SO GLOBEC

International Whaling Commission

Cetacean Visual Survey and Biopsy

Cruise Report

LMG0203

7 April – 20 May 2002

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Introduction

Recently, the International Whaling Commission (IWC) developed proposals for collaborative work in the Southern Ocean with the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and the International Global Ocean Ecosystem Dynamics (GLOBEC) program under the IWC Southern Ocean Whale Ecosystem Research (SOWER) program. This research program has the long-term aim to "*define how spatial and temporal variability in the physical and biological environment influence cetacean species in order to determine those processes in the marine ecosystem which best predict long-term changes in cetacean distribution, abundance, stock structure, extent and timing of migrations and fitness'.*

This objective is being pursued through collaboration with GLOBEC and CCAMLR using multidisciplinary ecosystem approach to data collection, analysis, and modeling. The IWC also recognizes that it lacks the data to determine baseline patterns of distribution (and the biological and physical processes responsible for such patterns) of baleen whales from which to judge the potential effects of climate change. Therefore, three further objectives have been defined by the Commission. They are: *to characterize foraging behavior and movements of individual baleen whales in relation to prey characteristics and physical environment, to relate distribution, abundance and biomass of baleen whale species to same for krill in a large area in a single season, and to monitor interannual variability in whale distribution and abundance in relation to physical environment and prey characteristics*.

SO-GLOBEC studies provide the ideal platform for such long-term studies, where scientists from a range of disciplines can conduct intensive focussed studies, within the framework of long term data synthesis and planning. Given the shared objectives among the IWC, GLOBEC and CCAMLR, the IWC has determined that the most effective means of investigating these ecological issues is to focus a considerable body of cetacean research within the framework provided by these programs.

The first of the “Predator Science Questions” in SO-GLOBEC has been formulated as: How does winter distribution and foraging ecology of top predators relate to the distribution and characteristics of the physical environment and prey (krill) (taken from J.A. van Franeker).

Methods

Standard methodology for multidisciplinary studies will be used throughout all GLOBEC collaborative cruises. This will involve experienced cetacean researchers conducting line transect sighting surveys throughout daylight hours in acceptable weather conditions. Data are recorded on a laptop based tracking program (Wincruz), and photo and video records are also obtained for species identification, group size ,verification, feeding (and other behavior), ice habitat use and individual identification.

During this cruise, observations were made from the bridge level by a single observer (AF). When conditions permitted, the observer was outside along the bridge wings, otherwise, observations were made from inside. Effort was focused 45° to port and starboard of the bow ahead of the vessel, while also scanning to cover the full 180° ahead of the vessel. In ice the method was adjusted to include searching in behind the vessel track as well, in order that cetaceans and seals hidden by ice would be detected more readily. The observer used a combination of naked-eye and binocular (7x50 Fujinon) searching. Effort would commence when the following conditions allowed: appropriate daylight, winds less than 20 knots or Beaufort Sea State less than or equal to 5, visibility greater than 1 mile (measured in the distance a minke whale blow could be seen with the naked eye as judged by the observer) and the ship actually steaming.

Sightings were recorded on a laptop based Wincruz Antarctic program which also logged gps position, course, ship speed, and a suit of other environmental and sighting conditions automatically. Visual observations were made during daylight hours whenever the ship was in transit. When possible, photographic and/or video documentation was made of each sighting for later use in individual identification, species confirmation, and habitat description.

A second component to the marine mammal work is biopsy sampling from small boats. On the occasion that weather conditions, daylight, timing, and whales were present, biopsy sampling was attempted from Zodiacs. Samples were obtained with a Barnett Wildcat Crossbow equipped with custom made floating bolts, and screw-on hollow point biopsy plugs. The bolts are designed to penetrate the skin and blubber (depending on the size of the plug; either 1inch or 0.5 inches) to the end of the plug, where the float begins, and bounce out of the whale, securing a sample with three small barbs inside the plug. Skin samples are preserved in dimethyl sulfoxide solution and will be send to the National Marine Fisheries Service, Southwest Fisheries Science Center for genetic analysis. Blubber samples will be frozen for later use in contaminant, pesticide, heavy metal, etc. analysis.

Results

Sightings

Generally, sighting conditions were very good during the cruise. Fine visibility and sighting conditions prevailed throughout much of the work at or between inshore stations. The only bout of poor weather came during work at the offshore station. This said, 73 hours were spent on full survey effort during this cruise.

In Antarctic waters (south of 60°S), 93 sightings of 248 cetaceans were made. These included 15 sightings of 34 minke whales, 5 sightings of 44 orcas, 71 sightings of 168 humpback whales, and 2 sightings of 2 unidentified large cetaceans (Figures 1,2). With respect to humpback whales, the sightings were generally clustered in open water or near ice edges where large aggregations of krill were observed on the ACDP (Figures 3) (see M. Zhou et al. report). These areas were around Alexander Island, the western edge of the canyon bisecting Margeurity Bay (figures 4,5), Johnston Passage southwest of Adelaide Island, and the French Passage/Argentine Islands (see Zhou et al for details on krill distribution in these areas), and to a lesser extent the Bransfield Strait and Neumayer Channel between Port Lockroy and Anvers Island.

Biopsy

A total of 20 biopsy samples were collected during this cruise. All of the samples came from humpback whales. All 20 samples collected contained skin, while 19 also contained blubber samples. Biopsy samples were collected on three separate days during the cruise. The first 4 samples were collected on 11 April 2002 in the Bransfield Straits in open water (63 57S, 61 41W). The next 8 samples were collected on 1 May 2002 north and east of Alexander Island near an ice edge (68 44S, 69 52W). The last 8 samples were collected near the French Passage in the Argentine Islands in open water on 13 May 2002 (65 10S, 64 08W). Dorsal fin photos were taken for all but the final four whales that were biopsied. Blowing snow and difficult working conditions precluded using an photo or video cameras during this final trip. Digital video was taken of all biopsy samples taken on 11 April and 1 May, and for the first 4 animals sampled on 13 May. For details and behavioral observations see Appendix 1.

Discussion/Preliminary Findings

A primary research objective of the cetacean studies being conducted in the SO GLOBEC is to determine the fall/winter distribution and ecology of baleen whales in relation to characteristics of their environment (physical, chemical, hydrographic, and biological) and the distribution of their prey (krill). Thus, at the planning meeting for the second year of SO GLOBEC, it was decided that cetacean observation effort could better serve the primary research objectives by using both survey platforms (N.B. Palmer and L.M. Gould). Thanks to the generosity of K. Daly, a berth was made available for a cetacean biologist on the L.M. Gould for the 0203 cruise.

Environmental conditions in and around Margeurite Bay were somewhat different than those encountered last year. Ice had already begun to form in the south and in the southern portion of the Bay, and by the end of the trip nearly all of Margeurite Bay had begun to freeze over with new ice. It is difficult to judge the true distribution within the study area from the data obtained from this cruise. These data were collected on the N.B. Palmer by D. Glasgow and will be used in

further spatial analysis. The data from this cruise, however, are a good indication of the relative distribution of baleen whales in nearshore waters and around 'hot spots' of prey distribution (krill) during the Austral fall and early winter.

Humpback whales were sighted with relative frequency from the Bransfield Straits at the northern reaches of the Peninsula to Alexander Island.High densities of humpback whales were seen in several areas where increased acoustic backscatter, associated with krill swarms, was observed. This indicates that many humpback whales are still foraging around the Antarctic Peninsula and seem to be driven north only by the advance of new ice. When the LMG was in transit south from Avian Island towards Alexander Island, over 50 humpback whales were seen in open water, clustered along the western edge of the deep canyon bisecting Margeurite Bay. Similarly, at the ice edge off Alexander Island over 2 dozen humpback whales were sighted. As the ice advanced in the following week, and the ship moved north, another aggregation of at least 25 humpback whales was seen at the southern portion of the Johnston Passage on the southwest coast of Adelaide Island. This area showed, along with the Alexander Island site, showed high densities of krill (Zhou et al. cruise report). It is very possible that the same whales that were feeding near Alexander Island had moved north and were foraging in the Johnston Passage area. Presumably, these whales could simply follow the advance of the sea ice throughout the winter. Many sightings made on this and previous trips were of pairs of humpback whales, one of which was often times substantially larger than the other. These may be mothers with dependent calves that are not reproducing in the coming year and thus have no pressing cause to migrate to higher latitudes, especially if there are abundant food supplies throughout the Antarctic Peninsula.

Table 1. Biopsy samples collected during LMG0203

Date	**Sample #**	**WOS#**	**Species**	**Skin**	**Blubber**
4//11	1	6	M.n.*	Y	Y
4/11	2	7	M.n.	Y	Y
4/11	3	9A	M.n.	Y	Y
4/11	4	9B	M.n.	Y	Y
5/1	5	53A	M.n.	Y	Y
5/1	6	53B	M.n.	Y	Y
5/1	7	53C	M.n.	Y	Y
5/1	8	54A	M.n.	Y	Y
5/1	9	54B	M.n.	Y	Y
5/1	10	56A	M.n.	Y	N
5/1	11	56B	M.n.	Y	Y
5/1	12	56C	M.n.	Y	Y
5/13	13	76A	M.n.	Y	Y
5/13	14	76B	M.n.	Y	Y
5/13	15	77A	M.n.	Y	Y
5/13	16	77B	M.n.	Y	Y
5/13	17	78A	M.n.	Y	Y
5/13	18	78B	M.n.	Y	Y
5/13	19	78C	M.n.	Y	Y
5/13	20	79A	M.n.	Y	Y
TOTAL				20	19

* *Megaptera novaeangliae* (humpback whale)

Figure 1. GIS map of all cetacean sightings from LMG0203

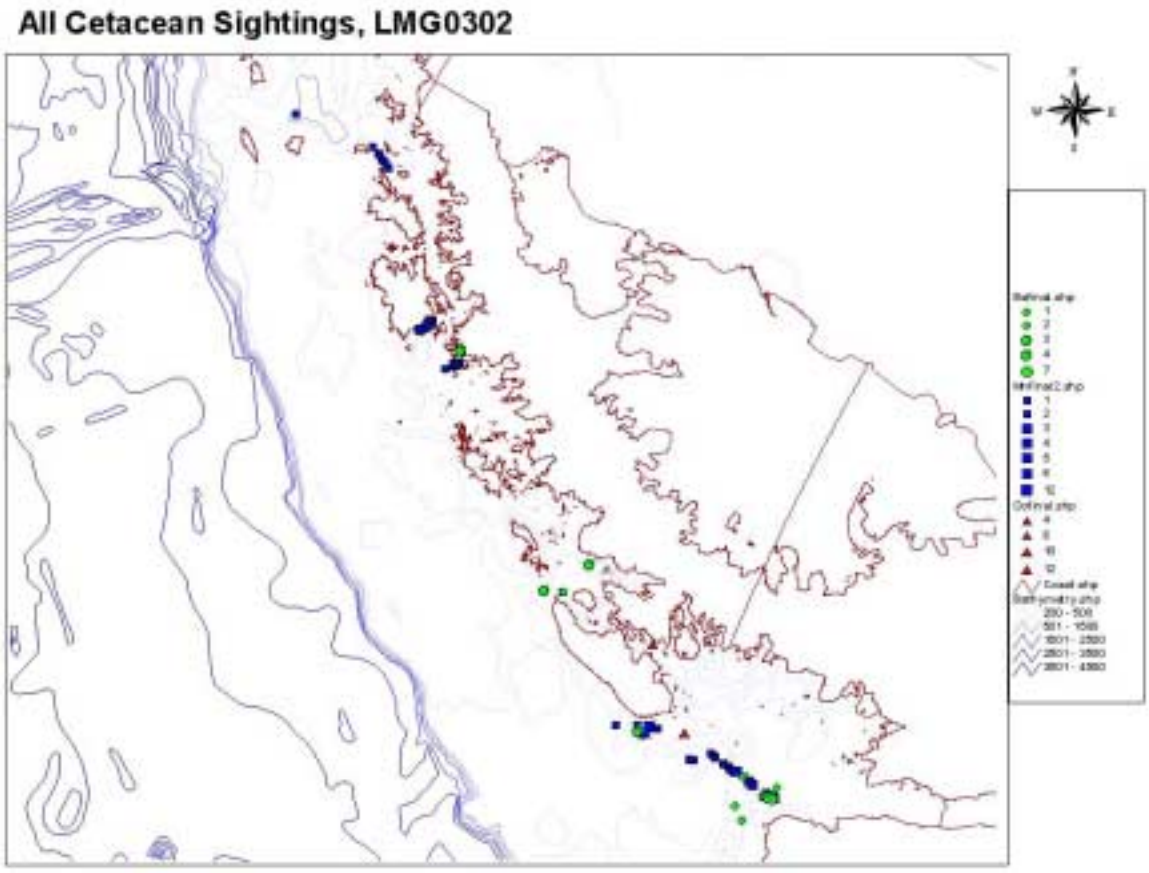


Figure 2. GIS map of all Minke whale and Orca Sightings from LMG0203

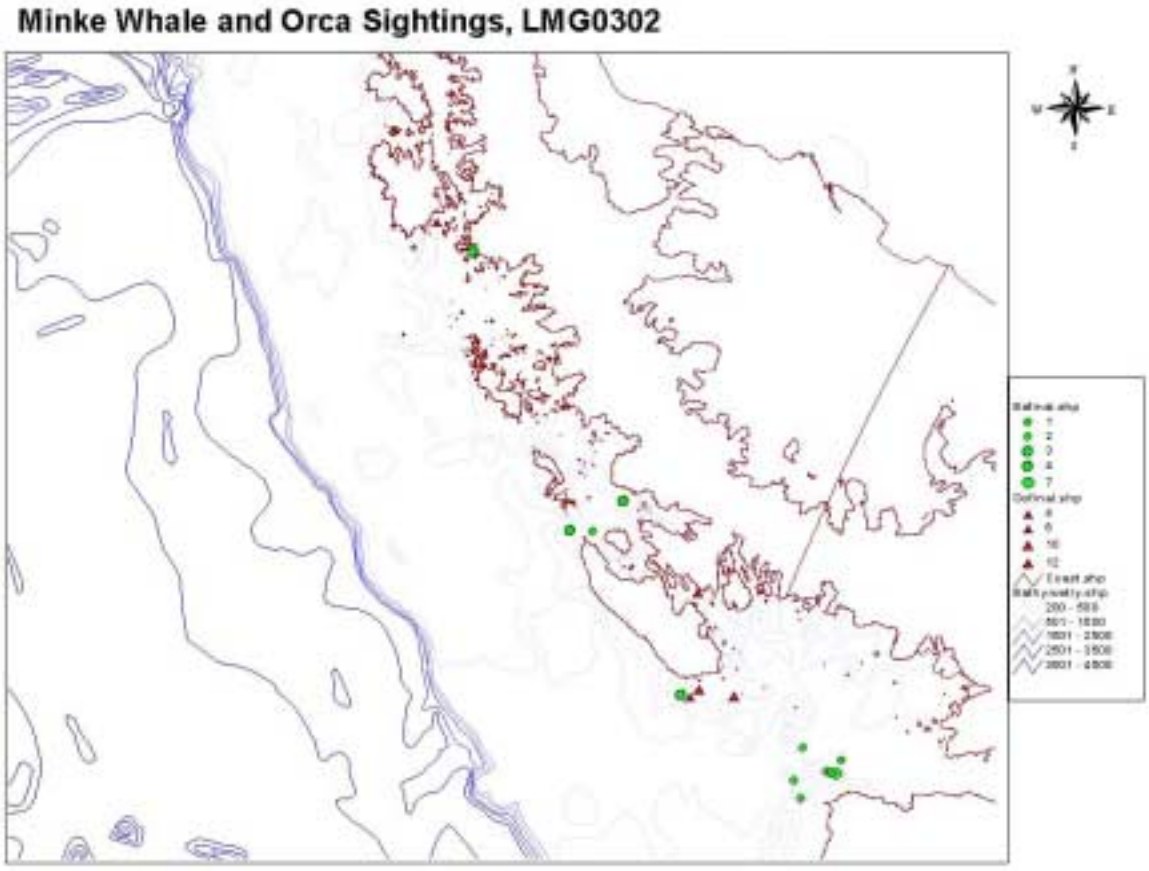


Figure 3. GIS map of all Humpback whale sightings from LMG0203

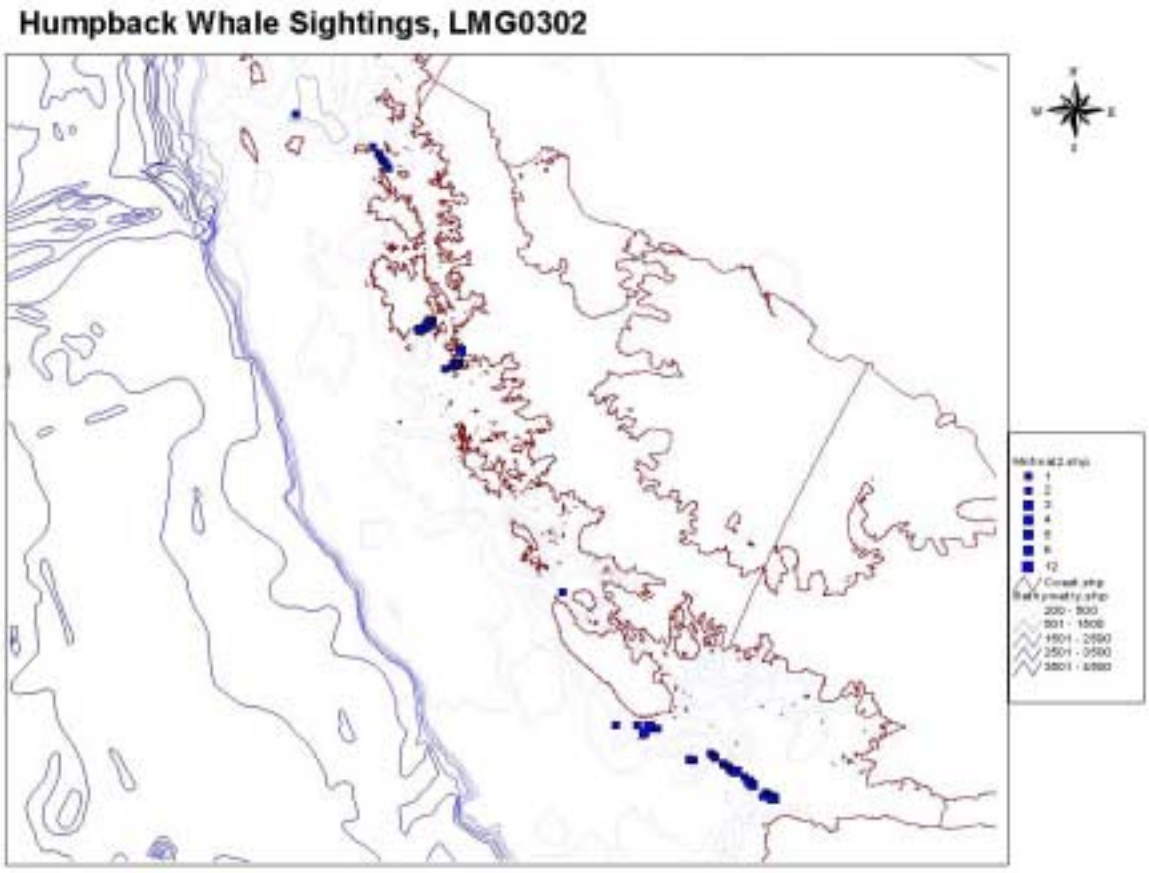


Figure 4. Map of Sighting transect lines and whale sightings in and around Margeurite Bay.

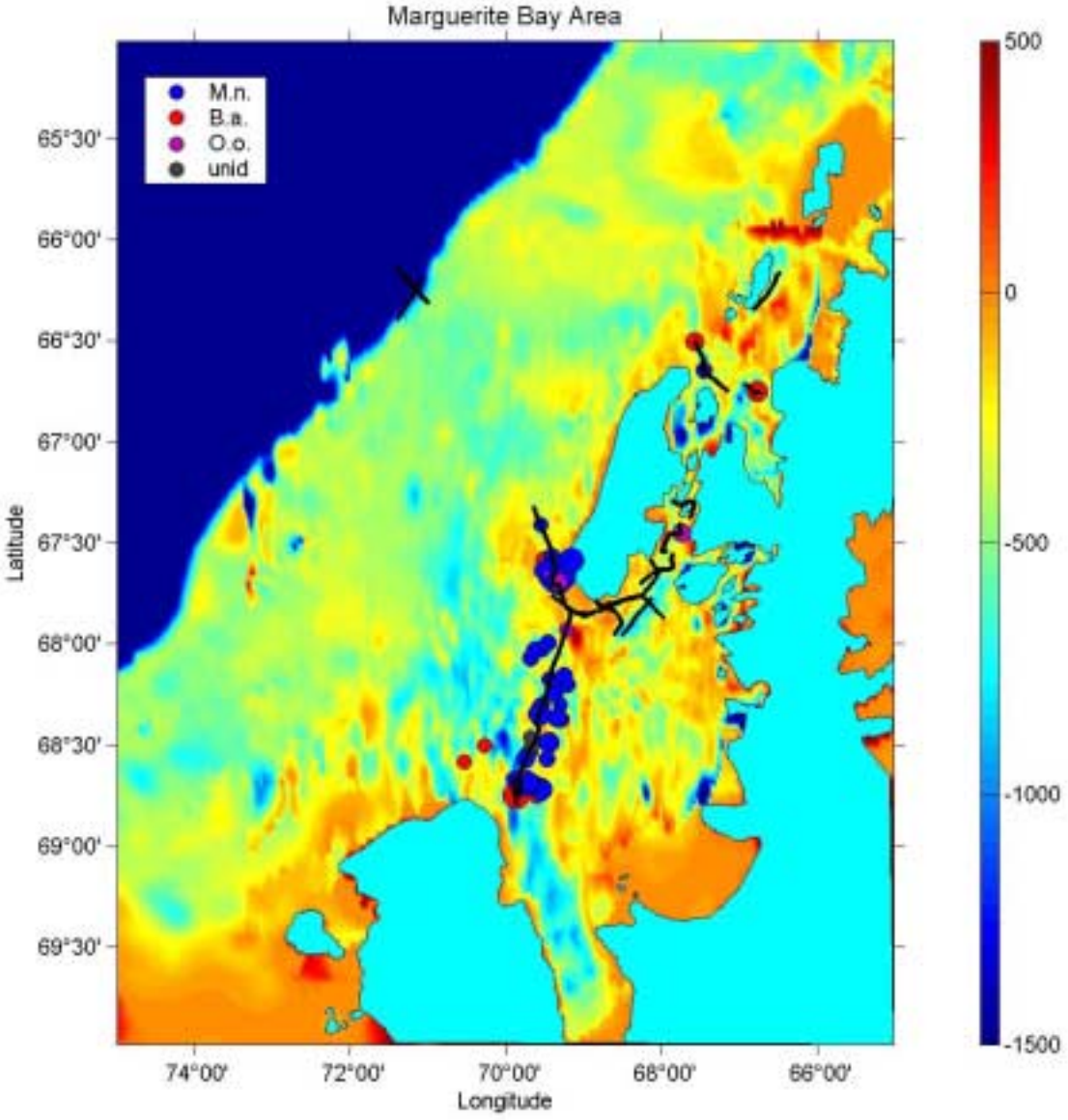
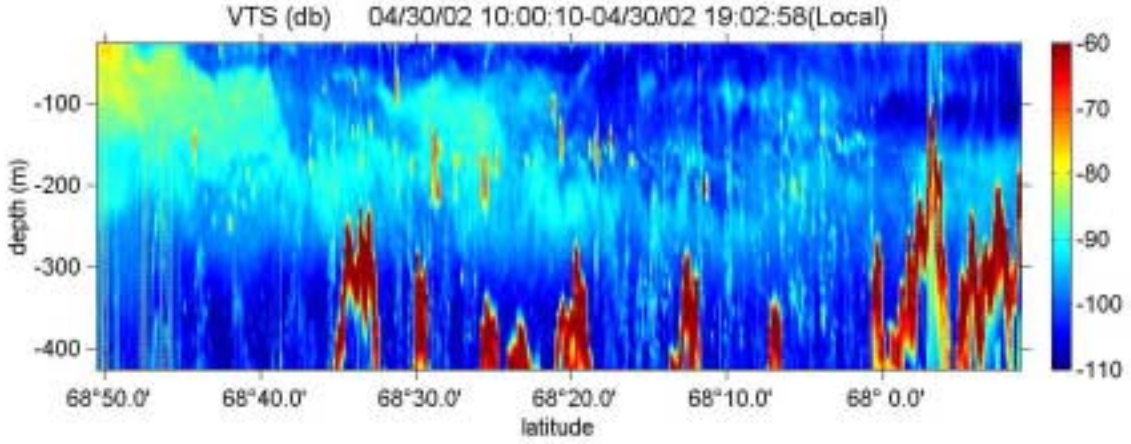


Figure 5. ADCP plot of transect line from Avian Island, south to Alexander Island, 30 April 2002.



Appendix 1. Biopsy Sampling Behavioral Log

11 April 2002, Bransfield Strait, 63 57S, 61 41W.

WOS6: humpback whale. Biopsy 1. 63 57S, 61 41W.Potential mom and calf pair. The whales were approachable to 50 metres then altered course away from the zodiac. We followed at a distance until the surfaced again, then sped up to get up close to animals. Took sample from the larger animal. Bolt hit the animal on the left lateral side posterior to the dorsal fin. The animal did not show significant behavioral change from the impact. Video 1, photos 2-26 on P33-02.

WOS7: humpback whale. Biopsy 2. 63 57S, 61 41W. Pair of larger animals travelling slowly at the surface. Animals swam away from the zodiac as we approached. We sped up to catch them at their next surfacing before they dove. Biopsy bolt hit on the left lateral, posterior to the dorsal fin. No behavioral response to the impact. Video 2, photos 2-26 on P33-02.

WOS9A: humpback whale. Biopsy 3. 64 00S, 61 45W. Two larger whales swimming together diving for 2-3 minutes at a time. Animals avoided the zodiac's approach at first. Then when they surfaced near us, we sped to reach them. Biopsy bolt hit left lateral posterior to the dorsal fin as the animals was diving. Animal raised and slapped its flukes in reaction to the dart. Video 1, photos 4-8 on P28-02.

WOS9B: humpback whale. Biopsy 4. 64 00S, 61 45W. Following the pair of animals and watching them just under the surface until they surfaced near the zodiac. Biopsy bolt hit mid lateral on the right side. There was no apparent reaction to the impact of the dart. Video 1, photos 9-11 on P28-02.

1 May 2002, north end of Alexander Island, at ice edge, 68 44S, 69 52W.

WOS53A: humpback whale. Biopsy 5. From a group of three animals that were lazy and logging at the surface. Upon approaches they simply dove shallow, returning to the same general area. WOS53A&C were larger animals, while WOS53B was somewhat smaller. Sample taken from WOS53A was right side lateral below the dorsal fin. Skin and blubber collected. Photos and video of all animals in the group. Minimal reaction to the biopsy dart.

WOS53B: humpback whale. Biopsy 6. The smaller of the three whales in this group. Sample of blubber and skin collected from left lateral side of the animal. Animal quickly dove after being struck.

WOS53C: humpback whale. Biopsy 7. Final animal from the group. Sample of blubber and skin taken from right lateral side. Lead animal began to dive,

followed by this animal which was struck and showed no sudden movement or change in diving rate/behavior.

WOS54A: humpback whale. Biopsy 8. A group of two animals that were swimming rather slowly and deliberately. Both animals in the group were sampled. Blubber and skin taken from right lateral side. Animal swiped its tail as it was diving when it got struck. Both animals were relatively large.

WOS54B: humpback whale. Biopsy 9. Second in the group of two animals. Were chased for 4 minutes after first encountered. Left lateral blubber and skin sample taken as the animal was surfacing.

WOS56A: humpback whale. Biopsy 10. From a group of animals that initially appeared to be two animals, but turned into four that were socializing and diving and rolling a bit among each other. First dart hit posterior left lateral side and bounced off without any sample. The dart may have hit near a transverse process. The nest dart hit higher up, just below the dorsal fin and collected only a skin sample.

WOS56B: humpback whale. Biopsy 11. Second of the animals in this group sampled. This animal surfaced at angles with its tail bent to one side typically. Blubber and skin sample collected as the animals were surfacing together from the left lateral side. Animal splashed with its fluke as the dart hit and it was diving.

WOS56C: humpback whale. Biopsy 12. Final animal sampled in this group that appeared, at this point, to be avoiding the zodiac. Blubber and skin sample collected from left lateral side of fast approach of the whales as they were swimming away.

13 May 2002 Argentine Islands, French Passage, 65 10S, 64 08W.

WOS76A Biopsy 13. First of two humpback whales from the pair. Biopsied from 10 metres away, left lateral blubber and skin sample. No adverse reaction to the dart.

WOS76B Biopsy 14. Second humpback whale of the group. Both large animals logging at the surface. Blubber and skin sample from 12 metres away on left lateral side. No adverse reaction to the dart.

WOS77A Biopsy 15. First of a group of two large humpback whales diving and feeding in the area. Blubber and skin sample taken from 10 metres, left lateral side. The animal waved its fluke as it dove and was struck by the dart.

WOS77B Biopsy 16. The second humpback from the group. Blubber and skin sample taken from 15 metres at the right lateral flank. The animal showed no visible reaction to the dart as it dove.

WOS78A Biopsy 17. Three samples taken from a group of 3 that joined with two other whales during work. All animals seemed large and were diving and feeding as well as socializing at the surface. They became more aware of our presence eventually and we left them after they showed signs of annoyance with us. Blubber and skin sample collected from 15 metres on left lateral flank. Animal waved its flukes as it dove and was struck by the dart.

WOS78B Biopsy 18. Second animal from this group. Blubber and skin sample collected from 15 metres from the right lateral flank. No reaction to the dart.

WOS78C Biopsy 19. Third animal from this group. Blubber and skin samples collected from left lateral side, shot from 15 metres. No apparent reaction to the dart.

WOS79A Biopsy 20. Single animal sampled from a group of two humpback whales that swam away from us after one sample was collected. Blubber and skin were collected from the left lateral flank on a shot from 10 metres. No apparent reaction to the dart.