PLANNING COMMITTEE FOR T-NASS
TRANS NORTH ATLANTIC SIGHTINGS SURVEY
M5: Copenhagen, April 7, 2008

1. CHAIR'S WELCOME AND OPENING REMARKS

Chair Genevieve Desportes welcomed participants (Appendix 1) to the post-cruise meeting of the T-NASS Planning Committee. She pointed out that T-NASS had achieved a trans-Atlantic coverage (Figure 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.

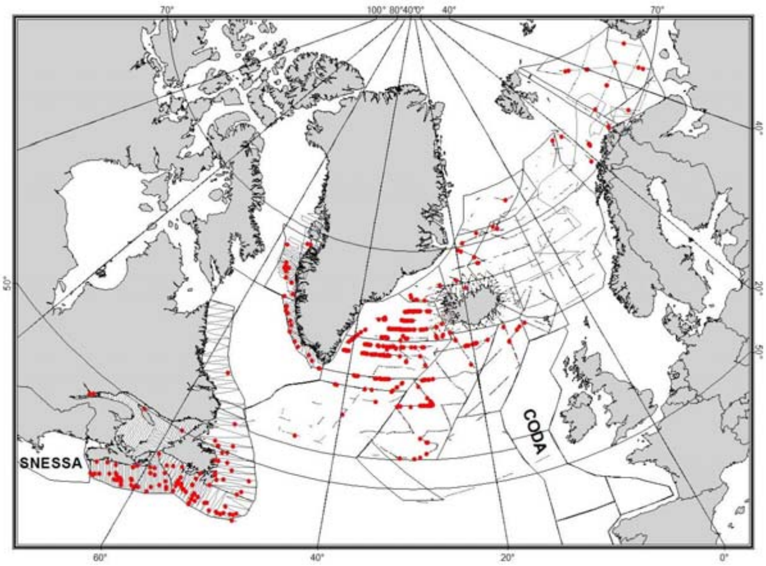

Figure 1. T-NASS total effort and fin whale sightings

2. ADOPTION OF AGENDA

The agenda (Appendix 2) 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 3.

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 & 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 JB 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 2 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 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:

1. 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.

2. 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.
3. Observers should be required to provide references and these references should be consulted before contracting.
4. Observers should have a medical examination, including a vision test, before departure. Observers should know their focus settings for binoculars.
5. 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 2 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.

5.10 T-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 & SNESSA

Ref. to specific sections under point 5.

5.12 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.

5.13 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 5.

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 N and NE 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 4.

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 Skymasters sightings data were recorded onto handheld audio recorders and transcribed to computer as soon as possible after each survey day.

The NL the 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 pinnipeds 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 (Figures 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 (Tables 2 and 3; Figure 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 requiredfor 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, incl. 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 r**ecommended** 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 4. 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 5.

7. SPECIAL MODIFICATIONS IMPLEMENTED FOR ENCOMPASSING HARBOUR PORPOISES

Such modifications were mainly implemented in the Icelandic aerial survey, see Appendix 6 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 MARECO 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 MarEco 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 6. 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/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 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 and Charlotte 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.

Table 1: T-NASS Planned and Realized Effort.

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

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				
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**

Working Group on T-NASS
Working Group on Abundance Estimate
Copenhagen, Denmark, 7-8 April 2008

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Working Group on T-NASS
Copenhagen, April 7, 2008

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, incl. 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 succes 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 H. 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/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

Working Group on T-NASS

Copenhagen, April 7, 2008

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, & 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 & Gosselin: Canada's Marine Megafauna Survey (poster for the SMM Conference 2007)
SC/15/TNASS/41	6	Lawson & 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 SurveyT-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 & Malinga. T-NASS extension: cruise report from Walter Herwig III (the No cruise)

SC/15/TNASS/49	8	Frie & 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 & 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, & Pike. T-NASS extension: an overview.
SC/15/AE/4	6,7	Pike & 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.

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.

RECOMMENDATIONS FOR IMPROVEMENT OF FUTURE LARGE SCALE SURVEYS

Cruise preparation, incl. 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 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 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

6. 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.
7. 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.
8. Observers should be required to provide references and these references should be consulted before contracting.
9. Observers should have a medical examination, including a vision test, before departure. Observers should know their focus settings for binoculars.
10. Observers should be chosen for their observer quality coupled with social skills and dedication for the project

11. A formal meeting 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

20. 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.

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.

iiii. 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

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