2006-2007 International Whaling Commission-Southern Ocean Whale and Ecosystem Research (IWC-SOWER) Cruise

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ABSTRACT

We conducted the 29th annual IWC-SOWER (formerly IDCR) Cruise in the western part of Antarctic Area III (000°-020°E) aboard the Japanese Research Vessel *Shonan Maru No.2*. The cruise departed Cape Town, South Africa on 21 December 2006 and returned to Cape Town on 23 February 2007. The cruise had two primary research components: fin whale population research in latitudes north of 60°S; and survey experiments designed to improve and interpret estimates of minke whale abundance from previous cruises. After departing Cape Town, the ship first transited south to the research area for fin whales, located between latitudes 55°S and 61°S. From 27 December to 2 January a visual survey for fin whales was conducted in Closing Mode. A total of 100.29 nmiles of trackline were covered in primary searching and 16 groups of fin whales (comprising 43 animals) were detected. Humpback whales were the most frequently sighted species in the fin whale research area with 53 groups/102 animals detected. Minke whale research was carried out from 4 January to 13 February in the vicinity of the ice edge. The focus of this research component was to evaluate BT mode (Buckland and Turnock, 1992) survey methodology and to conduct school size estimation experiments. 2,258 nmiles of trackline were surveyed during the minke whale research, including 1,482 nmiles in two BT modes and 634 nmiles during two school size estimation experiments. Minke whales were the most frequently sighted species in this research area, totaling 651 groups/2,174 animals. During the cruise, additional research was carried out on blue whales and humpback whales. 55 groups of 125 blue whales were sighted (121 individuals were identified as true blue whales). Of these, biopsies were collected from 72 whales and photo-id images collected from 114 whales. Acoustics recording was conducted at a total of 55 stations using sonobuoys. Sounds attributed to blue whales were recorded at 40 of 45 stations conducted in the vicinity of blue whale sightings. During the cruise, biopsy samples were collected from 15 fin whales. All of the biopsied fin whales but one, were photographed. Biopsy samples were also collected from 72 humpback whales and photo-id images from 160 including all the biopsied whales but three. Other notable sightings during the cruise were a group of six Layard's beaked whales including one calf, and seven sightings of killer whales. Five of the killer whale groups were identified as Type B. One group could not be identified to type because of unique pigmentation including very small eyepatches. During SOWER 2006-2007 the Estimated Angle and Distance Training Exercise and Experiment was completed as in previous years.

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INTRODUCTION

The 2006-2007 International Whaling Commission - Southern Ocean Whale and Ecosystem Research Program (IWC-SOWER) Cruise was conducted from 21 December 2006 to 23 February 2007. The cruise was the twenty-ninth in a consecutive series of Antarctic cruises conducted by the IWC. The first eighteen cruises were conducted under the auspices of the International Decade of Cetacean Research (IDCR) and known as the IWC/IDCR Southern Hemisphere Minke Whale Assessment Cruises. The subsequent and eleven most recent cruises were part of the IWC-SOWER Circumpolar program. The first twenty-six cruises focused on obtaining data to estimate the population size and distribution of minke whales south of latitude 60°S and comprised the first, second and third circumpolar series of surveys. A new phase of research was initiated during the 2004-2005 cruise.

The 2006-2007 cruise continued the research begun during the 2004-2005 cruise. The main objectives of the 2006-2007 cruise were to: (1) carry out a series of survey experiments designed to improve and interpret estimates of minke whale abundance from previous cruises; (2) undertake fin whale research in waters north of 60°S, involving a sighting survey and biopsy sampling of the skin for genetic analyses; (3) continue previous research on blue whales (including collecting biopsy samples, acoustic data, photographs for identifying individual animals and behavioural data); and (4) continue research on humpback whales.

Initial planning for the cruise was undertaken at the 2006 Meeting of the IWC Scientific Committee (IWC in Press). Logistical aspects for the cruise and operations of the ships were finalized at a Planning Meeting held in Tokyo on 27-29 September 2006 (Anon. 2006a).

The IWC provided partial funding for the cruise. The Government of Japan provided the research ship, the *Shonan Maru No. 2*. This ship has been used for all of the IWC-IDCR/SOWER cruises since the 1981-82 cruise. Specifications of the ship are given in Appendix A.

The research area for the cruise was selected as the western part of Area III (000° - 020°E). The fin whale research (and most of the humpback whale research) was to be conducted in the area bounded by latitudes 55°00'S and 61°00'S and longitudes 000°00' and 005°00'E. Research on minke and blue whales was to be conducted in the vicinity of the ice edge; research in this area had been previously undertaken during the 1979-80, 1987-88 and 1992-93 IWC/IDCR cruises and during the 2004-2005 and 2005-2006 IWC-SOWER cruises.

Personnel

Four researchers were selected for the cruise Paul Ensor (cruiseleader, New Zealand), Isabel Beasley (New Zealand), Kazuki Fukutome (Japan) and Paula Olson (USA). Yasunari Tsuda, Chief Radio Operator of the *Shonan Maru No.2* conducted acoustics research during the cruise.

Schedule

Listed below is the cruise itinerary.

Date	Event
18-Dec	*Shonan Maru No.2* arrived Table Bay Harbour, Cape Town
19-Dec	Pre-cruise Meeting
21 Dec	*Shonan Maru No.2* departed Table Bay Harbour
22-Dec	*Shonan Maru No.2* departed the 200 nmile EEZ of South Africa
25-Dec	*Shonan Maru No.2* intersected the 200 nmile EEZ of Norway surrounding Bouvet Island
27-Dec	Fin Whale Research Component commenced at position 55°00'S 000°00'E
1-Jan	*Shonan Maru No.2* departed the 200 nmile EEZ of Norway
2-Jan	Fin Whale Research Component completed at position 61°00'S 002°30'E and transit commenced to the minke whale research area
4-Jan	Minke Whale Research Component commenced from position 67°56'S 000°02'E
9-Jan	Estimated Angle and Distance Training
13-Feb	*Shonan Maru No.2* conducted Estimated Angle and Distance Experiment
13-Feb	Minke Whale Research Component completed at position 66°40'S 006°36'E and transit commenced to Cape Town
20-Feb	*Shonan Maru No.2* entered the 200 nmile EEZ of South Africa
22-Feb	Post-cruise Meeting held aboard the ship
23-Feb	*Shonan Maru No.2* arrived Table Bay Harbour, Cape Town
26-Feb	*Shonan Maru No.2* departed Table Bay Harbour, Cape Town

OBJECTIVES and METHODS

The main objectives for the 2006-2007 IWC-SOWER cruise were to:

(1) carry out a series of survey experiments designed to improve and interpret estimates of Antarctic minke whale abundance from previous cruises;

(2) undertake fin whale research in waters north of 60°S, involving a sighting survey and biopsy sampling of the skin for genetic analyses;

(3) continue research on blue whales (including collecting biopsy samples, acoustic data, photographs for identifying individual animals and behavioural data);

(4) continue research on humpback whales, especially on stock structure (including collecting biopsy samples and individual identification photographs).

Minke Whale Research Component

The goals of the Minke Whale Research Component were to evaluate BT mode (Buckland and Turnock, 1992) survey methodology, conduct school size estimation experiments (SS-III), conduct the associated distance and angle experiments and to carry out minke whale visual dive time experiments.

The research area selected for the minke whale research was 000°-020°E, close to the ice edge, based on the relatively high density of minke whales observed in this area during the 2004-2005 and 2005-2006 cruises. A total of 35 days were allocated for minke whale research. In addition, up to 6 days were allocated for blue whale research in the Minke Whale Research Area (see Blue Whale Research section below).

Although ice edge information was not as critical for this cruise as for the standard SOWER surveys, ice information was still received via the Internet from the US National Ice Center (NIC) during the cruise. (Available at http://www.natice.noaa.gov: SSM/I satellite image data provided on a daily basis.) As with recent cruises the SSM/I data were transformed aboard the vessels (by programs developed at ICR), from polar stereographic to Mercator projection. These images assisted with logistic decisions.

When Closing mode (NSC) or Passing mode (NSP) were the only activities of the day, research was conducted for 12 hours between 06:00-18:00 hrs. During days when survey was conducted in Passing mode with independent observer (IO mode) research was scheduled for 12 hrs a day between 06:00-19:00 hrs to allow for two 30-minute meal breaks. Research was scheduled for 12 hrs a day during the transits to and from the research area.

An Estimated Angle and Distance Training Exercise and Estimated Angle and Distance Experiment were conducted using the same protocol as on recent cruises (Anon. 2006b).

BT mode

Analyses of IO (Passing with independent observer) mode data on ICDR/SOWER cruises suggest that estimates of g(0) are positively biased and thus yield negatively biased abundance estimates. It has been suggested that a reason for this is that observers on the two platforms used for these analyses (the Top Barrel and the IOP) search in the same area of the sea. BT mode is a possible alternative method of searching because it intends to separate the areas searched by the two platforms (Tracker and Primary), with the Tracking platform searching an area ahead of the area searched by the Primary platform. This separation of search areas may yield estimates of abundance with reduced bias. Sightings made by the Tracker thus serve to set up binary trials for observations made by the Primary platform ('Seen' or 'Not Seen').

BT mode trials constituted the major part of the research planned for the minke whale research component of this cruise. The trials have two different possible uses:

1. The potential to affect interpretation of abundance estimates from previous cruises (by providing independent evidence on g(0) robust to data and to difficulties such as responsive movement);
2. Designing future survey methods.

As for the 2005-2006 IWC/SOWER cruise, the BT mode trials primarily focused on point (1) above, using a pair of 25X binoculars (big eye BT). The big eyes (Fujinon, 25x150 MTM) were mounted on the Upper Bridge, 10.5 metres above sea level, at an eye height of 12.03 metres. The Upper Bridge was the Tracker Platform in this option

of BT mode. The big eyes were fitted with reticles (specifications of the reticles and the formula used for conversion of reticle measurements to distance are provided in Appendix D).

Survey in big eye BT mode was conducted in NSP mode (as was most of the big eye BT survey on last year's cruise). A modification to the procedure used last year was that closure to all minke sightings initially detected by the big eyes was attempted after tracking and when the sightings were judged to be abeam of the vessel. The purpose was to obtain accurate school size information of the sightings detected by the big eyes.

The big eye binoculars were mounted in the same location as during last year's trials (in the observer box on the starboard side of the helmsman's seat). Modifications to the observer box had been completed last year to accommodate the binocular stand for the smaller, lighter weight big eyes used last year (Leviathan model). Additional modifications to provide attachment of the stand and vibration isolation for the Fujinon binoculars were completed this year during the vessel's annual dock repair work in Shiogama, Japan. A one-day sea trial on 25 October 2006 provided an opportunity to evaluate the effectiveness of the mounting. The big eyes were operated and evaluated by two researchers on a rotational basis.

Big eye BT mode was interspersed with SS-III experiments, minke whale dive time experiments, BT Option 2 mode trials, humpback whale biopsy sampling, BB mode searching and blue whale research.

As with last years big eye BT mode trials, it was recognised that a flexible cruise track design in the vicinity of the ice edge, where the sighting rate for minke whales was expected to be higher, would probably maximise the number of potential binary trials during BT mode. In addition, re-surveying areas with higher sighting rates was another acceptable approach to achieve this.

Additional trials to assess point (2) above were also attempted using last year's BT mode Option 2 in accordance with the recommendation of the Scientific Committee. For Option 2, the location of the Tracker Platform was the Top Barrel (with the two observers searching using 7x50 binoculars) and the IOP was the Primary Platform (with two observers searching with naked eye). A modification to last year's protocol was that both the Tracker and the Primary Platforms tracked sightings until they were estimated abeam with all re-sightings recorded. Full details of the methods used for BT mode trials are described in Anon (2006b).

SS-III

A school size estimation experiment (SS III) to investigate the difference between confirmed school sizes of minke whales (mainly obtained during NSC mode) and unconfirmed school sizes (mainly obtained during Passing mode) was undertaken.

The aim of the SS-III experiment was similar to the SS-II experiment conducted during the 1984-85 cruise. However, the SS-III experiment was undertaken in IO mode (instead of NSP mode as during the 1984-85 cruise). Abeam closure was attempted on all minke whale and 'like minke whale' sightings (instead of randomly selected sightings) with the proviso that only sightings for which the initial estimates of perpendicular distance from the trackline was less than or equal to 1.5 nmiles were considered for closure.

SS-III trials involved survey in IO mode, therefore the normal IO mode guidelines were to apply to the amount of time for continuous survey in this mode (i.e. no more than 100 nmiles surveyed continuously) to ensure observers take their scheduled rest periods. Therefore the trials were alternated with other research activities and particularly with the other main focus of the minke whale research (big eye BT mode survey). A full description of the methods to be used for the SS-III trials are provided in Anon (2006b).

During the cruise, an abeam closure protocol from NSP mode similar to the 1984-85 SS-II trials was also implemented. The modified SS-II type trials in NSP mode were conducted usually for short durations including: when survey was scheduled for big eye BT mode but when the big eyes could not be used (e.g. while setting up the SCANS camera on the big eyes or during big eye-users and data recorders meal breaks) and when it was not possible to use SS-III (IO mode) due to crew rotation schedules. The abeam closure protocol for the SS-III trials was also used for the SS-II trials.

SCANS II

Preliminary results from analyses of the 2005-2006 IWC-SOWER big eye BT data indicated considerable variability in distance estimates. Such variability can cause substantial problems for abundance estimation and the IWC Scientific Committee has recommended that ways to reduce the errors be investigated for SOWER. Use of the SCANS II equipment (on loan from Sea Mammal Research Unit, University of St. Andrews) on the SOWER cruise was recommended in order to investigate the variability in SOWER distance estimates.

An automated distance and angle measuring system and a voice recording system for big eye and 7X binocular users was operated successfully during the SCANS II survey in 2005 conducted in the Northeast Atlantic. Video cameras were attached to the binoculars in such a way that the field of view of the camera matched that of the binoculars and distances were calculated from the video image by measuring the dip between the horizon and the animal. A small, downward pointing webcam was also mounted on the binoculars. Images of an angle scale placed below the binoculars were then used to measure bearings. The capture of a bearing image was triggered by pressing a sighting or re-sighting button.

Additionally, SCANS II equipment incorporated a modified version of the data entry program, Logger, providing an opportunity to evaluate this program for direct data entry on the SOWER cruises. Logger allows direct entry (and recording) of data on sightings, observer effort, environmental conditions, and vessel position directly into a Microsoft Access database.

Consultation with Russell Leaper at the Pre-cruise Meeting and during the set-up phase for the equipment on the ship in Table Bay Harbour, Cape Town, indicated three main ways that the SCANS II equipment could be adapted and implemented for use during the cruise.

1. Video camera, angle board measuring camera, sighting/resighting timing buttons, and voice recording used in conjunction with the big eye binoculars during big eye BT mode.
2. Video camera, timing buttons, and voice recording used with a pair of 7x50 binoculars in the Top Barrel during the SS-III trials (IO mode).
3. Cue timing buttons and voice recording in the Top Barrel and IOP during BT Option 2.

The equipment was also potentially useful for recording the times of cues during the minke whale visual dive time experiment.

Minke whale visual dive time experiment

The purpose of this activity was to collect data on the surfacing rate of minke whales for use in estimation of $g(0)$. The visual dive time recordings are useful since they provide data on cue availability in different weather conditions and for different school sizes, as well as on school synchrony and dive behaviour. The visual dive time experiment was an important part of the minke whale research conducted on the 2004-2005 cruise. Although additional trials of the experiment were planned for last year's cruise there was no opportunity.

The trials were to be continued during the 2006-2007 cruise and two days of research time were allocated to the dive time experiment during the minke whale research component. Previous dive time data collected on the 2004-2005 cruise were restricted to observations in good conditions only (mainly sea states 0, 1 and 2 (Beaufort scale)) and few trials were completed on solitary animals. Therefore emphasis during this cruise was to be on conducting trials on a range of group sizes in poorer conditions (sea states 3 and 4), but within the standardized range of acceptable searching conditions. Additional trials were also to be conducted on solitary animals in a range of sea states. For a description of the protocol refer to Anon (2006b).

Biopsy sampling and Photo-identification studies

Priority species for biopsy and photo-identification studies were blue whale, fin, humpback and right whales (in that order of priority). Opportunities were to be taken for collection of biopsy samples from sperm and killer whales and other 'incidental' species during the normal process of confirming species identification and numbers, or if animals approach the vessel while off-effort.

Three types of biopsy equipment were available on board: Larsen guns, Paxarms guns and compound crossbows. Biopsy tissue samples were split, with one half for Japan and the other half for IWC. All samples were frozen. When samples had a "significant" amount of blubber attached, the blubber was removed from the skin, and frozen.

Photographs for identifying individual whales were obtained using digital cameras (Canon EOS 20D) each equipped with a 100-400 mm image-stabilized zoom lens. Additionally, researchers used their personal digital cameras and contributed images.

Fin Whale Research Component

The aim of the fin whale research was to carry out a sightings survey in closing mode and to conduct biopsy sampling.

The research area was selected as 55°- 61°S, 000°- 005°E. During the 2005-2006 cruise, research was conducted between the same latitudes and between longitudes 005°- 020°E. Thus, coverage on this cruise would complete basic coverage of the geographic area 55°- 61°S 000°- 020°E where indirect sources (catch records) suggest that historically; during January the highest densities of fin whales in Area III occurred.

Seven days were allocated for the Fin Whale Research Component.

Also in the Fin Whale Research Area, humpback whale biopsy sampling and photo-identification studies were undertaken on an opportunistic basis (see Humpback Whale Research section below).

Acceptable conditions for fin whale survey were assessed subjectively and were usually when the wind speed was <25 knots and sea state <Beaufort 6.

Blue Whale Research Component

The time allocated to a blue whale research component during this cruise was similar to recent IWC-SOWER cruises (apart from the 2004-2005 cruise when no specific time was allocated). Blue whale research was to be conducted during a maximum of six days during the cruise and was scheduled for mainly during the Minke Whale Research Component, as blue whales were expected to be more common in this area. An additional two days of blue whale research were allocated this year to allow for the possibility of blue whales being encountered in the Fin Whale Research Area. The blue whale research included a continuation of research focused on trying to discriminate between the 'true' and 'pygmy' subspecies of blue whale, including the collection of skin samples for genetic analysis, photographs for identification of individuals, acoustics recordings, and behavioural observations. During the Blue Whale Research Component we used the same research protocol as on recent IWC-SOWER cruises.

Blue whales were approached to within 1 nmile and for at least a 30-minute duration dive times were recorded if feasible. The whales were then approached for biopsy, photo-identification, and videotaping. The surfacing behaviour of blue whales was recorded from the Top Barrel on high-resolution digital video (Panasonic digital video camera NV-GS200K). Acoustic recording in the vicinity of blue whale sightings was undertaken (for details see Acoustics Research section below).

Humpback Whale Research Component

The importance of collecting humpback whale biopsy samples was stressed by the Scientific Committee in connection with its work on the comprehensive assessment of this species (IWC 2005). The major aim of this component was to collect biopsy samples and photo-identification images to help in clarifying the uncertainty concerning these stocks and the pattern of their migration. There was no specific allocation of research time to the Humpback Whale Research Component which was to be carried out opportunistically. The goal was to obtain biopsy samples from animals distributed as widely as possible spatially and temporally, but particular emphasis was placed on sampling whales from west of the longitude of South Africa. Effort was made to link the biopsy sample with a photograph of the individual biopsied.

Biopsy sampling and photo-ID studies were conducted as for the Fin Whale and Blue Whale Research Components.

Acoustics Research

Acoustic recording this year focused on opportunistic blue whale recordings, with the aims of obtaining acoustic recordings to compare with other regions worldwide and distinguishing 'true' from pygmy blue whales. Acoustic recordings were made using sonobouys (Ultra Electronics 53D DiFAR). The sonobuoys were programmed for 120 m (station # 1 – 22) and 30 m (station # 23 – 55) and usually to transmit for 4 or 8 hours. Channels 80-88 were used as these most closely matched the frequency response of the *Shonan Maru No. 2* antenna. Sonobuoy signals were received by an Icom IC-R100 communications receiver, with output to a computer for recording and real time monitoring. Signals were monitored in real time on the ship's NEC computer via a Digital Audio Tape (DAT) recorder and recorded to the ship's external hard disk. The computer program Ishmael was used to analyze the sonobouy signals received.

Oceanographic survey

No oceanographic sampling was undertaken, as on last year's cruise. An *Argo* float was deployed under the *Argo* oceanographic programme, outside the Norwegian EEZ surrounding Bouvet Island, at latitude 54°S. Deployment at the target latitude was made during the transit from the Antarctic.

NARRATIVE, RESULTS AND DISCUSSION

The following section is a descriptive account of the major aspects of the cruise. Details of the survey area, and cruisetracks are presented in Figure 1a, b, c and d.

PRE-CRUISE MEETING AND TRANSIT TO THE FIN WHALE RESEARCH AREA

The *Shonan Maru No. 2* arrived in Table Bay Harbour, Cape Town on 18 December 2006, and a Pre-cruise Meeting was held on 19 December at the Breakwater Lodge Hotel. Russell Leaper attended the Pre-cruise Meeting and presented details of the SCANS-II equipment. On 20 December the SCANS equipment was set up on the ship. The *Shonan Maru No.2* departed Cape Town at 14:30 hours on 21 December.

Permission for research in NSC mode within the 200 nmile Exclusive Economic Zone (EEZ) of South Africa was granted by the South African Government, however within the zone poor sighting conditions restricted research. A total of 3.42 hours of research in NSC mode (39.3 nmiles) was conducted. The vessel departed the EEZ on 22 December at position 37°04'S 015°56'E at 10:27 hours.

Between the boundary of the South African EEZ and the intercept with the Norwegian EEZ surrounding Bouvet Island, a total of 10.00 hours (116.2 nmiles) of searching in NSC mode was conducted.

The vessel entered the Norwegian EEZ on 25 December at position 50°58'S 004°05'E at 23:13 hours. On 26 December, the final day of the transit prior to arrival at the Fin Whale Research Area, good conditions were experienced and a total of 4.51 hours (53.7 nmiles) of searching in NSC mode was conducted.

The ship arrived in the vicinity of the starting point for fin whale research (position 55°00'S 000°00'E) early on the morning of 27 December.

FIN WHALE RESEARCH

The Fin Whale Research Component was commenced on 27 December from position 55°00'S 000°00'E (06:00 hrs). The starting position for the fin whale research was within the Norwegian 200 EEZ surrounding Bouvet Island. The *Shonan Maru No.2* departed the EEZ on 1 January (10:50 hrs at position 57°47'S 004°35'E) and departed the Fin Whale Research Area during the night of 2 January (18:45 hrs at position 61°00'S 002°30'E).

Although windy and rough sea conditions were experienced in the Fin Whale Research Area, sighting conditions were mostly acceptable for the first four days in the area. Foggy conditions resulted in only a small amount of research (3.30 hours) during the last three days allocated to the component. The proportion of time lost to poor weather conditions was relatively high: of the 84.00 hours available for research, 41.11 hrs (48.9%) were lost.

On completion of the second day of research, the cruisetrack design was modified from the single transect (joining positions 55°00'S 000°00' to 61°00'S 005°00'E) proposed in the Report of the Planning Meeting (Anon 2006a). The strategy was to increase the survey intensity in the northern part of the research area based on the encouraging number of fin and humpback whale detections in the north of the research area on the original trackline during the first two days of research. Also, the synoptic weather situation indicated that the persistent head winds and rough seas experienced on the original course would continue for the following few days. The revised cruisetrack design incorporated three equal-length transects (each 138.6 nmiles in length) in the area bounded by latitudes 55°00'S and 57°06.8'S and longitudes 000°00' and 005°00'E. Thus, most of the remaining 5 days of research time was allocated to survey in the north of the research area. The area south of latitude 57°06.8'S, was covered by a single survey transect constructed from position 57°06.8'S 005°00'E to the southern boundary of the fin whale research area at position 61°00'S 002°30'E[5]. The intercept of the original trackline with latitude 57°06.8'S was selected as a waypoint for the revised cruisetrack because the corresponding longitude represented exactly one third of the longitudinal span between 000°00' and 005°00'E.

The fin whale research survey was conducted in Closing Mode and during primary effort; a total of 100.2 nmiles of trackline was covered during 9.46 hours. A summary of research effort by mode in the Fin Whale Research Area is presented in Table 1. Sections of the trackline covered on primary effort are shown in Figure 1c.

[5] Waypoints for the revised cruisetrack were: 55°00'S 000°00'E, 57°06.8'S 001°40'E, 55°00'S 003°20'E, 57°06.8'S 005°00'E and 61°00'S 002°30'E

The total amount of primary effort achieved was not substantial. This resulted from the relatively high sighting rate of large baleen whales, large detection distances and therefore a considerable time was spent closing to sightings and considerable time allocated to biopsy and photo-ID. Closure was completed successfully to all primary sightings of large baleen whales.

During the Fin Whale Research Component, research on a solitary blue whale (see Blue Whale Research section below) and on humpback whales were also conducted (see Humpback Whale Research section below).

TRANSIT TO THE MINKE WHALE RESEARCH AREA

Transit to the Minke whale research area was conducted from the night of 2 January (on departure from the fin whale research area at 18:45 hrs) to the morning of 4 January (06:00 hrs when the minke whale research was commenced). The transit spanned the northern part of the 000°– 010°E Sector and 22.5 nmiles were covered on effort in NSC mode (during 1.97 hours of research).

MINKE WHALE RESEARCH

Research in the Minke Whale Research Area was conducted from 4 January until 13 February. A total of 163.09 hours of searching was conducted and 1981.9 nmiles were covered: big eye BT mode – 1206.5 nmiles (106.62 hours); SS-III mode – 393.1 nmiles (34.72 hours) and SS-II – 240.9 nmiles (9.34 hours).

Research was also conducted in NSC mode – 34.5 nmiles (3.07 hours) and BB mode – 106.9 nmiles (9.34 hours).

A summary of research effort by mode in the minke whale research area is presented in Table 1. Sections of the trackline covered on primary effort are shown in Figure 1d.

Very good weather conditions were experienced in the minke whale research area compared to most of the past SOWER Antarctic cruises. Of the 502.41 hrs available for research, only 142.84 hrs (28.4%) were lost to poor weather. This is an under-estimate because sometimes non-searching activities such as biopsy sampling was carried out in conditions unacceptable for minke whale survey. Generally, during the on-effort survey periods, only very good sighting conditions were experienced.

The minke whale research commenced from the western border of the research area (000°00'). Research commenced at position 67°56'S 000°02'E, approximately 40 nmiles from the ice edge. Survey generally proceeded eastward, however re-survey of several sections of the research area was undertaken. The Minke Whale Research Component was completed on the evening of 13 February, and transit to Cape Town was commenced from position 66°40'S 006°36'E.

The strategy for allocation of research time within the research area was similar to that used during the 2005-2006 cruise. Based on our observations during the 2004-2005 and 2005-2006 IWC-SOWER cruises, detections of minke whales were expected to be highest near the western and eastern borders of the research area. Research was thus commenced in the west of the research area and some time was spent there prior to moving to near the eastern border. Also, the intent of starting survey in the west of the research area, as well as conducting repeat surveys there, was to allow time for ice in the east of the research area (between longitudes 016°00'E and 020°00'E) to recede and potentially form a more compact edge. (As for last year, based on satellite ice information for this region, a large area of pack ice extending south of the ice edge was of low concentration and progressively decreasing in concentration). Potentially, recession to form a compact ice edge in this area would increase the likelihood of encountering minke whales outside the pack ice for the minke whale sightings experiments.

During the Minke Whale Research Component, research on blue whales was conducted (see Blue Whale Research Component below) and research on humpback whales was continued (see Humpback Whale Research Component below).

Estimated Angle and Distance Training Exercise

The Estimated Angle and Distance Training Exercise was conducted on the afternoon of 9 January during 2.17 hours. During the exercise the researchers familiarized themselves with the use of the reticles, and evaluated the reticle-distance conversion calculated for the big eyes on the *Shonan Maru No.2* Upper Bridge platform. The aim was to conduct the training exercise prior to, or soon after, the start of the fin whale research component, however during the Fin Whale Component sea conditions were unsuitable for carrying out the exercise.

BT Mode

Big eye BT mode

Almost the entire ice edge margin between 000°00' and 018°00'E was covered during research in big eye BT mode. Sections of the research area where the sighting rate of minke whales was higher were re-surveyed. The area near the western border of the research area between 000°00' and approximately 004°00'E longitude was surveyed several times between 4 and 11 January. The sighting rate of minke whales in this part of the research area was initially reasonably good, however the rate sharply decreased after 9 January.

Consequently, on 12 January we started following the ice edge towards the east of the research area in big eye BT mode. The sighting rate of minke whales was low along most of the ice edge, however near the eastern boundary of the research area there was a good number of detections of minke whales. Repeat surveys in big eye BT mode (alternating with other research items, particularly SS-III trials) were conducted near the eastern border of the research area between 16 and 26 January, frequently in a large east-facing bay extending between 014°00'E and 018°00'E.

Later, 26 January to 13 February, after substantial ice recession, surveys were conducted near the ice edge between 014°00'E and 005°00'E.

A total of 82 sightings (including all species) was first detected by the big eyes during the 1206.5 nmiles of survey in big eye BT mode. A total of 405 sightings were detected from all platforms combined.

Sightings by the big eyes during big eye BT mode included 64 groups of minke whales. In addition, 2 groups were classified as 'like minke whale' (based on the appearance of their blows). During the same period in big eye BT mode, a total of 273 groups of minke whales and 33 groups classified as 'like minke whale' were sighted by all platforms combined. 172 groups of minke whales and 31 groups classified as 'like minke whale' were detected by the Top Barrel.

Of the 64 groups of minke whales initially sighted by the big eyes, 34 groups were subsequently detected by the Top Barrel (Table 14). The number of re-sightings for each group was similar to the number of re-sightings normally observed during IO mode.

Abeam closure to sightings initially detected by the big eyes was attempted for 58 sightings. For 57 groups, the closure was successfully completed and the number of animals was confirmed. The confirmed group size for the minke whales sighted by the big eyes during big eye BT mode ranged from solitary individuals to 40 animals (mean group size was 4.74). The mean group size for minke sightings detected by the Top Barrel during big eye BT mode was 3.01. Closure was only attempted for big eye sightings therefore numbers for most Top Barrel sightings were unconfirmed during this passing mode survey.

For most of the on-effort periods in the minke whale research area, weather conditions were better than average and sea conditions very calm compared to those normally experienced during recent IDCR/SOWER minke whale surveys. However searching in big eye BT mode was attempted in a range of weather and sighting conditions which included reasonably long durations when the initial cue detected was mainly one of the following: body; body or ring; blow; or blow/body. For the big eye sightings, the numbers of each type of initial cues were: blow – 26, body – 34, blow/body – 5 and splash - 1.

The big eye binoculars used this year (Fujinon, 25x150 MTM) were substantially different to those used last year (Leviathan 25X). The Fujinon binoculars were larger, heavier, and of higher optic quality. This resulted in much reduced vibration levels, less wind buffeting and improved user friendliness. The mounting stand provided good isolation from the engine vibration which occurred sometimes but could be reduced by adjusting the engine RPM. The Fujinon big eyes could be used in a much greater range of conditions compared to last year, although (as for last year), searching was most often conducted downwind and/or in the shelter of the pack ice as a strategy to increase the likelihood of detections by the big eyes.

On this cruise, 23% of minke whale sightings in big eye BT mode were initially detected by the big eyes; compared to 14% last year. Contributing factors were possibly the heavier big-eyes (more resistant to wind buffeting) and this year's very good sighting conditions. The researchers using the big-eyes felt that the higher quality optics substantially increased their ability to detect cues.

However, as with last year, it was apparent there was considerable overlap in the search areas of the big eyes and the standard platforms. The mean radial sighting distance for big eye sightings of minke whale and 'like minke whale'

was 3.09 nmiles and for Top Barrel sightings was 2.07 nmiles. This represents a better separation of search areas than last year when the radial sighting distances were 2.70 nmiles (big eye) and 2.02 nmiles (Top Barrel).

As for last year, one reason for this lack of clear separation was perhaps the difference in platform heights. The big eyes were mounted on the Upper Bridge, 10.5 metres above sea level (eye height = 12.03 metres) while height of the Top Barrel platform is 19 metres (eye height = 20.5 metres). Visible horizon from the Upper Bridge is calculated this year as 6.69 nmiles and from the Top Barrel as 8.73 nmiles (Appendix D).

Also, as for last year, the big eye users felt that the narrow field of the big eyes constituted one of the greatest difficulties for detecting minke cues and tracking sightings compared to use of the usual 7X binoculars.

Vessel rolling and pitching, potentially a problem for use of the big eyes, was rarely a problem on this cruise due to the calm sea conditions experienced.

BT Option 2
BT - Option 2 trials were conducted for a total of 23.49 hours and 276.2 nmiles were covered.

During the BT – Option 2 trials, sightings included a total of 116 groups of minke whales and 30 groups classified as 'like minke whale'. Of these, a total of 89 groups (79 groups of minke whales and 10 groups classified as 'like minke whale') were detected by the Tracker platform (the Top Barrel using 7x50 binoculars). The Primary platform (two observers in the IOP searching with naked eye) subsequently detected 25 of these groups. A total of 49 groups (46 groups of minke whales and 3 groups classified as 'like minke whale') were detected by the Primary platform (including the groups assessed as duplicates).

Two groups of minke whales were initially detected by the Primary platform and subsequently detected by the Tracker platform. Not included in the above totals are two sightings of minke whales. One Tracker sighting was detected just prior to a course change to avoid pack ice and before the Primary platform had an opportunity for detection. The other sighting was from the Primary platform and detection was very soon after start-up, outside the ± 60 degree search area of the Tracker platform.

The trials were conducted near the ice edge during five days (27, 30 January and 1, 3 and 5 February). Although the sighting rate was high during all the trials, sighting conditions were markedly different between trials. On 27 January, minke whale sighting conditions were very good (wind speed was low and the sea condition was calm) and almost all initial cues were body cues. During all the other trials blow was the most frequently detected initial cue. 30 January, sightability was average (wind speeds ranged from 6-11 knots and sea state from 3-4). On 1 February sighting conditions were poor (wind 14-15 knots and sea state 3 and 4). On 3 and 5 February, conditions were windy. Sighting conditions were reasonably good on 3 February, and substantially poorer on 5 February. However there was a high sighting rate of minke whales and group sizes were larger than normally encountered.

The BT – Option 2 protocol was easily implemented and no major problems were encountered. Tracking of all sightings and data recording, (including recording of re-sightings for almost all sightings) was accomplished. Voice recordings of sightings and re-sightings detected by the Tracker and Primary platforms were made using the Miyashita voice recording system. It was originally planned to also use the SCANS system for tracker and primary platform voice recording. However, only the Miyashita system was used as previously there had been trouble with the SCANS sighting buttons in the Top Barrel during the SS-III trials.

SS-III

Areas of higher sighting rate were selected for the SS-III trials. The trials were conducted in the west of the research area (8-10 January) and further east in the research area (13 January - 9 February). Sightings during the SS-III trials, included a total of 178 groups of minke whales and 10 groups classified as 'like minke whale'. Abeam closures were attempted for a total of 99 groups. Almost always, the first group of minke whales or 'like minke whales' detected with a perpendicular distance less than or equal to 1.5 nmiles from the trackline was selected for abeam closure during an SS-III trial. Abeam identification of the groups selected for closure totalled 88 groups of minke whales, 10 groups classified as 'like minke whale' and 1 group classified as 'unidentified small whale'. Successful closure was completed for 96 groups including all the groups classified as 'like minke whale' and the 'unidentified small whale' group.

The abeam estimates of group size ranged 1 - 40 (mean 2.56).

The confirmed group sizes after closure ranged 1 - 35 (mean 3.92).

Three groups of minke whales could not be detected again during the closure attempt and the group sizes could not be confirmed. The unconfirmed number for each of these groups was a solitary animal.

While most of the confirmed group sizes were larger than the abeam estimates, for 5 groups the confirmed number was smaller than the abeam estimate. It is not known if animals left these groups prior to completion of the confirmation process.

During the closing procedure of all of the SS-III trials, to avoid confusion secondary sightings were not recorded because sighting rate of minke whales was usually high.

SS-II

SS-II trials were conducted for short durations (usually approximately one hour duration) throughout the Minke Whale Research Component. The trials were conducted when survey was scheduled for big eye BT mode, but when the big eyes could not be used for various reasons (while setting up the SCANS camera on the big eyes, during big eye-users and big eye-data recorders meal breaks and when the visibility near the horizon was unsuitable for big eye use) and also when it was not possible to use SS-III (IO mode) due to crew rotation schedules.

During SS-II trials, sightings included a total of 48 minke whale groups and 7 groups classified as 'like minke whale'. Abeam closures were attempted for a total of 32 groups. As with the SS-III trials, almost always, the first group of minke whales or 'like minke whales' detected with a perpendicular distance less than or equal to 1.5 nmiles from the trackline was selected for abeam closure. Abeam identification of the groups selected for closure was 29 groups of minke whales and 3 groups classified as 'like minke whale'. Successful closure was completed for 30 groups. Two of the three groups classified as 'like minke whale' could not be detected again and could not be confirmed. The abeam estimates for both these groups was a solitary animal.

The abeam estimates of group size ranged 1 - 10 (mean 2.53).

The confirmed group sizes after closure ranged 1 - 15 (mean 3.43).

While most of the confirmed group sizes were larger than the abeam estimates, for 2 groups the confirmed number was smaller than the abeam estimate. As for the SS-III trials it is not known if animals left the groups prior to completion of the confirmation process.

As for the SS-III trials, secondary sightings were not recorded during the SS-II closing procedure.

SCANS-II

Full implementation of the SCANS II system was not possible due to the difference between SCANS II and SOWER in platform configuration and in survey protocol. This includes the requirement during this SOWER cruise for recording data on paper and entry to computer files in the traditional manner (to facilitate data preparation and validation prior to the IWC-SC meeting scheduled for May 2007). However, we successfully collected 54 video and audio recordings of whale sightings from the 25X binoculars during big eye BT mode and 24 video and audio recordings from the 7X binoculars during SS III. A minimum amount of data relevant to each recorded sighting and re-sighting was entered real time into Logger.

Further direct entry of data into Logger was not practical on this cruise because the researchers were occupied with other duties. During the SS-III trials one researcher was required in the Top Barrel to operate the recording device because the computer cable was not long enough to reach the Top Barrel from the Upper Bridge, where the SCANS computer control system was installed.

Generally, the SCANS II equipment seemed sensitive to the Antarctic environment – particularly the timing button box and the computer – and occasionally the system would not operate, resulting in the loss of opportunity for recording on several days. Because of the unreliability, we did not use the SCANS system for cue timing during BT Option 2 or for the minke whale visual dive time experiment. We did not use the equipment during inclement weather and brought it indoors during snow showers and changeable weather.

The SCANS II system was operated on 16 days with the video camera on the big eyes during big eye BT mode. Video recordings were made of 54 whale sightings of 6 species, including 45 minke whale detections and 2 'like minke whale' detections (Table 15). Of the minke whale sightings that were tracked during big eye BT mode, 40 were recorded with the SCANS system.

The SCANS system was operated on 5 days with the video camera on the 7X binoculars in the Top Barrel during SS III Mode. 24 whale sightings were recorded, all minke whales.

The SCANS-II external hard drive crashed late in the cruise. The crashed hard drive contains the only copies of the video and audio files related to the big eye sightings. These files had been transferred from the SCANS computer to the SCANS hard drive because there was only sufficient storage capacity on the SCANS computer for the 7X video and audio files.

Minke Whale Dive Time Experiment

One trial of the Minke Whale Visual Dive Time Experiment was conducted during the cruise. The trial was conducted on 4 February on a group comprising three animals. Sighting conditions were poor and the duration was one hour. A total of 38 cues were detected (32 blows and 6 blow/body). There was a 9-minute interval near the end of the trial when no cues were detected and it is suspected some cues were missed due to the poor conditions.

Video recording was attempted, however due to the difficulty tracking the animals in poor conditions, few surfacing sequences were recorded. The Miyashita voice recording system was used to record cues. We had originally planned to use the SCANS system for voice recording however the SCANS sighting buttons had been unreliable during previous SS-III trials and so we preferred to use the Miyashita system.

Estimated Angle And Distance Experiment

The Estimated Angle and Distance Experiment was conducted on 13 February, the final day of the Minke Whale Research Component, during 3.47 hours. During the experiment the two researchers who used mainly the 25X binoculars during big eye BT mode survey, made their estimates using these binoculars.

BLUE WHALE RESEARCH

There were 55 sightings of blue whales (comprising 121 animals) during the cruise. 117 individuals of 51 groups were identified as true blue whales. 4 individuals were not approached closely and were classified as blue whale – undetermined.

Also, during the minke whale research there were 4 sightings (comprising 10 animals) of large baleen whales that were not approached and were classified as 'like blue whale' based on the appearance of their blows.

Group sizes of blue whales were: 26 solitary animals; 16 groups of 2; 3 groups of 3; 2 groups of 4; 4 groups of 5; 2 groups of 6 and 1 group of 11. No calves were seen this year.

A solitary blue whale (true) was sighted in the Fin Whale Research Area on 30 December at position 56°01'S 002°33'E (Figure 2a). A group of 3 true blue whales was seen on 3 January during the transit from the Fin Whale Research Area to the Minke Whale Research Area.

All the others were seen during the Minke Whale Research Component and usually in close proximity to the ice edge (Figure 2d). Blue whales were frequently observed near the pack ice in the west of the research area between 000°00' and 004°00'E at the beginning of the Minke Whale Research Component (January 3 – January 12). There were only two sightings during the transit eastward along the ice edge, on January 13 at 007°28'E and 008°37'E. During the last week of the minke whale research blue whales were frequently sighted near the ice edge between longitudes 008°18'E and 004°47'E.

Based on examination of digital images, several individual blue whales were re-sighted multiple times during the last week of the Minke Whale Research Component.

During the entire cruise, 47 groups (comprising 119 individuals) were approached for biopsy and photo-id research, which was conducted for a total of 79.82 hours. A total of 121 biopsy samples were collected from 72 true blue whales. Results of biopsy sampling are given in Table 12. The collection of individual identification photographs of blue whales occurred simultaneously with biopsy sampling. 114 individual blue whales were adequately photographed (Table 13) including all but 3 of the biopsied whales.

Video was recorded for 49 sightings comprising 116 animals during 9 hours 51 min. 10 sec. Video images of 96 animals were obtained (Table 16).

Acoustic recording was conducted in the vicinity of 45 of the 55 sightings of blue whales (see Acoustics Research Section below).

Blue Whale Dive Time Experiments were not undertaken on this cruise. Many of the sightings were in the vicinity of the pack ice edge and we were concerned that the whales would move into the pack ice and thus be inaccessible for photo-ID and biopsy sampling.

HUMPBACK WHALE RESEARCH

Collection of biopsy samples and photo-identification images of humpback whales was conducted throughout the entire cruise. Humpback whales were frequently encountered in the Fin Whale Research Area and much of the sampling was carried out in this area. Additional samples and photographs were obtained during the Minke Whale Research Component and during the transits.

A total of 72 humpback whales were biopsied during the cruise during 30.92 hours of research. 160 individuals were photographed including all but 4 of the biopsied animals (Tables 12 and 13).

Biopsy samples were collected from 4 humpback whales and 6 were photographed (during 1.68 hours of research) on the transit south after departure from the South African 200 nmile EEZ and before commencing the Fin Whale Research Component.

During the Fin Whale Research Component biopsy samples were collected from 23 humpback whales during 10.43 hours (Table 3). Most of the humpback whale samples were collected from the northern part of the Fin Whale Research Area where the survey intensity was higher. In the Fin Whale Research Area humpback whales were more difficult to approach compared to last year due to the greater proportion of solitary animals and generally smaller group sizes. All but one of the biopsied animals were photographed, as well as 41 other individuals.

Biopsy samples were collected from 5 humpback whales and 8 were photographed (during 3.34 hours of research) on 3 January during the transit from the Fin Whale Research Area to the Minke Whale Research Area.

In the Minke Whale Research Area biopsy samples were collected from 13 humpback whales and 21 individuals were photographed including all of the biopsied whales during 8.63 hours of research. The samples were mainly collected in the vicinity of the ice edge and widely spread longitudinally. A tissue sample was collected from a dead humpback whale observed at position 67°50'S 012°41'E on 26 January.

Biopsy samples were collected from 27 humpback whales and 62 were photographed during the transit north from the minke whale research area to Cape Town including all but 2 of the biopsied whales. On 14 February, 24 biopsy samples were collected from a group of 43 humpback whales detected at position 63°13'S 008°03'E.

ACOUSTICS RESEARCH

A total of 15 hours of acoustic monitoring was performed during the entire cruise. Fifty-eight sonobuoys[6] were deployed (55 stations) from 29 December 2006 through 9 February 2007 (Figure 3: Table 17). A total of 45 acoustic stations were in the vicinity of blue whale sightings (two sonobouys targeted fin whales, 1 targeted humpback whales, 1 targeted killer whales and 1 was deployed on an extremely calm sea condition day near the ice-edge where blue whales had been sighted last year). Successful blue whale recordings were obtained at 40 stations (88.9% success rate). This success rate is comparable to last years cruise, where 41 sonobuoys were deployed and blue whale sounds were recorded on 37 of these (90.2%).

Acoustic Recording during the Fin Whale Research Component

In the Fin Whale Research Area, fin whale sounds were the most commonly recorded sound. Acoustic recordings were made at four stations in the Fin Whale Research Area using sonobuoys. The first station (29 December) was in the vicinity of fin whales (fin and humpback whale sounds were recorded). Station 2 (30 December) was also in the vicinity of fin whales (strong fin whale sounds and humpback sounds were recorded). Station 3 (30 December) was in the vicinity of a solitary true blue whale (very strong and strong blue whale downsweeps and fin whale sounds were recorded). Station 4 (02 January) was in the presence of humpback whales and their sounds were recorded.

Acoustic recordings of fin whales were very successful this year. Fin whale recordings were obtained at 3 of the 4 stations in the fin whale research area (75% success rate), compared to a total of only 8 fin whale recordings from 75 sonobouys deployed during the 2005-2006 cruise (11% success rate).

[6] Of the 58 sonobuoys deployed, only 8 performed poorly either from the time of deployment (3) or within the first 30 minutes (5), for a 14% failure rate. This is consistent with the low sonobouy failure rate experienced during last years cruise (15%). Of the 50 ‘good’ buoys, whale vocalizations were recorded on 45 (90.0%: similar to last years success rate of 90.6%).

Acoustic Recording during the Blue Whale Research Component
In the Minke Whale Research Area, blue whale and humpback whale sounds were the most commonly heard species. A total of 44 sonobuoys were deployed in the vicinity of sighting blue sightings during the Minke Whale Research Component, with successful blue whale recordings at 39 stations (88.6% success rate).

Downsweeps were the most frequently recorded blue whale sound, which is similar to the pattern found during last year's cruise. Although the sounds were frequently faint (especially the 28 Hz sounds), there were occasions where the sounds were 'strong' and 'very strong' (Figures 4a and b).

Very strong and strong blue whale sounds, including downsweeps (range = 1 – 62) and 28 Hz calls (range 1 – 6) were recorded at 20 of the 44 stations (Table 17: Figure 4a). In particular, at station # 22 (08 January), a total of 120 calls were recorded over 4 hours, consisting of 62 very strong downsweeps and 4 very strong 28 Hz calls. During this day, approximately 21 blue whales were sighted in the vicinity at the time of the recordings.

On almost all occasions, blue whales were biopsied during periods in which sounds were recorded. Based on the recordings, it appeared that blue whales generally stopped vocalizing once the ship began to chase for biopsies. Three example situations are stations: #03 (30 December), #13 (7 January) and #18 (8 January). On all three occasions, a sonobuoy was deployed in very close proximity to a solitary animal and the recordings are almost certainly from these individual whales.

1. At station 3, two very strong downsweeps were recorded before chasing began at a distance of 1 nmile. Once the chase began, no further calls were recorded (no biopsy sample collected).
2. At station 13, two very strong downsweeps were recorded before chasing began at a distance of 1 nmile. During the chase no calls were recorded, although once the chase was finished one faint downsweep was obtained (1 biopsy sample collected).
3. At station 18, several very strong 28 Hz tonal calls were recorded before chasing began at a distance of 0.5 nmiles and initially during the chase. Only very faint downsweeps were recorded after the chase (1 biopsy sample was collected).

As we did not conduct Blue Whale Dive Time Experiments during this cruise, there was limited opportunity for acoustics recording of undisturbed animals prior to approaching blue whales for biopsy attempts. It was estimated that on calm sea days, the reception limit of the sonobouys used this year was 15 miles. The reception limit for recording blue whale sounds was estimated to be 5 miles.

No sounds attributed to pygmy blue whales were recorded.

Acoustics recording of other species
Humpback whales were frequently heard during both the Fin Whale and Blue Whale Research Components. Sperm whales were recorded on 5 occasions during the blue whale research component. No other cetacean species were recorded, apart from unknown acoustic detections (1600-1900 Hz) on 12 January, which may have originated from a group of 5 killer whales in the vicinity that was the target of the sonobouy. In a similar pattern to last year seal vocalizations were recorded in the western part of the study area; at 5 stations (10.0%).

BIOPSY SAMPLING AND PHOTO-IDENTIFICATION

After departure from Cape Town it was noticed that the replacement ammunition for the Larsen guns was of much weaker strength than had been ordered. The result was a large reduction in the effective range for biopsy sampling. The maximum effective range was approximately 40 metres compared with to up to more than 60 metres range with the usual type of ammunition.

Replacement darts for the Larsen system were also received for this cruise. The new darts were of a slightly different design to the darts previously used. The tails of many of the new darts sustained damage when used in combination with the stronger old-type ammunition even on quite low power settings. However, the new darts performed very well, and none were damaged with the new ammunition.

A total of 236 biopsy samples were collected from 160 individual blue, fin, humpback and killer whales during the cruise.

Fin whale
A total of 15 fin whales were biopsied during the cruise during 11.59 hours of research. 43 individuals were photographed including all of the biopsied whales.

In the Fin Whale Research Area, a total of 11 biopsy samples were collected from 9 fin whales during 5.73 hours. All the biopsied animals were photographed, as well as 22 other individuals.

In the Minke Whale Research Area, a total of 2 biopsy samples were collected from 2 fin whales during 2.15 hours. Three animals were photographed, including the biopsied animals.

Blue Whale
During the entire cruise, 47 groups of blue whales (comprising 119 individuals) were approached for biopsy and photo-id research, which was conducted for a total of 79.82 hours. A total of 121 biopsy samples were collected from 72 true blue whales. Results of biopsy sampling are given in Table 12. The collection of individual identification photographs of blue whales occurred simultaneously with biopsy sampling. 114 individual blue whales were adequately photographed (Table 13) including all but 3 of the biopsied whales.

The replacement weaker strength ammunition for the Larsen guns was problematic for sampling blue whales where generally larger firing ranges are required (35-60 metres), however it was fortunate that many of the blue whales encountered on his cruise were relatively easy to approach.

Due to the reduced range of the Larsen guns we generally had to spend longer durations chasing the whales to get closer than normal for biopsy sampling. As a result of the closer distances we were able to also make extensive use of the Paxarms system. Tethered darts were used with the Paxarms system to avoid the complication of locating and retrieving multiple floating darts.

It is likely that samples from more animals would have been collected if the usual type of ammunition had been available for the Larsen guns. An outcome of utilisation of the Paxarms system in addition to the Larsen guns, as well as approaching whales more closely due to the firing ranges being shorter, was a greater proportion of approaches to whales where multiple samples were collected compared to recent IWC-SOWER cruises.

Humpback whale
Most of the biopsy attempts on humpback whales were made using the Larsen system at ranges of approximately 20-35 metres. The Paxarms system using a tethered dart was also extensively used at ranges up to about 30 metres. While the replacement lower-strength ammunition for the Larsen guns reduced the effective range, this was not such a substantial problem in regard to sampling humpback whales. The guns were usually used on higher power settings to achieve the necessary range, however few of the darts were bent or damaged. Thus, the lower strength ammunition, used in combination with the new Larsen darts proved suitable for sampling humpback whales.

Killer whale
Six groups of killer whales were approached for biopsy and or photo-ID during the cruise. During the transit from Cape Town to the Fin Whale Research Area a group of killer whales (type undetermined) comprising 35 animals was approached. There was no opportunity for biopsy during the 0.60-hour encounter, however the animals were photographed. In the Minke Whale Research Area, 5 groups (all classified as type B) were approached during 2.05 hours of research. Two biopsy samples were collected from one individual and the groups were photographed. One group (5 whales, type undetermined) seen in the Minke Whale Research Area was not approached.

Minke whale
Opportunistic photo-identification was attempted from 5 January to 9 February on all Antarctic minke whale groups approached during normal closing procedures to confirm school size. The feasibility of using the images for photo-identification studies is presented in Appendix E.

SIGHTINGS

A list of all the sightings recorded during the fin whale research, by species, and by effort mode, is presented in Table 4. Sightings recorded during the minke whale research, by species, and by effort mode, is presented in Table 3. Figures 2a-e show the location of sightings.

Tables 5-9 list the sightings observed during transits to and from the research area, including those in the EEZ of South Africa and the EEZ of Norway surrounding Bouvet Island. Table 11 summarizes all sightings observed during the entire cruise.

Observations of cetaceans during transit within the 200 nmile EEZ of South Africa are presented in Appendix B. Observations in the 200 nmile EEZ of Norway are presented in Appendix C.

Fin Whale Research Area

Fin whales (16 groups, 43 animals) were observed in the northern portion of the fin whale research area. All of the sightings occurred north of 56°50'S, although only 21.4 miles were surveyed in the southern portion of the fin whale research area due to poor weather. During last year's fin whale research (when there was more spatial coverage), the largest aggregations of fin whales sighted were also in the northern portion of the research area, distributed near 56°S. Fin whale mean group size during 2006-2007 was 2.7 (the groups encountered comprised: 2 solitary animals, 6 pairs, 5 groups of three, 1 group of four and 2 groups of five).

Humpback whales were the most frequently encountered species in the Fin Whale Research Area (53 groups, 102 animals), and as last year, were sighted almost throughout the section of the area where coverage was achieved. Different from last year, no large aggregations of humpback whales were observed within the fin whale research area. Humpback whale mean group size was 1.92 (the groups encountered comprised: 25 solitary animals, 20 pairs, 4 groups of three, 2 groups of four, 1 group of eight and 1 group of nine animals).

A solitary blue whale (true) was encountered at position 56°02'S 002°33'E on 30 December. The whale was evasive and difficult to approach for biopsy but photo-id and video images were collected.

Southern bottlenose whales were observed infrequently in the fin whale research area (4 groups, 7 animals) and no minke whales were observed.

All sightings detected during the fin whale research period are presented in Table 2.

Minke Whale Research Area

Minke whales (651 groups, 2174 animals) were observed throughout the Minke Whale Research Area 000°-020°E and were the most frequently observed species. As the focus of the minke whale research was sightings experiments and not on obtaining an abundance estimate, areas of higher sighting rate were re-surveyed, thus double counting will have occurred. Mean group size was 3.34. The sighting rate and the mean group size for minke whales were higher than last year. In addition, 85 groups of 217 animals of 'like minke' whales were observed.

Blue whales (53 groups, 121 animals) were the second most commonly encountered species and were spread along pack ice edge. All but one group were found west of 010°E. A concentration of 50 whales were encountered 6 to 8 February between 007°18'E and 004°15'E. In the research area, group sizes ranged from solitary individuals to 11 animals. No calves were observed this year.

Humpback whales (30 groups, 58 animals including one dead whale) were sighted throughout the Minke Whale Research Area.

Sperm whales (30 groups, 30 animals) were sighted near the ice edge primarily before January 16 and mainly over the northern extremity of the Astrid Ridge.

Southern bottlenose whales (16 groups, 26 animals) were uncommon but were seen throughout the research area.

Killer whales (6 groups, 45 individuals) were infrequently sighted and widely distributed along the ice edge in the minke whale research area. Five groups comprising 40 animals were classified as Type B. One group (5 whales, type undetermined) seen in the Minke Whale Research Area was not approached.

Notable sightings

During the transit from Cape Town to the Fin Whale Research Area a group of killer whales comprising 35 animals was observed at Position 52°34'S 002°28'E. Due to their unusual pigmentation pattern the whales could not be

classified to type (Type A, B or C). The whales had a particularly small eye patch parallel with the body, a diffuse, 'washed' lateral pigmentation and no distinct cape as well as unusual saddle patches.

On 30 December (in the Fin Whale Research Area) there was a notable sighting of six Layard's beaked whales at position 56°00'S 002°35'E. The whales were swimming east in a cohesive group and spent over 2 minutes at the surface. The group consisted of 5 adults/subadults and one calf. No erupted teeth were observed on any of the adults, but the jaw of every whale was not visible.

ICE EDGE

Most of the research was conducted in the immediate vicinity of the northern margin of pack ice and the ship navigated along almost the entire ice edge between 000°00'E and about 019°00'E. During the first half of January the location of the ice edge between 010°00'E and 020°00'E was approximately the same as last year, however between 002°30'E and 010°00'E it was substantially farther north. From 19 January in the east of the research area, a large, east-facing bay in the ice edge centered on about latitude 68°30'S was observed. As ice recession progressed the bay increased in size and ice-free water of the bay became contiguous to the west leaving a substantial area of pack ice isolated from the main ice edge. The isolated area of pack ice disappeared in early February following further ice recession and the location of the ice edge was then approximately the same as during the 1987-88, 2004-2005 and 2005-2006 cruises in this region.

The ships officers, usually by a combination of visual and radar observations, recorded the location of the ice edge routinely during the cruise. Re-survey of several areas was undertaken and, as expected, substantial changes in the location of the pack ice occurred during the intervening periods. Because of this complexity and because the aim of the cruise was not to produce an abundance estimate, a best estimate of the position of the ice edge for the entire research area as normally produced on this series of cruises was not made.

KRILL – VISUAL OBSERVATIONS

We recorded a total of 96 visual observations of krill patches during the cruise. Most were circular in shape and usually between 20 and 60 metres in size.

The highest density of krill swarms detected visually was on a 93 nmile segment of trackline between positions 63°14'S 001°46'E and 64°47'S 001°14'E (roughly 200-300 nmiles from the ice edge) where at least 76 patches were observed on 3 January 2007. Sightings of krill swarms in the vicinity of the ice edge included 16 swarms observed between longitudes 000°03'E and 018°43'E (7 - 18 January). Eight of these were observed 7 - 12 January, between longitudes 000°03'E and 002°37'E near the western boundary of the research area.

In a large east-facing bay in the ice edge in the east of the research area there was an extensive area of greenish-brown watercolour apparently caused by a plankton bloom. When first detected the greenish-brown water had a well-defined eastern boundary with very transparent water near longitude 015°00'E on 19 January and extended westward to the pack ice edge. A western boundary with more transparent water was observed on 25 January at about longitude 011°30'E after substantial ice recession had occurred. A northern boundary of the discoloured water with clearer water was observed near position 68°00'S, 012°00'E on 26 January. The plankton bloom persisted throughout the time spent in this part of the research area (19 January through 12 February). On one very calm day, a well-defined surface current line running NW-SE was observed.

MARINE DEBRIS

Observations of marine debris encountered during the cruise, south of the northern boundary of the fin whale research area (latitude 55°S) were minimal this year (Table 18).

TRANSIT TO CAPE TOWN AND POST-CRUISE MEETING

The *Shonan Maru No.2* commenced transit to Cape Town from position 66°40'S 006°36'E on the evening of 13 February.

The 000°E-010°E sector was traversed on 14 February during the transit to Cape Town. South of 61°00'S (the southern boundary of the fin whale research area) 25.1 nmiles were covered in NSC mode during 2.11 hours of research and mainly in quite windy conditions.

During the transit between the Minke Whale Research Area and Cape Town, the Fin Whale Research Area (spanning latitudes 61°00'S to 55°00'S) was intersected. During the transit in the Fin Whale Research Area a total of 43.4 nmiles was covered during 3.70 hours of research on 15 February: NSC mode – 2.9 nmiles (0.24 hours) and BB mode – 40.5 nmiles (3.46 hours). The vessel entered the Fin Whale Research Area at 03:39 hours on 15 February at position 61°00'S 008°59.50'E and departed the area at 12:41 hours on 16 February at position 55°00'S 011°30.50'E.

On 16 February, an Argo buoy was successfully deployed from the *Shonan Maru No.2* on behalf of the Japan Agency for Marine Earth Science and Technology at position 54°00'S 011°54'E.

North of the fin whale research area (at latitude 55°00'S) and the boundary of the South African EEZ poor weather was experienced and no research was conducted.

The South African EEZ was intersected adjacent to the coast of South Africa. The vessel entered the EEZ on 20 February at 37°23'S 016°33'E at 18:50 hours. Permission for research in NSC mode within the 200 nmile Exclusive Economic Zone (EEZ) of South Africa was granted by the South African Government, however within the zone windy conditions prevented research.

The report of the cruise was finalized during a Post-cruise Meeting held aboard the vessel on the afternoon of 22 February.

The ship entered Table Bay Harbour at 09:15 hours on the morning of 23 February. The vessel departed Table Bay Harbour, Cape Town on 26 February.

MODIFICATIONS TO THE PROCEDURES, VESSEL AND EQUIPMENT

Last year, the ship owners made considerable modification to the Upper Bridge to accommodate the Leviathan big eyes. This year the Fujinon big eyes were installed in the same location (observer seat immediately on the starboard side of the helmsman) however, considerable additional work was required to provide attachment and vibration isolation for the big eyes. In addition, a replacement part for the stand was manufactured in order to reduce its height. The ship owners also installed a large plastic container on the Upper Bridge which could be used to accommodate the big eyes and protect them from very bad conditions.

A modified SS-III protocol was implemented and referred to as SS-II (abeam closure from NSP mode). A new effort mode (SZ mode) was introduced and used on the Effort Record to denote SS-II.

The IWC purchased considerable new equipment prior to this cruise including an additional digital camera, biopsy equipment and a computer:

- The two IWC-owned cameras (Canon 20D equipped with an image stabilized 100-400 mm lens) greatly enhanced the results of the photo-identification efforts. Although one of the cameras developed a fault later during the cruise and would not maintain battery charge.
- The IWC purchased a computer (Toshiba Model Tecra) and it was vital for data entry, archiving and back-up of digital photo-ID images.
- Replacement darts (100), tips (30), ammunition (1500 blanks) and propelling plugs (500) were purchased for the Larsen system.

RECOMMENDATIONS

The researchers and captain make the following recommendations based on their experience of this cruise (note that recommendations do not appear in any order of priority).

Acoustics: We re-iterate the acoustics recommendations 1-3 from the 2005-2006 IWC-SOWER cruise.

1. As the acoustics receivers currently do not have DiFAR capability. We recommend the VHF radios be sent back to Greeneridge for DiFAR modification and to have the output signal levels checked.
2. Purchase a dedicated acoustics computer, headphones, external hard drive and all necessary software for the SOWER cruises.
3. The purchased computer should have a stereo sound card (or an external sound card) so that 2 sonobuoys can be recorded at once onto different channels during the same recording. On the present cruise high quality recordings were made using only one computer/channel. However availability of a two channel recording capability would increase the likelihood of obtaining high quality recordings in the future.

Biopsy/photo-Identification

1. The replacement ammunition received for the Larsen guns was of lower strength (Blue strength) than ordered (Red strength). For biopsy sampling of large whales under difficult conditions, we recommend a re-supply of Red strength ammunition. The new aluminium-carbon shalf Larsen darts sustained considerable damage to the tails of the shafts when we were using the remnants of our Red strength ammunition. A stock of old-style alloy Larsen darts is recommended unless the new darts can be modified to be compatible with the higher strength Red ammunition. A re-supply of propelling plugs will also be required.
2. External hard drive storage (250GB) and a back up (two) are required for storing digital images and acoustic data. This could also potentially facilitate transferring the data to the IWC and Japan. On return to Cape Town at the end of the cruise, we purchased a 250GB external hard drive to back up the Photo-ID images and acoustic data. During the cruise, we had used the SCANS external hard drive as additional back up because both IWC-owned computers were full as well as personal computers. The SCANS drive crashed late in the cruise and was unusable.
3. The Larsen biopsy guns all require servicing.
4. Slightly stronger line for the Paxarms tethered system would be an advantage.
5. The IWC Canon 20D cameras and lenses require servicing.
6. Additional Camera batteries (3), card reader (1) and storage cards (2x2GB)

Blue whale video recording

1. To facilitate review and back-up of the blue whale video recordings an IEEE 1394 (I-Link) cable with a four-pin connector each end is required. This would enable connection of the current video camera (Panasonic digital video camera NV-GS200K, on loan from the Institute of Far Seas Fisheries) to a computer.

General

1. The high minke whale sighting rate and stable, good weather conditions experienced near the ice edge in the Minke Whale Research Area (000°00' - 020°00'E) on this cruise, and last years cruise, greatly enhanced the success of the minke whale research on these two cruises. Similarly, on previous cruises to the same area (the 2004-2005 and 1993-94 cruises), reasonable and very good conditions, respectively, were experienced. On all four cruises, a good number of detections of blue whales were made near the ice edge in this longitudinal range resulting in a substantial quantity of data collected. In addition, successful research on fin and humpback whales in the Fin Whale Research Area (farther north and bounded by the same longitudinal range) was carried out during this cruise, and last years' cruise. This area is a very satisfactory location for minke whale and large baleen whale research. To build on the success of recent cruises to this area, we recommend that plans for Future IWC-SOWER should include research in this Area.

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Table 1. Summary of search effort (time and distance) conducted during the cruise in each effort mode.

Area	**Start** Date Time	**End** Date Time	**NSC** Time-Distance (hours-nmiles)		**BZ (Big eye BT)** Time-Distance (hours-nmiles)		**BT (BT Option 2)** Time-Distance (hours-nmiles)		**SS (SS-III Abeam closure from IO)** Time-Distance (hours-nmiles)		**SZ (SS-II Abeam closure from NSP)** Time-Distance (hours-nmiles)		**BB** Time-Distance (hours-nmiles)	
Cape Town to boundary of South African EEZ	21 Dec 14:30	22 Dec 10:27	3.42	39.3	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Departure from South African EEZ to intercept of EEZ of Norway	22 Dec 10:27	25 Dec 23:13	10.00	116.2	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Intercept of Norwegian EEZ to start of Fin Whale Research	25 Dec 23:13	27 Dec 06:00	4.5	53.1	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Start of FWR to intercept of Norwegian EEZ	27 Dec 06:00	1 Jan 10:50	7.62	78.8	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Departure from Norwegian EEZ to end of FWR	1 Jan 10:50	2 Jan 18:45	1.83	21.4	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0

Table 1 continued. Summary of search effort (time and distance) conducted during the cruise in each effort mode.

Area	**Start** Date Time	**End** Date Time	**NSC** Time-Distance (hours-nmiles)		**BZ** **(Big eye BT)** Time-Distance (hours-nmiles)		**BT** **(BT Option 2)** Time-Distance (hours-nmiles)		**SS** **(SS-III Abeam closure from IO)** Time-Distance (hours-nmiles)		**SZ** **(SS-II Abeam closure from NSP)** Time-Distance (hours-nmiles)		**BB** Time-Distance (hours-nmiles)	
(Summary of FWR)	27 Dec 06:00	2 Jan 18:45	9.46	100.2	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Transit FWR to Minke Whale Research Area	2 Jan 18:45	4 Jan 06:00	1.97	22.5	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0
Minke Whale Research Area	4 Jan 06:00	13 Feb 18:00	3.07	34.5	106.62	1206.5	23.49	276.2	34.72	393.1	21.1	240.9	9.34	106.9
Transit MWR to intercept of South African EEZ	13 Feb 18:00	20 Feb 18:50	2.35	28.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	3.46	40.5
Transit from intercept with South African EEZ to Cape Town	20 Feb 18:50	23 Feb 09:15	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0	0.00	0.0

Table 2. Summary of experimental time (hours) during 2006-2007.

Area	**Start** Date Time	**End** Date Time	**Photo-ID, Biopsy** Time (hours)	**Minke whale visual dive time** Time (hours)	**Estimated angle and distance training** Time (hours)	**Estimated angle and distance experiment** Time (hours)
Transit from Cape Town to boundary of South African EEZ	21 Dec 14:30	22 Dec 10:27	0.00	0.00	0.00	0.00
Departure from South African EEZ to intercept of EEZ of Norway	22 Dec 10:27	25 Dec 23:13	1.53	0.00	0.00	0.00
Within EEZ of Norway	25 Dec 23:13	1 Jan 10:50	20.43	0.00	0.00	0.00
Fin Whale Research Area	27 Dec 06:00	2 Jan 18:45	18.33	0.00	0.00	0.00
Transit FWR to Minke Whale Research Area	2 Jan 18:45	4 Jan 06:00	4.58	0.00	0.00	0.00
Minke Whale Research Area	4 Jan 06:00	13 Feb 18:00	87.59	1.00	2.17	3.47
Transit MWR to intercept of South African EEZ	13 Feb 18:00	20 Feb 18:50	6.84	0.00	0.00	0.00
Total	-	-	139.30	1.00	2.17	3.47

Table 3. Number of sightings for all species (Groups/Animals) observed within the Minke Whale Research Area in each effort mode.

Species	BT Big eye		BT Option 2		SS (Abeam closure from IO)		SZ (Abeam closure from NSP)		BB		NSC		OE		Total	
	G	A	G	A	G	A	G	A	G	A			G	A	G	A
Minke (Antarctic)	229	755	93	344	145	496	38	123	20	48	5	7	4	13	534	1786
Minke (like Antarctic)	-	-	-	-	-	-	-	-			1	1	-	-	1	1
Minke (undetermined)	44	119	23	117	33	59	10	33	6	59	-	-	-	-	116	387
Like minke	33	65	30	101	10	12	7	26	5	13	-	-	-	-	85	217
Blue (true)	13	21	3	20	11	20	3	8	5	5	3	7	13	36	51	117
Blue (undetermined)	-	-	-	-	-	-	-	-	-	-	-	-	2	4	2	4
Like blue	1	1	-	-	1	4	1	3	-	-	-	-	1	2	4	10
Fin	1	2	-	-	-	-	1	1	-	-			-	-	2	3
Humpback	16*	31*	1	3	6	11	3	6	1	2	-	-	3	5	30*	58*
Like humpback	2	3	-	-	-	-	1	1	-	-	-	-	-	-	3	4
Sperm	25	25	-	-	-	-	3	3	2	2	-	-	-	-	30	30
Like sperm	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Killer (type B)	3	30	-	-	-	-	1	3	1	7	-	-	-	-	5	40
Killer (type undetermined)	-	-	-	-	1	5	-	-	-	-	-	-	-	-	1	5
Southern bottlenose	12	21	-	-	1	1	2	2	-	-	-	-	1	2	16	26
Like so. bottlenose	2	3	-	-	-	-	-	-	-	-	-	-	-	-	2	3
Ziphiid	3	8	-	-	-	-	2	3	-	-	-	-	-	-	5	11
Unid. large baleen	14	19	1	2	2	6	2	5	1	2	-	-	-	-	20	34
Unid. large whale	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	2
Unid. small whale	4	9	1	3	-	-	-	-	-	-	-	-	-	-	5	12
Unid. whale	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1	1

* including one dead whale.

Table 4. Number of sightings for all species (Groups/Animals) observed in the Fin Whale Research Area in each effort mode.

Species	NSC		OE		Total	
	G	A	G	A	G	A
Blue (true)	1	1	-	-	1	1
Fin	14	39	2	4	16	43
Humpback	45	89	8	13	53	102
Like humpback	-	-	1	1	1	1
So. bottlenose whale	3	5	1	2	4	7
Like southern bottlenose	1	2	-	-	1	2
Layard's beaked whale	1	6	-	-	1	6
Unid. large baleen	1	5	-	-	1	5

Table 5. Number of sightings for all species (Groups/Animals) observed during transit between Cape Town and the Fin Whale Research Area in each effort mode.

Species	NSC		OE		Total	
	G	A	G	A	G	A
Fin	4	9	2	4	6	13
Sei	1	1	-	-	1	1
Humpback	4	6	-	-	4	6
Minke (Antarctic)	1	1	-	-	1	1
Killer (type undetermined)	1	35	-	-	1	35
Southern bottlenose	2	6	1	2	3	8
Hourglass dolphin	1	7	-	-	1	7
Ziphiid	2	4	-	-	2	4
Unidentified large baleen whale	1	2	1	1	2	3
Unidentified whale	2	2	-	-	2	2

Table 6. Number of sightings for all species (Groups/Animals) observed during transit from the Fin Whale Research Area to the Minke Whale Research Area.

Species	NSC		Total	
	G	A	G	A
Blue (true)	1	3	1	3
Humpback	4	8	4	8
Minke (Antarctic)	1	1	1	1

Table 7. Number of sightings for all species (Groups/Animals) observed during the transit from the Minke Whale Research Area to Cape Town, in each effort mode.

Species	NSC		BB		OE		Total	
	G	A	G	G	G	A	G	A
Humpback	9	64	14	30	1	4	24	98
'Like humpback'	-	-	1	1	-	-	1	1
So. bottlenose whale	1	1	-	-	-	-	1	1
Hourglass dolphin	-	-	-	-	1	6	1	6
Unid. large baleen whale	1	2	2	4	-	-	3	6

Table 8. Number of sightings for all species (Groups/Animals) observed in the EEZ of South Africa during the transits: from Cape Town to the Fin Whale Research Area and from the Minke Whale research Area to Cape Town, in each effort mode.

Species	NSC		OE		Total	
	G	A	G	A	G	A
Transit from Cape Town to the Research Areas						
Humpback whale	1	1	-	-	1	1
Transit from the Research Areas to Cape Town						
No sightings	-	-	-	-	-	-

Table 9. Number of sightings for all species (Groups/Animals) observed during the transit between the boundary of the EEZ of South Africa and the intercept of the Norwegian EEZ surrounding Bouvet Island, in each effort mode.

Species	NSC		OE		Total	
	G	A	G	A	G	A
Fin	2	4	1	1	3	5
Sei	1	1	-	-	1	1
Humpback	1	2	-	-	1	2
So. bottlenose whale	1	4	-	-	1	4
Hourglass dolphin	1	7	-	-	1	7
Mesoplodon sp.	1	1	-	-	1	1
Unid. large baleen	1	2	1	1	2	3

Table 10. Number of sightings for all species (Groups/Animals) observed in the Norwegian EEZ surrounding Bouvet Island, in each effort mode.

Species	NSC		OE		Total	
	G	A	G	A	G	A
Blue (true)	1	1	-	-	1	1
Fin	16	44	3	7	19	51
Humpback	43	87	9	13	52	100
Like humpback	-	-	1	1	1	1
Minke (Antarctic)	1	1	-	-	1	1
Killer (type undetermined)	1	35	-	-	1	35
So. bottlenose whale	4	7	2	4	6	11
Layard's beaked whale	1	6	-	-	1	6
Ziphiid	2	4	-	-	2	4
Unid. large baleen	1	5	-	-	1	5
Unid. whale	2	2	-	-	2	2

Table 11. Summary of all sightings (Groups/Animals) observed during the entire cruise.

Species	Total	
	G	A
Minke (Antarctic)	536	1788
Minke (like Antarctic)	1	1
Minke (undetermined)	116	387
Like minke	85	217
Blue (true)	53	121
Blue (undetermined)	2	4
Like blue	4	10
Fin	24	59
Sei	1	1
Humpback	115	272
Like humpback	5	6
Sperm	30	30
Like sperm	1	1
Killer (type B)	5	40
Killer (type undetermined)	2	40
Southern bottlenose	9	21
Like so. bottlenose	3	5
Layard's beaked whale	1	6
Hourglass dolphin	2	13
Ziphiid	7	15
Unid. large baleen	26	48
Unid. large whale	2	2
Unid. small whale	5	12
Unid. whale	3	3

Table 12. Results of the biopsy sampling in 2006-2007. System: L=Larsen gun P=Paxarms gun. Note that some whales were sampled simultaneously with two or three darts (double or triple hit), while some whales were sampled twice during the course of the biopsy session (resulting in two biopsy sample numbers for the same whale).

Species & Date	Sight No.	School Size	No. of Whales Sampled	No. of Samples	System	Sample Numbers	Comments
Blue (true)							
03 January	005	3	1	2	L	07011052	052 double-hit
04 January	012	2	1	1	L	07011053	
05 January	007	1	1	1	L	07011054	
05 January	010	4	2	3	L, P	07011055, 07011056	055 double-hit
05 January	017	2	2	5	L, P	07011057, 07011058	057 double-hit, 058 triple-hit
05 January	019	5	1	2	L	07011059, 07011060	
06 January	004	1	1	1	L	07011061	
07 January	001	2	1	2	L	07011063, 07011064	
08 January	001	1	1	2	L	07011065	Samples from 2 approaches
08 January	004	1	1	2	L	07011066	066 double-hit
08 January	005	1	1	1	L	07011067	
08 January	011	2	1	3	L, P	07011068	068 triple-hit
09 January	005	5	5	5	L, P	07011069, 07011070, 07011071, 07011072, 07011073	
09 January	007	2	2	2	L, P	07011074, 07011075	
10 January	001	1	1	2	L	07011076	076 double-hit
12 January	005	2	1	1	L	07011085	Sighting 005 approached before 007
12 January	007	1	1	2	L, P	07011084	084 double-hit
12 January	009	1	1	2	L	07011089	
13 January	012	1	1	1	L	07011087	
13 January	015	1	1	1	P	07011088	
30 January	026	6	2	6	L	07011092, 07011093, 07011094	092 double-hit, 093 double-hit, 094 double-hit
31 January	025	5	3	9	L, P	07011095, 07011096, 07011097, 07011098, 07011099	095 double-hit, 096 double-hit, 097 triple-hit
05 February	041	11	7	9	L	07011101, 07011102, 07011103, 07011104, 07011105, 07011106, 07011107	144 double-hit, 145 double-hit
06 February	002	2	2	2	L	07011108, 07011109	
06 February	004	2	2	3	L	07011110, 07011111	010 double-hit
06 February	008	1	1	1	L	07011112	
06 February	010	2	1	2	L, P	07011113	113 double-hit
06 February	011	4	4	7	L, P	07011114, 07011115, 07011116, 0701117, 07011118, 07071119	114 double-hit
07 February	001	2	1	1	L	07011120	

Table 12 continued. Results of the biopsy sampling in 2006-2007.

Species & Date	Sight No.	School Size	No. of Whales Sampled	No. of Samples	System	Sample Numbers	Comments
07 February	002	7	3	5	L, P	07011121, 07011122, 07011123, 07011124	124 double-hit
07 February	003	5	5	9	L, P	07011125, 07011126, 07011127, 07011128, 07011129, 07011130	125 triple-hit, 128 triple hit
08 February	001	2	2	5	L, P	07011135, 07011136	135 double-hit, 136 triple-hit
08 February	002	1	1	1	L	07011137	
08 February	005	5	5	8	L, P	07011138, 07011139, 07011140, 07011141, 07011142, 07011143, 07011144	138 double-hit
08 February	011	6	5	11	L, P	07011145, 07011146, 07011147, 07011148, 07011149, 07011150, 07011151	148 triple-hit, 149 triple-hit
09 February	025	1	1	1	L	07011152	
Total			**72**	**121**			
Fin							
24 December	008	2	1	1	L	07021003	
26 December	001	3	2	2	L	07021004, 07021005	
26 December	002	3	1	1	L	07021006	
27 December	020	8	3	6	L	07021014, 07021015, 07021016, 07021017	014 & 015 double-hit
27 December	025	3	3	3	L	07021019, 07021020, 07021021	
27 December	027	5	1	1	L	07021018	Sighting 027 approached prior to 025
30 December	003	9	2	2	L	07021030, 07021031	
12 January	010	2	1	1	L	07021086	
13 February	001	1	1	1	L	07021153	
Total			**15**	**18**			
Humpback							
24 December	005	2	2	2	L	07071001, 07071002	Mother/calf
26 December	013	2	2	2	L	07071007, 07071008	Mother/calf
27 December	002	3	1	1	L	07071009	
27 December	004	2	2	3	L	07071010, 07071011	011 double-hit
27 December	005	2	2	2	L	07071012, 07071013	Mother/calf
28 December	001	2	1	1	L	07071022	
28 December	002	2	1	1	L	07071023	
28 December	004	2	1	1	L	07071024	
28 December	011	1	1	1	L	07071025	
28 December	014	2	2	3	L	07071026, 07071027	026 double-hit
28 December	017	2	1	2	L	07071028, 07071029	

Table 12 continued. Results of the biopsy sampling in 2006-2007.

Species & Date	Sight No.	School Size	No. of Whales Sampled	No. of Samples	System	Sample Numbers	Comments
30 December	009	8	3	5	L	07071032, 07071033, 07071034 , 07071035, 07071036	
30 December	017	3	2	3	L	07071037, 07071038	037 double-hit
01 January	001	3	2	2	L	07071039, 07071040	
01 January	002	2	2	4	L, P	07071041, 07071042, 07071043	042 double-hit
02 January	003	2	2	4	L, P	07071044, 07071045	045 triple-hit
03 January	001	2	2	4	L, P	07071046, 07071047, 07071048	046 double-hit
03 January	002	2	2	2	L	07071049, 07071050	
03 January	003	2	1	1	L	07071051	
06 January	016	2	1	1	L	07071062	
10 January	002	2	2	3	L, P	07071077, 07071078	078 double-hit
11 January	007	3	2	4	L, P	07071079, 07071080, 07071081	081 double-hit
11 January	008	2	2	2	L	07071082, 07071083	
14 January	009	2	1	2	L	07071090	
26 January	036	1	1	1	P	07071091	Dead whale
03 February	027	3	1	1	L	07071100	
07 February	006	2	2	3	L	07071132, 07071133, 07071134	
13 February	003	2	1	1	L	07071154	
14 February	002	3	3	4	L	07071155, 07071156, 07071157	057 double-hit
14 February	003	2	1	1	L	07071158	
14 February	006	2	2	2	L, P	07071159, 07071160	
14 February	010	43	20	25	L, P	07071161, 07071162, 07071163, 07071164, 07071165, 07071166, 07071167, 07071168, 07071169, 07071170, 07071171, 07071172, 07071173, 07071174, 07071175, 07071176, 07071177, 07071178, 07071179, 07071180, 07071181, 07071182, 070711083, 0707184	071 double-hit; duplicates possible in this group of samples
15 February	001	2	1	1	L	07071185	
Total			**72**	**95**			
Killer whale							
07 February	007	7	**1**	**2**	L	07101131	131 double-hit

Table 13. Summary of the photo-identification images collected in 2006-2007.

Species	No. of Groups Photographed	No. of Identifiable Whales Photographed
Blue (true)	49	114
Fin	14	43
Humpback	60	160
Minke (Antarctic)	73	150
Sperm	1	1
Killer whale (type B)	5	-
Killer whale (type undetermined)	1	-
Total	**203**	**468**

Table 14. Minke whale and 'like minke whale' sightings detected by the big eye (25X) binoculars during BT mode.

Date	Sighting No.	Cue	Radial Distance (nmiles)	Species	Confirmed Group Size	Detected by Top (Y/N)
05 January	005	Body	1.00	Minke (Antarctic)	2	N
06 January	003	Body	1.38	Minke (Antarctic)	3	N
06 January	006	Body	3.97	Minke (Antarctic)	5	N
06 January	008	Body	2.77	Minke (Antarctic)	2	Y
06 January	018	Body	0.46	Minke (Antarctic)	1	N
06 January	019	Body	0.98	Minke (Antarctic)	2	N
09 January	015	Body	2.77	Minke (Antarctic)	2	Y
09 January	019	Body	1.69	Minke (Antarctic)	1	Y
09 January	024	Splash	0.39	Minke (Antarctic)	2	N
11 January	004	Body	0.81	Minke (Antarctic)	2	N
14 January	019	Blow/body	3.55	Minke (Antarctic)	5	Y
14 January	025	Blow	1.69	Minke (Antarctic)	3	Y
16 January	009	Body	0.42	Minke (Antarctic)	1	N
16 January	013	Blow	2.44	Minke (Antarctic)	3	N
16 January	015	Body	3.23	Minke (Antarctic)	5	Y
16 January	018	Body	2.44	Minke (Antarctic)	7	Y
16 January	027	Blow/body	1.69	Minke (Antarctic)	2	Y
16 January	029	Blow	3.23	Minke (Antarctic)	2	N
18 January	003	Body	2.97	Minke (Antarctic)	4	Y
18 January	007	Body	3.55	Minke (Antarctic)	2	Y
18 January	011	Blow	2.77	Minke (Antarctic)	7	N
18 January	015	Body	4.62	Minke (Antarctic)	2	Y
18 January	016	Body	1.12	Minke (Antarctic)	1	N
18 January	029	Body	1.75	Minke (Antarctic)	5	N
18 January	036	Body	4.62	Minke (Antarctic)	2	N
18 January	040	Body	2.19	Minke (Antarctic)	2	N
18 January	044	Body	2.19	Minke (Antarctic)	2	N
18 January	049	Body	3.55	Minke (Antarctic)	2	N
18 January	051	Blow	6.80	Minke (Antarctic)	4	Y
18 January	055	Blow	6.80	'Like minke'	4	N
18 January	063	Blow/body	6.50	Minke (Antarctic)	4	Y
20 January	009	Blow	3.55	Minke (Antarctic)	7	Y
20 January	015	Blow	3.55	Minke (Antarctic)	17	Y
20 January	018	Blow	3.23	Minke (Antarctic)	5	N
20 January	022	Blow	3.97	Minke (Antarctic)	1	N
20 January	046	Body	1.27	Minke (Antarctic)	1	N
20 January	047	Body	2.77	Minke (Antarctic)	5	Y
20 January	052	Blow	5.14	Minke (Antarctic)	18	N
22 January	003	Blow/body	3.23	Minke (Antarctic)	1	Y
22 January	013	Blow	3.55	Minke (Antarctic)	8	Y
22 January	019	Blow	6.69	Minke (Antarctic)	5	Y
22 January	031	Body	3.55	Minke (Antarctic)	1	N
26 January	009	Blow/body	1.60	Minke (Antarctic)	3	Y
26 January	012	Body	2.77	Minke (Antarctic)	1	Y
26 January	015	Body	1.99	Minke (Antarctic)	3	Y
26 January	020	Body	6.69	Minke (Antarctic)	4	Y
26 January	021	Body	3.23	Minke (Antarctic)	1	N
26 January	037	Body	3.55	Minke (Antarctic)	1	N
26 January	041	Body	3.23	Minke (Antarctic)	2	Y
26 January	044	Body	4.62	Minke (Antarctic)	4	N

Table 14 continued. Minke whale and 'like minke whale' sightings detected by the big eye (25X) binoculars during BT mode.

Date	Sighting No.	Cue	Radial Distance (nmiles)	Species	Confirmed Group Size	Detected by Top (Y/N)
26 January	045	Body	2.77	Minke (Antarctic)	1	N
28 January	007	Blow	1.57	Minke (Antarctic)	4	Y
28 January	009	Blow	3.55	Minke (Antarctic)	4	Y
28 January	011	Blow	3.97	Minke (Antarctic)	4	Y
28 January	020	Blow	3.23	Minke (Antarctic)	5	Y
28 January	027	Body	1.82	Minke (Antarctic)	3	N
28 January	034	Blow	3.23	Minke (Antarctic)	1	N
31 January	015	Blow	2.30	Minke (Antarctic)	3	Y
31 January	021	Body	1.82	Minke (Antarctic)	6	Y
04 February	001	Blow	2.77	Minke (Antarctic)	3	N
04 February	005	Blow	2.59	'Like minke'	1	N
04 February	006	Blow	3.55	Minke (Antarctic)	4	Y
04 February	013	Blow	3.23	Minke (Antarctic)	25	Y
04 February	018	Blow	3.97	Minke (Antarctic)	7	Y
04 February	021	Blow	3.97	Minke (Antarctic)	3	Y
04 February	035	Blow	6.80	Minke (Antarctic)	3	N

Table 15. Sightings recorded with video and audio by the SCANS II system attached to 25X and 7X binoculars.

Binocular & Date	IWC Sighting No.	Logger Sighting No.	Species	Cue	Radial Distance (nmiles)
25X Binocular					
15 January	018	057	Sperm	Blow	3.97
15 January	021	058	Sperm	Blow	4.62
15 January	024	059	Sperm	Blow	6.50
15 January	028	060	So. bottlenose	Body	2.44
16 January	015	064	Minke (Antarctic)	Body	3.23
16 January	018	065	Minke (Antarctic)	Body	2.44
16 January	027	066	Minke (Antarctic)	Blow/body	1.69
16 January	029	068	Minke (Antarctic)	Blow	3.23
18 January	003	069	Minke (Antarctic)	Body	2.97
18 January	007	071	Minke (Antarctic)	Body	3.55
18 January	011	072	Minke (Antarctic)	Blow	2.77
18 January	015	074	Minke (Antarctic)	Body	4.62
18 January	016	075	Minke (Antarctic)	Body	1.12
18 January	029	077	Minke (Antarctic)	Body	1.75
18 January	036	079	Minke (Antarctic)	Body	4.62
18 January	040	081	Minke (Antarctic)	Body	2.19
18 January	044	082	Minke (Antarctic)	Body	2.19
18 January	049	084	Minke (Antarctic)	Body	3.55
18 January	051	085	Minke (Antarctic)	Blow	6.80
18 January	055	086	Like minke	Blow	6.80
18 January	063	087	Minke (Antarctic)	Blow/body	6.50
20 January	009	089	Minke (Antarctic)	Blow	3.55
20 January	015	093	Minke (Antarctic)	Blow	3.55
20 January	018	094	Minke (Antarctic)	Blow	3.23
20 January	022	096	Minke (Antarctic)	Blow	3.97
20 January	046	100	Minke (Antarctic)	Body	1.27
20 January	047	101	Minke (Antarctic)	Body	2.77
20 January	052	102	Minke (Antarctic)	Blow	5.14
22 January	003	105	Minke (Antarctic)	Blow/body	3.23
22 January	013	106	Minke (Antarctic)	Blow	3.55
22 January	019	107	Minke (Antarctic)	Blow	6.69
22 January	031	109	Minke (Antarctic)	Body	3.55
22 January	050	111	Unid. small whale	Blow	6.69
26 January	009	113	Minke (Antarctic)	Blow/body	1.60
26 January	012	114	Minke (Antarctic)	Body	2.77
26 January	015	115	Minke (Antarctic)	Body	1.99
26 January	020	116	Minke (Antarctic)	Body	6.69
26 January	021	117	Minke (Antarctic)	Body	3.23
26 January	024	118	Sperm	Body	1.75
26 January	037	119	Minke (Antarctic)	Body	3.55
26 January	039	120	Sperm	Body	3.55
26 January	041	121	Minke (Antarctic)	Body	3.23
26 January	044	122	Minke (Antarctic)	Body	4.62
26 January	045	123	Minke (Antarctic)	Body	2.77
28 January	007	125	Minke (Antarctic)	Blow	1.57
28 January	009	126	Minke (Antarctic)	Blow	3.55
28 January	011	127	Minke (Antarctic)	Blow	3.97

Table 15 continued. Sightings recorded with video and audio by the SCANS II system attached to 25X and 7X binoculars.

Binocular & Date	IWC Sighting No.	Logger Sighting No.	Species	Cue	Radial Distance (nmiles)
25X Binocular					
28 January	020	128	Minke (Antarctic)	Blow	3.23
31 January	015	132	Minke (Antarctic)	Blow	2.30
31 January	021	134	Minke (Antarctic)	Body	1.82
04 February	001	135	Minke (Antarctic)	Blow	2.77
04 February	005	136	Like minke	Blow	2.59
04 February	006	137	Minke (Antarctic)	Blow	3.55
04 February	013	138	Minke (Antarctic)	Blow	3.23
7X Binocular					
19 January	008	047	Minke (Antarctic)	Body	0.8
19 January	009	048	Minke (Antarctic)	Body	0.7
19 January	013	049	Minke (Antarctic)	Ring	0.6
19 January	029	050	Minke (Antarctic)	Body	3.4
19 January	031	051	Minke (Antarctic)	Body	2.2
19 January	033	053	Minke (Antarctic)	Body	3.6
19 January	035	054	Minke (Antarctic)	Body	1.6
19 January	039	056	Minke (Antarctic)	Body	3.1
19 January	041	057	Minke (Antarctic)	Body	2.1
19 January	045	059	Minke (Antarctic)	Body	3.5
19 January	051	060	Minke (Antarctic)	Body	1.7
19 January	053	061	Minke (Antarctic)	Body	2.9
19 January	057	063	Minke (Antarctic)	Body	3.5
19 January	058	064	Minke (Antarctic)	Blow	3.6
19 January	061	065	Minke (Antarctic)	Blow	2.7
21 January	012	067	Minke (Antarctic)	Blow	1.2
21 January	015	068	Minke (Antarctic)	Blow	2.4
21 January	017	069	Minke (Antarctic)	Blow	2.9
21 January	025	070	Minke (Antarctic)	Blow	2.3
21 January	030	071	Minke (Antarctic)	Blow	0.7
21 January	031	072	Minke (Antarctic)	Blow	1.5
21 January	034	075	Like minke	Blow	3.5
21 January	041	076	Minke (Antarctic)	Blow/body	0.5
09 February	009	218	Minke (Antarctic)	Blow	3.3

Table 16. Summary of video recording of blue whale sightings during 2006-2007.

Date	Sighting number	Group size	Numbers of animals recorded	Taped time (hour:min:sec)	Tape number
30-Dec-06	014	1	1	0:10:20	1
3-Jan-07	005	3	3	0:26:25	1
4-Jan-07	004	1	1	0:14:47	1
4-Jan-07	007	2	2	0:40:56	2
4-Jan-07	012	2	2	0:00:59	2
5-Jan-07	007	1	1	0:14:50	2
5-Jan-07	010	4	2	0:12:07	3
5-Jan-07	017	2	2	0:10:20	3
5-Jan-07	019	5	2	0:16:25	3
6-Jan-07	004	1	1	0:15:38	3
7-Jan-07	001	2	2	0:10:27	4
7-Jan-07	003	1	1	0:28:48	4
8-Jan-07	001	1	1	0:14:12	4
8-Jan-07	004	1	1	0:04:07	5
8-Jan-07	005	1	1	0:05:50	5
8-Jan-07	006	1	1	0:03:30	5
8-Jan-07	016	1	1	0:02:00	5
8-Jan-07	011	1	1	0:04:33	5
9-Jan-07	001	5	5	0:19:07	5
9-Jan-07	007	2	2	0:15:43	5
10-Jan-07	001	1	1	0:06:10	6
12-Jan-07	007	1	1	0:06:18	6
12-Jan-07	005	2	2	0:05:15	6
12-Jan-07	009	1	1	0:05:54	6
13-Jan-07	012	1	1	0:03:56	6
13-Jan-07	015	1	1	0:07:30	6
30-Jan-07	026	6	6	0:15:37	6
31-Jan-07	025	5	4	0:19:58	7
5-Feb-07	039	3	1	0:09:03	7
5-Feb-07	041	11	11	1:06:01	7, 8
6-Feb-07	002	2	2	0:08:38	8
6-Feb-07	004	1	1	0:06:24	9
6-Feb-07	008	1	1	0:13:05	9
6-Feb-07	001	2	2	0:03:53	9
6-Feb-07	010	2	1	0:08:35	9
6-Feb-07	007	1	1	0:15:48	9
6-Feb-07	011	4	4	0:09:30	9
7-Feb-07	001	2	2	0:06:22	10
7-Feb-07	002	7	7	0:22:11	10
7-Feb-07	003	5	5	0:15:30	10
8-Feb-07	001	2	2	0:09:34	10
8-Feb-07	002	1	1	0:01:57	10
8-Feb-07	003	3	1	0:00:44	11
8-Feb-07	005, 009, 010	5	5	0:22:48	11
8-Feb-07	011	6	6	0:21:25	11
9-Feb-07	011	1	1	0:01:22	11
9-Feb-07	025	1	1	0:06:38	11
			Total time(hour:min:sec)	9:51:10	

Table 17. Summary of Acoustics Recording during 2006-2007.

Date	**Station**	**Position**		**Time Monitored**	**Bio-Sounds Heard (species)**	**Details of the most prominent blue whale sounds[7]**			
YYMMDD		**Latitude (S)**	**Longitude (E)**	**(HH:MM:SS)**		*Very strong downsweep*	*Strong downsweep*	*Very strong 28 Hz tone*	*Strong 28 Hz tone*
06/12/29	1	56°45.07'	001°50.60'	2:07:00	Fin, Humpback	-	-	-	-
06/12/30	2	56°11.24'	002°26.10'	3:04:00	Fin (strong)	-	-	-	-
06/12/30	3	55°59.88'	002°33.64'	1:56:00	Blue (very strong), Fin	1	1	0	0
07/01/02	4	60°49.67'	002°38.17'	1:40:00	Humpback	-	-	-	-
07/01/03	5	64°56.51'	001°13.57'	1:02:00	Blue (very strong) Humpback	3	0	0	0
07/01/04	6	68°11.00'	000°09.18'	0:51:00	Blue (faint), Humpback	0	0	0	0
07/01/04	7	68°20.02'	001°03.97'	0:55:00	Blue (faint), Humpback	0	0	0	0
07/01/04	8	68°16.82'	000°43.03'	1:02:00	Blue (faint), Humpback	0	0	0	0
07/01/04	9	68°07.59'	000°33.55'	1:23:00	Blue (faint), Humpback	0	0	0	0
07/01/05	10	68°03.58'	000°33.55'	4:03:00	Blue (strong), Humpback	0	3	0	0
07/01/05	11	68°01.85'	001°16.07'	1:17:00	Blue (faint), Humpback	0	0	0	0
07/01/05	12	68°12.88'	001°25.48'	4:01:00	Blue (strong), Humpback	0	2	0	0
07/01/06	13	68°03.30'	001°42.85'	1:29:00	Blue (very strong), Humpback	1	1	0	0
07/01/07	14	67°33.84'	002°40.36'	1:21:00	Humpback				
07/01/07	15	67°44.43'	001°28.96'	1:03:00	Blue, Humpback	0	0	0	0
07/01/08	16	68°00.60'	000°09.58'	2:02:00	Blue, Humpback	0	0	0	0
07/01/08	17	68°09.95'	000°01.82'	0:13:00	No[8]				
07/01/08	18	68°11.15'	000°03.97'	1:28:00	Blue (strong 28Hz) Humpback	0	0	0	3

[7] Classified based on colour intensity of Ishmael display.
Strong downsweep and 28 Hz tone - dark red.
Very strong downweep - dark red with harmonics.

[8] Sonobuoy hydrophone noisy

Table 17 continued. Summary of Acoustics Recording during 2006-2007.

Date	Station	Position		Time Monitored	Bio-Sounds Heard (species)	Details of the most prominent blue whale sounds[7]			
YYMMDD		Latitude (S)	Longitude (E)	(HH:MM:SS)		*Very strong downsweep*	*Strong downsweep*	*Very strong 28 Hz tone*	*Strong 28 Hz tone*
07/01/08	19	68°17.91'	000°02.35'	1:00:00	Blue, Humpback	0	0	0	0
07/01/08	20	68°25.21'	000°05.58'	0:12:00	No[8]	-	-	-	-
07/01/08	21	68°41.21'	000°26.18'	0:13:00	No[8]	-	-	-	-
07/01/08	22	68°41.18'	000°25.62'	4:00:00	Blue (very strong), Humpback, Sperm	62	52	2	4
07/01/09	23	68°47.71'	000°47.10'	3:01:00	Blue, Humpback	0	2	0	0
07/01/10	24	68°16.97'	000°51.80'	0:13:00	No[8]				
07/01/10	25	68°17.35'	000°55.77'	1:20:00	Blue, Humpback	0	0	0	0
07/01/12	26	67°49.75'	003°40.73'	1:29:00	Blue, Humpback, unknown	0	0	0	0
07/01/12	27	67°38.79'	004°39.01'	1:04:00	Blue (faint), Humpback	0	0	0	0
07/01/12	28	67°37.38'	004°43.68'	2:50:00	Blue, Humpback, Sperm, Seals	0	0	0	0
07/01/13	29	67°24.11'	007°43.59'	1:24:00	Blue, Humpback, Sperm, Seals	0	0	0	0
07/01/13	30	67°41.60'	008°57.25'	0:02:00	No[8]	-	-	-	-
07/01/13	31	67°42.89'	008°58.01'	1:20:00	Blue (faint), Humpback Sperm, Seals	0	0	0	0
07/01/27	32	69°03.82'	010°13.56'	2:27:00	Seal				
07/01/30	33	68°22.60'	010°51.14'	1:00:00	Blue	0	0	0	0
07/01/30	34	68°35.72'	011°02.45'	1:09:00	Blue	0	0	0	0

[7] Classified based on colour intensity of Ishmael display.
Strong downsweep and 28 Hz tone - dark red.
Very strong downweep - dark red with harmonics.
[8] Sonobuoy hydrophone noisy

Table 17 continued. Summary of Acoustics Recording during 2006-2007.

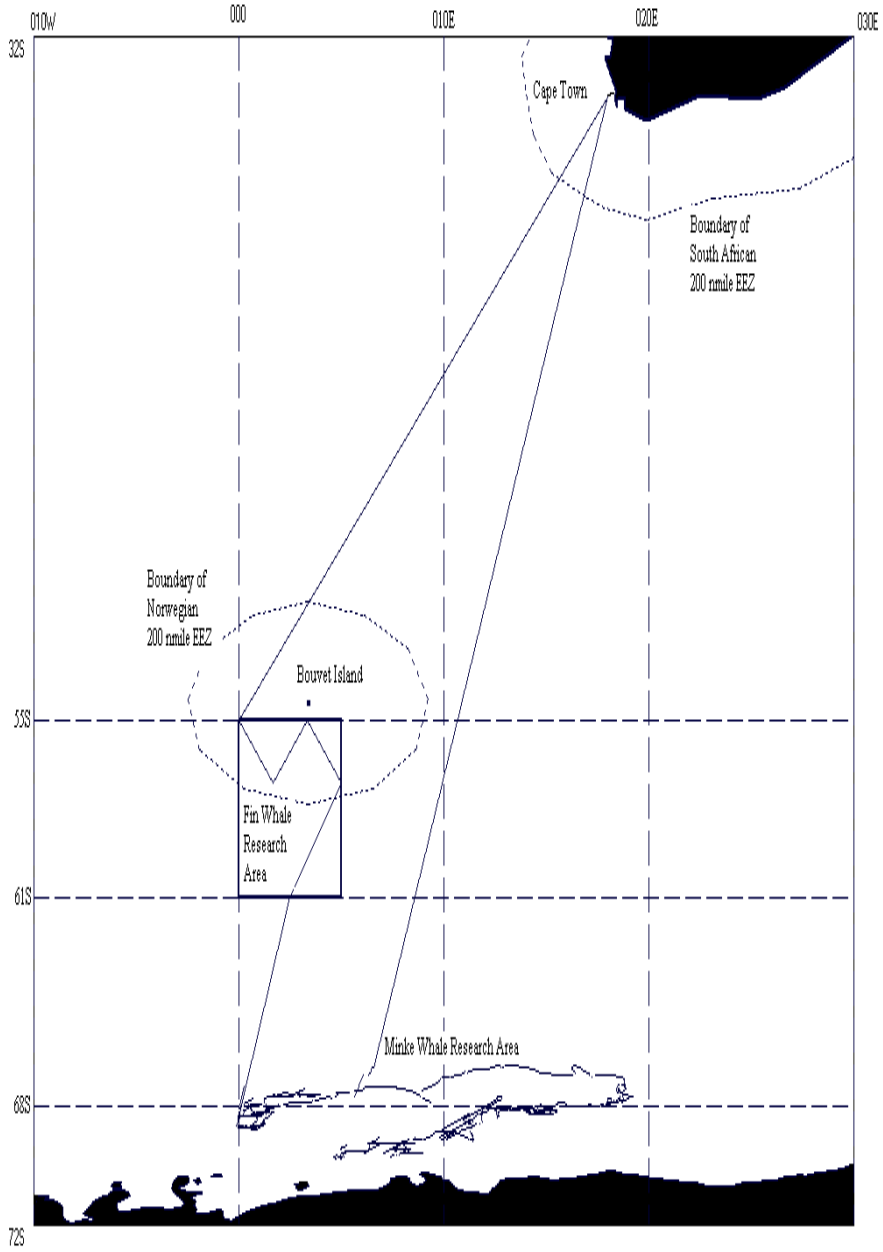
Date	**Station**	**Position**		**Time Monitored**	**Bio-Sounds Heard (species)**	**Details of the most prominent blue whale sounds**[7]			
YYMMDD		**Latitude (S)**	**Longitude (E)**	**(HH:MM:SS)**		*Very strong downsweep*	*Strong downsweep*	*Very strong 28 Hz tone*	*Strong 28 Hz tone*
07/01/30	35	68°35.61'	011°37.23'	2:02:00	Blue (3 strong calls)	0	3	0	0
07/01/31	36	69°17.11'	008°21.21'	2:03:00	Blue (faint 28Hz), Seals	0	0	0	0
07/01/31	37	69°12.32'	007°57.00'	1:44:00	Blue (faint)	0	0	0	0
07/02/04	38	69°42.48'	007°26.89'	0:15:00	Nil	-	-	-	-
07/02/05	39	69°06.23'	008°18.50'	1:54:00	Blue (very strong calls)	7	0	0	0
07/02/05	40	69°06.59'	008°06.79'	1:17:00	Blue (strong calls)	0	4	0	0
07/02/05	41	69°12.63'	008°02.13'	2:16:00	Blue (very strong calls)	1	5	1	0
07/02/05	42	69°16.56'	007°53.00'	3:04:00	Blue (very strong calls)	2	4	0	0
07/02/06	43	69°18.92'	007°12.89'	1:15:00	Blue (very strong calls)	13	22	0	0
07/02/06	44	69°22.39'	006°59.17'	1:41:00	Blue (very strong calls) Sperm	3	10	0	0
07/02/06	45	69°21.55'	006°01.62'	1:29:00	Blue (very strong calls)	13	16	0	0
07/02/06	46	69°24.44'	006°00.90'	0:16:00	Blue (strong calls)	0	15	0	0
07/02/06	47	69°23.49'	005°47.64'	0:44:00	Blue	0	0	0	0
07/02/06	48	69°22.30'	005°32.37'	1:20:00	Blue (strong calls)	0	2	0	0
07/02/07	49	69°24.59'	005°15.57'	1:31:00	Blue (very strong calls)	17	9	0	0
07/02/07	50	69°33.88'	005°37.75'	0:57:00	Blue (very strong calls)	2	5	0	0
07/02/07	51	69°43.73'	005°05.84'	0:28:00	Blue (faint)	0	0	0	0
07/02/08	52	69°52.72'	004°17.67'	1:14:00	Nil	-	-	-	-
07/02/08	53	69°49.17'	004°24.86'	2:02:00	Nil	-	-	-	-
07/02/08	54	69°40.64'	004°54.48'	3:57:00	Blue (strong 28Hz calls)	0	0	0	6
07/02/09	55	69°43.55'	005°08.86'	1:41:00	Nil				

[7] Classified based on colour intensity of Ishmael display.
Strong downsweep and 28 Hz tone - dark red.
Very strong downweep - dark red with harmonics.
[8] Sonobuoy hydrophone noisy

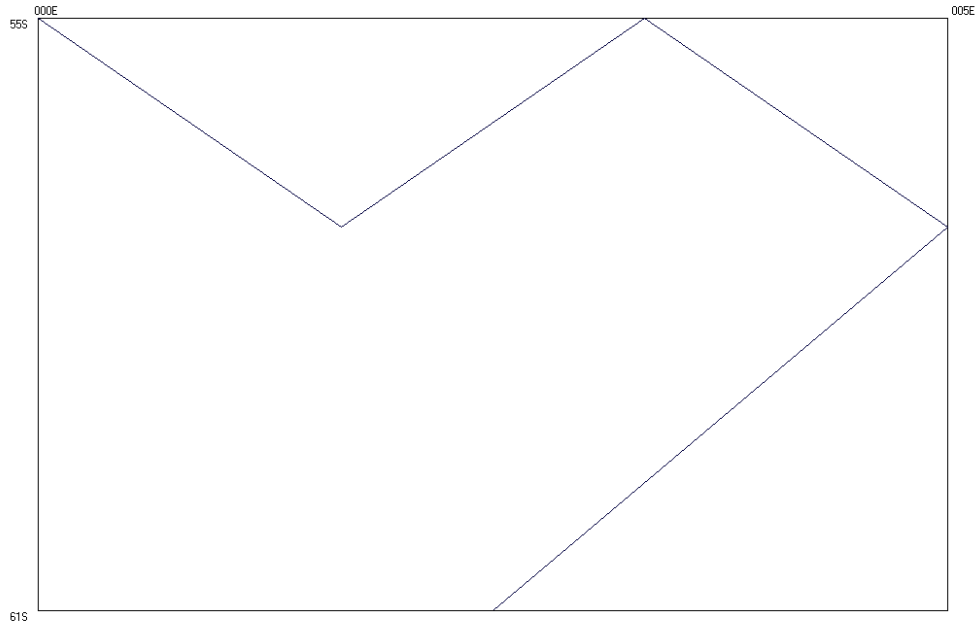
Table 18. Observations of marine debris south of the northern boundary of the Fin Whale Research Area (latitude 55°S) during 2006-2007.

Object	Date	Position	Size
Red fishing float	7 January	67°38'S 003°37'E	70 cm diameter
Red fishing float	26 January	67°53'S 012°30'E	1 m diameter

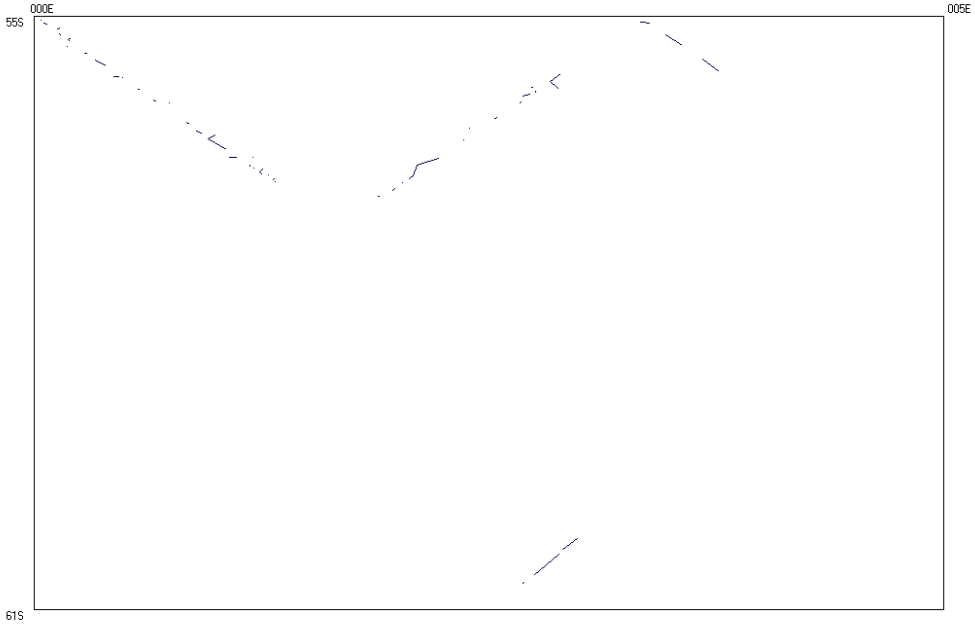
Figures 1a-d. Details of the cruisetracks. The black area represents land.



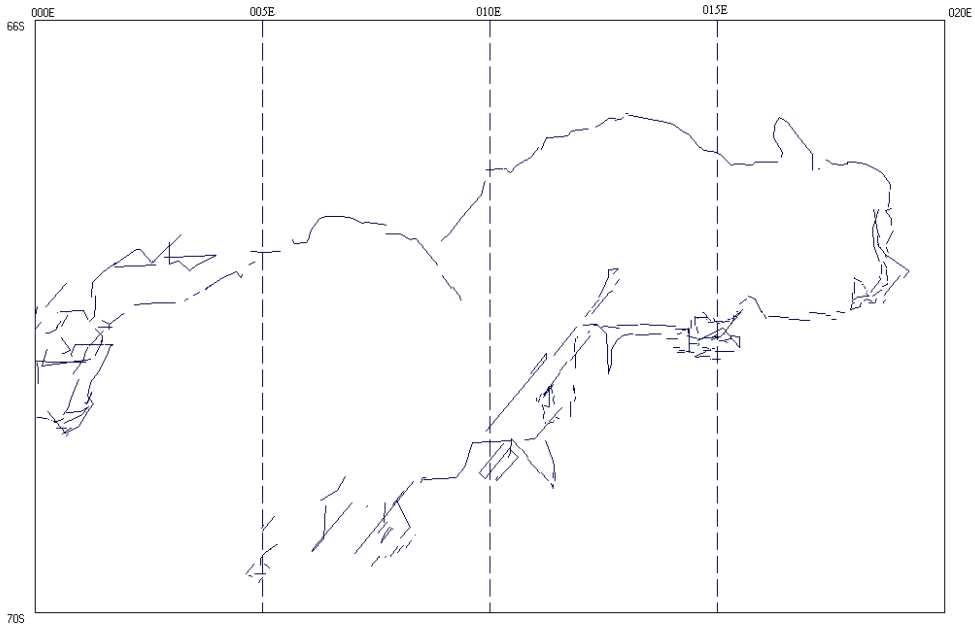
1a. The entire survey, including the transits to and from the Research Areas.



1b. The trackline design for the Fin Whale Research Component.



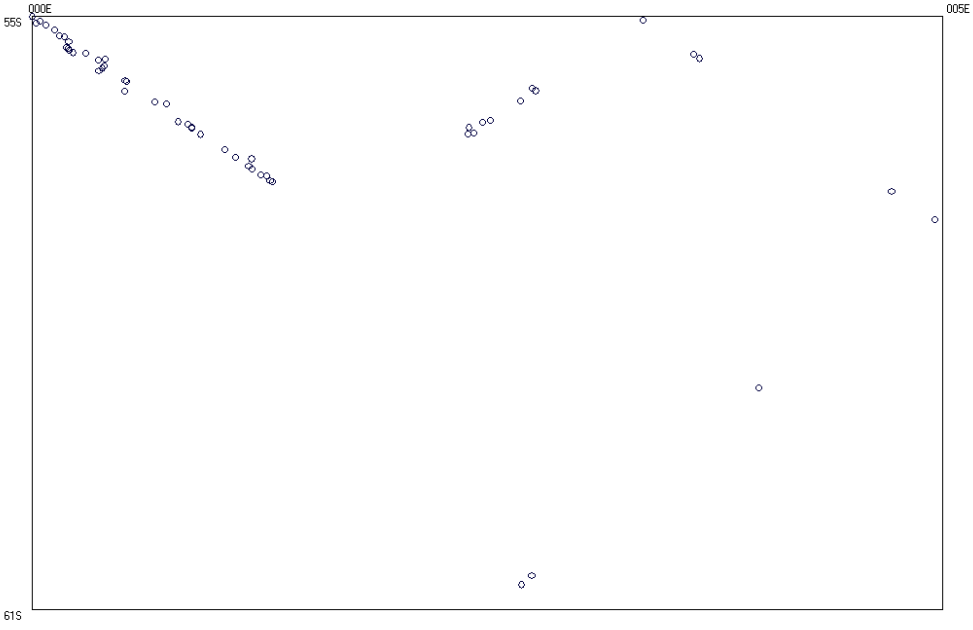
1c. Sections of the cruisetrack during the Fin Whale Research Component covered on search effort (all NSC mode).



1d. Sections of the cruisetrack during the Minke Whale Research Component covered on search effort. The extent of the pack ice is not shown as re-survey of some areas was conducted and the position of the ice edge changed substantially between surveys. The research was mainly conducted in the vicinity of the ice edge, thus the position of the ice edge at the time of survey is indicated approximately by the tracklines.

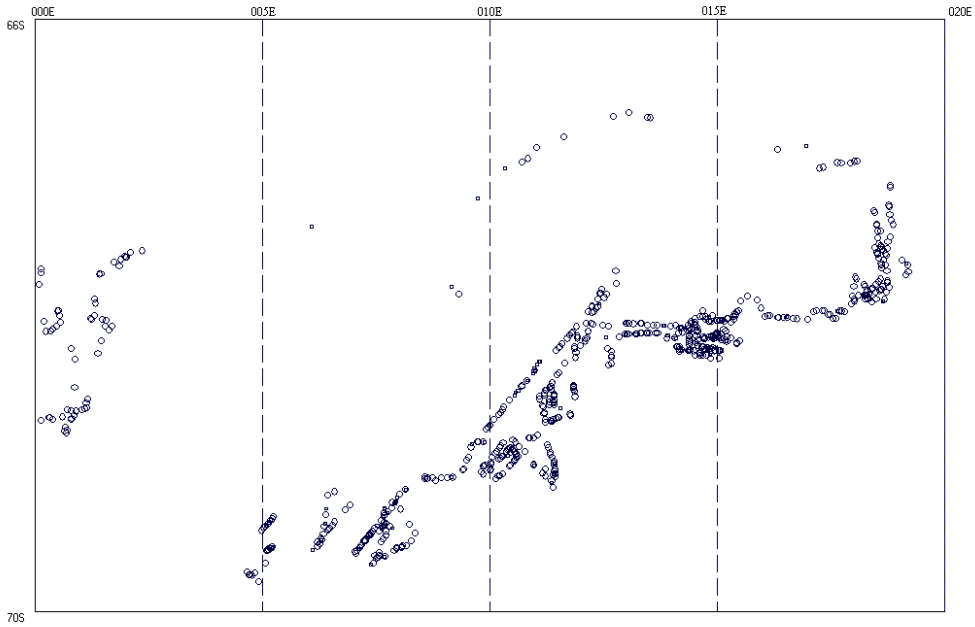
Figures 2a-b. Positions of whale sightings in the Fin Whale Research Area.

2 a. Positions of fin whale (O), true blue whale (●), southern bottlenose whale (□) and Layard's beaked whale (■) observed in the Fin Whale Research Area.

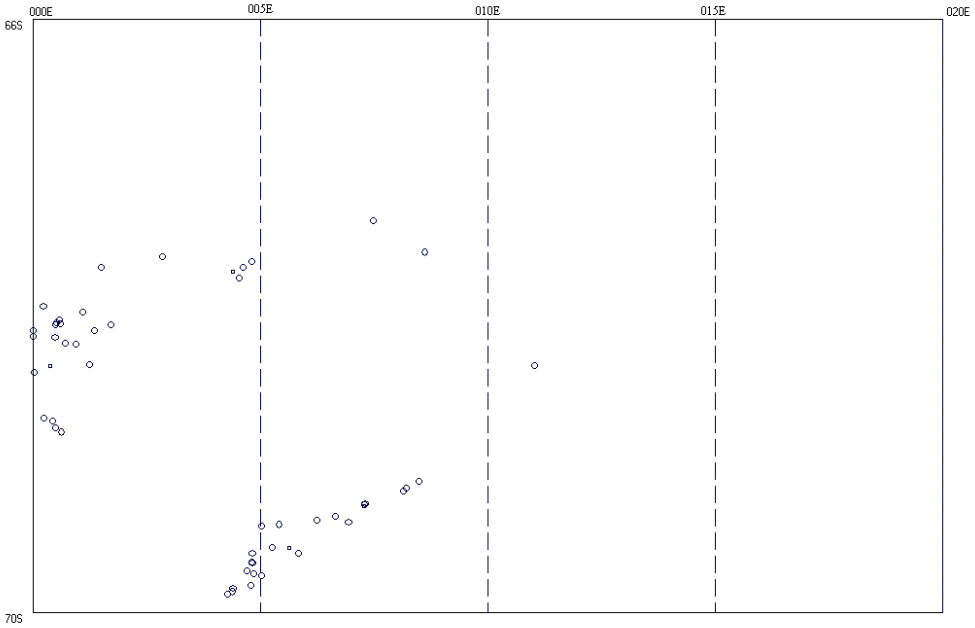


2 b. Positions of Humpback whale (O) observed in the Fin Whale Research Area.

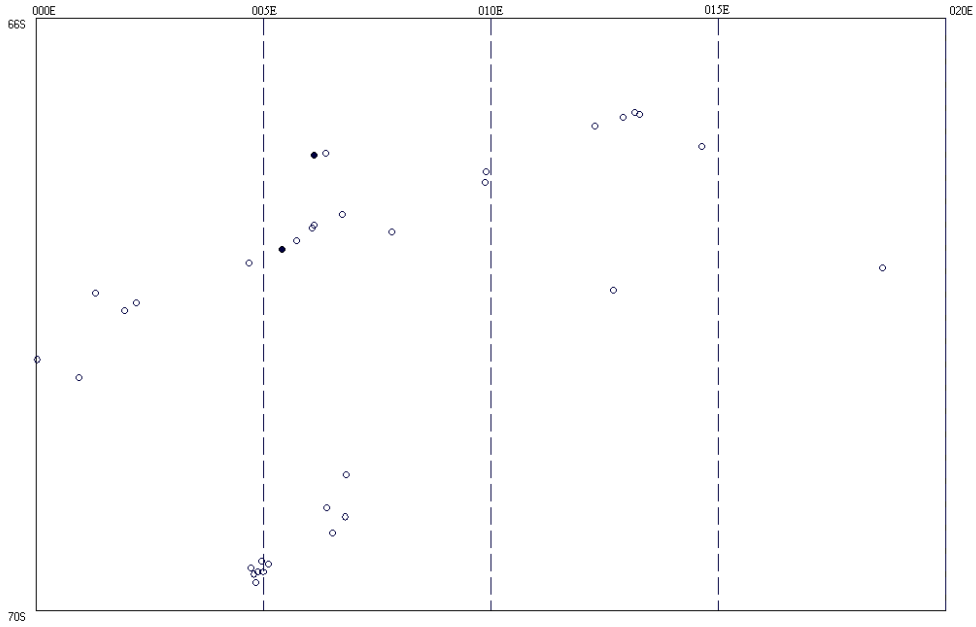
Figures 2c-f. Positions of whale sightings in the Minke Whale Research Area.



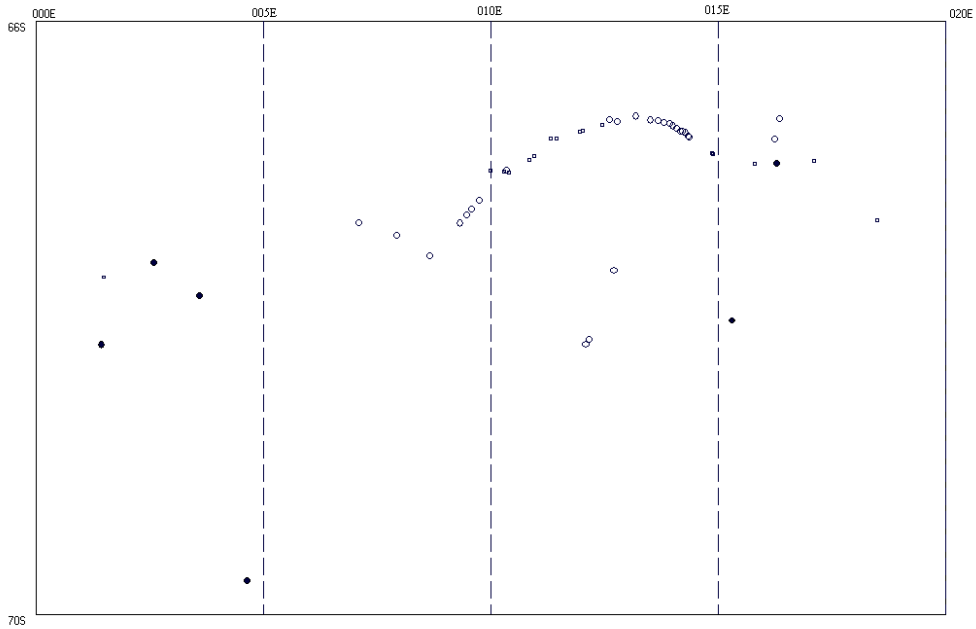
2c. Positions of minke whale (O) and 'like minke whale' (□) sightings in the Minke Whale Research Area.



2d. Positions of blue whale (blue - true and undetermined) (O) and 'like blue whale' (□) observed in the Minke Whale Research Area.



2e. Positions of humpback whale (O) and fin whale (●) observed in the Minke Whale Research Area.



2f. Positions of sperm whale (O), southern bottlenose whale (□) and killer whale (●) observed in the Minke Whale Research Area.

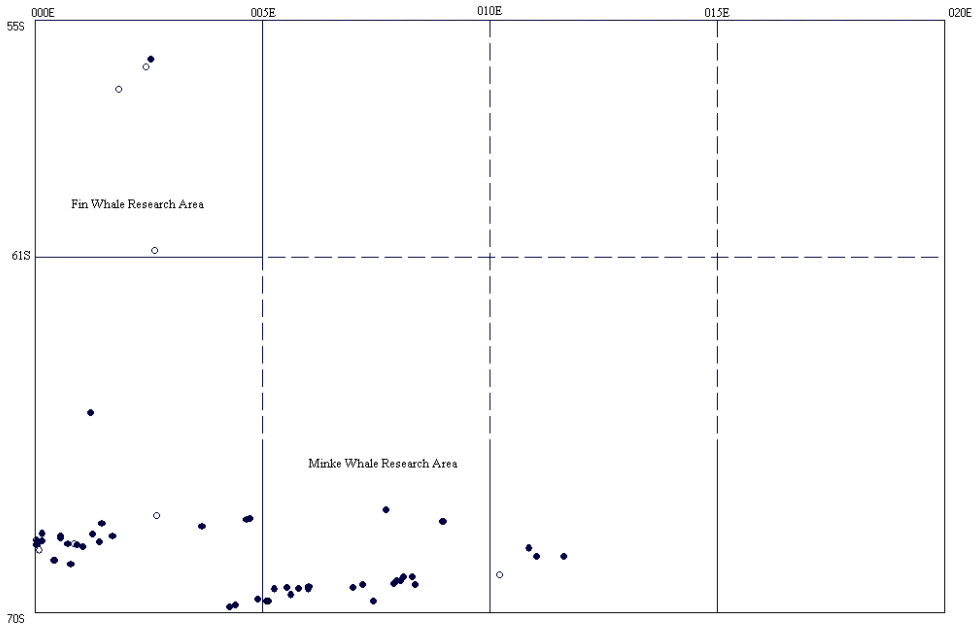


Figure 3. Locations of all acoustic recording stations during 2006-2007. Stations with blue whale acoustic detections (●) and stations with no blue whale acoustic detections (O).

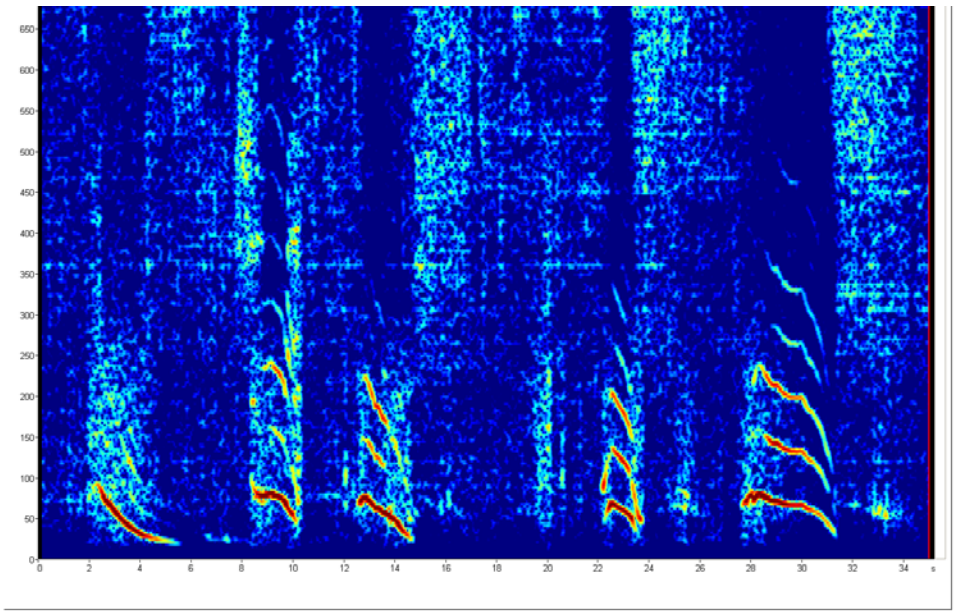


Figure 4a. Spectrogram of five very loud downsweeps calls from blue whales. Station # 49, 7 February 2007, position 69°25'S 005°16'E. (FET 16384 pts, 87.5% overlap, Hanning window).

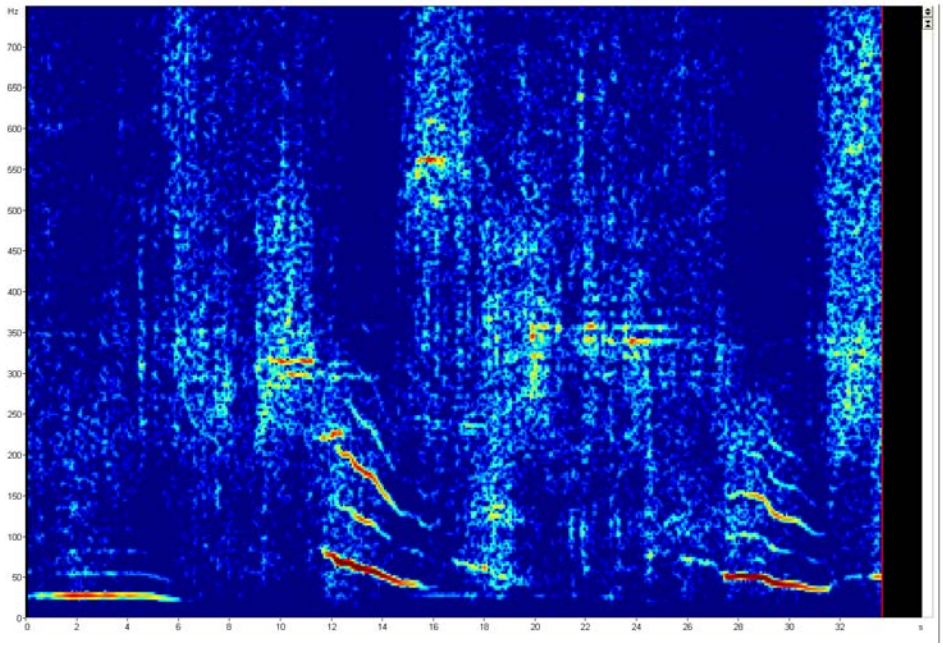


Figure 4b. Spectrogram of very loud 28 Hz tone and two very loud downsweep calls from blue whales. Station # 22, 8 January 2007, position 68°41'S 000°26'E. (FET 16384 pts, 87.5% overlap, Hanning window).

Appendix A: Ship specifications and crew list

Ship specifications:

	Shonan Maru No.2
Call sign	JFCF
Length	64.8 m
Breadth	10.2 m
International Gross tonnage	1015 t
Japan Gross tonnage	712 t
Barrel height	20.0 m
IOP height	14.0 m
Upper Bridge height	11.0 m
Bow height	6.5 m
Engine power (main)	5500 HP
Crew	19

Crew list:

	Shonan Maru No.2
Captain	H. Komiya
Chief Officer	M. Shiosaki
Second Officer	T. Takamatsu
Chief Engineer	N. Yamauchi
First Engineer	Y. Mori
Second Engineer	K. Kikuchi
Third Engineer	Y. Ohno
Chief Operator	Y. Tsuda
Boatswain	T. Shibata
Quartermaster	N. Nakamura
Quartermaster	T. Sawabe
Quartermaster	T. Nagai
Sailor	M. Takeuchi
Sailor	A. Uda
Sailor	K. Murakami
No. 1 Oiler	K. Sawaguchi
Wiper	Y. Kimura
Chief Steward	M. Endo
Steward	K. Oki

Appendix B. Observations of cetaceans while in the 200 nmile Exclusive Economic Zone of South Africa.

Introduction

The 2006-2007 International Whaling Commission - Southern Ocean Whale and Ecosystem Research Program (IWC-SOWER) Cruise surveyed in IWC Antarctic Area III in December 2006, and January - February 2007. The main objectives of the 2006-2007 cruise were to: (1) carry out a series of survey experiments designed to improve and interpret estimates of Antarctic minke whale abundance from previous cruises; (2) undertake fin whale research in waters north of 60°S, involving a sighting survey and biopsy sampling of the skin for genetic analyses; (3) continue the research on blue whales (including collecting biopsy samples, acoustic data, photographs for identifying individual animals and behavioural data); and (4) continue research on humpback whales. The research area for the fin whale study was the area bounded by latitudes 55°S and 61°S and longitudes 000° and 005°E. The minke whale research area was in the vicinity of the pack ice edge longitudes 000° and 020°E. (Anon 2006a). Details of the entire cruise are reported in Ensor *et al*. (2007).

The vessel from which the research was conducted (the *Shonan Maru No.2*) used Cape Town as the homeport for the cruise. The vessel passed through the 200 nmile Exclusive Economic Zone (EEZ) of South Africa on the transits to and from the Research Area. Permission was granted by the Department of Foreign Affairs of the Republic of South Africa for research in the Zone to be conducted in Closing Mode.

Methods

The ship departed Cape Town on 21 December 2006 and returned on 23 February 2007.

En route to the Antarctic research area the vessel intersected the South African EEZ and while in the zone research was to be conducted in Closing mode (NSC).

A description of the research procedures and data recording methodology is given in Anon (2006b).

Results

The ship departed Cape Town at 14:30 hours on 21 December 2006. Within the zone poor sighting conditions restricted research. A total of 3.42 hours of research in NSC mode (39.3 nmiles) was conducted. The vessel departed the EEZ on 22 December at position 37°04'S 015°56'E at 10:27 hours.

On return from the Antarctic the *Shonan Maru No.2* intersected the South African EEZ to the coast of South Africa. The vessel entered the EEZ on 20 February at position 37°23'S 016°33'E at 18:50 hours. Windy conditions were again experienced; no research was conducted. The *Shonan Maru No.2* and arrived Cape Town at 09:15 hours on 23 February 2007.

In the EEZ of South Africa, during both transits, a total of 3.42 hours of research was conducted and 39.3 nmiles were covered in NSC mode. One sighting was made within the South African EEZ (Table A).

References

Anon 2006a. Report of the Planning Meeting for the 2006-2007 IWC-SOWER Cruise. Available from the IWC Secretariat, Cambridge, United Kingdom.

Anon 2006b. 2006-2007 IWC-SOWER Cruise. Information for Researchers. Available from the IWC Secretariat, Cambridge, United Kingdom.

Ensor P., Komiya H., Beasley I., Fukutome K., Olson P. and Tsuda Y. 2007. 2006-2007 IWC-Southern Ocean Whale and Ecosystem Research (IWC-SOWER) Cruise. Available from the IWC Secretariat, Cambridge, United Kingdom.

Table A. Number of sightings for all species observed during transit in the South African 200 nmile EEZ in each effort mode.

Species	NSC		OE		Total	
	G	A	G	A	G	A
Transit from Cape Town to the Research Areas						
Humpback whale	1	1	-	-	1	1
Transit from the Research Areas to Cape Town						
No sightings	-	-	-	-	-	-

Appendix C. Observations of cetaceans while in the 200 nmile Exclusive Economic Zone of Norway surrounding Bouvet Island.

Introduction and Methods

The 2006-2007 International Whaling Commission - Southern Ocean Whale and Ecosystem Research Program (IWC-SOWER) Cruise surveyed in IWC Antarctic Area III in December 2006, and January - February 2007. The main objectives of the 2006-2007 cruise were to: (1) carry out a series of survey experiments designed to improve and interpret estimates of Antarctic minke whale abundance from previous cruises; (2) undertake fin whale research in waters north of 60°S, involving a sighting survey and biopsy sampling of the skin for genetic analyses; (3) continue the research on blue whales (including collecting biopsy samples, acoustic data, photographs for identifying individual animals and behavioural data); and (4) continue research on humpback whales. The research area for the Fin Whale Research Component was the area bounded by latitudes 55°S and 61°S and longitudes 000° and 005°E. The Minke Whale Research Area was in the vicinity of the pack ice edge longitudes 000° and 020°E (Anon 2006a). Details of the entire cruise are reported in Ensor *et al*. (2007)

The vessel from which the research was conducted (the *Shonan Maru No.2*) used Cape Town as the homeport for the cruise. The *Shonan Maru No.2* departed Cape Town on 21 December 2006 and returned on 23 February 2007.

The vessel intersected the 200 nmile Exclusive Economic Zone (EEZ) of Norway on the transit from Cape Town to the Fin Whale Research Area.

The Fin Whale Research Component was to be conducted during 7 days (27 December 2006 –2 January 2007) and a large proportion of the Fin Whale Research Area was within the Norwegian EEZ.

Permission was granted by the Government of Norway for research in the Zone to be conducted in Closing Mode (NSC). Permission was also granted for biopsy sampling and photo-ID studies.

A description of the research procedures and data recording methodology is given in Anon (2006b).

Results

The ship departed Cape Town at 14:30 hours on 21 December 2006 and transited to the starting position for the fin whale research (55°00'S 000°00'E).

The vessel entered the Norwegian EEZ surrounding Bouvet Island on 25 December at position 50°58'S, 004°05'E at 23:13 hours. On 26 December, the final day of the transit prior to arrival at the Fin Whale Research Area a total of 4.51 hours (53.7 nmiles) of searching in NSC mode was conducted.

The Fin Whale Research Component was commenced on the morning of 27 December from position 55°00'S 000°00'E (06:00 hours). The starting position for the fin whale research was within the Norwegian EEZ. The *Shonan Maru No.2* departed the EEZ on 1 January (10:50 hours at position 57°47'S 004°35'E) and completed the Fin Whale Research Component during the night of 2 January (18:45 hours at position 61°00'S 002°30'E).

The interim cruisetrack design for the Fin Whale Research was originally planned as a single transect (joining positions 55°00'S 000°00' and 61°00'S 005°00'E) as proposed in the Report of the Planning Meeting (Anon 2006a). The cruisetrack was modified on completion of the second day of research. The strategy was to increase the survey intensity in the northern part of the research area based on the encouraging number of fin and humpback whale detections in the north of the research area on the original trackline during the first two days of research. Also, the synoptic weather situation indicated that the persistent head winds and rough seas experienced on the original course would continue for the following few days. The revised cruisetrack design incorporated three equal-length transects (each 138.6 nmiles in length) in the area bounded by latitudes 55°00'S and 57°06.8'S and longitudes 000°00' and 005°00'E. The area south of latitude 57°06.8'S, was covered by a single survey transect constructed from position 57°06.8'S 005°00'E to the southern boundary of the fin whale research area at position 61°00'S 002°30'E[9]. The intercept of the original trackline with latitude 57°06.8'S was selected as a waypoint for the revised cruisetrack because the corresponding longitude represented exactly one third of the longitudinal span between 000°00' and 005°00'E.

[9] Waypoints for the revised cruisetrack were: 55°00'S 000°00'E, 57°06.8'S 001°40'E, 55°00'S 003°20'E, 57°06.8'S 005°00'E and 61°00'S 002°30'E

The revised cruisetrack design resulted in increased research effort conducted in the EEZ of Norway compared to the original plan.

In the EEZ of Norway, a total of 12.12 hours of research was conducted and 131.9 nmiles were covered in NSC mode. 87 sightings were made within the Norwegian EEZ (Table A).

In the EEZ of Norway, 42 biopsy samples were collected from 33 whales (12 Fin whales and 21 humpback whales) during 20.43 hours of research. Photo-ID images were obtained 1 blue whale (true), 34 fin whales (including all but one of the biopsied whales), 58 humpback whales (including all but 1 of the biopsied whales) and 1 group of killer whales.

On return from the Antarctic, the *Shonan Maru No.2* did not intersect the EEZ of Norway. The *Shonan Maru No.2* returned to Cape Town on 23 February 2007.

References

Anon 2006a. Report of the Planning Meeting for the 2006-2007 IWC-SOWER Cruise. Available from the IWC Secretariat, Cambridge, United Kingdom.

Anon 2006b. 2006-2007 IWC-SOWER Cruise. Information for Researchers. Available from the IWC Secretariat, Cambridge, United Kingdom.

Ensor P., Komiya H., Beasley I., Fukutome K., Olson P. and Tsuda Y. 2007. 2006-2007 IWC-Southern Ocean Whale and Ecosystem Research (IWC-SOWER) Cruise. Available from the IWC Secretariat, Cambridge, United Kingdom.

Table A. Number of sightings for all species (Groups/Animals) observed in the Norwegian 200 nmile EEZ surrounding Bouvet Island, in each effort mode.

Species	NSC		OE		Total	
	G	A	G	A	G	A
Blue (true)	1	1	-	-	1	1
Fin	16	44	3	7	19	51
Humpback	43	87	9	13	52	100
Like humpback	-	-	1	1	1	1
Minke (Antarctic)	1	1	-	-	1	1
Killer (type undetermined)	1	35	-	-	1	35
So. bottlenose whale	4	7	2	4	6	11
Layard's beaked whale	1	6	-	-	1	6
Ziphiid	2	4	-	-	2	4
Unid. large baleen	1	5	-	-	1	5
Unid. whale	2	2	-	-	2	2

Appendix D. 25X Binocular Reticle to Distance Conversion.

Distances to sightings detected in the 25X 'big eye' binoculars were calculated following the methods given in Lerczak and Hobbs (1998), using the formula:

(radius+height)*sin(anglebelow+angleabove) -sqrt(radius^2-((radius+height)*cos(anglebelow +angleabove))^2)

where

radius = radius of earth (= 6,371km)
height = eye height above sea level, in km
anglebelow = angle in radians below the horizon to sighting
angleabove = atan(sqrt(2*radius*height+height^2)/radius)

Platform eye height of the 25X binoculars on the upper bridge was **12.03** meters.

Table A. The reticle to distance scale used during big eye BT Mode.

25X RETICLE	DISTANCE (nmiles)
0	6.69
0.1	4.62
0.2	3.97
0.3	3.55
0.4	3.23
0.5	2.97
0.6	2.77
0.7	2.59
0.8	2.44
0.9	2.30
1	2.19
1.2	1.99
1.4	1.82
1.5	1.75
1.6	1.69
1.8	1.57
2	1.47
2.5	1.27
3	1.12
3.5	1.00
4	0.90
4.5	0.82
5	0.76
6	0.65
7	0.58
8	0.51
9	0.46
10	0.42
11	0.39
12	0.36
13	0.34
14	0.31
15	0.29
16	0.28
17	0.26
18	0.25
19	0.24
20	0.23

References

Lerczack, J.A. and Hobbs, R.C. 1998. Calculating sighting distances from angular readings during shipboard, aerial, and shore-based marine mammal surveys. Marine Mammal Science 14 (3) 590-9. [See Errata. 1998. Marine Mammal Science 14 (4):903]

Appendix E. Feasibility of Photo-Identification for Antarctic Minke Whales

Introduction

Opportunistic photo-identification was attempted from 5 January to 9 February on all Antarctic minke whale groups approached during normal closing procedures to confirm school size. This year's cruise resurveyed areas on numerous occasions during a series of sighting experiments, thereby providing an opportunity for resightings of individual minke whales. The aims of the photo-identification were to 1. assess the feasibility of photo-identification as a methodology for future studies, and 2. investigate short-term minke whale movements within the study area. Although photo-identification studies on dwarf minke whales have been undertaken in northern Queensland, Australia, no previous photo-identification studies have yet been conducted on Antarctic minke whales.

Methods

During closure to minke whales to confirm school sizes, photographs were taken with Canon EOS20D digital cameras, all with 100 – 400 mm lens (Canon L series with image stabiliser). Minke groups were photographed opportunistically, with up to three researchers taking photographs at a time (normally one researcher from the Upper Bridge and at least one from the ships bow). Photographs were later compared using the computer program ACDSee.

Basic classification of photographs showing an identified individual was conducted, based on:

image quality: 1 = excellent, 2 = good, 3 = average, and

individual recognisability: 1 = easily recognisable, 2 = easily recognisable with only a small portion of body available, 3 = only recognisable from an image showing at least the top half of the body, 4 = only recognisable from an image showing at least the top three-quarters of the body.

Features used for identification consisted of nicks and notches on the dorsal fin, scars and injuries over the body, cookie-cutter shark bites and distinctive pigmentation patterns. Assessing individuals based on pigmentation patterns only (i.e. no notches on dorsal fin or scars over body), often additionally relied on dorsal fin shape to ensure an individual was not double-counted in a group based on an unmatched left and right side image.

Results

73 groups of minke whales were photographed and two-thousand and fifty five images were taken. The images were taken opportunistically the normal school size confirmation procedure and the photographs were taken during a total of 4 hours and 58 minutes representing an average of 4 minutes per group. No classification of photo quality for each of the 2055 frames was conducted during the cruise as a result of time constraints. Photo quality was however assessed for the single best image of a photo-identified individual.

The average confirmed group size of the 73 groups photographed was 6.3 ± 6.97 individuals (range = 1 – 40; mode = 2). The average number of whales photographed in each group was 3.2 ± 2.67 (range = 1 – 15; mode 2) and the average number of whales individually identified in each group was 2.1 ± 2.49 (range = 0 – 11; mode = 0).

Feasibility of Photo-identification

A total of 459 individuals were encountered during photo-identification attempts. A total of 150 individual minke whales were individually identified (33% of the individuals encountered), consisting of: 76 left side identifications, 61 right side identifications and 13 identifications where both sides were identified. Of these 150 individuals, 11.3% were identified based on natural pigmentation and dorsal fin shape, 24.0% were identified based on nicks on dorsal fin, 24.7% were identified based on pigmentation only and 40% were identified based on cookie-cutter shark bites and pigmentation.

Images of individuals were classified according to image quality and individual recognisability (Table A).

Table A. Image quality and individual recognisability

Quality		**Recognisability**	
Excellent	7.3%	1	12.0%
Good	58.7%	2	22.7%
Average	34.0%	3	28.0%
		4	37.3%

Individual movements
There were no re-sights of individual minke whales based on the photographs collected.

Discussion

Photo-identification of Antarctic minke whales is feasible and may provide a useful tool for assessing population parameters, spatial and temporal movements and social structure in future studies.

A total of 150 individual minke whales were identified out of 459 individuals encountered during photo-identification attempts. It is possible that the total of 150 individuals is an over-estimate, resulting from the potential for classification of left and right side identifications of an individual as two different individuals. However, care was taken to minimise this probability and omit any potential duplicates. Considering that an average of only 4 minutes/group was spent on opportunistic photo-identification, these results indicate that dedicated photo-identification efforts would prove very successful.

There were no obvious re-sightings of individuals. However, limited time was available for comparison of photographs and a more detailed investigation may result in re-sightings that were overlooked (particularly of the individuals where recognisability was classified as 3 or 4).