Trans North Atlantic Sightings Survey – T-NASS

CRUISE REPORT for VENUS & Co
(JUNE 25 – JULY 23)

Geneviéve Desportes☺ and Sverrir Daníel Halldórsson ☻
☺ GDnatur, Stejlestræde 9, Kerteminde Denmark, genevieve@gdnatur.dk
☻ Marine Research Institute, Reykjavík, Iceland, dalli@hafro.is

1 Background on the NASS and T-NASS surveys

TNASS estimates the abundance of cetacean populations in the Northern North Atlantic from survey data collected during summer 2007. It will add to the long-term series of international North Atlantic Sightings Surveys (NASS) that have previously been conducted in 1987, 1989, 1995 and 2001. After the completion of TNASS in 2007, the NASS-TNASS series will have occurred over a time period of 20 years, which provides a realistic opportunity for detecting changes in abundance over time for species with long life spans and slow reproductive rates.

The project costs c. 4,200 kEuros and runs for 31 months in 2006-2008, with an abundance survey conducted in the summer of 2007, centred upon July. A total of 12 vessels and six planes were involved, with about 80 observers, some participating in several part of the survey**.**

The waters south east of the T-NASS area were surveyed simultaneously as part of the Cetacean Offshore Distribution and Abundance in the European Atlantic (European CODA project, coordinated by the Sea Mammal Research Unit, University of St. Andrews), while the waters to the southwest were covered by the Southern New England to Scotian Shelf Abundance survey (American SNESSA project, conducted by the National Marine Fisheries Service (NMFS), Woods Hole). CODA, SNESSA and T-NASS are coordinated in nature in term of timing (simultaneous or as close as possible), coverage (spatial contiguity) and methodology, with the coordinators of CODA and SNESSA participating in the T-NASS Planning Committee.

TNASS **provides a full trans-Atlantic coverage for the first time**, using both shipboard and areal survey and covering areas to the west of Greenland and the north-eastern coast of Canada that have not been covered in earlier surveys and extending in range between approximately 80 °N and 40 °N (Fig.1). The area covered by T-NASS and the associated CODA (European) and SNESSA (American) surveys (see above) exceed 2,000,000 nm^2. The core (dedicated) survey covered an area over 1,576,000 nm2, one of the largest whale surveys today. The extension of the TNASS to areas west of Greenland provides the first estimates of abundance for whale species in parts of that area, thus helping to resolve long-standing questions about the distribution of cetaceans in that area, and their connections with concentrations in adjacent areas. For increasing the area covered, especially with regards of mapping summer distribution, TNASS also took advantage of other surveys and platforms of opportunity occurring in the same period in adjacent areas (*e.g.* the ICES Redfish survey in the Irminger sea, the MAR-ECO survey on the Atlantic Ridge and the annual Norwegian-Russian pelagic survey in the Norwegian sea, (Appendix B) and placed dedicated whale observers on these vessels. This sub-project called T-NASS Extension added about 400,000 nm^2 to the total area covered.

2 T-NASS methodology and target species

2.1 Methodology

The survey was conducted in "BT" mode (Buckland & Turnock mode), **using two independent observer platforms.** The methodology was developed for the 1994 SCANS survey, and later on used in different surveys, e.g. NASS 1995 (Faroese vessel only), NASS 2001 and SCANS II 2005. This involves adopting passing mode and using two independent observation platforms, a Primary and a Tracking platform with the Primary Platform visually isolated from Tracker Platform but reporting all sightings to Tracker Platform. This configuration allows the estimation of abundance without the need to assume that either platform sees all cetaceans on the track-line. This method is particularly appropriate for the smaller cetacean species (like minke whales and dolphins) as some animals of these species may be missed even on the track-line. The method also accommodates responsive movements.

In this Double Platform configuration (DP mode), the tracking platform searches ahead of the primary platform, thus trying to detect the whales before they have reacted to the vessel. Duplicate sightings data enable accurate estimation of the proportion of schools detected on the transect and of the extent and direction of responsive movement and allow estimation of a g(0) value which is robust to any responsive movement which occurre within the observation range of the tracking platform. The data from the Primary Platform are used to estimate sighting rate and effective strip width.

BT mode survey can be thought of as a survey by the Primary, with the Tracker simply providing additional data that allows the Primary detection function to be estimated without assuming that all animals on the trackline are seen.

In case of too strong seas or persistent fog, preventing the trackers to estimate distances, the survey was conducted as a Single Platform survey (SP mode), with the tracker remaining in place, making observation but not tracking the animals. The Duplicat Idendifier (DI) continued assessing duplicates and the primary platform remained one-way isolated from the tracker platform.

Hydrophones, towed during the survey at the end of a 200m cable, detected the presence of animals by recording their clicks and/or whistles. These acoustic data were like having another PP. The acoustic survey was especially dedicated to sperm whales and beaked whales.

2.2 Target species

The core objective of the T-NASS survey was to determine the abundance of fin, minke, humpback and pilot whales as well as harbour porpoises. Data were, however, collected for all species encountered.

3 VENUS & Co cruise, blocks IF-N-N, IF-N-S & IF-N-W

This report deals with the survey conducted by the 'Icelandic' vessel Venus, between July 3 and July 23, 2007, as well as its rather special introduction period and encounter with the vessel originally rented, Glen Rose II.

Venus was responsible for a survey area North of Iceland (Fig. 2) delimited by the eastern coast of Greenland and bounded by c. 24° W and 4° E longitude, and 70° N and 74° N latitude (Block IF-N-N and IF-N-S), as well as a survey area between the Icelandic Westfjords and the coast of Greenlandic (Block IF-N-W).

3.1 Personnel

Captain:	Ingolf Rasmussen (FO)
Cruise leaders:	Sverrir Daníel Halldórsson (I) seconded by Geneviève Desportes (F-DK)
Whale Observers:	Hilmar Arinbjörnsson (I), Birgir Stefánsson (I), Anton Galan (I), Sigurður Einar Sigurðsson (I), Christophe Pampoulie (I), Igor Golyak (Ru) (Figure 3)
Acoustic observer:	Igor Golyak (Ru)
Crew:	Mikkjal Samuelsen (1st mate), Jens Elias Haraldsen (Ch. ingenior), Gert Ørvarodd (Cook), John Kristin Poulsen (deckman) - all from the Faroes.

3.2 Visual survey

3.2.1 Procedures

The Primary Platform (PP) contained two Primary Observers (PO) searching in a standard way for line transect surveys, and allowed to use binoculars for species identification. PP was audibly and visually isolated from the Tracking Platform (TP), but could communicate with the TP by radio. Effort should be concentrated within 500m from the vessel, but all sightings should however be recorded.
Each observer was equipped with a distance stick and a mounted angle-board. Distances to sightings should be estimated aided with the stick if horizon was visible and angles from the track-line to the cues should be read on the mounted angle-boards.
The survey should be conducted in passing mode, although some closing (no specific rules given) was allowed for species identification and school size estimation.

The Tracking Platform (TP) contained the Data Recorder (DR), the Duplicate Identifier (DI) and the two Tracking Observer (TO) searching with binoculars, one 7x50 on a monopod and one pair of 25x150 (2.7°) big eyes mounted on a solid adjustable monopod.
The trackers concentrated their effort beyond 500m ahead of the vessel or as far as possible, ideally detecting animals before they had reacted to the vessel's presence, attempting to track them via multiple sightings as they were approached by the vessel and until they had passed abeam. The binoculars and the big eyes had reticules and an angle board.
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. Unfortunately the HD video system never worked properly but the web cam systems worked at all times.

The platforms were equipped with an audio system ideally allowing the observers' comments to be recorded directly into the computer at each sighting and resighting, and the PP voice to be heard on the TP speakers. However, the system worked only sometimes and in a very un-predictive way. The DI was therefore obliged to record on paper the data from the trackers and often also to get information from the PP.

3.2.2 Assignment of observers to platforms and working schedule.

The eight observers were assigned positions as PO or TO, based on previous experience (Table 1). Two pairs of primary observers were constituted. Trackers were not assigned to pairs, but followed a four-day schedule which allowed all combinations of tracker pairs and the observers to alternatively start in the day. The observers worked three hours on and one hour off, following a four-day rotation schedule. Observers rotated between platform positions every half hour, but remained assigned to the same platform during the whole cruise. All PO and TO worked as DI, but only the TO and two of the PO worked as DR (SES & AG).

Table 1. T-NASS Venus: Observers assignments.

Period	Primary observers	Tracker observers
July 03 - July 23	Hilmar Arinbjörnsson / Sigurður Einar Sigurðsson (SES) Birgir Stefánsson / Anton Galan (AG)	Sverrir Daníel Halldórsson (SDH), Geneviève Desportes (GD), Christophe Pampoulie, Igor Golyak

Working days started at 6.30 with setting up, and effort observation at 7.00. Lunch breaks of one hour were at 12 and 18. Effort usually stopped at dinner, although in days of broken effort, effort was continued for 1-2 hrs after dinner.

Observation was not conducted if the visibility was less than 1 km, or if the wind exceeded 5 on the Beaufort scale. If visibility was reduced to only a few km, searching effort was carried out in single or combined platform mode.

3.2.3 Training of observers

A presentation/training session was held on June 27 in the Faroes, together with the observers for the Faroese vessel, Thor Chaser, and the other Icelandic vessel, Jakup B, which also departed from Tórshavn. At the presentation the whole T-NASS project, methodology and procedures were explained and some computer data entry training was done.

A formal meeting was held onboard after a few days of operation to re-explain procedures and survey rules, data collection methods, evaluate progress and inform on future plans. Small 'meetings' were hold as judged necessary. No post cruise meeting was held.
Early in to the survey a row of buoys were put out and towed after the vessel for observers to train in estimating distance from the ship. The buoys were fastened to a 300 m line with 50 meters interval.

3.2.4 Equipment

The Faroese ship Venus was available from July 2 to July 23. The 42 metre long long-liner was equipped with a 4-man Tracker Platform (TP) and a 2-man Primary Platform (PP). The TP and PP platforms were at 10.30m and 7.8 m above the sea surface respectively at departure from Tórshavn (see Figure 4 for a view of the 2 platforms). The height change according to fuel and water loads, as indicated in Table 2.

Table 2. T-NASS Venus: heights (m) from sea level to deck, according to fuel and water load. Height between main deck and PP is 2.78m and between PP to TP 2.5m.

Date	To main deck	To PP	To TP	Event
July 02	5.02	7.80	10.30	Tórshavn, full fuel and full water
July 23	5.25	8.03	10.53	Reykjavík - fuel, - water

The PP, the lowest of the two whale observation platforms, was situated on the top of the bridge and was a wooden shelter, equipped with two metallic chairs. It was placed directly against the ships railings slightly on port side to avoid the view being obstructed by the central infrastructures. It housed the POs searching with naked eyes.

The tracking platform (TP) was situated highest. A supporting metallic frame was bolted and attached with cables to the top of the bridge. The actual platform, a welded rectangular metallic box, was placed within the supporting frame, but separated by rubber bushing (Figure 4) to reduce as much as possible the effect of vessel vibrations at cruising speed, which makes searching through mounted binoculars difficult. A ladder protected by stair rails lead into the platform itself through a door.

The cruising speed was between 9 and 10 knots. The vessel was equipped with satellite connection and email contact could be kept through the cruise with the other vessels involved and the back-up staff on land.

3.2.5 Distance and angle experiment and training

Only the lower radar could be used, the upper one being blocked by the Tracker Platform. But since it was located just under the TP and behind the Primary Platform, the observers could not be on duty when the radar was on. The equipment for conducting the distance experiment using the video equipment was not provided.

The experiment was conducted by having 2 buoys set in the water. Their position was initially recorded by the bridge when set in the water, then taken again regularly by the bridge, the ship approaching them closely. The distance and angel to the initial position was recorded on the plotter in the bridge each time observers were ordered to note angel and distance, but as they drifted and were even removed from the water by fisherman, this was not considered precise procedure although the experiment was conducted in calm weather.

3.3 Acoustic survey

3.3.1 Methodology

The Rainbow click software was originally written to detect and analyze sperm whale clicks. The digesting card could read out two channels, each sampling 500 kHz. The porpoise detector was optimized for that species only. In order to detect vocalization from other odontocete species (common and bottlenose dolphins, beaked whales) there were made continuous recordings at the sample rate of 192 kHz on two channels. The hydrophone was not sensitive below 2 kHz and was therefore unsuitable for the detection of any baleen whale species. To achieve a higher sampling rate, RME Fireface 800 sound card was purchased. Hard disk recordings were made using the signals both from the sound card and from high frequency data acoustician board.

3.3.2 Equipment

The equipment consisted of a desktop computer, running automatic detection software, a hydrophone towed astern of the vessel, and various interface cards for recording the sounds into the computer.

The TNASS hydrophone array contained three elements and a depth sensor. Having three elements, allows calculating the distance to the target animal. The standard cable length for the TNASS hydrophones was 200m. There were three moulds at the end of the cable. The first contained two elements spaced 25cm apart.

The buffer box split the signal from the hydrophone so that it went both to the high speed National Instruments card for porpoise detection and to a sound card for detection at lower frequency signals.

The GPS unit was connected to the acoustic computer with a 10 m amplified USB extension lead, plugged in USB port.

3.3.2 Setting up

A very important thing was to find where to place acoustician equipment on board the ship. There were two possible solutions: installing the equipment at the stern and cover from wind and moisture, as it was done on “Jakup B”, or installing it on bridge and extend the cables. The second variant was chosen. The chart table was used for the placement of the computer system, buffer box, soundcards and hard disk for backing up (Fig. 5). The chart table was covered with a special rubber and every block was attached to the table or/and with each other to prevent any movement during pitching and rolling of the ship. The cable of the hydrophone and GPS cable were plugged in and extended outside the bridge. The GPS was placed on the open place above the bridge and attached to the side rail with tape. The hydrophone cable was stretched alongside, attached to the rails and coiled up on the deck at the stern, when not in use. The wooden drum, attached to the fender, was used for protection and more convenient setting out and pulling in of the cable. At least two additional attachments were recommended, using thin cord (about 5 or 6 mm) and rolling hitches, in case the main attachment failed. Three cords and many plastic fastening straps attached to the rails along the port side were actually used for more reliability.

4 Cruise narrative and dairy

4.1 Narrative

Sverrir Daníel Halldórrsson and Genevieve Desportes arrived in Tórshavn late at night on Monday June 25th and discover the planned ship Glen Rose II (owner Bjarti Mohr) in a state of total un-preparation and extreme filthiness over all, incl. bridge, kitchen and reserve room, cabins and bathrooms. Only crew members onboard were the 1st engineer and cook and although the ship was supposed to sail on Thursday 28th at 00.01, the captain and first maid, both from Poland were only supposed to arrive on Wednesday 27th with the late plane and to arrive about 23:00hr onboard, as they did,. Provisions were not bought. The cook was in no state to prepare what was needed and was finally fired. When second cook arrived from Poland and seeing the state of the vessel and kitchen he resigned instantly. According to the 1st engineer the ship had only ability to sail for 17 days without bunkering.

The tracker platform was not in place onboard and had to be fetch from a nearby village, which was done in the afternoon of the 26th. Setting up was started the next day and nearly completed on 29th, together with the construction of the PP, but then stopped in the uncertainty the vessel was to be able to sail.

To summarize a long and painful story, after being docked the Glen Rose II was recognized unable to sail and the contract was broken in the morning of Saturday June 30th by the owner Bjarti Mohr.
Another vessel, Venus (owner PF Thor), was rented and become available in the evening of June 30th.
De-installation of the platforms from Glen Rose and setting up on Venus started the same evening and was completed on June 2.
In the evening of June 2, one of the whale observers slipped while working on the platform setup and damaged his ribs and was transported to the hospital. He was however able to continue but this delayed the departure of the vessel until the next day.

After security and rescue instructions led by 1st maid Mikkjal, Venus left harbour at 15:00 Tuesday July 3rd. The vessel then started sailing full north to the planned track-lines in Block IF-N-S and to start at way point 1. Figure 6 gives the numbering of way points and transects. It had although been agreed that first Venus would sail full North and actually joined the Faroese track-line in block IF-E and then sailed on effort to WP1 on that track if weather permitting using it as training and if possible as fully covered track. This was done but high winds and fogs prevented any effort to be conducted and no training could be performed.

Venus reached her first track on June 4th in late afternoon and started sailing North West in fog and with no effort. Effort could be started on July 5th at 10.39am.

Since there had been a change in vessel, no permissions were still available for Venus for sailing in Greenlandic or Norwegian waters. These only became available on June 9th and June 10th respectively. Therefore Venus had to stop her progression on transect 1 on July 5th when reaching Greenlandic waters and sail south to join transect 10 and progress from there eastwards toward the Norwegian waters around Jan Mayen in hope of receiving the permission in time. The permission came just in time before Venus reached the Norwegian border. Broken effort, due to bad weather (fog and high seas), continued eastwards on transect 10 and further on NW on transect 9.

Because of the delay due to the Glen Rose II affair and the weather (already implying effort holes along the transects covered), it was decided to completely give up with the northernmost block IF-N-N and try to cover as good as possible the IF-N-S and IF-N-W blocks.

Therefore, when arriving north to the block border between IF-N-S and IF-N-N, on transect 9 south west of Jan Mayen, Venus sailed eastwards again in transit during the night to join the transect 2 South of Jan Mayen, as far east as possible. Progression started westward again on transect 2 and continued until reaching the ice edge. From there transit was made south to join transect 1 again, which was sailed south eastward until the previous stop point on July 5th (at the border of Icelandic and Greenlandic waters). From there transit south to transect 10 was made again during night. Then the western end of transect 10 was covered to the ice edge. The ice edge was followed on transit south west to track 11 and effort continued from there SE to the end of transect 11 close to Iceland. From there transit was made during the night to transect 12 in block IF-N-W. But as transect 12 was completely covered with ice the course was set SW following the ice edge to transect 13 as far north as possible.

The ice edge in the western block IF-N-W was much further south east than expected and the available track in that block became very much reduced. Also heavy fog close to the ice edge impaired maintaining the effort in many places. All in all, what could be covered on transect 13 (transect 12 was completely covered with ice), 14, 15 and 16 was sailed in a broken effort and Venus finally joined Way point 22 in the evening of July 22nd and started transiting to Hafnafjördur. Distance and angle experiments were made on Monday 23rd in good calm weather in Faxafló-bay before she arrived to harbour at about noon, when the research cruise concluded and the observers and the equipment were disembarked. The vessel and the crew sailed back to Tórshavn the same evening at 22:00.

4.2 Dairy

Table 3 resumes the daily effort accomplished, as well as the part of the track covered, WP reached, main activities during the day and eventual problems encountered.

Table 3. T-NASS Venus: Summary of effort and activities
See attached file

5 Modification to planned procedures

Four important adaptations / modifications to the procedure were performed.

5.1 A combined platform mode, called PP.

Besides using the Double Platform mode (DP mode) and the Single Platform mode (SP mode) as described under point 2.1, another mode was used during few days (July 7th-9th), because of a combination of very high humidity and computer problems. It was decided that it was safer to keep the computer and data recorder inside the bridge, which meant that the trackers did not have access to sightings buttons. The two platforms worked as a single platform with primaries and trackers remaining in place, the trackers shouting their sightings to the primary, who pushed the sightings buttons both for their sightings and the trackers ones.

5.2 Target species for tracking

Because of the relative low numbers of sightings in any species, it was decided on July 17 to only track fin, humpback and minke whales to increase the chance of getting enough sightings for conducting BT analysis for these 3 species.

5.3 Closing

Closing for species identification or school size estimate was not done, except in 2-3 exceptions. Because of the delay, priority being given to covering the transect on effort.

5.4 Ancillary data

No ancillary data were collected.

6 Results

6.1 Survey area and effort

The track was originally of c. 3,021 nm, with respectively 1,171 nm, 1,483 nm and 367 nm in the IF-N-N, the IF-N-S and the IF-N-W blocks. 26 days were planned for the cruise, with 3.5 days of transit at the minimum, leaving 22.5 days of possible effort with 134 nm of effort per day.
The loss of 5.5 days in Tórshavn in the beginning, left only 17 days for effort, resulting in 178 nm on effort every day for covering the whole track throughout the three allocated blocks.

Abandoning the IF-N-N block after the delay in Tórshavn and the bad weather encountered in the beginning shortened the track to 1850 nm and meant 109 nm to be covered per day over the 17 days available. This did not leave much room for accommodating bad weather on the way. One effort day was however gained by disembarking in Reykjavík instead of Tórshavn.

The length of the track in the IF-N-W block was actually much reduced because of the ice present much more east and south than expected. However even that did not help in gaining more time as sailing in ice and fog is very time consuming.
A total of about 891 nm were covered on effort, with 758 nm and 134 nm covered in block IF-N-S and IF-N-W respectively (Table 3). This corresponds to 51% and 36% of the original track-line covered in block IF-N-S and IF-N-W respectively, but in total only 30% of the original 3-block track covered (Figure 6).

6.2 Whale sightings

A total of 173 groups of cetaceans were encountered (Table 4). There were 29 duplicates between POs and TOs. Eight different species were identified during the cruise. The most frequently encountered species was humpback whales (66 sightings), followed by white beaked dolphin (25 sightings), fin whale (20 sightings) and minke whale (19 sightings). Only four sightings of sperm whales, three of killer whales and two of bottlenose whales were made during effort, although the two last species were seen a few times off effort. A few seals were encountered, but they were not systematically registered, when emphasis was given to cetaceans.

The overall geographical distribution of the sightings is shown on Figure 8. Sightings appeared in pulses and were typically clumped along the track.

The golden number of 20 duplicates was not achieved for any species (Table 4). There were 14 definite and probable duplicates of humpback whales.

Table 4. T-NASS Venus: Number of sightings made on effort per species (including like species) and per platform. Definite and possible duplicates between primary and tracker platforms are counted as duplicates. Definite and possible matches between trackers are excluded.

SPECIES		Trackers	Primaries	Duplicates (Definite & possible)	Total original sightings
Blue whale	BL	3	6	1	**8**
Fin Whale	FW	6	16	2	**20**
Humpback whale	HW	45	38	17	**66**
Minke whale	MW	13	7	1	**19**
Sperm whale	SP	2	3	1	**4**
Bottlenose whale	BW	1	1	0	**2**
Whitebeaked dolphin	WB	15	16	6	**25**
Killer whale	KW	1	2	0	**3**
Big cetacean	B?	10	7	1	**16**
Paterned dolphin	P?	1	0	0	**1**
Unidentified dolphin	U?	8	1	0	**9**
Total		**105**	**97**	**29**	**173**

6.3 Acoustic data

6.3.1 Working day

Acoustic researches started every morning except days when the vessel was drifting because of bad weather. The schedule was the following. The acoustic observer was opening the programs in the acoustic computer, then the scientists were deploying and sinking the hydrophone array cable, and detections could start. During the day the system was checked every hour. and comments about depth, speed and anything unusual were made in IFAW Logger program installed on the acoustic computer. Typical hydrophone towing depth during the survey, at a speed of 10 knots, was 5-7m. If the vessel slowed down for any reason, the depth was increasing. At the end of each day, the software were switched off, then the cable was pulled in by the crew (Fig.9), and all the data obtained during the day were backed up to the external terabyte hard disk for future analyses.

Actually, several problems were encountered when setting up the system, but fortunately the majority of them were solved before the cruise started. For instance, the Fireface 400/800 port in the computer did not work, so it was necessary to purchase another device. The magnet on the GPS system was defective, so it was affixed to the side with special tape. Several times the Whistle detector was malfunctioning. For some mysterious reasons, recordings stopped from time to time, in which case recordings had to be started again manually.

6.3.2 Data collected

The size of the folders (GigaBites) containing the sound recordings from Venus are given in Table 5.

Table 5. T-NASS Venus: Size of acoustic folders (GB)

High frequency	Middle frequency	Clicks	Whistles
6.69	510	36	0.027

7 Survey evaluation

7.1 Survey preparation

7.1.1 General preparation and vessels

The choice of Glen Rose in the first place was quite unfortunate. A proper inspection of the vessel and its background would have revealed that her chance of being able to sail, and in time, was slim.

For logistic and financial reasons, the setting up and training time had been reduced to:

- one day for the Cruise Leaders to set up the equipment in Tórshavn on already fastened/built platforms and train themselves to the new method.
- one day for training the observers to the BT method on equipped vessel.

It had been underlined that the implementation of the planned BT procedures necessitated training and that since the training time had to be reduced to only two days, the platforms had to be ready before that. This schedule was not respected from the start for many reasons. This, coupled to the problem encountered with two of the 'Faroese' vessels, ended up in the three 'Faroese' vessels leaving for implementing new procedures, involving 'demanding' equipment, without having received the proper training and having a chance to discover/discuss/solve the technical challenges brought by the (dis-)functioning equipment (see under point 7.5).

Clearly the implications of implementing totally new procedures, involving technical equipment, were not recognised enough through the preparatory phase. As is often the case, the reality diverted much from the original plans, which included the common training of the cruise leaders during a pilot survey. This would have at least insured a common understanding of the methodology and the procedures.

7.1.2 Planned coverage

The length of the track-line had already been planned too optimistically from the start, based on 30 effort days, while the whole cruise (incl. transit to and from the survey area) was in fact allocated 26 days.

The possible number of miles per day, based on the experience of the other Icelandic survey, was calculated as an average over the whole Icelandic area. It should probably be calculated over smaller area for the next survey, when the weather encountered south of Iceland is usually better than North, with for example effort time lost to fog close to the ice edge.

The loss of five days at the beginning did not improve the picture.

7.2 Observer work.

All observers had previous experience with whale observation, and 7 had experience with dedicated sighting surveys. Only two observers (GD and SDH), had experience with the BT method and of which one had experience with tracking using big eyes. All observers could be qualified as good or very good whale observers.

Because of the technical problems encountered before departure no training day in real conditions, i.e., with fully and equipped platform could be organised before departure. Further because of the weather conditions prevailing at the beginning of the cruise, coupled with the crucial lack of sightings and the technical problems encountered, the observers never got into the routine of the designed data recording for BT mode. There was therefore a lack of training of the observers in BT method procedures which could be felt all along the survey and is estimated to be a problem for the quality of the data collected.

It is also clear that some primary observers, used to simpler single platform data collection procedures, did not exhibit the most obvious enthusiasm for getting acquainted to a new, more difficult and demanding methodology. There was a general lack of disciplined within the primary observers in following the rules given, both in term of procedures and in some cases good behaviour practice during effort.

Some of the observers had not been sent the description of the methodology before the survey, and those who had did not seem to have read it or understood it properly as it was in english. Some of the observers had been told they only had to read ‘their part’, while it is clear that the BT methods involved the comprehension of the whole procedure for everyone.

It have to be kept in mind that working language during the survey was English and that English was not the native language for any of the observers on board Venus so for those not fluently speaking English it was a big challenge, when the BT method requires quick and efficient communication between platforms. The langage difficulty would have required even more practising and training.

Some of the observers difficulty/reluctance in adapting to the methodology can probably be explained by a lack of deeper knowledge of how BT method works due to complete lack of training before leaving. An informative/instructive handbook for observers describing the method in simpler way and translated into Icelandic would have helped, especially when training was not given priority.

Although the primary observers were only supposed to use binoculars for whale identification, they did ‘some’ searching using binoculars and, as former whalers, had problems concentrating their search close to the vessel. This is clearly reflected in the amount of sighting made further away than 500m, with only 34% of the sighting sighted within 500 m from the vessel and a dramatic peak of 23% in the distance 900-1000m and 38% above 900m. Several sightings were missed in the 500m zone by the primaries while they were picked up by the trackers.

It was also difficult to get the primary observers to make precise estimation of angle and distances, using the angle boards and distance sticks, as can be seen in the rounding of angles and distances.

However, it has to be acknowledged that the technical problems encountered, especially with the communication and online recorded system made the procedures much more difficult and heavy, and shade away the advantage of the methods for the observers themselves.

One pair of primary observers had difficulty in working together, competing for sightings and refusing to cooperate when sightings were made. This resulted several time in sightings being duplicated between the two primary observers sitting 50cm from each other. This pair of observers had some difficulties in respecting the effort schedule and informing on their position changing. This resulted few times in the observation platform being either manned only by one observer or by none for up to several minutes.

The trackers were much more willing in following the BT procedures and performed better with regards to the methodology and good behavioural practice.

It is clear that the choice of the observers must not only be based on the ability in spotting whales. The ability in working in a team (which was a real problem on Venus) and in following instructions given and accepting to be corrected (which both were also a problem on Venus) are equally important. Observers have to be able and willing to adapt to changes in procedures, there has come more to whale counting than paper and pencil. Likely dedication and enthusiasm for the project should figure in the list of essential criteria of selection. In short, methodology and observers have to fit together!

7.3 Crew work and vessel suitability

The captain and crew were dedicated to the research and helpful, particularly the chef engineer. None of the crew members had previous experience with whale survey work.

Although smaller than planned, Venus was a suitable platform for the work to be carried out and accommodation was good if not spacious. The fact that the vessel did not vibrate much or at all at cruising speed, depending on adjustment between propeller and engine speed, and/or the special mounting of the TP meant that very good working conditions were offered to the trackers, who could track comfortably in sea state 4.

The vessel was equipped with a satellite connection, so email and phone were available during the whole survey. An email access was created for the observers and very much used for communications with other participating vessels and people involved, as well as private matters.

7.4 Observation platform and equipment suitability

Both platforms offered satisfactory conditions for observation (Fig. 4). The front mast did however obstructed the view of both platforms and was situated just in front of the STBD primary that was located allmost midship. This was considered a bit of a problem especially for the Big Eyes.

The special anti-vibration fixation design (coupled probably with the ship moving characteristic) proved to be very successful in minimising the effect of the vessel vibrations. It was considered not uncomfortable to use the (very) big eyes at sea state Beaufort 4, sometimes even 5, and the trackers were actually fighting for using them, finding them very comfortable and with a splendid optic.

A monopod coupled with a strap for supporting the observer was again considered as a comfortable and safe solution for a tracker. It is very easy to implement - two holes in the side of the platform for the rope maintaining the strap - and very easy to adjust to each observer. It was considered a much better solution than a seat, which would not fit everyone - and much easier to 'design'!

The mounting of the binoculars on the monopod itself was however too week and after a few days became loose so the pointer for the angle board did not follow the movement of the binoculars and the angle had to be 'guessed' without using a pointer. This did again increased the work of the DI. Happily the web cam did work almost at all times, so precise angle could be obtained from the angle plate picture while validating.

The availability of the tarpaulins made the covering of the equipment very easy in case of rain and temporary off effort periods. However the humidity being quite high it was considered safer to take up and down to the bridge everyday all the binocular equipment and computer leads, which made the setting up quite a major exercise.

All the connections had been systematically protected from the humidity with plastic protection. It seems essential for future survey in similar weather conditions to plan having water proof computer and keyboard and stronger connections, as well as utilizing wire-less connection when possible.

Wind was of some problem as shelter walls on TP did not have wind breakers at top, causing the wind to go directly in the platform instead of being thrown over it. Even though the PP had wind brakers on top, the PO sat higher in the shelter to be able to see as close to the ship as possible. This resulted in them sitting to high for the wind do be thrown over them like what is possible when searching further away.

7.5 Visual data collection procedure

Although, they were in theory judged satisfactorily, many of the procedures 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 in no way perform as they should.

The sound system using the EDIROL sound card was found extremely unstable. It worked or not worked with any obvious reason, and mostly did not work. Closing the computer meant that the EDIROL may not work again when started a few minutes later. This meant that there were never proper recordings made of the sightings information, implying that all information had to be written down on paper immediately. This made the burden of the DI very heavy and distracted him from his duty as duplicate identifier. The voice of the Primary observers was often not audible on the tracker platform, and communication had to be done using radio or shouting, when too windy for or use of radio.

Also, because the transmission of information between the two platforms did not perform well or at all, the assignment of duplicates, as well as the online recording by the DR, became very difficult.

Clearly the BT method can only be implemented if the sound system works properly: the trackers' voiced-data being recorded automatically and not having to be taken on paper, and the communication between primary and tracker platforms good and effective, allowing the DI to be informed on the spot of any sighting events. This was obviously not the case.

The video ranging equipment never performed successfully, with enormous and somewhat anachronistic piece of film being recorded, with as a result very few useful video recordings made. The Fire-Stores did not seem to record properly, although they were used without batteries, reformatted in the evening and also reset as instructed. In a single day, both very long files (more than 1GB!) could be recorded, together with size of a more normal size. Many files did not correspond to a sighting event, but recorded during scanning period.

The web cam based system for recording angles for the trackers worked very satisfactorily most of the time, with very few angle missing at the end. More consideration, should however be given to the problem of sunlight, sometimes leading to over exposition of the picture so the surrounding of the angle plat should be of non reflective or dark painted material. It should also be noted that white is cameras worst enemy so using white board with thin black stripes as used for the web cameras is a guarantee for exposure problem.

The focus search area for the PO of within 500m from the vessel was much discussed, with the majority of the sightings made beyond that distance. Even in relatively high concentration of humpback whales, very few initial sightings were made within 500m. This criterion should be discussed again when applying the BT methodology to large whales. Avoidance to the vessel should also be investigated.

DI worked as observer when no sightings were being tracked so the fact that the DI was equipped with an angle board made it certainly easier for him to 'pass' sightings to the TOs.

Some definitions should still be more precise, probably leading to observations which are not comparable among vessels. This is particularly the case for the length of the swell, but also the sightability. There are still problem for assessing weather conditions. Some observers tended to not take in account the heading of the ship in relation to the wind. f. ex. judging much less wind and seastate when heading with wind but much more realistic when heading against.

7.6 Distance and angle experiment and training

The distance and angle experiment remains a heavy duty exercise, of which the precision is somewhat questioned.

It is clear that the behaviour of the observers is totally different between the normal recording duty and the experiment. The primary observers, who were very reluctant in using the distance sticks, did it very carefully during the experiment and took a long time in estimating distances. Also they used the angle board very carefully, which they did not appear to do during normal observation. Therefore the validity of this experiment is quite questionable, particularly in this case.

In most cases, as here, the primary platform is often very close to the radar and observers cannot be on duty when the radar is on. The equipment for conducting the distance experiment using the video equipment was not provided. The experiment was made by having buoys in the sea and sail around them and record their position several times the vessel passed as explained in section 3.2.6. Although the experiment was conducted in calm weather the lack of ability to use the radar, drifting of the buoys and one of the buoyas being removed from the water by fishermen while conducting the experiment added to the uncertainty of the validity of the experiment.

7.7 Visual data entry software

The Logger software proved fairly easy to use and no real problems were encountered in computer data entry.

A few things hovever caused small problems or illogical handling.

- The high density button was judged to difficult/long to reach in high density and should be of easier access, without needing to go to the effort form.
- The platform box was judged unnecessary since the button gives actually also the platform.
- The use of the 'change to resighting' function created some confusion, since it was not clear how the software was behaving and resightings were lost - i.e. not accessible for validation – until a thorough examination of the access database allowed to locate them.
- The use of the multispecies entry is not explained enough in the guidelines and created doubt upon what was actually entered and how it should be done.
- It was again felt that the sighting number of the tracker resighting should be filled automatically by the last sighting number as default procedure at least for the tracker sightings - with possibility of modification - since this is the absolute most usual case for the trackers.
- If the original tracker form was closed by mistake, while the track was going on then it was not possible to indicate the duplicate and match status. It was therefore felt that the tracker form should not be able to be closed as long as resightings remained opened.
- The last entered observers and their position should remain visible on the effort form.
- Order of input fields should be re-arranged according to the priority of the information entered
- Additional codes as Tail or Fluke should be added.
- Some species codes were considered non-logical and difficult to remember.

7.8 Validation of visual data

Validation was considered easy to perform but was made easier by the fact that there was no sound or video recording to get back to!

Some problems remain with the software:

- In log of the effort, there remains a problem in counting time when the effort is passing from double to single platform effort. The effort is only counted from the time it passes in single platform (event 13), the time spent in DP and possibly the corresponding miles covered, being ignored.
- The confidence in identification did not appear in the validation software, which is a problem since it replaces the code like 'species' normally used.
- Again, sometimes sightings or resightings existing in the database and actually filled in did not appear at the validation process.
- The possibility of working both on PP and TP sightings simultaneously while validating should exist (i.e., not having to close the one that is being worked on to be able to access the other one).
- It would be nice to have the possibility for asking for an overall table showing the effort statistics per day, without having to change dates every time and getting separate daily tables.

- On the show data programme, the way of selecting and deselecting 'Plot Options' to be shown on maps could be improved, with possibility of selecting or deselecting several things together, without being send back to the Plot Option menu after each selection.

7.9 Acoustic equipment

The acoustic researches were held under the competent monitoring of the acoustic observer and the help of the crew. Most of the equipment was working without particular problems. The software operated as it was supposed, automatically saving data to files.

There were, however, problems with the whistle detector. Recordings were stopping from time to time. In each case the recordings were recommenced manually. Comments about the time and duration of standstills were made in Logger. Even after consultation with Doug Gillespie, the reasons behind such interruptions were not recognized. Fortunately other detections were working duly.

8 Acknowledgements

Warm thanks to Ingolvur Rasmussen, captain of Venus, and his crew for their dedicated and pleasant co-operation in conducting the research. Special thanks to the cook for sending us home in an extended form! Special thanks to Jens for all the cup of coffee he earned and deserved, but did not get.

Thanks to Bjarni Mikkelsen, Eyðfinnur Stefansson and Høgni Arnbjarnarson for having providing help and patience before our arrival to the Faroes and during our extended and tormented setting up period. A special thank to Bjarni for having find us a replacement vessel in no time.

Thanks to Birgit Remmel to have given hospitality to the 8 lost observers of Glen Rose in her house of Tórshavn and prepared food for them.

Thanks to the SMRU staff, especially René, Doug, Russel and Kelly, for having prepared and send the equipment.

Thanks to Doug Gillespie and Russell Lepper for their patient advice during the cruise.

<u>Figure. 1.</u> Planned survey area for the T-NASS, showing the main survey area (grey), survey extensions (diagonal hatched) and associated surveys (cross hatched). C – Canada; G – Greenland; I – Iceland; F – Faroes; N – Norway (swamp area – an unknown portion of this area will be surveyed this year); i. – ICES Redfish survey extension; ii. – MAR-ECO survey extension; iii. – Norwegian/Russian Ecosystem Survey extension.

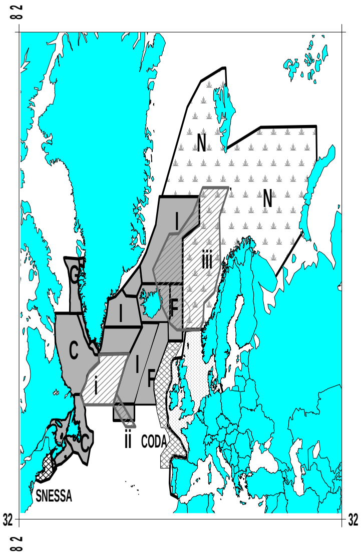


Figure 2. T-NASS Venus: Planned survey area and tracklines in blocks IF-N-N, IF-N-W and IF-N-S.

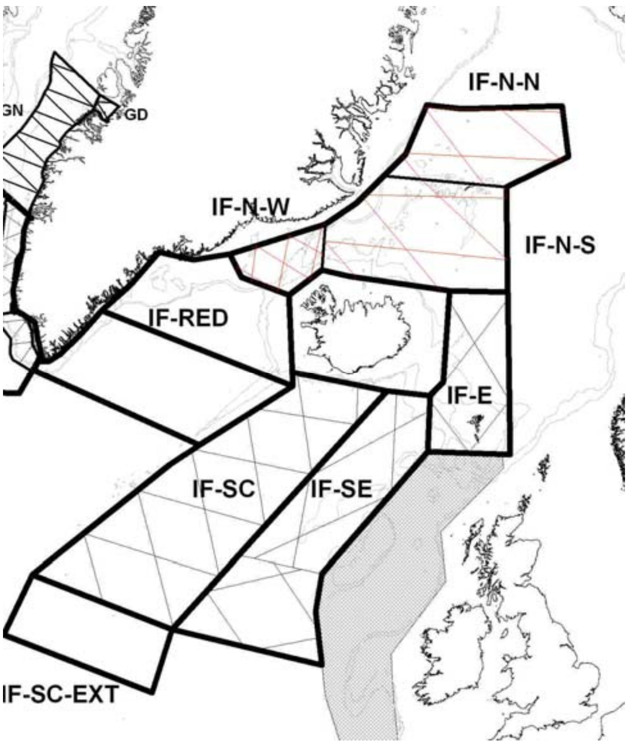


Figure 3. T-NASS VENUS: the whale observers in the ice

Figure 4. T-NASS Venus: View of the two platforms with the special anti-vibrating mounting of the tracker platform.

Figure 5. The acoustic equipment on the chart table.

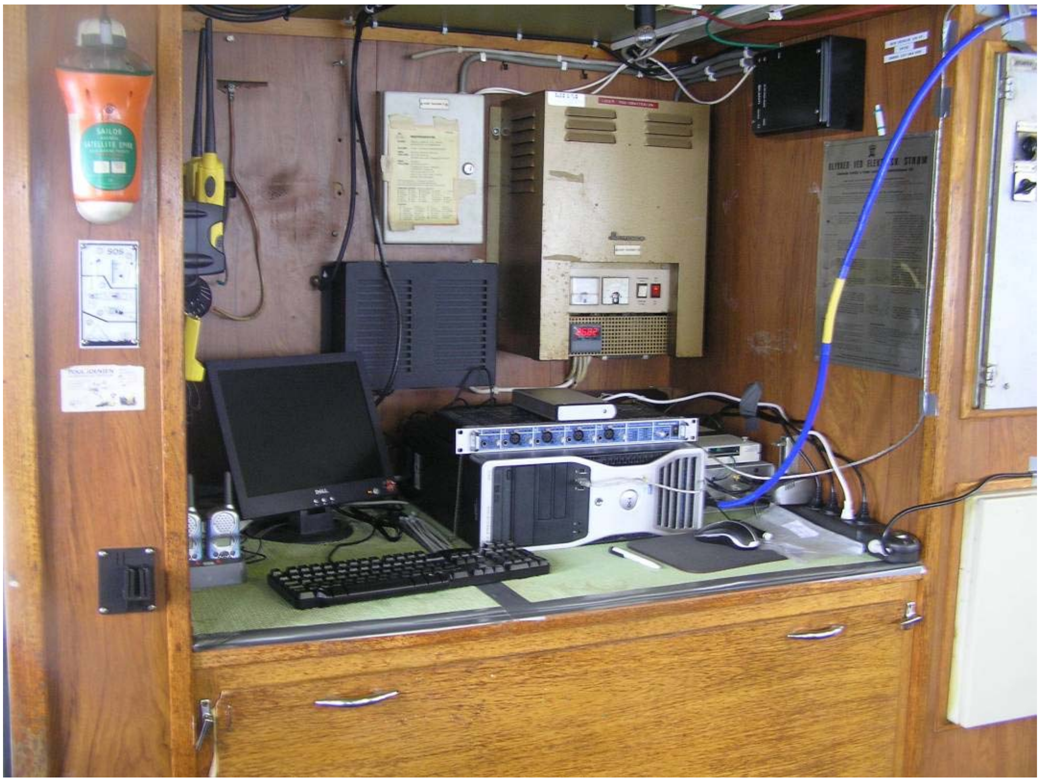


Figure 6. T-NASS Venus: way point and transect numbers in blue and black respectively.

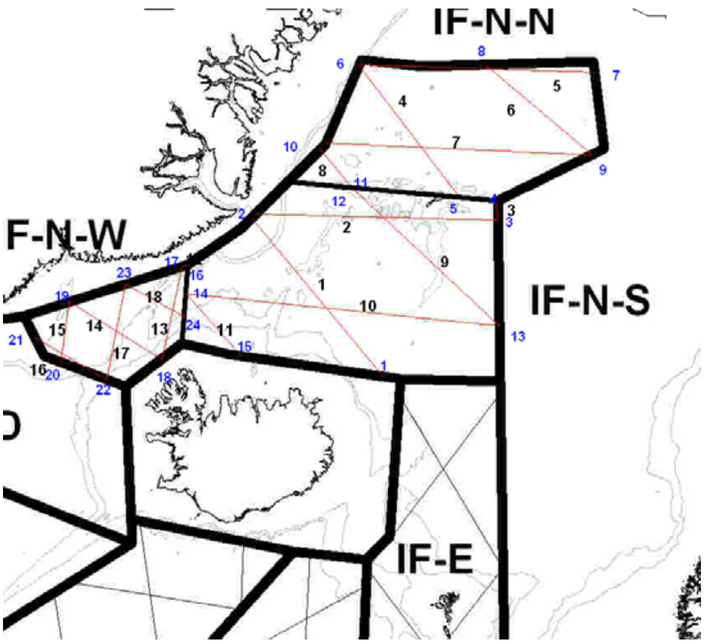


Figure 7. T-NASS Venus: Transect covered on effort during the cruise. Light grey, off effort; red, double platform effort; cyan: single platform effort; green, combined platform effort.

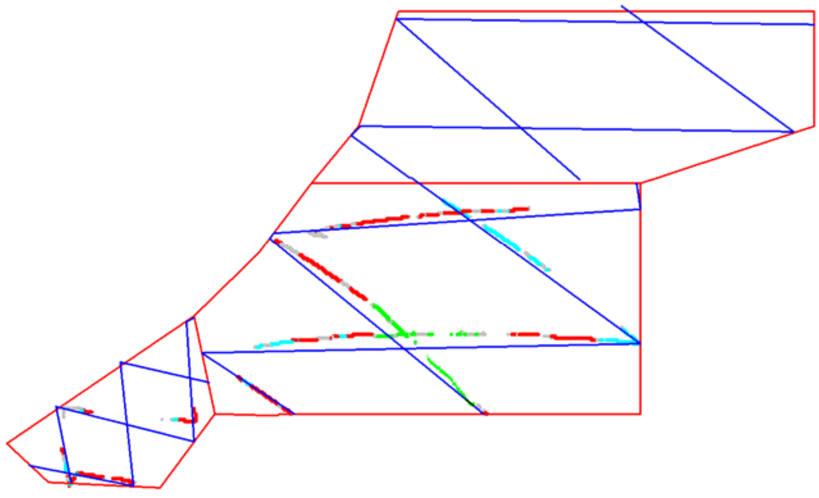
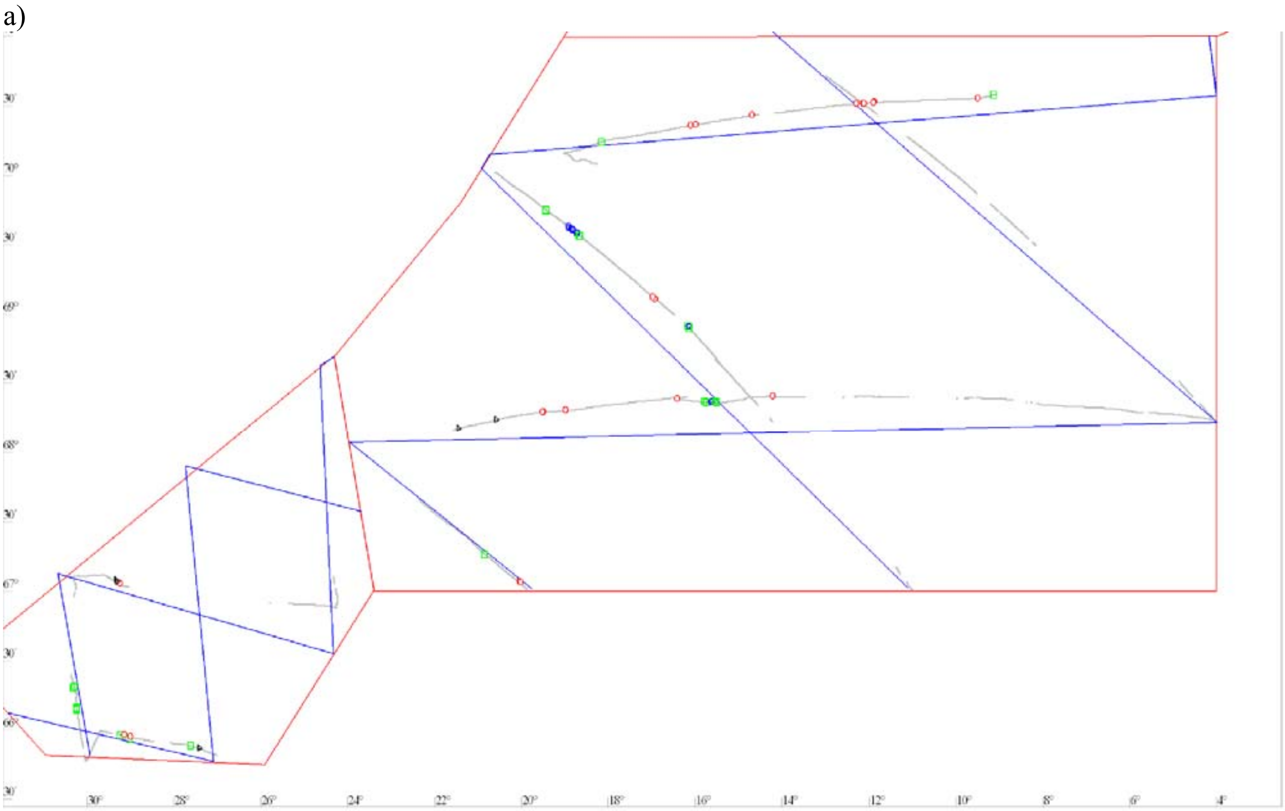


Figure 8. T-NASS Venus: Primary and tracker sightings made in effort during the cruise

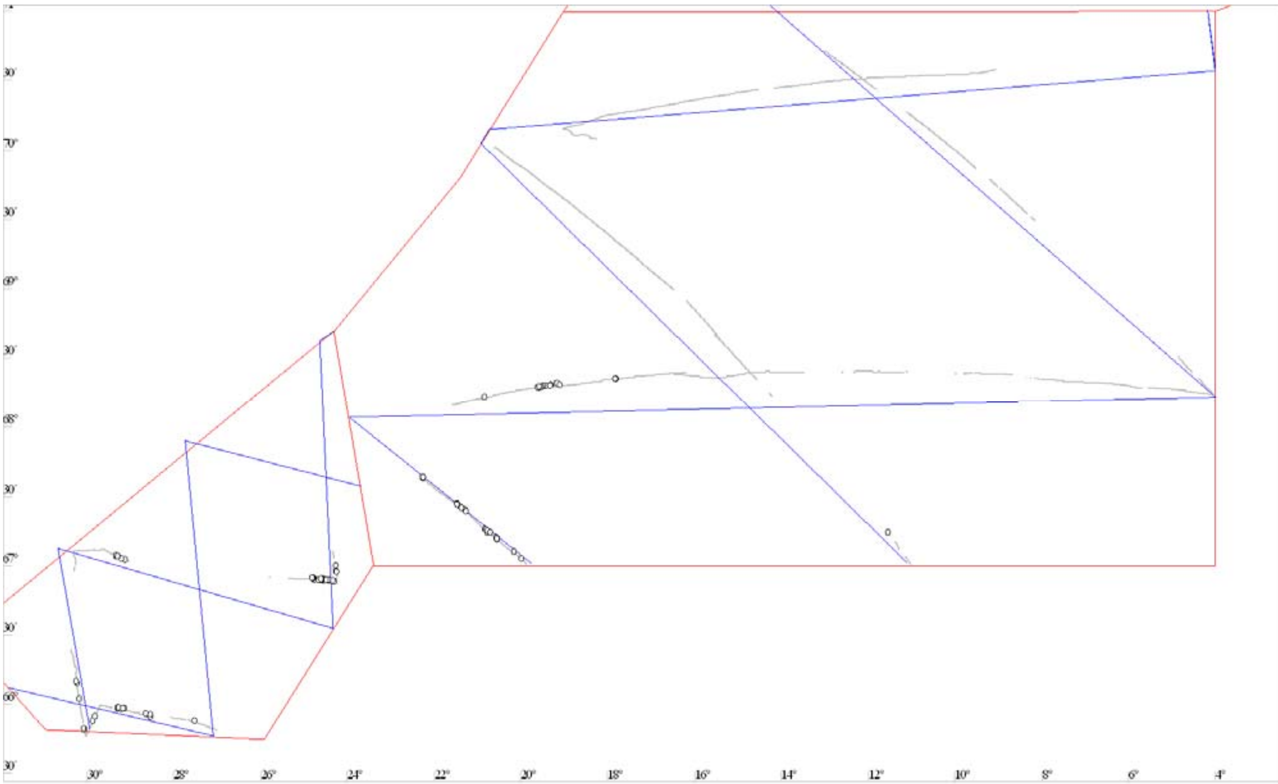
a) Blue whale (blue), fin whale (green), minke whale (red), sperm whale (black)
b) Humpback whale (black)
c) Killer whale (dark green), bottlenose whale (red), white beaked dolphin (black)

Big whale (black), unidentified dolphin (red)

a)



b)


30°
28°
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18°
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14°
12°
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8°
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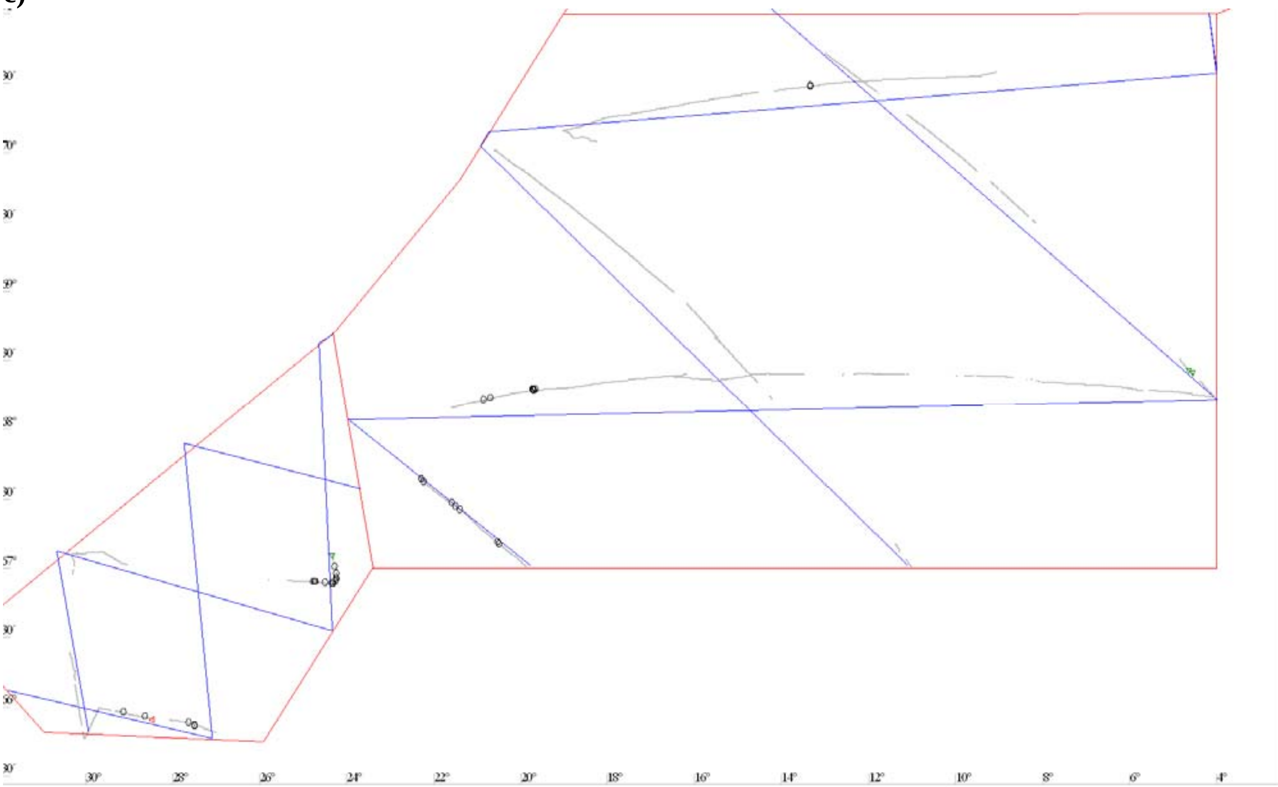
4°

c)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d)

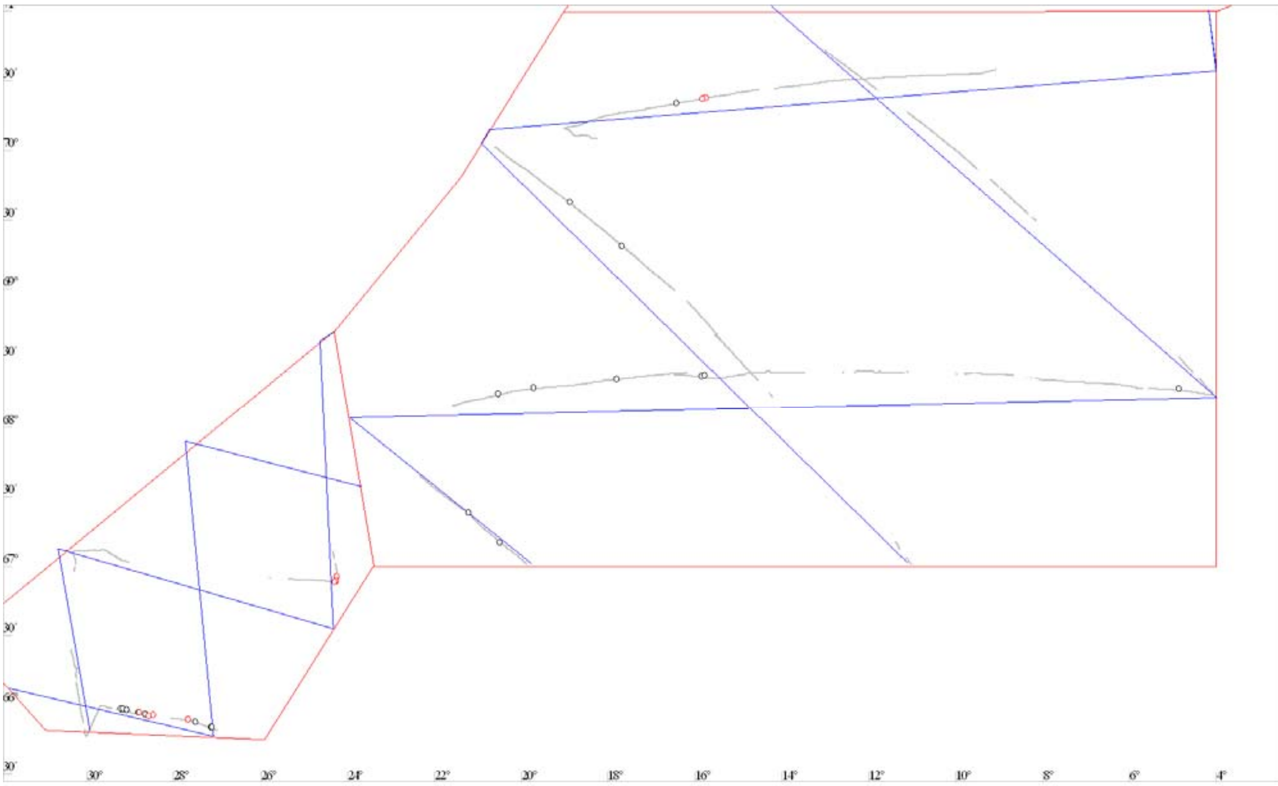

Figure 9. Pulling in the cable with the hydrophone (wooden drum used for protecting the cable).