This level seems to match the figure from the 2003 survey. In the later years Icelandic catches have declined, but insufficient information on by-catch is available. This prevents an estimate of total removals and therefore the design of an adequate management plan. The advice provided to the Icelandic government by the Institute of Marine Research (IMR) is to implement a management plan for this species.

The Committee reiterates its recommendation for a formal assessment of the stock and the establishment of clear management objectives. It also renews its recommendation from the last meeting about collecting information on the by-catch.

7.5.1.3 Norwegian by-catch monitoring

Haug communicated that there are no new abundance estimates for Norwegian harbour seals yet available. The last population estimate dates back to the period 2003-2006. By-catch which will be discussed later, will be included in the reported takes in the new management plan which is under development.

He also pointed out that the data from surveys are minimum counts. Correction factors are under development by means of ground truthing studies. These are running side-by-side with habitat use studies involving the use of GSM transmitters.

Genetic relationships in this species are investigated based on samples gathered from Greenland (21), Iceland (34) northern Norway (59) and Svalbard (60). Preliminary results clearly define 4 separate populations and indicate that Greenland and Svalbard seals are more closely related to each other than to Northern Norway or Iceland. This characterization reflects possible migration routes from Iceland and Svalbard to Greenland.

The Norwegian Polar Institute has received support from the Norwegian Research Council to perform harbour seal aerial surveys in Svalbard, satellite tracking and investigations of predation on harbour seals by Greenland Shark.

7.5.2 New request and future work

The Scientific Committee was requested to provide a formal assessment of the status of harbour seals around Norway and Iceland as soon as feasible.

In Iceland, new abundance estimates are available, but there is still insufficient information on by-catch.

Norway implemented a system for assessment of the two coastal seal species that secures updated information about abundance approximately every 5 yr. This system has provided two abundance estimates after 1996. As a third point estimate is needed for an assessment for harbour seals another survey is needed and will probably be performed by 2010.

The Committee considers that an assessment of the species should await until a third abundance estimate is available from Norway and until new, reliable by-catch data, new information on multipliers (ground truthing), and the distribution of catch areas are secured. It is reasonable to imagine that the Norwegian management plan will be ready by 2010. A similar timeframe will also be required for Iceland to develop its own programme. The SC recommends that both countries ensure better information on by-catch and on the proportion of direct catch and by-catch and their age composition and that an assessment be conducted in 2010.

7.6 Walrus

The Scientific Committee was asked to provide advice on the effects of human disturbance, including fishing and shipping activities, in particular scallop fishing, on the distribution, behaviour and conservation status of walrus in West Greenland. There has been no progress made on this issue.

7.6.1 Update on results from the 2006 (by GINR and NERI) and 2007 surveys

A new abundance estimate for West Greenland walrus was obtained in 2006. The results were not presented at the meeting but gave an estimate, corrected for potentially submerged animals during the survey, of 3,085 animals (90% CI: 1,239-7,681). Minimum counts of walruses hauled out on South East Baffin Island, were made during the same period and resulted in at least 775 animals. A correction for animals potentially at sea during the counts increases this estimate to at least 2,600 walruses for South East Baffin Island.

Satellite transmitters were attached to walruses in Central West Greenland in March 2006. They transmitted for more than a month during which two animals moved towards the coast of South East Baffin Island. Another one moved from Store Hellefiskebanke to the bank west of Disko Island. The others remained in the area where they had been tagged. In August 2007 during ground surveys in South East Baffin Island an animal was observed at a haul out with a satellite transmitter that had been deployed in Central West Greenland. These data confirm the hypothesis of a common stock of walrus between Greenland and Canada.

Aerial surveys are planned for 2009 in the North Water area.

The surveys planned for 2007 and 2008 in Greenland have been cancelled. In 2009, aerial survey are planned in East Greenland and the North Water area, as well as satellite tagging in the North Water area.

7.6.2 Update on the Greenlandic catch series

No progress has been made on the old catch series, which accounts for takes up to 2006. The Committee **reiterates its recommendation** that this be done, since it is required for a reliable assessment. A new, friendlier system for reporting catches similar to the one in force for narwhals and polar bears is effective since 2006-2007.

7.6.3 Update on the 4-year Greenlandic research programme

Information is given under 7.6.1

7.6.4 New request and future work

The Council requested the Scientific Committee to provide a formal assessment of the Davis Strait stock as soon as finalization of the catch series is complete and the results from the planned 2007 survey are available.

The Scientific Committee is then requested to provide estimates of sustainable yields of the North Water and West Greenland stocks of walrus. Considering the new data upcoming from the work conducted in 2006-2008, and the plan for 2009, the Committee recommends using this new information as input to a Working Group for the assessment of walrus. An assessment meeting for the West and North Greenland stocks should be held as soon as possible in 2008. A similar meeting for the East Greenland stock should subsequently be held. The Committee **reiterates**, however, the need for updating/revising the old catch series (see under 7.6.2).

Russia:
Zabavnikov informed about the intention of the Russian Federation to carry out walrus aerial surveys close to the Gasprom exploitation area by Dolgy Island. Multi-spectral surveys are planned for 2008-2009.

Norway:
Lydersen communicated that the walrus surveys in Svalbard 2006 were accepted for publication in 2007. The numbers are 2,629 (95% CI: 2,318-2,998).

New information on the historical sex ratio, is reported in an article by Wiig *et al* (2007). Presently the Svalbard walrus population is composed almost exclusively of males while in the 19th century it comprised 70% males. Most females are now in the Franz Josef land area while the males are in Svalbard.

On Svalbard, three automatic cameras have been set up to investigate the influence of tourism at walrus haul-outs and in 2008 an additional two should be installed. This project is designed to provide data on trends, to indicate potential effects of disturbance. This study will contribute in answering the request from the Council on providing advice on the potential effects of human disturbance on walruses.

8. TRANS NORTH ATLANTIC SIGHTINGS SURVEY

8.1 Reports of the Working Group for T-NASS

Third T-NASS planning meeting: St. Andrews, March 30 – April 1, 2007 (see NAMMCO/17/5 Annex 1.1)

Canada, the Faroes, Greenland, Iceland, Norway and Russia participated, as well as representatives from the SCANSII/CODA project and the IWC. The full report of the meeting is included as Annex 1.1.

Chairperson Geneviève Desportes reminded participants of the unprecedented uniqueness, value and synoptic character of T-NASS. She reminded the delegates that they had agreed on a strong coordination. The list of agreements from the two previous meetings and a remainder of time constraints ahead followed.

A status of the project was made. The resources per area as well as the secured funding were presented by the different parties. The external funding obtained as well as other possible sources of funding were discussed.

Coordination with opportunistic surveys

The three surveys contacted had agreed to have T-NASS dedicated whale observers onboard. The German and the Russian vessels participating in the **Redfish survey** in the Irminger sea will each have two observers on board and had agreed to tow hydrophones if provided. NAMMCO would provide three of these observers and PINRO one. The two Norwegian vessels participating in the **Pelagic survey** in the Norwegian sea would also each have two observers that the IMR would provide. The **MAR-ECO vessel** could only house one whale observer, provided by NAMMCO, and would tow a hydrophone. All equipment and procedural guides would be provided by NAMMCO.

General strategy for coverage considering both dedicated and opportunistic surveys

The value of simple distribution data and the importance of maximizing coverage was generally agreed upon. The opportunistic surveys could likely not be included for a density estimate within IWC framework. In conclusion, it was agreed that all the important areas for which it was necessary to obtain a reliable population abundance estimate of target species had to be covered by a dedicated survey.

The Scans II shipboard methodologies, both acoustic and visual.

D. Gillespie and R. Swift made a "hands on" presentation of these with equipment demonstration.

Survey design

- The boundaries of the different survey areas were established, taking into account the wish of a continuous coverage between SNESSA, T-NASS and CODA and their different subcomponents, as well as available effort and species distribution.
- A stratification was agreed upon, based mainly on known species distribution.
- Effort was then allocated to the strata , based on expected density of target species.

- Transect design would be carried out at a later point by D. Pike using the distance software.

The Committee regretted that very little, if any, consideration was given to T-NASS in the Norwegian decision on survey area, with highest priority given to survey the Eastern Barents Sea and not to join with the other components of T-NASS.

It recommended that Norway's survey join up at 74°N with the Icelandic block up to the ice edge appropriately, and that the transit area from Kirkenes be included. The committee urged Norway to use as much effort as they have available for a direct and contiguous participation in the T-NASS effort.

Survey protocols (survey mode and procedures) for shipboard surveys

Survey protocols and procedures were agreed upon, based on the adoption of the BT methodology at the previous planning meeting for the Icelandic/Faroese surveys and a standard line transect methodology for the Greenlandic and opportunistic surveys. This was done for the different component of the shipboard surveys.

1) Dedicated Icelandic and Faroese vessels with double platforms, tracking with big eyes and 7x50 binoculars, and eight observers, two primaries, two trackers a duplicate identifier and a data recorder working at the same time.
2) Dedicated Greenlandic survey with a single platform and 4 observers, 3 working at the same time.
3) Opportunistic surveys with a single platform and two observers (one for the MAR-ECO survey), working at the same time.

SMRU would be contracted to prepare the equipment for the BT method on the Icelandic and Faroese vessels, since the equipment would be similar to that they were preparing for the CODA shipboard surveys. It was agreed that CODA and T-NASS would have common survey forms (sightings, effort, etc.).

The equipment for the Greenlandic survey would be prepared by Greenland while the equipment for the opportunistic survey would be prepared by NAMMCO.

Rules for adaptation (i.e. changing the design underway) were adopted. It was agreed that training time on land and at sea has to be taken into consideration in the allocation of effort, as it takes time to get used to the new technology and distance estimation. It was agreed that at least 2 in-harbour days be used for training on equipment setup and use, and at least one sea day must be allocated to training in effort conditions and that training would continue further until satisfactory results be obtained.

It was agreed that transects should be based on the realizable effort plus a general bonus of circa 20% (Iceland and Faroes), where there was no other indication by the local coordinators. A parsimonious design will be used especially in the northern blocks assuming equal coverage in order to allow for flexibility to adapt the track design. This will allow the Icelanders to define the final survey tracks as late as possible in order to integrate the best and latest ice information available. If an area is missed by one vessel, another may step in to cover the tracks missed. In general how the "whale survey" time in the Redfish survey will be used must be defined on site.

Survey protocols for aerial surveys

Survey protocols and procedures were agreed upon, for the different component of the aerial surveys.

1) protocol for dedicated surveys with multiple observers, 1 leader and 1 platform (Canada and SNESSA) and multi-species nature: line transect as used in past surveys.
2) Review of protocol for dedicated surveys with 4 observers and 2 independent platforms (Iceland and Greenland – September survey): cue counting for fin and minke whales, with blow being the cue for fin whales and dive the cue for minke whales. In practice, the data collected will be in a manner to allow either cue counting or line transect analyses as appropriate. Flying at 600 feet was recommended if harbour porpoise was a target species.

Acoustic survey

It was unclear at the time of the meeting whether there would be funding for this survey, so there was no discussion on this point. It was agreed that protocol would follow the protocol adopted by SCANS II and CODA.

Contact and coordination during the main survey

It was agreed that contact and coordination would be established during the survey between the dedicated vessels. This was necessary to ensure internal coordination and solve technical problems, if any. Coordination was also necessary between the Canadian planes.

Desportes, supported by Donovan, will be the general advisor for protocol or design change for the shipboard survey and Donovan for the aerial survey.

Coordination with IPY-ESSAR

International Polar Year - Ecosystem Studies of Sub-arctic. and Arctic Regions (IPY-ESSAR) contact person Ken Drinkwater has and will continue receiving all information circulating internally in TNASS. There was no further information on other activities in IPY-ESSAR.

Strategy for dissemination to the wider public and press

The NAMMCO Secretariat has been appointed by the NAMMCO Council to be in charge of creating a website for T-NASS (creating site, producing text, maintaining and updating the site), as a subsection of the NAMMCO web site. The update of the site should be performed at least at the beginning and at the end of the survey and at completion of the analysis. There should be links to the IWC, Canada and Russia, USA, as well as to CODA. Multilingual Press Releases should be made available both at beginning and end of the survey.

Tasks to be completed

A list was established and agreed upon.

Data validation and analysis

It was agreed that having good rules for the validation and quality insurance of the data was as important as good analysis. It was agreed to define in the near future common data validation criteria (e.g. using e-mail) and suggested to start by examining the CODA protocol as an example. It was common understanding that a uniform analysis strategy was paramount for maintaining the synoptic character of TNASS.

It was agreed that it was important to define uniform data validation criteria and that it should be emphasized to the cruise leaders that they should check the quality of the data as frequently as possible. Data should comply with IWC data availability policy if TNASS (NAMMCO) data have to be accepted for use by the IWC for the implementation of a Revised Management Procedure (RMP). An *ad hoc* Data Group was established to look into these questions, composed of Desportes, Hammond, Donovan, Gunnlaugsson, Mikkelsen, Øien, Lawson, Simon and the NAMMCO Secretariat.

The Committee took note of the report presented by Desportes, but did not discuss it further, since this now belonged to the past.

First T-NASS Debriefing meetings: telephone meetings, November 12-13, 2007 (see NAMMCO/17/5 Annex 1.2)

A shipboard surveys debriefing telephone meeting was planned for November 12, 2007. Similarly, an aerial surveys debriefing meeting was planned for the following day.

On the dates of the meetings, only two of the planned seven shipboard survey reports and one of the five aerial survey reports had been delivered by the participants. These reports were to form the basis for the meeting.

Chairperson Genevieve Desportes expressed her strong disappointment and reminded participants that T-NASS was a coordinated action under the auspices of NAMMCO. The debriefing documents were not only instrumental for the meetings, but also an archive of information essential for analysis and for the preparation of future surveys, and needed both to continue updating the T-NASS website and to provide feedback to the Council and to the IPY umbrella project: ESSAR.

Lacking these basic documents, the Chair decided to only deal with the point in the agenda dealing with the status and planning of the analysis for the shipboard surveys data and to cancel the aerial surveys debriefing meeting. The delegates promised they would deliver cruise reports to the Secretariat by the end of November 2007. The need for a debriefing meeting was to be assessed once all the reports were made available.

Analysis status and planning

Iceland, Greenland and Norway reported their intention to give highest priority to the production of new abundance estimates for common minke whales (all countries) and fin whales (Iceland and Norway) to be presented at the T-NASS First Analysis

Meeting, at the NAMMCO Scientific Committee Meeting in April 2008 and at the IWC Scientific Committee meeting in June 2008. The figures would be used within the IWC Revised Management Procedure (RMP) and, in the case of minke whales, they will be included into the IWC Implementation Review. The Faroe Islands expressed their intention to give highest priority to the production of abundance estimates for pilot whales. In most cases, standard line transect analysis would first be used for the analysis of shipboard data, as in previous NASS surveys. BT analysis would later be considered if data warranted it. Greenland reported they would analyse the minke whale shipboard data, but had only few sightings for other species and it was unlikely they would produce estimates for these.

Working papers for consideration at the IWC SC meeting in Chile (May 2008) had to be submitted by the end of February 2008. The Chair noted that the deadline fell before the planned NAMMCO T-NASS meeting (April 2008) and that this implied that T-NASS data would be submitted to the IWC before being submitted to and reviewed within a NAMMCO forum.

Iceland took responsibility for the production of estimates from both minke and fin whale using Icelandic and Faroese data, while the Faroes would take the lead for Pilot Whale data analysis (incl. T-NASS main and extension).

D.Gillespie (SMRU) had accepted to check the quality and quantity of the T-NASS Acoustic data through random screening to better assess the need and possibility for detailed analysis. The delegates agreed to send a copy of both the acoustics and sightings database to D.Gillespie within the nearest future.

Cooperation with CODA

An exchange of cruise reports between CODA and T-NASS had been agreed through email. Also according to the agreement, CODA has sent their Cruise Reports to NAMMCO as well as the minutes of the CODA debriefing meeting. It was noted that CODA expected to receive the T-NASS Cruise Reports and the minutes of the T-NASS debriefing meetings in the nearest future.

The Chair noted that CODA had reiterated their interest in continuing cooperation with T-NASS, especially for the spatial analysis component.

Press release and input to the web site

The Secretariat reminded the delegates that for the production of a press release, for input to the NAMMCO-based T-NASS web site, and for the preparation of a poster to be submitted to the ECS annual conference in March 2008, they should provide:

1) The data of the total planned and realised effort (which was missing for Greenland)
2) General maps of the realised effort (which was missing for Greenland, the two Norwegian vessels and two of the Icelandic vessels)
3) Maps of the sightings for at least one species (preferably fin whale).

In case the Delegates have problems in producing the maps themselves, they had the option to send the Logger Database to the Secretariat with a deadline by the end of the week (16 November 2007).

Second T-NASS Debriefing Meeting: Copenhagen, April 7, 2008 (see NAMMCO/17/5 Annex 1.3)

Chairperson Genevieve Desportes noted that T-NASS had successfully achieved a trans-Atlantic coverage (Figure 1) and pointed out that the aim of this last meeting was to carry out a general evaluation and make recommendations for future similar surveys.

The effort planned and accomplished by the different vessels and planes was summarised (Table 1) and illustrated in Figure 1 (see below). The sightings were summarised in Table 2 (see below).

Shipboard evaluation

CODA

The survey area included offshore waters of the European Fishing Zone west of the UK, Ireland, France and Spain. Shipboard surveys were carried out during July 2007. Double platform methodolology was used and passive acoustic data were also collected. The visual procedure was similar to the procedure implemented during SCANS II. Some technical problems were encountered with the equipment, although not major ones. One of the platforms happened to be totally inadequate for a tracking procedure.

In July, five ships covered 10,000 km of transects in an area of 967,538 km^2. Sightings amounted to just over 1,500 encounters of seventeen species.

SNESSA

The shipboard survey was concentrated in the coastal waters in the Gulf of Maine. Primary objectives for the shipboard survey were to:

1) determine the spatial distribution and abundance of cetaceans, sea turtles, and seabirds in the study region,
2) use passive acoustics to record vocalizing cetaceans, and
3) conduct oceanographic sampling (e.g., CTD and bongo casts) to help define the habitat throughout the survey region about three times a day.

Two teams visually surveyed for cetaceans and sea turtles using the Buckland-Turnock (BT) procedure.

Compared to CODA/T-NASS BT procedure, SNESSA implemented a setup without communication between the two platforms and thus necessitating simpler equipment. The procedure performed very well, with no technical problems.

About 2,970 km of track lines were surveyed, of which *ca* 80% in Beaufort Sea State less than or equal to 3. The two cetacean teams identified 14 species/species groups of

cetaceans, and no turtle species, with *ca* 900 uniquely identified groups. Despite technical problems and loss of equipment, the passive acoustic high-frequency system operated for 785 km and the mid-frequency system operated for about 2,400 km. In addition there were 42 stations where bongo nets and CTDs were deployed to collect plankton and temperature/salinity data.

T-NASS Norway

The two Norwegian dedicated vessels followed the double platform procedure established in 1995 and the survey went smoothly, although the weather prevented coverage of more than 56% of the planned trackline.

T-NASS Greenland

The vessel used a standard single platform procedure. There were no major technical problems, but the prevalent bad weather (either fog or wind), combined with the time restriction due to the vessel itself (necessity to make water, assistance to vessel) resulted in a poor coverage of most of the block, with the small northeastern block and the southern block not covered at all.

There were however, severe technical problems with the acoustic equipment, and sounds were recorded for only part of the survey.

T-NASS Faroes-Iceland

The four vessels had difficulty implementing the BT methodology decided upon (double platform) with the CODA/T-NASS procedure because of technical problems encountered with the equipment provided, which did not perform as expected. The audio systems and the system for communicating between platforms, which is essential for implementing this procedure, in particular was deficient on all vessels. On some vessels, there were also problems with the video and webcam systems. Tracking with the "big-eyes" provided was considered impossible on three of the vessels, either because the optic was not good enough or because the platform was not stable enough.

The training in the new method which was planned before departure at the beginning of the survey, both for the cruise leaders and the observers, could not be implemented. This was either because the equipment arrived too late (on the day of departure for the vessel departing from Reykjavík) or because of the problems encountered with the vessels as such (two of the three vessels departing from the Faroe Islands had to be replaced) and the fact that the platforms were not ready in due time. This was particularly unfortunate when dealing with a new, quite demanding methodology. Some of the observers had difficulty adjusting to such a different and technical method.

Bad weather prevailed most of July combined with extensive ice coverage. This, together with the delay in departure for two of the vessels and the fact that the original effort had been planned too optimistically for some of the vessels, resulted in a low coverage of some of the blocks, with the northernmost block not covered at all and poor coverage near the east coast of Greenland.

The four vessels were pooling hydrophones for collecting cetacean sounds, in particular sperm whale. This module was successful, except for one vessel where the mid-frequency sound card was malfunctioning.

T-NASS shipboard general

A general review showed that the preparation for the cruise was less than adequate in some areas. The problems identified include in particular the choice of the vessels and the problems with the survey equipment (delivered late and not adequate), which resulted in difficulties in implementing the methodology planned. A list of recommendations was provided to avoid recurrence of these problems in future surveys and enhance their preparation and realization.

The problems noted should not detract from the fact that the T-NASS ship survey was generally successful in achieving its objectives. Cetacean surveys have become increasingly technical, so that the time needed for a thorough preparation has consequently increased. These facts need to be acknowledged and kept in mind for future surveys.

The BT method was still considered the best method available for cases where perception and availability biases were expected and responsive movement was a possibility. The need to use BT as opposed to simpler methods, such as a single platform survey, is to a large degree dependent on the target species and the biases that might be expected. For fin whales preliminary estimates of *g(0)* have been close to 1 and responsive movement is not expected. Thus a single platform mode would be adequate for this species and more efficient in terms of use of observers. For other species such as minke and pilot whales, *g(0)* may be low and responsive movement is expected. Therefore a BT type mode is required if absolute abundance estimates are desired for these species.

More problems were encountered in implementing BT in T-NASS than in SCANS II and CODA, primarily due to equipment problems and also to insufficient training and experience. The problems of implementing the method could be overcome in future surveys through improvements in equipment and better observer training. SNESSA had a good success in implementing the BT methodology with an alternative and less technically complex procedure. This alternative should certainly be investigated for future surveys.

Aerial evaluation

Preparations for the aerial surveys were generally considered to have been adequate in all cases. Minor modifications were made to the Canadian transect design because of logistical considerations. While minor equipment problems were encountered by all teams, the only serious one was the non-functional SST software in the early part of the Icelandic survey, however this did not detract from whale observations.

The survey platforms were adequate in most respects. The use of the large Arcturus

aircraft by Canada was unfortunately cancelled. It was considered that this platform was promising for covering large offshore areas and it was recommended that its use should be further investigated.

Lightweight immersion suits (pilot suits) were worn for the first time by observers on Icelandic craft and these were found to be comfortable and convenient. It is undeniable that they could save lives in some situations. In addition one of the observers had received underwater escape training and shared this experience with the crew. These safety measures were also implemented in SCANS II, and it is recommended they be used in future aerial surveys.

The data collection procedures in Iceland and Greenland were similar, but differed from those used in Canada and during SNESSA. The procedure used by Canada does not provide a way to estimate availability bias, which could be an issue, if and when absolute abundance estimates are desired.

Most of the observers employed in the aerial surveys had previous experience, and all received what was felt to be adequate ground and flight training. The value of monitoring the observers closely during the survey and providing feedback to them on a regular basis was again underlined.

Suggestions for improvement/enhancement of future aerial surveys, in particular in Iceland, were given. One of these was to investigate the possibility of using high definition video as a secondary un-manned platform. Generally the aerial portion of T-NASS was considered successful and relatively unproblematic compared to the ship based survey.

Special modifications for harbour porpoises

Such modifications were mainly implemented in the Icelandic aerial survey. They included the use of an experienced harbour porpoise observer, a change in altitude from 750 to 600 ft, and the implementation of special strata in some of the fjord systems. The use of an experienced harbour porpoise observer in the Icelandic survey was considered a success in that the number of harbour porpoise sightings increased dramatically compared to earlier surveys. The modifications implemented were thought to be satisfactorily and accepted by the group. They will lead to the first reliable harbour porpoise abundance in the Icelandic coastal area.

T-NASS extension evaluation

Three Extension survey efforts covered areas adjacent and to the south of the main T-NASS survey area in 2007:

a) Charlie Gibbs Fracture Zone on the North Atlantic Ridge north of the Azores – MAR-ECO, one observer;
b) Denmark Strait and the Irminger Sea - ICES Redfish survey, Russia and Germany, two observers on each, but the German trip was cancelled;

c) Norwegian Sea - pelagic Norwegian/Russian ecosystem survey, two observers on each (also covered by the Russian Redfish vessel on its way to the Irminger Sea).

The T-NASS Extension was considered a worthwhile addition to the main survey because it provided information on distribution and relative abundance for areas outside the main survey area. The usefulness of the data for deriving estimates of abundance is doubtful. The effort is generally well distributed in areas that could be designated as strata with relatively balanced coverage (except for the MAR-ECO data). However sightings are few except for minke and sperm whales and likely insufficient to be analyzed separately from the main survey data, and the data must be examined in more detail to see if this is feasible. Recommendations were provided to improve the effectiveness of such "opportunistic platform" surveys.

T-NASS acoustic evaluation

Although technical problems were encountered on some of the vessels, the acoustic system was generally easy to use and not a heavy burden on the responsible observers. If the data prove to be of value, there will be no objections to continuing to have an acoustic programme in future surveys. An evaluation of the potential of these data is currently being carried out at the SMRU and a decision on further analyses will be made when this process is completed.

General evaluation

General T-NASS coordination

The WG concluded that the T-NASS coordination provided many advantages over uncoordinated or less coordinated national surveys. The joint survey planning and commonality of methodology allows the combination of the resultant estimates from the coordinated survey, whereas this may not be possible if the surveys were not coordinated.

Mosaic surveys offer many practical advantages in that they can be conducted annually, possibly using the same vessels and observers over long periods, and can be built into annual budgets. On the other hand, the estimates from a mosaic survey apply over several years and must contain additional variance to account for annual variation and long term changes within survey blocks. This additional variance can be great if there are variations in distribution on an annual basis.

The choice between mosaic and synoptic surveys depends mostly on the intended use of the estimates. In a long-term harvest control system for a single species where estimates must be produced for a specific area on a set time schedule, mosaic surveys may be a viable alternative. However, this is not the case for all participants in T-NASS. For some participants it was more important to obtain a snapshot of distribution and abundance of several species, and for this purpose, a synoptic coverage offers advantages. In addition, temporal changes in distribution by comparison to past surveys (as was the case in T-NASS compared with earlier surveys) can more readily be determined with synoptic surveys.

It was also noted that a synoptic, multi-national survey covering a very large area tended to be more attractive to funding agencies: this was especially the case for the Canadian survey.

The Working Group concluded that the coordination of surveys under the T-NASS banner had been successful and productive. There was a feeling that national interests had dominated in most cases when planning decisions had to be made and implemented; this is understandable since most of the funding came from national research institutes. Nevertheless, a coordinated survey requires some degree of commitment to the survey as a whole.

In this regard, it was agreed that further cooperation in coordinating the output from the T-NASS project was of great importance. It was recommended that a primary publication on the planning, conduct and results of the T-NASS, particularly pertaining to general distribution of cetaceans throughout the entire survey area, including the extension areas, be produced as a priority. CODA and SNESSA agreed to participate in this. In addition products for a more general audience should be developed.

Feedback after the survey and input to website

Response to requests from the Secretariat or coordinator on update during and after the surveys was not always satisfactory, which proved very frustrating and led to difficulties in updating the website during the survey, in delays in reporting to authorities and in the presentation of results. Furthermore, accounting could not be updated to reflect actual expenditures.

It was strongly recommended to improve this area in future surveys, especially because funding agencies are interested in seeing the results of their support made public in a timely way.

The NAMMCO Secretariat will continue to maintain a section of the website devoted to T-NASS. It was agreed that, as a starting point, distribution maps for all important species, including sightings from the main T-NASS and extension areas, as well as the CODA and SNESSA surveys, should be developed and posted as a priority. All parties agreed to provide the data to Acquarone in a timely manner.

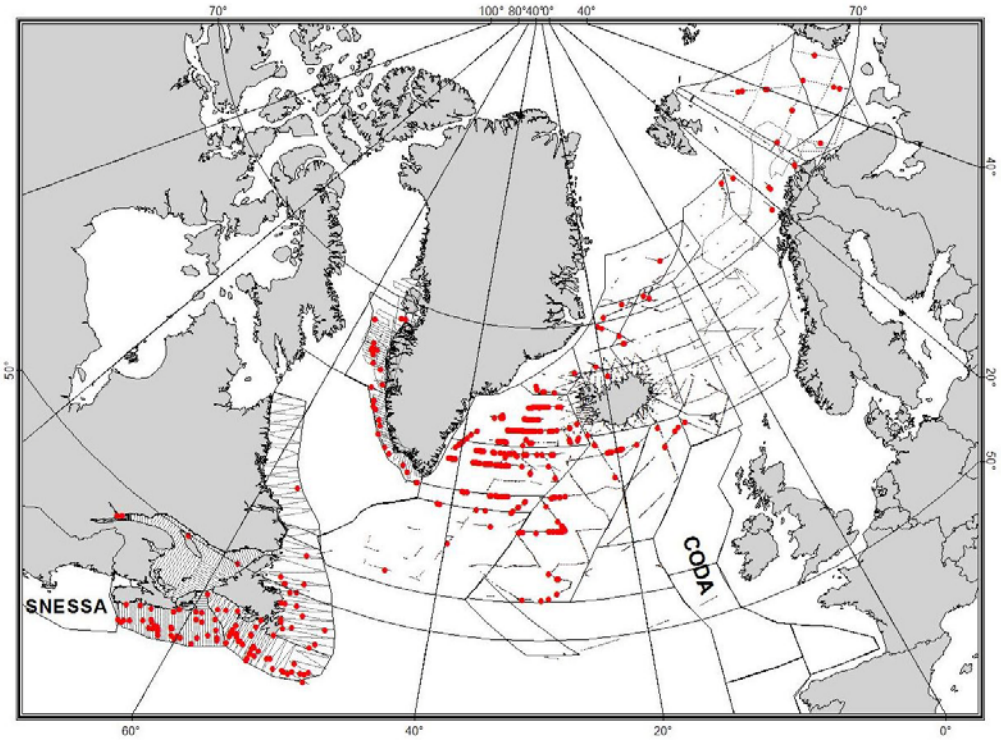

Fig. 1. T-NASS total effort and fin whale sightings.

Cooperation between T-NASS, CODA and SNESSA

The cooperation between T-NASS, CODA and SNESSA has been positive from the beginning. The provision of survey reports from both associated surveys to the NAMMCO meeting was acknowledged and appreciated. It was also agreed that sightings data would be shared for the production of general interest publications.

SURVEYS	platforms	Survey blocks		Trackline, nm			Surveyed area*
		planned	realised	planned	on effort	%	nm^2
Main	**12**	**Northern North Atlantic**		**69,928**	**57,781**	**83**	**1,474,530**
Extension	**5**				**5,253**		

SHIPBOARD

SURVEYS	Vessels	Survey blocks		Trackline, nm			Surveyed area*
		planned	realised	planned	on effort	%	nm^2
ICELAND Redfish/T-NASS	AF II	Irminger sea IF-RED	IF-RED	3,700	2,027	55	246,363
ICELAND	Venus	North Iceland IF-N-N, IF-N-S, IF-N-W	IF-N-S, IF-N-W	3,021	891	29	117,344
ICELAND	Jákup B	South centre Iceland IF-SC, IF-SC-Ext	IF-SC	2,711	2,500	92	119,116
FAROES	Thor Chaser	East-Southeast Iceland IF-E, IF-SE-S, IF-SE-N	IF-E, IF-SE-N, IF-SE-S	2,761	1,520	55	128,740
GREENLAND	Tulugaq	West Greenland GN, GC, GS, GD	GN, GC, GD	2,129	814	38	57,771
NORWAY	Ulvos & Havsel	Barents Sea east of 28E	Eastern Barents Sea	4,008	2,230	56	264,939
TOTAL	**7**			**18,330**	**9,982**	**54**	**934,273**

AERIAL

SURVEYS	Planes	Survey blocks		Trackline NM			Surveyed area*
		planned	realised	planned	on effort	%	nm^2
ICELAND	Partenavia	Iceland coastal shelf (9 blocks)	Iceland coastal shelf (9 blocks)	6447	5080	79	85,546
CANADA	Twin Otter	Newfoundland and Labrador (4 blocks)	Newfoundland and Labrador (4 blocks)	27,205	26,063	96	214,555
CANADA	Cesna Skymaster 337	St. Lawrence Gulf (4 blocks)	St. Lawrence Gulf (4 blocks)	6643	6,643	100	68,523
CANADA	Cesna Skymaster 337	Scotian Shelf (3 blocks)	Scotian Shelf (3 blocks)	4935	4,919	100	52,344
GREENLAND	Twin Otter	West Greenlandic shelf (? blocks)	West Greenlandic shelf (? blocks)	6368	5,094	80	119,289
TOTAL	**5**			**51,598**	**47,799**	**93**	**540,257**

SHIPBOARD EXTENSION

SURVEYS	Vessels	Survey blocks	Trackline NM			Surveyed area**
			vessel track	whale survey effort	%	nm^2
Pre - ICES Redfish, RU	Smólensk	Barents & Norwegian Sea	3,710	198	0	38,600
ICES Redfish, D	Walther Herwig III	Irminger sea	cancelled			0
ICES Redfish, RU	Smólensk	Irminger sea	8,600	755	0	90,000
Post - ICES Redfish, RU	Smólensk	Labrador, Norwegian & Barents Seas.	19,010	540	0	198,600
Norwegian Pelagic, NO	Eros	Norwegian Sea	NA	1,152		NA
Norwegian Pelagic, NO	Libas	Norwegian Sea	NA	1,568		NA
MAR-ECO, UK	James Cook	Mid Atlantic ridge	NA	1,040		NA
TOTAL	**5**			**5,253**		

*tentative value, subject to changes at analysis
** area corresponding to the vessel effort, not the whale survey effort

Table 1. Planned and Realized Effort. T-NASS.

2007 // On Effort Sightings	T-NASS SHIPBOARD						T-NASS AERIAL					T-NASS Extension						T-NASS TOTAL	CODA TOTAL	SNESSA TOTAL	SNESSA	
	Irminger Sea	South Centre Iceland	North Iceland	East - Southeast Iceland	West Greenland	Eastern Barents Sea	Iceland coastal	N. Foundland Labrador	St Lawrence Gulf + Cap breton	Scotian Shelf	West Greenland	Mid atlantic Ridge	Irminger Sea	Norwegian Sea	Norwegian Sea	Norwegian Sea	Barents Sea					
Species	Iceland, AFII	Iceland, Jakup B	Iceland, Venus	Faroes, Thor Chaser	Greenland, Tulugaq	Norway, Ulvos & Havsel	Iceland	Canada	Canada	Canada	Greenland	MarEco / J.Cook	Redfish / Smólensk	NO Pelag / Eros	NO Pelag / Libas	Pre&Post RedFish / Smólensk	Pre&Post RedFish / Smólensk				Shipboard	Aerial
Bowhead whale											1							**1**				
Blue whale	1	4	8					4	6	5			4					**32**	**1**			
Fin whale	235	69	20	3	2	15	7	73	4	44	25		10	3	6			**516**	**346**	**58**	43	15
Sei whale	13			1	1			1		2	5		7	2				**32**	**18**	**6**	4	2
Sei / Humpback														1				**1**				
Fin / Sei																			**10**	**26**	22	4
Fin / Humpback																						
Common minke whale	5		19	9	35	88	70	53	24	86	27			8	13	5	2	**444**	**23**	**75**	62	13
MW or BW					1													**1**				
Humpback whale	10	1	66	4	8	11	58	144	32	51	21		1		3	1		**411**		**251**	214	37
Right whale																				**44**	38	6
Sperm whale	28	27	4	7			4	11		11		9		10	17			**128**	**65**	**8**	2	6
Pygmy spermwhale										1								**1**				
Narwhal											2							**2**				
Beluga								5	203									**208**				
Northern bottlenose whale	2	9	2	13	2		1	10		3		1	4	2	1			**50**	**3**	**1**		1
Sowerby's beaked whale		1										1						**2**	**7**	**1**	1	
Cuvier's beaked whale										1								**1**	**15**			
Unid. beaked whale	1	10					3			4		1						**19**		**2**		2
Unid. Mesoplodon										9								**9**				

Table 2. Cetacean sightings made on effort during T-NASS and associated surveys.

2007 // On Effort Sightings	Irminger Sea	South Centre Iceland	North Iceland	East - Southeast Iceland	West Greenland	Eastern Barents Sea	Iceland coastal	N. Foundland Labrador	St Lawrence Gulf + Cap breton	Scotian Shelf	West Greenland	Mid atlantic Ridge	Irminger Sea	Norwegian Sea	Norwegian Sea	Norwegian Sea	Barents Sea	T-NASS TOTAL	CODA TOTAL	SNESSA TOTAL		
Species	Iceland, AFII	Iceland, Jakup B	Iceland, Venus	Faroes, Thor Chaser	Greenland, Tulugaq	Norway, Ulvos & Havsel	Iceland	Canada	Canada	Canada	Greenland	MarEco / J.Cook	Redfish / Smolensk	NO Pelag / Eros	NO Pelag / Libas	Pre&Post RedFish / Smolensk	Pre&Post RedFish / Smolensk				Shipboard	Aerial
Killer whale	5		3	3	0		11	1		7			2	8	11	5		**56**	**3**			
false killer whale																			**1**			
Long-finned pilot whale	41	12		13	1		9	10	7	37	15	11	10					**166**	**88**	**20**		20
long/short finned p.w.																			**4**	**2**	2	
White sided dolphin	8	15					3	92	13	15		6	4	1				**157**	**20**	**36**	25	11
White beaked dolphin	5		25			35	105	68	16	2	58		2	6	13	2	7	**344**		**1**	1	
Lagenorhynchus sp.						64												**64**				
Bottlenose dolphin				2			1			8								**11**	**39**	**15**		15
Common dolphin								28	2	201		35						**266**	**149**	**64**		64
Striped dolphin										1		4						**5**	**54**	**1**		1
Common/striped																			**74**			
Risso's dolphin									1	6								**7**	**3**	**31**		31
Harbour porpoise		9		10	3	37	119	36	25	4	46							**289**	**3**	**571**	440	131
Big cetacean	18	3	16	7		4	12	6	17	70		4	20	4		1	1	**183**				
Medium cetacean	1	2		5	3						3	1		1				**16**				
Small cetacean	1	2		1			8	2	3	12	3							**32**				
Patterned dolphin			1															**1**		**39**		39
Unidentified whale (blow)	3	1		9	1		4					1			3			**22**	**171**	**208**	184	24
Unidentified dolphin	25	1	9	11			16	40	105	201	15	10		2	1			**436**				
Unidentified animal																				**24**		24
TOTAL	**402**	**166**	**173**	**98**	**57**	**254**	**431**	**584**	**458**	**781**	**221**	**84**	**64**	**48**	**68**	**14**	**10**	**3913**	**1097**	**1460**	**1038**	**422**

Table 2 contd. Cetacean sightings made on effort during T-NASS and associated surveys.

First Meeting of the Working Group on Abundance Estimate (AE WG): Copenhagen, April 8, 2008 (see NAMMCO/17/5 Annex 2)

Many of the analyses had not yet been completed and some of the analyses presented were still preliminary.

Fin whales

Shipboard

Combined single platform estimates were provided for the Icelandic-Faroese area, using 3 degrees of certainty in species identification, and with and without a bias correction for distance estimation. In addition an estimate of *g(0)* using mark-recapture (or sight-resight) methods was provided. Total abundance for the combined platform estimate using the identification certainty classification most comparable to that used in previous analyses and no correction for bias in distance estimation was 20,644 (95% C.I. 15,053-26,540). The double platform analysis resulted in a mean value for *g(0)* for the primary platform of 0.87 (CV: 0.06), which is similar to that estimated for 2001 and give a bias-corrected estimate of 18,846 (CV: 0.15). Using a Double platform analysis, the total abundance in the survey area was 23,379 (CV: 0.19) using all effort and non-duplicate detections and 21,341 (CV: 0.17) for the equivalent primary platform estimate using effort conducted in double platform mode only, and without *g(0)* correction.

Estimated abundance is lower (but not significantly so) than the total estimate for 2001 of 24,887 (95% C.I. 18,186-30,214; Víkingsson *et al.* in press). Abundance increased rapidly in parts of this area between 1987 and 2001, and it appears that this increase has ceased.

Several potential biases and potential problems were identified, in particular the unconventional choice of last distance estimate from the trackers as sighting distance instead of the initial sighting distance standardly used and the way of applying the *g(0)* correction factor to the different effort segments. The WG defined the estimates as preliminary and gave suggestions for further work.

The WG also felt that the current confidence index for species identification is confusing and that another system should be used in the future, while ensuring consistency with previous analyses. It also agreed on the necessity of clarifying the notion of group size for this species.

The Norwegian eastern Barents Sea survey had only 15 primary fin whale sightings and an independent analysis will not be conducted. The estimate for the most recent 6 year cycle will be produced within the next year.

CODA experienced similar problems in using the same sighting classification as in T-NASS. The fin whale sightings were grouped in the southern most blocks. A double platform analysis using Mark-Recapture Distance Sampling (MRDS) methods to generate stratified abundance estimates was under way as a first step. It was yet to be decided how to handle the large number of unidentified whales. The detection

function developed from the mark-recapture analysis will be used for the density surface models.

Aerial

Donovan presented the Greenlandic aerial survey results discussed during the IWC RMP meeting held during the previous week. Two estimates have been produced:

a) Line transect with correction for perception bias by Mark-Recapture Distance Sampling. This estimate was not accepted mainly because of the very low number of duplicate sightings (eight duplicates).
b) Conventional line transect estimate which was acceptable for the purpose of RMP.

Suggestions were made in the IWC-RMP forum for clarification in a future paper to be presented at the IWC Annual Meeting in Santiago in June 2008.

The paper was not discussed at length, but the participants agreed that the conventional line transect estimate was acceptable, although the clarifications asked by the IWC group should also be provided to the WG.

The Greenland fin whale abundance estimate from 2007 was higher than estimates from previous surveys. However the WG noted that some were obtained using a different method and/or carried out in a different period and the survey area did not cover the entire summer range of the feeding stock. The WG therefore considered that there was insufficient information to reach a conclusion about the rate of increase of fin whales in this area.

The preliminary abundance estimate for the Canadian area, using standard method, is 1,008 (95% CI: 571-1786). Overall, the sighting density of fin whales in the Canadian T-NASS was lower than expected. Palka mentioned that the abundance of fin whales in the SNESSA survey area to the south of Canada was higher than expected, so these may have represented animals that were in Canadian waters during earlier surveys. However, bias corrections will have to be applied before any further discussion of the abundance estimate.

Palka reported also that fin whales were recorded for both aerial and shipboard surveys. Neither aerial or shipboard abundance estimates from the 2007 surveys are available yet but the initial impression is that there were more sightings than in previous years in the same area and time.

Minke whales

Aerial

Corrected estimates were only available for the Icelandic coastal area. The data, analysed following the cue counting methods (Hiby and Hammond 1989, Hiby *et al.* 1989, Buckland *et al.* 2001) with the DISTANCE 5.0 software packages and the same cue rate as in previous analyses, yielded a total estimate for the original blocks of 10,680 (95% CI 5,873, 17,121). Post-stratification decreased this estimate by 12%.

This estimate may be negatively biased because of visible cues missed by the observers near the plane. The 2007 point estimate is 24% that from the 2001 survey and the decrease is significant ($P<.05$). Abundance was lower in 2007 than 2001 in all blocks but one. These estimates were accepted as final by the WG.

There was an obvious difference in abundance compared with the previous survey in 2001. These differences in abundance could not be directly ascribed to changes in survey design or execution. Possible reasons for the decrease could not be determined definitively, but include population decrease, changes in spatial distribution (*i.e*. more minke whales outside the survey area) and/or changes in the timing of migration to or from the survey area. A possible change in seasonal distribution is consistent with recent changes in the ecosystem of the Icelandic continental shelf area perhaps as a result of higher sea temperatures. Indications of recent changes include a northward shift in distribution of several fish species, low abundance of sand eel and capelin and breeding failure in seabirds.

Shipboard

No analyses had been performed on the T-NASS shipboard data yet. In the Icelandic-Faroese area, there were fewer sightings than in previous surveys, but there was large gap in effort in areas of usually high density and the analysis would probably not generate a reliable estimate. The Norwegian survey indicated that sighting distribution between the 1995 and the 1991-2001 survey cycles was very similar, but that there was a shift westwards.

There were *ca* 29 unique sightings of minke whales made in the Greenlandic area. The WG recommended that analysis of the data be carried out as soon as possible.

Discussion

The WG discussed at length possible explanations for the decrease in minke whale abundance as observed in the Icelandic coastal area. A change in distribution could not be inferred from the surveys data. But some of the areas known as high density had a low or null coverage. It was pointed out that the catches in Norway and Iceland could certainly not explain such a decline. The group decided that at least two attempts to find an explanation could be made:

- The analysis of the T-NASS Extension minke data in the Norwegian Sea, an area which was not covered by the dedicated survey, as a comparison in sightings rate could inform on change in relative densities there.
- A spatial analysis of present and past minke data could allow identification of predictors of minke distribution and reveal whether minke whales could have been expected in 2007 in areas which were not covered by the 2007 dedicated survey e.g. the northern Icelandic blocks.

The WG recommended that these two analyses be carried out as soon as possible and underlined the importance of synoptic surveys, relative to mosaic surveys, in interpreting shifts in distribution.

Humpback whales

Some problems were identified with the analysis provided for the Greenlandic aerial survey, which had to be solved before an estimate could be accepted.

Humpbacks were not detected in the Denmark Strait area, but coverage had been very poor in this area. The number of sightings in the blocks north and west of Iceland and during the aerial component warrants further analysis, but the geographical overlap with the ship survey should be taken into consideration.

A preliminary uncorrected estimate was provided for Canadian areas, where there were quite a lot of sightings. Preliminary results from SNESSA pointed to an increase abundance compared to the previous survey.

Pilot whales

A number of sightings were made both in the T-NASS and the CODA surveys. It was agreed to combine data from both surveys, to produce a common detection function. It was suggested that the Faroese contract the analysis externally, and if possible in cooperation with CODA. Estimates would be also obtained from the Canadian and SNESSA data.

General comments were made on the difficulty to identify groups and group sizes for this species.

Harbour porpoises

The Icelandic aerial survey generated 119 sightings, which are a very much higher number than in previous similar survey in 2001. Harbour porpoise were a target species for T-NASS and this estimate will represent the first reliable estimate of harbour porpoise in coastal Icelandic waters.

In Greenland, the shipboard survey had only 8 animals sighted but 46 were sighted in the aerial survey. The WG recommends that Greenland develops a reliable abundance estimate for this species. It also suggests that Greenland coordinates the analysis with Iceland, as there is a high degree of similarity between the two surveys (similar methods and some of the same observers). It was noted that the harbour porpoise was the species with the highest number of sightings (46) in the Greenlandic aerial survey 2007.

In Canada, fewer porpoises were observed in 2007 than in the 2002-2003 aerial survey around Newfoundland, and in the larger-scale aerial surveys in the Gulf in 1995 and 1996. SNESSA had a lot of sightings in both surveys, but there was no indication of variation in population size.

Other species

Sightings were not very abundant for most of the other species. For sperm whales, both acoustic and visual analyses should be performed and compared with earlier surveys, and also include the extension data. There was a fair amount of white-beaked

dolphin data, and the WG recommended that abundance estimates be produced for this species.

T-NASS extension

Extension data should be reviewed in the context of the whole T-NASS survey to assess which analyses are worth conducting. In particular, minke whale sighting rates in the Norwegian Sea should be compared with earlier surveys in the same area, to see whether they are comparable taking into account the different methodologies.

Cooperative analysis

The group reiterated its decision to publish a common distribution paper and decided to create an e-mail discussion group for questions and discussion related to the analysis of the T-NASS, SNESSA, and CODA survey data. Spatial modelling was recommended for fin and humpback whales.

Publication of results

See under point 11.2.

8.2 Cooperation with CODA and SNESSA

For the first time a NASS survey cooperated with a European – CODA - and an American – SNESSA – concomitant survey, ensuring a coordinated effort and the broadest synoptic coverage possible.

The Committee commended this new cooperation, as well as the cooperation with other non-cetacean programmes, which was considered extremely valuable and positive. The fact that SNESSA, CODA and NAMMCO had agreed to publish as a priority, a joint primary publication pertaining to the general distribution of all cetaceans species throughout the entire survey area, was also considered as a very positive step. The Committee **recommended** that the publication be given a high priority.

8.3 Archiving T-NASS data

The delegates were reminded that T-NASS is a part of the ESSAR-IPY project and that IPY data policy involves a common data archiving and availability policy.

It was noted that data from T-NASS will be submitted to the IWC for archiving and use within the RMP.

The Scientific Committee recommended that T-NASS data be transformed to a format similar to the one employed by the IWC and be archived at the NAMMCO Secretariat with the necessary clauses for use restrictions.

8.4 New requests and future work

No special requests were presented other than the continuation of the abundance estimate work. Data on fin, minke and pilot whales should have highest priority in the analysis, followed by humpback whales and harbour porpoises.

The acoustics data from T-NASS have been sent to SMRU in St Andrews for quality evaluation.

The Committee recommends the analysis of sperm whale T-NASS acoustic data. Furthermore, the Committee encourages the participants in the T-NASS surveys to prepare and make available feedback on progress in this project to the Secretariat for drafting a common press release and for updating the T-NASS web space. It also reiterated its previous recommendation that the publication pertaining to the general distribution of all cetacean species throughout the entire survey area be given a high priority by all countries and that all participants forward the data to the Secretariat in a timely fashion.

The Committee **warmly thanked** the T-NASS Coordination Staff and the project Participants for their work.

9. CETACEANS STOCKS - STATUS AND ADVICE TO THE COUNCIL

9.1 Fin whale

9.1.1 Update on the stock delineation question

Víkingsson referred to the instance that genetic and non-genetic data relevant to stock assessment were presented to the joint NAMMCO and IWC fin whale working group in 2006. Results from subsequent genetic analysis generally support a lack of genetic divergence for fin whales across the North Atlantic (SC/15/18). The new genetic studies did not change the conclusion reached by the working group and are compatible with all stock structure hypotheses presented there. Results will be presented to the IWC SC.

The SC noted that here had been no progress since the 2006 fin whale WG meeting in genetic analyses of the Faroese fin whale biopsy samples taken in 2000-2001. In the light of previous indications that Faroese fin whales are very different from other N.Atlantic fin whales, the SC **urges** rapid completion of the genetic analysis of these samples using techniques compatible with those used currently on Icelandic samples. If results indicate that there are indeed genetic differences that are significant, this will have important implications in stock analysis currently ongoing in implementation processes.

9.1.2 Update on the work on relatedness

The two extreme hypotheses postulate either the existence of only one stock or the existence of multiple stocks, but where the evolutionary time since stock separation has been too short to be detected by standard genetic methods. A new, more sensitive method to investigate stock separation for closely related stocks, which employs the levels of kinship at the brother-sister or parent-offspring level, has been developed by Hans Skaug and is being applied to fin whale data.

9.1.3 New estimates from T-NASS

Víkingsson reported on the new estimate from Icelandic shipboard surveys presented at the April 2008 meeting in Copenhagen of the Working Group on Abundance Estimates (SC/15/10). The survey was performed using standard line transect methods and the calculations were made using Distance. The same methods as used in 2001 were employed, bearing in mind the possibility of comparisons between the point estimates. The resulting estimate numbered 20,644 (95% CI 15,053-26,540) and this figure is not significantly different from the previous assessment in 2001. A new estimate of *g(0)* was 0.87 (CV: 0.06).

Potential biases were accounted for in the calculations. *G(0)* may be overestimated because no covariate was used. Some other potential biases were also recognized, and they should be investigated. These include further evaluation of biases in distance estimation, responsive movement and uncertainty in species identification. Also the impact of using the location of the sighting the closest to abeam instead of the initial sighting, as standard, should be investigated.

The Committee welcomed this result and agreed that this estimate is "preliminary". It recommended that the analysis identified be carried out as soon as possible. The final estimate could be directly reviewed by the fin whale assessment group.

The Greenland estimates based on conventional line transect methods from the 2007 aerial survey, resulted in 4,660 (95% CI: 1,890-11,500) which was higher than the abundance estimate of 2005, accepted by the IWC, which was 3,200 (95% CI: 1,400-7,200).

The Working Group accepted the 2007 estimate for Greenland fin whales, and this was adopted by the SC.

The Norwegian estimate for the northeast Atlantic, including the whole 6 year cycle, will be available in the course of the next year.

Canada presented preliminary estimates that have yet to be corrected for bias. Estimates of abundance will shortly also become available from the SNESSA and CODA surveys.

9.1.4 Update on other progress

Russian Federation:

Fin whales are a rare species in the Barents Sea, but in the course of 2006-2007 there has been an increase in the frequency of sightings of fin whales in August–September during the Ecosystem Surveys and in the summertime coastal zone observations.

The Ecosystem Surveys have taken place later than T-NASS and in the time lag between the two surveys, the distribution of the whales could have shifted significantly. Furthermore, the T-NASS and Ecosystem Surveys' efforts and observation protocols are very different.

Faroes:

A catch statistics database for the North Atlantic is under compilation, and the work will be completed in a month from this meeting. When the work is completed, the database will be deposited at the NAMMCO Secretariat.

9.1.5 New request and future work

The Committee recommended that recent indications of changes in distribution (i.e. spatial dynamics) related to environmental changes, should be taken into account when designing future surveys.

With regards to an assessment for the Northeast Atlantic stocks of fin whale, such an assessment can be initiated when the 2007 estimates are finalized. This could be done in conjunction with a new assessment of the central stock subsequent to the new 2007 abundance estimate. The Committee recommended that this be done before the next SC meeting.

9.1.6 Update on the CITES and IUCN status reviews

In 2006, the Scientific Committee evaluated the status of fin whales in the Central North Atlantic as part of a periodic review under the Animals Committee of CITES. After reviewing biological information, CITES criteria A, B and C, and based on all available information, the NAMMCO Scientific Committee recognized that this species does not meet any of the biological criteria for listing in Appendix 1 (species in danger of extinction). The review process was stopped within CITES, in the middle of the review, for reasons that are unknown to the Scientific Committee.

The SC requested the Secretariat to find out the outcome of the meeting of the IUCN special group meeting regarding fin whales and their status.

9.2 Humpback whale

9.2.1 Revised Greenlandic 2005 estimate

The 2005 estimate of humpback whales from Greenland was presented neither at this meeting nor at the AE WG, and was therefore not discussed.

9.2.2 New estimates from T-NASS

Uncorrected abundance estimates from aerial surveys conducted off West Greenland were reported for 1984, 1987, 1988, 1989, 1993, 2005 and 2007, with also a fully corrected 2007 estimate of 3,820 (CV=0.51, 95% CI 1,489-9,803). The estimates are preliminary and following some adjustments of the analyses, five final and likely acceptable estimates are expected later this year (a joint 1987-89 uncorrected estimate, uncorrected estimates for 1993, 2005, 2007, and a fully corrected 2007 estimate).

The 2007 estimate was not accepted as final by the AE WG.

9.2.3 Review of the advice on catch limit for W. Greenland given in 2006

In 2006, the SC gave interim advice on the number of humpback whales that could be safely taken. The estimate of the 2007 survey, though not definitive, was higher than the estimate in 2005 on which this advice was based. Therefore, considering that in spite of the uncertainty of the 2007 estimate, there is no immediate indication of a

population decrease, the Committee did not see the reason to reconsider this interim advice until a proper assessment has been carried out.

9.2.4 Update on other progress (Greenlandic acoustic/tagging and Norwegian biopsy/photos)

Haug reported that Norway is continuing the photo-ID and tagging studies. There are no new progress reports on these. Furthermore, biopsies have been taken for stock structure studies.

Rosing-Asvid reported that in Greenland, multi-sensor archival tags (DTAGs) with a pressure sensor and three-axis accelerometers and magnetometers were used to study in detail the kinematics of lunge feeding in humpback whales. This study revealed that there is little evidence that whales accelerate forward before mouth opening to lunge at prey schools. There are on the contrary, indications that they adjust their fluking to match increased drag from the opening of the mouth to maintain a steadier and slow speed though the lunge. It was concluded that humpback whales seem to gulp rather than lunge at prey laden water masses. A small number of conventional tags were also deployed during the summer 2007 in Nuuk Fjord. In the same area, 55 ID photos of humpback whales were collected during 2007, leading to the identification of 20 individuals in Nuuk Fjord. Based on these data it is possible to infer that the whales migrate in and out of the fjord throughout the season, and that some individuals return to this specific location indicating a year-to-year site fidelity.

9.2.5 New requests and future work

The Committee **recommended** that biopsies and photo-ID data from all the areas be analyzed before the initiation of a new assessment.

Bloch is ready, after a request and in collaboration with the IWC office, to provide a historical North Atlantic catch list for humpback whales, if this was desirable and of any use in the work of assessment.

9.2.5.1 Possible cooperation with the IWC on a Humpback Whale assessment

After careful consideration, it was concluded that it is not helpful for NAMMCO to have a joint assessment with the IWC for Greenlandic and Icelandic humpback whales, because the AWMP for Greenland and RMP for Iceland are two different processes in the IWC system. Furthermore, the RMP can take up to six years to be completed and could delay the production of an assessment from NAMMCO.

It was noted that the novelty of the humpback whale assessment will surely require more than one meeting. The Committee recommends that the preliminary work (state of the art with evaluation of available information) should be done in connection with the fin whale assessment meeting before a separate meeting schedule is set up for humpback whale assessment alone.

It also recommended that abundance estimates for humpback whales from all surveys (2007 and older) should be made available to the fin whale assessment group.

9.3 The remembered whale: Sei whale

9.3.1 New estimates from T-NASS

Iceland reported very few sightings of sei whales. Greenland reported only five. An abundance estimate from these data would probably lead to a large confidence interval.

Bloch commented that sightings of sei whales are very variable in the Faroes. It seems that this species ranges more south than the NAMMCO area and that only occasionally it extends further north. Lockyer commented that during the whaling period of the 1970s and 1980s off Iceland, sei whales were unpredictable in their presence and density, resulting in highly variable catches.

Lockyer commented that the estimates of sei whales that can be derived from T-NASS data are unlikely to be valid unless there are data from blocks further south. The sei whale is in general a more southerly species with incursion to northerly waters occurring in years when perhaps sea temperature and prey abundance are favourable.

CODA had 18 sightings of sei whales and it is recommended that T-NASS sei whale data are combined with CODA sei whale data for analysis.

9.3.2 Update on research in the NAMMCO countries

Greenland's shipboard estimate from 2005 was not formally accepted. The estimates from the NASS (NASS 1989 had sei whales as a target species) gave a minimum estimate as sei whales were most abundant at the southernmost border of the NASS area.

Bloch is ready, following a request and in collaboration with the IWC office, to provide a historical North Atlantic catch list for sei whales, if this was desirable and of any use in the work of assessment.

9.3.3 New request and future work

With regards to a status of the species in East and West Greenland waters, the Committee **recommends** that the assessment group for fin whales make a state of the art investigation about the possibility of providing this status using all available data.

The SC recommends making all sei whale survey data available to the fin whale assessment group.

9.4 Minke whale

9.4.1 Update on stock delineation and relatedness

Haug reported that genetic studies based on data from the DNA register reveal very little evidence of genetic structuring among the animals in the North East Atlantic from the North Sea to Spitsbergen, including the area around Jan Mayen (Hans Skaug, *pers. comm.* unpublished study that will be presented at the IWC).

Víkingsson mentioned that Pampoulie *et al* (SC/15/18) had similar results about the lack of evidence of genetic structuring in the population over the whole North Atlantic.

9.4.2 New estimates

Aerial surveys from 2005 in Greenland gave a fully corrected estimate of 10,800 (95% CI: 3,600-32,000). This estimate was endorsed by the IWC in Anchorage in 2007 but was not presented to a NAMMCO forum.

Only the Icelandic aerial estimate from T-NASS in coastal Icelandic waters was presented at the AE WG in Copenhagen in April 2008 (SC/15/10).

Víkingsson presented the Icelandic estimate of minke whale abundance from the Icelandic aerial survey area. The total estimate for the original blocks is 10,680 (95% CI 5,873-17,121). Post-stratification decreases this estimate by 12%. This estimate may be negatively biased because of visible cues missed by the observers near the 'plane. The 2007 point estimate is 24% that from the 2001 survey and the decrease is significant ($P<0.05$). Abundance was lower in 2007 than 2001 in all blocks but one. A pronounced difference in sighting rate was detected between the two primary observers. Analysis using only data from experienced minke whale observers resulted in an estimate of 15,055 (95% CI: 6,357-27,278). The reason for the decrease cannot be determined definitively, but possibilities include population decrease, changes in spatial distribution (i.e. more minke whales outside the survey area) and/or changes in the timing of migration to or from the survey area.

Haug showed evidence of huge distributional changes in unrestricted whaling catches of minke in the Barents Sea between 1952 and 1980. Such changes can also happen over a much shorter time frame. Prey distribution seems to govern whale distribution.

The SCANS survey in 1994 and 2005 also indicated significant changes in spatial distribution between the two surveys (SC/15/O17 and O18).

It might be necessary to reconsider the Icelandic shipboard survey strategy. Presently the shipboard surveys proceed in weather conditions up to Beaufort 6, and effort in these conditions probably misses minke whale sightings, thus reducing the reliability of the shipboard estimate. It was noticed that the aerial survey covers a relatively small part of the Central North Atlantic stock area. Extensive areas around the aerial survey blocks had little or no shipboard coverage in conditions suitable for minke whale detection.

Reproductive failure and/or increased mortality were considered unlikely explanations for the apparent decrease in abundance. An adult mortality of 20%, with zero reproduction, would be required for such a reduction. The Committee considers that a mortality hypothesis is unlikely and that the recent catches (200 over 5 years) are too small to account for the missing animals. The most likely hypothesis is an ecological one that assumes that the whales are elsewhere during the time of the T-NASS surveys. It was noted that there have been significant shifts in diet composition of

Icelandic minke whales since the start of the Icelandic research programme, and prey abundance and distribution (notably of capelin and sand-eel) may also influence whale redistribution.

Haematological examinations from the Icelandic Scientific Whaling Programme showed no unexpected results that could indicate declined health status in the population. The same samples from the Scientific Whaling Programme should be analysed for body condition to determine if there are trends revealing decrease in fitness, even if a mortality hypothesis is considered unlikely to explain the diminished abundance.

Rosing-Asvid noted that NAMMCO's engagement to ecosystem approach to management calls for a more comprehensive investigation of the North Atlantic system. This would be under the jurisdiction of the Working Group on Marine Mammals and Fisheries Interactions. However, this investigation should strive to encompass the whole NAMMCO area.

The Committee reiterated the importance of synoptic surveys in interpreting shifts in distribution.

Annual Norwegian-Russian Ecosystem Surveys in 2006 and 2007 show an increase in numbers and distribution area for minke whales that could provide an index of distribution for these whales.

9.4.3 Estimate from SCANS II

The design-based abundance estimate is 13,281 (95% CI: 6,663-26,471). The data were truncated at perpendicular distance 870m. The best model included perpendicular distance only. No group size correction was applied since the majority of sightings were single animals. Variances were based on the empirical variance in estimated density between samples (SC/15/O17).

9.4.4 Update on progress

The sampling within the Icelandic research programme was completed in 2007 and samples are being analysed. A review of the main results is scheduled for 2010 (See 6.4).

9.4.5 Future work

The Committee endorsed the recommendations of the Working Group:

- Sighting rate for the T-NASS Extension survey in the Norwegian Sea should be calculated and used for comparison with the other T-NASS areas and previous estimates in this area.
- A spatial analysis of both the historical and present survey data including the Norwegian data is recommended to check whether the missing whales could be predicted to be in the areas not covered by the T-NASS survey.

All the abundance estimates from the Working Group on Abundance Estimates (AE WG) for the Icelandic coastal area were accepted, but none was indicated as the best.

The Committee urges that the AE WG selects which one should be used as a point estimate in future assessments.

The Scientific Committee also recommends that the analysis of all the minke whale data from the Greenlandic (aerial and shipboard), T-NASS Extension and Icelandic (shipboard) surveys on minke whales be undertaken as soon as possible.

The Committee recommended an investigation of potential changes in the ecosystem within the
framework of the Working Group on Marine Mammals and Fisheries Interactions.

The SC recommended that spatial distribution analysis should be undertaken, and that body condition indices in the Barents Sea and Iceland should be published when available.

9.5 Narwhal

9.5.1 Update on the 4-year Greenlandic research programme

Rosing-Asvid reported that a summer survey was flown in 2007 in the Melville Bay and Inglefield Bredning area. Data from this survey is currently being analysed to develop fully corrected abundance estimates. The dataset includes 328 sightings of which 32 were from the Melville Bay area.

A narwhal tagging programme has been run in West and North Greenland. Six animals were equipped with harpoon-delivered satellite transmitters in the Qaanaaq area in August 2007, while three animals were instrumented with backpack transmitters in September 2007. Another animal was tagged with a backpack transmitter in the Uummannaq area in November 2007.

An aerial survey for narwhals is planned for 2008 in East Greenland and an East Greenland narwhal tagging programme is planned, depending on funding.

Similarly, surveys in 2009-2010 in the North Water area are planned for both Walrus and Beluga, depending on funding.

Lydersen mentioned that two publications on narwhals from Svalbard had been produced since the last meeting:

1) Including satellite tracking and diving data (Lydersen *et al* 2007). These were collected for up to 46 days and present movement and diving patterns.
2) An investigation of POP pollution in blubber (Wolkers *et al* 2006). It seems that PCBs, PBDs are 3 times higher in sub-adult narwhal than in sub-adult belugas. This supposedly reflects a difference in diet since the detoxification capacity of the two species is probably very similar.

9.5.2 New estimates from the March 2006 and August 2007 surveys

No estimate was presented

The Management Committee **requested** a review of the 2007 narwhal and beluga survey plans by the T-NASS committee. It was **noted** that this had not been done, since the plans had not been presented to the T-NASS committee.

9.5.3 NAMMCO and JCNB Joint Working Group

The SC considered that there were enough data to warrant an update of the assessment of narwhal abundance and recommended that the NAMMCO/JCNB meet before March 2009 to allow the use of this assessment in the new quota series.

9.5.4 Future work

The Committee was informed that the narwhal quotas for West Greenland for the period from 2004 to 2008 were as reported in Table 3 (below).

The Committee noted that the catch quotas are still higher than the advice given of 135 (NAMMCO 2003, 2005, 2006) and expresses continued concern about the quota level. At the same time, the Committee recognizes that the preliminary data on abundance of narwhal and beluga show higher estimates and **urges** Greenland to submit fully corrected estimates derived from the March 2006, August 2007 and 2008 surveys to the Joint Working Group.

Period	Quota	Comments
July 2004 – June 2005	300	
July 2005 – June 2006	260	later raised 310
July 2006 – June 2007	217	+ 115 for Melville Bay + 10 to be distributed in the spring if necessary
July 2007 – June 2008	200	+ 100 for Melville Bay

Table 3. West Greenland quotas for narwhals (the quota for 2006-2007 had been initially set to 385 animals, but was lowered to 217 for West Greenland to compensate for extra animals taken in the previous period).

9.6 Beluga

9.6.1 Update on progress

Rosing-Asvid reported that a beluga tagging programme for West Greenland is planned for 2008-2009. This item also depends on funding.

Lydersen mentioned a recent genetic study that shows that Svalbard belugas (42 animals) are clearly distinct from West Greenland belugas (79 animals). Svalbard and White Sea animals (5 animals) seem to be more closely related to the Beaufort Sea than the West Greenland animals.

9.6.2 New estimates from the March 2006 and August 2007 surveys

No new corrected estimate from these surveys is available

As for narwhals, the Management Committee requested a review of the plans for the 2007 narwhal and beluga survey by the T-NASS committee. It was noted that this had not been done (see under 9.5.2).

9.6.3 NAMMCO and JCNB Joint Working Group

See point 8.5.3 above on narwhal

9.6.4 Future work

Age determination validation in beluga (and narwhal): expert meeting, workshop?

An Age Determination and Methods Validation workshop is needed and NAMMCO could act as the organizer at the discretion of the NAMMCO/JCNB Committee. Such a workshop should not only include tooth layer reading but also other techniques such as

- Aspartic acid racemisation – especially for narwhal
- Fatty acid ratios in blubber

Lockyer noted that although narwhals and belugas are often grouped together for aging purposes, they are separate species and methods should be pooled carefully. Furthermore, she pointed out that tooth-reading based age determination of belugas is going to be important also in the future and in the event of adoption of new techniques for standardization purposes. The necessity for such a workshop was transferred for discussion to the NAMMCO/JCNB Committee.

Lydersen mentioned that Norway for several years had tried to get funding for a joint Norwegian-Russian genetics and satellite tracking study of belugas without any success. It is highly recommended that this project be funded.

The Committee was informed that the beluga quotas for West Greenland for the period 2004-2008 have been set according to Table 4 (below).

Period	Quota
July 2004 – June 2005	320
July 2005 – June 2006	220
July 2006 – June 2007	140 + 20 for Qaanaq
July 2007 – June 2008	165

Table 4. West Greenland quotas for beluga.

The Committee commended Greenland for their management efforts to improve the conservation status of beluga. Nevertheless the Committee remained concerned that the total removals were still above the recommended level of 100 for West Greenland (2000 & 2001). At the same time, the Committee recognizes that the preliminary data on abundance of narwhal and beluga show higher estimates and encourages Greenland, as for narwhal (point 8.5.4 above), to submit fully corrected estimates

derived from the March 2006 and August 2007 surveys to the NAMMCO/JCNB Working Group.

9.7 Bottlenose whale

9.7.1 Update on progress

Mikkelsen reported that no progress had been made on this species in the Faroe Islands. Samples from three stranded animals in 2007 were taken but have not yet been analysed.

Zabavnikov mentioned that there has been an increase in sightings of bottlenose whales from fisheries vessels in the Barents Sea. In 2007 there were 30 reported observations in the Western and North Western part of the Barents Sea.

Víkingsson noted that Icelandic dietary data for bottlenose have been analysed by a student but that these data are not available yet.

Some data on distribution may come from the T-NASS and CODA surveys.

The Committee strongly recommends that the Faroese and Icelandic data on bottlenose whale feeding be made available as soon as possible.

9.7.2 Future work

The acoustic recordings from T-NASS 2007 will be screened for data on this species.

Sightings made during T-NASS will be reported as distribution data only because there are not enough points for an abundance estimate.

9.8 Killer whale

9.8.1 Update on progress

Lydersen reported two observations of killer whales north of 80°N 0°E in mid-March 2008 and on a film that can be found on *www.youtube.com/watch?v=eYq39tFNISk* about a minke whale being attacked and eaten by killer whales off Ny Ålesund on Svalbard.

Haug reported that changed winter distribution of herring has changed the distribution of killer whales in Norwegian waters.

Zabavnikov reported that killer whale sightings in the Barents Sea area are both in offshore and coastal areas and that killer predation on harp seals has been observed.

Mikkelsen mentioned that behaviour of killer whales around the Faroes suggests that they are looking for grey seals in near shore areas and killers have been observed to predate on eider ducks and other birds.

9.8.2 Future work

Víkingsson reported that a study involving photo-ID and genetics has been initiated by cooperation between the MRI in Reykjavik, the University of Aberdeen and Tiu

Similä under the supervision of Paul Thomson. This study involves the use of North Atlantic data from Iceland, Norway and Scotland. The Scientific Committee recommended that pictures taken during the T-NASS survey be made available for this project.

The Management Committee requested the SC to review the knowledge on the abundance, stock structure, migration and feeding ecology of killer whales in the North Atlantic, and to provide advice on research needs to improve this knowledge with priority to killer whales in the West Greenland – Eastern Canada area. At the last meeting, the SC concluded that there was not enough information to carry out the assessment at this time, particularly for the West Greenland area. This situation remains unchanged.

Lockyer mentioned that the IWC reviewed killer whales as a special topic under the Subcommittee on Small Cetaceans in 2007 and concluded that there was insufficient data for an assessment at the moment. The Committee did not intend to make a review of this species until new data are available.

9.9 Pilot whales

9.9.1 New estimates from T-NASS and CODA

Desportes mentioned that the methodology employed in T-NASS was designed for pilot whales as well as other key species and the coverage was sufficient for an estimate of this species. T-NASS was planned to cover the area of the 1989 survey.

The SC recommended that data from both aerial and shipboard surveys should be included in the analysis for pilot whales after being grouped and validated. Mikkelsen will take the lead for this task.

Kelly Macleod from SMRU will be charged with the task of estimating abundance and modelling the spatial distribution of pilot whales including Icelandic, Faroese and CODA data. There are indications that this process will likely be completed and an estimate be available by the end of 2008.

9.9.2 Monitoring programme for the Faroes

Lockyer presented the report from the WG on pilot whales (see NAMMCO/17/5 Annex 3), which had corresponded by email before this meeting and convened during the meeting of the SC. She provided the background to the development of this WG which had been established in response to a request from Council to the SC **"to** develop a proposal for the details of a cost-effective scientific monitoring programme for pilot whales in the Faroes." The WG had decided to define their work and concluded that, although this was not expressed directly in the Terms of Reference, the aim of the monitoring programme was to assess the continued sustainability of the Faroese catch and that "there should be both a long-term and short-term monitoring directed to determining the continued sustainability of the Faroese catches".

The WG summarised the previous assessments from NASS surveys, and also other previous data on catches and investigations. Although new abundance estimates

became available in 1995 and 2001, the accepted best estimates still refer to the combined 1987 and 1989 estimates, meaning that there had been no new assessment accepted in 20 yr. The estimate then was 778,000 (cv 0.295).

The WG reported that a basic catch reporting system was in place and had been for many centuries, providing a long catch history series where numbers of catch,, individuals per catch, and animal size in the traditional *skinn* value, date and place were recorded. In the last 20 years, individual length and sex were also reported.

Whilst the WG regretted that it was unable to conclude its work at this meeting, it nevertheless made some important recommendations and suggestions for designing and implementing a monitoring programme. The main outcome was a table summarising goals, sampling methods, skills and experience required, relative costs, time needed to obtain meaningful results, limitations and likely success, and relative overall priority in enabling the programme to achieve the main objective (Annex 1 of NAMMCO/17/5 Annex 3).

Lydersen commented that contaminants are not a useful method for monitoring animal health status and recommended routine blood screening as an inexpensive tool for assessing health of animals (see Tryland *et al*. 2006a and b).

Satellite tagging was noted as being potentially very useful in the longer term. If the main goal was to follow movements and determine home ranges, then the smallest tags (which would minimise damage from social interaction), and less expensive tag models that only recorded position and that had proved very durable (active for a year or more) in some species, were the best choice in this situation. Mikkelsen confirmed that when animals in a pod were corralled and tagged, all animals in the pod were released together.

Of all the goals and methods listed in the Annex 1 of NAMMCO/17/5 Annex 3, the SC identified two that were absolutely critical and of the highest importance to a monitoring programme. These were the official logging of all catches and the conducting of regular surveys for abundance estimates at approx. 6 yr intervals. The assessment of pilot whales has already been prioritised for the T-NASS data, and should include both T-NASS and CODA abundance data (see point 8.9.1).

The WG recommended that work that could be started immediately before a final programme could be detailed and approved, included:

- Calculation of indices of abundances from previous NASS surveys – 1987 and 1989, 1995 and 2001, as well as 2007.
- Full documentation and statistical analysis of historic and present catch series – including length / *skinn* composition and sex ratio of pods.

The first of these would enable all surveys – however poor in area coverage, to be used in monitoring trends in abundance. This would also help to minimize costs in the future should only partial area coverage be feasible during surveys. However, ecosystem changes might also influence whale distribution and these indices should be

used with caution. The second would involve analyses over time to detect oscillations and trends in the catch structure. Such an analysis is already planned to be undertaken by Bloch and Witting.

9.9.3 New requests and future work

The SC thanked the WG for its work, and recommended that calculation of new abundance estimates be prioritized using T-NASS and CODA data, and that analyses of indices of abundance be undertaken as proposed by the WG. The SC also recommended that new analyses and re-analyses of catch data and statistics be undertaken as a priority. The Committee recommends that a new assessment be made when the new estimates will be available.

The SC endorsed the recommendation of the WG on pilot whales that all survey plans, assessments, data analyses of catch and biological studies be routinely presented to the NAMMCO SC for evaluation, and that there should be an establishment of a standing WG on pilot whales that would meet periodically (e.g. every few years) to examine the information.

The SC requested the WG on pilot whales to reconvene as soon as practicable in order to complete its work and recommendations, taking into account comments that had been made during the main meeting.

Post script:

The WG on pilot whales reconvened after this SC meeting, in July 2008 in Copenhagen and produced a concluding report with recommendations on establishing a monitoring programme with various options involving different levels of monitoring and their related costs and benefits. This report was circulated among SC members and approved by correspondence. The WG report was then incorporated into the main SC report as an Addendum, which was presented to Council in August 2008 (NAMMCO 16). The recommendations from the WG were thus taken up for consideration in Council. The work of the WG is thus concluded for the present until Council request further action on implementation of the programme.

9.10 White-beaked, white-sided dolphins and bottlenose dolphins

9.10.1 Update on progress

Lagenorhynchus spp.

The Committee noted that any assessment of these species cannot be made before the end of 2008. It was also noted that there seem to be sufficient sightings from T-NASS surveys to generate an abundance estimate for at least white-beaked, and maybe white-sided dolphins (Iceland).

Mikkelsen reported that there had been no catches of white-sided dolphins in 2007 in the Faroes. No white-beaked dolphins have been caught in the Faroes.

Ólafsdóttir mentioned that there has been no progress on this species in Iceland since the last report. Samples of white-beaked dolphins are still being taken, but recently

only from strandings. Samples on diet and biological parameters from 70-100 animals have been analysed. A photo-ID project on white-beaked dolphins in Faxaflói and Húsavik area has been completed. This project was based on images of dorsal fins.

Víkingsson mentioned a tagging project of white-beaked dolphins in Faxaflói by an international group in 2006 which involved the capture and release of animals. The project investigated the characteristics of their acoustic and diving behaviour by employing conventional satellite transmitters and DTAGs.

Greenland reported that there is no work in progress on any of these species.

Tursiops
Mikkelsen reported that this species is occasionally observed in the Faroes. A few bottlenose dolphins are caught in the traditional drive fisheries.

The Committee noted that there are still not enough data to complete an assessment.

9.10.2 Future work
There is still insufficient information on white-sided dolphins, but the SC recommended that data from the T-NASS survey be analyzed for this species.

Mikkelsen reported that a satellite tracking project for white-sided dolphins is planned for the Faroes. This study will employ tags from Wildlife Computers and aims at a tag life of 200 days. The programme on the biology of the white-sided dolphin in the Faroes is in the analysis stage.

The SC recommended that white-beaked dolphin data from the Greenlandic aerial survey and the Norwegian shipboard survey be analysed.

9.11 Harbour porpoise
9.11.1 Estimate from T-NASS
Iceland, as well as Greenland to a lesser extent, have implemented modifications in their survey design to accommodate this species, as requested by the Council. This will lead to the first reliable abundance of harbour porpoises in Icelandic coastal area.

The Committee **recommends** that Greenland and Iceland coordinate the analysis of harbour porpoise data from the T-NASS surveys.

9.11.2 Update on the results of SCANS II
The abundance estimates within the 1994 survey area were calculated from the 1994 and 2005 data using density surface modelling; the estimates were 345,132 (95% CI: 272,904 – 479,222) and for 315,027 (95% CI: 201,507 – 395,077) respectively. Although the overall abundance estimates are not significantly different, there was a big difference in regional abundance between the 1994 and 2005, with lower abundance in the northern North Sea and a higher abundance in the southern North Sea and Celtic Sea in 2005.

9.11.3 Future work

Mikkelsen reported on plans for tagging of harbour porpoises in the Faroes and for a shipboard survey on the Faroese plateau in 2008-2009. It was recommended that this survey be designed to be compatible with SCANS II and other harbour porpoise surveys. It was suggested that a double platform setup similar to the SNESSA survey could also be used. There were also suggestions to investigate the possibility to employ an aerial survey.

Lydersen mentioned that a harbour porpoise has been photographed in Svalbard by the Monaco Glacier in 2006. The geographical configuration of the coast would have forced this animal to pass north of 80°N, thus giving it the northernmost record for a harbour porpoise. Occurrence of a harbour porpoise at this site was first recorded in 2004, then in association with a group of belugas.

With regards to conducting an assessment which might include distribution and abundance, stock identity, biological parameters, ecological interaction, pollutants, removals and sustainability of removals (NAMMCO 7), estimates of abundance and removals are still needed in all areas. The T-NASS survey will provide an estimate for the coastal area around Iceland, and maybe Greenland but will not do so for other areas.

10. BY-CATCH OF MARINE MAMMALS

Ólafsdóttir presented the report of the Working Group on By-Catch (BC WG) under the Management Committee in 2007. She reminded the Scientific Committee about the recommendations made:

1. Review by-catch monitoring systems used in other jurisdictions and various types of fisheries, and provide advice on the most effective systems in terms of delivering accurate and precise estimates of by-catch at reasonable cost;
2. Review information on fisheries and by-catch in NAMMCO member countries to determine which fisheries are likely to catch the greatest number of marine mammals and/or negatively affect the conservation status of marine mammal stocks;
3. Provide recommendations specific to country and fishery for monitoring by-catch in NAMMCO member countries;
4. On an ongoing basis, review the by-catch monitoring programmes in place in member countries and provide advice on how they can be improved.

10.1 Update on monitoring progress

10.1.1 Iceland

No progress on by-catch monitoring was reported for Iceland since the last meeting of the BC WG.

10.1.2 Norway

Haug presented SC/15/16 which described a system for monitoring by-catches of marine mammals in Norwegian coastal and inshore waters. A number of coastal fishing vessels had been contracted to provide very detailed information on their

fishing effort, catches and by-catches including incidental catches of seabirds and marine mammals. The skippers were offered economic compensation for providing the required information. The financial compensation in combination with the selection procedure and a continuous personal dialogue with the skippers contribute to the reliability of the reported information. A total of 18 vessels had been contracted by the end of 2005, two vessels in each of 9 fishery statistics areas covering the entire Norwegian coast. The data obtained so far indicates that this is a promising method for monitoring by-catches and estimating total removals of marine mammals by commercial coastal fisheries. Haug also presented SC/15/17 which reported the number of mammals taken as by-catch by the 18 vessels in 2006: 149 harbour porpoises, 27 harbour seals, 10 grey seals and 8 harp seals. A method to be used to extrapolate by-catches from observed fishing effort (on the 18 vessels) to total fishing effort (the entire Norwegian coastal fleet) has been developed and is currently being validated.

10.1.3 Faroes

No progress has been made in the Faroes on this subject.

10.1.4 Greenland

There is no separate reporting of by-catch for either small cetaceans or seals. By-catches are expected to be reported with direct catches, although this is not mandatory.

10.2 New request and future work

The Committee recommends the organization of a workshop to review the use and applicability of the by-catch monitoring systems in use in different organizations. It was suggested to seek contact with other organizations dealing with by-catch monitoring in view of initiating collaboration on this matter. Ólafsdóttir was designated chair for the Working Group for this workshop with the support and help from the NAMMCO Secretariat.

The following documents will be used to set priorities in the assessment of by-catch among the different species and fisheries.

- NAMMCO 15/MC/BC/6 - Bjørge, A., Ynnesdal, H. and Hartvedt, S. Spatial structure of Norwegian fisheries and the associated risk for by-catches of marine mammals.
- NAMMCO 15/MC/BC/7 - Bjørge, A., Borge, A. and Kleven, S. Observed and reported by-catches of marine mammals in Norwegian shelf and offshore fisheries, 2005.
- NAMMCO 15/MC/BC/9 - Ugarte, F. Potential for by-catch in Greenlandic fisheries.
- NAMMCO 16/MC/BC/6 - Bjørge, A. Information on observed by-catches of marine mammals in some selected Norwegian fisheries in 2006.

The Committee recommends that Iceland proceed in implementing a monitoring programme for its fleet.

11. PUBLICATIONS

11.1 NAMMCO Scientific Publications (NSP)

11.1.1 Update on the grey seal volume and NASS volume

Grey Seals volume

Acquarone reported that the NSP 6, Grey Seals in the North Atlantic and the Baltic was published and distributed in 2007. This volume has had a considerable success as demonstrated by the interest it has attracted and sales at the SMM Biennial Conference 2007 and at the ECS Annual Conference 2008.

Mention of this volume has been made on the MARMAM discussion list both as a volume and as individual articles.

A copy of the volume has been sent to the Editors of *Marine Mammal Science* with the purpose of reviewing.

NASS volume

Acquarone reported that the articles for inclusion in the volume have all been reviewed and that all but two are ready for publication.

Pike will shortly write the Introduction and together with Lockyer will begin the final editing of the volume.

The Committee recognizes the need to complete the process and recommends to proceed speedily with the publication process.

11.1.2 Update on the harbour seal volume

Desportes reported that the Editors (Desportes, Bjørge, Rosing-Asvid and Waring) have received responses from thirty groups and that therefore it is foreseeable that a similar number of papers will be submitted. Tentative titles and volume thematic subdivisions are listed in document SC/15/13. The deadline for submission has been set to 30 June 2008 and publication is expected in the first quarter of 2009.

It was noted that the editing responsibility, including contact with reviewers, has been divided among the editors.

11.2 Other publications

T-NASS:

Desportes reported that T-NASS participants have expressed interest in publishing the results from the 2007 surveys in a common platform. She mentioned that Greg Donovan (IWC) had offered to dedicate an issue of the *Journal of Cetacean Research and Management (JCRM)* to this purpose. Alternatively the T-NASS results could be submitted simultaneously to another journal (e.g. *Deep Sea Research*).

The Committee recommended that the Secretariat investigates the possibility of a common IWC- NAMMCO volume of JCRM and encouraged the authors to strive to publish all the T-NASS-related results in the same publication.

The Committee recommended looking into the possibility of making the NAMMCO Publications Series available online.

12. BUDGET

Desportes presented the budget and accounts which detailed the costs of all the Scientific Committee activities throughout 2007. These costs included special costs related to activities up to, during and after the T-NASS surveys. Acquarone proceeded to introduce the budget for the year 2008. As for the previous year, the budget included specific travel funding provided to experts, meeting costs and work contracts and T-NASS-related activities. All costs were within budget, and both the 2007 budget and accounting and the 2008 budget were approved as presented.

13. FUTURE WORK PLANS

13.1 Scientific Committee

It was decided that the next meeting of the Committee will be held in the Faroes at a place yet to be decided. The time for the meeting will be decided according to the timing of the next Council Meeting. Two alternative dates have been suggested:

1. Late April-early May 2009 if the Council decides to meet in the fall 2009
2. Middle-late November 2009 if the Council decides to meet in the spring 2010

13.2 Working groups

The following working groups will hold meetings during 2008/2009:

• Monitoring of pilot whales	summer 2008[2]
• Abundance Estimates	before the Assessment of whales
• Assessment of fin whales	before spring 2009 (before the next SC meeting)
• Assessment of minke whales	2008-2009
• Assessment of humpback/sei whales	The first step together with Assessment of fin whales
• Marine Mammals and Fisheries Interactions	between October 2008 and March 2009
• Beluga and narwhal	before March 2009
• By-catch monitoring	first half of 2009
• Walruses	2008-2009

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

13.3 Other matters

[2] Meeting held in Copenhagen, July 2008. The Report is NAMMCO/17/5 Addendum.

The Secretariat took note of these scheduled meetings and also noted that there might be additional requests from the Council in 2008. These will be reflected in the preparation of the 2009 budget.

14. ANY OTHER BUSINESS

14.1 IWC Workshop on Maximum Sustainable Yield Rate

Walløe attended this meeting in Seattle (WA, USA) in November 2007 on behalf of the Committee. No observer report has been provided to this meeting.

14.2 Marine Mammal Oil

An "Expert meeting on potential positive health effects of consuming whale and seal oil" was held in Copenhagen on 3 October 2007 hosted by NAMMCO. Acquarone reported that this meeting brought together a wide variety of stakeholders from research groups on human health, representatives of marine mammal hunter associations, producers of marine oils, politicians and managers. It was noted that positive effects of consuming marine mammal oils especially on joint pain and irritable bowel disease are evident and lasting and that these are maximised when the oil is cold-pressed and consumed mixed with high quality fish or olive oil.

14.3 Seals and Society Meeting

Acquarone reported about the "Seals and Society – how to manage resources and interactions in the Baltic Sea and North Atlantic" meeting in Vaasa (Finland) 16-18 October 2007. He mentioned that this conference was organized on the occasion of the Finnish presidency of the Nordic Council of Ministers. The aim of the conference was to generate solutions towards implementing sustainable management strategies for seal stocks and interactions between seals and society. Furthermore, the conference aimed at facilitating the exchange of experiences encountered in the Baltic Sea and North Atlantic and at identifying strategies and best practices for the implementation of seal stock management and conservation. The NAMMCO Chair Kate Sanderson chaired sessions of the conference and the NAMMCO Secretariat and several members of the Scientific and Management Committees attended the meeting and actively participated in the discussion. Material on the conference is available on the web page *www.seal2007vaasa.fi*

14.4 Bio-logging Conference

Lydersen mentioned that Barbara Block and Dan Costa, principal investigators of Tagging of Pacific Predators (*www.topp.org*), a Census of Marine Life project, are hosting the Third International Bio-logging Science Symposium. The gathering will take place from September 1-5, 2008 at the Asilomar Conference Grounds in Pacific Grove, California. Lydersen pointed out that this conference has high interest for people involved in tagging of marine mammals and that a special volume including the proceedings of the meeting will be published.

14.5 Election of Officers

The period of office for the current Chair and Vice-Chair is due to expire at the Council meeting in September 2008 after the report of the SC has been presented,

according to current Rules of Procedure (ROP) for the SC. It had been discussed within the committee whether or not a 3-yr term of office would not be more practicable for both the chairpersons and the Secretariat to enable better continuity of work. The present and past chairs noted that it took about a year just to become familiar with NAMMCO procedures. In the past, several Chairs have extended their terms of office for different reasons.

For practical reasons it was noted by the Secretariat that it would benefit from an experienced Chair while the new Scientific Secretary learns the tools of the trade.

The SC were thus in favour of proposing a change to the SC ROP to extend the terms of office to 3 yr, and recommended a standard 3-yr term of office as Chair and Vice-Chair. A proposal will put to Council (as per NAMMCO SC ROP Item VII).

The SC meanwhile, re-elected Desportes as Chair and Lars Witting as Vice-Chair. Desportes agreed to continue in office for a full 3-yr term (or through the next SC meeting and subsequent Council meeting) before transferring over to the current Vice-Chair, Witting. The SC members present were unanimous in agreement to this, and thanked her for her continued efforts.

15. MEETING CLOSURE

15.1 Acceptance of report

A draft version of the Report, containing all items that were agreed upon, was accepted on 14 April 2008. The final version was accepted by correspondence on 1 June 2008.

15.2 Closing remarks

The Chair noted that many studies which were referred to during the meeting, presented or commented upon, were often not tabled at the meeting, including papers which should be presented at the IWC SC shortly after. She thought this was a shame, since their presentations would increase information sharing within the committee. She asked therefore if people would agree to present the relevant documents as ‘other publications’ – already published articles can also be presented as such. The committee agreed to do so for this and the meetings to come.

The Chair thanked Acquarone for his diligent rapporteuring, and the Secretariat for organizing the meeting and for general support. The SC in turn thanked Desportes for her able chairing of the meeting. The meeting was then declared closed.

Appendix 1

AGENDA

1. CHAIRPERSON'S WELCOME AND OPENING REMARKS

2. ADOPTION OF AGENDA

3. APPOINTMENT OF RAPPORTEUR

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS
- 4.1 National Progress Reports
- 4.2 Working Group Reports
- 4.3 Other reports and documents

5. COOPERATION WITH OTHER ORGANISATIONS
- 5.1 IWC
- 5.2 ASCOBANS
- 5.3 ICES and NAFO
- 5.4 Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga

6. ROLE OF MARINE MAMMALS IN THE MARINE ECOSYSTEM
- 6.1 Update on the Dartmouth conference (Sep/Oct 2008)
- 6.2 Update on progress on modelling
- 6.3 Working Group on Marine Mammal – Fisheries Interactions
- 6.4 Icelandic programme on the feeding ecology of minke whales
- 6.5 New request and future work
- 6.6 Other matters

7. SEALS AND WALRUSES STOCKS - STATUS AND ADVICE TO THE COUNCIL
- 7.1 Harp seal and 7.2 Hooded seal
  - 7.1.1 and 7.2.1 Update on progress, incl. 2007 survey
  - 7.1.2 Future work
- 7.2 Hooded seal
  - 7.2.1 Taken under 7.1
  - 7.2.2 Review of SC recommendation from 2007
  - 7.2.2 New Requests and future work
- 7.3 Ringed seal
  - 7.3.1 Update on progress
  - 7.3.2 Future work
- 7.4 Grey seal
  - 7.4.1 Update on the Norwegian 2006 and 2007 surveys and effect of harvest levels
  - 7.4.2 Update on the Faroese satellite tagging programme and catch levels
  - 7.4.3. Update on other progress

13.1 Scientific Committee
13.2 Working groups
13.3 Other matters

14. ANY OTHER BUSINESS

14.1 Report on the IWC workshop on Maximum Sustainable Yield rate (Seattle, Nov 2007)
14.2 Marine Mammal Oil meeting
14.3 Seals and Society Meeting
14.4 Bio-logging conference
14.5 Election of officers

15. MEETING CLOSURE

15.1 Acceptance of report
15.2 Closing remarks.

Appendix 2

LIST OF DOCUMENTS

Doc. No.	Agenda	Title
SC/15/01		List of participants
SC/15/02	2	Provisional Annotated Agenda
SC/15/03	4	List of Documents
SC/15/NPR-F	4.1	National Progress Report – Faroe Islands
SC/15/NPR-G	4.1	National Progress Report – Greenland
SC/15/NPR-I	4.1	National Progress Report – Iceland
SC/15/NPR-N	4.1	National Progress Report – Norway
SC/15/NPR-C	*4.1*	*National Progress Report – Canada*
SC/15/NPR-R	4.1	National Progress Report – Russian Federation
SC/15/NPR-J/1	4.1	National Progress Report– Japan / Large Whales
SC/15/NPR-J/2	4.1	National Progress Report– Japan / Small Cetaceans
SC/15/04	5.1	Observers Report: 59th Meeting of the IWC Scientific Committee, Alaska
SC/15/05	5.2	Summary of relevant items from the report of the 14th ASCOBANS Advisory Committee Meeting (no observer)
SC/15/06	5.3	Report from the 2006-2007 activities in ICES
SC/15/07	9	Report of the NAMMCO 3rd Meeting for the Trans North Atlantic Sightings Survey, St Andrews, March 2007.

SC/15/08	9	Report of the NAMMCO 4th Meeting for the Trans North Atlantic Sightings Survey, Telephone meetings, October 2007.
SC/15/09	7, 9	Report of the NAMMCO Planning Committee for the Trans North Atlantic Sightings Survey, April 2008.
SC/15/10	7, 9	Report of the NAMMCO Working Group on Abundance Estimate
SC/15/11	8.9	Report of the NAMMCO Working Group on the Faroese Pilot Whale Catch Monitoring Programme
SC/15/12	13	SC budget 2007 and draft budget 2008
SC/15/13	14	Summary of 2007 requests by NAMMCO Council to the Scientific Committee, and plans of the Scientific Committee
SC/15/14	12.1	Status of NAMMCO Scientific Publications
SC/15/15	10.2	By-catch: request from Council and report of the MC-WGBC to the Management Committee
SC/15/16	10.1	Bjørge, A. *et al*. (Methods for collecting by-catch data in Norway)
SC/15/17	10.1	Bjørge, A. Preliminary Progress Report on Marine Mammal By-catch Monitoring in Norway, 2007 (Observed by-catch data from 2006)
SC/15/19	5.3, 6.2	Observers Report: FAO Workshop on Ecosystem Modelling, Italy
SC/15/20	14	Summary of requests by NAMMCO Council to the Scientific Committee, and responses by the Scientific Committee
SC/15/21		Frie, A.K. Distribution and diversity of grey seal haplotypes in the North Atlantic and the Baltic Sea.
SC/15/O01	7.2	Salberg, Arnt-Børre, Haug, Tore and Nilssen, Kjell Tormod. 2008. Estimation of hooded seal (*Cystophora cristata*) pup production in the Greenland Sea pack ice during the 2005 whelping season in the Greenland Sea pack ice during the 2005 whelping season
SC/15/O02	7.1	Skaug, Hans J., Frimannslund, Lennart and Øien, Nils I. 2007. Historical population assessment of Barents Sea harp seals (*Pagophilus groenlandicus*)

SC/15/O03	7.1, 7.2	Haug, Tore, Nilssen, Kjell Tormod and Øigård, Tor-Arne. Report from surveys to assess hooded and harp seal pup production in the Greenland sea pack-ice in March-April 2007.
SC/15/O04		Haug, T., Stenson, G.B., Corkeron, P.J. and Nilssen, K.T. 2006. Estimation of harp seal (*Pagophilus groenlanicus*) pup production in the North Atlantic completed: Results from surveys in the Greenland Sea in 2002. *ICES J. Mar. Sci.* 63: 95-104.
SC/15/O05		Freitas, C., Kovacs, K. M., Ims, R. A., Fedak, M. A., and Lydersen, C. 2008. Ringed seal post-moulting movement tactics and habitat selection. *Oecologia* 155:193–204.
SC/15/O06		Fulton, E. A., Smith, A. D. M. and Punt, A. E. 2005. Which ecological indicators can robustly detect effects of fishing? *ICES J. Mar. Sci.* 62: 540 – 551
SC/15/O07		Garcia, S. M., Zerbi, A., Alliaume, C., Do Chi, T. and Laserre, G. 2003. The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper no. 443. Rome, FAO. 71pp.
SC/15/O08		Innes, S., Heide-Jørgensen, M.P., Laake, J.L. Laidre, K.L., Cleator, H.J., Richard, P. and Stewart, R.E.A. 2002. Surveys of belugas and narwals in the Canadian High Arctic in 1996. *NAMMCO Scientific Publications* 4: 169-190
SC/15/O09		Krafft, B. A., Kovacs, K. M. and Lydersen, C. 2007. Distribution of sex and age groups of ringed seals *Pusa hispida* in the fast-ice breeding habitat of Kongsfjorden, Svalbard. *Mar. Ecol. Prog. Ser.* 335: 199–206.
SC/15/O10		Lydersen, C., Martin. A. R., Gjertz, I. and Kovacs, K. M. 2007. Satellite tracking and diving behaviour of sub-adult narwhals (*Monodon monoceros*) in Svalbard, Norway. *Polar Biol.* 30:437–442.
SC/15/O11		Plagányi, É. 2007. Models for an ecosystem approach to fisheries. FAO Fisheries Technical Paper No. 477. Rome, FAO. 108pp.
SC/15/O12		Tryland, M., Krafft, B. A., Lydersen, C., Kovacs, K. M. and Thoresen, S. I. 2006. Serum chemistry values for free-ranging ringed seals (*Pusa hispida*) in Svalbard. *Vet. Clin. Pathol.* 35(4):405–412.

SC/15/O13 Tryland, M., Thoresen, S. I., Kovacs, K. M. and Lydersen, C. 2006. Serum chemistry of free-ranging white whales (*Delphinapterus leucas*) in Svalbard. *Vet. Clin. Pathol.* 35(2):199–203.

SC/15/O14 Wiig, Ø., Born, E. W., Gjertz, I., Lydersen, C. and Stewart, R. E. A. 2007. Historical sex-speciWc distribution of Atlantic walrus (*Odobenus rosmarus rosmarus*) in Svalbard assessed by mandible measurements. *Polar Biol* 31:69–75.

SC/15/O15 Wolkers, H., Lydersen, C., Kovacs, K. M., Burkow, I., and van Bavel, B. 2006. Accumulation, Metabolism, and Food-Chain Transfer of Chlorinated and Brominated Contaminants in Sub-adult White Whales (*Delphinapterus leucas*) and Narwhals (*Monodon monoceros*) From Svalbard, Norway. *Arch. Environ. Contam. Toxicol.* 50: 69–78.

SC/15/O16 Nilssen, K.T. and Haug, T. 2007. Status of grey seals (*Halichoerus grypus*) in Norwegian waters. *NAMMCO Sci. Publ.* 6: 23-32.

SC/15/O17 Burt, M., Borchers, D.L. and Samarra, F. Design-based abundance estimates from SCANS-II.

SC/15/O18 Burt, M.L., Borchers, D.L. and Paxton, C.G.M. Model-based abundance estimates from SCANS-II.

Appendix 3

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ANNEX 1.1

NAMMCO PLANNING COMMITTEE ON THE TRANS NORTH ATLANTIC SIGHTINGS SURVEY (T-NASS) WORKING GROUP III

St. Andrews, UK, 30 March – 1 April 2007

PLENARY SESSION

1. CHAIRMAN'S WELCOME AND OPENING REMARKS

The Chairman, Geneviève Desportes, welcomed the Delegates (see Section 5) to the third planning meeting for the Trans North Atlantic Sightings Survey (T-NASS), kindly hosted by Phil Hammond at the Sea Mammal Research Unit (SMRU). She briefly reminded the convened Delegates of the unprecedented uniqueness, value and synoptic character of T-NASS. A listing of the agreements from the two previous meetings and a reminder of the time constraints ahead followed. The Chairman underlined that the Delegates have agreed on strong coordination and invited them to briefly introduce themselves to the new members. Finally the Chairman pointed out that by end of the meeting a draft instead of a full meeting report would be produced and that the full report will be submitted to the Delegates for approval by e-mail by the end of April.

2. ADOPTION OF THE AGENDA

The draft Agenda circulated before the meeting (Appendix 1) was adopted unanimously without modifications.

3. APPOINTMENT OF RAPPORTEURS

The NAMMCO Outgoing Scientific Secretary (Daniel Pike) and Appointee Scientific Secretary (Mario Acquarone) were designated as general rapporteurs. Specifically, Greg Donovan volunteered for reporting on the Aerial Surveys Working-Group and Mario Acquarone for reporting on the Shipboard Surveys Working-Group.

4. STATUS

At this point the Chairman invited the Delegates to present the status of the project in their respective areas.

4.1 Resources per area

Faroes

One vessel able to carry two platforms has been approached, but the charter contract has not been signed yet.

Iceland

A formal request procedure had to be followed, only 2 offers for vessels had been received, but none was good enough and both were refused. The Redfish Survey

vessel is ready and available. Other possibilities are being investigated to obtain vessels for the main T-NASS and there is confidence in finding other vessels in a matter of weeks. A Partenavia Observer aircraft equipped with bubble windows, and possibly even with photo equipment, has been secured for charter between 20 June- 21 July. This should amount to approximately 100 hr flying-time.

UK-CODA

The tender process for the ship charters will be completed in May and the contacts will be passed on to Iceland. There may be 2 Faroese platforms in sight.

Greenland

The vessel available for the Shipboard Survey belongs to the Danish Navy. The Navy has specified that they would have to respond to any emergency during the survey period, which could mean an interruption of the survey work. The ship will be made available in Ilulissat and has to return to Narsarsuaq at the end. This means that the surveying work will have to follow a North to South course. Due to military obligations the vessel will have to stay in Greenlandic waters. The Canadian part of South Baffin Bay and Davis Strait will have to be surveyed otherwise. The Greenland Delegate remarked that it is a small round-bottom vessel which may be very uncomfortable for the observers and have practical stability problems. A contract with Air Greenland has been signed for the charter of a Twin Otter aircraft with bubble windows for a series of surveys beginning in mid-August.

Canada

This survey will be conducted by the Federal Department of Fisheries and Oceans (DFO). Funding for the the Newfoundland-Labrador strata has been secured, and it will be surveyed using a charter Twin Otter aircraft. $100K CAN funding for the Gulf area survey component has been secured, and there is a an assurance that funds to conduct the full Gulf survey (an additional $50K CAN) will be found. As far as the Scotian shelf area is concerned there is no funding yet, but there is reasonable certainty that the area will be surveyed. The intent is to begin the Canadian survey in mid July in the northern Labrador area, and continue southwards in what is presumed to be the opposite direction to the annual migration patterns of several large whale species expected in the survey area. The Gulf survey will commence in July, with the likely survey platform being a Cessna 337 Super Skymaster (as has been done in previous surveys here). If funding is available, the Twin Otter team will continue flying transects along the Scotian Shelf in August at a time to correspond with the American effort to the south. The survey transects will be designed for all strata in the Canadian survey areas (with the assistance of D. Pike), and logistical planning is underway to begin the surveys later in the summer. All necessary equipment is in place to carry out the visual surveys. No vessel-based observations are planned. Lawson has requested several days flying time on a Canadian military aircraft, the Arcturus, whose primary mission is to monitor fisheries within NAFO areas. The aircraft has long range (up to 17 hours duration), is extremely well-equipped with navigation, observation and acoustic recording equipment. However this aircraft has a minimum manoeuvring airspeed of 170 knots which may be faster than practical for a marine mammal survey. The Canadians are hoping to assess the efficacy of this

platform during several trial flights in the Davis Strait between southern Baffin Island and Greenland, and off the Flemish Cap of eastern Newfoundland. The hope is that Jack Lawson will employ this platform in August.

4.2 General funding available

NAMMCO council has decided to allocate most of the 2007 NAMMCO Scientific Committee budget plus a special allocation of 150,000 NOK to T-NASS and T-NASS extension.

The Nordic Council of Ministers had allocated to T-NASS 128,000 DKK. There has been no success in finding additional funding. The latest rejection came from the Danish "A.P. Møller og Hustru Chastine McKinney Møllers Fond til amene Formal". The rest of the funding needed for equipment, salaries etc. will have to be sought from other sources.

NAMMCO will address applications for sponsorships in the order of magnitude of *ca* 20-50,000 DKK to small companies in the different T-NASS countries, if the necessary information is forwarded by these countries. An application of this kind has already been sent out in Iceland and a response is expected shortly. (for information, the answer given after the end of the meeting was positive and *ca* 300 kDKK were secured for the Icelandic part of the acoustic survey)

There is some uncertainty on how to finance the salaries of the observers on the Greenlandic surveys.

Some equipment could be loaned or rented. Paul Thompson makes available up to two hydrophones, even though one has to undergo repair. However they are different to the ones used in SCANS II and CODA and special analysis would be necessary, which is not optimal. Canada later agreed to loan two pairs of "Big Eye" binoculars and stands to other partners, as well as two sea surface temperature measurement systems for the aerial survey teams.

The Chairman urged all the Delegates check and report to the Secretariat the amount of funding already secured and what is needed for the ordering of necessary equipment (*e.g.* hydrophones for acoustic monitoring and standard material for opportunistic surveys).

4.3 Coordination with opportunistic surveys

Redfish Survey in the Irminger Sea

All vessels will embark observers and all have the capability of towing hydrophones. The **German vessel** will be leaving Bremerhaven 14 June and is planned to be back by 14 July. NAMMCO will provide two whale observers for this ship. The **Russian vessel** *Smolensk* will have one NAMMCO observer and one Russian observer onboard. It will be preferable to pick up the NAMMCO observer in Reykjavik for bureaucratic and practical reasons. *Smolensk* will leave Murmansk between 5-10 June and will have to be back in Murmansk at the end of July – for approximately 50 cruise

days. *Smolensk* will be calling in Reykjavik 22-24 June/9-10 July. In the Norwegian Sea, on its way to the Irminger Sea it will perform other Oceanographic and Ichthyology work within the framework of the INFERNO cooperation between Russia and Norway.

Pelagic survey in the Norwegian Sea: Norway

Two vessels have been charted for three weeks between 15 July and 7 August to perform an adaptive survey in a large area of the Norwegian Sea. One vessel will have BBC people to film blue whales in the waters around Jan Mayen. There will be two T-NASS observers on each vessel. IMR will hire the observers directly and NAMMCO will provide the equipment and the procedure.

4.4 SCANS II

Data analysis problems, avoidable with a better data collection. A list of comments based on her experience with SCANS II data was provided by Louise Burt (Appendix 2).

5. GENERAL STRATEGY FOR COVERAGE

The general strategy for coverage was discussed in the following points.

5.1 Survey design in Distance

Presentation by Len Thomas based on the distributed paper "Designing line transect surveys for complex survey regions" *J.Cetacean Res.Manage.*

An interesting and useful presentation was held by Len Thomas on the use of the programme *Distance* and on *Survey Design*. Among the points he made was that effort should be distributed equally over the survey area unless there is prior information that warrants stratification. The general coverage probability can be estimated if the coverage probability for all sub-areas is known. However this calculation is not (yet) implemented in *Distance*.

As far as the design of transects, it is clear that zigzag minimizes lost effort for transport from one transect to the next and that it is best to get many reasonably short transect samplers rather than few long ones. In big areas it is possible and advisable to divide the stratum lengthwise so that the number of lines, and thus samples, will be increased. This presents the advantage that the lines can be cruised in both directions In general an equal spaced zigzag has proven best for non rectangular areas.

In case the shape of the strata is very complex one can improve and ease the design by cutting the complex shape into sub-areas while retaining spacing. One will typically then generate several survey simulations for the same area. The subdivision in sub-areas presents the drawback that transects in adjoining sub-areas do not necessarily join up.

Complex coastlines such as fjord areas will necessarily present serious edge effects that are large proportional to the survey area. In this case it is generally more correct

to orient the transect lines perpendicular to long axis but shallow angle zigzags could also be used.

5.2 Considering the combination of both dedicated surveys and opportunistic surveys: do we want overlapping areas or can we rely on the opportunistic data?

The value of simple distribution data and on the importance of maximizing coverage was generally agreed upon. It was pointed out by some Delegates that T-NASS should strive as far as possible to provide an estimate compatible with IWC standards and this might mean that the opportunistic surveys could not be included for a density estimate within the IWC framework.

In conclusion all the important areas for which it is necessary to obtain a reliable population abundance estimate of target species have to be covered by a dedicated Survey.

6. SCANS II SHIPBOARD METHODOLOGIES: VISUAL AND ACOUSTIC (Presentation by Doug Gillespie and Rene Swift)

SCANS II shipboard methodologies were presented by Doug and Rene in their lab.

6.1 Presentation of the shipboard visual and acoustic methodologies and protocols

This point was treated together with the next in the laboratory with the equipment at hand.

6.2 Presentation of shipboard visual equipment and acoustic equipment

See above 6.1.

SUB-COMMITTEES

7A. SURVEY DESIGN

Present at this Sub-Committee were: Pike (chair), Acquarone (rapporteur), Desportes, Donovan, Golyak, Gunnlaugsson, Hammond, Lawson, Mikkelsen, Simon, Vikingsson, Zabavnikov and Øien. The Sub-Committee Chair Daniel Pike reminded the Delegates that the aim of the Sub-Committee is to help and assist with designing the following components of the survey (from West to East):

- Canadian aerial surveys, including Twin Otter, Skymaster, and Arcturus components;
- West Greenland Ship Survey;
- Iceland ship survey, taking into account existing redfish design;
- Iceland aerial survey, secondary inshore strata;
- Faeroes ship survey.

The task can be divided into the following 3 components:

1) Establishing boundaries of survey areas;
2) Stratification and Effort allocation;
3) Transect design.

The first two points should be agreed upon as a group and the transect design will be left for a specialized working group.

In general the procedure should be:

1) Establishment of boundaries of national survey areas, with regard to known boundaries of other surveys, available effort and species distributions.
2) Stratification within areas, based mainly on species distributions.
3) Assignment of effort to these strata, based on expected density of target species.

For the moment the Sub-Committee should concentrate its work on procedural points 1) and 2).

7A.1 Survey boundaries (in coordination with CODA, SNESSA and opportunistic surveys)

Because of the synoptic aspect of T-NASS it is necessary to examine the different areas each for itself and as a whole.

Norway

It has been decided to give highest priority to survey the Eastern Barents area if the permission from Russia can be obtained. A final decision on the permission to enter Russian waters is not far away. In the best of cases one vessel will survey the Eastern Barents Sea and the other will concentrate on VHF tagging and looking for blue whales with the BBC. A "Plan B" for Norway in case permission from Russia is refused could be to add to survey blocks BJ, NØN, SV and SVI.

The southernmost boundary of the Norwegian survey will be 74°N which will coincide with the northernmost extent of the Icelandic survey.

The committee regretted that very little, if any, consideration was given to T-NASS needs in the Norwegian decision.

Greenland ship

The ship survey should extend to the Greenland-Canada mid-water line. Greenland will have:

- a wide northern area out to 58°W from just south of Disko and down to the latitude of Nuuk
- a narrow southern area a little bit beyond the shelf extending a little the previous surveys.

It was agreed that these are fin whale areas and that we have to allocate equal sighting probability for the two strata.

Canada
Survey transects will extend from the coastlines out to slightly past the shelf break. The southeastern part of the Newfoundland area will be covered as much as possible but will have to be truncated at its outer margin because of technical considerations (Twin Otter range). The proposal for the Arcturus will be to survey across the southern Davis Strait (and perhaps the southwestern tip of Greenland), and off the Flemish Cap of S.E. Newfoundland over a period of 2-3 days.

Faroes
The area to be covered by the Faeroese will be contained between the Icelandic areas in the West, the Norwegian area in the North and the CODA boundary in the East. It was agreed to use a southern boundary at 52° N. Available effort is known.

Iceland ship
It was agreed to use a southern boundary at 52°N extending as far east as the CODA boundary and that it was not necessary to re-cover the opportunistic areas unless there is a very high density of animals. It was also agreed to delimit the north block I at 74°N and 4°W. The 74°N is because of the "Plan B" Norwegian survey which is planned to extend down to that latitude.

The Western boundary of the Icelandic Redfish vessel will be Cap Farvel so it meets with the Greenlandic ship survey. Available effort is known.

The two blocks south and east of Iceland will be covered by the Icelandic and Faroese vessels respectively.

Iceland aerial secondary strata
These will be done on days when it is impossible to fly offshore. It should be considered a pilot project and should cover several fjords that are not well covered in the main survey by establishing transects in them. There is little information available on the distribution of harbour porpoises in the area. Available effort is not known and these will be done opportunistically.

CODA's bight, south of Ireland, will be filled by France. The North and northwest boundaries are flexible. CODA will join to the SCANS II area, and the Faroese T-NASS block and CODA will join.

Additionally
Stratification of the new areas will be executed in an appropriate manner to reduce effort in areas of lesser priority because of the coverage by opportunistic surveys.

A small block "opportunistic stratum" will be drawn around the Charlie Gibbs fracture zone to be surveyed if there is time (down to 50°N). This can be done by the Icelandic or the Faroese vessels or both.

7A.2 Stratification

Canada

- Newfoundland: on the basis of fin and blue whale distribution there will be 3 strata, North, South and Central with most effort allocated to Central. Attention should be paid also to minke whale distribution, especially Davis Strait sightings.
- Gulf: stratification is complete and based on previous DFO aerial surveys by Kingsley.
- Scotian Shelf: not much basis for stratification, maybe East - West blocks but maybe not.

Greenland

- It was suggested as a possibility to divide the area from Nuuk south to Kap Farvel, into an inshore and offshore stratum. The inshore stratum should have most effort and should extend to just beyond shelf break, maybe 10 km or so.
- The coverage by the Arcturus might depend on realized effort in offshore stratum.

Iceland

- *Redfish blocks*: it was suggested to divide the area into 3 blocks: North, West and South, with higher effort in North and West blocks.
- Otherwise it should be similar to 2001 scheme.
- Eastward extent depends on the extent of the Norwegian survey.
- It my be useful to consider a southward extension west of Coda and east to Redfish extension blocks, as this is an important area for pilot whales and other species such as beaked whales.

Faroes

- Similar to 2001 but it depends on where the Norwegian effort is allocated.

7A.3 Effort allocation by stratum (and estimation of realizable effort)

The northern blocks

These will be divided in two blocks by a vertical line and the two resulting blocks will have equal coverage.

Redfish blocks

- A Western stratum that as far as possible has equal area coverage.
- A Northern area will be an extension of the Northern block (already decided).
- A Western boundary to the south-central block will be moved slightly to the west to include the Mid-Atlantic ridge. But pay attention: “the world is big down there” (Phil Hammond).

Greenland

Equal coverage will be attempted as a starting point (equal-space zigzag).

Canada

The Newfoundland and Labrador (NL) survey component will comprise 3 strata, with most effort allocated to the eastern stratum that will extend from southern Labrador to the southeastern coast of the island: NL Labrador Stratum (69,540 n.mi^2, 20% of NL effort); NL Eastern Stratum (81,360 n.mi^2, 40% of NL effort); NL Southern Stratum (62,660 n.mi^2, 40% of NL effort).

- Scotian Shelf: no stratification is planned, assuming equal probability (56,810 n.mi^2).
- Gulf: stratification from previous DFO surveys, assuming equal probability (66,930 n.mi^2).
- An equal-spaced zigzag pattern will be used in the Newfoundland and Labrador, and the Scotian Shelf strata. East-west and north-south transects will be employed in the Gulf strata.
- The opportunistic Arcturus trial will cover survey areas as determined above.

Norway

The Norwegian vessels will sail from Kirkenes. Time allocation for T-NASS is 2-3 weeks.

- It is recommended that Norway's survey join up appropriately at 74°N with the Icelandic block up to the ice edge, and that the transit area from Kirkenes be included.
- The committee appealed to Norway to use as much effort as they have available for a direct participation in the T-NASS effort.

7A.4 Transect design

See 7A.2 and 7A.3 above.

7A.5 Other (e.g. coastal harbour porpoise strata in Iceland)

See 7A.1 above.

7A.6 Rules for adaptation (i.e. changing the design underway)

It was firmly underlined that the tracks must **not** be redesigned underway so as not to jeopardize the validity of the estimate. However a redistribution of vessels is allowed.

Daniel Pike will provide the track design. He will contact the delegates for the details needed.

Geneviève reminded that, in the allocation of effort, training time on land and at sea has to be taken into consideration as it takes time to get used to the new technology and distance estimation.

It was agreed that at least 2 harbour days be used for equipment setup and use training and at least one sea day must be allocated to training in effort conditions and that training continues further until satisfactory results be obtained.

7B. SHIPBOARD PROTOCOLS

Present at this Sub-Committee were: Acquarone (rapporteur), Desportes (chair), Golyak, Gunnlaugsson, Hammond, Mikkelsen, Simon, Vikingsson and Øien.

The Chair (Desportes) reminded the group that the aim was not to finish the session with a written protocol, but it was important to reach an agreement on all the points that a protocol is composed of.

7B.1 Review of protocol for dedicated surveys with 8 observers and 2 independent platforms

7B.1.1 Survey modes

Iceland - Faroes - 4 vessels with 2 independent platforms which will follow the BT methodology, as agreed last meeting.

The higher-tracker platform will concentrate on far sightings and the lower-primary platform will concentrate on nearer sightings within 500 m from the trackline.

Tracking - it was agreed to track everything except sperm whales, and to assume minke whales as very high priority (i.e. always track even if you were tracking something else). It is important to be sure to track small cetaceans (species identification and school size).

It was agreed to track up to Sea State Beaufort 4 included, with no reason for tracking in Beaufort $\geq$ 5. When the conditions impose a stop in tracking, the platforms are combined as a single primary platform (the observers remain in place but work in the same way searching everywhere). A code should be inserted in the effort form for indicating which searching mode was used, i.e., the exact point when effort is shifted from two separate to one single (combined) platform should be recorded with certainty.

Note that when using the BT mode, it is important to keep the primary platform separate from the trackers, and to keep the same pairs of primary observers during the entire survey to minimize heterogeneity.

7B.1.2 Equipment

It was agreed not to use "Big eyes" because of cost and difficulty in timely delivery, but to use medium and small binoculars. The medium binoculars will be attached to a monopod fixed to the deck at the bottom end.

The observers should be advised to have their own computer with them to speed up the data validation and control process.

It was agreed on a previous occasion to use the visual equipment developed for SCANS and the order was placed for four kits.

7B.1.3 Survey procedures

Shipboard T-NASS will generally follow the procedures developed for SCANS.

For technical positions it might not be advisable to have persons with low computer or English skills (e.g. whalers).

Observers on the primary platform should concentrate to look and search without using binoculars up to 500 m but all their sightings will be recorded even beyond that distance.

T-NASS will aim to avoid paper forms, but these should be available in case of catastrophic events or "learning challenged" observers.

Observers with 7x50 binoculars should search between +60°-60° and the observers with the medium eyes binoculars should search +40°-40°. Trackers platform observers will track until duplicates are established or the animal has passed abeam of the vessel. The two trackers will cooperate on tracking the same sighting. The Duplicate Identifier (DI) will act as observer when not assisting the duplicate. The DI will be using 7x50 reticules and will pass any sighting to the trackers. Closing mode for ID will only happen when the sighting is abeam and closer than 1.5 nm.

7B.1.4 Sighting protocol

No need for discussion at this meeting.

7B.1.5 Data collection procedures

No need for discussion at this meeting.

7B.1.6 Calibration experiments (distance and angle experiment)

No need for discussion at this meeting.

7B.1.7 Data calibration

No need for discussion at this meeting.

7B.1.8 Cruise leader and observer training

Iceland

Training will be done by Desportes and Jacobsen (a tracker from SCANS II) first on land, then at sea and will possibly be held in common for all the vessels.

Faroes

Training will be done by Mikkelsen and Hansen (a tracker from SCANS II) first on land, then at sea.

7B.2 Review of protocol for the Greenlandic vessel with a single platform and 4 observers

Differing combinations of observers were suggested. One suggestion was to have at any time 2 observers on duty and 2 resting. The other suggestion was to have 3

observers working simultaneously and 1 rotating. It was recommended that if possible, 3 observers worked at the same time. If weather permitted long working days in a row, then two observers would work at any time. It was underlined that it is important to have best quality effort rather than effort over longer periods with doubtful quality (observers give better data working in pairs and need to rest). A minimum of 6 hrs rest per night was recommended.

Single Platform Surveys will be in Passing Mode (Closing allowed for species ID, when sighting passed abeam and not further than 1.5 nm)

The recommendation of the WG is to place 2 persons on the lowest platform. They should concentrate on searching with their naked eyes +90°-10° and reciprocal. Another observer should be placed in the crows' nest to keep a look out ahead with binoculars at +30°-30°. Binoculars (reticules) should in general be used only when looking at +30°-30° ahead.

The use of 3 observers is highly recommended and they have to be able to communicate easily with each other to avoid double sightings (via radio-link?). In case money is an issue then the observer in the barrel can communicate with the others through a radio-link. Data can be recorded on a single computer or on paper.

The ship will be in Nuuk in April and only at that time will it be clear if there is space in the crow's nest.

For the training of the observers, days must be allocated and eventually the cruise leader could be participating in the Icelandic training if useful (noting the difference in the equipment).

7B.3 Review of protocol for opportunistic surveys

7B.3.1 With 2 observers: Redfish (Russian and German) and pelagic survey

The ships will operate in passing mode with no closing. It was recommended that the two observers work and rest together at the same time.

To give an idea of the working hours it was pointed out that in the Norwegian Sea the rest time is usually 6 hrs. The Icelandic ships will trawl approximately 4 hrs three times a day when the speed will be at most 2 kn. This is an obvious time for the observers to rest. The Russian ship will trawl shallower with a corresponding reduction in trawl time.

The observers search with naked eyes from +90°-10° and reciprocal and that they use a recording system similar to the Greenlandic vessel. For large angles (60°-90° almost abeam) they should concentrate the search close to the vessel. Binoculars are only to be used for species ID and determination of school size.

7B.3.2 With one observer: MAR-ECO

The procedure is the same as those for the Redfish vessels. The recording system will also be the same as the Greenlandic vessel.

Single observers should look symmetrically around the trackline ahead, but concentrate on the trackline

7B.3.3 Training of 'opportunistic' observers

If possible, at the discretion and with the collaboration of the ship's captain, these observers could be trained in distance estimation using a buoy-radar reflector system.

7B.4 Ice edge protocol

In case of ice encounter the vessels should follow the SOWER protocol (IWC).

7B.5 Group size estimation for pilot whales and dolphins

In SCANS II Guidelines for Observers p.11 there are instructions for this situation. In those instructions it was indicated preferable to cut large groups in subunits and to record them separately. It is important to note as much as possible of the details of each sighting. For large and very "messy" groups, use common sense.

For all vessels, it is important to ensure that the data are entered/validated as soon as possible (e.g. every evening).

7C. AERIAL SURVEY PROTOCOL

Present at this Sub-Committee were: Donovan (Chair/Rapporteur), Lawson, Pike, Simon and Zabanikov.

7C.1 Review of protocol for dedicated surveys with 4 observers and 2 independent platforms (Iceland and Greenland – September survey)

7C.1.1 Survey mode

It was agreed that for fin and minke whales, cue counting would be the primary method, with blow being the cue for fin whales and dive the cue for minke whales. In practice, the data collected will be in a manner to allow either cue counting or line transect analyses as appropriate.

The surveys will be carried out in independent mode (at least one-way audio/visual isolation) to the extent possible. The pilot will not be considered as an observer but should quietly inform the cruise leader if making a sighting. Ideally, there will be an intercom system such that each observer has one way communication with the cruise leader during survey mode. For safety reasons, the pilot will need to be able to override the system. Further details can be found in the protocol document.

It is extremely important to ensure that the data are entered/validated as soon as possible (e.g. every evening). Appropriate software to allow the cruise leader to examine the data is essential to allow problems in collection to be identified as soon as possible. If necessary, an additional person should be used to ensure that the data entry entry/validation is kept up to date.

7C.1.2 Equipment

The Icelandic aerial survey will use the usual (serviced and checked) equipment for recording the necessary data for sightings (Icelanders to clarify the potential copyright issues around use of the Hval programme).

Jack Lawson has kindly offered to lend one Sea Surface Temperature (SST) sensor. It is recommended that this be used on both the Icelandic (July) and the Greenlandic (September) surveys provided this meets air safety approval for the planes. He will send the system to Iceland and Greenland as soon as possible.

There may be video/still photography capabilities on one or both surveys.

7C.1.3 Survey procedures

Survey speed

Aim for as slow as possible (around 100 knots) depending on stall speed.

Survey height

This depends on the primary target species. For the Icelandic survey, the altitude will be 600 feet as some priority is being given to harbour porpoises. In Greenland, it may be 750 feet (best for fin and minke whales) or lower if harbour porpoises are given some priority. There is no theoretical reason why different heights cannot be used depending on circumstances (e.g. low cloud, priority for harbour porpoises) provided altitude is accurately recorded (ideally a direct link to the altimeter) so that an appropriate effective searching width is estimated.

Survey conditions

Surveys will be carried out in Beaufort Sea States of 3 or less along with other acceptable visibility conditions (e.g. wind, rain, fog etc). Further details can be found in the protocol document.

Large schools

Procedure for closing on schools

In general, surveys are effectively carried out in 'passing mode' – however there may be occasions when it is not possible to get a good enough estimate of schools size (or for certain small cetaceans, species and school size) for priority species. It is important to take distance and angle readings to the smallest discrete groups feasible while on track. Include comments where appropriate. In such circumstances, the cruise leader may decide to close with the school after abeam and then circle to get a good estimate of school size. For surveys where a large number of non-primary target dolphin schools are expected/found that might result in considerable 'confirmation' time and compromise the overall survey for primary species, it might be appropriate to determine a rule (either random or every x^{th} sighting) to try to enable a correction factor to be determined (the school size estimates when abeam are compared with the 'confirmed' values). Further details can be found in the protocol document.

Recording of additional data (other than usual effort and sightings data associated with cetacean surveys)
It was agreed that recording of additional data should only be undertaken if the cruise leader was happy that this would not interfere with cetacean sightings and recording of primary data. Seal sightings will not be recorded in the Greenland survey. Marine debris, oil slicks may be recorded. SST data will automatically be recorded.

7C.1.4 Sighting protocol

The past Greenlandic protocol (05tnass_5) will form the basis for the final protocol document. The final version, taking into account discussions at this meeting, will be developed by the working group within the next month.

7C.1.5 Observer training

The importance of training was stressed. Considerable benefit can be obtained from training in the plane even when it is on the ground! Greg Donovan will rediscover the old cue-counting training program and circulate it to the working group. Priority should be given to giving the Greenland cruise leader training in Iceland.

7C.2 Review of protocol for dedicated surveys with multiple observers, one leader and one platform (Canada and SNESSA)

7C.2.1 Survey mode

7C.2.1.1 Survey mode (Canada)

As in 7C.1.1. A line transect was suggested. It was agreed that the survey timing off coastal Canada (NL and Scotian Shelf components) would be designed to start in the north and move towards the south over time. This would reduce the chances of double-counting marine mammals if they are migrating from south to north, as it is assumed species such as fin and humpback whales are in this area. Similar transect timing issues will be addressed in the Gulf.

7C.2.1.2 Survey mode (SNESSA)

Details on SNESSA were not available at the time of this meeting.

7C.2.2 Equipment

Surveys in Canada and the SNESSA will be aerial-based visual surveys using multiple observers and dedicated data recorders. The SNESSA will also have a vessel-based component (see above).

7C.2.2.1 Equipment (Canada)

The equipment used will ensure that the appropriate data can be collected, and in such as way as to accurately record the location and time of each sighting event. Therefore the data can be analyzed using cue counting or line-transect methods, depending on the species. This will be assured using a keypad triggering system for each observer that will be attached to the GPS-linked data recorder's laptop computer. The computer will be running a modified version of NMFS' VOR survey programme that can record

time, location, inclination, species ID, group size, sighting cue, weather, sighting conditions, and other notes. It is linked to a GPS system for location, and displays the course of the aircraft as well as the underlying transects for navigation checks.

Distances of the sighted animal(s) from the trackline will be determined be each observer using inclinometers.

7C2.2.2 Equipment (SNESSA)

Information on SNESSA equipment and protocols were not available at the time of the meeting.

7C.2.3 Survey procedures

Given the extensive survey coverage planned, the multi-species nature of the Canadian surveys, and the second rear observer station on the right side of the Otter, it is not feasible to use the 'circle back' procedure that has been used to estimate detection probabilities for harbour porpoises.

For the parts of the Canadian survey flown using the Twin Otter (NL and Scotian Shelf), independent data from front and rear observers at bubble windows on the right side of the aircraft (there is a single observer at the bubble window on the left side) will be compared to estimate detection probabilities (corrected for perception bias). While not ideal, it was agreed that it will also be possible to use correction factors obtained from the US surveys for harbour porpoises, which include a correction for availability bias derived from circle-back experiments. All three observers will be visually and aurally isolated from each other, passing data to the recorder using their keypads or headset microphones.

The Gulf surveys will be flown with a Cessna Skymaster, during which there will be two observers at bubble windows in the rear of the aircraft and a dedicated data recorder/navigator in the front right seat. As for the Twin Otter surveys, data will be recorded using the VOR programme on a GPS-linked laptop computer. Circle-back techniques are not planned to be used.

The Otter and Skymaster will be flown at 105 knots and 650 feet ASL (above sea level).

A proposal has been submitted that, if approved, will allow Canadian researchers to fly for several days in an Arcturus aircraft. This large, four-engine platform will be operated at 750 feet ASL and an airspeed of 170 knots. It is planned to have two independent teams of observers on the front and rear of the aircraft (6 people in total), collecting sightings data using the same protocol as for the Twin Otter. Circle-back techniques are not planned to be used. At this point it is unclear which survey pattern will be employed, but likely east-west oriented survey transects in two locations (described above).

7C.2.4 Sighting protocol

In both the Canadian and SNESSA aerial surveys, sightings data will be collected using Distance-based analyses of sightings locations relative to the survey trackline.

7C.2.5 Observer training

In the NL Region observer training has occurred using dedicated flights with the Twin Otter and Skymaster platforms in the past several years. For the Otter, all survey equipment has been employed and tested. In the 2007 T-NASS it is not planned to conduct further training in advance of the survey.

PLENARY SESSION

8. REVIEW OF SURVEY DESIGN

It was agreed that transects should be based on the realizable effort plus a general bonus of *ca* 20% (Iceland and Faroes), where there was no other indication by the local coordinators. A parsimonious design will be used especially in the northern blocks assuming equal coverage in order to allow for flexibility to adapt the track design. This will allow the Icelanders to define the final survey tracks as late as possible in order to integrate the best and latest ice information available.

If an area is missed by one vessel, another may step in to cover the tracks missed. In general, how the "whale survey" time in the Redfish survey will be used must be defined on site. The cruise leader will have to decide on the base of local weather, previous coverage, and ship schedule (e.g. stop during the night).

It is very important to establish a viable working rhythm between the Redfish and Whale time and to follow it throughout the whole area.

9. REVIEW OF SHIPBOARD PROTOCOL

Seat and shelter for the observers should be provided.

10. REVIEW OF AERIAL SURVEY PROTOCOL

- Data for small areas.
- Independent platforms in all areas.
- Weather as normal, up to and including Beaufort Sea State 3.
- Cameras may be present but only as ancillary.
- Data entered and validated every day.
- A ground person in Iceland to enter data.
- SST on loan from Canada.
- Standard methods.
- Altitude 600 ft but record if different (650 feet in Canada in Otter and Skymaster, 750 feet in Arcturus).

- Mainly passing mode, with closing to confirm species identification and group size if necessary (abeam) but careful if many non-primary dolphins.
- In Iceland closing may be carried out on a subset of dolphin schools to derive corrections for school size estimation.
- Additional data will be collected if it does not interfere with the primary objectives.
- Training important at all levels (even on the ground with a fishing rod).
- Greenlandic cruise leader to be trained on Iceland.
- US/Canada will not use cue counting.
- Arcturus: importance to maintain two independent teams.
- Icelandic plane:
  Experimental digital stills taking a strip of 200 m under the plane where each point twice right under the plane.
- Greenland:
  Not sure yet but there will be either stills or digital.

11. OBSERVERS STATUS

Iceland
Looking for at least one observer with acoustics background and/or a SCANS tracker.

Faroes
Looking for 2 experienced and 2 additional observers (even 2 inexperienced), an experienced acousticians would be desirable.

Greenland
Looking for one observer for plane and one for ship survey.

Norway
Observers are being hired now, names to be sent to Nils Øien if any available.

12. COLLECTION OF ANCILLARY DATA

Jack Lawson agreed to provide temperature probes for the Icelandic and Greenland planes and the appropriate survey coordinators will ensure that the necessary installation approval from the authorities is obtained.

Vessels will regularly record water temperature and marine debris.

13. ACOUSTIC SURVEY

It was unclear at the time of this meeting whether there would be acoustic material available. For this reason there was no input about this on the protocol.

In any case, ships carrying acoustic recording equipment must be able to:

- tow and hook up the material

- have a shelter for the electronics
- have a winch for hauling in the hydrophone.

In the Redfish Surveys the hydrophone will probably have to be hauled in while trawling. In the southern sector it would be desirable to have one hydrophone on the Faroese sector, so it could be used in an area adjacent to the CODA area.

Canada is investigating whether acoustic sono-buoys can be dropped from the Arcturus aircraft during the surveys. These will record marine mammal vocalizations, as well as ambient noise and anthropogenic sound sources.

14. BIOPSY AND TAGGING STUDIES

Biopsies and Photo-ID will have a very low priority but adequate equipment and instructions should be onboard.

15. BIRD SURVEY

It was unclear if it was possible to host bird observers on the Faroese and the two Icelandic vessels and there was certainly no room for them on the Redfish Survey, Greenlandic or Russian vessels.

Bird observers would have to bring their own platform and equipment.

Henrik Skov will be requested to contact the national contact persons and not expect an answer before at least a month.

16. CONTACT AND COORDINATION DURING MAIN SURVEY

As for previous surveys there should be contact for:

- internal coordination
- the “visual equipment”.

For any change in protocol or design the person responsible **must** contact the main advisor who will be equipped with (satellite)-phone and/or other permanent means of communication for the whole duration of T-NASS.

Genevieve Desportes will request technical support from the same team as CODA (Doug Gillespie: dg50@st-andrews.edu.uk).

Desportes, supported by Donovan, will be the general advisor for protocol or design change for the shipboard survey and Donovan for the aerial survey.

17. COORDINATION

Coordination matters were discussed under the following points.

17.1 IPY-ESSAR

Contact has been kept with IPY-ESSAR contact person Ken Drinkwater who has received all information circulating internally in T-NASS. There was no further information on other activities in IPY-ESSAR. It looks as if there are not many coordination activities within it, just a lot of paperwork.

17.2 Other matters

There should be coordination between the CODA - T-NASS (Faroese-Icelandic) vessels, especially those operating in adjacent areas. Contacts among the cruise leaders should be initiated shortly and Desportes will attend the CODA coordination meetings.

Permission to enter national waters has to be applied for and by the individual vessels. Usually this takes 3 months which means that applications should be sent as soon as possible. For entering into UK waters permission should state that T-NASS is in coordination with CODA which is financed by the UK government and endorsed by the IWC. T-NASS has also been endorsed by the IWC.

The IWC asks that a person trusted by the IWC Scientific Committee be designated to guarantee that IWC standards have been followed. Gísli Víkingsson will be the T-NASS contact person for the IWC.

18. T-NASS GENERAL ETHICS

T-NASS should be a reasonably environmentally responsible survey. To this end, waste should be collected entirely and brought back to shore even when international regulations would allow for disposal in the sea. This should be stated in the contract with the vessels. Furthermore, care should be taken that animals are not harassed in any way.

The Chairman suggested that T-NASS be made carbon-neutral. To this end some suggestions were made:

- the Carbon Trust for planting a CO_2 equivalent in trees
- partial participation by taking care of travel for observers
- minimization of oil consumption by good survey design.

In response to the general reaction, Hammond reminded them that EU-rules impose environmental considerations when choosing vessels. It was finally agreed that all cruise leaders and observers (all contracted personnel) be formally invited to contribute individually for carbon-neutral travel and that a pointer to a way to do so be included in the individual information material.

19. STRATEGY FOR DISSEMINATION TO THE WIDER PUBLIC AND PRESS

There is no money available in the T-NASS budget for the establishment and

maintenance of a website. The NAMMCO Secretariat has been appointed by the NAMMCO Council to be in charge of this task (creating the site, producing text, maintaining and updating the site). The site should ideally be a placed as a sub-section of the NAMMCO website and should be available at least in all NAMMCO languages. The update of the site should be performed at least at the beginning and at the end of the survey and at completion of the analysis. There should be links to the IWC, Canada, Russia, USA, as well as to CODA.

Multilingual Press Releases should be made available both at the beginning and the end of the survey.

NAMMCO and the different project participants should agree in advance on the content of both the website and the press releases.

20. TASKS TO BE COMPLETED

1) Data validation criteria
2) Protocols (to be ready by the end of April):
    a. Aerial (within a month)
    b. Ship (also as soon as possible, with priority to the single platform section. The latter has very high priority as it has to be sent to the translators)
3) Cruise reports guidelines and deadlines
4) Standard Contracts for Cruise Leaders and Observers
5) Survey Design
6) Request for permission to enter territorial waters to be submitted for individual vessels (immediately, as this can take several months to obtain).

21. DATA VALIDATION AND ANALYSIS

The Chairman reminded the Delegates that having good rules for the validation and quality insurance of the data is as important as good analysis. She therefore urged the Delegates to define common data validation criteria (e.g. using e-mail) very soon, and suggested starting by examining the CODA protocol as an example. It was common understanding that a uniform analysis strategy is paramount for maintaining the synoptic character of T-NASS.

To speed up the production of tangible results, data on the focal species should be assigned high priority. The high priority species to be analyzed first, are fin whales, minke whales and pilot whales, plus humpback whales for Canada. Norwegian large whale data will be available for the second analysis cycle. NAMMCO should ask David Borchers about the possibility of being contracted for the analysis of aerial survey data or at least to arrange it for the use of his software.

Opportunistic Surveys
A decision must be made on who is going to validate and analyze these data too. And

also in this case, it is important to define uniform data validation criteria.

Data
By this point it was clear that it is important to define uniform data validation criteria and that it should be emphasized to the cruise leaders that they should check the quality of the data as frequently as possible.

Data should agree with the IWC data availability policy if T-NASS (NAMMCO) data have to be accepted for use by the IWC for the implementation of an RMP.

An *ad hoc* Data Group to look into these questions will comprise: Geneviève Desportes, Phil Hammond, Greg Donovan, Thorvaldur Gunnlaugsson, Bjarni Mikkelsen, Nils Øien, Jack Lawson, Malene Simon and the NAMMCO Secretariat.

22. OTHER ITEMS

It would be particularly useful for finding good personnel for future surveys, to establish an information database on observers' performance. No action was decided on this as it surely will clash with regulations on storing personal information in several countries.

A NAMMCO stall at the Marine Mammal Biennial Conference in Cape Town, South Africa, could house a T-NASS theme exhibit. There is unfortunately no time for submission of a T-NASS poster at the same conference as the deadline for abstracts is in May.

23. NEXT MEETING

It was agreed to aim at an analysis meeting in the spring 2008 (March-May).

24. ADOPTION OF REPORT

The report will be circulated for approval in draft form the week after Easter.

25. FINAL REMARKS

The Chair closed the meeting and warmly thanked Phil Hammond and SMRU for housing this meeting with great hospitality, exceptionally good food, a choir of grey seals outside the meeting room and amazingly good weather.

Appendix 1

AGENDA

PLENARY

1. CHAIRMAN'S WELCOME AND OPENING REMARKS
2. ADOPTION OF AGENDA
3. APPOINTMENT OF RAPPORTEURS
4. STATUS
- 4.1 Resources per area (incl. description and resources of rented vessels)
- 4.2 General funding available
- 4.3 Coordination with opportunistic surveys
- 4.4 SCANS II data analysis problems, avoidable with a better data collection (Louise Burt / Phil Hammond)

5. GENERAL STRATEGY FOR COVERAGE:
- 5.1 Survey design in Distance (presentation by Len Thomas)
- 5.2 Considering the combination of both dedicated surveys and opportunistic surveys: do we want overlapping areas or can we rely on the opportunistic data?

6. SCANS II shipboard methodologies: visual and acoustic (Presentation by Doug Gillespie and Rene Swift)
- 6.1 Presentation of the shipboard visual and acoustic methodologies and protocols
- 6.2 Presentation of shipboard visual equipment and acoustic equipment

SUB-COMMITTEES

7A. SURVEY DESIGN (Pike (Chair), Donovan, Hammond, Lawson, Mikkelsen, Simon, Víkingsson, Øien, Zabavnikov + *Palka and Witting*)

7A.1 Survey boundaries (in coordination with CODA, SNESSA and opportunistic surveys)
7A.2 Stratification
7A.3 Effort allocation by stratum (and estimation of realizable effort)
7A.4 Transect design
7A.5 Other (e.g. coastal harbour porpoise strata in Iceland)
7A.6 Rules for adaptation (i.e. changing the design underway)

7B. SHIPBOARD PROTOCOLS (Desportes (Chair), Golyak, Gunnlaugsson , Hammond, Mikkelsen, Simon, Øien, + *Palka and Witting*)

7B.1 Review of protocol for dedicated surveys with 8 observers and 2 independent platforms
- 7B.1.1 Survey modes
- 7B.1.2 Equipment
- 7B.1.2 Survey procedures
- 7B.1.3 Sighting protocol
- 7B.1.4 Data collection procedures
- 7B.1.5 Calibration experiments
- 7B.1.6 Data calibration
- 7B.1.7 Cruise leader and observer training

7B.2 Review of protocol for the Greenlandic vessel with a single platform and 4 observers

7B.3 Review of protocol for opportunistic surveys
7B.3.1 With 2 observers: Redfish and pelagic survey
7B.3.2 With 1 observers: MAR-ECO
7B.3.3 Training of 'opportunistic' observers
7B.4 Ice edge protocol
7B.5 Group size estimation for pilot whales and dolphins

7C. AERIAL SURVEY PROTOCOL (Donovan (Chair), Lawson, Pike, Simon, + *Palka and Witting*)

7C.1 Review of protocol for dedicated surveys w. 4 obs and 2 independant platforms (Iceland and Greenland – September survey)
7C1.1 Survey mode
7C1.2 Equipment
7C1.3 Survey procedures
7C1.4 Sighting protocol
7C1.5 Observer training
7C.2 Review of protocol for dedicated surveys with 2 observers, 1 leader and 1 platform (Canada and SNESSA)
7C2.1 Survey mode
7C2.2 Equipment
7C2.3 Survey procedures
7C2.4 Sighting protocol
7C2.5 Observer training
7C.3 Review of protocol for *Arcturus* survey (Canada)

PLENARY

8. REVIEW OF SURVEY DESIGN
9. REVIEW OF SHIPBOARD PROTOCOL
10. REVIEW OF AERIAL SURVEY PROTOCOL
11. OBSERVERS STATUS
12. COLLECTION OF ANCILLARY DATA
13. ACOUSTIC SURVEY
14. BIOPSY AND TAGGING STUDIES
15. BIRD SURVEY
16. CONTACT AND COORDINATION DURING MAIN SURVEY
17. COORDINATION
17.1 IPY-ESSAR
17.2 Other matters
18. T-NASS GENERAL ETHICS
19. STRATEGY FOR DISSEMINATION TO THE WIDER PUBLIC AND PRESS
20. TASKS TO BE COMPLETED
21. DATA VALIDATION AND ANALYSIS
22. OTHER ITEMS
23. NEXT MEETING
24. ADOPTION OF REPORT.

Appendix 2

Louise Burt: Comments on validation of SCANS II shipboard visual survey data

The data that were collected on the visual survey were generally good. The cruise reports were useful and especially useful was a log of which transects were covered each day. Although primary observers didn't like recording sightings on paper forms, the primary data generally had few problems or missing fields. The paper forms also meant that primary data were easy and quick to check. Validation fell into three categories; correcting minor typos, interpolating for GPS not working and checking of the tracker angle and distance measurements.

1. Minor errors

There were minor typos that included things like using lowercase letters or codes such as cue or behaviour or using a single letter instead of the two letter code. This latter was OK if there was only one code beginning with that letter. More problematic was using codes that weren't included in the list of possible codes. Other out of range values also occurred for aspect, glare left and glare right where the values were greater than 360.

Records that had to cross-reference another record - i.e. duplicates or matches (same animal seen by 7x50 and "Big eye" trackers) - didn't always cross-reference correctly.

Platform code and button didn't always match!

Some problems with Transect numbers - missing, not always correct, didn't correspond in effort and sightings.

2. GPS not working

Occasionally the GPS would fail so that there would be missing sections in the GPS file, or it would get stuck so that from the GPS coordinates it looked like the vessel wasn't moving although the vessel was on search effort. Sometimes there was a link in the effort or sightings data to the GPS file but then no corresponding record in the GPS file.

3. Checking tracker and angles

This was the part that took the longest. Tracker angles and radial distances were checked if there were big discrepancies between the estimated values (obtained from the angleboard and reticules) and the 'measured' values (webcam and video). The commonest problems were

1. Not being able to find the video or webcam image
2. Couldn't find audio file to check commentary
3. Record linked to wrong image or video
4. Couldn't spot animal in the video
5. Video was blurred or horizon was unclear, fog or land
6. Webcam image was too bad to measure bearing (e.g. because of glare)
7. Angleboard estimate or radial distance missing from commentary
8. Not corrected for sighting abeam when measuring hearing from image
9. Pointer not aligned properly on angleboard
10. Typo in reticule or angle estimate
11. Not measuring bearings or distances carefully enough from images.

ANNEX 1.2

NAMMCO PLANNING COMMITTEE ON THE
TRANS NORTH ATLANTIC SIGHTINGS SURVEY (T-NASS)
WORKING GROUP IV
SHIPBOARD SURVEYS DEBRIEFING
Telephone meeting, 12 November 2007

1. CHAIRMAN WELCOME AND OPENING REMARKS

The Chairman expressed her profound disappointment at seeing that only two out of 7 Cruise Reports had been delivered to the TNASS Working Group in time for the meeting: the Faroes one and one of the Icelandic one. The first request for cruise report had been done by email on September 26. She reminded the delegates that T-NASS was a coordinated exercise under the auspices of NAMMCO, which had allocated special funding for the coordination. Big effort had also been put into it by the NAMMCO secretariat.

She underlined that the debriefing documents are an archive of information essential for the analysis and are an invaluable source of information for the future should NAMMCO again undertake the same kind of effort.

She questioned the delegates' will to cooperate within TNASS and suggested the question of coordinated effort should come on the agenda in the future. She reminded the delegates that the website had to be updated, a final Press Release had to be done, a preliminary report provided to the NAMMCO Council, as well as to the IPY umbrella project. Elementary input data fundamental to these activities were missing from most of the countries, although most of them were already conducting analysis and had the information at hands.

2. ADOPTION OF THE AGENDA

Due to the lack of submitted material the Chairman decided to deal only with points: 8.2, 8.3, 8.4, 9, 10, 11 and 12, which was accepted.

3. APPOINTMENT OF RAPPORTEURS

Mario Acquarone volunteered to report from this meeting.

8. ANALYSIS STATUS AND PLANNING

8.2 Priority and deadlines for Analysis (also with reference to the T-NASS First Analysis Meeting, 2008 and the NAMMCO Scientific Committee Meeting, April 2008)

Iceland, Greenland and Norway reported that they will give highest priority to the production of new abundance estimates for minke whales (all) and fin whales (Iceland and Norway) to be presented at the next IWC meeting. The figures will be used within the IWC Revised Management Procedure and, in the case of minke whales, they will

be included into the IWC Implementation Review. In order to be considered at the IWC meeting in Chile in May 2008 the working papers will have to be submitted by the end of February 2008. It was noted that the Icelandic aerial estimate for minke and fin whales would also be presented there. Greenland mentioned that they planned to present new abundance estimates for all the big whales to the IWC.

The chairman noted that the above mentioned IWC February deadline will fall before the next NAMMCO TNASS meeting (April 5-7, see point 12), meaning that the T-NASS data would be presented to the IWC before being presented to and reviewed by a NAMMCO forum.

The Faroe Islands reported that they will give highest priority to the production of abundance estimates for pilot whales. There are no external deadlines, but there was money in 2007 allocated to this analysis, so it should start in 2007. They will begin by looking at sighting distribution and will decide which analysis they will perform based on the type of distribution.

8.3 Plan for Analysis (Who does what and when?)

Iceland will in a first time analyze their shipboard data using standard Line Transect Analysis and will consider using BT analysis later. Thorvaldur Gunnlaugsson is in charge of this first type of analysis.

Greenland will also use standard Line Transect Analysis for their shipboard minke whale data and reported that they had very few primary sightings (about 20 minke whales and much less for other species) and therefore it was unlikely that they would produce reliable estimates for other species. Mads Peter was in charge of this analysis, which was well underway with preliminary estimate already produced.

Norway reported that they will start by analyzing minke whale data first and then proceed to fin whale data. The results of both species will be presented to the IWC.

The Faroes will cooperate with Iceland for the analysis. Iceland will be responsible for producing estimates from both minke and fin whale Faroese data, while the Faroes will take the lead for Pilot Whale data analysis. If they exist, pilot whale data from other areas than the Icelandic will also analyzed jointly with the Faroese. They would therefore be interested in knowing in which survey blocks there were pilot whale data. They were considering hiring and external analyst, probably someone from David Borchers' lab, as was done in the past.

8.4 Acoustic data check-up and analysis

The Chairman reported generally from the CODA debriefing meeting in St. Andrews and referred to the submitted material (SC/15/TNASS/35 and 36) for details.

Doug Gillespie (SMRU) has volunteered to check the quality and quantity of the TNASS Acoustic Data through random screening to better assess the need and possibility for detailed analysis. This was needed to find the right type and amount of funding for the analysis. The delegates agreed to send a copy of both the acoustics and

sighting database to Doug Gillespie at SMRU within the nearest future. Genevieve Desportes will re-con tact Doug to see how this could be best done and inform the delegates.

The Faroes noted that Phil Hammond (SMRU) had offered to include the Faroese acoustical data into the CODA data analysis. However he was not sure if this offer was sill valid and could not assess the timeframe for analysis. Also he thought that the Faroes data would be best analysed together with the other T-NASS data. He was ready to send the data for screening.

There was maybe some electrical noise on the Greenlandic recordings which might complicate or even impede any analysis. The Chairman noted that if Malene was not completely sure of the quality of the data, they could be sent to Doug, who had informed at the CODA meeting, that often parasite noise could be dealt with. Fernando Ugarte wondered if the data had not already been sent and will check with Malene what has happened with the Greenlandic acoustic data.

9. COOPERATION WITH CODA

9.1 Exchange of cruise reports between CODA and TNASS

The Chairman referred to an email round that had been sent to the delegates about the exchange of cruise reports and reported that she had received the agreement of Gisli Vikingsson and had not received any opposition to or negative comments about this exchange from others.

As agreed CODA has sent their Cruise Reports to NAMMCO (SC/15/TNASS/35) as well as the minute of the CODA debriefing meeting (SC/15/TNASS/36). CODA expected to receive the TNASS Cruise Reports and the minutes of the T_NASS debriefing minutes in the nearest future.

9.2 Coordinated Data Analysis with T-NASS

The Chairman reminded the delegates of CODA's renewed interest to continue cooperation with TNASS, especially for spatial analysis.

10 PRESS RELEASE AND INPUT TO WEB SITE

The Secretariat reminded the delegates that for the production of a press release and for input to the NAMMCO web site they should provide before the end of this week:

- The data of total planned and realised effort (missing for Greenland)
- A general map of the realised effort (missing for Greenland, the two Norwegian vessels and two of the Icelandic vessels)
- One map of the sightings for at least one species (preferably Fin Whale, missing for same as above).
- In case the Delegates cannot produce the maps themselves they have the option to send the Logger Database to the Secretariat.

11 OTHER ITEMS

All the Delegates agreed that they will make their Cruise Report available to the Secretariat before end of November 2007.

Iceland expressed interest in analyzing the TNASS Extension Surveys data, for minke and fin whale.

12 NEXT MEETING

The next TNASS Working Group meeting is tentatively set to April 5-7, 2008 in Reykjavik, back to back with the IWC Fin Whale WG meeting. Gisli Vikingsson has promised that he will give feedback before the end of the week about the dates of the IWC meeting.

It was proposed to invite the following external experts, besides the external member of the T-NASS working group (Hammond, Donovan and Palka)

- Hans Skaug
- Someone from David Borcher's lab
- Dan Pike (his status is to be defined: as Icelandic Scientist or as Invited Expert).

Appendix 1 - AGENDA (Part 1)

1. **CHAIRMAN WELCOME AND OPENING REMARKS**
2. **ADOPTION OF THE AGENDA**
3. **APPOINTMENT OF RAPPORTEURS**
4. **T-NASS OVERVIEW AND STATUS (by Geneviève Desportes)**
    a. Budget
5. **CRUISE EVALUATION PER PLATFORM** [c]
    a. Platform and Equipment Preparation
    b. Data Collection Procedures
    c. Evaluation of Observers
    d. Feedback from Observers
    e. Completed Effort (amount and distribution)
    f. Collected Data Quality (e.g. angle and distance)
    g. Overall Evaluation
6. **GENERAL EVALUATION**
    h. Use of BT method
    i. Cooperation with SMRU regarding equipment and guidelines
    j. Cooperation with SMRU regarding land back-up during the cruise
    k. Coordination between vessels
    l. General T-NASS coordination
    m. Other
7. **DATA COLLECTED (number of sightings, tracks, duplicates)**
    n. Target species:
        i. Fin Whales
        ii. Minke Whales
        iii. Humpback Whales
        iv. Pilot Whales

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[c] The Cruise Reports from each of the platforms should at least address the following points and should be circulated at the latest by 8:00 am UTC Monday 12 November 2007:

- modification to planned procedures (as described in observer guidelines)
- map of effort planned and achieved, including transect identification
- sightings distribution for the main species
- visual data obtained
- acoustic data obtained
- validation procedures both during the cruise and afterwards
- evaluation (w. description of main problems encountered)
- methodology
- data collection procedures
- observers
- platform suitability
- other.

v. Harbour Porpoises

o. Other species

p. Acoustic data

8. ANALYSIS STATUS AND PLANNING

q. What is possible with the data collected? (e.g. standard Line Transect Analysis, BT method)

r. Priority and deadlines for Analysis (also with reference to the T-NASS First Analysis Meeting, 2008 and the NAMMCO Scientific Committee Meeting, April 2008)

s. Plan for Analysis (Who does what and when?)

t. Acoustic data check-up and analysis

9. COOPERATION WITH CODA

u. Exchange of cruise reports

v. Coordinated Data Analysis with T-NASS

10. PRESS RELEASE AND INPUT TO WEB SITE

11. OTHER ITEMS

12. NEXT MEETING.

NB Items 5. - 7. not considered because of insufficient documentation available 12 November 2007.

Appendix 2 - LIST OF DOCUMENTS

Telephone meeting, 12 November 2007

Doc. No.	Agenda	Title
SC/15/TNASS/24		Report from the 3rd Planning Meeting – St. Andrews
SC/15/TNASS/25	1	List of Participants
SC/15/TNASS/26	2	Draft Agenda
SC/15/TNASS/27		List of Documents
SC/15/TNASS/28	4	T-NASS Overview (by Geneviève Desportes)
SC/15/TNASS/29	5, 6, 7	**Missing** - Cruise Report [d] from Arni Fridriksson II (by Gisli Víkingsson)

[d] The Cruise Reports from each of the platforms should at least address the following points and should be circulated at the latest by 8:00 am UTC Monday 12 November 2007:

- modification to planned procedures (as described in observer guidelines)
- map of effort planned and achieved, including transect identification
- sightings distribution for the main species

SC/15/TNASS/30	5, 6, 7	Cruise Report [e] from Venus - Genevieve Desportes and Sverrir D. Halldórsson.
SC/15/TNASS/31	5, 6, 7	**Missing** - Cruise Report [e] from Jákup B (by Thorvaldur Gunlaugsson) – a former preliminary version had been uploaded by the Secretariat
SC/15/TNASS/32	5, 6, 7	Cruise Report [e] from Thor Chaser - Bjarni Mikkelsen
SC/15/TNASS/33	5, 6, 7	**Missing** – Cruise Report [e] from Tulugaq (Jakob Rye)- - a simple Logbook for the Tulugaq had been uploaded by the Secretariat
SC/15/TNASS/34	5, 6, 7	**Missing** – Cruise reports [e] from Ulvos and Havsel (by Niels Øien). An en email message reporting on the cruise had been uploaded by the Secretariat
SC/15/TNASS/35	9	CODA Cruise Reports (Collated)
SC/15/TNASS/36	9	CODA Debriefing Report - minutes
SC/15/TNASS/O2		T-NASS Cruise Leader Guide
SC/15/TNASS/O3		T-NASS Observer Guide
SC/15/TNASS/O4		LOGGER Manual for CODA and T-NASS 2007
SC/15/TNASS/O5		Validation Manuals
SC/15/TNASS/O6		Acoustic Manual
SC/15/TNASS/O7		Forms and Sheets

- visual data obtained
- acoustic data obtained
- validation procedures both during the cruise and afterwards
- evaluation (w. description of main problems encountered)
- methodology
- data collection procedures
- observers
- platform suitability
- other

Appendix 3

A NOTE ABOUT THE T-NASS AERIAL TELEPHONE DEBRIEFING
Telephone meeting, 13 November 2007

The T-NASS Aerial Survey Debriefing teephone meeting scheduled for Tuesday, 13 November 2007 14:00 UTC was cancelled by the Chairman due to the paucity of documents available for discussion. Only the Icelandic report from Dan Pike was received, and the Canadian and Greenlandic reports were missing.

ANNEX 1.3

NAMMCO PLANNING COMMITTEE ON THE TRANS NORTH ATLANTIC SIGHTINGS SURVEY (T-NASS) WORKING GROUP V

Copenhagen, Denmark, April 7, 2008

1. CHAIR'S WELCOME AND OPENING REMARKS

Chair Genevieve Desportes welcomed participants (see Section 5) to the post-cruise meeting of the T-NASS Planning Committee. She pointed out that T-NASS had achieved a trans-Atlantic coverage (Fig. 1). The main purpose of this meeting was to carry out a general evaluation of the specific surveys and T-NASS in general, and to make recommendations that will improve future large-scale surveys.

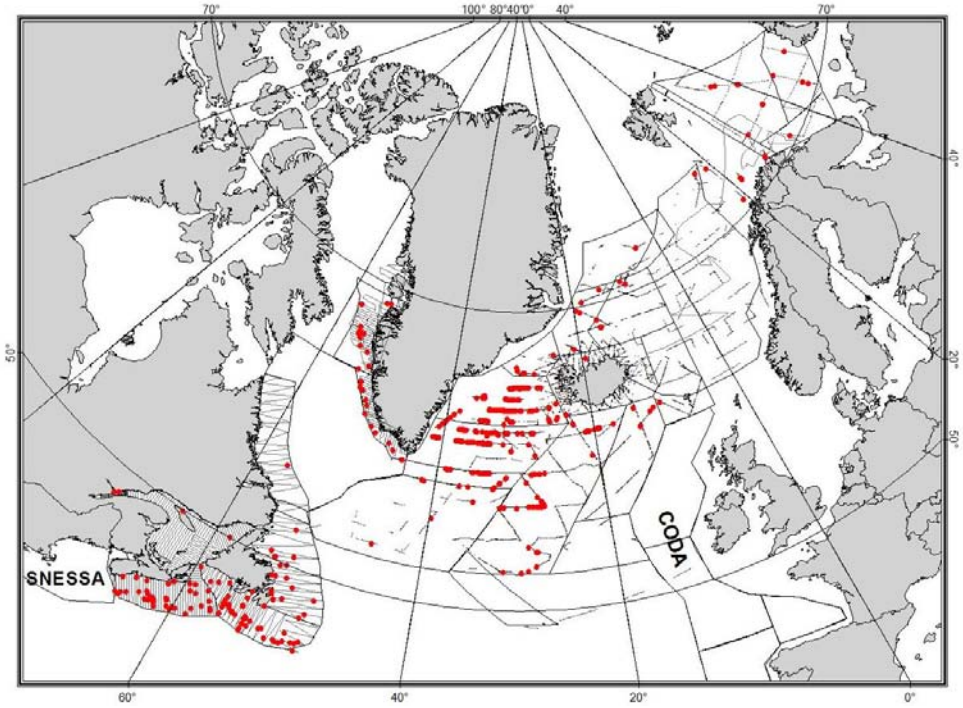

Fig. 1. T-NASS total effort and fin whale sightings

2. ADOPTION OF AGENDA

The agenda (Appendix 1) was adopted with small changes.

3. APPOINTMENT OF RAPPORTEURS

Daniel Pike was appointed Rapporteur for the meeting.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

Documents that were made available to the meeting are listed in Appendix 2.

5. SHIPBOARD EVALUATION

Cruise reports were available from the Faroese, Icelandic, CODA and SNESSA vessels. A log book was presented for the Greenlandic vessel and a verbal report for the Norwegian cruise in the eastern Barents Sea. Summaries are provided below.

***Tulugaq* (Greenland) –** SC/15/TNASS/33
The vessel used a standard single platform procedure. There were no major technical problems with the platforms, but severe technical problem with the acoustic equipment, and sounds were only collected for part of the survey. However, the need to refuel (at least every 10 days) and reload water (every 4 days), as well as a transit to Nuuk in the first days, which were not included in the time schedule used for designing the effort, made it impossible to cover the designed track.

The prevalent bad weather (either fog or wind) also resulted in a poor coverage of most of the blocks, with the small north eastern block and the south block not covered at all. Harbour facilities on the Western Greenlandic coast give little potential for re-design of the survey as it progresses.

A total of 814 nm of effort was achieved, which represents 38% of the planned coverage of 2,129 nm. A total of 57 cetacean sightings were made by the three single platforms of which some are duplicate. Common minke and humpback whales were the most commonly seen species, with 35 and 8 sightings respectively (Table 2); 152 sightings of seals were also made. The survey clearly underestimated the number of humpback whales, as is evident from the number of incidental sightings in near shore and fjord areas not included in the survey coverage.

***Venus* (Iceland) –** SC/15/TNASS/30
Venus was responsible for a survey area North of Iceland delimited by the eastern coast of Greenland and bounded by c. 24° W and 4° E longitude, and 70° N and 74° N latitude (2 blocks north and south), as well as a survey area between the Icelandic Westfjords and the coast of Greenland. The vessel originally rented for the survey was unable to sail, resulting in a lost of 5.5 days of survey time. The survey eventually started on July 3 in Tórshavn and ended on July 23 in Reykjavík, resulting in 17 days of effort after subtracting time for transit to and from the survey line.

The survey, conducted in passing mode, followed the standard Buckland and Turnock (BT) procedures decided upon at the planning meeting for the Faroese and Icelandic vessels and similar to that followed by the CODA vessels, as described in the common T-NASS observer guidelines and the guidelines for cruise leaders. The Primary Observers searched with naked eyes in a standard way for line transect surveys, the Tracking Observer searched with binoculars, one 7×50 on a monopod and one pair of

25×150 (2.7°) "Big Eyes" mounted on a solid adjustable monopod. Each TP position was equipped with a double video system. A web camera taking pictures of the angle board on the floor (for the subsequent measure of the angle to the sighting) and a high definition digital video cameras recording the sea surface and horizon (for the subsequent measure of the distance to the sighting on video images). Video recordings were triggered each time a sighting/resighting button was pressed. An audio system and computer connection allowed communication between the primary and tracker platform and the data recorder and direct recordings of sightings events and voice.
Unfortunately the HD video and communication systems never worked properly while the web cam systems worked at all times. When the vessel was progressing on the track and there was no ice present, she would tow a small hydrophone array (3 elements) situated at the extremity of a 200 m cable for recording high- and mid-frequency underwater sounds, such as echolocation clicks.

Survey progress was impaired by bad weather and only 891 nm were covered on effort, with 758 nm and 134 nm respectively in the northern and western blocks and no effort at all in the northernmost block. This corresponded to 51%, 36% and 0% of the intended effort in the respective blocks, with 30% of the total planned effort actually covered. The western block was very poorly covered because of bad weather in addition to extensive ice cover.

A total of 173 groups of cetaceans were encountered. There were 29 duplicates identified. Eight different species were identified during the cruise. The most frequently encountered species was humpback whales (66 sightings/17 duplicates), followed by white beaked dolphin (25), fin whale (20) and minke whale (19). The computer folders containing the sound recordings from *Venus* were 6.69 GB for high frequency, 510 GB for middle frequency and 36 GB for clicks.

The survey suffered a 5-day delay at the start because the first vessel chartered was deemed unseaworthy. Consequently, there was a lack of time for training the observers in the new and demanding procedures. Although the procedures were in theory judged satisfactorily, many proved difficult to follow in practice because of the technical problems encountered with the sound and video recording systems delivered by the Sea Mammal Research Unit, which did not perform as expected. Some of the observers were not considered the best choice for the type of technical survey conducted. Several points for improvement were given in the cruise report.

***Árni Friðriksson* (Iceland) –** SC/15/TNASS/29
MRI's research vessel *Árni Friðriksson*, RE 200 participated in the T-NASS from 25 June to 25 July 2007. As in 2001 this cruise was a combination of an acoustic redfish survey and cetacean sightings survey. The vessel covered the Irminger Sea area between Iceland and Greenland south to 57°N.

The survey design was based on the BT mode developed for the 1994 SCANS survey in the North Sea and adjacent waters. Some modifications were made to account for the primary target species (fin whales and common minke whales).

Preparations for the survey were severely hampered by a long delay in the arrival of the equipment that was delivered in the mid day on the day of departure. This prevented the scheduled training sessions and proper setup and testing of the equipment prior to departure. A few days after the start of the survey Germany decided to withdraw from the redfish/cetacean survey because of technical problems with their vessel. This necessitated a re-design of the survey area covered by *R/S Árni Friðriksson*.

Most of the observers had experience from previous cetacean sightings surveys and no major problems were associated with the quality of the observers.

Various technical problems were encountered throughout the survey including malfunctioning of the mid-frequency sound card, microphones, video cameras, webcams and inter-communication system. The "Big-Eye" also proved to be impossible to use due to vessel motion and was exchanged for a 7×50 binocular after few days of survey.

A total of 2,027 nm was covered on effort under varying conditions. Around 90% of the effort was conducted in sea state less than 5. The total area of the two blocks covered by AF was 845,000 km^2.

Coverage near the east coast of Greenland was very poor due to extensive ice and associated fog. This was particularly unfortunate, as this area is known from previous surveys to have high densities of the two primary target species: fin and common minke whales.

Distance experiments were conducted using an inflatable boat and the radar of the vessel. These indicated a negative bias of distance estimation by the primary platform of 9.7%. The mean error in angle estimation was 2-3 degrees.

A total of 443 cetacean sightings were made, comprising 1,479 animals. A total of 11 species were identified plus beaked whales that could not be identified at the species level. The most commonly sighted species was the fin whale (237 sightings, 319 animals). This is in accordance with previous surveys in this area. The second most common species in terms of sightings was the long-finned pilot whale (45 sightings, 539 animals). Other commonly-sighted species include humpback whales, sei whales, sperm whales and four species of dolphins (including the killer whale). In spite of the many difficulties encountered, the objectives of the cruise were accomplished successfully.

***Jákup B* (Iceland) –** SC/15/TNASS/31

The vessel *Jákup B* rented by the MRI from Faroes, surveyed the SC block. The vessel was embarked in Torshavn and completed most of the planned track successfully, although a large part of the track was covered during poor conditions due to bad weather that prevailed for the first half of the period. A distance exercise was conducted early in the survey and a distance experiment on the last day. The

experience with equipment was generally the same as on the other MRI vessels. The tracker platform was rather low and not suitable for "Big-Eye" tracking (×25 magnification) except in good conditions. The vessel was otherwise suitable and the crew cooperative. Most of the observers had extensive experience and the operation ran smoothly during long working hours. The vessel frequently slowed down or turned on sightings abeam for species identification and school size estimation. Densities were generally low and distribution was similar to earlier surveys in this area.

A total of 2,500 nm was covered on effort under varying conditions. Around 90% of the effort was conducted in sea state less than 5. The total area of the block covered by *Jákup B* was 119,000 nm^2.

A total of 166 unique cetacean sightings were made, with 9 species identified and beaked whales that could not be identified at the species level. The most commonly sighted species was the fin whale (69 sightings) followed by the sperm whale (27).

***Thor Chaser* (Faroes) –** SC/15/TNASS/32
The vessel originally planned for the survey became unavailable just before the survey started, leading to the need of replacing it and a delay in departure of three days. The vessel *Thor Chaser* surveyed the Faroese part of T-NASS during the period 1-22 July.

During 20 survey days the vessel realized 2,818 km of trackline, which was 55% of the planned effort. 2,346 km (83%) was completed in double-platform mode and 472 km (17%) in single platform mode. Realized effort inside area IF-E was 752 km (corresponding 45% of planned effort), inside IF-SE-N 1,800 km (87%) and inside IF-SE-S 263 km (19%). 49% of total effort was completed in Beaufort 2 or less, while the proportion effort completed in Beaufort 4 and greater was 35%.

Half of the observers had experience from cetacean sightings surveys and the rest were recruits. The major problem associated with the quality of the observers was species identification. A distance exercise was conducted early in the survey and a distance experiment on the last day.

A total of 105 groups of cetaceans were encountered. There were 20 duplicates identified. Species most frequently encountered were pilot whales (14 sightings), bottlenose whales (13 sightings) and harbour porpoises (10 sightings). The low realized effort was due to a combination of a delayed survey start and unfavourable weather conditions far north and south in the survey area. The folders containing the sound recordings from *Thor Chaser* were 20.3 GB for high frequency, 888 GB for middle frequency, 1.5 MB for whistles and 5.15 GB for clicks.

Norway – SC/15/TNASS/34
The Norwegian survey in 2007 was the last year's survey of a six-year cycle with the main purpose of estimating abundance of minke whales in the Northeast Atlantic. The area surveyed in 2007 was the Barents Sea east of 28ºE. The basic survey procedures followed were those established in 1995, but some modifications have been made to equipment and software used over the years. Double platform effort was used

exclusively, and the observers were organised into teams of two persons, and this has been consistent in all the Norwegian whale surveys since 1996. In total, about 2,300 nm were surveyed with primary effort in July. From the primary platform 88 sightings of minke whales were made. Other sightings include 99 dolphin sp., 37 harbour porpoise, 15 fin whales and 11 humpback whales.

CODA – SC/15/TNASS/35

Since 1994 there have been two major surveys (SCANS and SCANS II) of the European continental shelf to generate estimates of cetacean abundance and to contribute to an assessment of the impact of bycatch. In contrast, European offshore waters have only been partially surveyed and the abundance estimates generated suffer from several sources of bias. Offshore surveys to generate unbiased abundance estimates are especially important to complement on-shelf surveys for species that are distributed in both habitats. The aim of the CODA project was to generate new information on the distribution, abundance and habitat preferences of cetaceans in the offshore European Atlantic; these data will contribute to bycatch assessment for common dolphin and to our understanding of the effects of military and industrial activities on deep divers. The survey area included offshore waters of the European Fishing Zone west of the UK, Ireland, France and Spain. Shipboard surveys were carried out during July 2007. Line transect methods were used to collect double platform visual survey data to allow analyses to account for the probability of detection on the transect line to be less than one and for responsive movement of animals to the ship. Passive acoustic data were also collected on survey ships for all species. Five ships covered 10,000 km of transects in an area of 967,538 km^2. Sightings amounted to just over 1,500 encounters of seventeen species. Fin whale encounters were greatest and centred in the Bay of Biscay and further West. Common dolphins occurred mainly in the southern part of the survey area. Sperm whales and three Ziphiid species were recorded throughout the area. Abundance estimates will be calculated where data allow. Estimates for the common dolphin will be incorporated into a management framework that was developed during SCANS II to allow safe bycatch limits to be determined.

SNESSA – SC/15/AE/8a, SC/15/AE/9

During 30 July to 29 August 2007, a NOAA team based at the Northeast Fisheries Science Center conducted an abundance survey using an aircraft and ship in waters from Cape Hatteras, North Carolina to the Bay of Fundy, from the coast to beyond the 2,000 m depth contour. The shipboard survey (using the *R/V Henry Bigelow*) was concentrated in the coastal waters in the Gulf of Maine, the aerial survey (using a NOAA Twin Otter) covered the rest of the area. The shipboard results are reported in the document SC/15/AE/9, the aerial results are reported the document SC/15/AE/8a. The primary objective for the shipboard and aerial surveys was to determine the spatial distribution and abundance of cetaceans, sea turtles, and seals in the study region. In addition, the shipboard survey also had the following objectives 1) determine the spatial distribution and abundance of seabirds, 2) use passive acoustics to record vocalizing cetaceans by a team of people, and 3) conduct oceanographic sampling (e.g., CTD and bongo casts) to help define the habitat throughout the survey region about three times a day. On the ship, two teams visually surveyed for

cetaceans, seals and sea turtles using the BT procedure with a visual primary team and a "Big-Eye" tracker team, while surveying at about 11 knots, and another team visually surveyed for seabirds using the standard strip transect procedure. About 2,970 km of track lines were surveyed, of which about 2,400 km of track lines were conducted in good weather conditions (Beaufort Sea States less than or equal to 3) and will be used in the abundance estimates. Two visual teams identified 14 species/species groups of cetaceans, and no turtle species, which consists of about 900 uniquely-identified groups. Another visual team identified 13 non-seabird species and 34 seabird/water species, which totalled 2,749 groups (17,109 individuals). Despite technical problems and loss of equipment, the passive acoustic high-frequency system operated for 785 km and the mid-frequency system operated for about 2,400 km. In addition here were 42 stations where bongo nets and CTDs were deployed to collect plankton and temperature/salinity data. Abundance estimates derived using the visual cetacean data are being produced.

Compared to CODA/T-NASS BT procedure, SNESSA implemented a BT setup without communication between the primary and tracker platforms, with duplicate determined *a posteriori*, thus requiring much simpler equipment. The two trackers each had their own data recorder (a Fujitsu Stylistic Tablet PC), which recorded data on a hand-held computerized data sheet (*in-house* NMFS software) that used both touch pull-down menus and hand-writing recognition fields. The three primary observers recorded their data on the same type of computer. The procedure performed very well, with no technical problems.

5.1 Cruise preparation, incl. vessels, platforms and equipment (T-NASS)

It is obvious that preparation for the cruise was less than adequate in some areas. Problems identified include:

- The planned effort was more than could be reasonably achieved by some of the vessels even with very good conditions. This was especially true for the Greenlandic vessel because the endurance of the vessel was less than expected, and also for the other vessels due to a misspecification of available sea days.
- Two ships became unavailable, one due to its unseaworthy condition and the other due to contractual issues. This required changing ships at the last moment and resulted in a loss of several days of effort.
- The equipment ordered from SMRU arrived very late in one case, at mid-day on the day of the vessel's departure. The platforms were not installed on 3 charter vessels in the Faroes as had been planned and the vessels were not in the same harbour. This made the setup and testing of equipment and the planned one-day training of the observers on equipped vessels impossible in all cases.
- The Leviathan brand "Big-Eye" binoculars were found to be nearly unusable on the two vessels that employed them, due to excessive vessel movement and/or vibration combined with poor optics. The Canadian "Big Eyes" were found excellent on one vessel and difficult to use on another vessel, probably

due to differences in vessel stability. This was detrimental to the effectiveness of three of the tracker platforms.

- There were numerous technical problems with the audio and video equipment and the survey software that in some cases were never resolved. A particular problem was incompatible/ malfunctioning external sound cards which prevented the recording of audio. In addition communication between the platforms was very poor, which is problematic for the implementation of the BT method as planned.
- The media (external hard drives) meant to record the videos for distance estimate did not worked properly on any vessels.

The Working Group made the following recommendations to avoid recurrence of these problems in future surveys.

1. All prospective vessels should be thoroughly inspected by a knowledgeable person before they are contracted. The general condition and seaworthiness of the vessels, as well as their suitability as survey platforms, including autonomy for fuel and water, should be assessed. If possible a certificate of seaworthiness should be provided and the vessel should be tested at sea.
2. Equipment should be ordered and received well in advance of the survey, and should be thoroughly tested in the lab and onboard the vessels before departure.
3. The Cruise Leaders should meet together well in advance of the survey, and all equipment should be available for inspection and use at the meeting. This will better enable the Cruise leaders to work out problems the equipment and protocols before the survey begins. A pilot/training survey should be conducted with all cruise leaders onboard.
4. All vessels must be thoroughly prepared (e.g. platforms mounted) and equipment mounted before observer training begins.
5. Adequate time must be allocated for observer training before departure. This should include at least one day of class training, and one day of practical training onboard the vessels.
6. Backup equipment, ideally duplicates of all major items, should be purchased for each vessel.
7. The protocol should include detailed instructions on alternative methods in cases of equipment failure.
8. Observers on each vessel should be designated and trained as technical experts on each type of survey equipment, and they should be responsible for onboard repair and maintenance.

5.2 Data collection procedures (T-NASS)

Due to the equipment problems encountered most of the vessels had at times to revert to paper forms to record data. Some problems were noted and recommendations for improvements made.

1. Use of the “Big Eyes” seemed to depend on the stability of the platform and the willingness and determination of the trackers to persevere in using them.

If "Big Eyes" are to be used in future surveys, special attention should be given to the stability of the vessels and platforms. Further training on the proper setup and use of these would be useful.

2. A better data recording system, possibly using weatherproof computers with touch screens, should be developed and used. The recording system should be fully field tested well in advance of the survey.
3. Consideration should be given to having a dedicated data recorder for the primary platform.
4. There should be frequent meetings of the cruise leader and observers to identify and resolve procedural problems, particularly early in the survey, and to receive feedback from the observers. These could be combined with data validation.
5. The cruise leader should regularly review the sightings performance of the observers, with regard to radial distances and angles and species identifications.

Other measures that should be considered which might improve the methodology include:

6. The tracker platform should continue tracking sightings until the sighting comes abeam, even if it is identified as a duplicate by the Data Inputer (DI).
7. Trackers should also confirm sightings initially made by the primaries when feasible.
8. Trackers should adhere to tracking only sightings that are likely to come close to the trackline.
9. The role of the trackers when there is a dispersed sighting should be reconsidered, in that their efforts may be better applied to mapping and identifying the sighting as a whole rather than tracking a single group.

5.3 Evaluation of observers (T-NASS)

Some of the observers were unsuitable, for example in failing to follow the protocols despite repeated reminders, and not working well in a team environment. On one of the vessels language was an issue.

Specific **recommendations** include:

9. If required survey guidelines and protocols should be provided in the native language of the observers who will use them. A simplified guide should also be provided to the Captain and crew.
10. All observers should be evaluated after the survey by the CL's based on specific criteria, and these evaluations should be given to the observer and kept on file for future reference.
11. Observers should be required to provide references and these references should be consulted before contracting.
12. Observers should have a medical examination, including a vision test, before departure. Observers should know their focus settings for binoculars.
13. Observers should be chosen for their observer quality coupled with social skills and dedication for the project.

5.4 Feedback from observers (T-NASS)

No formal feedback from the observers was provided to the meeting, although all cruise leaders held informal discussions with observers during the survey. It was **recommended** that a formal meeting be held at the end of the cruise to gain further input from the observers. Another effective mechanism might be to have a suggestion book onboard that can be used at any time.

5.5 Completed effort (amount and distribution) vs planned (T-NASS)

Overall coverage was less than planned (Table 1, showing planned and realized effort by stratum), primarily due to 1) the withdrawal of the German vessel from the redfish survey which necessitated a reallocation of effort by the other vessels, 2) the late start of the *Thor Chaser* and *Venus* and 3) the unknown necessity of refuelling and taking water for the *Tulugaq*. Unusually poor weather (fog and high winds) also reduced coverage in some areas. However it is also the case that planned effort was overoptimistic given the number of sea days available: this appears to have resulted from an overestimation of available sea days for the Greenlandic and Faroese vessel and the *Venus*. Two blocks (South Greenland and IF-N-N) were not surveyed at all. Coverage was particularly poor near East Greenland, off NW Iceland, NE Iceland and in the southern part of the Faroese blocks. Nevertheless it was considered that coverage was adequate for abundance estimation of the target species in all areas except perhaps minke whales in offshore areas of the central North Atlantic. It was **recommended that** the survey design be based on realistic assessment of available ship time, using the achievements of past surveys in the specific area as a guide. The endurance capabilities of the vessels must also be considered.

5.6 Quality of collected data (e.g.: angle, distance …) (T-NASS)

Comparison of perpendicular distances to duplicate fin whale sightings measured by the tracker and primary platforms on the Faroese and Icelandic vessels suggests that, assuming the tracker measurements are accurate, the primary measurements are negatively biased. However it was noted that these were not measurements to the same cue, and that the primary platform might be more likely to spot whales that are moving towards the transect than those that are moving away from it. An alternative explanation would be that fin whales are attracted to the vessel. The CODA data exhibited the same features. It was recommended that further work should be done comparing the distance measurements of the two platforms to duplicate sightings, paying particular attention to measurements made close together in time. Gunnlaugsson agreed to lead this work.

5.7 Distance experiment

While it was acknowledged that distance experiments were useful as a training aid, their usefulness for bias correction was questioned. Therefore it was recommended that distance experiments be conducted primarily as a training exercise at the beginning of the survey and possibly at intervals throughout the survey. It was also recommended that the nature of distance experiments be revaluated and if appropriate a standard method of conducting these experiments be documented.

5.8 T-NASS Cooperation with SMRU regarding equipment and guidelines

As previously noted the equipment was received very late, apparently due to the late reception of the equipment order due to a misunderstanding. Some of the equipment (e.g. the computer sound cards) malfunctioned from the beginning and almost all other items malfunctioned to varying degrees, sometimes irreparably. Some of the items were found not to be robust to the shipboard environment. It is likely that the equipment was inadequately tested because of its "last minute" production, and its late arrival meant that it could not be thoroughly checked before departure (in one case it was installed after departure!). It was recommended that feedback be provided to SMRU on the T-NASS experience with these equipment sets, so that improvements can be made. Víkingsson agreed to lead this.

5.9 T-NASS cooperation with SMRU regarding land back-up during the cruise

The staff of SMRU was helpful and cooperative in attempting to resolve equipment problems during the cruise. In this regard particular thanks are given to Doug Gillespie and Russell Leaper.

5.10T-NASS coordination between vessels

Communication between the vessels at sea was considered important to monitor progress, cooperate in filling in gaps in coverage, and helping to resolve equipment problems and protocol issues. However some vessels were out of communication for extended periods. It was recommended that a regular communication schedule be established between vessels in future surveys.

5.11 Input from CODA and SNESSA

Refer to specific sections under point 5.

5.11.1 Comparative success in implementing the BT methodology on SCANS II, CODA, SNESSA and T-NASS

More problems were encountered in implementing BT in T-NASS than in SCANS II and CODA, primarily due to equipment problems and perhaps also to insufficient training and experience. The problems of implementing the method could be overcome in future surveys through improvements in equipment and better observer training. It was also noted that alternative BT modes, such as that used by SNESSA were less technically complex and equipment dependent. SNESSA had a good success in implementing the BT methodology with an alternative and less technically complex procedure. This alternative should certainly be investigated for future surveys.

Nevertheless the BT method was considered the best method available for cases where perception and availability biases were expected and responsive movement was a possibility. The need to use BT as opposed to simpler methods, such as a single platform survey, is to a large degree dependent on the target species and the biases that might be expected. For fin whales preliminary estimates of *g(0)* have been close to 1 and responsive movement is not expected (but see 5.6). Therefore a single platform mode would be adequate for this species and more efficient in terms of use of observers. For other species such as minke and pilot whales, *g(0)* may be low and responsive movement is expected. Therefore a BT type mode is required if absolute

abundance estimates are desired for these species.

5.12 Overall evaluation and what to remember next time

The many problems noted above should not detract from the fact that the T-NASS ship survey was generally successful in achieving its objectives. There will always be problems in mounting a large and complex cooperative project such as T-NASS, and very important that these problems be adequately documented and that we learn from them. To this end the recommendations for improving future large scale ship surveys are detailed in Appendix 4.

Cetacean surveys are becoming increasingly technical; the time needed for a thorough preparation has consequently increased. This needs to be acknowledged and kept in mind for future surveys.

6. AERIAL EVALUATION

Cruise reports were available for all surveys: Icelandic, Greenlandic, Canadian, and SNESSA. Summaries are provided below.

Iceland

The Icelandic aerial survey component of the T-NASS project was a continuation of a series of surveys, using nearly identical design and methodology, conducted in 1987, 1995 and 2001. Target species, in order of priority, were minke whales, harbour porpoises, and humpback whales. However all species encountered were recorded. One of the primary observers was highly experienced in aerial surveys for harbour porpoises, while the other had previous experience with minke whale surveys. The survey design and methodology (cue counting for minke and baleen whales, line transect for others) was identical to that used in 2001, except that some additional effort was flown in fiords and high-density areas on an opportunistic basis, and the survey was flown at 600 ft rather than 750 ft as previously. In addition sea surface temperature data were collected using an infrared temperature probe. Of the 30 days the plane was available, at least some effort was flown on 20. Unlike in previous years pack ice covered much of the north-western part of the survey area, including the northern part of Block 3 and the western parts of Blocks 4 and 5. Pack ice coverage ranged from 0 to 90% in these areas. Total realized effort was 79% of planned effort, not including double coverage in some areas and the additional fiord effort. 95% of realized effort was flown at Beaufort Sea State 3 or less. A total of 70 unique sightings of minke whales were made by the primary and secondary observers. The sighting rate for minke whales was much lower than in previous surveys in almost all areas. The harbour porpoise was the most frequently sighted cetacean in this survey. Harbour porpoises were seen in all strata but were most common in inshore areas and particularly off western Iceland. Humpbacks were most frequently sighted to the NW of Iceland and appeared to be strongly associated with the ice edge in some areas. Unlike in 2001 few humpbacks were sighted off eastern Iceland, but parts of this area were not covered. White-beaked dolphins were seen in all blocks but were most common to the North and N.E. of Iceland. Other species encountered at low frequency

include fin, sperm, pilot and beaked whales, and white-sided and bottlenose dolphins. The survey was generally successful in covering the area and no serious problems were encountered. Recommendations to enhance the success of future aerial surveys are provided in Appendix 3.

Canada

The Canadian study area extended from Cape Chidley, Labrador, down to the Scotian Shelf (SS) to meet the SNESSA effort in the Bay of Fundy. There were three aircraft involved, with 9 observers on effort**.** This survey provides full coverage of the Atlantic Canadian coast for the first time, covering the eastern coast of Canada that have not been surveyed completely in earlier surveys, or in some cases, at all.

The survey methodology was as similar as possible to that used previously in Canada, and the adjacent U.S. NMFS survey area (SNESSA) to maintain consistency. A single Twin Otter 300 was used in the NL survey, while a pair of Cessna Skymaster 337s was used simultaneously during survey effort in the Gulf and SS surveys. All observers were highly experienced, and had participated in training and practice surveys prior to the T-NASS effort.

On the Twin-Otter sightings were recorded using a dedicated survey programme which was GPS-linked, and also recorded input from the sea surface temperature probe in the belly of the aircraft. Declinations to sighted animals were made using hand-held inclinometers. On the Skymaster, sightings data were recorded onto handheld audio recorders and transcribed to computer as soon as possible after each survey day.

The NL crew consisted of a pilot, co-pilot, a single forward observer on the left, forward and rear observers on the right, and a navigator/data recorder. On the Gulf and SS, there were two independent observers, one on each side of each Skymaster aircraft. The two aircraft alternated the lines that they flew each day, so a single aircrew did not survey any one portion of a stratum alone.

All marine megafauna species encountered (with the exception of seabirds) were recorded, although in the NL survey area pinniped sightings were rarely recorded as they were infrequent, and DFO uses other means to estimate their abundance. Sighting angles and species identification were checked each night during the survey of the NL portion, as the data were recorded onto the computer in real time during each flight.

Newfoundland and Labrador

Most of the planned transect lines were flown, and most in good to very good sea states and sightability conditions (Canadian survey report Figs 2 and 3), with effort conducted from 17 July to 24 August, 2007. Some modifications to the Distance-based survey design were required for logistical purposes. Primarily, the team had to reduce survey coverage in several areas off the Labrador coast and off the Newfoundland southeast coast due to range limitations of the aircraft. Transect lines were re-drawn to maximize coverage while staying within operational limits.

Eighteen species were sighted (Table 2). The most commonly-sighted animal was the humpback whale, with relatively large numbers of sightings of Atlantic white-sided dolphins, fin whales, white-beaked dolphins and sunfish (*Mola mola*). Most sightings occurred in the southern stratum of the survey area, with relatively few along the Labrador coast (Canadian survey report Tables 2 and 3, and Fig. 4). Also, more sightings were made later in the survey period than initially (not just confounded by survey locality).

Gulf of St Lawrence and Scotian Shelf

Survey coverage was extremely good over this survey area, with effort conducted from 21 July to 27 August, 2007. Almost all planned transect lines were flown, and most in good to very good sea states and sightability conditions. Some modifications to the Distance-based survey design were required for logistical purposes and the planned equal-angle zig-zag transects were replaced with parallel transects spaced 10 nm apart.

The two Skymaster teams reported more than 1300 megafauna sightings, with 19 cetacean species identified and higher sightings rates in the Scotian Shelf than in the Gulf (Table 2).

Greenland

The aerial survey off West Greenland was conducted between 25 August and 29 September 2007. The survey platform was a Twin Otter operated by Air Greenland with four observer platforms and long range fuel tanks. Observations for cetaceans were conducted from four bubble windows and were recorded and geo-referenced onto a Redhen msDVRs system that also allowed for continuous video recording of the trackline as well as vertical digital photographic recordings. In addition sea surface temperature was recorded every two minutes on a separate computer.

The survey, conducted as a line transect survey with cue counting data collection for the three target species – minke, fin and humpback whales – was planned to systematically cover the banks off West Greenland from Uummannaq in the north to southernmost tip at Kap Farvel. East-west oriented parallel transects were chosen for most areas except for south Greenland were north-south oriented transects were deployed. Complex fjord systems were covered by a zigzag transect-design.

The survey covered a total of 220,924 km^2 and the accomplished effort was 9,434 km flown in sea state 5 or less, of which 5,285 were flown in sea state 3 or less. In terms of effort for cue counting estimation this corresponds to 190,163 seconds in sea state 5 of which 126,290 seconds were flown in sea state 3 or less. White-beaked dolphins were the most commonly seen species followed by harbour porpoise, then common minke, fin and humpback whales (Table 2).

SNESSA

During 30 July to 29 August 2007, the Northeast Fisheries Science Center conducted an abundance survey using an aircraft and ship in waters from Cape Hatteras, North Carolina to the Bay of Fundy, and from the coast to beyond the 2000 m depth contour.

The shipboard survey (using the *R/V Henry Bigelow*) was concentrated in the coastal waters in the Gulf of Maine, and the aerial survey (using a NOAA Twin Otter) covered the rest of the area. The primary objective for the aerial survey is to determine the spatial distribution and abundance of cetaceans and sea turtles in the study region. The airplane flew at 600 feet above the water surface at about 110 knots and the circle-back (Hiby) data collection methods were used, where circles were performed on groups of cetaceans and turtles that had 5 or less animals per group. There were about 8,900 km of on-effort track lines that were conducted in Beaufort 3 or less and will be used in calculating the abundance estimates. On these track lines, there were 15 species of identifiable cetaceans, and four turtle species detected. There were 98 circle-backs performed on 20 species/species groups that can be used to estimate *g(0)* for these species. The abundance estimates procedures using these data are underway.

6.1 Cruise preparation, including platforms and equipment

Preparations for the aerial surveys were generally considered to have been adequate in all cases. Minor modifications were made to the Canadian transect design because of logistical considerations. While minor equipment problems were encountered by all teams, the only serious one was the non-functional SST software in the early part of the Icelandic survey, and this did not detract from whale observations.

The survey platforms were adequate in most respects. The Twin Otter platform was preferred because it is relatively large, can carry more observers and uses Jet A fuel, which is more readily available than the Avgas required by the Partenavia and Skymaster. However it costs significantly more to use which will reduce available effort. The secondary platform on the Partenavia was considered less than adequate because it does not afford a good view of the transect, which is important for *g(0)* estimation using double platform methods. It was noted that experiments are ongoing in Canada and other areas in the use of drone aircraft, so this might be a possibility in the future.

The use of the large Arcturus aircraft by Canada was unfortunately cancelled. It was considered that this platform was promising for covering large offshore areas and it was recommended that its use should be further investigated.

Lightweight immersion suits (pilot suits) were used for the first time in Iceland and these were found to be comfortable and convenient. It is undeniable that they could save lives in some situations. In addition one of the observers had received underwater escape training and shared this experience with the crew. These safety measures were also implemented in SCANS II, and it is recommended they be used in future aerial surveys.

6.2 Data Collection procedures

The data collection procedures were similar between Iceland and Greenland but differed from those used by Canada and SNESSA. The single platform observer procedure used by Canada on the Skymaster platforms does not provide a way to estimate availability bias, so this will be an issue when absolute abundance estimates

are estimated. The double platform procedures employed in the Twin Otter team surveying the NL part of the Canadian survey will allow for estimation of *g(0)* however. A test flight during which the two Skymasters flew along the same trackline as the Twin Otter, in relatively close in-line formation, provided a low number of duplicate sightings data to conduct a comparative analysis of detection probability, and thus corrections to the Skymaster data will likely be not be possible using this method.

Pike provided recommendations for the improvement of procedures in the Icelandic survey, including minor changes to the protocol and the development of a protocol for very large schools; these are detailed in Appendix 3. The use of high definition video as a secondary platform should also be investigated. Such systems are relatively inexpensive, compact and have excellent resolution. The use of such a system might make a manned secondary platform unnecessary. It was recommended that this be further investigated.

The change in survey altitude from 750 to 600 ft in the Icelandic survey did not seem to detract very much from the effectiveness of the survey for minke whales and certainly improved its effectiveness for harbour porpoises.

6.3 Evaluation of observers

Most of the observers used in the aerial surveys had previous experience, and all received what was felt to be adequate ground and flight training.

Past experience has demonstrated the value of monitoring the observers closely during the survey and providing feedback to them on a regular basis. While this is relatively easy if the data are entered onboard the plane, it has proven difficult in cases where the data are recorded orally. The employment of a ground crew to enter data in the Icelandic survey greatly facilitated this process and should be continued in future surveys.

6.4 Feedback from observers

The cruise leaders consulted with the observers in the preparation of the cruise reports.

6.5 Completed effort vs planned

Table 1 shows the planned effort vs the effort realized under acceptable conditions. Realized effort was excellent in almost all areas, and spectacularly so in Canada. Some small portions of the Icelandic area, particularly the NE and SE “corners”, were missed because of persistent bad weather. Some areas were surveyed twice or received additional effort. Two planes were used to cover parts of the Canadian area, and this strategy could be considered for other areas.

6.6 Quality of collected data

This is presently under evaluation, but no serious issues have as yet arisen.

6.7 Distance experiment

Distance experiments were not carried out.

6.8 Coordination between planes

Three aircraft were used in Canada, and there was close coordination between these and the neighbouring SNESSA crew. The cruise leader of the Greenlandic survey received training in the initial part of the Icelandic survey. Close coordination between other areas during the survey was considered unnecessary as the survey areas were not contiguous and somewhat different methods and equipment sets were used.

6.9 Overall evaluation and what to remember next time

Generally the aerial portion of T-NASS was considered successful and relatively unproblematic compared to the ship-based survey. Specific recommendations are provided in Appendix 4.

7. SPECIAL MODIFICATIONS IMPLEMENTED FOR ENCOMPASSING HARBOUR PORPOISES

Such modifications were mainly implemented in the Icelandic aerial survey, see Appendix 5. for details. They include the use of an experienced harbour porpoise observer, a reduction in altitude from 750 to 600 ft, and the implementation of special strata in some of the fjord systems.

The use of an experienced harbour porpoise observer (from SCANS II and other surveys) in the Icelandic survey was considered a success in that the number of harbour porpoise sightings increased dramatically compared to earlier surveys. However in surveys designed to estimate the abundance of both small and large whales it is also important that an optimal searching pattern be used.

The secondary fiord strata attempted in Iceland were, however, only partially successful because of persistent high winds in some of the fiords. It was also found that harbour porpoise densities were not particularly high in those areas flown. Therefore these strata should not have high priority in future surveys, but could be flown on an opportunistic basis.

Overall, the modifications implemented were thought to be satisfactorily and commended by the Working Group. They will lead to the first reliable harbour porpoise abundance in Icelandic coastal area.

8. T-NASS EXTENSION EVALUATION

Three Extension survey efforts covered areas adjacent and to the south of the main T-NASS survey area at approximately the same time that T-NASS was in progress.

1) The MAR-ECO research programme placed one vessel (from UK) along the North Atlantic Ridge north of the Azores, and especially around the Charlie Gibbs Fracture

Zone.

2) The international Redfish survey, coordinated by ICES, covered the Denmark Strait and the Irminger Sea, with three vessels from Iceland, Russia and Germany. The Icelandic vessel would actually also be used as a full cetacean survey platform, as was done successfully in 2001. Unfortunately the German vessel cancelled the survey without reaching the Irminger Sea because of repeated mechanical injuries.

3) The pelagic Norwegian/Russian fish survey had two Norwegian vessels in the Norwegian Sea. The Russian vessel participating to the Redfish survey would also survey in the Barents Sea and in the Norwegian Sea on its way to the Irminger Sea.

The authorities behind the different surveys were contacted and the T-NASS coordinator participated to the ICES Planning Meeting for the Redfish survey (Murmansk, January 2007). Permission was obtained to have two observers onboard the different vessels, except on the MAR-ECO vessel which had only room to house a single observer.

In total, 5,253 nm of whale survey effort were conducted under T-NASS extension, with a total of 288 cetacean sightings made on effort.

Some discussion about the usefulness of the T-NASS Extension ensued at this meeting. In general it was considered a worthwhile addition to the main survey because it provided information on distribution and relative abundance for areas outside the main survey area that will be useful in putting the results of the main survey in context. The usefulness of the data for deriving estimates of abundance is less certain. The effort is generally well distributed in areas that could be designated as strata with relatively balanced coverage (except for the MAR-ECO data). However sightings are few except for minke and sperm whales and likely insufficient to be analyzed separately from the main survey data, and the data must be examined in more detail to see if this is feasible. Acquarone agreed to lead in this effort, and to put a proposal to NAMMCO for additional funding for analysis if that is required.

Some other recommendations were provided to improve the effectiveness of such “opportunistic platform” surveys.

1. Ideally at least 3 observers should be used, one of whom scans the sea with binoculars.
2. It would be very useful if these vessels could overlap in space and time with portions of the main survey, to provide some indication of their relative efficiency.
3. A great deal of other data were collected by these vessels and some of it might be useful in for modelling or other purposes. At the same time the cetacean data may be of interest to the fish researchers. This should be further investigated.

9. T-NASS ACOUSTIC EVALUATION

9.1 Data collection procedures

Although technical problems were encountered on some of the vessels, the acoustic system was generally easy to use and not a heavy burden on the responsible observers. If the data prove to be of value, there were no objections to continuing to have an acoustic programme in future surveys.

9.2 Data collected and planning of analysis

The evaluation of the potential of these data is ongoing at SMRU and a decision on further analyses will be made when that is completed.

10. GENERAL EVALUATION

10.1 General T-NASS coordination

In discussing the value of a coordinated international synoptic survey, it was necessary to consider what alternatives were available that might be expected to produce similar data. These included uncoordinated or partially coordinated national surveys, or "mosaic" surveys conducted annually and covering a large area over several years. It was concluded that the T-NASS coordination provided many advantages over uncoordinated or less coordinated national surveys. The joint survey planning and commonality of methodology means that the resultant estimates from the coordinated survey can be combined, whereas this may not be possible if the surveys were not coordinated. Mosaic surveys offer many practical advantages in that they can be conducted annually, possibly using the same vessels and observers over long periods, and can be built into annual budgets. On the other hand, the estimates from a mosaic survey apply over several years and must contain additional variance to account for annual variation and long term changes within survey blocks. This additional variance can be great if there are variations in distribution on an annual basis.

The choice between these two modes probably depends mostly on the use of the estimates. In a long-term harvest control system for a single species where estimates must be produced for a specific area on a set time schedule, mosaic surveys may be a viable alternative. However this is not the case for all participants in T-NASS. For some participants it was more important to obtain a snapshot of distribution and abundance of several species, and for this purpose a synoptic coverage offers advantages. In addition temporal changes in distribution by comparison to past surveys can more readily be determined with synoptic surveys.

It was also noted that a synoptic, multi-national survey covering a very large area tended to be more attractive to funding agencies: this was in particular the case for the Canadian survey.

The Working Group concluded that the coordination of surveys under the T-NASS banner had been successful and productive. Problems with the implementation of particularly the ship surveys have been mentioned under section 5 and

recommendations for improvement of future large scale surveys are provided within the report as well as collated in Appendix 5. Most importantly, planning the practical aspects of the survey, for example purchasing and testing equipment and training cruise leaders, must be done well in advance of the survey.

There was also a feeling that national interests had dominated in most cases when planning decisions had to be made and implemented. This is understandable since most of the funding came from national research institutes; nevertheless a coordinated survey requires some degree of commitment to the survey as a whole. In several cases, pieces of expensive technical equipment (e.g., "Big Eyes") were loaned amongst participating countries, decreasing the overall costs of conducting surveys using this equipment.

In this regard it was agreed that further cooperation in coordinating the output from the T-NASS project was of great importance. It was **recommended** that a primary publication on the planning, conduct and results of the T-NASS, particularly pertaining to general distribution of cetaceans throughout the entire survey area, including the extension areas, be produced as a priority. CODA and SNESSA agreed to participate in this. In addition products for a general audience should be developed (see 10.3-5)

10.2 Feedback after the survey

Response to requests from the secretariat or coordinator on updates after the surveys were not always effective in generating answers, which proved very frustrating and led to delays in reporting to different authorities and in building up content for the poster for the ECS.

10.3 Input to website before, during and after

Communication with the NAMMCO Secretariat during the survey was sporadic and it was difficult to update the website in a meaningful way. For future surveys this should be improved, as there is considerable public interest in these surveys and funding agencies are interested in seeing the results of their support made public in a timely way. It has continued to be difficult to obtain updates as data compilation and analysis continues. It was hoped that cooperation in this area could be improved.

The NAMMCO Secretariat will continue to maintain a section of the website devoted to T-NASS. It was agreed that, as a starting point, distribution maps for all important species, including sightings from the main T-NASS and extension areas, as well as the CODA and SNESSA surveys, will be developed and posted as a priority. All parties agreed to provide the data to Acquarone in a timely manner.

10.4 Press release

It was recommended that the NAMMCO Secretariat develop a press release detailing the conduct and general results of the survey, including maps of the distribution of target species.

10.5 Other
There were no other points.

11 COOPERATION BETWEEN T-NASS, CODA AND SNESSA

The cooperation between T-NASS, CODA and SNESSA has been positive from the beginning. The provision of survey reports from both T-NASS-associated surveys to this meeting was acknowledged and appreciated. It was also agreed that sightings data would be shared for the production of general interest publications (see point 10.3).

12. T-NASS OVERVIEW AND STATUS

12.1 Overview of effort and data collected: ECS poster
A poster presentation outlining the planning, conduct and general results of T-NASS, including a map of fin whale sightings, was presented at the ECS conference in Egmond aan Zee.

12.2 Budget
A budget was presented but it could not be updated to reflect actual expenditures, when no feedback had been provided on the actual expenses. The cooperation of national delegates was requested for the update of the budget, so it could constitute usable guidelines/references in future surveys.

13. OTHER ITEMS

The Working Group thanked Genevieve Desportes for her hard work, patience and determination in the face of almost insurmountable adversity in her role as the coordinator of the T-NASS project. Geneviève noted that she had got fantastic support from the 'successive men' of the secretariat in this coordination work, Daniel Pike then Mario Acquarone. She also thanked Patrice Simon (DFO Canada) for his enthusiasm for the project and his role in getting Canada to participate. She expressed her appreciation to all who had participated in the planning and conduct of T-NASS, also Christina Lockyer and Charlotte Winsnes from the Secretariat.

14. ADOPTION OF REPORT

A preliminary report was accepted on 8 April 2008. The final report was accepted by correspondence on 9 July 2008.

SURVEYS	platforms	Survey blocks		Trackline, nm			Surveyed area*
		planned	realised	planned	on effort	%	nm^2
Main	**12**	**Northern North Atlantic**		**69,928**	**57,781**	**83**	**1,474,530**
Extension	**5**				**5,253**		

SHIPBOARD

SURVEYS	Vessels	Survey blocks		Trackline, nm			Surveyed area*
		planned	realised	planned	on effort	%	nm^2
ICELAND Redfish/T-NASS	AF II	Irminger sea IF-RED	IF-RED	3,700	2,027	55	246,363
ICELAND	Venus	North Iceland IF-N-N, IF-N-S, IF-N-W	IF-N-S, IF-N-W	3,021	891	29	117,344
ICELAND	Jákup B	South centre Iceland IF-SC, IF-SC-Ext	IF-SC	2,711	2,500	92	119,116
FAROES	Thor Chaser	East-Southeast Iceland IF-E, IF-SE-S, IF-SE-N	IF-E, IF-SE-N, IF-SE-S	2,761	1,520	55	128,740
GREENLAND	Tulugaq	West Greenland GN, GC, GS, GD	GN, GC, GD	2,129	814	38	57,771
NORWAY	Ulvos & Havsel	Barents Sea east of 28E	Eastern Barents Sea	4,008	2,230	56	264,939
TOTAL	**7**			**18,330**	**9,982**	**54**	**934,273**

AERIAL

SURVEYS	Planes	Survey blocks		Trackline NM			Surveyed area*
		planned	realised	planned	on effort	%	nm^2
ICELAND	Partenavia	Iceland coastal shelf (9 blocks)	Iceland coastal shelf (9 blocks)	6447	5080	79	85,546
CANADA	Twin Otter	Newfoundland and Labrador (4 blocks)	Newfoundland and Labrador (4 blocks)	27,205	26,063	96	214,555
CANADA	Cesna Skymaster 337	St. Lawrence Gulf (4 blocks)	St. Lawrence Gulf (4 blocks)	6643	6,643	100	68,523
CANADA	Cesna Skymaster 337	Scotian Shelf (3 blocks)	Scotian Shelf (3 blocks)	4935	4,919	100	52,344
GREENLAND	Twin Otter	West Greenlandic shelf (? blocks)	West Greenlandic shelf (? blocks)	6368	5,094	80	119,289
TOTAL	**5**			**51,598**	**47,799**	**93**	**540,257**

SHIPBOARD EXTENSION

SURVEYS	Vessels	Survey blocks	Trackline NM			Surveyed area**
			vessel track	whale survey effort	%	nm^2
Pre - ICES Redfish, RU	Smólensk	Barents & Norwegian Sea	3,710	198	0	38,600
ICES Redfish, D	Walther Herwig III	Irminger sea	cancelled			0
ICES Redfish, RU	Smólensk	Irminger sea	8,600	755	0	90,000
Post - ICES Redfish, RU	Smólensk	Labrador, Norwegian & Barents Seas.	19,010	540	0	198,600
Norwegian Pelagic, NO	Eros	Norwegian Sea	NA	1,152		NA
Norwegian Pelagic, NO	Libas	Norwegian Sea	NA	1,568		NA
MAR-ECO, UK	James Cook	Mid Atlantic ridge	NA	1,040		NA
TOTAL	**5**			**5,253**		

*tentative value, subject to changes at analysis
** area corresponding to the vessel effort, not the whale survey effort

Table 1. Planned and Realized Effort. T-NASS.

2007 // On Effort Non duplicate Sightings (incl. duplic for Tulugaq)	T-NASS SHIPBOARD						T-NASS AERIAL					T-NASS Extension						T-NASS TOTAL	CODA TOTAL	SNESSA TOTAL	SNESSA	
	Irminger Sea	South Centre Iceland	North Iceland	East - Southeast Iceland	West Greenland	Eastern Barents Sea	Iceland coastal	N. Foundland Labrador	St Lawrence Gulf + Cap breton	Scotian Shelf	West Greenland	Mid atlantic Ridge	Irminger Sea	Norwegian Sea	Norwegian Sea	Norwegian Sea	Barents Sea					
Species	Iceland, AFII	Iceland, Jakup B	Iceland, Venus	Faroes, T.Chaser	Greenland, Tulugaq	Norway, Ulvos & Havsel	Iceland	Canada	Canada	Canada	Greenland	MarEco / J.Cook	Redfish / Smólensk	NO Pelag / Eros	NO Pelag / Libas	Pre&Post RFish / Smólensk	Pre&Post RFish / Smólensk				Shipboard	Aerial
Bowhead whale											1							1				
Blue whale	1	4	8					4	6	5			4					32	1			
Fin whale	237	69	20	5	2	15	7	73	4	44	25		10	3	6			520	346	58	43	15
Sei whale	13	31		1	1			1		2	5		7	2				63	18	6	4	2
Sei / Humpback														1				1				
Fin / Sei																			10	26	22	4
Fin / Humpback																						
Common minke whale	5	2	19	9	35	88	70	53	24	86	27			8	13	5	2	446	23	75	62	13
MW or BW					1													1				
Humpback whale	10	1	66	4	8	11	58	144	32	51	21		1		3	1		411		251	214	37
Right whale																				44	38	6
Sperm whale	31	27	4	9			4	11		11		9		10	17			133	65	8	2	6
Pygmy spermwhale										1								1				
Narwhal											2							2				
Beluga								5	203									208				
Northern bottlenose whale	2	9	2	13	2		1	10		3		1	4	2	1			50	3	1		1
Sowerby's beaked whale		1										1						2	7	1	1	
Cuvier's beaked whale										1								1	15			
Unid. beaked whale	1	10					3			4		1						19		2		2
Unid. Mesoplodon										9								9				

Table 2. Cetacean sightings made on effort during T-NASS and associated surveys (cont. next page).

2007 // On Effort Non duplicate Sightings (incl. duplic for Tulugaq)	T-NASS SHIPBOARD						T-NASS AERIAL					T-NASS Extension						T-NASS TOTAL	CODA TOTAL	SNESSA TOTAL	SNESSA	
	Irminger Sea	South Centre Iceland	North Iceland	East - Southeast Iceland	West Greenland	Eastern Barents Sea	Iceland coastal	N. Foundland Labrador	St Lawrence Gulf + Cap breton	Scotian Shelf	West Greenland	Mid atlantic Ridge	Irminger Sea	Norwegian Sea	Norwegian Sea	Norwegian Sea	Barents Sea					
Species	Iceland, AFII	Iceland, Jakup B	Iceland, Venus	Faroes, T.Chaser	Greenland, Tulugaq	Norway, Ulvos & Havsel	Iceland	Canada	Canada	Canada	Greenland	MarEco / J.Cook	Redfish / Smólensk	NO Pelag / Eros	NO Pelag / Libas	Pre&Post RFish / Smólensk	Pre&Post RFish / Smólensk				Shipboard	Aerial
Killer whale	6		3	5	0		11	1		7			2	8	11	5		**59**	**3**			
false killer whale																			**1**			
Long-finned pilot whale	45	12		14	1		9	10	7	37	15	11	10					**171**	**88**	**20**		20
long/short finned p.w.																			**4**	**2**	2	
White sided dolphin	8	15		3			3	92	13	15		6	4	1				**160**	**20**	**36**	25	11
White beaked dolphin	6		25			35	105	68	16	2	58		2	6	13	2	7	**345**		**1**	1	
Lagenorhynchus sp.						64												**64**				
Bottlenose dolphin				2			1			8								**11**	**39**	**15**		15
Common dolphin								28	2	201		35						**266**	**149**	**64**		64
Striped dolphin										1		4						**5**	**54**	**1**		1
Common/striped																			**74**			
Risso's dolphin									1	6								**7**	**3**	**31**		31
Harbour porpoise		9		10	3	37	119	36	25	4	46							**289**	**3**	**571**	440	131
Big cetacean	26	3	16	7		4	12	6	17	70		4	20	4		1	1	**191**				
Medium cetacean	1	2		4	3						3	1		1				**15**				
Small cetacean	1	2		1			8	2	3	12	3							**32**				
Patterned dolphin			1															**1**		**39**		39
Unidentified whale (blow)	26	1		9	1		4					1			3			**45**	**171**	**208**	184	24
Unidentified dolphin	24	1	9	12			16	40	105	201	15	10		2	1			**436**				
Unidentified animal																				**24**		24
TOTAL	**443**	**199**	**173**	**108**	**57**	**254**	**431**	**584**	**458**	**781**	**221**	**84**	**64**	**48**	**68**	**14**	**10**	**3997**	**1097**	**1460**	**1038**	**422**

Appendix 1

AGENDA

1. CHAIR'S WELCOME AND OPENING REMARKS
2. ADOPTION OF AGENDA
3. APPOINTMENT OF RAPPORTEURS
4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS
5. SHIPBOARD EVALUATION
- 5.1 Cruise preparation, including vessels, platforms and equipment (T-NASS)
- 5.2 Data collection procedures (T-NASS)
- 5.3 Evaluation of observers (T-NASS)
- 5.4 Feedback from observers (T-NASS)
- 5.5 Completed effort (amount and distribution) vs Planned (T-NASS)
- 5.6 Quality of collected data (e.g. angle, distance…) (T-NASS)
- 5.7 Distance experiment
- 5.8 T-NASS Cooperation with SMRU regarding equipment and guidelines
- 5.9 T-NASS Cooperation with SMRU regarding land back-up during the cruise
- 5.10 T-NASS Coordination between vessels
- 5.11 Input from CODA and SNESSA
- 5.12 Comparative success in implementing the BT methodology on SCANS II, CODA, SNESSA and T-NASS
- 5.13 Overall evaluation and what to remember next time

6. AERIAL EVALUATION
- 6.1 Cruise preparation, incl. platforms and equipment
- 6.2 Data Collection procedures
- 6.3 Evaluation of observers
- 6.4 Feedback from observers
- 6.5 Completed effort vs planned
- 6.6 Quality of collected data (e.g. angle, distance…)
- 6.7 Distance experiment
- 6.8 Coordination between planes
- 6.9 Overall evaluation and what to remember next time

7. SPECIAL MODIFICATIONS IMPLEMENTED FOR ENCOMPASSING HARBOUR PORPOISES
8. T-NASS EXTENSION EVALUATION
9. T-NASS ACOUSTIC EVALUATION
- 9.1 Data collection procedures
- 9.2 Data collected and planning of analysis

10. GENERAL EVALUATION
- 10.1 General T-NASS coordination
- 10.2 Feedback after the survey
- 10.3 Input to website before, during and after
- 10.4 Press release
- 10.5 Other

11. COOPERATION BETWEEN T-NASS, CODA AND SNESSA
12. T-NASS OVERVIEW AND STATUS
12.1 Overview of effort and data collected: ECS poster
12.2 Budget
13. OTHER ITEMS
14. ADOPTION OF REPORT

Appendix 2

LIST OF DOCUMENTS

Doc. No.	Agenda	Title
SC/15/TNASS/24	10	Report from the 3rd Planning Meeting – St. Andrews, March 2007
SC/15/TNASS/29	5, 9	Víkingsson. Cruise Report from Arni Fridriksson II - Iceland (Irminger Sea)
SC/15/TNASS/30	5, 9	Desportes and Halldórsson. Cruise Report from Venus – Iceland (Northern Iceland)
SC/15/TNASS/31	5, 9	Gunlaugsson. Cruise Report from Jákup B – Iceland (South central Iceland)
SC/15/TNASS/32	5, 9	Mikkelsen. Cruise Report from Thor Chaser – Faroes (South East Iceland)
SC/15/TNASS/33	5, 7, 9	Rye Hansen. Logbook from Tulugaq – Greenland (West Greenland)
SC/15/TNASS/35	5.12, 11	CODA Cruise Reports (Collated)
SC/15/TNASS/36	5.12, 11	CODA Debriefing Meeting - minutes
SC/15/TNASS/40	6, 10, 12	Lawson and Gosselin: Canada's Marine Megafauna Survey (poster for the SMM Conference 2007)
SC/15/TNASS/41	6	Lawson and Gosselin. Cruise report for the T-NASS Canadian Aerial Survey
SC/15/TNASS/42	5, 6, 10, 12	Desportes *et al.* From the Barents Sea to the St. Lawrence: a Trans-North Atlantic Sightings Survey T-NASS 2007. Poster for the ECS 2008
SC/15/TNASS/43	6, 7	Heide-Jørgensen. Cruise report for the T-NASS Greenlandic aerial survey (South and Western Greenland)
SC/15/TNASS/44	5, 6, 10	Minutes of the shipboard survey debriefing and note on the aerial survey debriefing (telephone meeting, 12-11/2007)
SC/15/TNASS-AE/45	1	List of participants to SC/15/TNASS & AE WG, Copenhagen, April 7-8, 2008
SC/15/TNASS/46	2	Draft Agenda for SC/15/TNASS, Copenhagen, April 7, 2008
SC/15/TNASS-AE/47	4	List of documents for SC/15/TNASS-AE, Copenhagen, April 7, 2008

SC/15/TNASS/48	8	Rappé and Malinga. T-NASS extension: cruise report from Walter Herwig III (the No cruise)
SC/15/TNASS/49	8	Frie and Shafikov. T-NASS extension: cruise report from Smolensk (Murmansk (RU) to St. Anthonys (CA) through the Irminger Sea)
SC/15/TNASS/50	8, 9	Mackey. T-NASS extension: cruise report from the James Cook (mid Atlantic Ridge)
SC/15/TNASS/51	8	Desportes and Acquarone. T-NASS extension: cruise report for Eros and Libas (Norwegian Sea)
SC/14/TNASS/O4		Report from the WG on Abundance Estimates – Kerteminde March 2002
SC/14/TNASS/O5	10	Report from the 1st Planning Meeting – Reykjavik, March 2006
SC/14/16	10	Report from the 2nd Planning Meeting – Reykjavík, November 2006
SC/15/TNASS/O2	5	T-NASS Cruise Leader Guide
SC/15/TNASS/O3	5	T-NASS Observer Guide
SC/15/TNASS/O4	5	LOGGER Manual for CODA and T-NASS 2007
SC/15/TNASS/O5	5	Validation Manuals
SC/15/TNASS/O6	5	Acoustic Manual
SC/15/TNASS/O7	5	Forms and Sheets
SC/15/TNASS/O8	8	T-NASS Extension Observer Guide
SC/15/TNASS/O9	8	T-NASS Extension Cruise Leader Guide
SC/15/AE/3	8	Desportes, Acquarone and Pike. T-NASS extension: an overview.
SC/15/AE/4	6,7	Pike and Gunnlaugsson. T-NASS Icelandic aerial survey: Survey report and a preliminary abundance abundance estimate for minke whales (*Balaenoptera acutorostrata*)
SC/15/AE/8	6	Palka. Cetacean abundance estimates in the US North Atlantic waters: aerial survey
SC/15/AE/9	5	Palka. Cetacean abundance estimates in the US North Atlantic waters: shipboard survey
SC/15/AE/15	5	MacLeod. Cetacean Offshore Distribution & Abundance (CODA): an overview.

Appendix 3

RECOMMENDATIONS FOR THE IMPROVEMENT OF PROCEDURES IN THE ICELANDIC AERIAL SURVEY, INCLUDING MINOR CHANGES TO THE PROTOCOL AND THE DEVELOPMENT OF A PROTOCOL FOR VERY LARGE SCHOOLS

1. Survey altitude should be chosen with regard to the target species. If harbour porpoises are a target, survey altitude should be maintained at 600 ft. Since this altitude appeared to function well for minke whales, it should probably be maintained in future surveys.
2. The secondary fiord strata should be further developed and flown on an opportunistic basis.
3. The protocol modifications emphasizing the collection of abeam declinations should be maintained.
4. The Large School Protocol should be further developed and maintained.
5. The SST sensor is inexpensive, compact, trouble free in operation and potentially provides valuable data for spatial modelling. It should be used in future surveys. However, a way of ground truthing the temperature measurements should be found.
6. A reliable way of finding accommodations in the towns used as bases in Iceland (Isifjorthur, Akureyri, Egilstathir, Hofn) at short notice should be found.
7. The use of high definition video as a secondary platform should be investigated. Pike had the opportunity to use such a system in Antarctica in 2008, and was very impressed by the image quality and our ability to sight Antarctic minke whales on the video. This seems to be far easier than with still photos. Available systems are compact and relatively inexpensive. A single camera could be pointed straight down, or 2 cameras pointed slightly to the side could be used to widen the area covered. Used as a secondary platform, a video system would be independent, provide a clear and unobstructed view of the transect and point, and provide a permanent record that could be reviewed at any time. It would also provide additional information on sea state and ice conditions. If such a system were in use, the flight leader could enter data in flight, as is done during SCANS, American and Canadian aerial surveys.

Appendix 4

RECOMMENDATIONS FOR IMPROVEMENT OF FUTURE LARGE SCALE SURVEYS

Cruise preparation, including vessels, platforms and equipment (T-NASS)

1. All prospective vessels should be thoroughly inspected by a knowledgeable person before they are contracted. The general condition and seaworthiness of the vessels, as well as their suitability as survey platforms, including autonomy for fuel and water, should be assessed. A certificate of seaworthiness must be provided and the vessel should be tested at sea.
2. Equipment should be ordered and received well in advance of the survey, and should be thoroughly tested in the lab and onboard the vessels before departure.
3. The Cruise Leaders (CLs) should meet together well in advance of the survey, and all equipment should be available for inspection and use at the meeting. This will better enable the CLs to work out problems the equipment and protocols before the survey begins. A pilot/training survey should be conducted with all CLs onboard.
4. All vessels must be prepared thoroughly prepared (e.g. platforms mounted) and equipment mounted before observer training begins.
5. Adequate time must be allocated for observer training before departure. This should include at least one day of class training, and one day of practical training onboard the vessels.
6. Backup equipment, ideally duplicates of all major items, should be purchased for each vessel.
7. The protocol should include detailed instructions on alternative methods in cases of equipment failure.
8. Observers on each vessel should be designated and trained as technical experts on each type of survey equipment, and they should be responsible for onboard repair and maintenance.

Data collection procedures

9. Effectiveness of the “Big-Eye” binoculars seemed to depend on the stability of the platform and the willingness and determination of the trackers to persevere in using them. If “Big Eyes” are to be used special attention should be given to the stability of the vessels and platforms. Further training on the proper setup and use of these would be useful.
10. A better data recording system, possibly using weatherproof computers with touch screens, should be developed and used. The recording system should be fully field tested well in advance of the survey.
11. Consideration should be given to having a dedicated data recorder for the primary platform.
12. There should be frequent meetings of the cruise leader and observers to identify and resolve procedural problems, particularly early in the survey, and

to receive feedback from the observers. These could be combined with data validation.

13. The cruise leader should regularly review the sightings performance of the observers, with regard to radial distances and angles and species identifications.

Observers

14. If required, survey guidelines and protocols should be provided in a language native to the observer using them. A simplified guide should also be provided to the Captain and crew.
15. All observers should be evaluated after the survey by the CL's based on specific criteria, and these evaluations should be given to the observer and kept on file for future reference.
16. Observers should be required to provide references and these references should be consulted before contracting.
17. Observers should have a medical examination, including a vision test, before departure. Observers should know their focus settings for binoculars.
18. Observers should be chosen for their observer quality coupled with social skills and dedication for the project
19. A formal meeting should be held at the end of the cruise to gain input from the observers. Another effective mechanism might be to have a suggestion book onboard that can be used at any time.

Survey design

20. The survey design should be based on realistic assessment of available ship time, using the achievements of past surveys in the specific area as a guide. The endurance capabilities of the vessels must also be considered.

Distance estimation Experiment

21. Distance experiments should be conducted primarily as a training exercise at the beginning of the survey and possibly at intervals throughout the survey.
22. The nature of distance experiments should be revaluated and if appropriate a standard method of conducting these experiments be documented.

Communication between platforms conducting a synoptic survey

23. It was recommended that a regular communication schedule be established between vessels in future surveys.

Aerial surveys

24. Lightweight immersion suits (pilot suits) and underwater escape training were recommended to be used in future aerial surveys.

25. The use of high definition video as a secondary platform should also be further investigated. Such systems are relatively inexpensive, compact and have excellent resolution. The use of such a system might make a manned secondary platform unnecessary.

Appendix 5

SPECIAL MODIFICATIONS IMPLEMENTED FOR ENCOMPASSING HARBOUR PORPOISES

The measures taken in the aerial Icelandic survey to increase survey effectiveness for harbour porpoises were as follows.

i. Decrease in survey altitude to 600 ft. This appeared to be successful, in that no problems were encountered in surveying at this altitude, and a large number of harbour porpoise sightings were recorded. The altitude decrease did not seem to detract from the efficiency of the survey for minke whales, in that the effective search area decreased by only 15% compared with 2001.

ii. Secondary fiord strata. These strata were added because it was suspected that harbour porpoises might be especially abundant within fiords. They were to be flown on an opportunistic basis, when weather conditions were unsuitable for surveying in other areas. Of the 4 secondary strata designed, only Breidafjorthur (block 2A) and Reytharfjorthur were flown successfully. Winds within the fiords were often stronger than outside, which prevented our completion of the Eyafjorthur stratum. In the limited effort that was completed, it did not appear that harbour porpoises were especially abundant in the fiords. Only one sighting was made in Reytharfjorthur and none in Eyafjorthur. In contrast 11 sightings were made on the additional Breidafjorthur transects so this is likely a high density area for the species. The extra Breidafjorthur effort was incorporated into the survey through post stratification of block 2. No operational difficulties were encountered in flying the sometimes very short fiord transects. Generally this was considered to be a worthwhile addition to the survey.

iii. Specialized harbour porpoise observer. Observer P1 had participated in the SCANS II and German North Sea porpoise surveys and was very experienced with this species. Observer P1 recorded 78 sightings of harbour porpoise compared to 38 for observer P2. The total number of harbour porpoise sightings was far greater than in any previous survey. It also seemed that observer P2 increased in effectiveness for this species in response to the large number of sightings made by P1. Therefore this measure should be considered a resounding success.

iv. Use of cue counting for harbour porpoises. The intention here was to try cue counting with the dive as a cue, as for minke whales. This was less successful than anticipated. Of the 78 porpoise sightings made by P1, only 17 displayed a definite cue. Many of the animals were recorded as resting on the surface, milling or underwater. It therefore seems that cue counting may not be viable method for this species.

ANNEX 2

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON ABUNDANCE ESTIMATES

Copenhagen, Denmark, 8 April 2008

1. CHAIRMAN'S WELCOME AND OPENING REMARKS

Chair Øien welcomed the participants (see Section 5). He pointed out that the purpose of this meeting was to examine the early results from the T-NASS 2007 surveys and to discuss plans for further data analysis with special attention to integration with the concurrent CODA and SNESSA surveys.

A summary of the effort achieved and the sightings made during these three surveys is presented in Tables 1 and 2.

2. ADOPTION OF AGENDA

The adopted agenda is given in Appendix 1.

3. APPOINTMENT OF RAPPORTEURS

Acquarone was appointed as rapporteur.

4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS

Documents that were made available for the meeting are listed in Appendix 2.

Note that all estimates presented in this document should not be used as final point estimates for the surveys unless fully corrected and openly endorsed.

5. FIN WHALES

5.1 Shipboard Iceland/Faroes

Pike presented abundance estimates for fin whales from the Icelandic and Faroese survey areas (NAMMCO SC 15/AE/05).

Combined single platform estimates were provided using three degrees of certainty in species identification, and with and without a bias correction for distance estimation. In addition an estimate of *g(0)* using mark-recapture (or sight-resight) methods was provided. Density and abundance were estimated using stratified line transect methods (Buckland *et al.* 2001) using the DISTANCE 5.0 (Thomas *et al.* 2005) software package. Total abundance for the combined platform estimate using the identification certainty classification most comparable to that used in previous analyses and no correction for bias in distance estimation was 20,644 (CV=0.15, 95% CI:15,053-26,540) and 18,846 (CV=0.15) for the bias-corrected data.

The double platform analysis resulted in a mean value for *g(0)* for the primary

platform of 0.87 (CV=0.06), which is similar to that estimated for 2001 and a total abundance in the survey area of 23,379 (CV=0.19) using all effort and non-duplicate detections and of 21,341 (CV=0.17) for the equivalent primary platform estimate using effort conducted in double platform mode only, and without *g(0)* correction.

Estimated abundance is lower (but not significantly so) than the total estimate for 2001 of 24,887 (95% CI:18,186-30,214) (Víkingsson *et al.* in press). Abundance increased rapidly in parts of this area between 1987 and 2001, and it appears that this increase has ceased.

The basic methodology used was the BT mode with two independent sighting platforms. The analysis carried out is similar to the one used in 2001. The most reliable estimate of distance was chosen among the available as that corresponding to the closest sighting to the abeam position. The estimated bias in distance estimation was applied to the sighting by the primary platform only. Duplicates were identified in the field, as well as later from the information available from the dataset and audio recordings. Single platform estimates were generated for all three sighting classes using all unique sightings from both platforms.

Double platform: The total abundance in the survey area was 23,379 (CV=0.19) using all effort and non-duplicate detections and 21,341 (CV=0.17) for the equivalent primary platform estimate using effort conducted in double platform mode only, and without *g(0)* correction.

Potential biases

- Poor weather and other external factors contributed to reduce coverage in some areas that have had high densities of fin whales in previous surveys. The net effect of poor coverage in some areas most likely will give a negatively biased estimate of abundance.
- The least restrictive sighting classification probably results in a positively biased estimate.
- The radial distances estimated by the primary platforms were estimated negatively biased by about 9.7% based on the distance experiment conducted at the beginning of the survey, but the bias correction used in the estimate was 13%. However there is some evidence based on comparison of duplicate sightings that suggests that the bias obtained from the distance experiments may have been underestimated in the experiments.
- *g(0)* might be somewhat overestimated because no covariates (other than distance) improved the fit of the conditional detection function.

Multi-year Comparisons

There was an apparent increase in fin whale abundance between the 1987 and 2001 surveys. The calculations from the 2007 T-NASS suggest a stable abundance since the last survey.

The Working Group reviewed the analysis and identified several problems and work needed before the analysis could be considered for acceptance.

- The *g(0)* calculated for the Primary platform in double platform mode should not be applied without further investigation to the data in combined platform mode. Combining the two platforms into one, which was done at times, indeed results in a different type of effort with more observers and a likely higher *g(0)*. However it is not possible to estimate *g(0)* when the platforms are combined in this way. The group therefore concluded that the estimated *g(0)* was applied correctly by the authors.
- The choice of the last distance estimate from the trackers was used because it was assumed that there was no responsive movement of the whales and this last distance estimate should be the most accurate. The discussion failed to convince the meeting participants of the validity of this unconventional selection method. It was suggested that a re-analysis be carried out using the initial detection distance standardly used in abundance estimation to investigate the possibility of a bias.
- The current species identification confidence index is confusing. The participants felt that another system should be used in the future, while ensuring consistency with previous analyses.
- The delegates agreed on the necessity of clarification of the survey procedures which should include a species specific definition of 'group'. Group size estimates seem to be particularly difficult to assess for pilot whales, leading to difference between observers. In fin whales, however, group sizes are generally small. Group size estimates differed between tracker and primary platforms and it was generally accepted that the tracker estimate is better. Macleod reported that for the SCANS-II survey duplicates were used to determine a species-specific correction factor to be used for bias corrections of group sizes for all primary sightings. It was agreed that Gunnlaugsson would look into this for fin whales.

NOTE ADDED AFTER MEETING:

These estimates were revised for presentation to the IWC Scientific Committee in June 2008. The main differences were i) the choice of a more inclusive species identification certainty classification as being most consistent with previous NASS estimates; and ii) no correction for bias in distance estimation by primary observers as the magnitude of this bias (if it exists) remains uncertain. The combined platform estimate using unique sightings from both platforms was 21,628 (CV=0.15). Inclusion of less certain species identification sightings increased this estimate by up to 22%. g(0) was estimated as 0.77 (CV=0.10) for this same certainty classification using the "trial configuration" under the assumption of point independence. The total corrected estimate was 27,493 (CV=0.20).

5.2 Shipboard Norway

Øien reported that the Norwegian eastern Barents Sea survey had only 15 primary fin whale sightings. The independent analysis for the Barents Sea alone will not be

conducted due to the few sightings, but the estimate for the most recent 6 years cycle will be produced within the next year.

5.3 Aerial Greenland

In the absence of Heide-Jørgensen, Donovan reported the Greenlandic aerial survey results (NAMMCO SC/15/AE10) presented during the previous week to the IWC RMP meeting (IWC SC/M08/AWMP7).

Two abundance estimates have been produced:

c) Line transect with correction for perception bias by mark recapture distance sampling (MRDS). This estimate was not accepted mainly because of the very low number of duplicate sightings (eight duplicates).

d) Conventional line transect estimate, which was acceptable for the purpose of RMP.

Suggestions were made at the IWC-RMP Intersessional Workshop for clarification in a future paper to be presented at the IWC Scientific Committee Meeting in Santiago in June 2008.

The analysis was not discussed at length, but the participants agreed that the conventional line transect estimate was acceptable, although the clarifications asked at the IWC RMP Intersessional Workshop should also be provided to the Working Group.

The Greenland fin whale abundance estimate from 2007 was higher than estimates from previous surveys, some were however obtained using a different method and/or carried out in a different period. It was also noted that the survey area did not cover the entire summer range of the feeding stock. The Working Group therefore agreed that there was insufficient information at this stage to reach a conclusion about the rate of increase of fin whales in this area.

5.4 Aerial Canada

It should be noted here that all Canadian estimates are preliminary and are given at places without variance. Some estimates have yet to be corrected for biases, including observer bias (Newfoundland and Labrador).

Lawson and Gosselin reported results for fin whales sighted during the Canadian component of the T-NASS (see NAMMCO SC/15/AE/12)

Standard methods were employed and 98 fin whale sightings were made across the survey area, of which only six were in the Gulf of St Lawrence. The preliminary abundance estimate for fin whales is 1,008 (95% CI: 571-1786). Overall, the numbers of fin whales in the Canadian waters were lower than expected. Surveys conducted in the Gulf in 1995-1996 resulted in higher estimates than the 2007 survey; this could be due to: (a) a real population decline, (b) survey bias, and (c) a later arrival of whales in the area in 2007.

Palka mentioned that the number of fin whales sighted in the SNESSA survey area to the south of Canada (see below under 5.6) was higher than seen in previous years in the same area and month, which also suggests a delayed migration to northern waters.

The Working Group concluded that further refinement of the analysis is required before further discussion of this abundance estimate is conducted.

5.5 CODA

MacLeod reported on the CODA area (see NAMMCO SC/15/AE/15).

A total of five vessels participated in the effort which was divided in four blocks. The fin whale sightings were concentrated in the southern blocks (195 primary, 241 tracker, 90 duplicates, and mean group size 1.15).

There were problems in the classification of whales similar to those experienced on the T-NASS ship survey: a large number of sightings were classified as unidentified whales particularly on one of the vessels.

A double platform analysis using Mark-Recapture Distance Sampling methods to generate stratified abundance estimates is planned as a first step. This will be finished by early May to be presented to the annual meeting of the IWC. Estimates will be performed for fin whales alone and for pooled fin and sei whales. It has yet to be decided how to handle the large number of unidentified whales. The detection function developed from the mark-recapture analysis will be used for the density surface models. Dynamic in addition to static variables will be incorporated in the density surface models to generate abundance estimates and investigate habitat preferences.

Plots of perpendicular distances of fin whale duplicates at the time they were seen by the tracker (x-axis) and then by the primary (y-axis), and plots of tracker sightings and primary sightings seen in relation to the vessel at (0,0), both clearly suggested that fin whales move towards the ship.

The Working Group discussed the graphs and concluded that there could be several interpretations:

- Fin whales respond to the vessel by moving towards it;
- Primary observers systematically underestimate radial distances relative to the trackers;
- Primary observers are more likely to spot whales that are moving towards the vessel, relative to those that are moving away from the vessel.

The WG concluded that either attraction to the vessel or systematic underestimation of distance by the primaries would represent a potential bias in standard analysis and that it should be seriously looked at in all fin whale datasets when possible, in particular in the Icelandic-Faroese one.

5.6 SNESSA

Palka reported on the SNESSA surveys, where fin whales were recorded for both aerial and shipboard surveys (see NAMMCO SC/15/AE/8 & 9).

The abundance estimates from the 2007 surveys (both aerial and shipboard) were not available yet but the initial impression was that there were more sightings than in previous years in the same area and time.

Palka reported a new analysis form she was exploring to obtain a corrected abundance estimate for species with few sightings, both in each survey but also over the years. For the aerial surveys (with circle-back) the estimate of *g(0)* will be pooled over years that have the same aircraft and setup and year is a possible covariate. Then the estimate of *g(0)* for individual species will be derived by pooling species that have similar detection function shapes. Only groups of <= 5 animals are included in the calculation of *g(0)* because these are the only groups that are circled on, and thus have the data needed to estimate *g(0)*. This then assumes that groups larger than five are seen with certainty, *g(0)* is assumed to be equal to1. The group proposed alternative grouping, when some of the species grouped had very different surfacing behaviour as perceived by an observer.

6. MINKE WHALES

6.1 Shipboard Iceland/Faroes

No estimate was calculated yet. There are less than 40 sightings in the dataset, which is fewer than in previous surveys. There have been quite large gaps in the effort due mostly to the adverse weather conditions along the coast of Greenland, which has been a high density area in previous surveys. Coverage was also poor to the north and east of Iceland. An analysis is planned even though the estimate might not be as reliable as from previous surveys.

6.2 Shipboard Norway

Øien reported that the total estimate for the 1996-2001 survey cycle was 107,000 (cv: 0.14) and for the 2002-2007 cycle was 103,000 (cv: 0.16). Sightings rates in the Barents Sea in 2007 did not appear to be different from previous surveys in the same area.

The CM area (Jan Mayen) shows approximately the same abundance in 2005 as in 1997 (27,000 versus 25,000).

The distributions seems to be similar between the two Norwegian survey cycles, but there was a shift westwards between the synoptic survey in 1995 and the 1996-2001 cycle.

Donovan underlined here the importance of synoptic surveys in interpreting shifts in distribution, while they are difficult to interpret with mosaic surveys.

6.3 Shipboard Greenland

No documents were provided to the meeting, although it was noted that there were a total of 35 minke whale sightings and this was the most sighted species for the Greenlandic shipboard survey. In a preliminary estimate, a total of 29 unique sightings had been identified, leading to a rough estimate of 4,000 minke whales (Jacob Hansen Rye, *pers. comm.*).

The Working Group **recommended** that a proper analysis of these data be carried out as soon as possible.

6.4 Aerial Iceland

Pike reported on the Icelandic aerial survey in the coastal area (NAMMCO SC/15/AE/04).

Data analyses were carried out using the DISTANCE 5.0 software packages and stratified cue counting methods (Hiby and Hammond 1989, Hiby *et al.* 1989, Buckland *et al.* 2001). Only sightings made in conditions up to Beaufort Sea State (BSS) 3 were included in the calculations. The duplicates were classified (based on cues) in two classes of confidence and the data post stratified. Individual observer performance and bias was also evaluated. The ESW was truncated at 1,200 m. Several covariates were tried in modelling the detection function, but no covariate seemed to improve the fit and the simple half normal model with a single cosine adjustment parameter resulted in the lowest AIC. The cue rate was assumed to be 53 cues per whale per hour, the same rate used in previous analyses.

A total of 71 cues were sighted by the primary and secondary observers at BSS 3 or less. Of these, 9 were cues sighted by both the secondary observer and the primary observer on the same side of the plane (*i.e.* duplicate cues). The total estimate for the original blocks is 10,680 (95% CI: 5,873-17,121). Post-stratification decreases this estimate by 12%. This estimate may be negatively biased because of visible cues missed by the observers near the plane.

One of the primary observers appeared to be more effective in detecting minke whales than the other and his sighting rate was much higher. Analysis using solely data from this observer only resulted in an estimate of 15,055 (95% CI: 6,357-27,278).

The 2007 point estimate (data from both observer used) is 24% of that from the 2001 survey and the decrease is significant ($P<0.05$). Abundance was lower in 2007 than 2001 in all blocks but one. The reason for the decrease cannot be determined definitively, but possibilities include population decrease, changes in spatial distribution (*i.e.* more minke whales outside the survey area) and/or changes in the timing of migration to or from the survey area. The differences in abundance cannot be directly ascribed to changes in survey design or execution.

It was noted that the two-observers estimate is most probably negatively biased and that the single-observer estimate may be unreliable because it is based on a low number of sightings (27). The WG did not opt for either of the two, but accepted the

analyses as satisfactorily and recommended the acceptance of the estimates by the Scientific Committee.

Reasons for the obvious change in abundance, although not in the general distribution pattern in the area surveyed, compared with the 2001survey were discussed. None of the several possible explanations seem to better explain the dramatic decrease alone.

Víkingsson pointed out that this apparent change in numbers is consistent with recent changes in the ecosystem of the Icelandic continental shelf area perhaps as a result of high sea temperatures in the area. Indications of recent changes include a northward shift in distribution of several fish species, low abundance of sand eel and capelin, and breeding failure in seabirds.

Pike suggested that one way to investigate the temporal change would be by executing spatially smaller surveys throughout the summer. Looking more closely at the Norwegian data in the areas around Jan Mayen to investigate the abundance of minke whales in the area and the trend in distribution and abundance there could also be helpful.

6.5 Aerial Greenland

No documents were available to the meeting

6.6 Aerial Canada

Lawson and Gosselin reported results for minke whales sighted during the Canadian component of the T-NASS (see NAMMCO SC/15/AE/12)

The uncorrected abundance of minke whales in Canada was calculated to be 997 for the northeast Newfoundland stratum, 394 for the southern Newfoundland Stratum and 2,218 for the Gulf of St. Lawrence and Scotian Shelf areas.

The more extensive survey of 2007 provides a higher estimate than the most recent uncorrected estimate of 1,014 whales (95% CI: 598-1,719) that was obtained by combining estimates from relatively smaller nearshore areas of Newfoundland surveyed in consecutive summers of 2002 and 2003.

Uncorrected estimates for different species, including minke whales, from the 2002-03 nearshore surveys of Newfoundland were not consistently different than the estimates of the larger extensive survey of 2007. Some of the 2002-2003 estimates for smaller cetaceans and minkes were larger than the estimates obtained for the larger area surveyed in 2007, and some estimates were smaller. These differences need further investigation before conclusions can be drown.

6.7 SCANS II

Paxton reported on the SCANS survey in the coastal area (NAMMCO SC/15/AE/6 & 7).

Design-based abundance estimates: the analysis of the shipboard data was based on mark-recapture line-transect methods and the analysis of the aerial data was based on the method of Hiby and Lovell (1998) and Hiby (1999). The study region was divided into 17 blocks, surveyed by seven ships and three aircraft. Estimates of group and animal abundance were obtained for each block and the whole study region. SCANS II minke whale Design-based abundance estimate was 13,281 (CV=0.36) for the shipboard survey (*g(0)* = 0.55 ; CV=29.2) and 5,333 (CV=0.55, in particular due to only 15 sightings) for the aerial survey, with a total of 18,614 (CV=0.30; 95%; CI: 10,445-33,171). Data from the shipboard survey indicated that minke whale had a tendency of moving away from the trackline.

Model-based abundance estimates: data were analysed using density surface modelling methods (Hedley and Buckland, 2004). Explanatory covariates were used to species density throughout the study region. Using these methods the abundance estimates was 18,790 minke whales (CV=44.0; 95% CI: 7,310-38,085). This analysis approach allows density to be estimated at a much higher resolution (i.e. estimates can be made for smaller regions than blocks) than is possible with a conventional line transect analysis and thus to obtain abundance estimates for regions other than the predefined survey blocks. Thus, minke whale abundance were estimated for the SCANS 1994 study region to 15,594 minke whales (CV=44.5; 95% CI: 6,144-33,465). For comparison, the same analysis methods were used to analyse the data collected during SCANS 1994, giving 7,785 minke whales (CV=25.0; 95% CI: 5,067-12,753). Paxton underlined the difference between predictive models (using static variables: 'why are the animals there?') and explanatory models (using dynamic variables: 'where are the animals?') in model-based abundance estimation. These kinds of methods allow producing useful maps and graphs of environmental predictors of the density of whales; they still need to be perfected, though.

Comparison of estimated density surface between 1994 and 2005 indicated changes in spatial distribution between the two surveys, with higher densities in the North Sea, South Ireland, North West Scotland and the western part of the Channel in 2005. The point estimates suggested also an increase in animals in the North Sea in 2005 although the estimates were not significantly different.

The Working Group thanked Paxton for this review and noted the changes in density distribution between the two surveys. It concluded that one interesting use of Model-based abundance estimates would be to help explain temporal changes in the spatial distribution of animals.

6.8 CODA

The 15 CODA minke primary sightings were all concentrated in the northern block. These sightings were too few to warrant a separate analysis and should be analyzed in combination with the T-NASS data.

6.9 SNESSA

There were 45 sightings of minke whales. Estimates have not been calculated yet, but sightings rates were apparently similar with earlier surveys.

6.10 Summary Discussion

The group discussed at length possible explanations for the decrease in minke whale abundance as observed in the Icelandic coastal area, which did not seem to be compensated by an apparent increase (few estimates have been calculated to date) in abundance (sighting rates) in other surveyed areas. A change in distribution could not therefore be inferred from the surveys data. It was pointed out that the low catches in Norway and Iceland could certainly not explain the decline. The group decided that at least two things could be attempted:

- The analysis of the T-NASS Extension minke data in the Norwegian Sea, an area which was not covered by the dedicated survey. A comparison in sightings rate could inform on change in relative densities there.
- A spatial analysis of present and past minke data could allow identification of predictors of minke distribution and reveal whether minke whales could have been expected in 2007 in areas which were not covered by the 2007 dedicated survey, *e.g.*, the northern Icelandic blocks.

The WG **recommended** that these two analyses be carried out as soon as possible.

7. OTHER TARGET SPECIES

The data collected can be seen on Table 2

7.1 Humpback whales

Greenland aerial

Donovan reported on the Greenlandic aerial survey results (NAMMCO SC/15/AE11) presented to the IWC RMP Intersessional Workshop meeting in the previous week (see point 5.3, (IWC SC/M08/AWMP6)).

The approach used in the document was considered in principle correct, but that there were objections to resulting estimate for 2007 of 3,820 (CV=0.51). It was noted that it would be more appropriate to consider only the periods corresponding to the time of the survey when developing the availability bias correction factor. For this reason the IWC RMP Intersessional Workshop asked the authors to present new calculations according to this advice.

The Working Group agreed with the view of the IWC RMP Intersessional Workshop and its recommendation for further analysis.

Iceland-Faroese shipboard/aerial

66 unique sightings out of 81 were seen by Venus and all concentrated in the northwest corner, and it would be probably difficult to generate a reliable overall estimate. No animals were detected by the east coast of Iceland where they have been abundant in previous survey, although the area was very poorly covered. There were also 56 unique sightings in the aerial survey. Pike pointed out that there is an overlap between the aerial and shipboard areas where most of the sightings were made and that this has to be taken into consideration during the analysis.

The estimate from this survey would probably be lower than that from the 2001 one,

due to the difference in coverage alone. An external expert has been contracted to develop the abundance estimates.

Canada
Lawson and Gosselin reported results for humpback whales sighted during the Canadian component of the T-NASS (see NAMMCO SC/15/AE/12)

There were 144 sightings for the Newfoundland and Labrador stratum and 83 for the Gulf of St. Lawrence and Scotian Shelf strata leading to an uncorrected estimate of 2,317 animals (95% CI: 1,383-4,149).

SNESSA
There were 37 sightings made by the aerial team and 169 from the shipboard. There are good indications that the abundance is much higher than the last survey when only 40 sightings were made.

CODA
No humpback whales were observed in the CODA area, nor have they been recorded on previous SCANS surveys.

Eastern Barents Sea
Some (11) sightings were made. It seems that the survey was somewhat too early in the season for humpback whales.

7.2 Pilot whales

Iceland-Faroese shipboard and CODA
No distribution map had been produced at the time.

The NASS conducted since the 1987/89 survey had not provided comprehensive estimates of abundance mainly because of limited coverage. An estimate of pilot whale abundance is a priority for the Faroes and is one of the NAMMCO Council's requests for advice.

The number of sightings was low in most T-NASS and CODA blocks, mostly concentrated in two blocks, the northern block of the Irminger Sea (45) and the northern CODA block (25). CODA has agreed to combine their data with the Faroese-T-NASS data to produce a common detection function. It was suggested that the Faroese data be analyzed by an external contractor. The Faroese would take the lead on this matter and were investigating the possibility of Macleod undertaking the task.

Canada
Lawson and Gosselin reported results for pilot whales sighted during the Canadian component of the T-NASS (see NAMMCO SC/15/AE/12).

In the Newfoundland and Labrador area 10 sightings were made and 43 in the Gulf of St. Lawrence and Scotian shelf area. The uncorrected abundance estimate was 5,833

whales (95% CI: 3,020-10,867). General comments were made on the difficulty in determining the groups divisions and group sizes for this species.

SNESSA
The east coast surveys had sightings of two groups from shipboard survey (coastal) and 20 groups from the aerial survey (offshore).

7.3 Harbour porpoises

Iceland aerial
The T-NASS survey had 119 sightings which is a very much higher number than in the previous similar survey in 2001. This is likely due to the employment of a specialized harbour porpoise observer on the survey. An external specialist has been contacted to perform the analysis.

Harbour porpoise were a target species for T-NASS and this estimate will represent the first reliable estimate of harbour porpoise in coastal Icelandic waters.

CODA
There were only 2 primary and 1 tracker sightings.

SCANS II
The abundance estimates within the 1994 survey area were calculated from the 1994 and 2005 data using density surface modelling; the estimates were 345,132 and for 315,027 respectively. Although the overall abundance estimates are not significantly different, there was a big difference in regional abundance between the 1994 and 2005, with lower abundance in the northern North Sea and a higher abundance in the southern North Sea and Celtic Sea in 2005. This has been also inferred from stranding data for the same period.

Canada
Fewer animals (n=58) were observed in 2007 than in a smaller-scale aerial survey around Newfoundland in 2002-2003. Similarly, the number of individuals sighted in both the Gulf and Scotian Shelf in 2007 (n=95) was lower than in the smaller-scale aerial surveys in the Gulf in 1995 and 1996 (n=395). The uncorrected estimate is 4,566 (95% CI: 2,242-9,305) animals for all areas in 2007.

Greenland
During the shipboard survey 8 animals were sighted (20+ were seen on the market in town) while 46 animals were sighted in the aerial.

The WG **recommends** that Greenland develops reliable abundance estimates for this species. It also suggests that Greenland coordinates the analysis with Iceland as there is a high degree of similarity between the two surveys (similar methods and one of the same observers). It was noted that the harbour porpoise was the species with the second highest number of sightings (46) after the white-beaked dolphin (58) in the Greenlandic aerial survey.

SNESSA
The sightings were 387 for the shipboard and 131 for the aerial survey. There was no indication of variation in population size, which had previously been estimated to be 81,000.

8. OTHER SPECIES

Sperm whales

Iceland/Faroes
An evaluation of the acoustic data is in process, which should reveal whether the quality of the data would allow an abundance estimate to be calculated. The visual data would also be analyzed to get an estimate of relative abundance like in previous surveys, although sightings were not very abundant.

Canada
There were 22 sightings among all the Canadian survey strata. It may be possible to perform a combined analysis to derive a population estimate.

SNESSA
The area is not a typical sperm whale habitat. However eight sightings were made.

CODA
In this area 34 primary and 28 tracker sightings were distributed over all blocks but they were more concentrated in the southern one. An absolute estimate of abundance will be calculated using the acoustic data. A visual estimate using conventional distance sampling (at least) will also be generated.

Pike reminded the delegates that many sperm whales were sighted during the T-NASS-extension cruises and that these data have to be included in the analysis.

Killer whales

Canada
There were a total of 26 individual whales sighted. From current photo-identification efforts there are at least 64 known individuals, and a considerable number of new individuals that are not a part of the catalogue. Thus the total eastern Canadian estimate for killer whales is at least 100 individuals.

Iceland aerial
Only 11 sightings were made (including a group of 9 individuals clearly associated with a minke), which is roughly equivalent to previous surveys.

SNESSA
No killer whale sightings for this survey and very few in the previous years.

CODA
A total of 3 tracker sightings were made for this species.

White-beaked dolphins

Iceland-Faroese shipboard-aerial

There are a large number of white beaked dolphin sightings and that there seem to be enough data for further analysis. She noted also that more information on the species was awaited by the SC for being able to conduct a review of the species.

The Working Group recommended the analysis of the data and the production of abundance estimates as soon as feasible.

Canada

Lawson and Gosselin reported results for white beaked dolphins sighted during the Canadian component of the T-NASS (see NAMMCO SC/15/AE/12).

There were a total of 617 individual white-beaked dolphins sighted, and preliminary analyses yielded an uncorrected abundance estimate of 1,716 dolphins (95% CI: 893-3,038).

9. T-NASS EXTENSION

Extension data has to be investigated to assess which analyses are worth conducting. The data should be reviewed in the context of the whole T-NASS survey. The data on minke whales in the Norwegian Sea seems particularly interesting to further explore in terms of sightings rate and comparison with earlier surveys in the same area in the framework of the present discussion: where have the minke whales gone.

10. COOPERATIVE ANALYSIS

10.1 Within T-NASS

The advantage of using the same person for conducting analysis of the same species was emphasized.

10.2 With CODA and SNESSA

Donovan reminded the delegates of their agreement to produce common total distribution maps and a common survey report for the three surveys, task that Desportes and Acquarone had promised to undertake as soon as the necessary data (shapefiles of realized, and possibly planned, effort and of sightings) is made available by the responsible leader of each survey. This should be followed by a primary, peer reviewed publication.

The interest in conducting spatial analysis was reiterated (see under point 6). It was also agreed that spatial modelling be used for fin and humpback whales analyses.

11. PUBLICATION OF SURVEY RESULTS

The NAMMCO SC had previously discussed the advantage of getting the results of such a comprehensive survey published together. The possibility of producing a NAMMCO special Issue had been mentioned.

Alternatively, Donovan offered to dedicate an issue of the IWC journal to the publication of T-NASS distribution and abundance results. The submission of papers should be completed before the end of 2008 and publication could occur within a year from this meeting pending review.

12. OTHER ITEMS

Donovan asked about the existence of an agreement for the archiving of T-NASS data. He suggested a common archiving location. The IWC offered their facilities for archiving these data in DESS database format. This question should be posed to the NAMMCO SC with special respect to the suitability of this solution.

Palka suggested the data or subsets be submitted voluntarily to the OBIS-SEAMAP database as well.

13. NEXT MEETING

It was agreed that the need for another meeting would be considered as the analysis was progressing.

Palka suggested the group create an e-mail discussion group for questions and discussion related to the analysis of the T-NASS, SNESSA, and CODA survey data. The suggestion was accepted by the group.

14. ADOPTION OF REPORT

Considering the lack of time and the impossibility of being able to have a final accepted report for the meeting of the NAMMCO SC, Desportes ask the participants if it would be acceptable to present a preliminary report to the SC and finalize the report later. The participants would have a chance to comment on a first version of the preliminary report before it was presented to the SC. The report would then be finalized and re-circulated to the NAMMCO SC. This way of proceeding was agreed upon.

The final report was agreed upon by correspondence on 9 July 2008.

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SURVEYS 2007	platforms	Area	Miles on effort	Surveyed area* nm^2
T-NASS Shipboard	7	Central Northern North Atlantic + Eastern Barents Sea	9 982	934 273
T-NASS Aerial	5	Eastern Canadian Seaboard, coastal Iceland, West Greenland	47 799	540 257
T-NASS Total	**12**	**Trans Northern north atlantic**	**57 781**	**1 474 530**
T-NASS Extension	**5**	**Irminger, Norwegian and Barents Seas + mid Atlantic ridge**	**5 253**	
CODA Shipboard	**5**	**European Atlantic offshore waters**	**5 400**	**522 429**
SNESSA Shipboard	**1**	**Cape Hatteras to Bay of Fundy (coastal)**	**1 604**	
SNESSA Aerial	**1**	**Cape Hatteras to Bay of Fundy (offshore)**	**1 295**	
2007 TOTAL			**71 332**	**1 996 959** + **SNESSA & TNASS Extension**

Table 1. Summary of the Effort realized and the area covered during T-NASS and the associated surveys, CODA and SNESSA.

2007 // On Effort Non duplicate Sightings (incl. duplic for Tulugaq)	T-NASS SHIPBOARD						T-NASS AERIAL					T-NASS Extension						T-NASS TOTAL	CODA TOTAL	SNESSA TOTAL	SNESSA	
	Irminger Sea	South Centre Iceland	North Iceland	East - Southeast Iceland	West Greenland	Eastern Barents Sea	Iceland coastal	N. Foundland Labrador	St Lawrence Gulf + Cap breton	Scotian Shelf	West Greenland	Mid atlantic Ridge	Irminger Sea	Norwegian Sea	Norwegian Sea	Norwegian Sea	Barents Sea					
Species	Iceland, AFII	Iceland, Jakup B	Iceland, Venus	Faroes, T.Chaser	Greenland, Tulugaq	Norway, Ulvos & Havsel	Iceland	Canada	Canada	Canada	Greenland	MarEco / J.Cook	Redfish / Smólensk	NO Pelag / Eros	NO Pelag / Libas	Pre&Post RFish / Smólensk	Pre&Post RFish / Smólensk				Shipboard	Aerial
Bowhead whale											1							**1**				
Blue whale	1	4	8					4	6	5			4					**32**	**1**			
Fin whale	237	69	20	5	2	15	7	73	4	44	25		10	3	6			**520**	**346**	**58**	43	15
Sei whale	13	31		1	1			1		2	5		7	2				**63**	**18**	**6**	4	2
Sei / Humpback														1				**1**				
Fin / Sei																			**10**	**26**	22	4
Fin / Humpback																						
Common minke whale	5	2	19	9	35	88	70	53	24	86	27			8	13	5	2	**446**	**23**	**75**	62	13
MW or BW					1													**1**				
Humpback whale	10	1	66	4	8	11	58	144	32	51	21		1		3	1		**411**		**251**	214	37
Right whale																				**44**	38	6
Sperm whale	31	27	4	9			4	11		11		9		10	17			**133**	**65**	**8**	2	6
Pygmy spermwhale										1								**1**				
Narwhal											2							**2**				
Beluga								5	203									**208**				
Northern bottlenose whale	2	9	2	13	2		1	10		3		1	4	2	1			**50**	**3**	**1**		1
Sowerby's beaked whale		1										1						**2**	**7**	**1**	1	
Cuvier's beaked whale										1								**1**	**15**			
Unid. beaked whale	1	10					3			4		1						**19**		**2**		2
Unid. Mesoplodon										9								**9**				

Table 2. Unique* sightings recorded on effort in the components of T-NASS and associated surveys.(contd. next page)

* The sightings of the Greenlandic shipboard survey (*Tulugaq*) include duplicates

2007 // On Effort Non duplicate Sightings (incl. duplic for Tulugaq)	T-NASS SHIPBOARD						T-NASS AERIAL					T-NASS Extension						T-NASS TOTAL	CODA TOTAL	SNESSA TOTAL	SNESSA	
	Irminger Sea	South Centre Iceland	North Iceland	East - Southeast Iceland	West Greenland	Eastern Barents Sea	Iceland coastal	N. Foundland Labrador	St Lawrence Gulf + Cap breton	Scotian Shelf	West Greenland	Mid atlantic Ridge	Irminger Sea	Norwegian Sea	Norwegian Sea	Norwegian Sea	Barents Sea					
Species	Iceland, AFII	Iceland, Jakup B	Iceland, Venus	Faroes, T.Chaser	Greenland, Tulugaq	Norway, Ulvos & Havsel	Iceland	Canada	Canada	Canada	Greenland	MarEco / J.Cook	Redfish / Smólensk	NO Pelag / Eros	NO Pelag / Libas	Pre&Post RFish / Smólensk	Pre&Post RFish / Smólensk				Shipboard	Aerial
Killer whale	6		3	5	0		11	1		7			2	8	11	5		**59**	**3**			
false killer whale																			**1**			
Long-finned pilot whale	45	12		14	1		9	10	7	37	15	11	10					**171**	**88**	**20**		20
long/short finned p.w.																			**4**	**2**	2	
White sided dolphin	8	15		3			3	92	13	15		6	4	1				**160**	**20**	**36**	25	11
White beaked dolphin	6		25			35	105	68	16	2	58		2	6	13	2	7	**345**		**1**	1	
Lagenorhynchus sp.						64												**64**				
Bottlenose dolphin				2			1			8								**11**	**39**	**15**		15
Common dolphin								28	2	201		35						**266**	**149**	**64**		64
Striped dolphin										1		4						**5**	**54**	**1**		1
Common/striped																			**74**			
Risso's dolphin									1	6								**7**	**3**	**31**		31
Harbour porpoise		9		10	3	37	119	36	25	4	46							**289**	**3**	**571**	440	131
Big cetacean	26	3	16	7		4	12	6	17	70		4	20	4		1	1	**191**				
Medium cetacean	1	2		4	3						3	1		1				**15**				
Small cetacean	1	2		1			8	2	3	12	3							**32**				
Patterned dolphin			1															**1**		**39**		39
Unidentified whale (blow)	26	1		9	1		4					1			3			**45**	**171**	**208**	184	24
Unidentified dolphin	24	1	9	12			16	40	105	201	15	10		2	1			**436**				
Unidentified animal																				**24**		24
TOTAL	**443**	**199**	**173**	**108**	**57**	**254**	**431**	**584**	**458**	**781**	**221**	**84**	**64**	**48**	**68**	**14**	**10**	**3997**	**1097**	**1460**	**1038**	**422**

Table 2 contd. Unique* sightings recorded on effort in the components of T-NASS and associated surveys.

Appendix 1

AGENDA

1. CHAIRMAN WELCOME AND OPENING REMARKS
2. ADOPTION OF AGENDA
3. APPOINTMENT OF RAPPORTEURS
4. REVIEW OF AVAILABLE DOCUMENTS AND REPORTS
5. FIN WHALES
- 5.1 Shipboard Iceland/Faroes
- 5.2 Shipboard Norway
- 5.3 Aerial Greenland
- 5.4 Aerial Canada
- 5.5 CODA
- 5.6 SNESSA

6. MINKE WHALES
- 6.1 Shipboard Iceland/Faroes
- 6.2 Shipboard Norway
- 6.3 Shipboard Greenland
- 6.4 Aerial Iceland
- 6.5 Aerial Greenland
- 6.6 Aerial Canada
- 6.7 SCANS II
- 6.8 CODA
- 6.9 SNESSA
- 6.10 Summary Discussion

7. OTHER TARGET SPECIES
- 7.1 Humpback whales
- 7.2 Pilot whales
- 7.3 Harbour porpoises

8. OTHER SPECIES
9. T-NASS EXTENSION
10. COOPERATVE ANALYSIS
- 10.1 Within T-NASS
- 10.2 With CODA and SNESSA

11. PUBLICATION OF SURVEY RESULTS
12. OTHER ITEMS
13. NEXT MEETING
14. ADOPTION OF REPORT.

Appendix 2

LIST OF DOCUMENTS

Doc. No.	Agenda	Title
SC/15/T-NASS-AE/45	1	List of participants to SC/15/T-NASS and AE WG, Copenhagen, April 7-8, 2008
SC/15/AE/1	2	Draft Agenda
SC/15/T-NASS-AE/47	4	List of Documents for SC/15/T-NASS-AE, Copenhagen, April 7-8, 2008
SC/15/AE/3	5, 6, 7, 8, 10, 11	Desportes, Acquarone and Pike. T-NASS extension: an overview.
SC/15/AE/4	6	Pike and Gunnlaugsson. T-NASS Icelandic aerial survey: Survey report and a preliminary abundance abundance estimate for minke whales (*Balaenoptera acutorostrata*).
SC/15/AE/5	5	Pike, Gunnlaugsson, Vikingsson and Mikkelsen. Estimates of the abundance of fin whales (*Balaenoptera physalus*) from the T-NASS Icelandic and Faroese ship surveys conducted in 2007.
SC/15/AE/6	6,7	Burt, Borchers and Samarra. Design-based abundance estimates from SCANS-II.
SC/15/AE/7	6,7	Burt, Borchers and Paxton. Model-based abundance estimates from SCANS-II.
SC/15/AE/8	5,6,7,8	Palka. Cetacean abundance estimates in the US North Atlantic waters: aerial survey.
SC/15/AE/9	5,6,7,8	Palka. Cetacean abundance estimates in the US North Atlantic waters: shipboard survey.
SC/15/AE/10	5	Heide-Jørgensen *et al.* Abundance of fin whales in West Greenland in 2007 (IWC SC/M08/AWMP7).
SC/15/AE/11	7	Heide-Jørgensen *et al.* Rate of increase and current abundance of humpback whales in West Greenland (IWC SC/M08/AWMP6).
SC/15/AE/12	5,6,7,8	Lawson and Gosselin. Canada's Marine Megafauna Survey - A Component of the 2007 T-NASS.
SC/15/AE/15	5,6,7,8	MacLeod. Cetacean Offshore Distribution and Abundance (CODA): an overview.

ANNEX 3

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON PILOT WHALES

Qeqertarsuaq, Greenland, 11 and 13 April 2008

1. WELCOME AND INTRODUCTIONS

The WG convened to discuss draft proposals for a monitoring plan for long-finned pilot whales in the Faroe Islands, developed during the course of internet discussions in the previous few months. The chair of the WG, Christina Lockyer welcomed all members. Apart from the chair, participating members present included Mario Acquarone, Dorete Bloch, Geneviève Desportes, Bjarni Mikkelsen and Gísli Víkingsson. Michael Kingsley, Maria Dam and Thorvaldur Gunlaugsson, also members of the WG, were unable to participate in this instance.

2. ELECTION OF CHAIR AND RAPPORTEUR

Christina Lockyer, was appointed as chair of the meeting, She also acted as rapporteur.

3. ADOPTION OF AGENDA

The agenda was adopted without changes – see Appendix 1.

4. REVIEW OF DOCUMENTATION AND INFORMATION

Documentation is listed in the Appendix 2.

5. DISCUSSION OF THE BACKGROUND AND THE TERMS OF REFERENCE (TOR) FROM COUNCIL AND THE BASIC GOAL OF THE WG

The WG had as Terms of Reference (TOR) and goal, the following extracts from the NAMMCO Annual Report 2006 –

- Extract from NAMMCO Annual Report 2006 vol.I, p.18 -
  "The SC is requested to develop a proposal for the details of a cost-effective scientific monitoring programme for pilot whales in the Faroes."

- Extract from NAMMCO Annual Report 2006 vol.II, p.335 -
  "**7.14 Pilot whales**
  7.14.1 Update on progress since the last ICES SG meeting in April 1996
  The Committee last considered this species in 1996, operating under a general request to provide an assessment and advice on the sustainability of Faroese catches. Many of the recommendations for research concerned improving surveys to obtain better estimates of abundance, particularly by expanding

spatial coverage and addressing inter-annual variability. Other recommendations included satellite telemetry to assess movements, and research on social structure, ecology and multi-species interactions. It was strongly recommended that a long-term research and population monitoring strategy be developed related to the Faroe Islands fishery, which should include both longer term monitoring which would help improve understanding of the status of the harvest animals, and short term monitoring to detect more rapid changes as might occur. It was noted that a successful satellite telemetry programme had been carried out in the Faroes, which had provided valuable new knowledge about the movements of pilot whale pods in the medium term (several months) (Heide-Jørgensen *et al.* 2002, Bloch *et al.* 2003).

Discussion

The Committee was concerned that NASS conducted since 1987/89 had not provided comprehensive estimates of abundance for this species, mainly because of coverage, timing and technical issues. A major priority should therefore be to obtain a better estimate from the T-NASS. The Committee was also concerned that the recommended monitoring programme had not been instituted in the Faroes, although some samples are collected from most *grinds* on an *ad hoc* basis. It was therefore recommended that such a program be developed as soon as possible under the auspices of the Committee.

7.14.2 Future work

The work on satellite telemetry will continue in the Faroes. The Committee recommended that the most recent tagging data be published. This is a target species of the T-NASS. The Committee noted that there had been no assessment of pilot whales since 1994."

The WG had available two earlier status reports – SC/5/4 (ICES CM1996/A-6) from the meeting of the ICES Study Group on Long-finned Pilot Whales, held in Cambridge, April 1996, and NAMMCO SC/5/AE 3 on the abundance estimate of N. Atlantic pilot whales from the NASS-95.

SC/5/4 noted that in 1993 the Study Group recommended the following:

> In 1993, the Study Group recommended that further research be carried out on the following points:
>
> > The possibility that the low mtDNA variability compared to that in other delphinid species is related to the cohesive social structure.
> >
> > Further genetic analyses using methods other than analysis of mtDNA to determine reproductive relationships within and among different groups, and to compare animals from different regions.

However, no additional work had been undertaken by 1996, and there was nothing new to report. Bjarni Mikkelsen brought attention to a 2000 paper on genetics and water temperature (Fullard *et al*., 2000).

With respect to pollutant studies it was reported that

> At the 1993 meeting, the convergent results from studies on organochlorines, heavy metals and parasite loads, with significant inter-pod variation, indicated that although pods occur in the same area, they have spent different portions of their time in different areas. These data negated the hypothesis of just one resident Faroese population.
>
> No further work pertinent to this matter had been carried out since the 1993 meeting.

The report recommended that satellite tagging should be developed and carried out to follow movements of pilot whales in the Faroes area.

The report referred to the abundance estimates derived from NASS89 and earlier for the eastern N. Atlantic.

> Line-transect estimates of abundance, based on the 1987 and 1989 North Atlantic Sightings Surveys (NASS-87 and NASS-89) were presented in the report of the Study Group's 1993 meeting and in Buckland *et al.*, (1993). The NASS-89 survey covered the greater area. When the Icelandic, Faroese and Spanish data are combined, they result in a total abundance estimate of 778,000 whales (CV=0.295).

The report presented information on prey abundance and distribution correlation

A relationship was found between squid catches in the area and pilot whale drives, and between the timing of pilot whale catches and in the occurrence of blue whiting in their feeding area in the Norwegian Sea. The migration of blue whiting in the Faroe area differs from year to year between the Faroe-Shetland Channel, the Faroe Bank Channel and east of Faroe Bank and is correlated with the position of the fronts between the currents in the area. There seems to be a relationship between the blue whiting migration route in a particular year and the location of the pilot whale catches in the Faroes.

Doc. NAMMCO SC/5/AE 3 presented abundance estimates from the NASS95 survey, and these are extracted from this document and presented below in Table 1. The overall abundance is just under 215,000 animals (.95 CI ca 130,000 – 355,000). The new data from the TNASS should be prioritised to produce updated abundance estimates as soon as feasible and surveys should be repeated at regular intervals in order to maximise the outcome of any monitoring programme adopted.

Nationality	Block	Block size (nm^2)	Abundance estimate, *N*	95% Confidence interval of *N*
Icelandic	4	67 708	7 585 (80.3)	(1 490, 38 605)
	7	67 708	19 490 (44.3)	(7 593, 50 026)
	8	55 472	42 940 (85.5)	(8 407, 219 313)
	9	123 957	45 057 (46.0)	(18 761, 108 212)
Faroese	A and B	341183	99 768 (63.0)	(28 934, 344 006)
Overall		784 996	214 840 (26.0)	(130 054, 354 899)

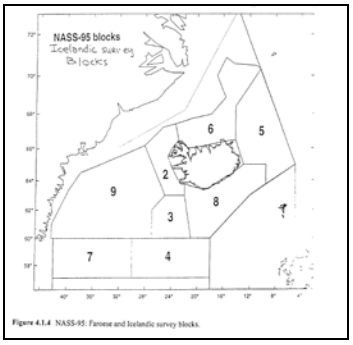

Table 1. Abundance estimates by block (seen in chart to right). Figures in parentheses are % cvs.

The lower estimates compared to earlier NASS89 surveys was only partly explained by different areal coverage, and comparison on just similar Faroese blocks indicated lower – but not significantly - abundance in 1995 (ICES CM1996/A-6).

NAMMCO 1997, in commenting on the work of the ICES Study Group of 1996, reported that apart from status and assessment, sustainability of catches around the Faroes was a concern.

The Recruitment area for pilot whales which are coastal could be much further afield. The use of tagging could be useful here although tagging in other areas than the Faroes would be desirable. Genetics was useful in determining population structure, but presently this told more about intra- and inter-school relationships more than overall population.

Historic catches could be used to tell about sustainability (Bloch *et al*., 1990; Bloch, 1994; Bloch and Lastein, 1994).

Gísli commented that while genetics might not tell very much, new technology on relatedness – Hans Skaug *et al* (2008) was a promising tool.

The WG discussed the TOR and its interpretation. It concluded that, although this was not expressed directly in the TORS, the aim of the monitoring programme was to assess the continued sustainability of the Faroese catch and that "there should be both a long-term and short-term monitoring directed to determining the continued sustainability of the Faroese catches".

6. DISCUSSION OF METHODS AS COMPONENTS FOR A SAMPLING AND MONITORING PROGRAMME ALREADY PRESENTED, AND ANY NEW METHODS, PARTICULARLY WITH REFERENCE TO RELEVANCE TO THE TOR.

There is already a basic sampling programme in existence (with full coverage of nearly all catches today) and catch statistics on schools in the *grindedrap* since 1584 (in blocks of time) and also *grinds* and sampling since July 1988 – January 2008 (Dorete Bloch's paper SC/15/PW4). Dorete's doctoral thesis (Bloch, 1994) has new results and papers on the pilot whale catches. Otherwise there is nothing really new. Samples collected since the 1986-88 programme have not been worked up, so that ca 20 yr have elapsed since any analyses have been done, and here is only sporadic new information.

Information on pollution analyses was provided by Maria Dam via the e-mail discussion group and in a table of costs information, ca 200,000 DKK is available for 2008 analyses of POPs in the Faroes, Iceland and Greenland for a joint project.

The WG considered document SC/15/PW7 introduced by Bjarni Mikkelsen on recent developments in satellite tagging in the Faroes. Whales are not easily accessible for tagging because scientists compete with the locals for suitable target schools of whales. The pod should be intact when released after tags have been applied. Tags have been available since 1997. Tagging of 4 whales in 2000 showed that the stability of a pod may not be strong because the tagged whales dispersed. The shelf life of tags was not good as the battery runs down.

In 2004 tagging was possible again and 7 whales were tagged. Cooperation with local people is essential.

There are now 9 tags available for deployment, but scientists may have to wait many years for another good opportunity to deploy. Duration of the tags has been at best 133 days. Most range only from several to only few days. In 2004, the tagged group did not disperse, except from one animal leaving the group, so different pod behaviour pattern from previous efforts.

There is a continuous development of smaller and more efficient tags. This is important because social behaviour is very important within the pod so tags must be discrete. Loss and damage of tags is believed to be due to such social body contact. Pilot whales often log at the sea surface , so possibilities for uplinking of satellite data are good. Other oceanographic data can also be collected by satellite tags – e.g. sea temperature and salinity, etc. but these greatly add to the cost. Wildlife Computers provide tags at present but SMRU tags that incorporate other data gathering are much more expensive. Minimising the effect on the animals is important as stability of the whale group is important.

A key problem with telemetry is the unpredictability of how and when the method can be deployed. The method is potentially valuable for monitoring stability and dispersion of pods but also how far animals venture. So far all tagged whales have predominantly moved to northeast of Faroes towards Norway in the Faroes-Shetland channel and northward. Southern Norwegian Sea appears to be a home range for the tagged pods from the two tagging events. However it was noted that these were conducted about the same time of the year (late summer) and taggings at other times of the year might give different results. It is important to continue to determine if the catchment area for recruitmet is mainly from N.E.of Faroes towards UK and Norway or also from the west towards Iceland.
It was suggested that perhaps Iceland and Faroes could cooperate in a tagging programme? This might also tell where animals came from as well as where they go to.

Diving depth can be monitored from the tags. Maximum dive depth was 848m, and within every 24 hr period there are always dives to below 600 m. This may indicate foraging behaviour perhaps for squids. Dive behaviour may thus be linked to potential diet. Swimming speed is 1-5m per sec.

In a final evaluation of the method, it was noted that it would be most valuable if the tags would remain on the animals for up to a year.

The WG considered the recent information on pilot whale abundance from the TNASS and Abundance Estimate WGs, and considered the report of the Abundance Estimate WG SC/15/AE/13. No distribution map has yet been produced. It was noted that sightings from both TNASS and CODA surveys were limited and thus data was agreed to be combined for both surveys. It was advised that an external contractor be sought to do the analysis for abundance. The WG noted that there is a request from NAMMCO 16 (NAMMCO/16/MC/4, item 3.8.4) for a priority assessment of pilot whales on completion of TNASS.

The WG then discussed SW/15/PW3 which provided a summary table of ideas on methods that could be employed as part of a monitoring programme to collect relevant information. This had been compiled as a result of e-mail correspondence within the WG. In particular emphasis was placed on the goal of the methods and what useful information would be gathered that could contribute to the monitoring of sustainability of catches. It was recognised that this was a first step and that details of such a

sampling and methods part of a monitoring programme would require considerably more effort from the WG at a future meeting to develop a meaningful, feasible and coordinated programme.

It was also recognised that this only provided input to the next important stage where regular integration of data, results and analyses would be required in reports to the authorities with recommendations on the status of the catches in relation to the population.

Sampling and Methods

- Catches - numbers of schools, individuals and date and place
- Catch composition by total body length, age, sex and reproductive status – biological sampling of teeth, ovaries, etc.
- Tagging, parasites, and contaminants for determining catchment area and recruitment
- Genetics, contaminants, internal parasites (linked with stomach and gut sampling) for population structure and relatedness
- Population parameters and dynamics – biological parameters, reproductive rates and growth using teeth, ovaries, etc.
- Replacement and sustainability – population dynamics – trends in biological parameters
- Environmental parameters – sea temperature, salinity, prey abundance, contaminants in relation to spatial distribution.
- Health and body condition – contaminants, body fat (blubber thickness, girth) – linked to growth and reproduction, virology, (stomach contents not necessary).
- Surveys and assessments are required ideally at regular intervals - e.g. 5-10yr (usually every 6 yr in Iceland) to detect trends in abundance. Indices in abundance need to be estimated so that all surveys can be meaningful.

Environmental factors are important as they influence the behaviour and health of whales. Many studies could indicate "alarm bells" when changes were imminent or taking place and initiate additional specialist studies. Contaminants may disturb the health of the population and its fecundity. Parasites may be labour intensive to sample and hand-in-hand with stomach and gut sampling which is not essential.

7. COMPARISON OF THESE METHODS WITH WHAT SUCCEEDED IN PREVIOUS RESEARCH AND MONITORING PROGRAMMES – NOTES AND TIPS

The WG briefly examined the work of the Faroese 1986-88 research progamme reported in the IWC Special Issue on pilot whales (*Rep.int.Whal.Commn* (Special Issue 14). The following were noted:

- Environmental monitoring in relation to whale distribution could be very interesting for very long-term monitoring, as such had proved enlightening

for other species such as minke whales and harbour porpoises in explaining redistribution (data presented at this SC meeting).

- Focus on reproduction should be in females – especially age at sexual maturity, examination of ovaries for ovulation/pregnancy, presence of foetus (with allowance for missing of small fetuses and timing of the breeding season).
- Numbered plastic tag duplicate series could be essential to identify separated body parts during the grind flensing stage when sampling.
- Body condition – blubber thickness and girth – simplify sampling and measurement as much as possible by selecting just one representative body site.

8. DISCUSSION OF ANALYSES THAT COULD BE UNDERTAKEN ON EXISTING DATA NOW

The following were considered important and to be undertaken before the start of any monitoring programme:

- Calculation of indices of abundances from previous NASS surveys – 87 and 89, 95 and 2001, as well as 2007.
- Full documentation and statistical analysis of historic catch series – including length / *skinn* composition of pods – oscillation in mean lengths over time may be inherent or correlated with factors external – although not surface temperature (for *skinn* values, see Bloch and Zachariassen, 1989). A full analysis is already planned to be undertaken by Dorete Bloch in collaboration with Lars Witting.

9. DRAFTING OF A MONITORING PACKAGE THAT INCLUDES BASIC ESSENTIALS WITH RELATIVE COSTS, AND DESIRABLE BUT NON-ESSENTIAL ADD-ON PROJECTS – TO BE PRESENTED TO THE SC FOR CONSIDERATION

Sampling component

Refer to Annex 1 for a summary of the methods and sampling possibilities suggested.

Reporting and evaluation component

- Catch statistics are reported annually to national authorities today, and it is desirable to report also catch composition annually.
- Catch information and catch composition data and analyses should be submitted annually as part of the NAMMCO Progress report and presented to the NAMMCO SC.
- Survey plans should be announced to the NAMMCO SC, and on completion, reported on together with the final abundance assessment to the NAMMCO SC for evaluation, as has commonly been the practice in NAMMCO.
- Reporting of analyses on population biology and health and other sample-based studies should be undertaken at regular intervals – not necessarily annually.

- New information with assessment results from surveys and analysis of catches in relation to abundance should be submitted to perhaps an international study group (e.g. standing NAMMCO WG on pilot whales) after each new results from a survey have been obtained to provide a more comprehensive integrated status report which can be evaluated expertly.
- All pilot whale reports evaluated by the NAMMCO SC should be submitted to national authorities.

10. CONCLUSION AND REPORT

It is clear that another WG meeting will be required to finalise the monitoring programme proposal with detailed costs. Timing could be in early July 2008. The WG will need to detail sampling strategy and advantages of different methods together with costs, and possibly collaborate with the Faroese in advising on any revisions of their existing sampling protocol for the authorities during *grinds*. However, any final proposal must be considered by the SC and will thus not be available for the Council meeting in 2008. However the Faroes will not be able to begin a sampling and monitoring programme before 2009, since it has to be approved by the Council.

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Appendix 1 - AGENDA

1. Welcome and introductions.
2. Election of chair and rapporteur.
3. Adoption of agenda.
4. Review of documentation and information.
5. Discussion of the background[5] and the TOR[6] from Council and the basic goal of the WG.
6. Discussion of methods as components for a monitoring programme already presented, and any new methods, particularly with reference to relevance to the ToR.

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[5] Extract from NAMMCO Annual Report 2006 vol.II, p.335 -
"**7.14 Pilot whales**
7.14.1 Update on progress since the last ICES SG meeting in April 1996
The Committee last considered this species in 1996, operating under a general request to provide an assessment and advice on the sustainability of Faroese catches. Many of the recommendations for research concerned improving surveys to obtain better estimates of abundance, particularly by expanding spatial coverage and addressing inter-annual variability. Other recommendations included satellite telemetry to assess movements, and research on social structure, ecology and multi-species interactions. It was strongly recommended that a long-term research and population monitoring strategy be developed related to the Faroe Islands fishery, which should include both longer term monitoring which would help improve understanding of the status of the harvest animals, and short term monitoring to detect more rapid changes as might occur. It was noted that a successful satellite telemetry program had been carried out in the Faroes, which had provided valuable new knowledge about the movements of pilot whale pods in the medium term (several months) (Heide-Jørgensen *et al.* 2002, Bloch *et al.* 2003).

Discussion
The Committee was concerned that NASS conducted since 1987/89 had not provided comprehensive estimates of abundance for this species, mainly because of coverage, timing and technical issues. A major priority should therefore be to obtain a better estimate from the T-NASS. The Committee was also concerned that the recommended monitoring program had not been instituted in the Faroes, although some samples are collected from most *grinds* on an *ad hoc* basis. It was therefore recommended that such a program be developed as soon as possible under the auspices of the Committee.

7.14.2 Future work
The work on satellite telemetry will continue in the Faroes. The Committee recommended that the most recent tagging data be published. This is a target species of the T-NASS. The ommittee noted that there had been no assessment of pilot whales since 1994."

[6] Extract from NAMMCO Annual Report 2006 vol.I, p.18 -
"The SC is requested to develop a proposal for the details of a cost-effective scientific monitoring programme for pilot whales in the Faroes."

7. Comparison of these methods with what succeeded in previous monitoring programmes.
8. Discussion of analyses that could be undertaken on existing data now.
9. Drafting of a monitoring package that includes basic essentials with relative costs, and desirable but non-essential add-on projects – to be presented to the SC as a recommendation.
10. Conclusion and report.

Appendix 2 - LIST OF DOCUMENTS

SC/15/PW/1	Draft agenda
SC/15/PW/2	Document list
SC/15/PW/3	Draft monitoring programme ideas
SC/15/PW/4	Review of examinations of long-finned pilot whales since 1.July 1988
SC/15/PW/5	Pilot whale WG e-mail discussions
SC/15/PW/6	Pilot whale monitoring programme budgets in the Faroe Islands
SC/15/PW/7	Movements and diving of pilot whales in autumn and early winter
SC/5/4 (ICES CM 1996/A-6)	Report of the ICES Study Group on long-finned pilot whales, 1996
SC/5/AE/3	Pilot whale abundance in the N.Atlantic, estimated from NASS-95

Annex 1

Proposals for sampling and methods in a monitoring programme for sustainability of pilot whale catches off the Faroe Islands

Goal	Method	Level of skill / experience required	Relative cost	Time period needed for meaningful results	Comments on whether method tried before and success	Relative overall importance
Recording of annual catches and effort for national catch statistics database	Official logging of catch: place, date, numbers of catch, whale *Skinn*, body length and sex	Uncomplicated but accuracy required	Low cost in all aspects	Depends on focus of analysis; both short- and long-term.	Catch statistics recorded by local sheriff at time of grind, with long historic records of similarly collected data. Basic essential data gathering that is vitally important.	Very High
Understanding population composition, dynamics (biological parameters) and productivity; body condition; parasites for population identity; health	Biological sampling: teeth for age, reproductive organs; blubber thickness, body girth; parasites; virology	Both low level and experienced levels, depending on study type	Medium cost in money & effort (collection and analysis)	Short- and medium-long-term for snapshot and trends respectively.	Used in 1986-88 scientific programme; basic important study for understanding population and position in ecosystem.	High

Distribution and abundance and associated trends	Surveys: oceanic and coastal; opportunistic and dedicated; development of indices of abundance	Experienced observer skills required; skills for analyses.	Medium to high costs; also in analytical phase	Most useful when surveys repeated at intervals of several years.	Essential to undertake periodically – 5-10 yr.	High
School and population structure. Relatedness studies, (protein expression) - protein expression refers to the other tissues and is secondary	Genetic sampling: skin (muscle, heart, liver, blood, other) - skin is easy and quick the other tissues need more effort	Uncomplicated sampling protocol. Experienced skills for analyses.	Low cost sampling, easy to transport, store and archive. Analysis cost presently high but likely to fall in near future.	Useful after short period; can be repeated at intervals of time.	Used in 1986-88 scientific programme; useful but not essential in deciding on sustainability of pop-ulation in the short-term. Individual based related-ness studies used for other species. Comparison with biopsies and samples from stranded animals in other areas easy.	Medium-High
Population health (may have implications on reproduction); environ-mental health; human health as consumers; pop-ulation structure	Contamination studies: heavy metals; organo-pollutants	Uncomplicated sampling protocol. Experienced skills for analyses.	Costly if under-taken routinely each year. Recent costs about 190,000 DKK per year. Ensured funding needed for long-term studies.	In short-term valuable as a snapshot; more useful in the long-term for monitoring changes.	Currently programme run-ning to end of 2008. This work is not essential for monitoring sustain-ability of population but is very important for monit-oring health risks to the human population as consumers and health of the whales.	Medium-High
Distribution, mi-gration; dive pat-terns; feeding; ocean data gath-	Tagging - satellite and VHF	Experienced skills for deployment and analysis.	Very costly to deploy and in all aspects. Last Faroese tagging	Long-term: describes movements of individuals only	Very informative of individuals, but not essential as part of a monitoring programme. To	Medium-High

ering e.g. temperature; potential recruitment area			programme cost ca 300,000 DKK		be effective need to tag multiple animals regularly over years.	
Correlation of e.g. monthly sightings of schools with water temperature, squid / fish abundance if known, other species of whale, general climate, etc.	Spatial analysis	Experience in modelling and analysis; will require access to data that may or may not already exist or be in useful format.	Could be costly as specialist knowledge and data sources required. Probably analyses best done periodically every few years to detect trends, which may reduce overall costs.	Probably long-term i.e. years	Could be valuable for predictive purposes; also indicative of potential ecosystem threats other than human exploitation.	Low

ADDENDUM

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON PILOT WHALES

Copenhagen, Denmark, 7-8 July 2008

1. WELCOME AND INTRODUCTIONS

Lockyer welcomed the convened Working Group (WG) Members and gave a brief introduction to the house and facilities including schedule and catering plans. She then invited them to introduce themselves. Present were: Mario Acquarone (NAMMCO), Dorete Bloch (Faroe Islands), Maria Dam (Faroe Islands), Geneviève Desportes (Faroe Islands and Scientific Committee Chair), Thorvaldur Gunnlaugsson (Iceland), Michael Kingsley (Greenland), Christina Lockyer (NAMMCO) – see Appendix 4.

2. ELECTION OF CHAIR AND RAPPORTEUR

Lockyer was elected Chair and Acquarone rapporteur.

3. ADOPTION OF AGENDA

The Agenda was adopted with the addition of item "10. Other business".

4. REVIEW OF NEW DOCUMENTATION AND INFORMATION, INCLUDING THE WG REPORT FROM APRIL 2008 AND SC REPORT EXTRACTS

The Chair presented the documents sent out with the invitation (Appendix 2). No additional documents were submitted to the group.

Lockyer underlined that after the report from this meeting is circulated to and approved by the Scientific Committee (SC) it will be presented to Council (2-4 September 2008, Sisimiut).

5. DETAILED SCIENTIFIC EVALUATION OF COMPONENTS OF MONITORING PLAN PRESENTED IN ANNEX 3 OF THE APRIL WG REPORT (SC/15/11)

The WG had as Terms of Reference and goal, the following extract from the NAMMCO Annual Report 2006: "The SC is requested to develop a proposal for the details of a cost-effective scientific monitoring programme for pilot whales in the Faroes." (Extract from NAMMCO Annual Report 2006 vol. I, p.18)

The WG had interpreted the aim of the monitoring programme as being to assess the continued sustainability of the Faroese catch and that "there should be both a long-term and short-term monitoring directed to determining the continued sustainability of the Faroese catches" (SC/15/11).

The Chair asked the Members if there were any comments on the report from the April 2008 meeting of this working group (SC/15/11). There were no comments.

It was suggested beginning the evaluation by a table on which Monitoring activities were divided from Research activities. It was further suggested that Monitoring should further be divided into "monitoring according to the requests from Council" and "additional monitoring". Research could accordingly be divided into research that would help the monitoring requested from Council and other research. There would also be a monitoring section on "supporting activities". The WG accepted this as a way forward (Table 1).

	Monitoring	**Research**
Commission Requests	A.Abundance (Surveys) B. Catch numbers, ages by sex C. Reporting	A.1. Review analysis of past surveys (abundance indices for trends) A.2. Development of survey methods specifically for pilot whales A.3. Area of stock distribution (tagging, population structure) B.1. Analysis of existing catch series B.2. Short-term intensive sampling to analyse variability in support of a cost effective long-term monitoring plan
Additional Topics	D. Catch: length at age E. Contaminants F. Reproductive status G. Health H. Condition	A.4. Genetics A.5. Life table E-F.1. Effect of contaminants on reproduction G.1. Health (what parameters to monitor and their meaning) H.1. Spatial analysis
Supporting Activities	I. Data to be collected in case of strandings elsewhere than Faroes J. Review of tissues banks K. Review of management plans for small cetaceans under exploitation	

Table 1. Proposed activities of a monitoring programme

The WG used Appendix 3 (extracted from the Report of the first meeting of the WG, presented to the NAMMCO SC15 (SC/15/11) – Proposal for sampling and methods in a monitoring programme for sustainability of pilot whale catches of the Faroe Islands) as the basis for discussion of priorities in the monitoring plan. The following items constitute the most important and essential of such a plan and are summarised in Table 1 above.

The following paragraphs expand and discuss in detail the items listed in Table 1.

Commission requests
The following items represent the basic requirements for a monitoring programme that would fulfil the request for monitoring by Council.

A. Abundance surveys
The WG **recommended** that the abundance surveys provide both indices of abundance and absolute abundance. Surveys should be carried out at least every six years. Abundance surveys are the cornerstone of stock assessments.

The following points illustrate monitoring-specific required research:

A.1: ***Review of past data*** - A reviewed analysis of past surveys, specifically NASS data (Faroese-Icelandic and 1987 and 1989 Spanish data) developing indices of abundance in different areas, would produce essential baseline data against which to compare new results to produce trends in population size. This has already been endorsed by the SC (SC/15/11).

A.2: ***Survey methods*** – the effectiveness of methods used in the recent T-NASS survey with respect to this species should be verified. Pilot-whale-specific survey design and methods (e.g. timing of the survey, height of the observation platform and recording of school size) should be refined and included in future surveys.

A.3: ***Area of stock distribution*** – The definition of a survey area of relevance to the assessment of the exploited stock(s) should be verified from information on population structure obtained *e.g.* by a tagging programme. Tagging is instrumental to understanding distribution and movements and as a base for survey design. A number of options in the choice of tags were discussed. It is preferable to deploy a larger number of smaller simple tags rather than fewer more complex instruments for the same cost. Among the possibilities, not mutually exclusive, the WG elected SPOT5 satellite tags (cost 12-14,000 DKK, adapted for harpoon deployment) for short term detailed movement of individuals, and sub-dermal microchips (or a modified, recoverable "Discovery" tag) for longer term mark-recapture and movement studies, as the most promising options. Tags should be deployed both in the Faroes and elsewhere in the North Atlantic according to an experimental design to be specifically developed. Natural marks, such as genetic markers are an alternative and genetic samples should be collected from all available catches to keep open the possibility of a DNA register. Photo-ID does not appear to be a feasible alternative for north Atlantic pilot whales owing to the large population size, paucity of natural marks, absence of historical photograph data and the logistic difficulty of photographing animals taken in the drives.

The following additional items are optional research topics that complement, but are not essential, for the development and assessment of the monitoring programme:

A.4: ***Genetics*** – Relatedness (Skaug, H. *et al.* 2008. Relatedness of North Atlantic fin whales; an update. IWC SC/M08/RMP WP3) based on biopsy sampling activities run in parallel with the tagging programme and integrated by *grind*-sampled biopsies could provide information on the genetic structure of the population, thus defining relations in and between pods and delineating stocks. The availability of tissue samples from pilot whales in other areas and previous periods for specific genetic analysis could be investigated and to this end it would be worth exploring existing tissue banks (*e.g.* in the Faroes and in ASCOBANS member countries). Continuance of the Faroese tissue bank is encouraged. Alcohol as a medium for genetics-directed sample storage, rather than freezing at -80^{o}C, was suggested.

A.5: ***Life table*** – Age-specific knowledge of life history parameters could in the long term form a basis for population modelling as an alternative check on the sustainability of the harvest. However, the compiling of such a table is labour intensive and the WG was unable to accord this activity a high priority.

B. Catch statistics

The most basic information used in management is numbers caught and age by sex. These are routinely collected for fish stocks. The present official reporting system gives the information of date, number of whales, *skinn* (a measure for weight), length and sex of individual whales caught in the Faroe Islands. In order to determine whether the catch is sustainable it is, however, necessary to know the individual age and sex, to be able to determine whether changes in age distribution occur. To meet this requirement it is necessary to do some additional sampling and analyses beyond the monitoring already in place. Teeth (lower jaws) should be collected for age determination alongside the numbers and sex of the whales. The design of appropriate sub-sampling schemes for recording and analysis of data would be a part of the finalisation of a monitoring plan. The WG recommends the continuation and improvement of the current catch statistics recording along with jaw collection.

The following points illustrate monitoring-specific required research:

B.1: ***Analysis of existing catch series*** – An in-depth analysis of existing long-term catch series with associated data on size and other biological details is an excellent starting point for a demographic study through a catch- at–age-and-sex data table (see Agenda item 6), below).

B.2: ***Intensive short-term catch sampling*** – Design of a long-term monitoring plan will need better information on the within- and between-year variability of the data to be recorded. A short-term intensive sampling programme of sex and age distribution data over a three year period is necessary to assess the present within- and between-year variabilities and to compare them with those measured under the 1986-88 sampling programme. Such analyses will facilitate the design of a solid, cost-effective and long-term monitoring programme.

During this intensive sampling, it would be cost-effective and valuable to take additional samples that may be used to shed light on causes for possible demographic changes. This includes pieces of meat and blubber, ovaries, mid-girth measurement, and lateral blubber thickness, and from some individuals blood, kidney and liver samples. These additional samples will then be used for studies of contamination, condition, health and reproduction, including also the potential negative effects of contaminants on the whale organism. (See further explanation and discussion below under items D.-F. and I.).

C. Reporting

Progress, results and conclusions from the monitoring programme (including all survey plans and analyses) are to be reported and submitted for review to the NAMMCO SC.

Additional topics

The following items represent additional components in a monitoring plan that are important for additional interpretations of items A. and B. (above), though not strictly essential for a basic monitoring programme, are recommended because they represent great added value for a minimal outlay of cost and manpower if undertaken alongside item B.

D. Catches

Currently date, locality, numbers, sex and size (length and *skinn*) are routinely collected for all *grinds*. It is recommended to continue the recording of these data.

E. Contaminants

There is currently (1996-2008) a programme for contaminant analysis of the Faroese pilot whales under the auspices of AMAP (Arctic Monitoring and Assessment Programme). Periodic analyses during the past three decades represent valuable data on contamination of pilot whales in Faroese waters. In this respect the Faroese pilot whales are one of the very few species of cetaceans with a long history of contaminant concentration measurements. It is recommended that the current programme is intensified and integrated with the new monitoring programme. See also additional remarks under item **F. Reproductive status** below.

F. Reproductive status

Reproductive status, especially of females (state of maturity, age at sexual maturity, pregnant, lactating, etc.) is valuable for providing a picture of the overall production and reproductive health of the population. The collection and examination of ovaries and presence/absence, length and sex of a foetus should be included in the programme.

The following additional item is an optional research topic that complements, but is not essential, for the development and assessment of the monitoring programme:

E – F.1: Effect of contaminants on reproduction – The long history of sampling and analyses of contaminants in the Faroese pilot whales gives the possibility of examining the effect of pollutants on reproduction. This also emphasises the

added value of continuing the contaminant studies.

G. Health

The general health status of this population has not been monitored, and is unknown, but may be important in explaining future changes in stock status. A possible method is analysis of blood samples. (*e.g.* Tryland, M. *et al.* 2006. - Serum chemistry of free-ranging white whales (*Delphinapterus leucas*) in Svalbard. *Veterinary Clinical Pathology* 35(2):199-203). However it is unknown what pathological conditions this population is subject to, or how to detect them. Therefore any health status monitoring would be dependent on the following research activity in the early stages of the developing the monitoring programme:

G.1: ***Health*** – A general examination of a sample of animals taken in the harvest for pathological conditions, including disease and parasite infestation, in order to determine which pathological conditions may be frequent and significant and how to detect them reliably and cheaply.

H. Condition

Body condition as distinct from general health (above) is an indication of short term feeding success. In 1986-1988 (Lockyer, C. 1993. Seasonal changes in body fat condition of Northeast Atlantic pilot whales, and their biological significance. *Rep. int. Whal. Commn* – Special Issue 14: Biology of Northern Hemisphere Pilot Whales, pp.325-350), girth and blubber thickness were used as indicators of body fat condition. The most useful measures were girth (G3) and lateral blubber thickness (probably body site L3 is the most practicable). It is recommended that these are collected routinely along with length, when they may be collected with little extra effort.

The following additional item is an optional research topic that complements, but is not essential, for the development and assessment of the monitoring programme:

H.1: ***Spatial analysis of distribution data*** – In the long term, this should be considered especially in view of NAMMCO's commitment to an ecosystem approach to management, but is of low priority relative to a monitoring programme.

Supporting activities

These items listed in Table 1 are of low priority to the establishment of a Faroese monitoring programme. Items I. and J. could be valuable in the longer term for obtaining pilot whale data and samples from a wider geographic area that could augment Faroese data and analyses. Item K. addressing reviews of other cetacean management plans, could provide useful reference and guidance on future management of the pilot whale. Further discussion of some of these points follows later.

6. ANALYSES THAT COULD BE UNDERTAKEN ON EXISTING DATA

- It was (item J., Supporting Activities in Table 1) suggested recommending approaching organizations that might have pilot whale samples in their tissue bank (e.g. in ASCOBANS countries). It was suggested posting an announcement for existing tissue banks on MARMAM. The WG recommended that the Secretariat investigate the availability of genetic samples before the next NAMMCO Scientific Committee meeting (SC16) with a view to an extensive study involving samples from sources other than Faroese.

- The WG recommended the completion of the demographic analysis based on the historical Faroese catch data (see Research Activity 2a)).

- The WG further recommended producing indices of trends of abundance by areas based on past surveys (see Research Activity A.1)), specifically NASS data (Spanish data from 1987 and 1989, and not only Faroese-Icelandic data) before the next NAMMCO Scientific Committee meeting (SC16).

- The WG finally recommended the initiation of an intensive 3 years' sampling programme (see Research Activity B.2)) in order to investigate the variability of the parameters to be included in the long-term monitoring programme.

7. TENTATIVE COSTING OF RECOMMENDED COMPONENTS, MANPOWER NEEDS AND POTENTIAL FUNDING CHANNELS

All prices must be taken with reservations.

- A preliminary budget covering expenditures for sampling, age determination and reporting results is 825 DKK per individual whale, including manpower, for an initial three years' intensive sampling programme as outlined in research activity B.2 and reporting item C. This budget is calculated from the annual average take of 6.3 *grinds* consisting of 150 whales each and in total 1,000 whales per year. Basic funding for this component will originate from Faroese government sources. Additional funding sources will have to be identified.

- Surveys: synoptic ship-based sighting surveys should be carried out at intervals of not more than 6 years (about 2 M DKK in 2007, including analysis). Manpower needs will depend on the survey method of choice and on the number of simultaneous working platforms. In the previous NASS surveys funding was obtained through the Faroese government sources, Nordic Council of Ministers, Oil Companies and private funds.

- Other tissue sampling: in the calculated costs for the intensive three years' sampling for age determination in item a. above (see also Item B.2)), additional measurements and sampling including soft tissue like foetus, meat, blubber, liver, kidney and ovaries were included. The inclusion of these additional components over and above mere catch statistics, sex and age is

estimated to increase the total basic sampling cost per whale by 6 % from 775 DKK to 825 DKK. Given the importance of these tissues for monitoring and/or study of other impact factors and individual body condition indices, it is considered a highly cost-effective strategy to expand the scope of the sample and data collection. Thus sampling of all catches, strandings and opportunistic sources (live sampling) should be encouraged. Presently there are only data on costs and manpower needs for the part of the supporting research activities that includes monitoring of pollutants like PCBs, pesticides and heavy metals (see Item E). The monitoring of PCBs and pesticides in blubber, and heavy metals like mercury and cadmium in muscle, liver and kidney has been estimated to amount to 5,700 DKK per whale for a total of 50 individuals. This includes sample preparation, analyses, data assessment and reporting. This estimate also includes the determination of stable isotopes of carbon and nitrogen which are used for food-web indications.

8. IMPLEMENTATION OF A REPORTING AND EVALUATION SCHEME FOR THE MONITORING PROGRAMME – NEED FOR A STANDING WG?

The WG recommended that a report on the monitoring programme be presented to NAMMCO every SC meeting as a part of the Faroese National Progress Report. Similarly the Group also recommended that a review of the initial intensive sampling programme be carried out at the latest within four years after its start in order to allow for the timely definition of the long-term monitoring programme. In particular, abundance survey planning and results should be presented in time before the annual meeting of the NAMMCO SC in order to allow for a thorough scientific review.

The WG noted that there is currently an outstanding request for the results from the completed Icelandic minke whale research programme to be presented to the SC for review. The WG considered that after evaluation by the SC, it could be useful to investigate which components of this Icelandic programme were potentially relevant to the pilot whale monitoring programme.

In view of the magnitude of the task of reporting, reviewing and adjustment of the pilot whale monitoring programme the group reiterated its previous recommendation that a standing working group be created. This was endorsed at the previous SC meeting (SC/15/11).

9. RECOMMENDATIONS ON A FUNCTIONAL MONITORING PACKAGE

The WG emphasised that the absolute minimum requirements for a monitoring programme would be the implementation of items A., B. and C. including the necessary preliminary research activities of Table 1. For reasons of cost effectiveness and added research value, the WG also recommended that items D., E., F. and H. (together with research activities) be seriously considered as part of a complete

package. Items G. and H.1 are interesting in the long term but not a priority. Supporting activities (items I. – K.) require further consideration by the WG.

10. OTHER BUSINESS

It was suggested drawing up a wish list for data collected in case of strandings or takes in other areas than the Faroes (see Table 1, supporting activity I.). The WG agreed to continue this matter by correspondence and develop a list that could be circulated along with the Secretariat's enquiries regarding availability of tissues in tissue banks and institutions (see Table 1, supporting activity J.).

The WG recommends that an "Alert Hotline" channel of communication for pilot whales be instigated whereby strandings – live and dead – could be quickly communicated to interested researchers so that opportunistic sampling relevant to the monitoring programme could be made in any North Atlantic area. The internet MARMAM site (marmam@lists.uvic.ca) could be instrumental in setting this up.

11. FINAL REPORT

This report was accepted in a preliminary version on 8 July 2008 and finalised on 14 July 2008.

Appendix 1 - AGENDA

1. Welcome and introductions
2. Election of chair and rapporteur
3. Adoption of agenda
4. Review of new documentation and information, including the WG report from April 2008 and SC report extracts
5. Detailed scientific evaluation of components of monitoring plan presented in April WG report, Annex 1 (SC/15/11)
6. Analyses that could be undertaken on existing data
7. Tentative costing of recommended components, manpower needs and potential funding channels
8. Implementation of a reporting and evaluation scheme for the monitoring programme – need for a standing WG?
9. Recommendations on a functional monitoring package
10. Other business
11. Final report.

Appendix 2 - LIST OF DOCUMENTS

SC/15/PW/1 July	Draft agenda
SC/15/PW/2 July	Document list
SC/15/11	Report of the Pilot Whale Working Group, Qeqertarsuaq, 11 and 13 April 2008
SC/15/Report extract	Report of the Fifteenth Meeting of the NAMMCO Scientific Committee – Extract only for the Pilot Whale WG

Appendix 3

Proposals for sampling and methods in a monitoring programme for sustainability of pilot whale catches off the Faroe Islands

Goal	Method	Level of skill / experience required	Relative cost	Time period needed for meaningful results	Comments on whether method tried before and success	Relative overall importance
Recording of annual catches and effort for national catch statistics database	Official logging of catch: place, date, numbers of catch, whale *Skinn*, body length and sex	Uncomplicated but accuracy required	Low cost in all aspects	Depends on focus of analysis; both short- and long-term.	Catch statistics recorded by local sheriff at time of grind, with long historic records of similarly collected data. Basic essential data gathering that is vitally important.	Very High
Understanding population composition, dynamics (biological parameters) and productivity; body condition; parasites for population identity; health	Biological sampling: teeth for age, reproductive organs; blubber thickness, body girth; parasites; virology	Both low level and experienced levels, depending on study type	Medium cost in money & effort (collection and analysis)	Short- and medium-long-term for snapshot and trends respectively.	Used in 1986-88 scientific programme; basic important study for understanding population and position in ecosystem.	High

Distribution and abundance and associated trends	Surveys: oceanic and coastal; opportunistic and dedicated; development of indices of abundance	Experienced observer skills required; skills for analyses.	Medium to high costs; also in analytical phase	Most useful when surveys repeated at intervals of several years.	Essential to undertake periodically – 5-10 yr.	High
School and population structure. Relatedness studies, (protein expression) - protein expression refers to the other tissues and is secondary	Genetic sampling: skin (muscle, heart, liver, blood, other) - skin is easy and quick the other tissues need more effort	Uncomplicated sampling protocol. Experienced skills for analyses.	Low cost sampling, easy to transport, store and archive. Analysis cost presently high but likely to fall in near future.	Useful after short period; can be repeated at intervals of time.	Used in 1986-88 scientific programme; useful but not essential in deciding on sustainability of pop-ulation in the short-term. Individual based related-ness studies used for other species. Comparison with biopsies and samples from stranded animals in other areas easy.	Medium-High
Population health (may have implications on reproduction); environ-mental health; human health as consumers; pop-ulation structure	Contamination studies: heavy metals; organo-pollutants	Uncomplicated sampling protocol. Experienced skills for analyses.	Costly if under-taken routinely each year. Recent costs about 190,000 DKK per year. Ensured funding needed for long-term studies.	In short-term valuable as a snapshot; more useful in the long-term for monitoring changes.	Currently programme run-ning to end of 2008. This work is not essential for monitoring sustain-ability of population but is very important for monit-oring health risks to the human population as consumers and health of the whales.	Medium-High
Distribution, mi-gration; dive pat-terns; feeding; ocean data gath-	Tagging - satellite and VHF	Experienced skills for deployment and analysis.	Very costly to deploy and in all aspects. Last Faroese tagging	Long-term: describes movements of individuals only	Very informative of individuals, but not essential as part of a monitoring programme. To	Medium-High

ering e.g. temperature; potential recruitment area			programme cost ca 300,000 DKK		be effective need to tag multiple animals regularly over years.	
Correlation of e.g. monthly sightings of schools with water temperature, squid / fish abundance if known, other species of whale, general climate, etc.	Spatial analysis	Experience in modelling and analysis; will require access to data that may or may not already exist or be in useful format.	Could be costly as specialist knowledge and data sources required. Probably analyses best done periodically every few years to detect trends, which may reduce overall costs.	Probably long-term i.e. years	Could be valuable for predictive purposes; also indicative of potential ecosystem threats other than human exploitation.	Low