ANNEX 5

PLANNING COMMITTEE
FOR THE
TRANS NORTH ATLANTIC SIGHTINGS SURVEY
Reykjavik, 18-19 November, 2006

1. CHAIRMAN'S WELCOME AND OPENING REMARKS

Chair Genevieve Desportes welcomed delegates (see Annual Report Section 6.5) to the second planning meeting for the Trans North Atlantic Sightings Survey. She reminded delegates that it had been concluded at the first planning meeting that the full participation of Canada and Greenland, as well as Iceland, the Faroes and Norway, and coordination with surveys off Western Europe (CODA) and the Eastern USA, meant that the TNASS presented a perhaps unique opportunity to obtain very broad and synoptic coverage of the northern North Atlantic. By fully coordinating the national components of TNASS, in terms of timing, target species, coverage, stratification, methodologies, survey protocols and observer training, the results of the TNASS could be much more valuable than the sum of its parts. Therefore some flexibility on these matters will be required to make an integrated TNASS a reality.

2. ADOPTION OF AGENDA

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

3. APPOINTMENT OF RAPPORTEURS

Daniel Pike, Scientific Secretary of NAMMCO, agreed to coordinate the production of the Report, with the assistance of other members as required. Documents available to the meeting are listed in Appendix 2.

4. OVERVIEW OF AVAILABLE RESOURCES BY JURISDICTION

A summary of the survey platforms and effort available to TNASS by jurisdiction is provided in Table 1, and a map of the survey area is provided in Fig. 1.

4.1 Canada

The Canadian components of TNASS will extend from the Canadian eastern Arctic to the southern Scotian Shelf. The surveys are divided into four initiatives: 1) Canadian Eastern Arctic IPY Survey, 2) Canadian Grand Banks IG Survey, 3) Gulf of St. Lawrence, and 4) Scotian Shelf, (Figure 1). The northward extent of the Arctic survey is uncertain and will depend on coordination with Greenland. The surveys will be carried out using a DeHavilland Twin Otter high-winged survey aircraft as the main platform. A Lockheed CP-140A Arcturus reconnaissance aircraft may be used in offshore areas, particularly Davis Strait between Canada and SW Greenland, but the availability of this platform is as yet unconfirmed. Virtually all cetacean species in the area, as well as sea turtles, basking sharks and sunfish, will be target species of the

survey, but most emphasis will be placed on species that are considered to be endangered or threatened in the area. A standardized methodology for aerial surveys has been developed over several years in this area.

4.2 Greenland

The main survey off West Greenland will extend from just north of Disko Bay south to Cape Farewell. It will probably use the same stratification and survey design as was used in 2005. Target species will be minke, fin and humpback whales, but all cetaceans encountered will be registered. Either a Partenavia or a Twin Otter will be used as a survey platform. Another survey, focusing on narwhal, will be carried out in Inglefield Bredning and Melville Bay in August, but the two surveys will not be connected. The preferred timing for the southern survey is August-September as fog is less prevalent then than earlier in the summer. However it may be possible to do two surveys, one in July and one in September. In addition the Coast Guard has been approached to provide ship time for some offshore work, but it seems unlikely that this will be provided. Standard cue counting methods, as used in earlier surveys, will be used in the main survey, while the narwhal survey will use double platform line transect methods.

4.3 Iceland

The Icelandic component of TNASS will be broadly similar to that carried out in 2001. The target species will be minke and fin whales (primary) and humpback whales and harbour porpoises (secondary). Aerial survey, using a Partenavia with bubble windows, will be used to cover the inshore out to the edge of the continental shelf. Offshore areas will be covered using three survey vessels. The western part of the area, between Iceland and Greenland, will be surveyed by a vessel participating in an International Redfish Survey, a co-platforming arrangement that functioned well in 2001. The northern and eastern parts will be surveyed by two dedicated cetacean survey vessels. The boundaries of the survey area will be established in cooperation with other TNASS partners.

4.4 Faroes

The Faroese contribution to TNASS will be similar to 2001, with one vessel being chartered for about one month. Target species of the survey will be pilot and fin whales, and white-sided dolphins. The boundaries of the survey block will be determined with regard to the Icelandic and Norwegian components, and to the CODA survey.

4.5 Norway

Norway will be continuing its “mosaic” surveys in 2007, which will be the final year of a 6-year series. The target species is the minke whale. To date the eastern Barents Sea has not been covered and it is hoped that this can be done in 2007; this will, however, require permission from Russian authorities to enter territorial waters. If permission is not granted, the survey area will be selected based on a preliminary analysis that will determine the area not already surveyed or areas surveyed in poor sighting conditions. Some consideration will also be given to coordination with the T-NASS. Two vessels will be used for a period of four weeks centred in July.

4.6 Russian Federation

The Russian Federation, in cooperation with Norway, will continue a series of "ecosystem" surveys, using both ships and an aerial platform. The surveys will be carried out in two areas: the Norwegian sea in July, and the Barents Sea in August/September. The Norwegian Sea survey will use one Russian vessel and two Norwegian vessels. The Russian vessel will carry a single marine mammal observer, and will also be carrying out acoustic fish surveys and trawl surveys. Presently data are not collected in a way that would allow estimation of marine mammal density. The aerial survey will utilize a specialized twin engined airplane which carries four observers who collect sightings of marine mammals, birds, fish and other data. It is conducted as a strip survey with the strip half-width equivalent to the altitude of the plane. The Barents Sea survey will be carried out using similar effort and methods, but here the Norwegian vessel also carries dedicated marine mammal observers.

4.7 CODA

The original proposal to the EU LIFE Nature programme was to cover all European Atlantic waters from the shelf edge (the offshore limit of SCANS-II in 2005) out to the 200 nm fishing limit of UK, Ireland, France, Spain and Portugal. When the proposal was rejected by the EU LIFE programme, almost all other supporting institutions agreed in principle to go forward with a reduced project with the same objectives. The partners and co-financiers are in Spain: Institute of Oceanography (IEO), Azti-Tecnalia, and Spanish Cetacean Society (SEC); in France: University of La Rochelle and the Ministry of Defence (Navy); in Ireland: University College Cork, Department of Environment (Duchas), Sea Fisheries Board (BIM); and in the UK: University of St Andrews, Joint Nature Conservation Committee, Department for Trade and Industry (new co-financier), Department for Environment (DEFRA). Duchas and DEFRA have yet to confirm but an answer is expected from DEFRA within a few days; if this is positive CODA will definitely go ahead.

The survey area is planned to be from the Spanish/Portuguese border in the south to a common boundary with the Faroes survey block in the north, and from the shelf edge to as far as resources allow offshore. The survey will be in the month of July 2007. There will be three ship months: two weeks on the *Cornide* and two weeks on the *Investigador* in Spanish waters and Bay of Biscay; one month on a French navy vessel in the central area; and one month on a charter ship in the northern area.

The target species will be the common dolphin and deep diving whale species (sperm/beaked whales). SCANS-II double platform visual methods will be used for all species encountered. Towed acoustics will be focussed on sperm/beaked whales and delphinids.

4.8 USA

The primary objective of surveys carried out off the US eastern seaboard is to estimate abundance for as many cetaceans as the data allow. These data will be used in species-specific stock assessments, primarily to determine whether human induced mortality is of concern. All cetacean species are targeted, however the species with high levels of fishery by-catch (harbour porpoises, common dolphins, white-sided dolphins, pilot

whales, and all turtles) or species that are endangered (humpback, fin, and sei whales) are of highest interest. A single ship and a Twin Otter plane will be used in the survey, which will be conducted in August. In addition to the visual survey, the ship will also use passive acoustic methods. In general the plane will survey inshore while the ship will survey offshore, but there will be overlap between the two to allow comparison of density estimates. The northern boundary of the survey area will be determined in cooperation with Canada.

5. COORDINATION ISSUES

In discussing issues of coordination, it was noted that all participants are making large investments of money, time and effort in their surveys. All participants see the value of coordination to the extent that is feasible, because a fully coordinated survey will produce results that will be more reliable and valuable for all parties.

5.1 Timing

In principle it was agreed that all surveys should ideally occur in the same time period, and that this should be similar to previous surveys to maintain comparability in the time series. The preferred timing for all participants was advanced as follows:

Norway:	July (no flexibility);
Faroes:	July
Iceland:	Late June/July
Greenland:	August/September
Canada:	Scotian Shelf: August (to coordinate with USA)
	Grand Banks: July/August
	Northern areas: July or August;
USA:	August (no flexibility)
CODA:	July (no flexibility)
Russia:	Norwegian Sea: July
	Barents Sea: August/September

It was explained that August/September was preferred by Greenland because fog was generally less prevalent then than in July, and it was considered that the chances of a successful survey were much higher in September than in July. However it was noted that previous surveys (prior to 2005) had been conducted in July, although several of these had been unsuccessful. Greenland noted that it may be possible to attempt two surveys, one in July and one in September, but this will depend on the level of funding received.

There was considerable discussion over the timing of the Greenlandic survey for fin and minke whales. It was noted that although some successful surveys had been carried out in July, several had not been successful due to poor weather, especially fog and/or high winds. September was preferred by Greenland because fog was generally less prevalent then than in July, and it was considered that the chances of a successful survey were significantly higher in September than in July (a successful survey was conducted in September in 2005). Greenland noted that it may be possible to attempt two surveys, one in July and one in September, but this will depend on extra funding.

From the perspective of TNASS, the value of components being as synoptic as possible was stressed. It was noted that a major value of synoptic surveys is that it reduces difficulties of interpretation of abundance estimates due to migration. Although the migration pattern of minke and fin whales is poorly understood, it will be difficult to rule out the possibility of animals sighted in July to the east of Greenland being counted in a September survey off West Greenland; most members of the Working Group agreed that the possibility for animals seen off the USA/southern Canada in August being seen in July off West Greenland seems more unlikely.

The Working Group noted that there is a risk that a July survey off West Greenland may not result in an abundance estimate; it recognised that from a Greenlandic perspective, the highest priority was to obtain an abundance estimate for management purposes – and that the chances of obtaining such estimates generally are higher in August/September than in July owing to widespread fog early in the summer. However, the Working Group also noted that there is no guarantee that a September survey will result in an estimate and that the interpretational problem in the context of the overall TNASS survey will certainly be greater for a September survey. The latest too has management implications since the area covered by the Greenland survey is not believed to cover the complete range of either the fin or the common minke whale populations.

Given this, the Working Group agreed that from a TNASS perspective, an early abundance estimate from West Greenland that is timed in with the other surveys is clearly preferable. It **strongly recommends** that a three-week survey be undertaken off West Greenland in July perhaps into early August, and that this survey be coordinated with the northern portion of the Canadian aerial surveys. It also **recommends** that Canada coordinate the southern portion of its surveys with the USA surveys being undertaken in August.

The Greenlandic scientists commented that a survey in July is unlikely to be prioritised by Greenland unless the chances of obtaining abundance estimates are significantly enhanced, e.g., by additional funding that allows for surveys to be undertaken in both July and September. If Greenland gives priority to a survey in September 2007, the Working Group **strongly recommends** that Greenland, supported by the other NAMMCO countries, includes considerable survey effort also in July 2007.

5.2 Coverage

A general overview of planned coverage is provided in Figure 1. The northern extent of the Canadian coverage will be adjusted to match that of Greenland, and the released survey effort will be applied to Hudson Strait and to areas farther south. Coverage of central Davis Strait is dependent on the availability of the Arcturus survey platform.

Given that the funding of several components of the TNASS is as yet uncertain, it was not possible to plan the coverage of the TNASS in detail. It was agreed in principle that jurisdictions would cooperate fully in establishing the borders of their survey areas to be contiguous and to maximize the spatial coverage of TNASS. This task will be assigned to the Survey Design Subcommittee (See 7.1).

The western edge of the Icelandic survey area is limited by the ice edge off East Greenland. While it was recognized that several species of cetaceans, possibly including minke whales, may occur within the ice pack, it was not considered feasible to survey within the pack ice.

The Planning Committee noted that Norway presently plans to survey in the eastern Barents Sea, an area that is not contiguous with the TNASS area. While recognizing that the Norwegian survey plan is based on providing optimal estimates of minke whale abundance for use in the RMP, the Planning Committee stressed that the opportunity to get synoptic coverage of a much larger area was not likely to arise again in the near future, and that this should be seen as valuable to the Norwegian management programme. It was also noted that the TNASS proposal had been endorsed by both NAMMCO Council and the IWC Scientific Committee. The Planning Committee therefore **strongly recommended** that Norway survey in an area contiguous to the main TNASS survey area in 2007. A preferred area would be that to the northeast of the Icelandic survey area, extending to the Norwegian coast (See Fig. 1).

5.3 Coordination with associated surveys

5.3.1 CODA

It was agreed that TNASS will cooperate closely with CODA in establishing contiguous survey boundaries.

5.3.2 USA

It was agreed that TNASS (primarily the Canadian component) will cooperate with the US survey as closely as possible.

5.4 Coordination with "Opportunity" ship board surveys

5.4.1 MAR-ECO

Research will be conducted along the North Atlantic Ridge under the MAR-ECO project by an American and a British vessel in July 2007. Permission to place cetacean observers aboard these vessels, subject to funding (see 6.2.2) has already been sought. The American vessel will carry a single cetacean observer, whose activities will be as compatible to the TNASS protocol as possible. As these are multi-purpose surveys that will include periodic trawling, it was uncertain whether or not an acoustic array could be accommodated by the vessels. This has also been requested, subject to funding, but a response has not yet been received.

5.4.2 ICES Redfish

In addition to an Icelandic vessel which will be a co-platform for the cetacean survey, Russian and German vessels will participate in an International Redfish Survey, coordinated by ICES, in 2007. These vessels will survey an area to the south and west of the main Icelandic survey area (see Fig. 1). Permission to place cetacean observers and acoustic arrays on these vessels (subject to funding) has already been requested, and a decision on this is pending. If granted, it would constitute a substantial addition to the main TNASS survey area.

5.4.3 Russian/Norwegian surveys in the Norwegian Sea

The planned Russian surveys are described under 5.4. It was clarified that the observers aboard the Russian vessels do not presently use standard line transect methods, but it was considered that a TNASS protocol for "opportunity" vessels could be adopted. Norwegian vessels also conduct fish surveys in the same area and time period, and it was agreed to investigate the possibilities of placing observers onboard. The aerial survey uses a strip transect methodology, cruising at no more than 300 km/hr at an altitude of 200 m with two teams of independent observers. The methodology is described in Anon (2005). This will be evaluated in terms of the potential value of this survey effort to TNASS.

5.4.4 Russian survey in the Barents Sea

See Item 5.4.3. It was considered that this survey was of less interest to TNASS because of the difference in timing.

5.4.5 IPY-ESSAR

The TNASS has been accepted as a component project of the Ecosystem Studies of Subarctic and Arctic Regions (ESSAR) project for the International Polar Year (IPY). ESSAR involves many projects covering physical and chemical oceanography as well as ecological studies at various trophic levels. To date the actual cross coordination of these components within ESSAR has been limited, but the Planning Committee considered that this presented an opportunity that should be more closely investigated. Pike agreed to lead coordination in this area.

5.4.6 Other

Iceland will be carrying out an ecosystem survey in the Greenland Sea in August 2007, which will involve oceanographic and fish surveys. There will be bird observers on board who will also record observations of cetaceans, but there is no room for additional observers on this vessel. However because of its timing it is of limited concern to TNASS.

6. FUNDING

6.1 Integrated budget

An integrated budget for TNASS has been prepared and used in several funding applications, and a summary of this is provided in Table 2. Total cost of the project is projected at approximately 34 million DK, of which about 15 million is confirmed at this time. Base funding from the Greenlandic, Norwegian and Faroese governments is confirmed, and there is a firm funding commitment from the Icelandic government. NAMMCO has also allocated special funds for TNASS for 2007. Funding for the Grand Banks portion of the Canadian programme has been confirmed, and it is expected that funding for the Arctic portion, from the Canadian IPY programme, will be confirmed in January. Funding for the Scotian Shelf and Gulf components is less certain and confirmation may not be available until spring 2007.

In a "worst case" funding scenario, it is likely that surveys could be conducted in an area similar to that surveyed in 2001, as well as West Greenland and the Grand Banks

region of Canada. In addition, the associated CODA, MAR-ECO, ICES Redfish and US surveys will likely go ahead irrespective of TNASS. Coordination and public outreach activities would proceed at a lower level than presently planned, and would be funded primarily by NAMMCO and national governments. In such a scenario the analyses planned for 2007/8 would proceed more slowly, mainly under national funding, and would therefore be less integrated in nature.

6.2 External funding proposals

6.2.1 Nordic Council

An application for funding was sent to the Nordic Council in the second quarter of 2006 and initially rejected. A revised application totalling 1.7 million DKK over two years (07/8) has been submitted to support activities related to survey coordination, planning and post-survey meetings, cooperative analytical work, including provision of external expertise, support for Russian observers and dissemination of information to the public. A response to this application is expected by mid January 2007.

6.2.2 NORA

A total of 830,000 DKK (730 in 2007 and 100 in 2008) has been sought from the Nordisk Atlantsamarbejde to fund "Sub-project 1", the operation of "platform of opportunity" surveys in areas adjacent to the main TNASS survey area. This will cover costs related to placing two observers on each of four ships, including wages, equipment, travel, data preparation and analysis. While the main targets of this application were the MAR-ECO and International Redfish Surveys, there may be other opportunities, such as the Norwegian mackerel survey, if these prove unfeasible. A response to this application is expected by mid December 2006.

6.2.3 Beckett Fund and JL Fund

Similar funding requests totaling 2,110 kDKK have been submitted to these Danish private funds, to support "Sub-project 2", the passive acoustic survey. The main cost is the equipment since the observers from the visual survey will deploy, monitor and operate the acoustic equipment. A secondary cost is related to the data preparation and analysis (which is very time consuming), as well as the reporting of the results, projected to take 12 months for two persons. The budget is presently based on equipping 12 vessels, 6 TNASS vessels and 6 vessels from three fishery surveys. A response to this request is expected in December 2006. It was noted that timing was critical here as the equipment will have to be ordered by the end of January if it is to be completed on time. Consideration should also be given to the prioritization of this equipment should partial funding be received.

6.2.4 What next?

As the main work of drafting funding proposals for these activities has been completed, it would be relatively easy to submit them to other potential supporters, including possibly industry. Members were requested to seek out external funding opportunities using any contacts they might have. However it was noted that it may be too late to seek funding from most sources for a project in summer 2007.

7. SURVEY DESIGN

7.1 Survey design issues

General

SC/14/TNASS/16 discussed strategies for creating good designs given the constraints inherent in many shipboard surveys of cetaceans: severely limited ship time and complex topography. Good survey design is essential for obtaining reliable results using standard (design based) analytical methods. Even for more complex (model based) analytical methods, a good survey design is very helpful. While it is difficult to optimise a survey design for multi-species surveys in which different species have very different distributions, there are some general rules of thumb for deciding what constitutes good survey design. A 'good' design is one (a) that employs randomization in laying out transects; (b) that is stratified if density of target species is known to vary on a large scale; (c) where each location within a stratum has an equal probability of being surveyed (equal coverage probability); (d) that produces at least 10-20 transects per stratum; (e) that, given the previous points, gives maximum efficiency per unit effort – for example by minimizing time spent travelling between survey lines (off-effort time). The use of computer software, such as the programme Distance, to create designs and compare their properties using simulation, was advocated, and an example of survey design, a multi-species survey of cetaceans in coastal British Columbia, Canada was presented. The design uses an equally spaced zig-zag configuration of transects in more open strata combined with sub-stratification to minimize off-effort time. In the highly convex inshore stratum, a systematic cluster sampling algorithm was used. Within the selected clusters a systematic parallel line layout to ensure equal coverage probability in the long, narrow fjords was developed.

The Planning Committee endorsed the approach of using automated design within DISTANCE to develop "design unbiased" track layouts for all strata. The level of coverage within each stratum will depend on the expected density of target species and the level of funding available. In many cases the latter is not yet known so design cannot proceed as yet. One confounding factor includes the need for the survey 'design axis' (the long axis used to orient the transects) to address issues of migrating animals, such that the survey does not progress only in the same direction as the direction of animal migration. A Working Group on shipboard survey design was established to develop appropriate designs for each block, after decisions have been made about funding, permits, survey effort to be allocated, and survey boundaries. The Working Group will also investigate the possibility of changing the design of the redfish survey with regard to the point above. Membership is Pike (Chair), Donovan, Hammond, Lawson, Mikkelsen, Palka, Simon, Víkingsson, Williams and Øien.

Harbour porpoise

The harbour porpoise is a target species for Iceland, and probably should be for Greenland, considering that there is a substantial directed harvest in Greenland and substantial by-catch in Iceland. In 2005, the NAMMCO Scientific Committee noted that estimates of abundance of harbour porpoises were required for these and other areas (NAMMCO 2006). Harbour porpoises probably have a more inshore distribution than minke whales in these areas, and may occur within the fjords. Therefore, if the harbour porpoise is to be a target species, some change in survey design may be required for both areas. Consideration should be given to allocating more effort to

inshore areas, especially fjords. While this may cost more flying time, it may not increase the total duration of the survey. Fjords could be surveyed on days when conditions farther offshore were unsuitable, utilizing time that would otherwise be spent on standby. A possible approach is to maintain the existing design for Iceland, and develop a "secondary" design concentrating effort in fjords and areas where harbour porpoise density is expected to be high. The secondary transects could be flown on an opportunistic basis. The same could be done for Greenland, but there, the fjord areas are so extensive that a great amount of extra effort would be required to cover them adequately. An alternate approach would be to fly only a few fjords on an experimental basis, or adopt the approach using "Primary Sampling Units" outlined in SC/14/TNASS/16.

The Planning Committee agreed that a secondary fjord stratum should be developed for Iceland waters to be surveyed on a pilot/opportunistic basis, without substantially compromising the efficiency of the survey for minke whales.

7.2 Approaches to stratification

It was noted that the Working Group on shipboard survey design should examine information from previous surveys (especially NASS) to assess whether the proposed survey design blocks (SC/14/TNASS/14, Figure 1) are appropriately drawn. It was agreed that the Working Group should discuss stratification, allocation of effort by stratum and the design of survey transects (Items 7.3-7.5) after it is known how much survey effort each country can contribute to the overall survey.

8. FIELD METHODS

8.1 Dedicated ship surveys

8.1.1 Review of SCANS-II and US methods

Hammond summarised the data collection methods used on the SCANS-II surveys in 2005. Surveys were in standard BT mode on all seven vessels. On the primary platform, there were two observers searching with the naked eye. Angles were recorded from angle boards and each observer had a measuring stick for estimating radial distance. On the tracker platform there were four scientists: two observers (one searching with "big-eye" binoculars, the other with pole-mounted 7×50s), a duplicate identifier and a data recorder, who was in contact with the observers on the primary platform. Distance was measured via a video camera mounted on the "big-eyes". Angle was measured via a webcam attached to the underside of the "big-eyes", taking images of lines on the deck. Each observer on each platform had a sighting/resighting button that when pressed relayed a time stamp to the data collection computer and started the audio recordings. On the tracker platform, the button also started the video camera and webcam. Details of the equipment and protocols are given in the SCANS-II shipboard observer handbook.

The equipment and protocol generally worked very well. The webcam gave excellent angle data and video estimates of distance were obtained for between 40-50% of sightings. The electronics generally worked well but some cables had to be replaced during the survey.

Palka described the methods used in the US North Atlantic surveys. US surveys use two symmetrical sighting teams, with each team comprising 4 people of whom 3 were on-effort at a time. Of the three people, two used high powered binoculars, while one person surveyed by eye and recorded the data from all three team members. Duplicate sightings were determined after the survey using information on the timing of the sighting, position relative to the ship, and swim direction. To more easily determine which sightings were duplicates, observers were encouraged to record more than one location of each sighting, particularly for those sightings that were far from the ship and/or changed swim directions. More details of the data collection methods can be found in Palka (2006). To account for reactive movements, possible heterogeneities and *g(0)*, methods described in Palka and Hammond (2001) were used to determine if there was evidence of responsive movement and if so, to correct the estimates. If there was no evidence of responsive movements then the data were analyzed using the direct duplicate with covariate method (Palka 2005a).

8.1.2 Survey mode

There was considerable discussion about the most appropriate method(s) to use on the dedicated vessels. Dedicated vessels included the Icelandic redfish vessel as well as the two Icelandic vessels and the Faroese vessel. Factors taken into account in the discussion included area, target species, analytical approaches, problems encountered on previous surveys, practical arrangements, cost etc. In conclusion, it was agreed that all vessels would follow the same survey mode and use the same equipment and protocols to the extent possible; there is less flexibility on the redfish survey.

It was agreed that the primary searching mode should be BT mode with high powered binoculars (choice of "big-eyes" or "little-eyes" would be left to the sub-group identified below) for the tracking platform. For the target species, where possible, tracking would be attempted until the animals were estimated to come abeam. Under poor conditions (*e.g.* heavy swell, Beaufort 5 or more), tracking will cease and if searching continues it will be in one-way IO mode. The detailed protocol will be developed by a sub-group on shipboard protocols comprising Desportes, Gunnlaugsson, Hammond, Palka and Víkingsson. That group will also consider aspects such as school size estimation, delayed closure, how to revise the survey design in response to the ice edge etc. The personnel requirements will be for 8 observers per vessel. The choice of observers is discussed under Item 9.

8.1.3 Data collection procedures

It was agreed that the data collection procedures followed on SCANS-II will be used. This includes:

- Webcam for the tracking platform to record angles (and investigation of an electronic system for the primary platform);
- Video measurement of distance for the tracking platform;
- Electronic data entry.

Practical aspects of this are considered further under Item 8.1.5.

8.1.4 Calibration experiments

The need for angle/distance experiments for the primary observers was agreed. Details

will be determined by the sub-group on shipboard protocols. For the trackers, visual distance estimates will be calibrated using a factor based on a comparison of the video distance measurement and reticule readings.

8.1.5 Equipment

Equipment needs are dictated by the decisions taken above with respect to protocols. It was agreed that given the relative complexity of the system, it is essential to contract out the acquiring and installation of the equipment, as well as training, to experienced personnel. It is important to carry spares (especially of cables) and consideration should be given to the use of Toughbook computers (www.panasonic.com). Questions of training are discussed further below under Item 9.2.1.

8.2 Opportunistic ship surveys

8.2.1 Advances in monitoring methods from SCANS-II

Hammond summarised the work being undertaken in the SCANS-II project related to using relative abundance data to monitor changes in abundance that will be used to help inform recommendations for best practice in monitoring cetacean populations in the periods between major absolute abundance surveys such as SCANS and NASS. This focussed on acoustic data and visual data collected by seabird observers both of which have monitoring potential if used on ships of opportunity.

Each of the seven SCANS-II survey ships towed hydrophones 200m behind the vessel that recorded high frequency clicks and lower frequency whistles. Acoustic data were stored digitally on computers running programmes Logger, RainbowClick and Whistle. Analysis identified harbour porpoise clicks and estimated perpendicular distance for tracks of clicks so that acoustic detection rates could be calculated. Information of ship noise was also collected and correlated with detection rate.

Each ship (except one) carried one or more seabird observers who also collected cetacean data independently, which were used to calculate harbour porpoise detection rates.

Acoustic and seabird observer detection rates will be regressed on BT estimates of absolute abundance; the variability accounted for by the relationship is a measure of how well each method is able to reflect true abundance. This variability can be incorporated into a power calculation to determine the relative power of each method to detect a trend in abundance of a given size over a given period. Information on the cost of each method will then give an indication of the relative cost to achieve a given power to detect a given trend. This comparison will be helpful when recommendations are considered.

8.2.2 Survey mode, data collection procedures, calibration experiments and equipment

The Planning Committee agreed that to the extent possible, the methods, data collection procedures and equipment to be used by observers on vessels of opportunity should be the same as those for the primary platform on dedicated vessels. It was agreed that wherever possible, at least two observers are present; if a choice has to be made between

one observer on two vessels and two observers on one vessel the latter is to be preferred. A protocol will be determined by the sub-group on shipboard protocols; recognising that this may need to be tailored to the particular conditions related to each vessel. Desportes agreed to liaise with the proponents of the platform of opportunity surveys on this issue.

8.3 Acoustic survey

8.3.1 State of the art

Methods to collect, identify and analyse harbour porpoise and sperm whale echolocation clicks are well advanced. For harbour porpoises, detection rate and distance of click trains from the trackline can be estimated as described under Item 8.2.1. For sperm whales, there are methods to estimate absolute abundance (Leaper *et al.* 1992). Methods of analysis for other species are less well advanced. There is ongoing work on bottlenose whale clicks (*e.g.* Hooker and Whitehead 2002). Methods to analyse delphinid whistles are less well advanced. There are plans to use SCANS-II visual and acoustic data to investigate methods to distinguish among whistles from different dolphin species. Whistles are produced in a behavioural context and the relationship between vocalisation rate and abundance is unknown.

8.3.2 Equipment and data collection

The Planning Committee noted that there is a funding request in for the acoustic programme. SMRU is a partner in this work and will be responsible for ensuring that the appropriate equipment (and manuals) is present on at least the dedicated TNASS vessels (apart from Norwegian vessels that may operate in Russian waters, because of permit problems). Even if the funding request is not granted, it is anticipated that the Faroese vessel will deploy acoustic equipment. The CODA vessels will all deploy acoustic equipment. Iceland will investigate the possibility of buying acoustic equipment if the funding request fails.

8.4 Dedicated cetacean aerial surveys

8.4.1 Review of previous methods used

Hammond summarised the aerial survey methods used on the SCANS-II survey. In 1994, the SCANS aerial surveys used two aircraft flying in tandem and a probabilistic method was used to account for animals missed on the trackline in the estimation of effective strip half width (*esw*) for the harbour porpoise. On SCANS-II in 2005, a modified 'circle back' or 'racetrack' method was used, in which a single aircraft circles back and resurveys a section of track line following a sighting. Robust estimation of *esw* requires a sufficient number of circles to be flown; the number depends on the detection probability of the species. For harbour porpoises, which have a low detection probability, the desired number of circles was determined by simulation to be about 60 (check) and 90 were achieved by the three aircraft.

Circles were not flown for species other than harbour porpoise. Information on availability bias from other sources was used to correct minke whale and bottlenose dolphin estimates. For common dolphin, striped dolphin and white-beaked dolphin, an availability bias correction from striped dolphin data was used. Estimates for species other than harbour porpoise were not corrected for perception bias but this was considered not to be large for dolphins.

In US waters, aerial surveys are flown in a Twin Otter with two large bubble windows and a belly window at 600 feet at 110 knots. Five scientists were employed: two searched through the bubble windows, one searched through a belly window, the fourth was a data recorder and the fifth was at rest. The racetrack data collection method and the VOR data entry programme developed by Hiby (1999) was used. In addition, GPS and sea surface temperature data were collected. Two external key pads were also connected to the data entry programme, where the keyboards were held by the bubble window observers and when a sighting passed perpendicular to the observer, a key on the external keyboard was depressed which then automatically recorded the time and side the observer was on. One difference from the traditional racetrack method was that the circling back procedure was used for any species that was found in a group of 5 animals or less and not seen again within 30 seconds of the time of the sighting that initiated the circle-back. This has allowed an estimation of *g(0)* for species groups, i.e., harbour porpoises, dolphins, and whales (Palka 2005b). In addition, the VOR programmes have been used to determine duplicate sightings and the direct duplicate with covariate method was used to estimate *g(0)* and abundance (Palka 2005b).

In both Iceland and Greenland, the predominant approach has been to use cue-counting for minke and fin whales. The protocol has evolved over the years but is based on that originally described in Donovan and Gunnlaugsson (1989). SC/10/AE/12 and SC/14/TNASS/O/3 provide a critique and some suggestions for improvements for the aerial surveys.

8.4.2 Survey mode, data collection procedures and equipment

It was agreed that a sub-group on aerial survey protocols would be established (comprising, Donovan, Pike, Witting, Palka, Lawson, Simon) the remit of which is to include data collection methods and equipment. It was agreed that the while data would be collected in such a way to enable a variety of analytical approaches to be used (e.g. cue counting, and standard line transect, and, if possible 'racetrack',), cue counting will be the primary method for obtaining abundance estimates for minke and fin whales.

Given the priority to be accorded to obtaining abundance estimates for harbour porpoises off Iceland, it was agreed that the available information be evaluated by the sub-group to determine whether it will be possible to obtain suitably precise estimates of minke whale abundance if the survey is flown at 600 feet. This is the optimum height for harbour porpoise surveys and one that will best allow use of SCANS-II estimates of animals missed on the trackline, in the likely event that employing the racetrack method in Iceland may result in the loss of too much effort. The relatively high density of minke whales in Icelandic waters means that precise estimates of abundance can be expected from surveys flown at 600 ft. The very low densities expected of minke and fin whales off West Greenland preclude flying at 600 feet as this will compromise the ability to obtain an abundance estimate. Hammond and Donovan will consult with Hiby and Borchers about the possibility of using cue counting for harbour porpoises (and investigate whether it is possible to use data from SCANS and SCANS-II to evaluate this).

Issues relating to choice of observers are dealt with under Item 9.

8.5 Collection of ancillary data

The Planning Committee noted that the collection of appropriate effort, weather and behavioural data will be dealt with by the relevant sub-groups on protocols. It therefore limited its discussion to additional environmental data that might be collected without compromising survey effort. It agreed that all of the dedicated planes should be equipped with temperature probes (as already used on the US and Canadian planes); these cost CAN$2,200 and automatically record sea surface temperature at 300 millisecond intervals.

Considerable environmental data are collected remotely from the Russian ecosystem programme planes. The practicality of installing any such equipment on the dedicated planes will be evaluated by the sub-group on aerial survey protocols after receiving additional information to be provided by Zabavnikov.

The possibility of installing high resolution digital video or still cameras to record a narrow strip directly under the planes was considered. It has the possibility of providing information on animals missed on the trackline and may be additionally valuable for harbour porpoise studies in West Greenland where the survey height will not be optimum for visual observers to see harbour porpoises. The Planning Committee agreed that this showed some promise but noted that it was not necessary for abundance estimates to be obtained from the aerial surveys. Before making any recommendation for installation of such cameras, it agreed that it would be necessary to test the efficacy of the approach by appropriate experiment. However, it also noted that this does not preclude countries voluntarily installing such equipment should they so wish.

8.6 Biopsy and tagging

The Planning Committee noted that at present there were no plans to carry out telemetry work from any of the vessels, although such plans may be developed. It recommended that each vessel with appropriate expertise carry equipment such that opportunistic biopsy and/or photo-identification work could be undertaken at the Cruise Leader's discretion such that the visual survey component was not compromised. The Cruise Leader would be aided in such decisions by countries providing advice on the origin of existing biopsy samples for each species and where data gaps may exist that had potential management significance with respect to stock structure.

9. OBSERVERS

9.1 Selection

Aerial surveys

If possible experienced observers should be used on all surveys. This is particularly important for Greenland as sightings are relatively rare so there is no opportunity for in-flight training. For Iceland, it was also considered important to have at least one observer who was experienced with harbour porpoise surveys. It was also recommended that a "relief" observer be employed for each survey. This observer could step in in case of illness, and otherwise transcribe data from the surveys in a timely manner. This was considered very important in order to provide timely feedback to the observers to correct any problems that might arise.

Greenland will aim to select observers with experience from previous minke whale surveys and to conduct training in Iceland if necessary. Some experienced observers are available in Iceland, and every effort will be made to obtain the services of an experienced harbour porpoise observer for the survey. Canada and the USA have a core group of experienced observers and these will be used in their surveys.

Ship surveys

Given that equipment, survey modes and protocols will be similar to those used on SCANS-II, it was recommended that at least one observer experienced with SCANS tracking methods be employed on all vessels. Otherwise observers will be selected separately by each jurisdiction.

9.2 Training

9.2.1 Shipboard

It was considered unlikely that funds would be found to conduct a full shipboard training survey. Training of cruise leaders will be conducted at a meeting in advance of the survey. It was recommended to allocate some time for each vessel at the beginning of the survey to conduct onboard training. Training will be conducted by the cruise leader in cooperation with the experienced tracker, subject to the common survey protocol, which will be provided well in advance of the survey. Øien volunteered to assemble a training DVD illustrating survey equipment, techniques and common sighting situations.

9.2.2 Aerial

Both ground and in-flight training is required for aerial observers, even as a refresher for experienced observers. Given that high densities of minke whales are generally found in Faxafloi Bay close to Reykjavik, this is a particularly convenient place to conduct in-flight training. A minimum of 5 hours of plane time should be allocated to training.

9.2.3 Acoustic

As in SCANS-II, one observer will be responsible for the deployment and operation of the acoustic array on each vessel. This was considered a relatively easy task, although some training is required. Provision for this training will be decided upon once funding for the acoustic survey is certain.

10. TASKS TO BE COMPLETED

	What	Who	When
1	Develop survey design, including stratification, effort allocation and transects.	Design WG	1 Mar 2007
2	Shipboard survey protocol, including for opportunistic ships.	Ship Protocol WG	1 Mar 2007
3	Aerial survey protocol.	Aerial Protocol WG	1 Mar 2007
4	Assess suitability of Russian aerial survey effort for inclusion in TNASS.	Aerial protocol WG	Jan 2007

5	Consult with experts re. the possibility of using cue counting for harbour porpoises and investigate whether it is possible to use data from SCANS and SCANS-II to evaluate this.	Donovan/ Hammond	Jan 2007
6	Provide information on specifications of equipment used in Russian aerial surveys.	Zabavnikov	Dec 2006
7	Follow up requests for placement of cetacean observers to MAR-ECO and ICES-Redfish Surveys.	Desportes/Pike	Dec 2006
8	Investigate possibility of placing observers aboard Russian and Norwegian fishery survey vessels, Norwegian Sea in July.	Zabavnikov/Øien/ Pike/Desportes	Dec 2006
9	Coordination with IPY-ESSAR.	Pike	Ongoing
10	Order acoustic equipment (subject to funding).	Desportes/Gillespie	1 January 07

11. DISSEMINATION OF RESULTS/PUBLIC RELATIONS

Funding for the establishment of a website and production of publicity materials has been applied for from the Nordic Council. If successful, an independent web site will be established, and all partners will contribute material. This site will also be reciprocally linked to the CODA and US sites.

12. NEXT MEETING

Most decisions about funding for the TNASS will be available by the end of January 2007, except for Canada for which information may not be available until April. It was considered feasible for the working groups to finish their work on survey design and survey protocols by the beginning of March. Therefore the next meeting of the Planning Committee will be held in March 2007.

13. ADOPTION OF REPORT

A draft version of the Report, containing all important items agreed upon, was accepted on 19 November 2006. The Chair thanked all members for contributing to what had been a very productive meeting, and noted that a great deal of progress had been made in planning the TNASS and linking it to associated surveys. She considered it very encouraging that a group of nations and jurisdictions with often different political outlooks was able to work cooperatively to plan and execute a project dedicated to the common objective of cetacean conservation. She also thanked the Rapporteurs for their hard labours and the Marine Research Institute for hosting the meeting. The Planning Committee thanked Desportes for her efficient chairing of the meeting.

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JURIS-DICTION Main survey	PLATFORM	DAYS	IND. PLAT-FORM	CRUISING SPEED (knots)	RANGE (hrs or days)	ALTI-TUDE	WIND-OWS (Pairs)	PLATFORM HEIGHT (m) 1	2	OBS.
Canada	Twin Otter 300	52	2	105	5 hrs	600	1			2
	Lockheed	3	2	170	10 hrs	750t	3			6+
Greenland	Arcturus Partenavia or Twin Otter		2	90	5-8 hrs	750	1			3
Iceland	Partenavia	20	2	90	8 hrs	600	1			3
	ship 1	30	2	10						8
	ship 2	30	2	10						8
	ship 3	30	2	10						8
Faroes	Ship 1	28	2	10				10.5	12	8
Norway	Ship 1	28	2	10						8
	Ship 2	28	2	10						8

Associated surveys										
USA	Twin Otter	30	1	100	5 hrs	600	1+belly			3
	R/V Bigelow	30	2					11.4	15	8
CODA	Cornide	14	2							8
	Investigador	14	2							8
	Ship 3	28	2							8
	Ship 4	28	2							8
Russia Norwegian Sea	Antonov-26	115 hrs	2	<186		650	2			4
	Ship 1		1							1

Table 1. Survey platforms and effort available to the TNASS and associated survey

Fund	Sent	Specific project	Ext. Part	Applied for 2,007	Applied for 2,008	Applied for Total	Answer	Granted 2,007	Granted 2,008	Granted Total
NAMMCO	Mar-06	Coordination incl. analysis, Russia, extl expertise, awareness campaign		260,000	110,000	**370,000**	mar-06/07	260,000		**260,000**
NAMMCO / NMR-Arctic	30/08/2006			973,000	712,000	**1,685,000**	19/01/2006			
NAMMCO / NORA	24/10/2006	1) Opportunistic surveys		730,000	100,000	**830,000**	mid 12/06			
NAMMCO / Beckett-Fonden	01/11/2006	2) T-NASS Acoustic	SMRU	1,680,000	430,000	**2,110,000**	mid 12/06			
NAMMCO / JL Fondet	07/11/2006	2) T-NASS Acoustic	SMRU	1,680,000	430,000	**2,110,000**	mid 12/06			
NAMMCO Total						**4,625,000**				
Faroese national		Faroese survey				**2,200,000**	Nov-06			**1,350,000**
Faroese oil		Faroese survey				**550,000**	Nov-06			**555,000**
Iceland national		Icelandic survey		6,363,000		**6,363,000**				
Norway national		Norwegian survey		4,620,000		**4,620,000**		4,620,000		**4,620,000**
Greenland national		Greenlandic survey		1,500,000		**1,500,000**				
Canada IPY		Can. Eastern arctic IPY		2,090,000	168,000	**2,258,000**				
Canada diverse		Can. Grand Bank		1,777,000		**1,777,000**		1,777,000		**1,777,000**
Canada diverse		Can. Gulf of St. Lawrence		1,704,000		**1,704,000**				
Canada diverse		Can. Scotian Shelf		1,777,000		**1,777,000**				
Russian Fed.										

Table 2. An overview of funding for TNASS, as of November 2006.

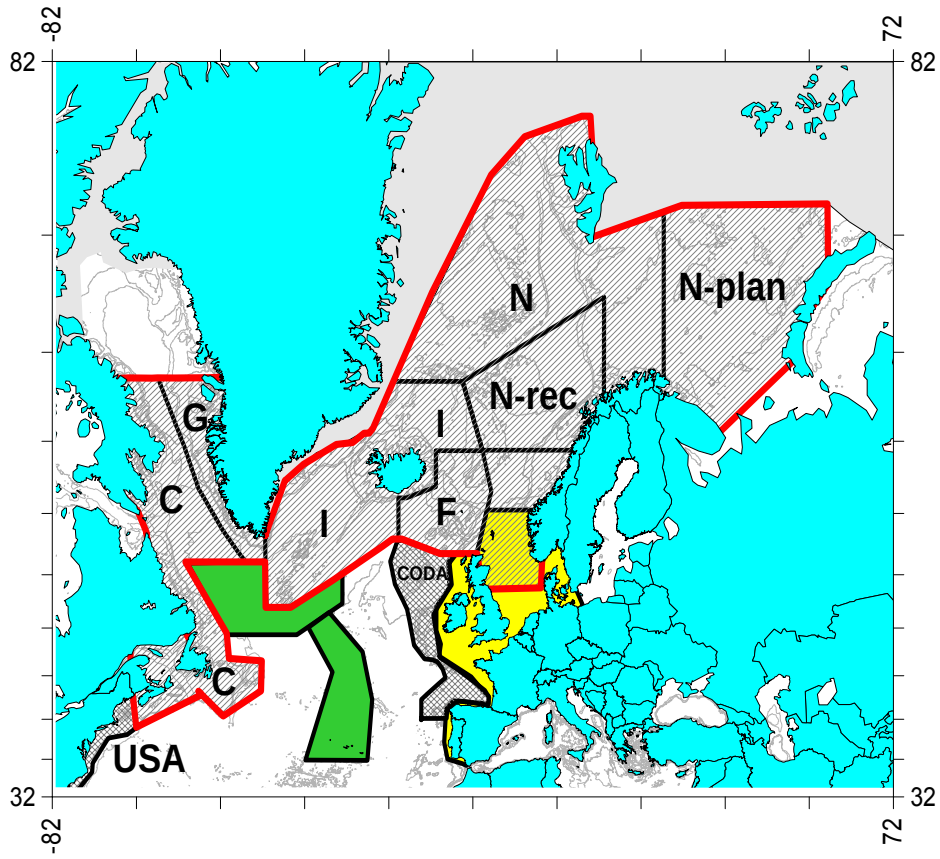

Fig. 1. TNASS and associated survey areas. The TNASS area is outlined in red, and includes the survey areas of Canada (C), Greenland (G), Iceland (I), the Faroes (F) and Norway (N). The Norwegian area is surveyed over a 6-year period, and the area planned to be surveyed in 2007 is shown as N-plan. The area recommended to be surveyed in 2007 is shown as N-rec. The yellow area was covered by SCANS-II in 2005, and the shaded area is the approximate southern extent of pack ice in the summer. Associated surveys are the American Eastern Seaboard and CODA surveys. The approximate areas of the ancillary ICES Redfish and MAR-ECO surveys are green.

Appendix 1

AGENDA

1. Chair's welcome and opening remarks
2. Adoption of agenda
3. Appointment of rapporteurs
4. Overview of available resources by jurisdiction
   - 4.1 Canada
   - 4.2 Greenland
   - 4.3 Iceland
   - 4.4 Faroes
   - 4.5 Norway
   - 4.6 Russian Federation
   - 4.7 CODA
   - 4.8 USA
5. Coordination issues
   - 5.1 Timing
   - 5.2 Coverage
   - 5.3 Coordination with associated surveys
     - 5.3.1 CODA
     - 5.3.2 USA
     - 5.3.3 Other
   - 5.4 Coordination with "Opportunity" shipboard surveys
     - 5.4.1 MAR-ECO
     - 5.4.2 ICES Redfish
     - 5.4.3 Russian survey in Norwegian sea (06-07)
     - 5.4.4 Russian survey in Barents Sea (08-09)
     - 5.4.5 IPY-ESSAR
6. Funding
   - 6.1 Integrated budget
   - 6.2 External funding proposals
     - 6.2.1 Nordic Council
     - 6.2.2 NORA
     - 6.2.3 Beckett Fund
     - 6.2.4 JL Fund
     - 6.2.5 What next
7. Survey design
   - 7.1 Survey design issues
   - 7.2 Approaches to stratification
   - 7.3 Rough stratification
   - 7.4 Allocation of effort by stratum
   - 7.5 Specifications for transects
8. Field Methodology
   - 8.1 Dedicated ship
     - 8.1.1 Advances in survey methods from SCANS-II
     - 8.1.2 Survey modes
     - 8.1.3 Data collection procedures

8.1.4 Calibration experiments
8.1.5 Equipment
8.2 Opportunity ship
8.2.1 Advances in monitoring methods from SCANS-II
8.2.2 Survey modes
8.2.3 Data collection procedures
8.2.4 Calibration experiments
8.2.5 Equipment
8.3 Acoustic survey
8.3.1 Status of the art (what information can be obtained from which species)
8.3.2 Equipment and data collection
8.4 Aerial
8.4.1 Survey modes
8.4.2 Data collection procedures
8.4.3 Calibration experiments
8.4.4 Equipment
8.5 Collection of behavioural and ancillary data
8.6 Biopsy and tagging studies
8.7 Other matters
9 Cruise Leaders and Observers
9.1 Selection
9.2 Training
9.2.1 Visual
9.2.2 Aerial
9.2.3 Acoustic
10. Dissemination of results/public relations
11. Tasks to be completed
12. Next meeting
13. Adoption of report.

Appendix 2

LIST OF DOCUMENTS

Doc. No.	Title
SC/14/TNASS/1	List of Participants.
SC/14/TNASS/2	Draft Agenda.
SC/14/TNASS/3	List of Documents.
SC/14/TNASS/4	Proposed contribution to TNASS: Canada.
SC/14/TNASS/5	Proposed contribution to TNASS: Greenland.
SC/14/TNASS/6	Proposed contribution to TNASS: Iceland.
SC/14/TNASS/7	Proposed contribution to TNASS: Faroes.
SC/14/TNASS/8	Proposed contribution to TNASS: Norway.
SC/14/TNASS/9	Proposed contribution to TNASS: Russian Federation.
SC/14/TNASS/10	Preliminary survey plan: CODA.
SC/14/TNASS/11	Preliminary survey plan: USA.
SC/14/TNASS/12	Overview over TNASS funding applications.
SC/14/TNASS/13	TNASS Budget.
SC/14/TNASS/14	Subproject 1: Extending TNASS: Collection of data from non-dedicated survey ships.
SC/14/TNASS/15	Subproject 2: TNASS acoustic.
SC/14/TNASS/16	Thomas, L., Sandilands, D. and Williams, R. Designing line transect surveys for complex survey regions.
SC/14/TNASS/17	Pike, D.G. Some recommendations for future aerial surveys off Iceland and Greenland.

BACKGROUND DOCUMENTS

Doc. No.	Title
SC/14/TNASS/O/1	Gunnlaugsson, Th., Halldórsson, S.D., Ólafsdóttir, D. and Víkingsson, G.A. NASS 2001 Icelandic shipboard survey report (SC/10/AE/10).
SC/14/TNASS/O/2	Desportes, G. *et al.* An evaluation of the methodology used in the NASS-2001 Faroese ship survey. (SC/10/AE/11).
SC/14/TNASS/O/3	Pike, D.G., and Víkingsson, G.A. The NASS-2001 Icelandic aerial survey: Introduction and evaluation. (SC/10/AE/12).
SC/14/TNASS/O/4	Report of the NAMMCO Scientific Committee Working Group on Abundance Estimates, March 2002.
SC/14/TNASS/O/5	Report of the Trans North Atlantic Sightings Survey, First Planning Meeting, March 2006.
SC/14/TNASS/O/6	Williams, R., Hedley, S.L. & Hammond, P.S., 2006. Modelling distribution and abundance of Antarctic baleen whales using ships of opportunity. *Ecology and Society* **11**(1): 1. [Online - URL: http://www.ecologyandsociety.org/vol11/iss1/art1/.]

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