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Post-Survey Report, RSV *Aurora Australis* Voyage 3, December 2007 - January 2008

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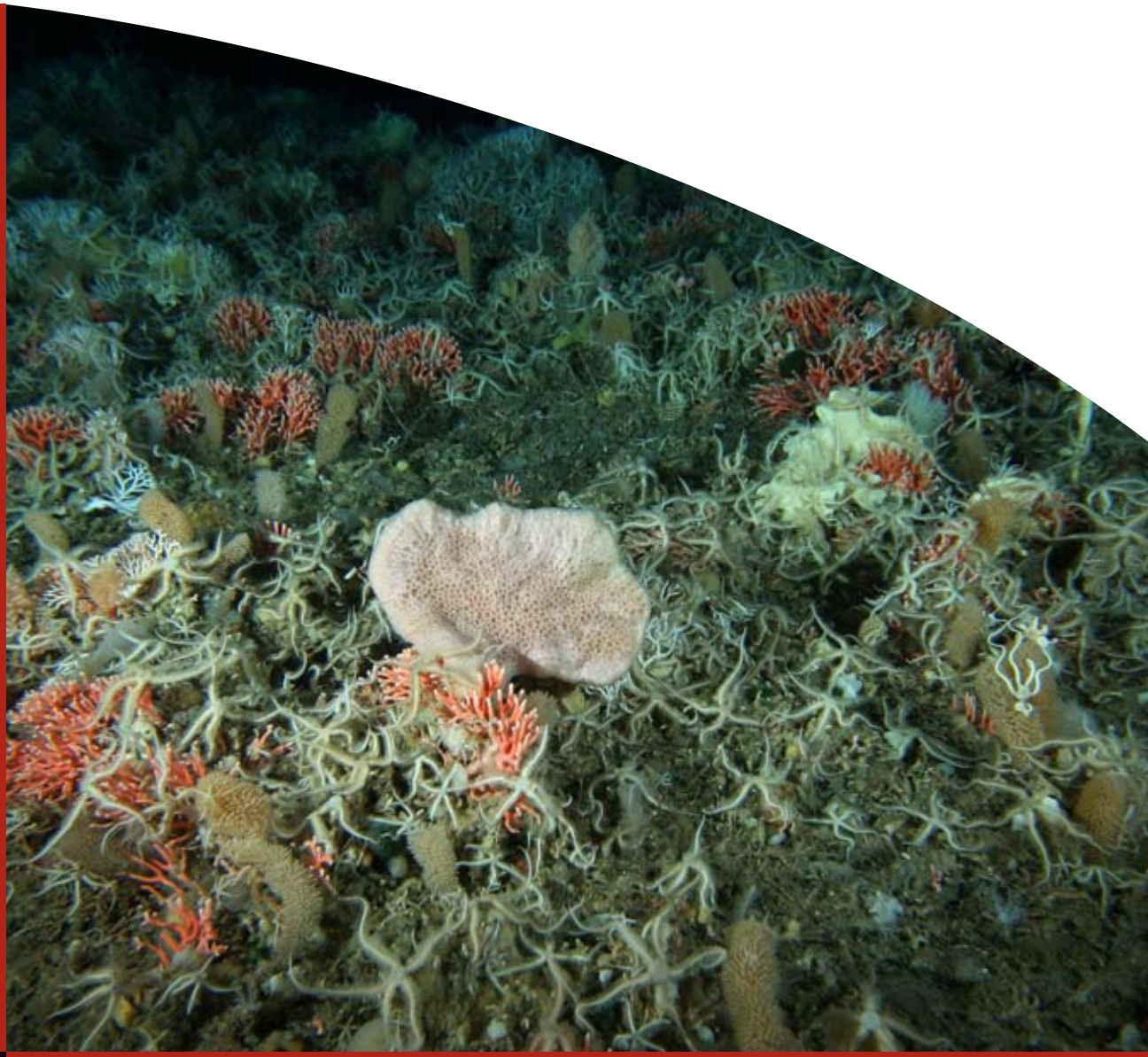

Collaborative East Antarctic Marine Census (CEAMARC):

Post-Survey Report, RSV *Aurora Australis* Voyage 3, December 2007 - January 2008

GEOSCIENCE AUSTRALIA
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by

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Executive Summary

The Cooperative East Antarctic Marine Census project (CEAMARC) survey was a collaborative survey involving 5 nations under the umbrella of the Census of Antarctic Marine Life (CAML). The CAML is an international program sponsored by the Sloan Foundation and is part of the overall Census of Marine Life. It is also an endorsed International Polar Year (IPY) project. The survey took place in December to January 2006-2007 on the *RSV Aurora Australis*. The survey aims were

- To collect biological samples and underwater video records of the seabed to document the fauna and communities associated with representative habitats.
- To collect data on water properties and currents to document the oceanographic environment of the survey area.
- To acquire sidescan data and sediments to describe the substrate types and environment of deposition for the various seabed habitats.

Geoscience Australia provided sediment sampling equipment, sidescan sonar and underwater video equipment to provide physical data to support the biological sampling.

In total, CEAMARC collected:

- 130 conductivity-temperature-depth casts with sampling bottles
- 87 AAD beam trawls
- 13 French beam trawls
- 6 sled trawls
- 102 box corers
- 3 Smith-MacIntyre grabs
- 9 Van-Veen grabs
- 5 continuous plankton recorder deployments
- 25 Geoscience Australia Deep Underwater Camera deployments
- 33 AAD video deployments
- 39 AAD still camera deployments
- 23 plankton water samples
- 2 sidescan sonar deployments

Sediment samples, GA video and sidescan sonar data are archived at GA.

CEAMARC has provided a major new set of data to further the understanding of the Antarctic marine biodiversity and the relationship between physical conditions and benthic communities.

Chapter 1. Introduction

1.1 Introduction

The polar regions are experiencing greater rates of climate change than elsewhere on the planet (IPCC, 2007). The biota of the polar regions is uniquely adapted to the extreme environments in which they exist and may be vulnerable to shifts in climate. Thus there is an urgent need to identify and establish the state of the various communities in the Antarctic, at all levels from viruses through to vertebrates, and in particular their diversity, so that we can understand the effects of climate change and natural variability on the ecosystems of the region (Hosie et al., 2007). The Antarctic region is expected to be particularly vulnerable to global warming, through the reduction in sea ice and decline in sea ice biota, conditions favouring warm temperature species and permitting invasive species, as well as increased CO_2 leading to ocean acidification, increased UV exposure, and possible effects of harvesting impacts (Ingolfsson et al., 2003; IPCC, 2007; Trathan et al., 2007). Although there have been numerous biological surveys around Antarctica, especially in the last two decades, our current knowledge of Antarctica's marine biodiversity is still patchy. For the most part almost nothing is known about the mesopelagic, bathy/abysso-pelagic and benthic biota of the continental slope and deep-sea abyssal plains, or about the biota associated with hot vents, cold seeps, and seamounts (Hosie et al., 2007).

The Census of Antarctic Marine Life (CAML; www.caml.aq) seeks to rectify this by studying the evolution of life in Antarctic waters to determine how this has influenced the diversity of the present biota and to use these observations to predict how it might respond to future change. It is a five year project that will focus the attention of the public on the icebound oceans of Antarctica, reaching its peak of activity during the International Polar Year (IPY; www.ipy.org) in 2007/08 (Fig. 1.1). CAML is investigating the distribution and abundance of Antarctica's vast marine biodiversity to develop a benchmark for the benefit of humankind. For example, it will study how Antarctica is affected by climate change, and how change will alter the nature of the ecosystem services currently provided by the Southern Ocean for the benefit of humankind, such as food and biological products, and atmospheric carbon absorption.

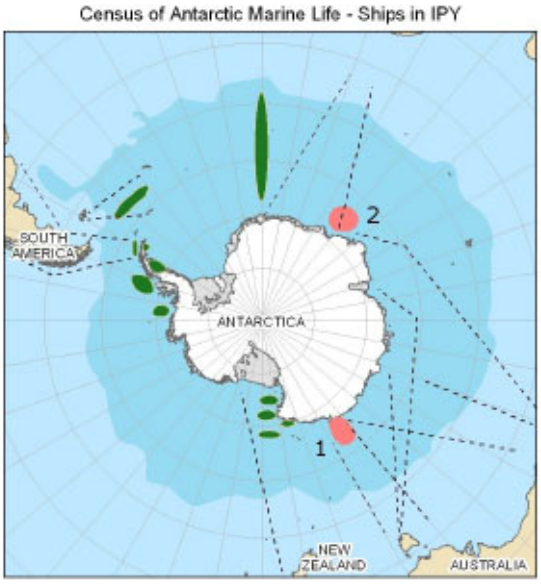

Fig. 1.1 CAML ship sampling during IPY. Red areas are (1) Australia-France-Japan survey; (2) Japan survey. Green areas are surveys by other nations.

CAML aims to show what is known, unknown and unknowable about the Southern Ocean. The project will integrate knowledge across all regions, biomes, habitats and fields of study to strengthen our knowledge of ecosystem dynamics in this high-latitude, oceanic system. Only through a multi-scale level of investigation will a better understanding of the diversity and status of Antarctica's marine life be obtained. CAML will provide a robust benchmark for tracking future change in the Antarctic marine environment. With reference to

earlier ‘Discovery’ voyages, some assessment can be made of faunal changes occurring over the past 60 to 70 years. CAML will therefore provide legacy sites for future comparability studies. It will employ modern genomic scientific techniques and contribute to the Barcode of Life Initiative (BOLI; www.dnabarcodes.org/), as well as integrating with other Census of Marine Life (CoML; www.coml.org) projects. In particular, CAML will interact very strongly with the Arctic Census of Marine Life (ArcCoML; www.arcodiv.org), drawing comparisons between differences in ecological structure and dynamics between the Arctic and Southern Oceans.

The key focus of CAML is the major ship-based research program during the austral summer of 2007-2008. Scientists from about 30 countries and 50 institutions on 14 research vessels are conducting various surveys around Antarctica in support of CAML, either as individual national projects or through consortia of nations (Fig. 1.1). Some projects will also be conducted on tourist vessels. CAML is potentially the largest survey of the Antarctic marine biodiversity ever conducted.

1.2 CEAMARC

Australia, France and Japan are working together during CAML in the Collaborative East Antarctic Marine Census (CEAMARC) to study the plankton, fish, benthos, bottom sediments and oceanography of the waters adjacent to Terre Adelie and George V Land (Fig. 1.2). The survey area has been identified by these nations as a region that has been poorly studied compared to the Atlantic and Indian Ocean sectors; yet offers some of the best conditions to study the effects of sea ice dynamics on the biota of the region, such as krill-salp interactions and the resulting flow-on effects to fish, penguins, seals and the benthos.

This is a region where all collaborators have previously conducted research. The area corresponds with Area C of Japanese Antarctic Research Expedition Studies on the Antarctic Ocean and Global Environment (STAGE) program. Australia and Japan have previously worked together in a four ship time-series study of the sea ice ecology of this area in 2001 and 2002. France has also conducted inshore studies of the benthos, plankton and fish in the coastal waters north of their station Dumont D’Urville in Terre Adelie (Gutt et al., 2007; Koubbi et al., 1997).

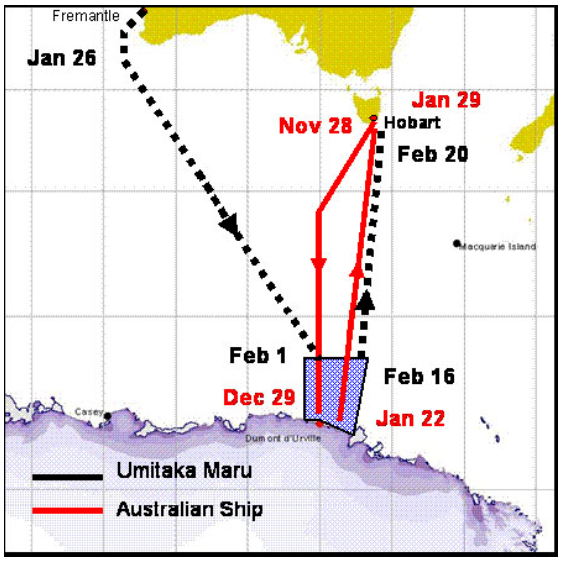

Fig. 1.2 Map of the planned CEAMARC legs. Blue polygon shows the survey area. Dates are indicative only.

CEAMARC provided an opportunity to combine the resources of Australia, France and Japan to conduct a more coordinated and comprehensive survey of the region using ships and scientists from each nation.

Below 200 m depth, there has been little study in the eastern Antarctic region of the fish and cephalopod biodiversity, deep-water plankton, the benthos, and the environmental parameters that control these communities (Beaman and Harris, 2005). Some important differences in the composition of the fish fauna, as well as striking

interspecific differences at cytogenetic level, have already been observed in the coastal fish fauna (from 0 to 200m depth) of the Terre Adelie sector, suggesting important divergences between populations (Koubbi et al., 1997). CEAMARC investigated the diversity of the fish fauna (from gene level to fish habitats) and will compare these with similar studies in other sectors of the Southern Ocean.

Knowledge of the composition and community structure of the benthos is essential to help explain the distribution of bottom- and nearbottom-dwelling fish, and the potential impacts of commercial trawling (Fig. 1.3). However, there is inherent value in studying the benthos to understand the evolution of the communities and how they have adapted to the unique Antarctic environment, which has long been isolated from other continental ecosystems (Brandt et al., 2007). Some groups are poorly represented in the Antarctic or absent, such as shrimps and crabs, whereas for other groups there is a very high general and localised species endemism, e.g. Amphipoda, Echinodermata, Pycnogonida, Isopoda, and Polychaeta. The Antarctic benthos is noted for its high degree of species diversity, high biomass and gigantism among some groups (Arntz et al., 1994).

Fig. 1.3 Antarctic benthos and fish.

The macrozooplantkon of the upper water column (surface to 200m) have been moderately well-sampled in eastern Antarctic waters between Syowa Station and the Ross Sea (Nicol et al., 2000). The main target of the research was Antarctic krill *Euphausia superba* as a key species in the Antarctic marine food web. Smaller mesozooplankton, such as small copepods of <4 mm have been poorly studied, as have the deep-water zooplankton fauna and gelatinous zooplankton in general. There have been few comprehensive sampling surveys of the meso- and bathy-pelagic species, yet previous studies have reported very high species diversity (Hosie et al., 2007). Gelatinous zooplankton often dominates the deeper waters, but they have often been ignored while some are difficult to sample and preserve because they are fragile. CEAMARC, together with the wider CAML program, specifically targeted the mesozooplankton and gelatinous zooplankton and especially the deeper zooplankton.

1.3 CEAMARC V3 Objectives

The CEAMARC sampling involved Australia's Antarctic research vessel *Aurora Australis* (V3), the *Umitaka Maru* of the Tokyo University of Marine Science and Technology, and the French resupply vessel *l'Astrolabe.* The *Aurora Australis* survey focused mainly on benthic and demersal sampling, plus a physical-chemical oceanographic survey in support of the IPY project Climate of Antarctica and the Southern Ocean (CASO) during December 2007 to January 2008 (Fig. 1.4). *L'Astrolabe* conducted an inshore plankton and oceanographic survey in January 2008. *Umitaka Maru* conducted a comprehensive survey of the epi-, meso- and bathypelagic zones in February 2008 on and north of the continental shelf. The objectives for the CEAMARC V3 survey on *Aurora Australis* were as follows:

1. To collect biological samples and underwater video records of the seabed to document the fauna and communities associated with representative habitats.

2. To collect data on water properties and currents to document the oceanographic environment of the survey area.

3. To acquire sidescan data and sediments to describe the substrate types and environment of deposition for the various seabed habitats.

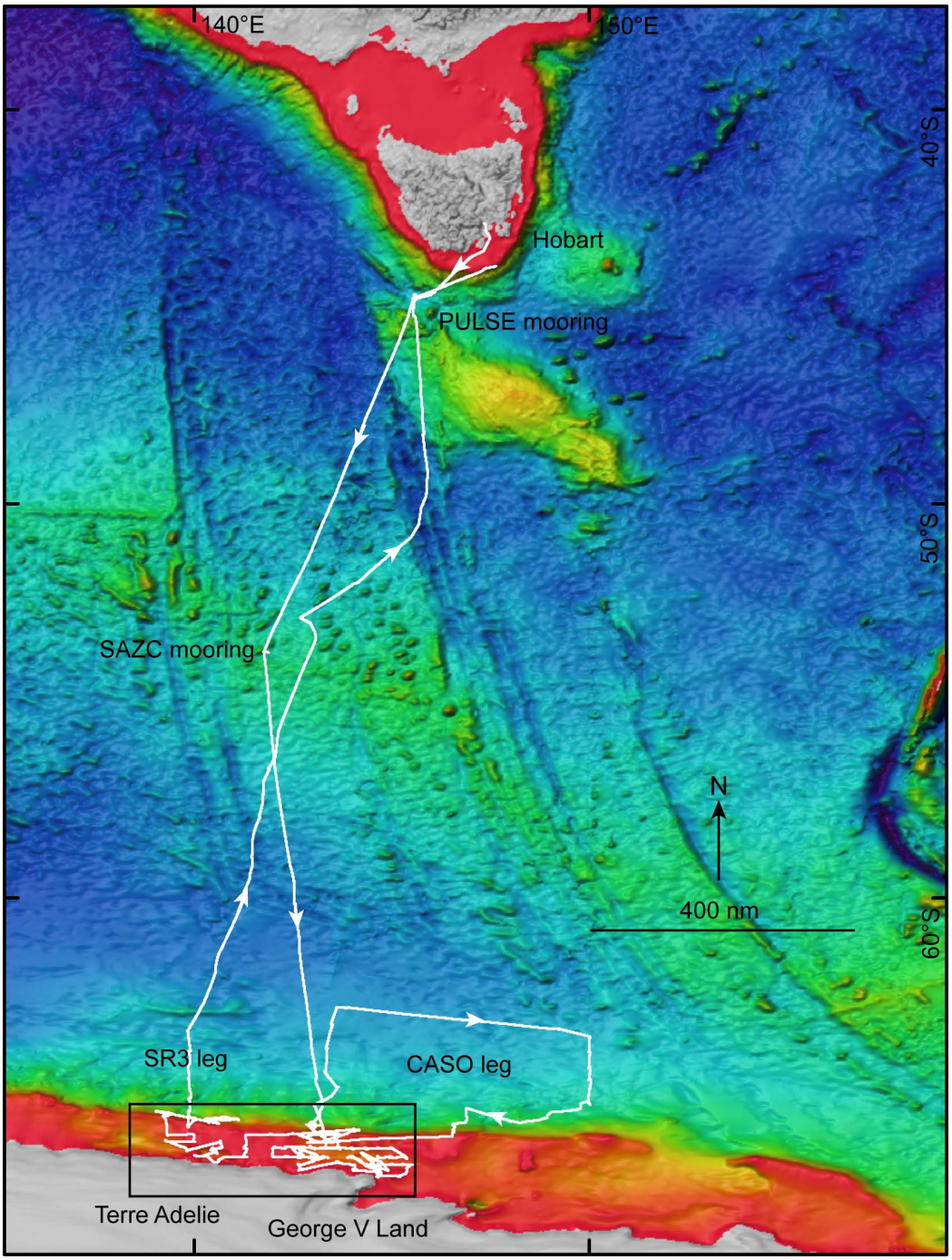

Fig. 1.4 CEAMARC V3 track Hobart to Antarctica. CEAMARC area shown in box. CASO stands for **C**limate of **A**ntarctica and the **S**outhern **O**cean, an oceanographic sampling project

Once on the Antarctic shelf, the CEAMARC V3 survey sampled the demersal fish and benthic biota of the continental shelf and slope, between 138 and 146°E longitude (Fig. 1.6). Various sampling gear, such as beam trawls, benthic sleds and sediment grabs, were used. In addition, sidescan sonar, underwater video and still images assisted with the classification of the sea floor and benthic communities, and to collect images of organisms that are poorly sampled or damaged by traditional sampling. Of particular interest were the effects of iceberg gouging on benthic communities and how they respond to this disturbance. This report is a compilation of the Geoscience Australia input to the CEAMARC V3 expedition on *Aurora Australis*. Each chapter describes the basic purpose of each sampling technique for the equipment supplied by Geoscience Australia, the locations of sample sites, and any metadata.

1.4 CEAMARC V3 Track

The CEAMARC V3 survey started in Hobart on 16 December 2007 and arrived on the Antarctic shelf to commence CEAMARC surveying on 22 December 2007 (Fig. 1.4). Over the following 29 days until the vessel departed Antarctica, about 120 sites were sampled on and near the continental shelf off George V Land and Terre Adelie (Figs. 1.5 and 1.6). The ship arrived in Hobart on 27 January 2008 after 43 days at sea. The science party and crew are listed in Appendix 1. A voyage narrative describing daily activities is in Appendix 2. In summary, the following activities were achieved in the CEAMARC area and on route during V3:

- 1 Argos float
- 130 conductivity-temperature-depth casts with sampling bottles
- 3 acoustic recording packages
- 87 AAD beam trawls
- 13 French beam trawls
- 6 sled trawls
- 102 box corers
- 3 Smith-MacIntyre grabs
- 9 Van-Veen grabs
- 5 continuous plankton recorder deployments
- 25 Geoscience Australia Deep Underwater Camera deployments
- 33 AAD video deployments
- 39 AAD still camera deployments
- 10 oceanographic mooring visits and deployments
- 23 plankton water samples
- 2 sidescan sonar deployments
- 1 trace metal sampling

Full details are in following chapters and appendices.

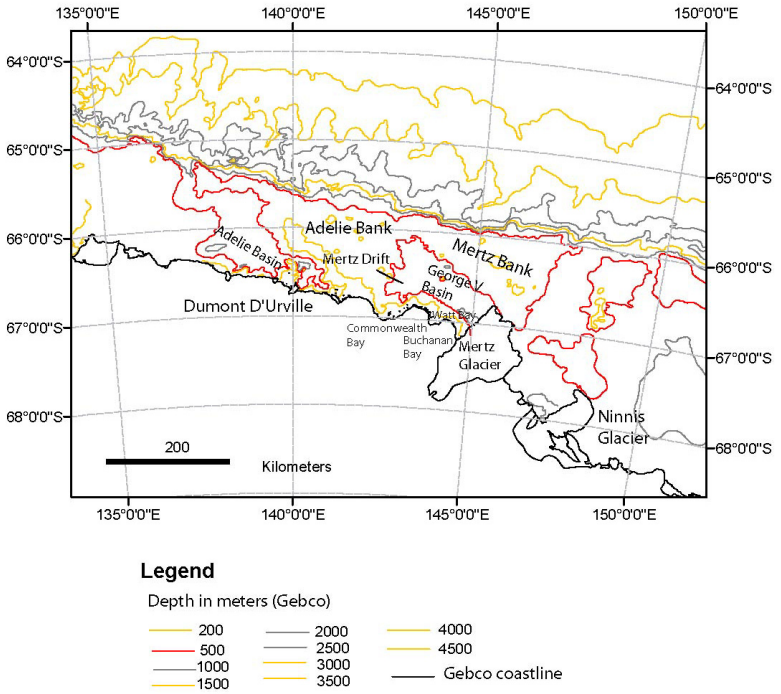

Figure 1.5. Named locations on the George V-Terra Adelie margin. Contours and coastline from Gebco.

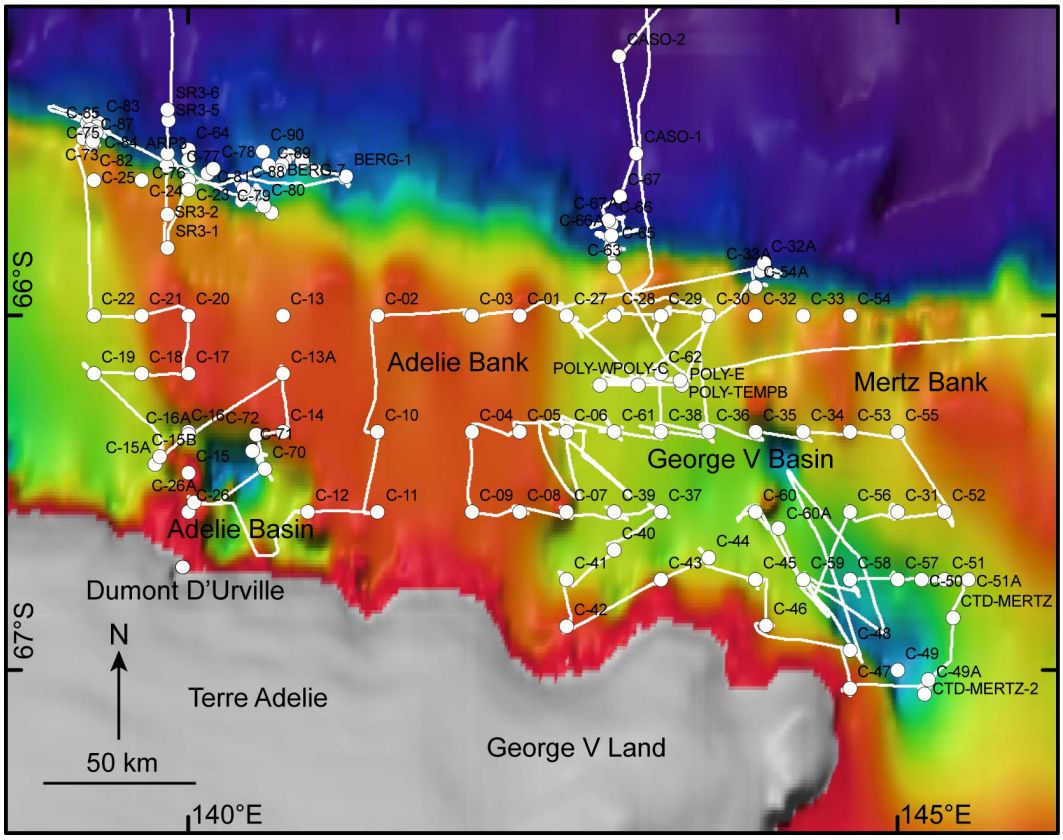

Fig. 1.6 CEAMARC V3 track and station locationson the Terre Adelie and George V Shelf.

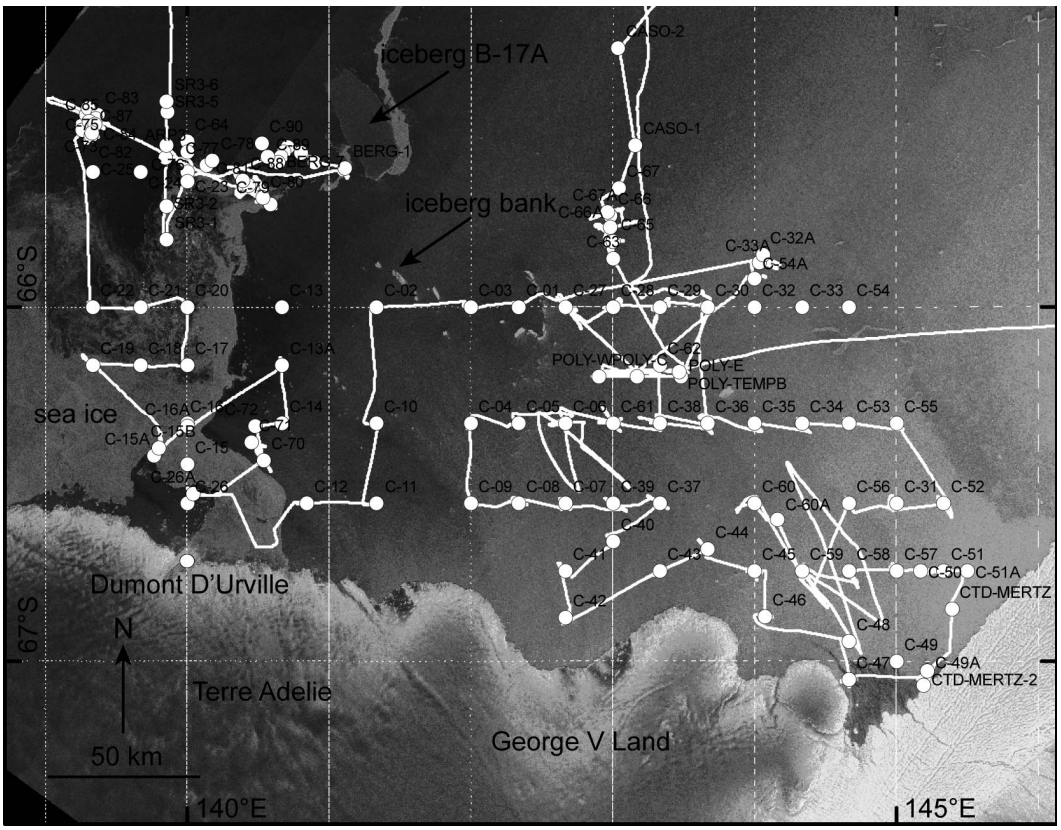

Fig. 1.7 Envisat ASAR image 2 Jan 2008 22:25 UTC.

Chapter 2. Sediment Data

2.1 Introduction

The Terre Adelie and George V shelves are deep with an average shelf break depth of 500 m and are approximately 130 km wide. The shelf is dominated by the deep George V Basin to the east and the Adelie Basin in the western study area (Fig. 1.5, Porter-Smith, 2003). The George V Basin reaches its deepest point of over 1300 m adjacent to the Mertz Glacier Tongue. The basin axis trends parallel to the coast, shoaling gently to depths of about 800 m, before swinging north towards a U-shaped sill connecting the basin to the shelf break at a depth of approximately 450 m. Within the west arm of the basin, a sediment drift deposit of about 400 km^2 was mapped and named the Mertz Drift (Harris et al., 2001). The George V Basin is bounded to the northeast by the flat-topped Mertz Bank, and to the west by the Adelie Bank, shoaling to depths of about 200 m (Domack, 1982). The Adelie Basin is about 1000 m deep on the inner Terre Adelie shelf, and shoals gently into a broad trough to the west of the Adelie Bank.

The study area has been the focus of numerous geological expeditions, collecting grab and core samples, particularly along the George V shelf (e.g. Anderson, 1999; Beaman and Harris, 2005; Domack, 1982; Domack, 1988; Domack and Anderson, 1983; Dunbar et al., 1985; Hampton et al., 1987; Harris and Beaman, 2003; Presti et al., 2003). In general, a sandy mud characterises the lower basin deeper than 600 m depth (Beaman and Harris, 2005). This sediment is also known as siliceous mud and diatom ooze (SMO). In the upper basin, slightly gravelly, sandy mud is found between 500 to 600 m. Again, mud is dominant within samples but with a slight increase in proportion of gravel compared to the deeper lower basin. Sediment on the majority of the outer banks and shelf edge is gravelly, muddy sand. Sediments in this zone are also called an ice-keel turbate, comprising a mix of reworked glacial till, ice-rafted debris and marine biogenic material (Barnes and Lien, 1988). Within the inner shelf shallower than 200 m, gravel dominates the surficial sediment. This information was used to help plan the CEAMARC V3 sample sites.

Hence an objective of CEAMARC V3 was to acquire sediment samples to describe the substrate types and environment of deposition for the various seabed habitats of the study area. At most sites, a box core, Van-Veen or Smith-MacIntyre grab were deployed to collect surficial sediment samples. The methods are described below and activity details are listed in Appendix 4.

2.2 Methods

A box core was the preferred method for obtaining a sample of the seabed sediment and macro-infauna/epifauna at each site (Fig. 2.1). The box core generally obtained a sample of the top 10 to 20 cm of sediment, depending on the mud content of the seabed. Sediments with higher proportions of gravel or sand were more difficult to penetrate and the Van-Veen grab became the next preferred option (Fig 2.2). The Smith-MacIntyre grab was only used a few times with generally poor results. Where grabs returned with no sediment, up to three attempts were made at the site and sometimes with alternative grab devices until a better sample was obtained. Sample sites are shown in Fig. 2.3.

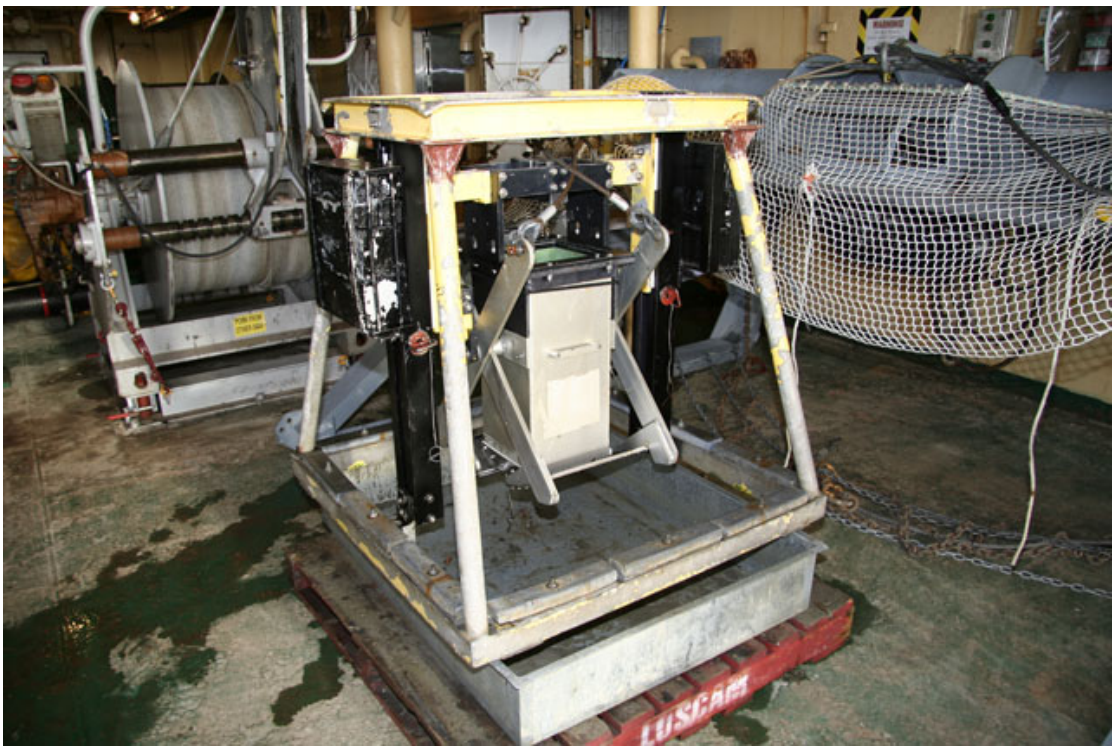

Fig. 2.1 Box core device.

Fig. 2.2 Van-Veen grab device.

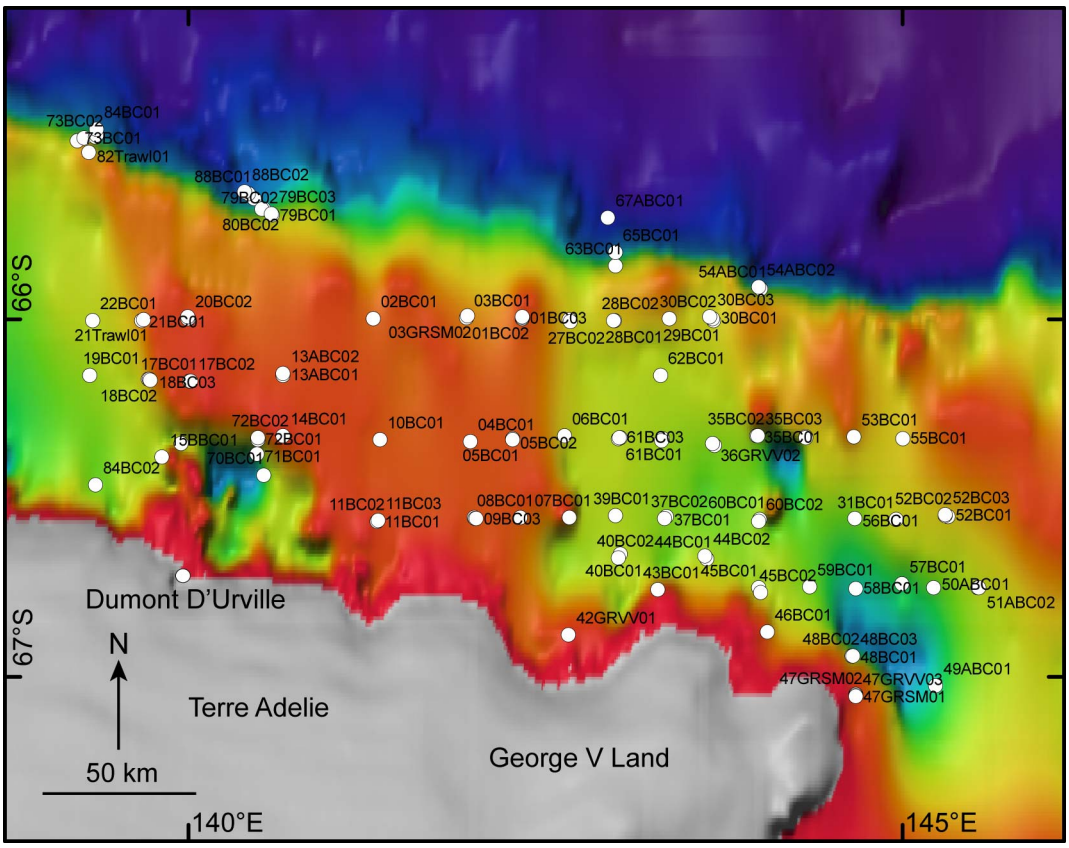

Fig. 2.3 CEAMARC V3 grab sample and box core sites.

The sediment samples were named by:

1. CEAMARC site (e.g. 16);
2. Instrument (e.g. box corer = BC; Smith-MacIntyre = GRSM; Van Veen = GRVV); and
3. Sequence of sample at each site (e.g. first sample = 01, second sample = 02).

For example, 16BC02 is the second sample at CEAMARC site 16 using the box core. 52BC03 is the third sample at CEAMARC site 52 using the box core. 47GRVV03 is the third sample at CEAMARC site 47 using the Van-Veen grab.

If a good volume of material was retrieved, the following sub-samples were obtained:

1. 200 g surface scrape (labelled A and frozen);
2. short (20 cm) push core (labelled B and stored cool);
3. bulk (labelled Bulk and stored cool); and
4. rocks-only (labelled Rocks and stored cool).

For example, 16BC02A is a 200 g surface scrape sub-sample from 16BC02. 16BC02B is a push core sub-sample from 16BC02. 16BC02Bulk is a bulk sediment sub-sample from 16BC02. 16BC02Rocks is a rocks-only sub-sample from 16BC02. Cores obtained are listed in Appendix 5.

The planned post-cruise analyses of the sediment samples will comprise:

1. Grain size
2. Total organic carbon
3. Total organic nitrogen
4. Carbon and nitrogen isotopes
5. Biogenic silica and carbonate
6. Physical properties of cores
7. X-rays for infauna and sedimentary structures

Chapter 3. Video Data

3.1 Introduction

Underwater video and still-imagery tools are successful groundtruth techniques for recording seabed megabenthos and habitat characteristics. On the Antarctic shelf, a number of surveys have utilised these tools to collect data on landscape statistics, geology-benthos relations, shallow- and deep-shelf community structure (Teixido et al., 2002), (Bowden, 2005; Gutt and Starmans, 1998; Piepenburg et al., 2002; Ragua-Gil et al., 2004). On the East Antarctic shelf within the CEAMARC study area, previous work has mostly been restricted to black and white still-images from the 2000 WEGA expedition (Beaman and Harris, 2005; Brancolini and Harris, 2000) and several colour still-images from the 2001 NBP0101 expedition (Leventer et al., 2001). More recently, ROV video data were used to differentiate mega-epibenthic diversity within several miles north of the French Antarctic station, Dumont D'Urville (Gutt et al., 2007). This study found that sessile suspension feeders dominated depths from 20 to 110 m, and that sponges were rare at these depths. The only study to examine benthos distribution across the George V Shelf (Beaman and Harris, 2005) showed that local-scale (10s of km) biotopes could generally be differentiated according to depth and geomorphology. This information was used to help plan the CEAMARC V3 sample sites to obtain a better understanding of benthos distribution across the Terre Adelie and George V shelves.

An objective of CEAMARC V3 was to collect underwater video records of the seabed to document the fauna and communities associated with representative habitats in the study area. At 22 sites, the GA DUC camera was deployed to collect underwater video along transects within several metres of the seabed. The methods are described below and activity details are listed in Appendix 6.

3.2 Methods

The Geoscience Australia Deep Underwater Camera (DUC) was used for obtaining video transects of the seabed (Fig. 3.1). Note, the AAD underwater video was another groundtruth tool used during the CEAMARC V3 expedition and is not reported here. The DUC camera comprised a large metal frame on which was bolted a video camera housing, 2 x 250 watt lights in front, 2 x 100 watt lights to rear, 2 x oil-filled 12 volt batteries and electronics and floatation containers. The cylindrical metal housing contained a Sony DVCAM Camcorder DSRPDX10 recording to an internal Sony 6 mm DVCAM tape cassette. A live video feed was transmitted up the electronic winch cable to a laptop set up in the *Aurora Australis* aft winch control room. The laptop imagery was used for fine control of the deck winch to maintain control over the camera height above the seabed. The quality of the video was therefore a function of the speed over the ground, the roughness of the seabed, and the ability of the winch operator to maintain a height above the seabed within the limits of the illumination. With experience, the DUC camera proved to be a very useful tool for video transects over quite rough ground, and also as the first instrument to be deployed at sites in order to make decisions about subsequent gear use at the sites. The sample sites for the GA DUC camera are shown in Fig 3.2.

Fig. 3.1 Geoscience Australia Deep Underwater Camera.

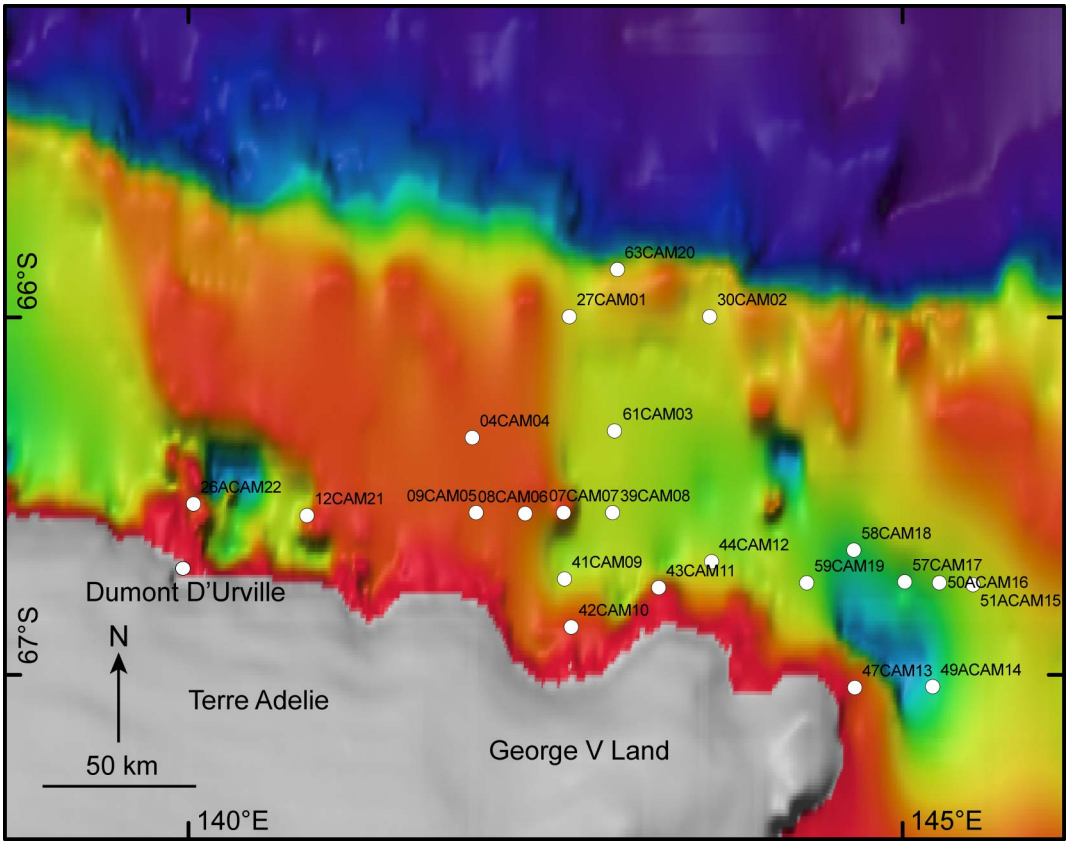

Fig. 3.2 CEAMARC V3 GA video sites.

The video samples were named by:

1. CEAMARC site (e.g. 16);
2. Instrument (e.g. camera = CAM); and
3. Sequence of deployments through the survey overall (e.g. first deployment = 01; second deployment = 02).

For example, 09CAM05 is the fifth camera deployment of the survey overall, and was at CEAMARC site 09.

The post-cruise analysis of the AVI video data will involve logging 15-second interval seabed geology and biology (species, class, order, and whatever is significant for the habitat) directly into GNAV software for overlay into ArcGIS.

Chapter 4. Sidescan Data

4.1 Introduction

In the past, sidescan sonar been used to examine iceberg scour features on the Antarctic shelf. The devastation caused by the impact of icebergs on benthic communities has been referred to as one of the most destructive natural disasters any living community can experience (Gutt and Starmans, 2001). Grounded icebergs leave imprints of their passing on the seabed, such as circular depressions, linear scours, and criss-crossing ridges and grooves (Barnes and Lien, 1988). These features may be several metres in height and found in depths to about 500 m, and are easily detected by their acoustic shadows on sidescan records. On the Antarctic shelf, sidescan sonar has typically been used on the relatively shallow (200 to 500 m) outer shelf banks where icebergs are known to become grounded during transport by ocean currents (Gutt and Starmans, 2001; Massom, 2003). On the East Antarctic shelf, sidescan sonar techniques have been used by previous expeditions to MacRobertson Land (Harris and O'Brien, 1996), Prydz Bay (Harris et al., 1998), and George V Land shelves (Barnes, 1987; Barnes and Lien, 1988), and the images confirm the ubiquity and diversity of iceberg scour features on the shallow banks and offshore moraines.

An objective of CEAMARC V3 was to acquire sidescan data to describe the substrate types and environment of deposition for the various seabed habitats. At two sites early in the survey, the sidescan sonar was deployed to collect acoustic images of the seabed in depths of about 440 and 680 metres. Due to problems with the tow winch, the weight of the sonar fish, issues with the acoustic image, and limited time at each site, no further deployments were made during the survey. The methods are described below and survey details are listed in Appendix 6.

4.2 Methods

An EdgeTech 4200FS sidescan sonar (Fig. 4.1) was used during the survey to collect acoustic imagery of the seabed in conjunction with the Discover acquisition software installed on a dedicated processor set up in the *Aurora Australis* aft winch control room. A large deck-mounted winch provided the power and controls to the sidescan fish when towed through the water. A remote winch control was also set up in the aft winch control room to allow the sidescan operator control over the fish height above the seabed by heaving in or veering the winch. Each survey was configured:

- High Speed Mode (HSM)
- Low frequency system on (120 kHz)
- Normal display mode
- Recording in native JSF format
- Range setting 300 metres
- Slant range correction off
- Sound speed 1500 m/sec
- Speed correction on
- TVG start at origin
- Navigation offsets all 0 metres
- Power level 100%

Fig. 4.1 EdgeTech 4200FS sidescan.

The raw sonar files were named by:

4. Survey name (e.g. AA032007);
5. Julian date (e.g. 357 = 24 Dec 2007);
6. Time in UTC for the start of recording (e.g. 0810 = hhmm); and
7. Sequence of files after the 1st file recorded (e.g. .001 = 2nd, .002 = 3rd file).

For example, AA0322073570810.002.jsf is the 2nd raw file recorded during a sonar deployment on the survey AA032007, at Julian date 357, commencing at 0810 UTC.

An issue that became apparent during the initial deployment was the relatively light weight of the sonar fish, which prevented it from gliding closer to the seabed even at a slow speed of about 1 to 2 kn. For the second deployment, a 50 kg weight was attached to the cable above the fish which assisted in making the sonar sink lower. However, over 1000 m of cable needed to be streamed, making it very difficult to record layback while controlling the sonar and it did not result in an improvement in image quality. Based on this and the long time required to deploy and recover the sidsecan fish, the operation was considered impracticable for further surveying of the CEAMARC stations. The two sample sites are shown in Fig. 4.2.

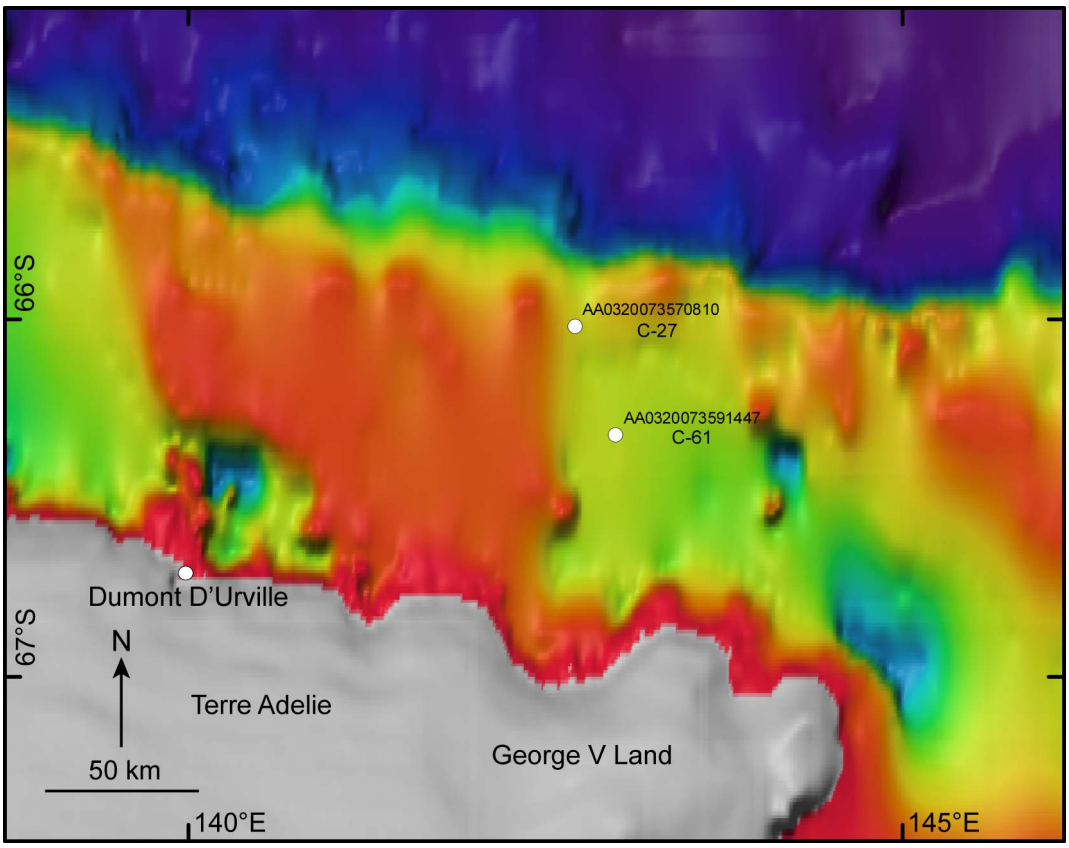

Fig. 4.2 CEAMARC V3 sidescan sites.

The raw files were post-processed in Caris HIPS/SIPS using a vessel configuration file, AuroraAustralis.hvf, which used a Reference Point at the GPS position directly above the winch block used to deploy the sonar. Each file was imported through the Conversion Wizard:

1. EdgeTech format
2. AA0320073570810.jsf etc.
3. Project AA032007, Vessel AuroraAustralis, Day 2007-357 etc.
4. Navigation Coordinate Type Geographic
5. tick Navigation, Set extents Project file
6. JSF Channel All data, Preserve 16 bits

All files were checked in the Caris Sidescan Editor and slant range corrected after the altitude was manually digitized. A serious issue that became obvious once files were imported and mosaiced together was that the internal magnetic compass (providing the heading information used to steer the port and starboard beams) was in error due to the close proximity of the South Magnetic Pole. Caris HIPS/SIPS provided an alternative option to use the ship's Course Made Good to steer the sidescan beams, however, this also resulted in beams that swung forward and aft in response to the ship's heading, and the resulting image mosaic was still quite poor. The mosaiced images were exported as geotif images for import to ArcGIS and will be used to study iceberg scour length, height and orientation at these sites.

Conclusions

The CEAMARC benthic survey collected data and samples from 67 stations on the George V Land shelf. samples included trawls of benthic organisms and demersal fish, sediment samples and water. Video transects were collected independently by the GA video and also by cameras in the AAD beam trawls. Ongoing interpretation of the samples and data will greatly enhance the understanding of the Antarctic marine biodiversity and the relationship between physical conditions and benthic communities. The spatial variability of benthic communities will help identify communities that are vulnerable to disturbance.

References

Anderson, J.B., 1999. Antarctic Marine Geology. Cambridge University Press, Cambridge, U.K., 289 pp.

Arntz, W.E., Brey, T., Gallardo, V.A., 1994. Antarctic zoobenthos. Oceanography and Marine Biology: an Annual Review, 32: 241-304.

Barnes, P.W., Lien, R., 1988. Icebergs rework shelf sediments to 500 m off Antarctica. Geology, 16: 1130-1133.

Beaman, R.J., Harris, P.T., 2005. Bioregionalisation of the George V Shelf, East Antarctica. Continental Shelf Research, 25: 1657-1691.

Bowden, D.A., 2005. Quantitative characterization of shallow marine benthic assemblages at Ryder Bay, Adelaide Island, Antarctica. Marine Biology, 146: 1235-1249.

Brancolini, G., Harris, P.T., 2000. Post Cruise Report AGSO Survey 217: Joint Italian/Australian Marine Geoscience Expedition aboard the R.V. Tangaroa to the George Vth Land Region of East Antarctica during February-March, 2000. AGSO Record No. 2000/38, Australian Geological Survey Organisation, Canberra, Australia.

Brandt, A., Gooday, A.J., Brandao, S.N., Brix, S., Brokeland, W., Cedhagen, T., Choudhury, M., Cornelius, N., Danis, B., De Mesel, I., Diaz, R.J., Gillan, D.C., Ebbe, B., Howe, J.A., Janussen, D., Kaiser, S., Linse, K., Malyutina, M., Pawlowski, J., Raupach, M., Vanreuse, A., 2007. First insights into the biodiversity and biogeography of the Southern Ocean deep sea. Nature, 447: 307-311.

Domack, E.W., 1982. Sedimentology of glacial and glacial marine deposits on the George V - Adélie continental shelf, East Antarctica. Boreas, 11: 79-97.

Domack, E.W., 1988. Biogenic facies in the Antarctic glacimarine environment: basis for a polar glacimarine summary. Palaeogeography, Palaeoclimatology, Palaeoecology, 63: 357-372.

Domack, E.W., Anderson, J.B., 1983. Marine geology of the George V continental margin: combined results of Deep Freeze 79 and the 1911-14 Australasian Expedition. In: R.L. Oliver, P.R. James and J.B. Jago (Editors), Fourth International Symposium on Antarctic Earth Sciences. Australian Academy of Science, Canberra, Australia, pp. 402-406.

Dunbar, R.B., Anderson, J.B., Domack, E.W., 1985. Oceanographic influences on sedimentation along the Antarctic continental shelf. In: S.S. Jacobs (Editor), Oceanology of the Antarctic Continental Shelf. Antarctic Research Series Volume 43. American Geophysical Union, Washington D.C., USA, pp. 291-312.

Gutt, J., Koubbi, P., Eleaume, M., 2007. Mega-epibenthic diversity off Terre Adelie (Antarctica) in relation to disturbance. Polar Biology, 30: 1323-1329.

Gutt, J., Starmans, A., 1998. Structure and biodiversity of megabenthos in the Weddell and Lazarev Seas (Antarctica): ecological role of physical parameters and biological interactions. Polar Biology, 20: 229-247.

Gutt, J., Starmans, A., 2001. Quantification of iceberg impact and benthic recolonisation patterns in the Weddell Sea (Antarctica). Polar Biology, 24: 615-619.

Hampton, M.A., Kravitz, J.H., Luepke, G., 1987. Geology of sediment cores from the George V continental margin, Antarctica. In: S.L. Eittreim and M.A. Hampton (Editors), The Antarctic Continental Margin: Geology and Geophysics of Offshore Wilkes Land, CPCEMR Earth Science Series. Circum-Pacific Council for Energy and Mineral Resources, Houston, Texas, pp. 151-174.

Harris, P.T., Beaman, R.J., 2003. Processes controlling the formation of the Mertz Drift, George Vth continental shelf, East Antarctica: evidence from 3.5 kHz sub-bottom profiling and sediment cores. Deep-Sea Research Part II, 50(8-9): 1463-1480.

Harris, P.T., Brancolini, G., Armand, L., Brusetti, M., Beaman, R.J., Giorgetti, G., Presti, M., Trincardi, F., 2001. Continental shelf drift deposit indicates non-steady state Antarctic bottom water production in the Holocene. Marine Geology, 179(1-2): 1-8.

Harris, P.T., O'Brien, P.E., 1996. Geomorphology and sedimentology of the continental shelf adjacent to Mac. Robertson Land, East Antarctica: a scalped shelf. Geo-Marine Letters, 16: 287-296.

Harris, P.T., Taylor, F., Pushina, Z., Leitchenkov, G., O'Brien, P.E., Smirnov, V., 1998. Lithofacies distribution in relation to the geomorphic provinces of Prydz Bay, East Antarctica. Antarctic Science, 10(3): 227-235.

Hosie, G.W., Stoddart, M., Wadley, V., Koubbi, P., Ozouf-Costaz, C., Ishimaru, T., Fukuchi, M., 2007. The Census of Antarctic Marine Life and the Australian-French-Japanese CEAMARC (Collaborative East Antarctic Marine Census) contribution, International Symposium Asian Collaboration in IPY 2007-2008. National Institute of Polar Research, Tokyo, Japan, pp. 47-50.

Ingolfsson, O., Hjort, C., Humlum, O., 2003. Glacial and climate history of the Antarctic Peninsula since the Last Glacial Maximum. Arctic, Antarctic, and Alpine Research, 35(2): 175-186.

IPCC, 2007. Climate Change 2007: The Physical Science Basis, Summary for Policymakers, Intergovernmental Panel on Climate Change, Geneva, Switzerland.

Koubbi, P., Hureau, J.-C., Vacchi, M., White, M., 1997. Results of the preliminary survey on the coastal distribution of fish larvae in Adelie Land (Southern Ocean) during January–February 1996. Cybium, 21(4): 381-392.

Leventer, A., Brachfield, S., Domack, E.W., Dunbar, R., Manley, P., McClennen, C., 2001. Coring Holocene Antarctic Ocean Sediments. NBP0101 Cruise Report, Colgate, USA.

Massom, R.A., 2003. Recent iceberg calving events in the Ninnis Glacier region, East Antarctica. Antarctic Science, 15(2): 303-313.

Nicol, S., Pauly, T., Bindoff, N.L., Wright, S., Thiele, D., Hosie, G.W., Strutton, P.G., Woehler, E., 2000. Ocean circulation off east Antarctica affects ecosystem structure and sea-ice extent. Nature, 406: 504-507.

Piepenburg, D., Schmid, M.K., Gerdes, D., 2002. The benthos off King George Island (South Shetland Islands, Antarctica): further evidence for a lack of a latitudinal biomass cline in the Southern Ocean. Polar Biology, 25: 146-158.

Porter-Smith, R., 2003. Bathymetry of the George Vth Land shelf and slope. Deep-Sea Research Part II, 50(8-9): 1337-1341.

Presti, M., De Santis, L., Busetti, M., Harris, P.T., 2003. Late Pleistocene and Holocene sedimentation on the George V Continental Shelf, East Antarctica. Deep-Sea Research Part II, 50(8-9): 1441-1461.

Ragua-Gil, J.M., Gutt, J., Clarke, A., Arntz, W.E., 2004. Antarctic shallow-water mega-epibenthos: shaped by circumpolar dispersion or local conditions. Marine Biology, 144: 829-839.

Teixido, N., Garrabou, J., Arntz, W.E., 2002. Spatial pattern quantification of Antarctic benthic communities using landscape indices. Marine Ecology Progress Series, 242: 1-14.

Trathan, P.N., Forcada, J., Murphy, E.J., 2007. Environmental forcing and Southern Ocean marine predator populations: effects of climate change and variability.

Philosophical Transactions of the Royal Society of London B Biological Sciences, 362: 2351-2365.
Barnes, P.W., 1987. Morphological studies of the Wilkes Land continental shelf, Antarctica - glacial and iceberg effects. In: S.L. Eittreim and M.A. Hampton (Editors), The Antarctic Continental Margin: Geology and Geophysics of Offshore Wilkes Land, CPCEMR Earth Science Series. Circum-Pacific Council for Energy and Mineral Resources, Houston, Texas, pp. 175-194.

Appendix 1. Scientific Party

Voyage Management and Support	
Dr Martin Riddle (AAD)	Voyage Leader and Chief Scientist
Ms Sarah Robinson (AAD)	D. Voyage Leader and Lab Manager
Dr Edi Albert (AAD)	Medical Officer
Mr Chris Kuplis (AAD)	Senior Communications Officer
Marine Science Technical Support	
Mr Aaron Spurr (AAD)	Gear Officer
Mr Kim Briggs (AAD)	Electonics
Mr Tony Veness (AAD)	Electronics
Ms Belinda Ronai (AAD)	Programmer
Mr Stuart Crapper (AAD)	Gear Officer
CEAMARC Project	
Dr Catherine Ozouf-Costaz (CNRS)	Fish Biologist
Dr Samuel Iglesias (MNHN)	Fish Biologist
Dr Stefan Chilmonczyk (INRA)	Fish Biologist
Mr Frédéric Busson (MNHN)	Fish Biologist
Mr Romain Causse (MNHN)	Fish Biologist
Dr Bertrand Richer de Forges (IRD)	Taxonomist
Mr Jean-François Barazer (IRD)	Fishery Officer
Mr Thomas Silberfeld (MNHN)	Biologist
Dr Marc Eleaume (MNHN)	Benthic Ecologist
Dr Bernard Métivier (MNHN)	Taxonomist
Ms Sophie Mouge (MNHN)	Education & Outreach
Mr Jules Biggart (MAq)	Education & Outreach
Dr Robin Beaman (JCU)	Marine Geologist
Mr Jack Pittar (GA)	Marine Technician
Dr Glenn Johnstone (AAD)	Applied Benthic Ecologist
Mr Chris Gillies (UNE)	Benthic Ecologist
Ms Helena Baird (UTAS)	Benthic Ecologist
Mr Jeff Hoffman (JCVI)	Environmental Genomics
Mr Jeff McQuaid (JCVI)	Environmental Genomics
Ms Margot Foster (ABC)	Media Outreach
CASO Project	
Dr Steve Rintoul (CSIRO)	Oceanographer
Mr Mark Rosenberg (ACECRC)	Oceanographer
Ms Esmee van Wijk (ACECRC/CSIRO)	Oceanographer
Ms Jessica Trevena (UNSW)	Oceanographer
Ms Alicia Navidad (CSIRO)	Hydrochemist
Dr Mark Warner (UW)	Oceanographer
Dr Beverley Henry (QCCCE)	Chemist
Ms Emily Lemagie (UW)	Oceanographer
Mr Tomas Remenyi (ACECRC)	Hydrochemist
GEOTRACES Project	

Ms Jill Sutton (ANU)	Biologist
Ms Andrea De Leon (ANU)	Geochemist
Ms Claire Thompson (ANU)	Geochemist
CO2 Project	
Ms Kristina Paterson (CSIRO)	Biogeochemist
Ms Kate Berry (CSIRO)	Biogeochemist
Ms Danica Ellicott (RAN)	Oceanographer
Ms Melissa Coman (ANU)	Oceanographer
Venoms Project	
Dr Bryan Fry (UMelb)	Biochemist
Dr Janette Norman (MVic)	Molecular Biologist
Mr Eivind Undheim (NTNU)	Zoologist
Ms Hanne Thoen (NTNU)	Zoologist
Protists Project	
Dr Harvey Marchant (ANU)	Phytoplankton Biologist
Primary Production Project	
Ms Sarah Merefield (IASOS)	Biologist
Mr Ben Smethurst (IASOS)	Biologist
Crew	
Capt. Ian Moodie (P&O)	Master
Mr Tim Sharpe (P&O)	1st Officer
Mr Nick Hess (P&O)	2nd Officer
Mr Toby White (P&O)	3rd Officer
Mr Jamie Oliver (P&O)	4th Officer
Mr Evan Peters (P&O)	Chief Engineer
Mr Paul Scales (P&O)	1st Engineer
Mr Stephen Siejka (P&O)	2nd Engineer
Mr Colin Peart (P&O)	3rd Engineer
Mr Per Larsen (P&O)	Chief Int. Rating
Mr Glen Colledge (P&O)	Integrated Rating
Mr John Allwood (P&O)	Integrated Rating
Mr Les Mockler (P&O)	Integrated Rating
Mr Roger Davis (P&O)	Integrated Rating
Mr Paul Hansen (P&O)	Integrated Rating
Mr Jonathon Lumb (P&O)	Integrated Rating
Mr Tim Freeman (P&O)	Integrated Rating
Mr Ashleigh Pollock (P&O)	Chief Steward
Ms Lynnette McLaren (P&O)	Steward
Mr John Leonard (P&O)	Chief Cook
Ms Kym Farmer (P&O)	2nd Cook
Mr Dan Nicholson (P&O)	Extra IR/Marine Science
Mr David Suleiman (P&O)	Extra IR/Marine Science
Mr Kel Lewis (P&O)	Greaser
Mr Gordon Patterson (P&O)	Trainee Engineer

Appendix 2. Voyage Narrative

15-12-07 Saturday. Shipboard laboratory safety inductions took place for all scientific staff. Loading and stowage of scientific equipment continued all day.

16-12-07 Sunday. *Aurora Australis* sailed from Hobart at 19:00 hrs into the Southern Ocean for transit to Antarctica for the Collaborative East Antarctic Marine Census (CEAMARC) and Climate of Antarctic and Southern Ocean (CASO) research programs as part of the International Polar Year (IPY).

17-12-07 Monday. Continued transit to Antarctica. Weather sunny with light winds and a 3 m SW swell. Air temp. 11.4° and sea temp. 10.1°. A surface sediment trap PULSE mooring was deployed to collect sinking particulate matter. The ship's Acoustic Doppler Current Profiler (ADCP) became operational and tested successfully to depths of 500 to 700 m.

18-12-07 Tuesday. On transit to Antarctica. Weather mostly sunny breaks, wind 19 kn and swell 3 m from SW. Air temp. 9.9° and sea temp. 10.1°. The first conductivity/temperature/depth (CTD) profile was conducted to >1000 m. An Argo float was deployed, which is an autonomous CTD controlled by an on-board computer that sinks and rises through the water column over a two year period sending data back via satellite. An acoustic mooring was deployed on the seabed in 2000 m which records the calls of whales, with the data used to estimate the
presence, relative abundance, and movement of the different whales in the region.

19-12-07 Wednesday. Transit to Antarctica. Weather overcast, wind 8 kn and 2 m swell from W. Air temp. 6.0°, sea temp. 5.3°. At 11:00 hrs, we arrived at a previously-deployed Sub-Antarctic Zone Site C (SAZC) mooring. A successful acoustic release allowed recovery of all buoys, lines and instruments on deck. A second acoustic mooring was deployed for whale monitoring. The ship continued the transit towards the main CEAMARC/CASO sample sites on the George V continental shelf at about latitude 66°S, longitude 143°E. The social committee started an iceberg sweep to guess the time of first sighting of an iceberg with all extra monies raised going to Camp Quality, the ship's charity.

20-12-07 Thursday. In the Southern Ocean on transit to Antarctica. Weather overcast with sea fog. Wind 18 kn from NW. Slight seas and a 2 m NW swell. Air temp. 4.0°, sea temp. 2.9°. The setting up and preparation of GA equipment continued in the aft winch room. At 10:00 hrs, each leader of a scientific team gave a brief overview of the planned major scientific activities with the intention of stimulating further collaborations among the various research groups. This was followed after lunch by a talk on the structure and evolution of reptile venom. At 15:00 hrs, all people new to Antarctica participated in a 'crossing the line' ceremony where King Neptune and his entourage visited to initiate them into his realm.

21-12-07 Friday. On transit to the CEAMARC/CASO sites. Weather foggy, wind 5.1 kn from S. Seas slight with a 2 m NW swell. Air temp. 0.7°, sea temp. 0.5°. The marine GIS database was prepared for the sampling site waypoints on the Terre Adelie and George V Land shelf and slope regions. Due to the heavy sampling schedule planned for 25 Dec, Christmas was brought forward and at 14:00 hrs, a sumptuous lunch was prepared by the galley staff, followed by communal present-giving amongst all ship staff and science crew. The first iceberg was sighted at 21:45 hrs.

22-12-07 Saturday. Arrival at CEAMARC/CASO sites on the George V shelf. Weather is sunny with wind 10 kn from NW. Seas calm and no swell. Air temp. -2.0° and sea temp. -1.2°. The ship arrived on the outer George V shelf 50 nm north of Commonwealth Bay with many observations of icebergs, pack ice and Antarctic wildlife. A transfer of stowed heavy scientific equipment between decks took place all day in preparation for commencement of sampling in the afternoon. A final brief was held for all scientific staff regarding sampling protocols and rules for deck operations. At 16:00 hrs, the three CASO Mertz Polynya moorings were prepared and deployed through the night.

23-12-07 Sunday. At the first CEAMARC site on the George V shelf. Weather sunny, wind 9 kn from SE. Seas rippled and a low NE swell. Air temp. -1.5° and sea temp. -0.6°. Ice conditions, 2/10 loose pack ice with distant icebergs. Sampling activities commenced at 0715 hrs on the first site (27). A heavy benthic sled was deployed to capture the top few cm of sediment, infaunal and invertebrate benthos. Enough material was obtained to keep the biological team busy for hours photographing, tagging and storing the marine life. At 12:49 hrs the box core was deployed which successfully returned a 15 cm section of the seabed. A mini-core and Pb210 sample was obtained for post-cruise analysis. A CTD was deployed at the site and will be at each remaining CEAMARC site. Through the

morning, problems arose when the GA winch failed to rotate when using the controller. GA and ship staff continued fault-finding the problem until solved after midday. At 15:55 hrs the GA deep underwater camera (DUC) was deployed using the winch to 450 metres depth. The winch operated correctly but sluggishly. Images of the seabed and benthos were of high quality revealing relict iceberg furrows. At 19:10 hrs, the EdgeTech 4200FS sidescan was deployed in 450 m. The lightness of the sidescan fish required over 1000 m of cable streamed to achieve a satisfactory image of the seabed, however, the winch started tripping out and the sidescan transect was aborted.

24-12-07 Monday. At CEAMARC sites on the George V shelf. Weather overcast, wind 7 kn from NW. Seas rippled with a long low swell. Air temp. -1.0°, sea temp. -1.26°. Ice conditions, 3/10 open pack ice. The first CEAMARC site took about 20 hours to complete as gear was tested and operations fine-tuned, then the ship moved to subsequent sites on the outer George V shelf. Each haul of the sleds and trawls bring up new and interesting material, a highlight being the first Antarctic record for a particular group of molluscs. Through the morning, GA staff worked on the camera and sidescan winch to correct hydraulic and electrical problems. The winch became more responsive as a result. A replay of the DUC camera results from the first site revealed a yellow hue to the vision. A custom white balance correction was made to the camera in order to correct for the underwater lamps used in the system. At 22:50 hrs, the DUC camera was deployed in about 450 m and returned excellent vision of a relict iceberg-scoured seabed covered in bryozoan hash. On heaving in, the winch continued to cut out resulting in a suspension of all further deployment of equipment from this winch until repaired.

25-12-07 Tuesday. At CEAMARC sites on the George V shelf. Weather overcast, wind 8 kn from E. Calm seas with low NE swell. Air temp. -1.0°, sea temp. -0.22°. Ice conditions, 1/10 open pack ice and distant icebergs. Continued sampling in the outer George V Basin with depths increasing towards the south and consequently longer sampling periods needed for each item of equipment. Beam trawl still cameras recorded excellent high-resolution images of the seabed and benthos. Work continued on the winch to find the cause of it cutting out. Hydraulic lines were bled of air and all electrical connections checked. At 23:10 hrs the DUC camera was deployed in 663 m depth. Despite worsening weather conditions, the winch performed well under careful monitoring during the heave-in operation and did not cut out. Christmas day for all onboard was a quiet affair as celebrations had been brought forward to 21 Dec.

26-12-07 Wednesday. At CEAMARC sites on the Adelie Bank. Weather poor visibility, sleet and snow, wind 40 kn from SE. Seas rough. Air temp. -2.3°, sea temp. -1.0°. Sampling completed on the outer George V Basin as weather conditions worsened during the deployment of the EdgeTech sidescan. A weight was fitted to enable the fish to be flown at these deeper depths which helped lower the towfish in the deep waters of the basin. The sidescan was operated in High Definition Mode low frequency (210 kHz) at a towfish depth of about 550 m in 650 m of water. The imagery was quite poor and seabed features wee mostly undefinable. Throughout the remainder of the day, the ship rode out the storm with no further deployment of gear until the weather eased later in the evening. The next CEAMARC sites to be sampled were on the inner Adelie Bank in relatively shallow water depths of about 250 m. Neither the DUC camera nor sidescan were deployed.

27-12-07 Thursday. At CEAMARC sites on the Adelie Bank. Weather good visibility, wind 18 kn from SE. Seas moderate and a low swell. Air temp. -1.3°, sea temp. -1.2°. Ice conditions, are frequent tabular icebergs with occasional bergy bits. The wind and seas eased through the day allowing further CEAMARC sampling along the eastern Adelie Bank sites. The sidescan was not deployed at any sites. The box core was used at all sites and mostly had successful results except in areas with dense benthos on the seabed. The DUC camera was deployed through the day and proved to be quite robust in filming the seabed, including being flown over steep inner shelf canyons and valleys. The sides of the canyon walls were covered in profuse marine life and the camera was able negotiate this terrain well. The ship continued east across the Adelie Bank and into the George V Basin. Trawl samples were quite successful. So far, we have caught and documented about 28 different species of fish from the trawl samples. The fish assemblage appears to be quite different from that found at the coastal sites off the French research station, Dumont D'Urville, about 40 nm WSW of our current position. Many of these fish are new records for the region and there are likely to be new species amongst them.

28-12-07 Friday. At CEAMARC sites in George V Basin. Weather good visibility, fine and sunny. Wind 7 kn from NW, seas rippled and a low swell. Air temp. -0.5°, sea temp. -0.6°. Ice conditions, only scattered icebergs. The DUC camera was deployed in dramatic bathymetry starting on the relatively flat Adelie Bank and into the George V Basin in a short distance. Recent evidence of iceberg scouring was observed in the seabed. The sidescan was not deployed at any stations. The vessel moved into the deeper western end of the George V Basin and sampled directly over the Mertz Drift area. The

seabed was muddy compared to the bank with sparse biota comprising ball-shaped hexactinellid sponges. In the deeper sample sites, we found the first of the giant crustaceans which are characteristic of the Antarctic. Overnight we caught amphipods that were 5 cm long and isopods that were more than 8 cm long. These groups include the sand hoppers and sea slaters which are also found around the coast of Australia but are usually less than a cm long. Small movies of the underwater video were created to share with the crew, which proved popular.

29-12-07 Saturday. At CEAMARC sites on the George V Coast. Weather good visibility, cloudy with sunny breaks. Wind 10 kn from the E and rippled seas with a low NE swell. Air temp. 0.5°, sea temp. -0.7°. Ice conditions, scattered icebergs, some brash ice with the continent in sight. We worked towards the coast of Commonwealth Bay, coming within sight of Mawsons Hut at Cape Denison for one CEAMARC sample station. Contact was made with people refurbishing the hut before we continued east along the George V Coast towards the Mertz Glacier. The seabed has been so rugged at one or two sites that we have not been able to safely deploy the trawl and have instead used the DUC camera to document the animals living there. The epibenthic sled was modified slightly with the hope that we can use it to skim some animals from this boulder-strewn bottom. Everybody is now well into the routine of sampling around the clock and are working very efficiently. The glass sponges, so-called because they have skeletons (spicules) made of fine strands of silicate, looking exactly like glass-fibre, have been the outstanding feature of the last few sites.

30-12-07 Sunday. At CEAMARC stations along the Mertz Glacier. Weather sunny with high clouds, good visibility, wind 17 kn from S. Seas slight with a low ENE swell. Air temp. 0.5°, sea temp. -1.6°. Ice conditions, bergs frequent in open water. The ship worked within 2 nm of the continent and is the closest we will be to land during the voyage. Only a small outcrop of exposed rock was visible directly to the south amongst the remaining landscape, which was entirely covered with ice as far as we could see. A computer software corruption in the laptop controlling the DUC camera resulted in about six hours of downtime. GA staff worked on rewriting the controlling software to resolve the problem. The next site surveyed with the camera was a relatively shallow 180 m. Crushed rocks that came up in the samples are evidence that the seabed at these depths is frequently disturbed by the keels of passing icebergs. Later in the afternoon, the vessel headed east to within a few km of the 50 nm long Mertz Glacier tongue. A sample site in the deepest part of the basin at about 1200 m revealed occasional sponges and tunicates. The scientific highlight of this site was the discovery in the high-definition photographs of highly pigmented patches on the sediment surface. The colour is very like the patches of photosynthetic micro-organisms found on sediments in shallower places but at this depth (1200 m) no light penetrates and so photosynthesis is not possible. The most likely explanation is that they are caused by organic material from the upper waters that has sunk to the bottom fast enough to retain photosynthetic pigments. This explanation is consistent with the CTD cast at this site which indicated patches of photosynthetic micro-organisms at various depths through the water-column. The trawling, coring and CTD water sampling continued along the Mertz Glacier in excellent weather conditions and great views of the floating ice tongue.

31-12-07 Monday. At CEAMARC sites in the eastern George V Basin. Weather low cloud, occasional snow and sleet, wind 15 kn from SE. Slight seas with a low NNW swell. Ice conditions, scattered bergs and bergy bits in open water. The GA equipment continued to work well with the DUC camera usually being deployed first in sequence at each new site to enable decisions to be made about the use of subsequent equipment. The George V Basin was sampled in the deepest area adjacent to the Mertz Glacier, then in sites towards the west in basin depths from about 500 to 800 m. Evidence from previous multibeam surveys show the presence of iceberg scours to 575 m. The camera was deployed across a scour to find concentrations of epibenthos along the edges where the gradient increases and is typically quite rough. The seabed is well colonised by marine life, so these scours are likely quite old and are not recently formed. Sediments from the box core are a siliceous mud and diatom ooze.

01-01-08 Tuesday. At CEAMARC sites in the central George V Basin. Weather overcast with low cloud blowing snow and sleet. Wind 40 kn from SE. Seas 4 m from SE. Air temp. -1.8°, sea temp. -0.7°. Ice conditions, none visible. The vessel continued sampling a transect towards the west in the central basin to about 900 m depth. These deeper sites show no evidence of iceberg scour, and instead the seabed is relatively flat and muddy with sparse marine life. By late morning, the wind and seas had increased to the point that sampling was too difficult and the ship hove-to in order to ride out the weather. So far we have collected about ten species of the worm-like, shell-less molluscs (Aplacophora), and a parasitic mollusc (family Eulimidae) on a sea cucumber (holothurian). Some of the Aplacophora and the Eulimid species may well be new records for Antarctica. Among the highlights of the video captured by the trawl-mounted camera was the footage of a surprised-looking pelagic octopus sitting on the seabed just before it was scooped up by the trawl. New Year on the ship

is a special occasion and the day shift celebrated it on Tasmanian/ship's time with a masked ball. The creativity of those on board came to the fore in the lead up to the New Year, as many clever costumes were improvised from the limited materials at hand.

02-01-08 Wednesday. At CEAMARC sites in the central George V Basin. Weather overcast, low cloud, occasional sleet. Wind 30 to 40 kn from SE. Seas moderate to rough, 3 to 4 m. Air temp. -1.0°, sea temp. -1.0°. Ice conditions, isolated bergs and open water. The ship continued to ride out the rough weather through the day so most people caught up on paperwork, read or slept. Attempts were made to deploy equipment in the evening. Trawling was not possible, however CTDs were successful. The DUC camera cable termination failed during deployment which required a retermination before the next use. So far, we have caught at least 38 fish species, including 32 Notothenioids, 2 or more Liparids and 4 Zoarcids. The number of species continues to increase every day. Interestingly, many species previously recorded to be common in the depth range 0 to 200 m along the Terre Adelie coast (*Trematomus newnesi*, *Notothenia coriiceps*, *T. bernacchi*, *T. hansoni*, *Pagothenia borchgrevinki*, *Gymnodraco acuticeps*) are rare or absent in our catches. The exceptions are two species, the icefish (*Chionodraco hamatus*) and the pelagic species, *Pleuragramma antarcticum*, which were previously found to be common in the shallow coastal areas and are also common at our sites. The latter dominates almost all catches in a range of sizes from small fingerlings to large size adults. Most species caught since the beginning of the voyage are not new to science, but previously had not been recorded in this sector of the Eastern Antarctic continental shelf. The catches are highly diverse but it is too early to say whether diversity is linked to seabed type or to particular types of benthic assemblage. We have collected many fingerlings and post-larval fish from the canyons, suggesting that these steep and rugged areas may play a role as nursery grounds for some species, particularly channichthyids. We have not yet caught any skate although they are known from the area off Dumont D'Urville and have been observed in our videos. They are probably escaping in front of the trawl.

03-01-08 Thursday. At CEAMARC sites on the Mertz Bank. Weather mostly fine and clear with some cloud. Wind 17 kn from S. Seas moderate. Air temp. -1.0°, sea temp. -0.7°. Ice conditions, isolated bergs in open water. With the return of good weather, the ship commenced sampling along the middle shelf of the George V Basin and Mertz Bank. The DUC camera was unserviceable due to a fault in the winch cable connection. Throughout the morning this cable was reterminated but did not fix the problem when the camera was tested at midday. Overall impressions of the seabed invertebrate communities are that the diversity and species composition on the Adelie Bank seems roughly equivalent to that known from Dumont D'Urville at shallower depths (40 to 200m), but tends to decrease in Commonwealth Bay, possibly because of increased iceberg scouring. Two stations (38 and 36) show strikingly different benthic communities compared to surrounding stations, with many anemones, synascidians and serolid isopods. These stations are situated well beneath the action of icebergs at the bottom of the George V Basin where water conditions may play a role in shaping very different assemblages. The multibeam data, previously collected in this area by the US research vessel the Nathaniel B. Palmer, provides a very detailed picture of the seabed including tracks of past iceberg scouring. For those sites where it is available, it is proving invaluable for interpreting the relationship between the living communities and the physical environment of the seabed. A multibeam capability must be considered as an essential element of a modern program of benthic biodiversity research.

04-01-08 Friday. At CEAMARC sites on the Mertz Bank. Weather overcast, low clouds, wind 34 kn from SE. Seas moderate to rough. Air temp. -4.0°, sea temp. -0.6°. Ice conditions, isolated bergs and open water. The relatively calm weather in morning allowed the ship to complete four stations along the western Mertz Bank in depths 500 to 600 metres. Winds increased in the afternoon slowing the rate of sampling. The DUC camera winch cable was reterminated and the camera waited retesting in the ocean. Trawl sampling returned large amounts of biological material from this area. The big isopods, amphipods and sea-spiders of the past few days were put firmly in their place by the arrival of the Big Polychaete. This magnificent bristle-worm (a polynoid or scale-worm) was about 230 mm long, 90 mm across, with scales more than 24 mm in diameter and weighed about 330 g. It is by far the largest polychaete seen by any of the benthic ecologists on board. We have since captured video imagery of these monsters scurrying along the seabed as the trawl approaches. To top it off, the bristle-worms arrived complete with their own over-size parasitic nematodes (up to 4 inches long) infesting the space under the scales.

05-01-08 Saturday. At CEAMARC sites on outer shelf. Weather cloudy with winds decreasing to 14 kn from SE. Seas moderate with swell 1 to 2 m. Air temp. -1°, sea temp. -0.5°. Ice conditions, isolated bergs and bergy bits on an open sea. The ship completed sampling the main circuit of eastern CEAMARC benthic sites yesterday at about 21:00 hrs and then returned to the polynya moorings on the outer shelf to move the Pole Compass. The polynya moorings measure the speed and direction of

water currents through the water column using an Acoustic Doppler Current Profilers (ADCP), but at this distance from the South Magnetic Pole (only about 135 nm WNW of the moorings) normal magnetic compasses are not accurate. The Pole Compass is designed to give accurate readings even when very close to the magnetic pole, and is positioned alongside each of the ADCP polynya moorings for a few days in order to allow correction of the data from their simpler onboard compasses. The Pole Compass was redeployed by 05:00 hrs and then CEAMARC sampling resumed with the first of four sites (400 m, 800 m, 1600 m and 2400 m) in a transect over the edge of the shelf break. The DUC camera was tested after retermination of the winch cable then deployed successfully at the 400 m site. At the 800 m slope site, our first trawl blew out and all the material was lost. Examination of the trawl-mounted video explained why. The seabed was 100% covered with living material – colourful branching coralline species and gorgonians forming the major lower storey structure and large branching sponges the upper storey. Amongst this were numerous sea-stars, sea-cucumbers, crustacea and fish. In marked contrast, the communities at 1600 m and 2100 m were rather sparse with much uncolonised rock and coarse sediment visible.

06-01-08 Sunday. At the CASO transect sites in the Southern Ocean. Weather cloudy and good visibility with winds decreasing 8 kn from SE. Slight seas and a confused swell. Air temp. -0.5°, sea temp. -0.2°. Ice conditions, isolated bergs and bergy bits in an open sea. We have now commenced the main CASO (Climate of the Antarctic and Southern Ocean) sampling for the voyage. As we transited north of the shelf into the deeper Southern Ocean, iceberg sightings became less frequent but the wildlife continued to impress with a pod of three inquisitive Humpback whales displaying near the ship while stationary for a CTD dip. The remainder of crew not directly involved with CASO sampling repaired gear or planned for the remaining CEAMARC leg.

07-01-08 Monday. On the CASO transect in the Southern Ocean. Weather mostly cloudy, good visibility, wind 12 kn from south. Slight seas with a low NE swell of 1 m. Air temp. -0.3°, sea temp. 0.8°. Ice conditions, open water and no bergs. We are now well into the main CASO leg of the voyage. We will spend about 6 days using the CTD to sample the water column from 31 sites in a large loop that will take us about 150 nm northwards from the George V shelf break and then east for a similar distance before heading south again to return to the shelf break. At our current location the water is about 3600 m deep and each CTD cast is taking about two and half hours. During this circuit we will sample three canyon systems discovered using multibeam seabed imagery obtained by US and Italian survey vessels. These canyons are thought to drain the cold dense Antarctic bottom water formed in the Mertz Polynya. In the evening, we sampled the northern-most site, nearly 250 nm from the continent and are now heading east to sample some of the deepest sites which are about 4000 m deep. Being this far north, we experienced our first, brief nightfall for the year.

08-01-08 Tuesday. On the CASO transect in the Southern Ocean. Weather clearing with patchy high cloud. Wind 5 kn from NW. Seas slight with a low confused swell. Air temp. 1.0°, sea temp. 0.7°. Ice conditions, open water with no bergs in sight. CTD sampling of waters from the sea-surface to the seabed continued around the clock. CASO is a major multinational project for the International Polar Year involving scientists from 18 nations and is led by Australia. CASO will provide the first circumpolar snapshot of the physical and biogeochemical state of the Southern Ocean as a benchmark for the assessment of past and future change. It will also demonstrate the feasibility of a sustained Southern Ocean observing system. On Voyage 3, CASO is focused on the region close to the Antarctic continental shelf and the fate of cold, dense Antarctic bottom water from the Mertz Polynya. This region is one of the few places in the ocean where surface waters are sufficiently dense to allow them to sink to the deep ocean. This transfer of water from the surface to the abyss is part of a global system of ocean currents known as the overturning or thermohaline circulation, which strongly influences the Earth's climate. Our measurements on Voyage 3 are aimed at understanding how the Antarctic contribution to this global current system works and whether it is changing. We are presently re-occupying sites first measured on the *Aurora Australis* in the 1994-5 season and have made excellent progress in unusually calm conditions.

09-01-08 Wednesday. On the CASO transect in the Southern Ocean. Weather sunny with low cloud, wind 15 kn from NW. Slight seas and a low confused swell. Ice conditions, no bergs in sight and open water. By midday we had conducted 14 of the 31 CASO stations, and have completed the first two legs of the CASO stations over the Antarctic continental slope and rise. The first leg followed a deep canyon running from south to north that drains the bottom water produced in the Mertz polynya region. We found clear evidence that even now, in summer, dense water produced during the winter is spilling off the shelf and cascading down the canyon. The southwards leg that we are now doing, to the east of the Mertz polynya outflow, is a repeat of stations occupied during the BROKE expedition in 1996. Here we have sampled bottom water flowing west from the Ross Sea. In previous work, Steve Rintoul

and others showed that the bottom water of the entire Australian – Antarctic Basin became lower in salinity between the early 1970s and 2001. By comparing the bottom water properties on the different legs of CASO, we will be able to determine, first, if the bottom waters are continuing to change, and second, the relative contribution of the Ross Sea and the Mertz polynya to changes in the deep branch of the global overturning circulation.

10-01-08 Thursday. On the CASO transect in the Southern Ocean. Weather overcast with low cloud. Winds 18 kn from NW. Moderate seas and WNW swell to 3 m. Air temp. 0.0°, sea temp. -1.6°. Ice conditions, frequent bergs and pack ice. We continued working southwards towards Antarctica, sampling along the eastern transect of the CASO circuit. In the morning we deviated slightly to the west to avoid dense pack-ice that accumulated to the north and east of the Mertz Glacier. To avoid spending time pushing through the sea-ice, we relocated the sampling sites so that they followed the ice edge southwards towards the continental shelf break. On each of the CASO stations we have occupied so far, we can see a distinct layer of cold, oxygen-rich bottom water near the seafloor. There is, however, a clear contrast between the bottom water measured on the western and eastern CASO legs. In the west, we sampled the bottom water formed in the Mertz polynya area, which is fresher than the water above it and particularly rich in oxygen and chlorofluorocarbons (CFCs). In the east, the bottom water is lower in oxygen and is much saltier, indicating this water was formed in the Ross Sea and has travelled west through the deep channel south of the Balleny Islands.

11-01-08 Friday. On the CASO transect in the Southern Ocean. Weather overcast with low cloud, moderate visibility. Wind 20 kn from SE. Seas moderate to rough with a SSE swell to 2 m. Air temp. -2.6°, sea temp. -1.1°. Ice conditions, scattered bergs and some bergy bits. We continued to meet dense pack ice as we attempted to head south along the CASO CTD transect west of the Mertz Glacier. Rather than spend time pushing against the ice we decided to move to the middle of the three CASO transects, to sample along longitude 147°E to the north of the Mertz. We completed two of the sites along this transect before again meeting dense pack ice and once more moved slightly west. We have now completed three sites along 146° 35E. Satellite imagery indicates that the sites directly to the south of our current position should be clear. The CTD data indicates that we are again positioned over an outflow of bottom water generated by the Mertz Polynya as it pours off the continental shelf, in contrast to the Ross Sea bottom water detected further east. This is the first time it has been confirmed that Mertz bottom water streams over the shelf in more than one place. Over the past few days we have collected water samples from as deep as 4000 m. At this depth, the pressure is about 400 times atmospheric pressure. To put this in perspective, if you opened a full diving cylinder at this depth the pressure would force water into the cylinder and fill about a quarter of it rather than allow the air out. This evening, we completed this phase of the CASO sampling and headed directly to the polynya moorings to take advantage of the weather window to again move the Pole Compass, before re-starting the CEAMARC seabed sampling.

12-01-08 Saturday. On Polynya moorings site in George V Basin. Weather fine and sunny. Wind 3 kn from NE. Seas smooth nil swell. Ice conditions, scattered bergs and bergy bits. Through the night, we travelled directly to the polynya moorings to take advantage of a window of calm weather to recover the Pole Compass. The Pole Compass was released from the seabed at the eastern polynya mooring site after midnight and within the hour was on deck and being prepared for re-deployment at the central polynya mooring site. Before re-deployment, the Pole Compass had to run through some data recording cycles, and while waiting for this to happen, the ship did east-west passes along the line of the three polynya moorings to calibrate the Acoustic Doppler Current Profiler (ADCP). This data provided a second calibration check for the instruments on the polynya moorings. At about 10:30 hrs we left the mooring site and returned westwards to continue the seabed sampling for CEAMARC. During the morning several pods of killer whales were spotted and at lunch today we saw and had radio contact with the French research vessel, L'Astrolabe, which crossed our track about 5 nm away. It is also part of the CEAMARC Census of Antarctic Marine Life program and reported very heavy sea-ice on our planned sampling transect at longitude 140°E. The first trawl for this second phase of CEAMARC went in the water at 13:05 hrs.

13-01-08 Sunday. On CEAMARC sites on the Adelie Bank. Weather mostly low cloud, moderate visibility, wind 18 kn from SE. Seas slight to moderate and a low swell to 0.5 m. Air temp. -1.0°, sea temp. -0.5°. Ice conditions, frequent large bergs in open water. This second phase of CEAMARC benthic sampling started very well with six stations completed in the last 24 hrs. We have caught up with the planned sampling schedule, having 24% of sites left to do and 25% of the total time allocated to CEAMARC to do them in. If the weather remains kind to us we should complete the schedule as planned. The only slight variation being the re-location of some sites to avoid dense pack-ice on longitude 140°E directly north of the French research station at Dumont D'Urville. We have also re-

aligned some sites, on the basis of very accurate bathymetry obtained using multibeam depth data to get better series of samples from shallow to deep. Yesterday's samples from 400 m, 800 m and 1100 m were a very interesting contrast to those from a similar depth series reported previously on the outer shelf and slope, which at 800 m was dominated by a colourful garden of filter-feeding coralline species. Yesterday's 800 m site had a very sparse covering of surface-living filter-feeders, such as sponges and bryozoans, but had very large numbers of *Macrourus whitsoni* or rat-tails, a common fish from these depths throughout the world. The seabed photographs indicated a lot of 'marine snow' (organic particulates) in the water and a piscean wall of mouths - fish waiting on the seabed for food to be washed past them by the currents. So although only 20 nm apart and sharing the common characteristics of very high productivity and biomass, the benthic fauna at these sites were intriguingly different.

14-01-08 Monday. At CEAMARC sites on the Adelie Coast. Weather clear skies and good visibility. Wind decreasing 20 kn from E. Seas moderate and a confused swell 2 m. Air temp. 0.3°, sea temp. -0.7°. Ice conditions, large bergs in open water, continent in sight. The vessel manoeuvred towards the Adelie Coast through the night, negotiating many grounded bergs. In early morning, we were off the French base Dumont d'Urville and commenced sampling the coastal zone in waters to 300 m depth. These sites proved to be very diverse with complex multi-layered sponge and bryozoan dominated communities. Unfortunately the trawl with the digital camera which has been providing us with such excellent images of the seabed suffered some damage when it landed upside down. The French beam trawl has been used at several sites and it proved very efficient, collecting very large hauls and appearing to retain some of the smaller infauna that may be lost through the mesh of the AAD trawls. The DUC camera was deployed once in shallow waters. The remainder of the day was spent sampling the Adelie Basin in waters to 1000 m, which is a glacially-carved trough close to the coast. Twice we had the cod-end of the trawl blow out and recovered only a very small haul retained by the coarser outer mesh. The trawl-mounted video camera provided only brief but tantalising glimpses of a seabed covered with large numbers of surface feeding sea-cucumbers between long periods of total darkness, caused when the trawl sank in the fine diatomaceous ooze.

15-01-08 Tuesday. At CEAMARC sites on the Adelie Bank. Weather clear skies and good visibility. Light winds from NE. Calm seas and a low E swell to 0.5 m. Air temp. 0.5°, sea temp. -1.2°. Ice conditions, frequent bergs, bergy bits and growlers in open water. After about 10 hours of trying to trawl in the Adelie Basin, we moved on to the next site at 800 m on the basin slope and, while sampling, considered options for completing the deep basin. The 800 m site was sampled in reasonable time, so we returned to the deep site and deployed the French beam with the intention of floating it briefly across the bottom. In the event the trawl was on the bottom for about 8 minutes and came up with a fine haul. The community was dominated by the large elasipodid sea cucumbers seen on the video, looking very like fat little hippopotamuses grazing on the seabed, but included many other species including sea stars (similar to Acodontaster and Cuenotaster), brittle stars (cf Astrotoma), stalked tunicates (cf Molgula), large gastropods, many small bivalves and several pelagic octopus. The night shift then took over and made up for lost time, completing four sites. We are well on track to meet our original sampling plan, having completed 91% of sites with 85% of time used. If the weather holds, we will have some time in hand when we have completed the original 67 sites and will use this to sample extra sites in transects over the shelf break to compare with those from the eastern sector.

16-01-08 Wednesday. At CEAMARC sites on the Adelie Bank. Weather overcast with 8/8 cloud, occasional snow falls and poor visibility. Wind 6 kn from NW. Seas slight and a low swell 0.5 m. Air temp. -0.2°, sea temp. 0.0°. Ice conditions, isolated bergs and occasional growlers in open water. The run of good weather and cooperative sea-ice continues. In the past 24 hrs, a further seven sites were sampled, with the night shift once again completing four sites in their 12 hr watch. At mid-day today we had sampled 68 sites, one more than the total of 67 originally planned. We are now sampling the first of the additional transects in deep water over the edge of the continental shelf. The sea-ice has been particularly kind to us as only a few days ago the western-most sites we sampled yesterday were covered with sea-ice and were inaccessible for sampling. The high resolution satellite imagery available to the ship has been invaluable in making decisions about where and when to attempt sampling throughout the voyage. 56 species of fish have now been collected, with 16 species added to the list during this second phase of CEAMARC sampling in the western sector. More than 40 rapid spleen and cephalic kidney cell cultures have been prepared from a wide range of fish species and the best ones will be used later for comparative gene mapping. Primary fibroblast cell lines have been prepared from species representing the most important families of Antarctic notothenioids and successfully grown up for, as far as we know, the first time on board a ship. These will be used for genomic studies on the adaptations of Antarctic fish to their environment.

17-01-08 Thursday. At CEAMARC sites on the Adelie Bank. Weather partly cloudy with good visibility. Wind 10 kn from SE. Seas slight with low ENE swell to 0.5 m. Air temp. -1.5°, sea temp. 0.9°. Ice conditions, distant bergs and open water. We are currently sampling one of two planned transects from shallow (400m) to deep-water (1200m) over the edge of the continental shelf. Last night we ran the trawl-mounted still camera down the slope for two hours and got some excellent images of the gradually sloping seabed. We have also trawled across the slope, at 400 m, 800 m and 1200 m, to collect the animals seen on the photographs, sampled the water column with the CTD, and collected sediments. Yesterday we had two failed trawls at 400m, one because the cod-end blew out, the other collected a single large rock which damaged the net. We are now returning to the 400 m site for one last attempt before moving on to the next transect about 20 nm to the east. At about midday yesterday, we met a fishing vessel very close to our planned sampling sites. While manoeuvring to identify it we acquired densely spaced depth data using the underway data logging system. This was quickly manipulated by our Data Manager to produce a very accurate bathymetric chart that proved to be very useful in deciding the best line for running the transects.

18-01-08 Friday. At CEAMARC sites on the Adelie Bank and slope. Weather partly cloudy, good visibility, wind 7 kn from NE. Seas slight and a moderate WNW swell to 3 m. Air temp. 1.0°, sea temp. 1.0°. Ice conditions, scattered bergs including one large berg (35 km long) in open water. We are now sampling the second of the transects into deep-water over the edge of the continental shelf. This one is down the path of what appears to be a submarine canyon based on detailed multibeam imagery. The seabed here is very rugged and the sampling is particularly difficult, which is the reason why it was left to the end of the CEAMARC phase of the voyage. There is too much risk of damaging the gear for us to have attempted it earlier. However, the deck crew have done an excellent job of deploying the equipment over very difficult terrain and we have been rewarded with superb imagery and samples. We are again seeing many of the species that previously were only found in the 'coral garden' reported down a similar slope in the western sector. Here the diversity appears to be somewhat greater as it is not so completely dominated by a few very abundant species. We had contact with a second fishing vessel yesterday afternoon, owned by the same company as the one seen a day ago.

19-01-08 Saturday. At CEAMARC sites on the outer Adelie Bank. Weather low cloud, sunny intervals, passing snow flurries. Seas slight with a low confused swell. Air temp. 0.2°, sea temp. 1.2°. Ice conditions, very large berg and numerous smaller bergs in open water. As predicted, sampling the very rugged seabed in this canyon system at the edge of the continental shelf has been difficult. The results, however, have been well worth the effort. At the cost of some torn trawl nets, we have managed to get imagery and samples down to 1500 m, with the very diverse seabed offering up a similarly diverse fauna. Last night we recorded the most fish species from any one trawl - 16 including at least one which was new to this survey. The benthic invertebrates were similarly diverse with a great range of sedentary groups, such as sponges, bryozoans (lace coral), tunicates (sea squirts), gorgonians and some very large solitary corals, forming the main supporting structure for an equally diverse variety of mobile groups such as polychaete worms, amphipod crustaceans, ophuroids (brittle stars), crinoids (feather stars), echinoids (sea urchins), asteroids (sea stars), pycnogonids (sea spiders) and a range of molluscs. Early this morning we stopped the benthic work temporarily and switched our efforts to sampling the waters around the very large iceberg nearby, with the intention of identifying whether it is a source of trace nutrients that might stimulate plankton growth. Satellite imagery indicates the iceberg is about 35 km long by 18 km wide The berg is designated B-17A and came into this region in October 2006. It comes from a large chunk of the Ross Ice Shelf that calved between 160°-165°W in April 2000. This section subsequently broke up, with other fragments heading in the opposite direction.

20-01-08 Sunday. On the SR3 transect outer shelf Adelie Bank. Weather overcast, visibility good. Wind gusting to 30 kn from NW. Seas moderate and a NW swell to 2.5 m. Ice conditions, large iceberg bank in open water. Yesterday water samples were collected from 7 sites at a range of distances from the large iceberg using the Fast Rescue Craft (FRC). While sampling was happening, the *Aurora Australis* maintained its position down-wind and down-current to ensure there was no risk of the ship contaminating the surface waters. These samples are to be analysed for ultra-low levels of trace elements and even the presence of the ship's hull in the immediate sampling area could compromise the results. Recovery of the FRC was delayed while a mechanical problem was fixed. The ship then returned to each of the sites sampled from the FRC and took a CTD sample to be used to define the extent of influence of melt water from the iceberg. We returned to the CEAMARC canyon site just before the shift change at midnight to resume sampling with the intention of deploying the trawl mounted digital camera in a transect from 850 m to 1300 m. The plan was to document the transition from the abundant shallower fauna to the less diverse deeper communities and then to sample with the French beam trawl. Unfortunately, by this time the wind was too strong to maintain the ship on the correct course at the low speeds required for trawling. Prudence dictated it was time to call a halt and

CEAMARC sampling officially finished at 8 minutes past midnight. Overall, 82 different sites were occupied during CEAMARC, with samples collected from at least 78 sites; well in excess of the 67 sites we had hoped for. Everyone involved is to be congratulated for putting in an enormous and sustained effort to achieve such an excellent result. Through the remainder of the day, the ship commenced CTD sampling along the SR3 transect north of the Adelie Bank.

21-01-08 Monday. On SR3 transect in the Southern Ocean. Weather foggy and poor visibility. Light winds to 8 kn from NW. Seas slight and a moderate westerly swell to 3 m. Air temp. 1.6°, sea temp. 1.3°. After finishing the CEAMARC survey at midnight a day and a half ago, we steamed to the start of a series of 12 CASO CTD water sampling sites in a transect from the edge of the Antarctic continental shelf northwards into the Southern Ocean. At the time of writing we are sampling the last few sites, with the final samples to be collected at latitude 63° 21S this evening from just below the sea surface to just above the seabed at a depth of 3812 m. For most people, the day was spent packing up gear and samples and preparing reports.

22-01-08 Tuesday. On transit in the Southern Ocean. Weather overcast with low cloud and occasional fog patches. Wind 21 kn from W. Moderate seas and a W swell to 3 m. Air temp. 3.1°, sea temp. 3.1°. Ice conditions, nil. The last of the 12 CASO CTD casts along the SR3 transect were completed at 20:00 hrs last night. This was the 130th CTD for the voyage, with 44 samples taken along the CASO transects and a further 86 at the CEAMARC sites. The SR3 transect was first occupied in 1991 by *Aurora Australis*; the present voyage will be the 7th re-occupation of the line. The time series of measurements along SR3 is the longest and most continuous set of observations available to document changes in the deep and bottom waters of the Southern Ocean. The CASO CTD stations east of the Mertz Glacier taken earlier in the voyage showed clearly that the bottom water flowing west from the Ross Sea is significantly fresher than observed in the 1990s. The SR3 line of stations just completed will show whether the bottom water produced in the Mertz Polynya region is also changing. The CTD samples taken at the CEAMARC sites will provide key information on physical conditions in the overlying waters that may help explain the distribution and abundance patterns seen in the communities of bottom-living animals. With an average depth of about 1300m for all 130 sites, a total of about 170 km of CTD wire has been paid out from the winch and wound back in again during the course of the voyage.

23-01-08 Wednesday. On transit in the Southern Ocean. Weather mostly cloudy, distant rain, winds 25 kn from NW. Seas moderate to rough, WNW swell to 3 m. Air temp. 4.7°, sea temp. 4.3°. Ice conditions, nil. This morning, the last of the CTD casts for genomic analysis of marine micro-organisms near the seabed were taken in depths of about 3000 m. The Continuous Plankton Recorder is now being towed behind the ship on the second of three deployments for the return journey. During each deployment it collects zooplankton from the near surface waters on a silk spool that is gradually wound past the opening in the CPR using a simple clockwork mechanism driven by a small propeller. When analysed, differences in the zooplankton community over the 400 mile deployment can be identified. Everyone is busy on board processing data, collating reports and preparing paperwork for arrival in Hobart.

24-01-08 Thursday. On transit in the Southern Ocean. Weather overcast with low cloud. Good visibility. Winds 23 kn from NW. Moderate seas and NW swell to 3 m. Air temp. 11.5°, sea temp. 11.0°. The swell has moderated significantly since yesterday and everyone is much more comfortable as the ship gently rolls its way home via the PULSE mooring at about 45°S. People are still busy packing, processing data and preparing results. The partial pressure of CO2 (pCO2) in the ocean and atmosphere will continue to be measured until we reach Tasmania. The region of greatest CO2 concentration in the surface waters was measured at the Subantarctic front (53°S), where oceanic pCO2 was up to 25% above atmospheric levels. The Subantarctic zone is a region of uptake for atmospheric CO2 throughout the year, with the highest uptake over summer due to shallower mixed layers and increased biological production. It is now well known that even slight acidification of the ocean caused by rising atmospheric CO2 levels will make it hard for some animals to build or maintain calcium carbonate shells. The combination of benthic biologists and chemists on the voyage has provided an excellent opportunity for exploring the likely impact of ocean acidification on the seabed living animals around Antarctica. At 13:00 hrs, a multi-media seminar was held called Images from the Deep, highlighting the 3D bathymetry data, video and still imagery from the voyage.

25-01-08 Friday. On transit in the Southern Ocean. Weather scattered cloud and good visibility, winds 20 kn from NW. Seas moderate with a NW swell to 3 m. People are still busy packing, processing data and preparing results. With fine weather and moderate winds, many albatross were seen flying around the ship riding the air pressure in front of the long low swells. The largest of the albatross, the

Wandering albatross, were frequently observed close to the ship. These birds are on the wing for over year but may alight on the sea surface occasionaly. They follow the low pressure systems around the globe and finally breed on remote Southern Ocean islands. They have undergone dramatic declines in the past years due to mortality from being caught in long-line fishing.

26-01-08 Saturday. On transit in the Southern Ocean. Weather scattered cloud but mostly fine and sunny. Winds 6 kn from N. Seas slight and SW swell to 1 m. Air temp. 15°, sea temp 16.8°. This morning we re-visited and observed the surface float for the PULSE mooring deployed on the first day of the voyage. We are now in transit to the edge of the continental shelf off the Tasman Peninsula where we will acquire data to ensure correct alignment of the Acoustic Doppler Current Profiler (ADCP) used to measure currents in the water-column while we are underway. This involves steaming up and down several times over the same track for about 10 nm. This morning we celebrated Australia Day in the traditional way - with a Devonshire morning tea of scones, jam and cream, followed by an awards ceremony. Voyage Management and expeditioners wish to express their thanks to Captain Ian Moody and the bridge team, galley staff, engine-room and deck personnel for making this a most successful and enjoyable voyage.

27-01-08 Sunday. Arrival in Hobart. Weather overcast and potential rain. Air temp. 15°, sea temp 17°. The ship passed through Derwent River and berthed at 08:00 hrs at Macquarie No. 4 wharf.

Appendix 3. List of Stations and Activities

StationNo	EventID	EventType	SampleName	StartDateTime	EndDateTime	Duration	StartLatDeg	StartLonDeg	EndLatDeg	EndLonDeg	StartDepth	EndDepth
PULSE	2	Mooring	PULSE	17/12/2007 0:00	17/12/2007 0:00	0.0	-44.678500	145.604500	-44.678500	145.604500	3627.4	3627.4
PULSE	3	CTD	CTD001	17/12/2007 6:10	17/12/2007 8:24	2.2	-44.880000	145.540800	-44.869200	145.532300	3530.3	3549.6
Transit	4	Argos Float	Argos1	17/12/2007 8:42	17/12/2007 8:42	0.0	-44.873700	145.526600	-44.873700	145.526600	3541.5	3541.5
ARP1	5	ARP	ARP1	17/12/2007 10:39	17/12/2007 10:39	0.0	-45.202100	145.433800	-45.202100	145.433800	1941.8	1941.8
Transit	6	CPR	CPR1	17/12/2007 21:27	18/12/2007 22:15	24.8	-47.707600	144.394700	-53.613300	141.820400	4355.9	2895.1
SAZC	11	Mooring	SAZC	19/12/2007 0:05	19/12/2007 1:25	1.3	-53.739200	141.771300	-53.740300	141.822200	2070.0	2070.0
SAZC	12	CTD	CTD002	19/12/2007 1:39	19/12/2007 3:00	1.4	-53.739200	141.826300	-53.750400	141.833600	2070.0	2070.0
SAZC	13	CTD	CTD003	19/12/2007 3:52	19/12/2007 4:34	0.7	-53.756800	141.858700	-53.759100	141.864900	2070.0	2070.0
ARP2	14	ARP	ARP2	19/12/2007 5:26	19/12/2007 5:26	0.0	-53.739200	141.768900	-53.739200	141.768900	2078.7	2078.7
Transit	19	CPR	CPR2	19/12/2007 6:28	19/12/2007 17:20	10.9	-53.924800	141.781300	-56.333500	142.008500	2881.3	3385.1
Transit	21	Plankton Water Sample	GSXX0000346	20/12/2007 4:32	20/12/2007 4:42	0.2	-58.949787	142.390170	-58.989122	142.397097	4072.5	4240.7
Transit	38	CPR	CPR3	20/12/2007 17:32	21/12/2007 13:54	20.4	-61.259025	142.666445	-65.256967	143.248500	4302.1	2842.3
POLYNYA-E	24	Mooring	POLYNYA-E	22/12/2007 8:13	22/12/2007 9:33	1.3	-66.167240	143.489027	-66.200625	143.477010	535.2	561.9
POLYNYA-W	25	Mooring	POLYNYA-W	22/12/2007 11:53	22/12/2007 12:54	1.0	-66.199530	142.904882	-66.199347	142.902862	562.8	560.2
POLYNYA-W	30	Mooring	POLYNYA-W-COMPASS	22/12/2007 13:39	22/12/2007 14:50	1.2	-66.189708	142.913992	-66.189488	142.926405	557.6	565.4
POLYNYA-C	31	Mooring	POLYNYA-C	22/12/2007 15:57	22/12/2007 16:48	0.8	-66.195572	143.105180	-66.200245	143.168695	603.0	612.4
CEAMARC-27	32	Station	CEAMARC-27	22/12/2007 19:02	23/12/2007 14:25	19.4	-66.027515	142.738243	-66.034322	142.778525	444.6	452.2
CEAMARC-27	33	Sled Trawl		22/12/2007 19:31	22/12/2007 20:43	1.2	-66.008118	142.684982	-65.985583	142.632543	432.8	461.9
CEAMARC-27	34	CTD	CTD004	22/12/2007 23:01	22/12/2007 23:53	0.9	-66.003902	142.660445	-66.007990	142.658030	453.6	448.3
CEAMARC-27	35	Plankton Water Sample	GSXX0000347	23/12/2007 0:06	23/12/2007 0:16	0.2	-66.012062	142.657338	-66.019615	142.662602	451.0	438.2
CEAMARC-27	37	Box Corer	27BC01	23/12/2007 1:23	23/12/2007 1:37	0.2	-65.998230	142.661280	-66.002080	142.667195	451.7	436.8
CEAMARC-27	39	Box Corer	27BC02	23/12/2007 1:49	23/12/2007 2:00	0.2	-66.005137	142.670440	-66.007397	142.672522	432.7	434.6
CEAMARC-27	40	Beam Trawl French		23/12/2007 2:16	23/12/2007 2:32	0.3	-66.011240	142.679138	-66.001133	142.668638	436.9	443.2
CEAMARC-27	42	Beam Trawl French		23/12/2007 3:16	23/12/2007 3:31	0.3	-65.998735	142.668192	-65.987748	142.670738	440.7	457.2
CEAMARC-27	43	GA Camera	27CAM01	23/12/2007 4:55	23/12/2007 5:57	1.0	-65.988348	142.646283	-66.006625	142.692327	465.0	430.0
CEAMARC-27	44	Side Scan Sonar	AA0320073570810	23/12/2007 8:10	23/12/2007 8:44	0.6	-66.019553	142.703830	-66.048273	142.760137	438.4	457.3
CEAMARC-27	45	Beam Trawl French		23/12/2007 9:27	23/12/2007 10:27	1.0	-66.052413	142.763643	-66.013518	142.713093	451.8	433.9
CEAMARC-27	46	Beam Trawl AAD		23/12/2007 13:26	23/12/2007 14:22	0.9	-66.013913	142.715945	-66.033177	142.775223	433.3	443.8
CEAMARC-28	47	Station	CEAMARC-28	23/12/2007 15:36	23/12/2007 22:40	7.1	-66.001885	142.990238	-65.996090	143.054383	472.7	470.2

CEAMARC-28	48	Beam Trawl AAD		23/12/2007 15:36	23/12/2007 16:28	0.9	-66.001817	142.990572	-65.987147	143.055063	475.6	473.5
CEAMARC-28	49	CTD	CTD005	23/12/2007 16:59	23/12/2007 18:02	1.1	-65.983108	143.062980	-65.977843	143.051152	469.4	466.9
CEAMARC-28	50	Sled Trawl		23/12/2007 18:30	23/12/2007 19:15	0.7	-65.980375	143.034952	-66.002422	142.995068	468.2	470.2
CEAMARC-28	51	Box Corer	28BC01	23/12/2007 19:45	23/12/2007 20:03	0.3	-66.005858	142.982070	-66.004137	142.977633	467.5	468.2
CEAMARC-28	52	Box Corer	28BC02	23/12/2007 20:12	23/12/2007 20:31	0.3	-66.003518	142.976392	-66.002102	142.970313	470.5	465.5
CEAMARC-28	53	Beam Trawl French		23/12/2007 21:36	23/12/2007 22:37	1.0	-66.002640	142.952100	-65.996375	143.049193	464.8	475.3
CEAMARC-29	54	Station	CEAMARC-29	23/12/2007 23:30	24/12/2007 7:19	7.8	-65.997868	143.279198	-65.987143	143.410418	466.7	458.8
CEAMARC-29	55	Beam Trawl AAD		23/12/2007 23:42	24/12/2007 1:05	1.4	-66.000458	143.297105	-66.056665	143.292288	472.5	495.4
CEAMARC-29	56	CTD	CTD006	24/12/2007 1:55	24/12/2007 2:36	0.7	-66.003483	143.330742	-65.999607	143.352940	470.6	467.8
CEAMARC-29	57	Box Corer	29BC01	24/12/2007 2:52	24/12/2007 3:06	0.2	-65.999703	143.361298	-65.998660	143.372375	471.1	462.4
CEAMARC-29	58	Sled Trawl		24/12/2007 3:49	24/12/2007 4:46	0.9	-65.995032	143.370710	-66.003377	143.285043	462.8	478.8
CEAMARC-29	59	Beam Trawl French		24/12/2007 5:56	24/12/2007 6:59	1.1	-66.007972	143.315247	-65.976563	143.387588	478.6	452.6
CEAMARC-30	60	Station	CEAMARC-30	24/12/2007 8:21	24/12/2007 14:25	6.1	-65.999722	143.668162	-65.997142	143.649760	424.9	436.9
CEAMARC-30	61	Box Corer	30BC01	24/12/2007 8:27	24/12/2007 8:50	0.4	-66.001147	143.671247	-66.003710	143.678462	426.3	430.9
CEAMARC-30	62	Box Corer	30BC02	24/12/2007 9:07	24/12/2007 9:20	0.2	-66.001242	143.672303	-65.998025	143.663220	427.8	432.3
CEAMARC-30	63	Box Corer	30BC03	24/12/2007 9:28	24/12/2007 9:49	0.4	-65.996217	143.657960	-65.991475	143.642920	433.9	432.7
CEAMARC-30	64	CTD	CTD007	24/12/2007 10:16	24/12/2007 11:00	0.7	-65.992710	143.638297	-65.993605	143.627108	429.2	437.1
CEAMARC-30	65	GA Camera	30CAM02	24/12/2007 11:50	24/12/2007 13:00	1.2	-65.996887	143.628020	-66.004227	143.696090	435.7	426.6
CEAMARC-30	66	Beam Trawl AAD		24/12/2007 13:40	24/12/2007 14:24	0.7	-66.003943	143.716085	-65.997188	143.649962	425.6	432.6
CEAMARC-36	67	Station	CEAMARC-36	24/12/2007 16:35	24/12/2007 20:56	4.3	-66.316967	143.652897	-66.350332	143.659362	561.1	593.1
CEAMARC-36	68	Beam Trawl AAD		24/12/2007 16:42	24/12/2007 17:45	1.1	-66.320207	143.649167	-66.358042	143.694935	570.0	588.3
CEAMARC-36	69	CTD	CTD008	24/12/2007 18:11	24/12/2007 18:58	0.8	-66.362575	143.699022	-66.359687	143.695823	596.5	595.5
CEAMARC-36	70	Van Veen Grab	36GRVV01	24/12/2007 19:08	24/12/2007 20:00	0.9	-66.359253	143.695902	-66.355262	143.674095	593.0	595.7
CEAMARC-36	71	Van Veen Grab	36GRVV02	24/12/2007 20:21	24/12/2007 20:52	0.5	-66.353948	143.674635	-66.350837	143.661223	591.8	600.1
CEAMARC-38	72	Station	CEAMARC-38	24/12/2007 21:39	25/12/2007 3:36	6.0	-66.335347	143.384685	-66.346972	143.215447	695.8	717.5
CEAMARC-38	73	Beam Trawl AAD		24/12/2007 21:50	24/12/2007 23:33	1.7	-66.333198	143.357078	-66.317857	143.189452	702.0	693.6
CEAMARC-38	74	CTD	CTD009	25/12/2007 0:17	25/12/2007 1:03	0.8	-66.329540	143.289258	-66.331107	143.272573	706.3	709.4
CEAMARC-38	75	Van Veen Grab	38GRVV01	25/12/2007 1:45	25/12/2007 2:13	0.5	-66.334565	143.314232	-66.340057	143.319143	705.9	706.6
CEAMARC-38	76	Van Veen Grab	38GRVV02	25/12/2007 2:20	25/12/2007 3:08	0.8	-66.341542	143.319338	-66.352692	143.326595	708.7	705.0
CEAMARC-61	77	Station	CEAMARC-61	25/12/2007 4:17	25/12/2007 16:31	12.2	-66.335642	143.039985	-66.354740	143.056528	690.2	694.1
CEAMARC-61	78	Beam Trawl AAD		25/12/2007 4:20	25/12/2007 5:37	1.3	-66.335733	143.035850	-66.326597	142.905852	683.6	560.1
CEAMARC-61	84	Plankton Water Sample	GSXX0000348	25/12/2007 6:34	25/12/2007 6:44	0.2	-66.336515	142.985685	-66.337823	142.986962	663.2	663.1

CEAMARC-61	83	CTD	CTD010	25/12/2007 6:36	25/12/2007 7:21	0.8	-66.336890	142.985800	-66.338663	142.981795	664.1	661.6
CEAMARC-61	85	Box Corer	61BC01	25/12/2007 7:46	25/12/2007 8:23	0.6	-66.334572	142.995280	-66.340363	143.015657	663.3	677.9
CEAMARC-61	90	Box Corer	61BC02	25/12/2007 8:39	25/12/2007 9:11	0.5	-66.336467	143.009772	-66.332997	143.033122	676.6	681.8
CEAMARC-61	93	Box Corer	61BC03	25/12/2007 9:47	25/12/2007 10:22	0.6	-66.336788	143.000870	-66.330270	143.023780	667.0	675.2
CEAMARC-61	94	GA Camera	61CAM03	25/12/2007 12:10	25/12/2007 13:37	1.4	-66.337838	142.989330	-66.289293	142.928493	664.8	619.9
CEAMARC-61	95	Side Scan Sonar	AA0320073591447	25/12/2007 14:30	25/12/2007 15:50	1.3	-66.322047	142.980147	-66.349960	143.035535	660.3	692.9
CEAMARC-06	98	Station	CEAMARC-06	26/12/2007 10:42	26/12/2007 15:25	4.7	-66.331013	142.686707	-66.308430	142.712910	399.0	408.5
CEAMARC-06	99	Beam Trawl AAD		26/12/2007 10:46	26/12/2007 11:56	1.2	-66.331272	142.680572	-66.339160	142.559122	390.6	294.3
CEAMARC-06	101	CTD	CTD011	26/12/2007 13:01	26/12/2007 13:33	0.5	-66.329405	142.643070	-66.326385	142.630078	391.5	380.0
CEAMARC-06	102	Box Corer	06BC01	26/12/2007 13:48	26/12/2007 14:09	0.3	-66.328555	142.626173	-66.331697	142.629317	376.4	389.9
CEAMARC-06	103	Beam Trawl AAD		26/12/2007 14:26	26/12/2007 15:11	0.8	-66.332373	142.635475	-66.316935	142.696227	389.9	408.3
CEAMARC-05	106	Station	CEAMARC-05	26/12/2007 16:29	26/12/2007 18:45	2.3	-66.305080	142.304472	-66.341410	142.262373	227.1	194.5
CEAMARC-05	107	Beam Trawl AAD		26/12/2007 16:36	26/12/2007 17:16	0.7	-66.308813	142.293920	-66.334330	142.304052	217.4	211.8
CEAMARC-05	108	CTD	CTD012	26/12/2007 17:33	26/12/2007 17:59	0.4	-66.337827	142.296608	-66.336152	142.276993	217.7	211.7
CEAMARC-05	109	Box Corer	05BC01	26/12/2007 18:14	26/12/2007 18:24	0.2	-66.338185	142.268740	-66.339310	142.266838	202.1	198.9
CEAMARC-05	110	Box Corer	05BC02	26/12/2007 18:20	26/12/2007 18:40	0.3	-66.338997	142.267728	-66.340762	142.264527	200.1	196.9
CEAMARC-04	111	Station	CEAMARC-04	26/12/2007 19:35	26/12/2007 22:20	2.8	-66.310435	142.009485	-66.355772	141.991685	229.6	261.5
CEAMARC-04	112	Beam Trawl AAD		26/12/2007 19:41	26/12/2007 20:14	0.5	-66.316385	142.000365	-66.337808	141.988052	237.0	254.6
CEAMARC-04	113	CTD	CTD013	26/12/2007 20:32	26/12/2007 20:53	0.4	-66.343532	141.985287	-66.346102	141.974105	259.1	265.1
CEAMARC-04	114	Box Corer	04BC01	26/12/2007 21:06	26/12/2007 21:16	0.2	-66.347095	141.971623	-66.347970	141.972842	267.1	266.6
CEAMARC-04	115	GA Camera	04CAM04	26/12/2007 21:41	26/12/2007 22:19	0.6	-66.336160	141.982143	-66.355703	141.991670	252.5	261.6
CEAMARC-09	116	Station	CEAMARC-09	26/12/2007 23:30	27/12/2007 3:36	4.1	-66.523605	141.974048	-66.557782	141.991520	502.0	323.0
CEAMARC-09	117	Beam Trawl AAD		26/12/2007 23:41	27/12/2007 0:27	0.8	-66.534813	141.982677	-66.565528	142.007127	520.4	337.2
CEAMARC-09	119	CTD	CTD014	27/12/2007 0:36	27/12/2007 1:16	0.7	-66.567380	142.007377	-66.568323	141.996262	326.6	299.1
CEAMARC-09	120	Box Corer	09BC01	27/12/2007 1:38	27/12/2007 1:50	0.2	-66.560458	141.995218	-66.561027	141.998520	325.0	330.6
CEAMARC-09	121	Box Corer	09BC02	27/12/2007 1:58	27/12/2007 2:09	0.2	-66.561323	142.001180	-66.561633	142.005232	331.1	338.8
CEAMARC-09	122	Box Corer	09BC03	27/12/2007 2:15	27/12/2007 2:26	0.2	-66.561758	142.007748	-66.561953	142.011275	341.4	349.7
CEAMARC-09	123	GA Camera	09CAM05	27/12/2007 2:54	27/12/2007 3:32	0.6	-66.548203	142.016383	-66.556623	141.993980	383.7	320.3
CEAMARC-08	125	Station	CEAMARC-08	27/12/2007 5:04	27/12/2007 9:13	4.2	-66.564310	142.387775	-66.543227	142.301970	383.1	383.1
CEAMARC-08	126	Beam Trawl AAD		27/12/2007 5:04	27/12/2007 6:10	1.1	-66.564283	142.387202	-66.557057	142.277252	383.9	385.3
CEAMARC-08	127	CTD	CTD015	27/12/2007 6:42	27/12/2007 7:17	0.6	-66.557332	142.318238	-66.560883	142.313175	369.6	363.1
CEAMARC-08	368	Plankton Water Sample	GSXX0000350	27/12/2007 6:43	27/12/2007 6:53	0.2	-66.557405	142.317970	-66.558185	142.316635	369.6	369.1

CEAMARC-08	128	Plankton Water Sample	GSXX0000349	27/12/2007 6:51	27/12/2007 7:01	0.2	-66.558060	142.316777	-66.558817	142.315762	369.1	369.7
CEAMARC-08	129	Box Corer	08BC01	27/12/2007 7:33	27/12/2007 7:44	0.2	-66.559198	142.321418	-66.558455	142.327885	368.3	368.9
CEAMARC-08	130	GA Camera	08CAM06	27/12/2007 8:09	27/12/2007 9:03	0.9	-66.559877	142.375785	-66.546095	142.300887	391.1	381.6
CEAMARC-07	131	Station	CEAMARC-07	27/12/2007 10:44	27/12/2007 14:50	4.1	-66.550707	142.629145	-66.565530	142.662952	141.6	446.7
CEAMARC-07	132	Beam Trawl AAD		27/12/2007 10:52	27/12/2007 11:14	0.4	-66.553653	142.636368	-66.562480	142.657522	138.7	384.4
CEAMARC-07	133	CTD	CTD016	27/12/2007 11:56	27/12/2007 12:30	0.6	-66.568452	142.649583	-66.574120	142.637782	405.5	370.9
CEAMARC-07	136	Box Corer	07BC01	27/12/2007 13:06	27/12/2007 13:13	0.1	-66.559385	142.661730	-66.559967	142.663993	337.7	358.8
CEAMARC-07	139	GA Camera	07CAM07	27/12/2007 13:50	27/12/2007 14:49	1.0	-66.549830	142.622718	-66.565387	142.662590	151.8	445.4
CEAMARC-39	140	Station	CEAMARC-39	27/12/2007 16:10	27/12/2007 22:06	5.9	-66.577815	143.043407	-66.563512	143.007478	873.0	881.6
CEAMARC-39	141	Beam Trawl AAD		27/12/2007 16:37	27/12/2007 18:05	1.5	-66.549847	142.958825	-66.580347	143.087292	866.6	866.9
CEAMARC-39	142	CTD	CTD017	27/12/2007 18:45	27/12/2007 19:37	0.9	-66.560677	143.007865	-66.556508	142.998438	869.1	865.7
CEAMARC-39	143	Box Corer	39BC01	27/12/2007 19:50	27/12/2007 20:15	0.4	-66.554728	142.995702	-66.552635	142.978692	868.5	863.7
CEAMARC-39	144	GA Camera	39CAM08	27/12/2007 20:45	27/12/2007 22:01	1.3	-66.545803	142.944787	-66.562197	143.002627	826.1	869.0
CEAMARC-37	145	Station	CEAMARC-37	27/12/2007 22:52	28/12/2007 4:31	5.6	-66.545360	143.279048	-66.564472	143.316562	822.7	827.2
CEAMARC-37	146	Beam Trawl AAD		27/12/2007 22:56	28/12/2007 0:08	1.2	-66.547023	143.282917	-66.574353	143.383400	826.4	807.8
CEAMARC-37	147	Beam Trawl AAD		28/12/2007 0:22	28/12/2007 1:43	1.4	-66.570203	143.377362	-66.540413	143.256735	810.4	822.9
CEAMARC-37	148	CTD	CTD018	28/12/2007 2:28	28/12/2007 3:12	0.7	-66.557697	143.326993	-66.552898	143.342480	827.0	821.5
CEAMARC-37	149	Plankton Water Sample	GSXX0000351	28/12/2007 2:36	28/12/2007 2:46	0.2	-66.556912	143.329098	-66.555795	143.332155	825.7	823.9
CEAMARC-37	150	Box Corer	37BC01	28/12/2007 3:32	28/12/2007 3:59	0.5	-66.555037	143.341983	-66.558250	143.335092	822.9	825.5
CEAMARC-37	151	Box Corer	37BC02	28/12/2007 4:01	28/12/2007 4:30	0.5	-66.558555	143.334177	-66.564420	143.316675	823.7	826.7
CEAMARC-40	153	Station	CEAMARC-40	28/12/2007 5:45	28/12/2007 9:18	3.5	-66.651118	142.956655	-66.676898	142.996347	604.3	517.6
CEAMARC-40	152	Beam Trawl AAD		28/12/2007 5:46	28/12/2007 7:04	1.3	-66.651393	142.957427	-66.660613	143.021050	604.1	599.5
CEAMARC-40	154	CTD	CTD019	28/12/2007 7:24	28/12/2007 8:04	0.7	-66.664215	143.023720	-66.661733	143.020362	612.2	574.1
CEAMARC-40	155	Box Corer	40BC01	28/12/2007 8:13	28/12/2007 8:39	0.4	-66.659162	143.023755	-66.666027	143.014555	615.0	565.4
CEAMARC-40	156	Box Corer	40BC02	28/12/2007 8:47	28/12/2007 9:15	0.5	-66.668312	143.010968	-66.676023	142.997863	541.2	548.8
CEAMARC-41	157	Station	CEAMARC-41	28/12/2007 11:09	28/12/2007 15:58	4.8	-66.728955	142.623910	-66.730355	142.615968	548.5	564.9
CEAMARC-41	158	GA Camera	41CAM09	28/12/2007 11:15	28/12/2007 12:07	0.9	-66.730887	142.625542	-66.742050	142.633707	561.4	590.6
CEAMARC-41	159	CTD	CTD020	28/12/2007 12:39	28/12/2007 13:38	1.0	-66.749765	142.666007	-66.746392	142.650998	700.9	716.6
CEAMARC-41	160	Sled Trawl		28/12/2007 14:14	28/12/2007 14:54	0.7	-66.729977	142.623405	-66.756435	142.643670	554.6	445.2
CEAMARC-41	161	Sled Trawl		28/12/2007 15:10	28/12/2007 15:57	0.8	-66.761293	142.652902	-66.730943	142.616558	546.1	557.9
CEAMARC-42	162	Station	CEAMARC-42	28/12/2007 17:06	28/12/2007 20:51	3.8	-66.863702	142.686280	-66.893823	142.642912	411.5	238.9
CEAMARC-42	163	GA Camera	42CAM10	28/12/2007 17:07	28/12/2007 17:49	0.7	-66.863992	142.685845	-66.876303	142.666217	407.8	382.4

CEAMARC-42	164	CTD	CTD021	28/12/2007 18:01	28/12/2007 18:37	0.6	-66.877893	142.664677	-66.878358	142.654312	398.3	403.9
CEAMARC-42	165	Van Veen Grab	test	28/12/2007 18:47	28/12/2007 19:06	0.3	-66.880175	142.653573	-66.883250	142.652480	383.5	315.6
CEAMARC-42	166	Van Veen Grab	42GRVV01	28/12/2007 19:11	28/12/2007 19:23	0.2	-66.884330	142.652560	-66.885340	142.656148	317.2	327.8
CEAMARC-42	167	Beam Trawl AAD		28/12/2007 20:04	28/12/2007 20:46	0.7	-66.865025	142.684803	-66.889402	142.648285	396.4	262.9
CEAMARC-43	168	Station	CEAMARC-43	28/12/2007 22:40	29/12/2007 2:24	3.7	-66.759168	143.281858	-66.747982	143.328548	154.9	296.4
CEAMARC-43	169	Beam Trawl AAD		28/12/2007 23:05	28/12/2007 23:49	0.7	-66.742652	143.366772	-66.754960	143.301662	353.0	163.4
CEAMARC-43	170	CTD	CTD022	29/12/2007 0:07	29/12/2007 0:29	0.4	-66.757200	143.290383	-66.757640	143.286205	166.2	160.0
CEAMARC-43	369	Plankton Water Sample	GSXX0000352	29/12/2007 0:16	29/12/2007 0:26	0.2	-66.756738	143.288913	-66.757468	143.287405	172.4	162.5
CEAMARC-43	171	Box Corer	43BC01	29/12/2007 0:45	29/12/2007 0:52	0.1	-66.758735	143.283275	-66.759887	143.284687	154.5	152.5
CEAMARC-43	172	GA Camera	43CAM11	29/12/2007 1:14	29/12/2007 1:50	0.6	-66.759317	143.290172	-66.752190	143.299185	158.8	266.3
CEAMARC-44	173	Station	CEAMARC-44	29/12/2007 3:39	29/12/2007 8:29	4.8	-66.687810	143.669037	-66.709462	143.657388	764.0	539.7
CEAMARC-44	174	CTD	CTD023	29/12/2007 3:48	29/12/2007 4:30	0.7	-66.689090	143.670812	-66.695542	143.670500	759.1	732.7
CEAMARC-44	175	GA Camera	44CAM12	29/12/2007 5:01	29/12/2007 5:56	0.9	-66.692723	143.667412	-66.678515	143.642150	753.5	778.1
CEAMARC-44	176	Box Corer	44BC01	29/12/2007 6:06	29/12/2007 6:29	0.4	-66.676050	143.637457	-66.670923	143.625147	775.8	767.3
CEAMARC-44	177	Box Corer	44BC02	29/12/2007 6:32	29/12/2007 6:55	0.4	-66.670045	143.623388	-66.664558	143.610460	767.3	770.5
CEAMARC-44	178	Beam Trawl AAD		29/12/2007 7:18	29/12/2007 8:29	1.2	-66.669058	143.614500	-66.709462	143.657388	774.7	539.7
CEAMARC-45	179	Station	CEAMARC-45	29/12/2007 9:56	29/12/2007 14:45	4.8	-66.750152	143.994535	-66.749902	144.071347	609.6	882.0
CEAMARC-45	180	CTD	CTD024	29/12/2007 10:04	29/12/2007 10:46	0.7	-66.751778	143.988315	-66.757815	143.970702	610.2	498.4
CEAMARC-45	181	Box Corer	45BC01	29/12/2007 11:18	29/12/2007 11:41	0.4	-66.750650	143.995255	-66.758522	143.997687	609.3	589.8
CEAMARC-45	182	Box Corer	45BC02	29/12/2007 11:49	29/12/2007 12:12	0.4	-66.761908	144.001552	-66.771495	144.010745	594.7	549.5
CEAMARC-45	184	Beam Trawl AAD		29/12/2007 13:34	29/12/2007 14:44	1.2	-66.750458	143.950198	-66.749885	144.069742	640.9	877.7
CEAMARC-46	185	Station	CEAMARC-46	29/12/2007 15:37	29/12/2007 18:52	3.3	-66.858110	144.070470	-66.872170	143.998818	502.5	315.2
CEAMARC-46	186	CTD	CTD025	29/12/2007 15:54	29/12/2007 16:34	0.7	-66.876090	144.068230	-66.874780	144.059838	623.3	650.6
CEAMARC-46	187	Box Corer	46BC01	29/12/2007 16:45	29/12/2007 17:07	0.4	-66.874613	144.053263	-66.876957	144.051128	636.3	615.5
CEAMARC-46	188	Sled Trawl		29/12/2007 17:55	29/12/2007 18:44	0.8	-66.872902	144.109150	-66.871293	144.016260	554.2	314.1
CEAMARC-48	189	Station	CEAMARC-48	29/12/2007 20:27	29/12/2007 23:15	2.8	-66.938822	144.625492	-66.939077	144.607672	341.9	305.8
CEAMARC-48	190	CTD	CTD026	29/12/2007 20:41	29/12/2007 21:07	0.4	-66.943052	144.659698	-66.941330	144.651407	328.8	329.3
CEAMARC-48	191	Box Corer	48BC01	29/12/2007 21:17	29/12/2007 21:28	0.2	-66.940977	144.647725	-66.941812	144.646207	329.1	330.5
CEAMARC-48	192	Box Corer	48BC02	29/12/2007 21:33	29/12/2007 21:43	0.2	-66.942317	144.645880	-66.942973	144.645972	331.8	338.8
CEAMARC-48	193	Box Corer	48BC03	29/12/2007 21:53	29/12/2007 21:59	0.1	-66.942187	144.647560	-66.941240	144.648357	333.7	328.8
CEAMARC-48	194	Beam Trawl AAD		29/12/2007 22:30	29/12/2007 23:08	0.6	-66.939433	144.685795	-66.938703	144.620748	408.9	326.3
CEAMARC-47	195	Station	CEAMARC-47	30/12/2007 0:04	30/12/2007 3:09	3.1	-67.032635	144.661533	-67.034307	144.673397	186.8	206.4

CEAMARC-47	196	GA Camera	47CAM13	30/12/2007 0:07	30/12/2007 0:34	0.5	-67.033700	144.662277	-67.041662	144.663857	182.2	173.3
CEAMARC-47	197	CTD	CTD027	30/12/2007 0:31	30/12/2007 1:02	0.5	-67.040558	144.663887	-67.042455	144.667190	181.0	177.4
CEAMARC-47	370	Plankton Water Sample	GSXX0000353	30/12/2007 1:05	30/12/2007 1:15	0.2	-67.042740	144.667760	-67.043698	144.669730	177.6	183.9
CEAMARC-47	198	Smith-McIntyre Grab	47GRSM01	30/12/2007 1:24	30/12/2007 1:30	0.1	-67.045490	144.669698	-67.046818	144.668938	186.7	182.0
CEAMARC-47	199	Smith-McIntyre Grab	47GRSM02	30/12/2007 1:38	30/12/2007 1:44	0.1	-67.048473	144.668122	-67.049917	144.668277	188.0	190.1
CEAMARC-47	200	Van Veen Grab	47GRVV03	30/12/2007 1:50	30/12/2007 1:56	0.1	-67.051057	144.668550	-67.052248	144.669048	191.4	197.3
CEAMARC-47	201	Beam Trawl AAD		30/12/2007 2:25	30/12/2007 3:07	0.7	-67.067700	144.661870	-67.036803	144.672420	200.4	195.1
CEAMARC-49A	203	Station	CEAMARC-49A	30/12/2007 4:58	30/12/2007 14:21	9.4	-67.040840	145.183615	-66.998818	145.298480	1314.5	1046.9
CEAMARC-49A	202	GA Camera	49ACAM14	30/12/2007 4:58	30/12/2007 6:36	1.6	-67.040742	145.183767	-67.018573	145.246337	1318.3	1165.2
CEAMARC-49A	204	CTD	CTD028	30/12/2007 7:22	30/12/2007 8:28	1.1	-67.030748	145.197473	-67.035312	145.200602	1246.5	1243.2
CEAMARC-49A	205	Box Corer	49ABC01	30/12/2007 8:48	30/12/2007 9:36	0.8	-67.027325	145.214725	-67.021963	145.245880	1175.0	1157.6
CEAMARC-49A	206	CTD	29	30/12/2007 10:55	30/12/2007 11:47	0.9	-67.059203	145.192840	-67.054400	145.194768	1350.6	1332.5
CEAMARC-49A	371	Plankton Water Sample	GSXX0000354	30/12/2007 11:05	30/12/2007 11:15	0.2	-67.057898	145.191850	-67.057033	145.192425	1350.7	1350.1
CEAMARC-49A	207	Beam Trawl AAD		30/12/2007 12:10	30/12/2007 14:19	2.1	-67.046928	145.150820	-66.999782	145.295250	1266.6	1051.6
CTD-MERTZ	208	Station	CTD-MERTZ	30/12/2007 15:23	30/12/2007 16:13	0.8	-66.855050	145.391120	-66.846798	145.376045	650.9	645.1
CTD-MERTZ	209	CTD	CTD030	30/12/2007 15:30	30/12/2007 16:12	0.7	-66.851463	145.386313	-66.847418	145.376235	648.0	646.5
CEAMARC-51A	210	Station	CEAMARC-51A	30/12/2007 17:03	30/12/2007 20:50	3.8	-66.752647	145.469147	-66.747473	145.436112	537.8	544.6
CEAMARC-51A	211	GA Camera	51ACAM15	30/12/2007 17:05	30/12/2007 17:56	0.9	-66.752263	145.472022	-66.750057	145.523150	542.9	532.8
CEAMARC-51A	212	CTD	CTD031	30/12/2007 18:08	30/12/2007 18:41	0.6	-66.750165	145.525272	-66.751855	145.524673	534.8	533.7
CEAMARC-51A	213	Box Corer	51ABC01	30/12/2007 19:01	30/12/2007 19:16	0.3	-66.753002	145.527713	-66.754150	145.529297	533.0	533.5
CEAMARC-51A	214	Box Corer	51ABC02	30/12/2007 19:18	30/12/2007 19:34	0.3	-66.754217	145.529353	-66.755388	145.532667	530.1	531.8
CEAMARC-51A	215	Beam Trawl AAD		30/12/2007 19:51	30/12/2007 20:46	0.9	-66.750233	145.534688	-66.747675	145.444313	526.2	546.3
CEAMARC-50A	216	Station	CEAMARC-50A	30/12/2007 21:22	31/12/2007 1:13	3.8	-66.740003	145.282617	-66.749313	145.344573	582.5	564.0
CEAMARC-50A	217	GA Camera	50ACAM16	30/12/2007 21:30	30/12/2007 22:24	0.9	-66.742528	145.273778	-66.754222	145.233122	585.0	598.8
CEAMARC-50A	218	CTD	CTD032	30/12/2007 22:35	30/12/2007 23:13	0.6	-66.754765	145.227570	-66.751570	145.220940	600.4	596.7
CEAMARC-50A	219	Box Corer	50ABC01	30/12/2007 23:28	30/12/2007 23:37	0.2	-66.753733	145.217835	-66.754898	145.215037	598.4	599.3
CEAMARC-50A	220	Beam Trawl AAD		30/12/2007 23:49	31/12/2007 1:03	1.2	-66.753423	145.208488	-66.752373	145.334453	597.2	568.5
CEAMARC-57	222	Station	CEAMARC-57	31/12/2007 2:33	31/12/2007 7:23	4.8	-66.745772	145.029882	-66.746275	145.047657	644.1	632.2
CEAMARC-57	221	GA Camera	57CAM17	31/12/2007 2:34	31/12/2007 3:38	1.1	-66.745657	145.028845	-66.730723	144.980417	643.8	626.4
CEAMARC-57	223	CTD	CTD033	31/12/2007 4:12	31/12/2007 4:53	0.7	-66.738565	144.980007	-66.738392	144.960175	648.5	644.1
CEAMARC-57	224	Box Corer	57BC01	31/12/2007 5:18	31/12/2007 5:47	0.5	-66.742958	144.986158	-66.743473	145.002992	651.6	644.2
CEAMARC-57	225	Beam Trawl AAD		31/12/2007 6:23	31/12/2007 7:21	1.0	-66.745397	144.962393	-66.745588	145.041465	660.9	635.7

CEAMARC-58	226	Station	CEAMARC-58	31/12/2007 8:24	31/12/2007 15:56	7.5	-66.747892	144.675757	-66.780842	144.724422	848.8	863.8
CEAMARC-58	227	CTD	CTD034	31/12/2007 8:27	31/12/2007 9:16	0.8	-66.748135	144.673370	-66.746578	144.658875	844.9	844.2
CEAMARC-58	228	GA Camera	58CAM18	31/12/2007 9:52	31/12/2007 10:52	1.0	-66.746680	144.644142	-66.756473	144.673417	841.0	843.0
CEAMARC-58	229	Box Corer	58BC01	31/12/2007 13:44	31/12/2007 14:05	0.3	-66.753840	144.665345	-66.757177	144.669582	842.2	841.0
CEAMARC-58	230	Beam Trawl AAD		31/12/2007 14:36	31/12/2007 15:52	1.3	-66.736708	144.640282	-66.778042	144.718625	845.7	860.5
CEAMARC-59	231	Station	CEAMARC-59	31/12/2007 17:11	31/12/2007 21:00	3.8	-66.734387	144.317618	-66.743753	144.332067	904.6	907.6
CEAMARC-59	232	GA Camera	59CAM19	31/12/2007 17:12	31/12/2007 18:27	1.3	-66.734862	144.318223	-66.758308	144.343030	901.0	916.3
CEAMARC-59	233	CTD	CTD035	31/12/2007 18:50	31/12/2007 19:34	0.7	-66.759228	144.344235	-66.753507	144.347135	918.5	915.9
CEAMARC-59	234	Box Corer	59BC01	31/12/2007 19:42	31/12/2007 20:12	0.5	-66.751387	144.343967	-66.752002	144.347072	915.5	914.0
CEAMARC-59	235	Beam Trawl AAD		31/12/2007 20:43	31/12/2007 20:45	0.0	-66.735040	144.332067	-66.736862	144.333023	906.4	906.0
CEAMARC-59	236	Beam Trawl AAD		31/12/2007 20:51	31/12/2007 20:56	0.1	-66.739812	144.331597	-66.742017	144.332080	905.3	906.7
CEAMARC-60A	238	Station	CEAMARC-60A	2/01/2008 4:46	2/01/2008 5:58	1.2	-66.608363	144.158295	-66.605957	144.115417	839.6	834.8
CEAMARC-60A	239	CTD	CTD036	2/01/2008 4:58	2/01/2008 5:54	0.9	-66.606887	144.149868	-66.607198	144.119750	838.2	835.8
CEAMARC-60	249	Station	CEAMARC-60	2/01/2008 6:39	2/01/2008 10:58	4.3	-66.562313	144.002935	-66.544953	144.021557	810.0	785.4
CEAMARC-60	250	Box Corer	60BC01	2/01/2008 6:40	2/01/2008 7:06	0.4	-66.562417	144.002983	-66.566750	143.996888	809.7	813.9
CEAMARC-60	251	Box Corer	60BC02	2/01/2008 7:10	2/01/2008 7:36	0.4	-66.567670	143.995172	-66.571893	143.983470	815.2	817.3
CEAMARC-60	254	Beam Trawl AAD		2/01/2008 8:10	2/01/2008 9:30	1.3	-66.543750	143.990627	-66.577652	143.873172	786.9	786.2
CEAMARC-60	255	GA Camera		2/01/2008 10:49	2/01/2008 10:57	0.1	-66.542725	144.016640	-66.544808	144.021328	787.1	786.6
CEAMARC-59	256	Station	CEAMARC-59	2/01/2008 18:00	2/01/2008 20:59	3.0	-66.750643	144.326510	-66.788687	144.413470	913.1	951.6
CEAMARC-59	257	CTD	CTD037	2/01/2008 18:03	2/01/2008 18:45	0.7	-66.750525	144.326047	-66.750203	144.325185	914.7	912.5
CEAMARC-59	372	Plankton Water Sample	GSXX0000355	2/01/2008 18:45	2/01/2008 18:55	0.2	-66.750203	144.325185	-66.745807	144.321385	912.5	908.6
CEAMARC-59	602	Plankton Water Sample	GSXX0000356	2/01/2008 18:55	2/01/2008 19:05	0.2	-66.745807	144.321385	-66.735570	144.302578	908.6	900.1
CEAMARC-59	258	Beam Trawl AAD		2/01/2008 19:13	2/01/2008 19:18	0.1	-66.736895	144.301513	-66.738215	144.305183	903.4	903.7
CEAMARC-59	259	Beam Trawl AAD		2/01/2008 19:22	2/01/2008 20:59	1.6	-66.738715	144.307023	-66.788687	144.413470	903.6	951.6
CEAMARC-56	260	Station	CEAMARC-56	2/01/2008 22:34	3/01/2008 1:24	2.8	-66.560408	144.665490	-66.584348	144.700013	581.9	600.4
CEAMARC-56	261	CTD	CTD038	2/01/2008 22:37	2/01/2008 23:25	0.8	-66.560222	144.665460	-66.559757	144.664473	582.6	585.0
CEAMARC-56	262	Box Corer	56BC01	2/01/2008 23:31	2/01/2008 23:47	0.3	-66.560278	144.664465	-66.561978	144.663693	582.8	585.9
CEAMARC-56	263	Beam Trawl AAD		3/01/2008 0:15	3/01/2008 1:24	1.1	-66.543317	144.645158	-66.584230	144.699845	574.9	598.8
CEAMARC-31	264	Station	CEAMARC-31	3/01/2008 2:24	3/01/2008 5:48	3.4	-66.572405	144.969900	-66.575223	145.020825	473.0	450.1
CEAMARC-31	265	GA Camera		3/01/2008 2:24	3/01/2008 2:41	0.3	-66.572188	144.969938	-66.565912	144.976497	474.8	464.3
CEAMARC-31	266	CTD	CTD039	3/01/2008 2:56	3/01/2008 3:42	0.8	-66.566230	144.977733	-66.565033	144.956177	467.1	471.4
CEAMARC-31	267	Box Corer	31BC01	3/01/2008 3:46	3/01/2008 4:02	0.3	-66.564245	144.954343	-66.566108	144.945267	465.8	475.5

CEAMARC-31	268	Beam Trawl AAD		3/01/2008 4:36	3/01/2008 5:48	1.2	-66.538527	144.972508	-66.575135	145.020713	440.7	449.2
CEAMARC-52	269	Station	CEAMARC-52	3/01/2008 6:35	3/01/2008 10:33	4.0	-66.556708	145.324367	-66.595342	145.382897	406.4	415.3
CEAMARC-52	270	CTD	CTD040	3/01/2008 6:49	3/01/2008 7:28	0.7	-66.555522	145.332952	-66.554938	145.323965	407.3	411.4
CEAMARC-52	271	Box Corer	52BC01	3/01/2008 7:30	3/01/2008 7:45	0.2	-66.555202	145.322873	-66.558345	145.312222	410.7	403.6
CEAMARC-52	272	Box Corer	52BC02	3/01/2008 7:59	3/01/2008 8:13	0.2	-66.555470	145.299660	-66.551618	145.297483	406.6	410.4
CEAMARC-52	273	Box Corer	57BC03	3/01/2008 8:14	3/01/2008 8:24	0.2	-66.551298	145.297408	-66.548757	145.296435	410.6	406.1
CEAMARC-52	274	Beam Trawl AAD		3/01/2008 8:49	3/01/2008 9:57	1.1	-66.539917	145.290892	-66.570748	145.342185	403.5	414.4
CEAMARC-55	275	Station	CEAMARC-55	3/01/2008 12:59	3/01/2008 15:20	2.4	-66.334393	144.997523	-66.352055	145.043142	395.0	392.3
CEAMARC-55	276	CTD	CTD041	3/01/2008 13:02	3/01/2008 13:37	0.6	-66.334877	144.996125	-66.335697	145.002653	387.6	391.4
CEAMARC-55	277	Box Corer	55BC01	3/01/2008 13:43	3/01/2008 13:55	0.2	-66.336513	145.001177	-66.337912	144.998640	393.2	396.2
CEAMARC-55	278	Beam Trawl AAD		3/01/2008 14:16	3/01/2008 14:20	0.1	-66.320888	144.972857	-66.322437	144.976363	391.9	389.5
CEAMARC-55	279	Beam Trawl AAD		3/01/2008 14:25	3/01/2008 15:15	0.8	-66.324275	144.981717	-66.347918	145.040135	399.2	388.4
CEAMARC-53	280	Station	CEAMARC-53	3/01/2008 16:11	3/01/2008 18:17	2.1	-66.332182	144.656935	-66.344265	144.690760	423.0	418.5
CEAMARC-53	281	CTD	CTD042	3/01/2008 16:12	3/01/2008 16:48	0.6	-66.332190	144.657063	-66.332855	144.653230	422.5	424.9
CEAMARC-53	282	Box Corer	53BC01	3/01/2008 16:55	3/01/2008 17:07	0.2	-66.332977	144.655858	-66.332845	144.660082	421.1	422.9
CEAMARC-53	283	Beam Trawl AAD		3/01/2008 17:28	3/01/2008 18:14	0.8	-66.319760	144.637922	-66.342923	144.687892	420.3	420.6
CEAMARC-34	284	Station	CEAMARC-34	3/01/2008 19:04	3/01/2008 21:44	2.7	-66.333043	144.349113	-66.354347	144.379077	452.2	457.1
CEAMARC-34	285	CTD	CTD043	3/01/2008 19:13	3/01/2008 19:48	0.6	-66.333110	144.328350	-66.332678	144.321527	455.3	458.3
CEAMARC-34	286	Box Corer	34BC01	3/01/2008 19:55	3/01/2008 20:06	0.2	-66.332798	144.321352	-66.333733	144.320070	457.9	459.9
CEAMARC-34	287	Box Corer	34BC02	3/01/2008 20:10	3/01/2008 20:20	0.2	-66.334048	144.319717	-66.334617	144.318907	454.6	457.7
CEAMARC-34	288	Beam Trawl AAD		3/01/2008 20:42	3/01/2008 21:43	1.0	-66.321365	144.308882	-66.353690	144.377852	451.9	459.7
CEAMARC-35	289	Station	CEAMARC-35	3/01/2008 22:45	4/01/2008 1:43	3.0	-66.333113	143.985383	-66.355090	144.047462	514.0	520.6
CEAMARC-35	290	CTD	CTD044	3/01/2008 22:49	3/01/2008 23:27	0.6	-66.333250	143.984710	-66.331228	143.979992	514.7	518.0
CEAMARC-35	291	Box Corer	35BC01	3/01/2008 23:30	3/01/2008 23:43	0.2	-66.331085	143.979047	-66.330695	143.980330	518.3	518.1
CEAMARC-35	292	Box Corer	35BC02	3/01/2008 23:47	3/01/2008 23:59	0.2	-66.330415	143.980205	-66.331065	143.980177	517.7	518.2
CEAMARC-35	293	Box Corer	35BC03	4/01/2008 0:06	4/01/2008 0:19	0.2	-66.331307	143.981032	-66.331550	143.981472	518.7	517.2
CEAMARC-35	294	Beam Trawl AAD		4/01/2008 0:40	4/01/2008 1:42	1.0	-66.321085	143.976490	-66.354740	144.046778	504.3	518.5
CEAMARC-36	295	Station	CEAMARC-36	4/01/2008 3:17	4/01/2008 4:35	1.3	-66.314322	143.607717	-66.339087	143.686475	582.8	562.9
CEAMARC-36	296	Beam Trawl AAD		4/01/2008 3:21	4/01/2008 3:24	0.1	-66.312868	143.616528	-66.314263	143.620237	578.2	578.2
CEAMARC-36	297	Beam Trawl AAD		4/01/2008 3:38	4/01/2008 4:34	0.9	-66.318845	143.632170	-66.338835	143.685495	566.4	560.7
CEAMARC-38	298	Station	CEAMARC-38	4/01/2008 6:05	4/01/2008 7:08	1.1	-66.313737	143.302020	-66.350380	143.334583	686.0	702.9
CEAMARC-38	299	Beam Trawl AAD		4/01/2008 6:08	4/01/2008 7:07	1.0	-66.315523	143.301408	-66.350292	143.334553	692.6	702.9

CEAMARC-62	300	Station	CEAMARC-62	4/01/2008 8:12	4/01/2008 11:14	3.0	-66.164595	143.332923	-66.176752	143.346432	543.7	547.9
CEAMARC-62	301	CTD	CTD045	4/01/2008 8:29	4/01/2008 9:11	0.7	-66.155893	143.333245	-66.158243	143.316155	542.4	543.3
CEAMARC-62	302	Box Corer	62BC01	4/01/2008 9:23	4/01/2008 9:40	0.3	-66.158823	143.308310	-66.161602	143.302612	542.1	541.0
CEAMARC-62	303	Beam Trawl AAD		4/01/2008 10:16	4/01/2008 11:13	0.9	-66.143585	143.295548	-66.176218	143.345790	534.1	544.4
POLYNYA-TEMP-A	304	Mooring	POLYNYA-TEMP-A	4/01/2008 12:35	4/01/2008 13:30	0.9	-66.189062	142.913375	-66.175365	142.926465	556.1	556.1
POLYNYA-TEMP-A	305	CTD	CTD046	4/01/2008 13:48	4/01/2008 14:27	0.7	-66.169485	142.925658	-66.166167	142.920400	551.1	551.1
POLYNYA-TEMP-A	306	CTD	CTD047	4/01/2008 15:26	4/01/2008 16:06	0.7	-66.178353	143.164138	-66.178742	143.150802	584.3	583.0
POLYNYA-TEMP-A	307	CTD	CTD048	4/01/2008 17:02	4/01/2008 17:39	0.6	-66.178282	143.478233	-66.179422	143.474138	542.2	540.3
POLYNYA-TEMP-B	308	Mooring	POLYNYA-TEMP-B	4/01/2008 18:06	4/01/2008 18:23	0.3	-66.179987	143.474580	-66.185783	143.467135	541.5	549.3
POLYNYA-TEMP-B	309	GA Camera	test	4/01/2008 18:53	4/01/2008 19:06	0.2	-66.189352	143.511682	-66.189618	143.526267	542.9	527.6
CEAMARC-63	310	Station	CEAMARC-63	4/01/2008 21:11	5/01/2008 0:42	3.5	-65.874340	143.018172	-65.837290	142.971717	427.0	518.4
CEAMARC-63	311	GA Camera	63CAM20	4/01/2008 21:14	4/01/2008 22:07	0.9	-65.873112	143.016457	-65.846727	142.984797	429.6	429.4
CEAMARC-63	312	CTD	CTD049	4/01/2008 22:16	4/01/2008 22:50	0.6	-65.844998	142.982077	-65.846767	142.985133	428.5	427.8
CEAMARC-63	313	Box Corer	63BC01	4/01/2008 22:54	4/01/2008 23:05	0.2	-65.846730	142.985242	-65.844288	142.982852	427.6	425.8
CEAMARC-63	314	Beam Trawl AAD		4/01/2008 23:50	5/01/2008 0:36	0.8	-65.869947	143.001547	-65.841172	142.976038	430.2	428.8
CEAMARC-65	315	Station	CEAMARC-65	5/01/2008 1:06	5/01/2008 5:02	3.9	-65.811583	142.994668	-65.768288	142.983528	858.1	1651.4
CEAMARC-65	317	Box Corer	65BC01	5/01/2008 1:08	5/01/2008 1:29	0.4	-65.811230	142.993737	-65.807488	142.983730	869.6	951.6
CEAMARC-65	316	CTD	CTD050	5/01/2008 1:39	5/01/2008 2:41	1.0	-65.805838	142.979062	-65.799385	142.986148	985.5	1091.1
CEAMARC-65	318	Beam Trawl AAD		5/01/2008 3:37	5/01/2008 4:57	1.3	-65.827830	142.995613	-65.771243	142.985232	609.0	1601.1
CEAMARC-66A	319	Station	CEAMARC-66A	5/01/2008 5:22	5/01/2008 7:35	2.2	-65.762055	142.987455	-65.764068	142.945978	1715.3	1776.3
CEAMARC-66A	320	CTD	CTD051	5/01/2008 5:30	5/01/2008 7:30	2.0	-65.763075	142.991857	-65.764545	142.947835	1688.5	1766.7
CEAMARC-65	321	Station	CEAMARC-65	5/01/2008 8:01	5/01/2008 9:31	1.5	-65.810747	142.942513	-65.807698	143.065660	982.5	768.7
CEAMARC-65	322	Beam Trawl AAD		5/01/2008 8:20	5/01/2008 9:29	1.2	-65.823045	142.955393	-65.808030	143.062733	774.9	766.4
CEAMARC-66A	323	Station	CEAMARC-66A	5/01/2008 10:50	5/01/2008 13:43	2.9	-65.768292	142.880663	-65.752558	143.175502	1752.0	1673.1
CEAMARC-66A	324	Beam Trawl AAD		5/01/2008 11:01	5/01/2008 13:42	2.7	-65.765752	142.919633	-65.754005	143.175607	1764.2	1657.8
CEAMARC-67A	325	Station	CEAMARC-67A	5/01/2008 15:40	5/01/2008 23:18	7.6	-65.745333	142.850380	-65.685985	142.927265	1922.8	2234.8
CEAMARC-67A	326	Beam Trawl AAD		5/01/2008 15:46	5/01/2008 18:21	2.6	-65.743922	142.858913	-65.718697	143.060260	1956.6	2065.5
CEAMARC-67A	327	CTD	CTD052	5/01/2008 19:00	5/01/2008 20:29	1.5	-65.722923	142.957907	-65.727080	142.952443	2123.2	2095.6
CEAMARC-67A	328	Box Corer	67ABC01	5/01/2008 20:38	5/01/2008 23:06	2.5	-65.727702	142.950932	-65.691830	142.918623	2091.8	2202.6
CEAMARC-67	329	Station	CEAMARC-67	5/01/2008 23:45	6/01/2008 1:40	1.9	-65.657302	143.041838	-65.660840	143.034210	2409.1	2396.7
CEAMARC-67	330	CTD	CTD053	5/01/2008 23:48	6/01/2008 1:34	1.8	-65.657387	143.042962	-65.659458	143.033358	2408.5	2399.3
CASO-01	331	Station	CASO-01	6/01/2008 3:16	6/01/2008 5:28	2.2	-65.531118	143.154960	-65.540815	143.156222	2723.3	2711.6

CASO-01	332	CTD	CTD054	6/01/2008 3:17	6/01/2008 5:22	2.1	-65.531300	143.155327	-65.539885	143.151315	2722.9	2711.4
CASO-02	333	Station	CASO-02	6/01/2008 7:15	6/01/2008 9:37	2.4	-65.246732	143.036880	-65.256677	143.020542	3066.9	3060.5
CASO-02	334	CTD	CTD055	6/01/2008 7:20	6/01/2008 9:36	2.3	-65.248198	143.037140	-65.256602	143.020383	3062.9	3060.5
CASO-03	335	Station	CASO-03	6/01/2008 11:37	6/01/2008 14:08	2.5	-65.006865	143.495708	-65.013300	143.472740	3288.8	3285.4
CASO-03	337	CTD	CTD056	6/01/2008 11:45	6/01/2008 14:03	2.3	-65.008890	143.494712	-65.012468	143.474235	3289.7	3286.4
CASO-04	338	Station	CASO-04	6/01/2008 15:25	6/01/2008 17:53	2.5	-64.784170	143.651422	-64.788382	143.616463	3452.5	3427.6
CASO-04	339	CTD	CTD057	6/01/2008 15:30	6/01/2008 17:52	2.4	-64.784483	143.650617	-64.788368	143.616755	3450.6	3427.6
CASO-05	340	Station	CASO-05	6/01/2008 20:05	6/01/2008 22:38	2.6	-64.394615	143.294335	-64.390768	143.314807	3610.5	3616.2
CASO-05	341	CTD	CTD058	6/01/2008 20:12	6/01/2008 22:35	2.4	-64.389358	143.296743	-64.390265	143.313827	3614.2	3617.1
CASO-06	342	Station	CASO-06	7/01/2008 1:42	7/01/2008 5:04	3.4	-63.799453	143.375475	-63.788415	143.337703	3805.1	3803.7
CASO-06	343	CTD	CTD059	7/01/2008 1:50	7/01/2008 4:46	2.9	-63.800170	143.381157	-63.810208	143.340640	3802.8	3790.4
CASO-07	344	Station	CASO-07	7/01/2008 8:06	7/01/2008 11:47	3.7	-63.208255	143.501593	-63.179202	143.466887	3994.8	4002.2
CASO-07	345	CTD	CTD060	7/01/2008 8:15	7/01/2008 11:46	3.5	-63.209398	143.497997	-63.180535	143.466585	3994.4	4001.2
CASO-08	346	Station	CASO-08	7/01/2008 13:45	7/01/2008 16:53	3.1	-62.761917	143.607745	-62.758325	143.631695	4117.9	4112.9
CASO-08	347	CTD	CTD061	7/01/2008 13:50	7/01/2008 16:49	3.0	-62.761750	143.609062	-62.757807	143.630615	4117.9	4111.7
CASO-09	348	Station	CASO-09	7/01/2008 20:23	7/01/2008 23:03	2.7	-62.904033	145.055340	-62.904075	145.031247	4022.9	4021.3
CASO-09	349	CTD	CTD062	7/01/2008 20:27	7/01/2008 23:02	2.6	-62.904338	145.055218	-62.904168	145.032537	4023.0	4021.3
CASO-10	350	Station	CASO-10	8/01/2008 2:43	8/01/2008 5:58	3.2	-63.054162	146.477183	-63.056183	146.485075	3949.8	3946.8
CASO-10	351	CTD	CTD063	8/01/2008 2:44	8/01/2008 5:58	3.2	-63.054160	146.477225	-63.056177	146.485185	3949.8	3947.4
CASO-11	352	Station	CASO-11	8/01/2008 9:27	8/01/2008 12:37	3.2	-63.175502	147.853085	-63.183685	147.874055	3912.5	3911.1
CASO-11	353	CTD	CTD064	8/01/2008 9:29	8/01/2008 12:33	3.1	-63.175147	147.852650	-63.182925	147.875248	3912.5	3911.1
CASO-12	354	Station	CASO-12	8/01/2008 15:30	8/01/2008 18:04	2.6	-63.311370	149.210165	-63.319552	149.223438	3793.3	3796.1
CASO-12	355	CTD	CTD065	8/01/2008 15:35	8/01/2008 18:01	2.4	-63.310342	149.216763	-63.319163	149.223563	3804.8	3798.3
CASO-13	356	Station	CASO-13	8/01/2008 20:10	8/01/2008 22:48	2.6	-63.496840	149.990810	-63.497345	150.029080	3737.1	3730.8
CASO-13	357	CTD	CTD066	8/01/2008 20:18	8/01/2008 22:47	2.5	-63.497388	150.003982	-63.497153	150.028790	3737.3	3730.8
CASO-14	358	Station	CASO-14	9/01/2008 0:48	9/01/2008 3:42	2.9	-63.898663	150.004950	-63.892827	150.023483	3672.0	3671.1
CASO-14	359	CTD	CTD067	9/01/2008 0:55	9/01/2008 3:41	2.8	-63.899147	150.000465	-63.892933	150.023240	3675.4	3671.1
CASO-15	360	Station	CASO-15	9/01/2008 5:53	9/01/2008 8:55	3.0	-64.300280	149.998517	-64.294812	150.036833	3595.3	3578.0
CASO-15	361	CTD	CTD068	9/01/2008 6:06	9/01/2008 8:54	2.8	-64.302312	149.998025	-64.295165	150.036308	3598.9	3579.0
CASO-15	597	Plankton Water Sample	GSXX0000358	9/01/2008 6:10	9/01/2008 6:20	0.2	-64.301992	149.999555	-64.300242	150.002532	3596.4	3593.5
CASO-16	362	Station	CASO-16	9/01/2008 11:14	9/01/2008 13:56	2.7	-64.595512	149.997243	-64.584775	150.059643	3473.5	3473.0
CASO-16	363	CTD	CTD069	9/01/2008 11:15	9/01/2008 13:52	2.6	-64.595028	149.997500	-64.585290	150.056273	3475.0	3473.9

CASO-17	364	Station	CASO-17	9/01/2008 16:14	9/01/2008 18:24	2.2	-64.998063	149.994415	-64.983962	149.996222	3313.6	3323.4
CASO-17	365	CTD	CTD070	9/01/2008 16:14	9/01/2008 18:24	2.2	-64.998063	149.994415	-64.983962	149.996222	3313.6	3323.4
CASO-18A	366	Station	CASO-18A	10/01/2008 0:42	10/01/2008 3:15	2.6	-65.395095	149.494687	-65.393735	149.521743	3077.8	3078.4
CASO-18A	367	CTD	CTD071	10/01/2008 0:45	10/01/2008 3:14	2.5	-65.395155	149.496462	-65.393763	149.521662	3078.7	3078.4
CASO-19A	373	Station	CASO-19A	10/01/2008 5:56	10/01/2008 8:26	2.5	-65.576145	148.883700	-65.571475	148.890537	2691.3	2702.2
CASO-19A	374	CTD	CTD072	10/01/2008 5:56	10/01/2008 8:23	2.4	-65.576105	148.883702	-65.571603	148.890163	2691.6	2704.4
CASO-30	375	Station	CASO-30	10/01/2008 13:31	10/01/2008 15:38	2.1	-65.325722	146.914938	-65.328360	146.884435	2975.2	2958.9
CASO-30	376	CTD	CTD073	10/01/2008 13:33	10/01/2008 15:34	2.0	-65.325767	146.913953	-65.328013	146.888355	2975.2	2957.8
CASO-29	377	Station	CASO-29	10/01/2008 17:12	10/01/2008 19:06	1.9	-65.629603	146.919827	-65.630050	146.893697	2724.0	2710.9
CASO-29	378	CTD	CTD074	10/01/2008 17:15	10/01/2008 19:05	1.8	-65.630010	146.919193	-65.630102	146.894258	2717.4	2715.4
CASO-28A	379	Station	CASO-28A	10/01/2008 20:56	10/01/2008 22:30	1.6	-65.793340	146.616767	-65.789693	146.597215	2055.8	2110.3
CASO-28A	380	CTD	CTD075	10/01/2008 20:57	10/01/2008 22:27	1.5	-65.793250	146.616468	-65.790017	146.598473	2055.8	2107.4
CASO-27A	381	Station	CASO-27A	10/01/2008 23:23	11/01/2008 0:42	1.3	-65.828447	146.590922	-65.826175	146.580580	1438.0	1498.0
CASO-27A	382	CTD	CTD076	10/01/2008 23:27	11/01/2008 0:40	1.2	-65.829142	146.591755	-65.826480	146.581235	1424.5	1496.8
CASO-26A	383	Station	CASO-26A	11/01/2008 1:40	11/01/2008 2:51	1.2	-65.872198	146.583645	-65.870472	146.550210	914.3	906.6
CASO-26A	384	CTD	CTD077	11/01/2008 1:44	11/01/2008 2:46	1.0	-65.872692	146.580773	-65.872370	146.553453	915.7	873.3
CASO-25A	385	Station	CASO-25A	11/01/2008 3:57	11/01/2008 4:50	0.9	-65.918125	146.569028	-65.918575	146.559925	523.2	523.0
CASO-25A	386	CTD	CTD078	11/01/2008 3:59	11/01/2008 4:49	0.8	-65.916993	146.568210	-65.918390	146.560647	527.2	521.6
CASO-24A	387	Station	CASO-24A	11/01/2008 6:05	11/01/2008 6:50	0.8	-66.037152	146.525173	-66.039947	146.500985	272.7	293.6
CASO-24A	388	CTD	CTD079	11/01/2008 6:09	11/01/2008 6:42	0.6	-66.037468	146.523508	-66.039185	146.511793	281.8	282.4
POLYNYA-TEMP-B	389	Mooring	POLYNYA-TEMP-B	11/01/2008 12:44	11/01/2008 13:40	0.9	-66.184558	143.469885	-66.183757	143.466448	585.7	585.7
POLYNYA-TEMP-B	390	ADCP Calibration		11/01/2008 13:41	11/01/2008 23:00	9.3	-66.183652	143.466097	-66.181245	143.171502	585.7	585.7
Transit	596	Plankton Water Sample	GSXX0000357	11/01/2008 13:48	11/01/2008 13:58	0.2	-66.183263	143.465040	-66.179770	143.469177	580.5	580.5
Transit	598	Plankton Water Sample	GSXX0000359	11/01/2008 14:11	11/01/2008 14:21	0.2	-66.178117	143.481913	-66.180298	143.459852	580.5	580.5
POLYNYA-C	391	Mooring	POLYNYA-C-COMPASS	11/01/2008 23:19	11/01/2008 23:35	0.3	-66.176673	143.165272	-66.182195	143.166160	580.5	591.3
CEAMARC-54A	392	Station	CEAMARC-54A	12/01/2008 1:56	12/01/2008 4:54	3.0	-65.912568	143.954555	-65.906178	143.989030	380.8	363.1
CEAMARC-54A	393	Beam Trawl AAD		12/01/2008 2:04	12/01/2008 3:08	1.1	-65.912427	143.966988	-65.915508	144.076507	370.4	355.6
CEAMARC-54A	394	CTD	CTD080	12/01/2008 3:40	12/01/2008 4:23	0.7	-65.917185	143.996092	-65.913858	144.003152	369.0	360.1
CEAMARC-54A	395	Box Corer	54ABC01	12/01/2008 4:27	12/01/2008 4:38	0.2	-65.913675	144.003878	-65.910922	143.999297	360.3	372.1
CEAMARC-54A	396	Box Corer	54ABC02	12/01/2008 4:41	12/01/2008 4:52	0.2	-65.910028	143.997488	-65.906868	143.990568	370.3	366.5
CEAMARC-33A	397	Station	CEAMARC-33A	12/01/2008 5:28	12/01/2008 8:33	3.1	-65.866070	144.017210	-65.875398	144.100292	824.2	860.9
CEAMARC-33A	398	Beam Trawl AAD		12/01/2008 5:34	12/01/2008 6:50	1.3	-65.867650	144.028163	-65.889027	144.143937	816.1	668.3

CEAMARC-33A	399	CTD	CTD081	12/01/2008 7:25	12/01/2008 8:30	1.1	-65.877870	144.087273	-65.875440	144.099040	785.9	857.5
CEAMARC-32A	401	Station	CEAMARC-32A	12/01/2008 9:10	12/01/2008 13:00	3.8	-65.852100	144.037288	-65.859737	144.097402	1193.5	1226.1
CEAMARC-32A	400	Beam Trawl AAD		12/01/2008 9:12	12/01/2008 11:00	1.8	-65.852588	144.039763	-65.879022	144.182082	1194.2	998.5
CEAMARC-32A	402	CTD	CTD082	12/01/2008 11:37	12/01/2008 13:00	1.4	-65.865255	144.105327	-65.859737	144.097402	1120.5	1226.1
CEAMARC-01	403	Station	CEAMARC-01	12/01/2008 16:48	12/01/2008 18:54	2.1	-66.004398	142.315502	-65.990315	142.332207	229.8	236.4
CEAMARC-01	404	Beam Trawl AAD		12/01/2008 16:56	12/01/2008 17:00	0.1	-66.006342	142.305585	-66.005032	142.309505	234.0	231.3
CEAMARC-01	405	Beam Trawl AAD		12/01/2008 17:03	12/01/2008 17:38	0.6	-66.003882	142.313777	-65.996010	142.358330	233.5	232.5
CEAMARC-01	406	CTD	CTD083	12/01/2008 17:53	12/01/2008 18:19	0.4	-65.998583	142.337835	-65.997130	142.336485	231.3	234.1
CEAMARC-01	407	Box Corer	01BC01	12/01/2008 18:23	12/01/2008 18:28	0.1	-65.997105	142.336282	-65.996062	142.335560	230.8	231.4
CEAMARC-01	408	Box Corer	01BC02	12/01/2008 18:34	12/01/2008 18:39	0.1	-65.994975	142.334902	-65.994122	142.334293	230.4	233.0
CEAMARC-01	409	Box Corer	01BC03	12/01/2008 18:43	12/01/2008 18:48	0.1	-65.993247	142.333725	-65.992372	142.333303	231.2	234.8
CEAMARC-03	410	Station	CEAMARC-03	12/01/2008 19:39	12/01/2008 21:44	2.1	-66.002553	142.021502	-65.985652	141.958055	246.6	243.4
CEAMARC-03	411	Beam Trawl AAD		12/01/2008 19:44	12/01/2008 20:25	0.7	-66.000305	142.014300	-65.999400	141.956417	244.6	240.5
CEAMARC-03	412	CTD	CTD084	12/01/2008 20:43	12/01/2008 21:06	0.4	-65.996962	141.945560	-65.995047	141.943298	240.4	239.5
CEAMARC-03	413	Box Corer	03BC01	12/01/2008 21:09	12/01/2008 21:15	0.1	-65.994627	141.943980	-65.993202	141.946130	241.4	239.0
CEAMARC-03	414	Smith-McIntyre Grab	03GRSM02	12/01/2008 21:25	12/01/2008 21:32	0.1	-65.990762	141.950413	-65.989173	141.953050	248.7	241.9
CEAMARC-02	415	Station	CEAMARC-02	12/01/2008 23:03	13/01/2008 0:30	1.5	-66.000620	141.360652	-65.998188	141.288122	235.7	229.6
CEAMARC-02	416	Beam Trawl AAD		12/01/2008 23:07	12/01/2008 23:47	0.7	-66.000720	141.353593	-65.998410	141.298535	232.6	229.6
CEAMARC-02	417	CTD	CTD085	12/01/2008 23:55	13/01/2008 0:19	0.4	-65.997555	141.291122	-65.998488	141.288818	230.3	230.7
CEAMARC-02	418	Box Corer	02BC01	13/01/2008 0:24	13/01/2008 0:29	0.1	-65.998510	141.288453	-65.998268	141.288202	229.4	229.7
CEAMARC-10	419	Station	CEAMARC-10	13/01/2008 2:18	13/01/2008 4:08	1.8	-66.335165	141.267253	-66.342025	141.339792	207.8	224.7
CEAMARC-10	420	Beam Trawl AAD		13/01/2008 2:23	13/01/2008 3:00	0.6	-66.335097	141.272662	-66.335717	141.332938	206.7	224.8
CEAMARC-10	421	CTD	CTD086	13/01/2008 3:13	13/01/2008 3:47	0.6	-66.337645	141.346495	-66.339763	141.339435	228.0	227.4
CEAMARC-10	422	Box Corer	10BC01	13/01/2008 3:58	13/01/2008 4:06	0.1	-66.340410	141.335560	-66.341482	141.337562	230.3	229.8
CEAMARC-11	423	Station	CEAMARC-11	13/01/2008 5:26	13/01/2008 8:43	3.3	-66.562208	141.243155	-66.564008	141.340100	179.3	210.5
CEAMARC-11	424	Beam Trawl French		13/01/2008 5:33	13/01/2008 5:55	0.4	-66.561803	141.261932	-66.563407	141.299650	176.9	185.5
CEAMARC-11	425	CTD	CTD087	13/01/2008 6:12	13/01/2008 6:40	0.5	-66.566285	141.313200	-66.568247	141.316157	178.8	166.6
CEAMARC-11	426	Box Corer	11BC01	13/01/2008 6:47	13/01/2008 6:54	0.1	-66.568367	141.316502	-66.568798	141.317478	166.7	171.0
CEAMARC-11	427	Box Corer	11BC02	13/01/2008 6:58	13/01/2008 7:04	0.1	-66.568788	141.318148	-66.568667	141.319018	171.3	171.9
CEAMARC-11	428	Box Corer	11BC03	13/01/2008 7:09	13/01/2008 7:15	0.1	-66.568433	141.320103	-66.568247	141.321845	171.8	172.6
CEAMARC-11	429	Beam Trawl AAD		13/01/2008 7:53	13/01/2008 8:42	0.8	-66.563722	141.255738	-66.563988	141.337993	170.2	204.6
CEAMARC-12	430	Station	CEAMARC-12	13/01/2008 10:08	13/01/2008 12:58	2.8	-66.559873	140.796935	-66.556592	140.777300	384.3	377.2

CEAMARC-12	431	Beam Trawl French		13/01/2008 10:08	13/01/2008 10:50	0.7	-66.559853	140.797323	-66.558248	140.844572	360.9	151.3
CEAMARC-12	432	CTD	CTD088	13/01/2008 11:16	13/01/2008 11:49	0.5	-66.563587	140.864568	-66.567470	140.867490	313.8	312.3
CEAMARC-12	599	Plankton Water Sample	GSXX0000360	13/01/2008 11:39	13/01/2008 11:49	0.2	-66.566253	140.866652	-66.567470	140.867490	315.8	312.3
CEAMARC-12	433	GA Camera	12CAM21	13/01/2008 12:20	13/01/2008 12:56	0.6	-66.558835	140.837977	-66.556690	140.780827	165.0	355.3
CEAMARC-69	434	Station	CEAMARC-69	13/01/2008 14:00	13/01/2008 15:00	1.0	-66.652630	140.621930	-66.635272	140.430058	449.1	378.3
CEAMARC-26A	435	Station	CEAMARC-26A	13/01/2008 16:20	13/01/2008 18:41	2.4	-66.516457	139.998373	-66.533028	140.044712	188.3	268.7
CEAMARC-26A	436	Beam Trawl AAD		13/01/2008 16:23	13/01/2008 17:06	0.7	-66.516823	140.001423	-66.532065	140.046382	175.9	262.0
CEAMARC-26A	437	CTD	CTD089	13/01/2008 17:22	13/01/2008 17:39	0.3	-66.533947	140.051347	-66.532785	140.046357	171.0	262.3
CEAMARC-26A	438	GA Camera	26ACAM22	13/01/2008 18:10	13/01/2008 18:31	0.4	-66.525070	140.025325	-66.529998	140.038738	223.7	211.4
CEAMARC-70	439	Station	CEAMARC-70	13/01/2008 20:11	14/01/2008 5:07	8.9	-66.436345	140.535920	-66.444583	140.564583	1207.6	944.5
CEAMARC-70	440	CTD	CTD090	13/01/2008 20:11	13/01/2008 21:05	0.9	-66.436357	140.535818	-66.436028	140.525978	1206.9	1200.2
CEAMARC-70	600	Plankton Water Sample	GSXX0000361	13/01/2008 20:15	13/01/2008 20:25	0.2	-66.436178	140.533780	-66.436268	140.530205	1202.6	1202.9
CEAMARC-70	441	Beam Trawl AAD		13/01/2008 21:34	13/01/2008 23:05	1.5	-66.425393	140.512402	-66.468515	140.583867	1095.4	823.2
CEAMARC-70	442	CTD	CTD091	13/01/2008 23:42	14/01/2008 0:50	1.1	-66.436268	140.536448	-66.439577	140.520467	1202.6	1060.0
CEAMARC-70	443	Box Corer	70BC01	14/01/2008 1:03	14/01/2008 1:34	0.5	-66.440173	140.520228	-66.442632	140.521907	1044.8	1018.1
CEAMARC-70	444	CTD	CTD092	14/01/2008 2:02	14/01/2008 3:02	1.0	-66.436735	140.536258	-66.443318	140.528748	1188.3	966.2
CEAMARC-70	445	Beam Trawl AAD		14/01/2008 3:53	14/01/2008 5:03	1.2	-66.415802	140.488363	-66.443082	140.558563	1017.8	963.9
CEAMARC-71	446	Station	CEAMARC-71	14/01/2008 6:08	14/01/2008 9:57	3.8	-66.389542	140.417950	-66.378855	140.482180	827.2	611.3
CEAMARC-71	447	Beam Trawl AAD		14/01/2008 6:16	14/01/2008 7:25	1.2	-66.388780	140.428852	-66.399938	140.539173	791.5	684.2
CEAMARC-71	448	CTD	CTD093	14/01/2008 8:06	14/01/2008 9:07	1.0	-66.385960	140.451635	-66.384510	140.463273	695.8	676.6
CEAMARC-71	449	Box Corer	71BC01	14/01/2008 9:24	14/01/2008 9:48	0.4	-66.382468	140.471393	-66.379883	140.479210	644.3	624.3
CEAMARC-70	450	Station	CEAMARC-70	14/01/2008 10:44	14/01/2008 12:11	1.5	-66.408482	140.507955	-66.451335	140.539667	971.1	849.0
CEAMARC-70	451	Beam Trawl French		14/01/2008 10:44	14/01/2008 12:11	1.4	-66.408622	140.508170	-66.451223	140.539643	971.5	854.9
CEAMARC-72	452	Station	CEAMARC-72	14/01/2008 13:07	14/01/2008 15:43	2.6	-66.342133	140.479688	-66.340183	140.524323	401.8	330.1
CEAMARC-72	453	CTD	CTD094	14/01/2008 13:13	14/01/2008 13:49	0.6	-66.342448	140.480485	-66.342565	140.480637	421.8	400.0
CEAMARC-72	454	Box Corer	72BC01	14/01/2008 13:59	14/01/2008 14:09	0.2	-66.340845	140.480973	-66.338263	140.481413	392.4	386.8
CEAMARC-72	455	Box Corer	72BC02	14/01/2008 14:14	14/01/2008 14:23	0.2	-66.336778	140.481822	-66.334175	140.481922	393.3	398.6
CEAMARC-72	456	Beam Trawl AAD		14/01/2008 14:49	14/01/2008 15:43	0.9	-66.341073	140.445923	-66.340190	140.524052	443.7	330.5
CEAMARC-14	457	Station	CEAMARC-14	14/01/2008 16:10	14/01/2008 17:43	1.6	-66.332553	140.663472	-66.331687	140.702292	164.7	169.7
CEAMARC-14	458	CTD	CTD095	14/01/2008 16:15	14/01/2008 16:36	0.4	-66.331788	140.664008	-66.330500	140.657268	167.3	166.4
CEAMARC-14	459	Box Corer	14BC01	14/01/2008 16:41	14/01/2008 16:47	0.1	-66.329712	140.655960	-66.327898	140.654070	165.2	165.4
CEAMARC-14	460	Beam Trawl AAD		14/01/2008 17:07	14/01/2008 17:40	0.6	-66.333008	140.652127	-66.331778	140.698230	164.9	168.2

CEAMARC-13A	461	Station	CEAMARC-13A	14/01/2008 18:42	14/01/2008 20:24	1.7	-66.162647	140.661773	-66.172810	140.663715	225.2	208.6
CEAMARC-13A	462	CTD	CTD096	14/01/2008 18:42	14/01/2008 19:04	0.4	-66.162788	140.661888	-66.160485	140.657542	227.1	216.4
CEAMARC-13A	463	Box Corer	13ABC01	14/01/2008 19:10	14/01/2008 19:16	0.1	-66.159162	140.658000	-66.156777	140.657900	220.7	219.0
CEAMARC-13A	464	Box Corer	13ABC02	14/01/2008 19:21	14/01/2008 19:26	0.1	-66.154615	140.657342	-66.152673	140.656402	221.1	221.0
CEAMARC-13A	465	Beam Trawl AAD		14/01/2008 19:43	14/01/2008 20:20	0.6	-66.148263	140.649927	-66.170068	140.664390	213.0	211.3
CEAMARC-16A	466	Station	CEAMARC-16A	14/01/2008 21:55	15/01/2008 0:14	2.3	-66.336963	140.039100	-66.351810	139.951668	490.9	627.2
CEAMARC-16A	467	Beam Trawl AAD		14/01/2008 22:00	14/01/2008 22:51	0.9	-66.338398	140.029210	-66.346792	139.959147	509.9	625.6
CEAMARC-16A	468	CTD	CTD097	14/01/2008 23:05	14/01/2008 23:48	0.7	-66.346405	139.948180	-66.349308	139.943237	626.7	658.9
CEAMARC-16A	469	Box Corer	16ABC01	14/01/2008 23:55	15/01/2008 0:12	0.3	-66.349765	139.943180	-66.351548	139.950265	666.3	666.3
CEAMARC-15B	470	Station	CEAMARC-15B	15/01/2008 0:58	15/01/2008 4:21	3.4	-66.404848	139.794140	-66.387703	139.814883	908.8	908.8
CEAMARC-15B	471	Beam Trawl AAD		15/01/2008 1:00	15/01/2008 2:12	1.2	-66.403927	139.794363	-66.363118	139.809807	895.7	853.2
CEAMARC-15B	472	CTD	CTD098	15/01/2008 2:47	15/01/2008 3:48	1.0	-66.391698	139.806825	-66.392097	139.796703	931.2	931.2
CEAMARC-15B	473	Box Corer	15BBC01	15/01/2008 3:56	15/01/2008 4:19	0.4	-66.390835	139.803210	-66.388022	139.813627	931.2	931.2
CEAMARC-19	474	Station	CEAMARC-19	15/01/2008 5:53	15/01/2008 9:02	3.1	-66.174677	139.366465	-66.160595	139.308062	673.5	673.5
CEAMARC-19	475	Beam Trawl AAD		15/01/2008 6:01	15/01/2008 7:01	1.0	-66.170640	139.353133	-66.149150	139.273872	673.5	653.2
CEAMARC-19	476	CTD	CTD099	15/01/2008 7:20	15/01/2008 8:12	0.9	-66.143158	139.261368	-66.139222	139.258942	646.4	643.0
CEAMARC-19	477	Box Corer	19BC01	15/01/2008 8:43	15/01/2008 9:00	0.3	-66.156317	139.297670	-66.160112	139.306857	664.0	672.1
CEAMARC-18	478	Station	CEAMARC-18	15/01/2008 9:49	15/01/2008 12:23	2.6	-66.166802	139.620587	-66.172283	139.739182	414.1	358.7
CEAMARC-18	479	Beam Trawl AAD		15/01/2008 9:50	15/01/2008 10:38	0.8	-66.166858	139.621110	-66.166775	139.690202	413.6	402.4
CEAMARC-18	480	CTD	CTD100	15/01/2008 10:52	15/01/2008 11:29	0.6	-66.166798	139.701425	-66.170248	139.708388	386.1	390.6
CEAMARC-18	481	Box Corer	18BC01	15/01/2008 11:35	15/01/2008 11:47	0.2	-66.170480	139.710855	-66.170828	139.717768	393.8	382.7
CEAMARC-18	482	Box Corer	18BC02	15/01/2008 11:53	15/01/2008 12:04	0.2	-66.171007	139.721337	-66.171450	139.727373	375.4	373.8
CEAMARC-18	483	Box Corer	18BC03	15/01/2008 12:09	15/01/2008 12:17	0.1	-66.171740	139.729758	-66.172088	139.733818	369.5	361.5
CEAMARC-17	484	Station	CEAMARC-17	15/01/2008 13:00	15/01/2008 14:36	1.6	-66.168918	139.928190	-66.173585	140.015398	148.0	150.2
CEAMARC-17	485	Beam Trawl AAD		15/01/2008 13:03	15/01/2008 13:44	0.7	-66.169132	139.932052	-66.174595	139.989905	149.9	151.4
CEAMARC-17	486	CTD	CTD101	15/01/2008 13:54	15/01/2008 14:16	0.4	-66.175537	139.996848	-66.175508	140.003003	152.3	149.1
CEAMARC-17	487	Box Corer	17BC01	15/01/2008 14:19	15/01/2008 14:24	0.1	-66.175663	140.003545	-66.175360	140.006373	149.4	148.9
CEAMARC-17	488	Box Corer	17BC02	15/01/2008 14:27	15/01/2008 14:31	0.1	-66.174955	140.008535	-66.174372	140.011500	150.0	150.9
CEAMARC-20	489	Station	CEAMARC-20	15/01/2008 15:49	15/01/2008 18:00	2.2	-65.988082	139.994655	-65.991593	139.990003	192.8	194.0
CEAMARC-20	490	Beam Trawl AAD		15/01/2008 15:51	15/01/2008 16:36	0.7	-65.989378	139.994898	-66.016440	140.000462	192.1	189.5
CEAMARC-20	491	CTD	CTD102	15/01/2008 16:58	15/01/2008 17:17	0.3	-66.001010	139.999542	-66.000025	139.996998	192.2	190.6
CEAMARC-20	492	Box Corer	20BC01	15/01/2008 17:23	15/01/2008 17:30	0.1	-65.999368	139.996270	-65.997935	139.994995	190.5	190.9

CEAMARC-20	493	Box Corer	20BC02	15/01/2008 17:34	15/01/2008 17:40	0.1	-65.997208	139.994378	-65.995997	139.993463	191.3	191.4
CEAMARC-20	494	Van Veen Grab	20GRVV03	15/01/2008 17:48	15/01/2008 17:56	0.1	-65.994388	139.992142	-65.992592	139.990687	191.3	192.3
CEAMARC-21	495	Station	CEAMARC-21	15/01/2008 18:46	15/01/2008 21:02	2.3	-65.999302	139.682665	-66.004287	139.667683	193.8	214.4
CEAMARC-21	496	Beam Trawl AAD		15/01/2008 18:48	15/01/2008 19:33	0.8	-65.999418	139.679642	-66.003450	139.607585	195.6	360.3
CEAMARC-21	497	CTD	CTD103	15/01/2008 20:26	15/01/2008 20:47	0.4	-66.002047	139.666118	-66.002440	139.662562	212.9	222.1
CEAMARC-21	498	Box Corer	21BC01	15/01/2008 20:53	15/01/2008 20:59	0.1	-66.003050	139.663677	-66.003830	139.666310	220.6	215.4
CEAMARC-22	499	Station	CEAMARC-22	15/01/2008 22:00	16/01/2008 0:18	2.3	-65.999887	139.332743	-66.013238	139.326620	468.8	484.2
CEAMARC-22	500	CTD	CTD104	15/01/2008 22:03	15/01/2008 22:36	0.6	-66.000442	139.332477	-66.003290	139.328665	468.8	469.9
CEAMARC-22	501	Box Corer	22BC01	15/01/2008 22:39	15/01/2008 22:50	0.2	-66.003350	139.326482	-66.004945	139.327740	474.0	472.1
CEAMARC-22	502	Beam Trawl AAD		15/01/2008 23:21	15/01/2008 23:24	0.1	-65.988750	139.300595	-65.989830	139.303437	473.7	473.2
CEAMARC-22	503	Beam Trawl AAD		15/01/2008 23:28	16/01/2008 0:17	0.8	-65.991210	139.307423	-66.012937	139.327062	472.4	483.0
CEAMARC-73	504	Station	CEAMARC-73	16/01/2008 4:42	16/01/2008 9:00	4.3	-65.490708	139.282818	-65.476160	139.261152	401.1	493.8
CEAMARC-73	505	Beam Trawl AAD		16/01/2008 4:49	16/01/2008 5:33	0.7	-65.495743	139.282567	-65.489210	139.228257	408.4	411.8
CEAMARC-73	506	CTD	CTD105	16/01/2008 5:52	16/01/2008 6:31	0.7	-65.486562	139.218607	-65.485662	139.218857	415.2	414.1
CEAMARC-73	507	Box Corer	73BC01	16/01/2008 6:45	16/01/2008 6:56	0.2	-65.486145	139.218748	-65.487333	139.219242	415.6	413.2
CEAMARC-73	508	Beam Trawl French		16/01/2008 7:52	16/01/2008 8:29	0.6	-65.498018	139.304245	-65.482538	139.264830	401.1	432.8
CEAMARC-73	509	Box Corer	73BC02	16/01/2008 8:48	16/01/2008 9:00	0.2	-65.479192	139.261108	-65.476313	139.261050	465.3	494.8
CEAMARC-74	510	Station	CEAMARC-74	16/01/2008 10:01	16/01/2008 11:30	1.5	-65.440628	139.287463	-65.436968	139.288748	1189.7	1292.4
CEAMARC-74	511	CTD	CTD106	16/01/2008 10:05	16/01/2008 11:29	1.4	-65.440098	139.288358	-65.437052	139.288887	1207.7	1287.8
CEAMARC-82-83	512	Station	CEAMARC-82 TO 83	16/01/2008 13:00	16/01/2008 16:15	3.2	-65.524890	139.287228	-65.437140	139.368232	416.1	1582.2
CEAMARC-82-83	513	Beam Trawl AAD		16/01/2008 13:15	16/01/2008 16:09	2.9	-65.520823	139.299635	-65.439578	139.365662	405.1	1542.8
CEAMARC-86E	515	CTD	CTD107	16/01/2008 17:28	16/01/2008 18:14	0.8	-65.468843	139.344267	-65.472685	139.336898	787.3	705.8
CEAMARC-86E	514	Station	CEAMARC-86E	16/01/2008 17:28	16/01/2008 21:13	3.8	-65.468843	139.344267	-65.480917	139.403187	787.3	784.1
CEAMARC-86E	516	Box Corer	86EBC01	16/01/2008 18:24	16/01/2008 18:40	0.3	-65.474300	139.340228	-65.477153	139.347302	696.9	669.8
CEAMARC-86E	517	Van Veen Grab	86EGRVV02	16/01/2008 19:00	16/01/2008 19:23	0.4	-65.466873	139.346750	-65.471105	139.355898	834.6	793.3
CEAMARC-86E	518	Beam Trawl AAD		16/01/2008 20:00	16/01/2008 21:13	1.2	-65.460995	139.307988	-65.480868	139.402942	814.9	784.0
CEAMARC-84	519	Station	CEAMARC-84	16/01/2008 21:49	17/01/2008 4:16	6.4	-65.437392	139.279987	-65.475202	139.341855	1236.6	681.3
CEAMARC-84	520	Beam Trawl AAD		16/01/2008 22:07	16/01/2008 23:40	1.6	-65.444595	139.318593	-65.469418	139.432493	1231.0	1137.8
CEAMARC-84	521	Box Corer	84BC01	17/01/2008 0:17	17/01/2008 0:50	0.6	-65.453027	139.361237	-65.448218	139.333410	1229.1	1221.3
CEAMARC-84	522	Box Corer	84BC02	17/01/2008 3:20	17/01/2008 4:14	0.9	-65.458830	139.358997	-65.474373	139.342300	1064.5	699.8
CEAMARC-87	523	Station	CEAMARC-87	17/01/2008 4:44	17/01/2008 5:27	0.7	-65.507638	139.361150	-65.491287	139.309438	402.1	407.7
CEAMARC-87	524	Beam Trawl French		17/01/2008 4:47	17/01/2008 5:26	0.7	-65.506300	139.358743	-65.491523	139.310280	398.4	407.9

CEAMARC-79-80-81-88	525	Station	CEAMARC-79-80-81-88	17/01/2008 8:50	17/01/2008 12:30	3.7	-65.711342	140.611672	-65.616397	140.350595	419.4	1595.0
CEAMARC-79-80-81-88	526	Beam Trawl AAD		17/01/2008 9:02	17/01/2008 12:23	3.3	-65.706372	140.593527	-65.614070	140.336540	422.5	1573.7
CEAMARC-81	527	Station	CEAMARC-81	17/01/2008 13:00	17/01/2008 20:25	7.4	-65.647732	140.436978	-65.629897	140.479787	1170.2	1050.4
CEAMARC-81	528	CTD	CTD108	17/01/2008 13:00	17/01/2008 14:12	1.2	-65.647715	140.436508	-65.651208	140.436992	1168.8	1104.8
CEAMARC-81	529	Box Corer	81BC01	17/01/2008 14:17	17/01/2008 15:15	1.0	-65.651573	140.435202	-65.654622	140.466860	1100.6	1030.6
CEAMARC-81	530	Beam Trawl AAD		17/01/2008 16:11	17/01/2008 17:39	1.5	-65.636570	140.451558	-65.678938	140.379270	1209.3	807.4
CEAMARC-81	531	Beam Trawl AAD		17/01/2008 18:36	17/01/2008 18:40	0.1	-65.674675	140.391033	-65.673375	140.394442	981.8	1017.8
CEAMARC-81	532	Beam Trawl AAD		17/01/2008 18:42	17/01/2008 20:19	1.6	-65.672358	140.397598	-65.633722	140.483020	1051.2	1077.7
CEAMARC-80	533	Station	CEAMARC-80	17/01/2008 21:15	18/01/2008 0:56	3.7	-65.684127	140.526973	-65.664413	140.553502	824.1	815.3
CEAMARC-80	534	Box Corer	80BC01	17/01/2008 21:17	17/01/2008 21:38	0.4	-65.684062	140.526375	-65.682625	140.516692	825.3	879.8
CEAMARC-80	535	Box Corer	80BC02	17/01/2008 21:42	17/01/2008 22:07	0.4	-65.682452	140.514878	-65.681658	140.504812	895.8	950.1
CEAMARC-80	536	CTD	CTD109	17/01/2008 22:29	17/01/2008 23:12	0.7	-65.685407	140.531942	-65.685880	140.532112	789.2	783.7
CEAMARC-80	537	Beam Trawl AAD		17/01/2008 23:41	18/01/2008 0:55	1.2	-65.696902	140.490200	-65.664585	140.554038	820.9	812.9
CEAMARC-79	538	Station	CEAMARC-79	18/01/2008 2:23	18/01/2008 7:05	4.7	-65.701715	140.586893	-65.693127	140.535932	424.6	693.6
CEAMARC-79	539	Box Corer	79BC01	18/01/2008 2:25	18/01/2008 2:38	0.2	-65.701662	140.586628	-65.700045	140.584615	426.0	431.4
CEAMARC-79	540	Box Corer	79BC02	18/01/2008 2:43	18/01/2008 2:55	0.2	-65.699433	140.583385	-65.698075	140.579993	429.6	434.3
CEAMARC-79	541	Box Corer	79BC03	18/01/2008 3:00	18/01/2008 3:11	0.2	-65.697588	140.578702	-65.696607	140.576117	434.5	433.7
CEAMARC-79	542	CTD	CTD110	18/01/2008 3:28	18/01/2008 4:14	0.8	-65.695255	140.571813	-65.692998	140.570742	463.3	513.2
CEAMARC-79	543	Beam Trawl French		18/01/2008 5:06	18/01/2008 5:47	0.7	-65.708418	140.602120	-65.694995	140.548648	419.9	598.4
CEAMARC-79	544	Beam Trawl French		18/01/2008 6:13	18/01/2008 7:02	0.8	-65.706925	140.597385	-65.693818	140.538905	423.9	666.0
CEAMARC-88	545	Station	CEAMARC-88	18/01/2008 8:19	18/01/2008 20:25	12.1	-65.633910	140.389545	-65.597952	140.294452	1465.5	1627.5
CEAMARC-88	546	Box Corer	88BC01	18/01/2008 8:20	18/01/2008 9:45	1.4	-65.633948	140.389783	-65.643313	140.442133	1462.7	1284.8
CEAMARC-88	547	CTD	CTD111	18/01/2008 10:16	18/01/2008 11:59	1.7	-65.633627	140.389052	-65.631060	140.391598	1454.7	1369.3
CEAMARC-88	548	Box Corer	88BC02	18/01/2008 12:29	18/01/2008 13:56	1.5	-65.636007	140.396492	-65.630397	140.365720	1428.0	1494.5
CEAMARC-88	549	Beam Trawl French		18/01/2008 14:37	18/01/2008 17:22	2.8	-65.606792	140.316527	-65.670548	140.484747	1595.9	1029.0
CEAMARC-88	550	Beam Trawl AAD		18/01/2008 17:48	18/01/2008 20:24	2.6	-65.659663	140.457880	-65.598518	140.295837	1088.2	1624.6
ICEBERG 1	551	Trace Metal Sampling-FRC		18/01/2008 22:00	19/01/2008 1:30	3.5	-65.616523	140.586918	-65.606303	141.030127	917.8	1222.5
ICEBERG 1	552	Station	ICEBERG 1	19/01/2008 4:18	19/01/2008 4:47	0.5	-65.596438	141.104922	-65.593398	141.106932	1305.6	1339.0
ICEBERG 1	553	CTD	CTD112	19/01/2008 4:19	19/01/2008 4:46	0.5	-65.596273	141.104923	-65.593472	141.106788	1305.9	1337.0
ICEBERG 2	554	Station	ICEBERG 2	19/01/2008 5:50	19/01/2008 6:16	0.4	-65.578130	140.893055	-65.575078	140.894698	1296.0	1339.0
ICEBERG 2	555	CTD	CTD113	19/01/2008 5:51	19/01/2008 6:15	0.4	-65.578087	140.893078	-65.575282	140.894768	1298.9	1331.9
ICEBERG 3	556	Station	ICEBERG 3	19/01/2008 7:01	19/01/2008 7:34	0.6	-65.552612	140.803998	-65.548658	140.811313	1040.8	989.7

ICEBERG 3	557	CTD	CTD114	19/01/2008 7:02	19/01/2008 7:33	0.5	-65.552388	140.803870	-65.548845	140.810828	1037.7	991.4
ICEBERG 4	558	Station	ICEBERG 4	19/01/2008 8:20	19/01/2008 8:52	0.5	-65.534892	140.704548	-65.534402	140.714793	1043.9	1058.8
ICEBERG 4	559	CTD	CTD115	19/01/2008 8:21	19/01/2008 8:51	0.5	-65.534947	140.704642	-65.534560	140.714315	1037.7	1059.0
ICEBERG 4	601	Plankton Water Sample	GSXX0000362	19/01/2008 8:32	19/01/2008 8:42	0.2	-65.535073	140.707148	-65.534937	140.709702	1058.9	1067.8
ICEBERG 5	560	Station	ICEBERG 5	19/01/2008 9:18	19/01/2008 9:58	0.7	-65.549418	140.683697	-65.544980	140.694830	1000.6	917.9
ICEBERG 5	561	CTD	CTD116	19/01/2008 9:20	19/01/2008 9:53	0.5	-65.548985	140.684035	-65.545717	140.691703	947.3	947.3
ICEBERG 6	562	Station	ICEBERG 6	19/01/2008 10:31	19/01/2008 10:59	0.5	-65.564565	140.660740	-65.563930	140.667927	946.5	909.8
ICEBERG 6	563	CTD	CTD117	19/01/2008 10:32	19/01/2008 11:00	0.5	-65.564508	140.660912	-65.563912	140.667928	945.3	945.3
ICEBERG 7	564	Station	ICEBERG 7	19/01/2008 11:25	19/01/2008 11:55	0.5	-65.580578	140.636783	-65.577663	140.644220	994.4	989.3
ICEBERG 7	565	CTD	CTD118	19/01/2008 11:26	19/01/2008 11:55	0.5	-65.580555	140.637047	-65.577663	140.644220	994.7	989.3
CEAMARC-89	566	Station	CEAMARC-89	19/01/2008 12:53	19/01/2008 13:08	0.3	-65.574103	140.584175	-65.571877	140.551635	973.4	908.4
CEAMARC-89	567	Beam Trawl AAD		19/01/2008 12:53	19/01/2008 13:08	0.2	-65.574075	140.583433	-65.571990	140.552762	969.9	902.2
SR3-1	568	Station	SR3-1	19/01/2008 16:10	19/01/2008 16:41	0.5	-65.802310	139.851632	-65.799265	139.852182	208.1	208.1
SR3-1	569	CTD	CTD119	19/01/2008 16:11	19/01/2008 16:39	0.5	-65.802313	139.851780	-65.799628	139.851423	210.6	208.3
SR3-2	570	Station	SR3-2	19/01/2008 17:25	19/01/2008 17:55	0.5	-65.706907	139.849968	-65.706307	139.851563	300.8	299.6
SR3-2	571	CTD	CTD120	19/01/2008 17:26	19/01/2008 17:52	0.4	-65.706425	139.849933	-65.706415	139.851388	301.1	300.1
SR3-3	572	Station	SR3-3	19/01/2008 19:02	19/01/2008 19:49	0.8	-65.565740	139.849375	-65.565537	139.854530	900.6	917.4
SR3-3	573	CTD	CTD121	19/01/2008 19:03	19/01/2008 19:47	0.7	-65.565677	139.849782	-65.565578	139.853645	900.8	912.5
ARP3	574	ARP	ARP3	19/01/2008 20:48	19/01/2008 20:50	0.0	-65.587843	139.993785	-65.587100	139.991183	1071.5	1081.7
SR3-4	575	Station	SR3-4	19/01/2008 21:35	19/01/2008 22:37	1.0	-65.527825	139.847763	-65.523458	139.860347	1302.4	1329.3
SR3-4	576	CTD	CTD122	19/01/2008 21:36	19/01/2008 22:33	1.0	-65.527690	139.847710	-65.523867	139.857262	1305.0	1316.1
SR3-5	577	Station	SR3-5	19/01/2008 23:28	20/01/2008 0:50	1.4	-65.431100	139.850397	-65.429740	139.860140	1878.3	1793.4
SR3-5	578	CTD	CTD123	19/01/2008 23:29	20/01/2008 0:49	1.3	-65.431070	139.850287	-65.429690	139.859253	1877.9	1797.7
SR3-6	579	Station	SR3-6	20/01/2008 1:42	20/01/2008 4:09	2.5	-65.395940	139.848765	-65.394812	139.873645	2420.9	2475.2
SR3-6	580	CTD	CTD124	20/01/2008 1:52	20/01/2008 3:59	2.1	-65.398230	139.855028	-65.395872	139.873092	2435.8	2472.5
SR3-7	581	Station	SR3-7	20/01/2008 6:15	20/01/2008 8:45	2.5	-65.074570	139.859292	-65.063020	139.895387	2577.3	2707.2
SR3-7	582	CTD	CTD125	20/01/2008 6:18	20/01/2008 8:44	2.4	-65.074305	139.861832	-65.062998	139.894482	2568.8	2705.8
SR3-8	583	Station	SR3-8	20/01/2008 10:30	20/01/2008 12:55	2.4	-64.813230	139.860485	-64.808023	139.860525	2600.6	2615.5
SR3-8	584	CTD	CTD126	20/01/2008 10:31	20/01/2008 12:54	2.4	-64.812978	139.861070	-64.808112	139.860675	2600.6	2615.5
SR3-9	585	Station	SR3-9	20/01/2008 14:42	20/01/2008 16:59	2.3	-64.550218	139.851202	-64.549783	139.861173	3086.2	3084.3
SR3-9	586	CTD	CTD127	20/01/2008 14:45	20/01/2008 16:58	2.2	-64.550000	139.851752	-64.549728	139.860817	3084.3	3084.3
SR3-10	587	Station	SR3-10	20/01/2008 19:22	20/01/2008 21:42	2.3	-64.209693	139.842798	-64.203372	139.878035	3534.8	3538.5

SR3-10	588	CTD	CTD128	20/01/2008 19:23	20/01/2008 21:41	2.3	-64.209823	139.843135	-64.203595	139.877673	3536.6	3538.5
SR3-11	589	Station	SR3-11	21/01/2008 0:15	21/01/2008 2:55	2.7	-63.866127	139.842695	-63.863962	139.900288	3734.1	3738.9
SR3-11	590	CTD	CTD129	21/01/2008 0:17	21/01/2008 2:55	2.6	-63.865810	139.842993	-63.863962	139.900288	3732.3	3738.9
SR3-12	591	Station	SR3-12	21/01/2008 6:00	21/01/2008 8:51	2.9	-63.351623	139.833450	-63.365838	139.822638	3809.8	3809.8
SR3-12	592	CTD	CTD130	21/01/2008 6:00	21/01/2008 8:50	2.8	-63.351607	139.833510	-63.365758	139.822177	3809.8	3811.6
Transit	593	CPR	CPR4	21/01/2008 9:13	22/01/2008 21:20	36.1	-63.346060	139.838357	-56.700367	141.879300	3808.5	3704.8
Transit	603	Plankton Water Sample	GSXX0000363	22/01/2008 3:05	22/01/2008 3:15	0.2	-59.989895	141.224303	-59.985155	141.201477	4427.7	4462.6
Transit	604	Plankton Water Sample	GSXX0000364	22/01/2008 21:45	22/01/2008 21:55	0.2	-56.689382	141.867193	-56.690210	141.874060	3586.5	3528.8
Transit	594	CTD	CTD131	22/01/2008 21:54	23/01/2008 0:00	2.1	-56.690260	141.873713	-56.686828	141.892365	3528.8	3576.9
Transit	605	Plankton Water Sample	GSXX0000365	22/01/2008 23:02	22/01/2008 23:12	0.2	-56.687787	141.883292	-56.687158	141.883553	3519.2	3528.8
Transit	595	CPR	CPR5	23/01/2008 0:07	24/01/2008 12:57	36.8	-56.680025	141.899945	-50.461012	145.699515	3518.5	4715.5
Transit	606	Plankton Water Sample	GSXX0000366	24/01/2008 3:54	24/01/2008 4:04	0.2	-52.019778	144.058247	-52.015143	144.081163	3138.1	3191.8
Transit	607	Plankton Water Sample	GSXX0000367	24/01/2008 23:35	24/01/2008 23:45	0.2	-48.232795	145.793920	-48.229458	145.810550	3511.7	3432.6
Transit	608	Plankton Water Sample	GSXX0000368	26/01/2008 1:59	26/01/2008 2:09	0.2	-44.347745	146.657470	-44.330617	146.700622	2007.4	2065.4

Appendix 4. List of Sediment Samples

StationNo	EventID	SampleName	LatDeg	LonDeg	Date	Time	Depth	Comments	LabelScrape	LabelCore	LabelBulk	LabelRocks
CEAMARC-27	37	27BC01	-66.000322	142.665038	23-Dec-07	0130	440	minor sediment	27BC01A			
CEAMARC-27	39	27BC02	-66.006250	142.671233	23-Dec-07	0154	430	successful	27BC02A	27BC02A		27BC02D
CEAMARC-28	51	28BC01	-66.004616	142.978800	23-Dec-07	1957	466	nil sediment				
CEAMARC-28	52	28BC02	-66.002816	142.973233	23-Dec-07	2023	463	successful	28BC02A	28BC02B		28BC02Rocks
CEAMARC-29	57	29BC01	-65.999216	143.367016	24-Dec-07	0258	466	successful	29BC01A	29BC01B		
CEAMARC-30	61	30BC01	-66.002716	143.675383	24-Dec-07	0838	423	nil sediment				
CEAMARC-30	62	30BC02	-65.998958	143.665766	24-Dec-07	0915	421	nil sediment				
CEAMARC-30	63	30BC03	-65.993500	143.649283	24-Dec-07	0940	430	successful	30BC03A	30BC03B		30BC03Rocks
CEAMARC-36	70	36GRVV01	-66.356850	143.681850	24-Dec-07	1942	593	minor sediment	36GRVV01A			
CEAMARC-36	71	36GRVV02	-66.352050	143.666516	24-Dec-07	2040	592	only rocks				36GRVV02Rocks
CEAMARC-38	75	38GRVV01	-66.338383	143.318950	25-Dec-07	0206	704	nil sediment				
CEAMARC-38	76	38GRVV02	-66.344400	143.312950	25-Dec-07	0237	708	successful	38GRVV02A	38GRVV02B		
CEAMARC-61	85	61BC01	-66.337666	143.005766	25-Dec-07	0805	671	nil sediment				
CEAMARC-61	90	61BC02	-66.334566	143.020616	25-Dec-07	0854	677	nil sediment				
CEAMARC-61	93	61BC03	-66.335216	143.012000	25-Dec-07	1003	673	successful	61BC03A	61BC03B		
CEAMARC-06	102	06BC01	-66.330283	142.627966	26-Dec-07	1359	380	successful	06BC01A	06BC01B		06BC01Rocks
CEAMARC-05	109	05BC01	-66.338950	142.267783	26-Dec-07	1820	196	nil sediment				
CEAMARC-05	110	05BC02	-66.340300	142.265100	26-Dec-07	1835	194	nil sediment				
CEAMARC-04	114	04BC01	-66.347550	141.972250	26-Dec-07	2111	263	successful	04BC01A	04BC01B		04BC01Rocks
CEAMARC-09	120	09BC01	-66.560300	141.995483	27-Dec-07	0143	323	nil sediment				
CEAMARC-09	121	09BC02	-66.561566	142.003200	27-Dec-07	0203	335	nil sediment				
CEAMARC-09	122	09BC03	-66.561816	142.009500	27-Dec-07	0220	343	minor sediment	09BC03A			
CEAMARC-08	129	08BC01	-66.559050	142.323283	27-Dec-07	0737	370	successful	08BC01A	08BC01A		
CEAMARC-07	136	07BC01	-66.560000	142.664100	27-Dec-07	1313	368	successful	07BC01A	07BC01B		07BC01Rocks
CEAMARC-39	143	39BC01	-66.553116	142.985000	27-Dec-07	2006	865	successful	39BC01A	39BC01B		
CEAMARC-37	150	37BC01	-66.555216	143.344166	28-Dec-07	0343	848	nil sediment	37BC01A	37BC01B		
CEAMARC-37	151	37BC02	-66.560483	143.328433	28-Dec-07	0410	952	successful				
CEAMARC-40	155	40BC01	-66.661316	143.021066	28-Dec-07	0824	700	minor sediment				
CEAMARC-40	156	40BC02	-66.671833	143.004933	28-Dec-07	0859	720	nil sediment				
CEAMARC-42	166	42GRVV01	-66.885033	142.654616	28-Dec-07	1917	322	nil sediment				

CEAMARC-43	171	43BC01	-66.759316	143.284083	29-Dec-07	0048	155	minor sediment				
CEAMARC-44	176	44BC01	-66.672850	143.629550	29-Dec-07	0621	840	nil sediment				
CEAMARC-44	177	44BC02	-66.666866	143.616666	29-Dec-07	0643	870	nil sediment				
CEAMARC-45	181	45BC01	-66.754250	143.993716	29-Dec-07	1131	682	nil sediment				
CEAMARC-45	182	45BC02	-66.766883	144.006866	29-Dec-07	1200	680	minor sediment				
CEAMARC-46	187	46BC01	-66.875783	144.051233	29-Dec-07	1655	663	successful	46BC01A	46BC01B		46BC01Rocks
CEAMARC-48	191	48BC01	-66.941450	144.646616	29-Dec-07	2123	329	nil sediment				
CEAMARC-48	192	48BC02	-66.942666	144.645900	29-Dec-07	2138	329	nil sediment				
CEAMARC-48	193	48BC03	-66.941450	144.648233	29-Dec-07	2157	329	nil sediment				
CEAMARC-47	198	47GRSM01	-67.046316	144.669250	30-Dec-07	0128	185	nil sediment	47BC01A			
CEAMARC-47	199	47GRSM02	-67.049233	144.668100	30-Dec-07	0141	231	minor sediment				
CEAMARC-47	200	47GRVV03	-67.051650	144.668650	30-Dec-07	0153	192	minor sediment				47GRVV03Rocks
CEAMARC-49A	205	49ABC01	-67.024516	145.231866	30-Dec-07	0915	1350	successful	49ABC01A	49ABC01B		
CEAMARC-51A	213	51ABC01	-66.753483	145.527916	30-Dec-07	1908	534	minor sediment				
CEAMARC-51A	214	51ABC02	-66.754683	145.531316	30-Dec-07	1926	534	successful	51ABC02A	51ABC02B		51ABC02Rocks
CEAMARC-50A	219	50ABC01	-66.754016	145.217333	30-Dec-07	2329	604	successful	50ABC01A	50ABC01B		
CEAMARC-57	224	57BC01	-66.742683	144.995033	31-Dec-07	0532	723	successful	57BC01A	57BC01B		
CEAMARC-58	229	58BC01	-66.755900	144.668483	31-Dec-07	1356	845	successful	58BC01A	58BC01B		
CEAMARC-59	234	59BC01	-66.751583	144.345150	31-Dec-07	1955	915	successful	59BC01A	59BC01B	59BC01Bulk	59BC01Rocks
CEAMARC-60	250	60BC01	-66.564033	143.998833	02-Jan-08	0654	907	minor sediment				
CEAMARC-60	251	60BC02	-66.570450	143.991150	02-Jan-08	0722	920	successful	60BC02A	60BC02B	60BC02Bulk	
CEAMARC-56	262	56BC01	-66.561383	144.663983	02-Jan-08	2339	587	successful	56BC01A	56BC01B	56BC01Bulk	
CEAMARC-31	267	31BC01	-66.564283	144.950333	03-Jan-08	0352	500	successful	31BC01A	31BC01B	31BC01Bulk	
CEAMARC-52	271	52BC01	-66.556966	145.316683	03-Jan-08	0739	453	minor sediment				
CEAMARC-52	272	52BC02	-66.553350	145.298333	03-Jan-08	0807	447	nil sediment				
CEAMARC-52	273	52BC03	-66.549900	145.296850	03-Jan-08	0819	449	successful	52BC03A	52BC03B	52BC03Bulk	
CEAMARC-55	277	55BC01	-66.337183	145.000333	03-Jan-08	1349	395	successful	55BC01A	55BC01B	55BC01Bulk	
CEAMARC-53	282	53BC01	-66.332916	144.659083	03-Jan-08	1701	424	successful	53BC01A	53BC01B	53BC01Bulk	
CEAMARC-34	286	34BC01	-66.333283	144.320650	03-Jan-08	2001	461	minor sediment				
CEAMARC-34	287	34BC02	-66.334500	144.318866	03-Jan-08	2016	461	successful	34BC02A	34BC02B	34BC02Bulk	
CEAMARC-35	291	35BC01	-66.331183	143.979550	03-Jan-08	2337	520	minor sediment	35BC01A		35BC01Bulk	
CEAMARC-35	292	35BC02	-66.330850	143.979800	03-Jan-08	2353	521	minor sediment	35BC02A		35BC02Bulk	
CEAMARC-35	293	35BC03	-66.331066	143.981400	04-Jan-08	0012	519	minor sediment				
CEAMARC-62	302	62BC01	-66.160266	143.305850	04-Jan-08	0932	590	successful	62BC01A	62BC01B		

CEAMARC-63	313	63BC01	-65.845633	142.984366	04-Jan-08	2259	429	successful	63BC01A	63BC01B	63BC01Bulk	
CEAMARC-65	317	65BC01	-65.809166	142.988183	05-Jan-08	0118	1025	successful	65BC01A	65BC01B		
CEAMARC-67	328	67ABC01	-65.709650	142.932466	05-Jan-08	2155	2500	unsuccessful				
CEAMARC-54A	395	54ABC01	-65.912050	144.001366	12-Jan-08	0432	404	minor sediment				
CEAMARC-54A	396	54ABC02	-65.908233	143.993566	12-Jan-08	0446	408	successful	54ABC02A	54ABC02B	54BC02Bulk	
CEAMARC-01	407	01BC01	-65.996566	142.335883	12-Jan-08	1825	233	minor sediment			01BC01Bulk	
CEAMARC-01	408	01BC02	-65.994516	142.334550	12-Jan-08	1836	234	minor sediment				
CEAMARC-01	409	01BC03	-65.992750	142.333466	12-Jan-08	1846	235	minor sediment			01BC03Bulk	
CEAMARC-03	413	03BC01	-65.993900	141.945050	12-Jan-08	2111	242	successful	03BC01A	03BC01B		
CEAMARC-03	414	03GRSM02	-65.990666	141.951800	12-Jan-08	2128	245	successful			03GRSM02Bulk	
CEAMARC-02	418	02BC01	-65.998433	141.288333	13-Jan-08	0025	232	successful	02BC01A	02BC01B	02BC01Bulk	
CEAMARC-04	422	10BC01	-66.340916	141.335566	13-Jan-08	0402	252	successful	10BC01A	10BC01B	10BC01Bulk	
CEAMARC-11	426	11BC01	-66.568650	141.317166	13-Jan-08	0651	184	minor sediment				
CEAMARC-11	427	11BC02	-66.568733	141.318716	13-Jan-08	0701	188	minor sediment				
CEAMARC-11	428	11BC03	-66.568300	141.321250	13-Jan-08	0712	188	unsuccessful				
CEAMARC-70	443	70BC01	-66.441116	140.520183	14-Jan-08	0121	1053	successful	70BC01A	70BC01B	70BC01Bulk	
CEAMARC-71	449	71BC01	-66.380833	140.476050	14-Jan-08	0937	860	unsuccessful				
CEAMARC-72	454	72BC01	-66.339766	140.481266	14-Jan-08	1403	390	minor sediment				
CEAMARC-72	455	72BC02	-66.335316	140.481933	14-Jan-08	1418	397	successful	72BC02A	72BC02B	72BC02Bulk	
CEAMARC-14	459	14BC01	-66.328833	140.655083	14-Jan-08	1643	168	successful	14BC01A	14BC01B	14BC01Bulk	
CEAMARC-13A	463	13ABC01	-66.158150	140.658300	14-Jan-08	1912	220	unsuccessful				
CEAMARC-13A	464	13ABC02	-66.153500	140.656833	14-Jan-08	1923	224	successful	13ABC02A	13ABC02B	13ABC02Bulk	
CEAMARC-16A	469	16ABC01	-66.350500	139.945633	15-Jan-08	0001	673	successful	16ABC01A	16ABC01B	16ABC01Bulk	
CEAMARC-15B	473	15BBC01	-66.389266	139.809783	15-Jan-08	0408	1132	successful	15BBC01A	15BBC01B	15BBC01Bulk	
CEAMARC-19	477	19BC01	-66.158216	139.302983	15-Jan-08	0852	780	successful	19BC01A	19BC01B	19BC01Bulk	
CEAMARC-18	481	18BC01	-66.170716	139.715100	15-Jan-08	1142	428	minor sediment				
CEAMARC-18	482	18BC02	-66.171066	139.724783	15-Jan-08	1159	408	minor sediment			18BC02Bulk	
CEAMARC-18	483	18BC03	-66.171950	139.732116	15-Jan-08	1213	400	minor sediment				
CEAMARC-17	487	17BC01	-66.175566	140.004966	15-Jan-08	1421	152	unsuccessful				
CEAMARC-17	488	17BC02	-66.174550	140.010616	15-Jan-08	1429	153	successful			17BC02Bulk	
CEAMARC-20	492	20BC01	-65.998766	139.995783	15-Jan-08	1726	193	unsuccessful				
CEAMARC-20	493	20BC02	-65.996516	139.993800	15-Jan-08	1737	193	minor sediment			20BC02Bulk	
CEAMARC-20	494	20GRVV03	-65.993233	139.991133	15-Jan-08	1753	194	successful	20GRVV03A	20GRVV03B	20GRVV03Bulk	
CEAMARC-21	498	21BC01	-66.003483	139.665150	15-Jan-08	2056	216	successful	21BC01A	21BC01B	21BC01Bulk	

CEAMARC-21	496	21Trawl01	-65.999418	139.679642	15-Jan-08	1848	200	successful			21Trawl01Bulk	
CEAMARC-22	501	22BC01	-66.004133	139.326650	15-Jan-08	2243	472	successful	22BC01A	22BC01B	22BC01Bulk	
CEAMARC-73	507	73BC01	-65.486833	139.219000	16-Jan-08	0651	560	minor sediment			73BC01Bulk	
CEAMARC-73	509	73BC02	-65.476216	139.261133	16-Jan-08	0900	550	unsuccessful				
CEAMARC-82	513	82Trawl01	-65.520333	139.300213	16-Jan-08	1315	400	successful			82Trawl01Bulk	
CEAMARC-86E	516	86EBC01	-65.475733	139.343933	16-Jan-08	1831	686	minor sediment	86EBC01A		86EBC01Bulk	
CEAMARC-86E	517	86EGRVV02	-65.469000	139.352333	16-Jan-08	1912	821	unsuccessful				
CEAMARC-84	521	84BC01	-65.450966	139.349633	17-Jan-08	0031	1230	unsuccessful				
CEAMARC-84	522	84BC02	-66.466733	139.347350	17-Jan-08	0351	920	successful	84BC02A	84BC02B	84BC02Bulk	
CEAMARC-81	529	81BC01	-65.653133	140.453666	17-Jan-08	1450	1051	unsuccessful				
CEAMARC-80	534	80BC01	-65.683450	140.521516	17-Jan-08	2126	855	unsuccessful				
CEAMARC-80	535	80BC02	-65.682050	140.510683	17-Jan-08	2151	920	minor sediment			80BC02Bulk	
CEAMARC-79	539	79BC01	-65.700933	140.585933	18-Jan-08	0232	464	unsuccessful				
CEAMARC-79	540	79BC02	-65.698783	140.581583	18-Jan-08	0249	470	minor sediment			79BC02Bulk	
CEAMARC-79	541	79BC03	-65.697066	140.577500	18-Jan-08	0305	477	unsuccessful				
CEAMARC-88	546	88BC01	-65.639300	140.418266	18-Jan-08	0902	1389	unsuccessful				
CEAMARC-88	548	88BC02	-65.634495	140.387308	18-Jan-08	1314	1428	minor sediment			88BC02Bulk	88BC02Rocks

Appendix 5. Sediment cores – Locations and descriptions

Sample Id.	Longitude	Latitude	Water depth (m)	Length (cm)	Description
02BC01B	141.288333	-65.998433	232	15	Olive (5Y 4/3) fine to coarse sand in SMO matrix. Sand fraction contains dark terrigenous grains. Occassional gravel sized fragments.
03BC01B	141.945050	-65.993900	242	6	Core not sampled.
04BC01B	141.972250	-66.347550	263	7	Olive (5Y 4/3) silty sand with abundant quartz grains, spicules and other biogenic fragments. Large angular pebble at 6cm.
06BC01B	142.627966	-66.330283	380	4	Olive (5Y 4/3) medium to coarse sand with quartz and dark terrigenous grains.
07BC01B	142.664100	-66.560000	368	4.5	Olive (5Y 4/3) medium to coarse sand and gravel with abundant quartz and dark terrigenous grains. Surface has abundant bryozoan fragments and spicules.
08BC01	142.323283	-66.559050	370	27.5	Olive (5Y 4/3) very slightly sandy silt with spicules throughout.
10BC01B	141.335566	-66.340916	252	19.5	Olive (5Y 4/3) silty sand with abundant bryozoan fragments and spicules throughout.
13ABC02B	140.656833	-66.153500	224		Core not sampled.
14BC01B	140.655083	-66.328833	168	10.8	Light olive brown (2.5Y 5/3) muddy sand with abundant quartz and dark terrigenous grains
15BBC01B	139.809783	-66.389266	1132	21.8	Olive (5Y 4/3) slightly fine sandy silt throughout.
16ABC01B	139.945633	-66.350500	673	13	Olive (5Y 4/3) fine sandy silt, with increasing biogenic material in the sand fraction from 8cm.
19BC01B	139.302983	-66.158216	780		Olive (5Y 4/3) slightly sandy silt with some spicules.
20GRVV03B	139.991133	-65.993233	194	15.5	Olive (5Y 4/3)muddy sand with abundant quartz and other terrigenous grains. Large terrigenous angular pebbles throughout.

Sample Id.	Longitude	Latitude	Water depth (m)	Length (cm)	Description
21BC01B	139.665150	-66.003483	216	26.5	Olive (5Y 4/3) muddy sand with spicules present throughout, and abundant in upper 3cm and lower 5cm. Sand fraction has quartz, other terrigenous grains and clacareous biota. Transition to higher mud content (sandy mud) from 4cm.
22BC01B	139.326650	-66.004133	472	17.5	Olive (5Y 4/3) silty sand with black terrigenous sand grains. Transition to clayey sand from 14cm. Angular pebbles at base.
27BC02A	142.671233	-66.006250	430	5	Olive (5Y 4/3) silty coarse sand with quartz and dark terrigenous grains. Some angular cobbles.
28BC02B	142.973233	-66.002816	463	7.5	Olive (5Y 4/3) silty coarse sand with terrigenous and biogenic (forams) component.
29BC01B	143.367016	-65.999216	466	24.2	Olive (5Y 4/3) slightly sandy silt, with calcareous sand grains. Some gravel sized biogenic fragments in upper 2cm. Angular pebbles at 20-24cm.
30BC03B	143.649283	-65.993500	430	5.7	Dark olive gray (5Y 3/2) medium sandy clay. Angular pebble at 5cm.
31BC01B	144.950333	-66.564283	500	25	Dark olive gray (5Y 3/2) sandy mud with quartz grains. Large angular cobbles at 14-15cm and 25-26cm.
34BC02B	144.318866	-66.334500	461	20	Olive (5Y 4/3) silty sand with abundant quartz and other terrigenous grains, and minor biogenic fraction. Transition from 6cm to dark olive gray (5Y 3/2) sandy clay with terrigenous and biogenic grains, and gravel.
38GRVV02B	143.312950	-66.344400	708	14.5	Olive (5Y 4/3) silt throughout.
37BC02B	143.344166	-66.555216	848	22	Olive (5Y 4/3) silt throughout.
39BC01B	142.985000	-66.553116	865	8.4	Olive (5Y 4/3) slightly sandy silt with decreasing sand fraction with depth. Dense spicule mat at 4-7cm.
46BC01B	144.051233	-66.875783	663	12	Olive (5Y 4/3) silty fine to medium sand of quartz and other dark terrigenous grains. Abundant spicules in lower part of the core.
49ABC01B	145.231866	-67.024516	1350	15	Light olive brown (2.5Y 5/3) sandy clay with abundant biogenic fragments in surface layer (agglutinated forams?) and spicules. Sharp transition to clayey silt from 3cm.

Sample Id.	Longitude	Latitude	Water depth (m)	Length (cm)	Description
50ABC01B	145.217333	-66.754016	604	13.5	Olive (5Y 5/3) sandy silt throughout.
51ABC02B	145.531316	-66.754683	534	11.5	Olive (5Y 4/3) silty sand with quartz and other terrigenous material in sand fraction. Angular gravel and pebbles also present.
52BC03B	145.296850	-66.549900	449	12.5	Olive (5Y 4/3) silty sand of quartz and other terrigenous grains. Transition to dark olive gray (5Y 3/2) clay from 5cm with angular gravel and pebbles.
53BC01B	144.659083	-66.332916	424	20	Olive (5Y 4/3) sandy clay with quartz and other terrigenous grains. Coarse sand pocket at 3.5-5cm. Occassional angular pebbles.
54ABC02B	143.993566	-65.908233	408	14	Olive (5Y 4/3) muddy coarse sand. Transition to dark olive gray (5Y 3/2) sandy clay from 8cm
55BC01B	145.000333	-66.337183	395	10	Olive (5Y 4/3) slightly sandy clay with terrigenous and biogenic grains. Large bryozoan fragments present in upper 4cm. Other biogenic fragments present throughout.
56BC01B	144.663983	-66.561383	587	18.5	Olive (5Y 4/3) sandy clay with minor terrigenous gravel. Band of dark olive gray (5Y 3/2) at 14-18cm with higher clay and gravel content.
57BC01B	144.995033	-66.742683	723	12	Olive (5Y 4/3) slightly sandy silt with biogenic and dark terrigenous sand grains.
58BC01B	144.668483	-66.755900	845	9.5	Olive (5Y 4/3) silt with large angular cobbles from 2cm.
59BC01B	144.345150	-66.751583	915	10	Olive (5Y 4/3) silt throughout.
60BC02B	143.991150	-66.570450	920	11	Olive (5Y 4/3) silty sand with quartz and dark terrigenous grains.
61BC03B	143.012000	-66.335216	673	14.9	Olive (5Y 4/3) silty sand with spicules present throughout and abundant from 0-4cm.
62BC01B	143.305850	-66.160266	590	14.3	Olive (5Y 4/3) slightly sandy silt with gravel fragments of terrigenous and some biogenic material. Large angular pebble at 9-13cm.
63BC01B	142.984366	-65.845633	429		Core not sampled.

Sample Id.	Longitude	Latitude	Water depth (m)	Length (cm)	Description
65BC01B	142.988183	-65.809166	1025	18.5	Olive (5Y 4/3) muddy coarse sand with large coral and other biogenic fragments.
70BC01B	140.520183	-66.441116	1053	4	Olive (5Y 4/3) sandy mud with spicules, quartz and dark terrigenous grains.
72BC02B	140.481933	-66.335316	397	9.5	Olive (5Y 4/3) coarse sand with abundant black terrigenous grains throughout.
84BC02B	139.347350	-66.466733	920	24	Olive (5Y 4/3) sandy mud with spicules present throughout. Dense spicule layers at 0-1cm and 14-17cm.

Appendix 6. List of Video Deployments

StationNo	EventID	SampleName	StartLatDeg	StartLonDeg	EndLatDeg	EndLonDeg	Date	StartTime	EndTime	StartDepth	EndDepth
CEAMARC-27	43	27CAM01	-65.997416	142.660833	-66.004016	142.682333	23-Dec-07	0517	0546	464	428
CEAMARC-30	65	30CAM02	-65.998683	143.649366	-66.001550	143.678416	24-Dec-07	1210	1241	432	439
CEAMARC-61	94	61CAM03	-66.323333	142.983766	-66.307733	142.957050	25-Dec-07	1233	1304	663	655
CEAMARC-04	115	04CAM04	-66.341550	141.985283	-66.348883	141.988233	26-Dec-07	2152	2206	251	260
CEAMARC-09	123	09CAM05	-66.550600	142.010100	-66.553833	142.000416	27-Dec-07	0304	0320	389	332
CEAMARC-08	130	08CAM06	-66.554650	142.352633	-66.549700	142.327216	27-Dec-07	0828	0843	385	389
CEAMARC-07	139	07CAM07	-66.551300	142.627100	-66.561983	142.653083	27-Dec-07	1357	1437	145	341
CEAMARC-39	144	39CAM08	-66.551233	142.967566	-66.554566	142.978033	27-Dec-07	2112	2127	824	861
CEAMARC-41	158	41CAM09	-66.736366	142.629966	-66.739233	142.631633	28-Dec-07	1132	1152	578	580
CEAMARC-42	163	42CAM10	-66.868000	142.680050	-66.873666	142.671650	28-Dec-07	1718	1738	411	395
CEAMARC-43	172	43CAM11	-66.758883	143.289116	-66.753250	143.297783	29-Dec-07	0119	0144	161	229
CEAMARC-44	175	44CAM12	-66.687416	143.658233	-66.683250	143.650733	29-Dec-07	0521	0537	756	770
CEAMARC-47	196	47CAM13	-67.035266	144.662366	-67.041066	144.663733	30-Dec-07	0013	0032	205	177
CEAMARC-49A	202	49ACAM14	-67.031200	145.209933	-67.026300	145.224533	30-Dec-07	0542	0603	1314	1157
CEAMARC-51A	211	51ACAM15	-66.750400	145.490333	-66.749550	145.508983	30-Dec-07	1722	1743	545	533
CEAMARC-50A	217	50ACAM16	-66.746816	145.258266	-66.750916	145.244750	30-Dec-07	2148	2207	592	594
CEAMARC-57	221	57CAM17	-66.742483	145.011116	-66.737033	144.993616	31-Dec-07	0252	0315	640	637
CEAMARC-58	228	58CAM18	-66.655400	144.655500	-66.750366	144.664116	31-Dec-07	1014	1030	840	843
CEAMARC-59	232	59CAM19	-66.744950	144.329433	-66.750966	144.336150	31-Dec-07	1742	1801	903	913
CEAMARC-63	311	63CAM20	-65.862783	143.003183	-65.855316	142.994700	04-Jan-08	2134	2149	715	717
CEAMARC-12	433	12CAM21	-66.558183	140.825800	-66.556950	140.795416	13-Jan-08	1228	1246	158	358
CEAMARC-26A	438	26ACAM22	-66.526866	140.030266	-66.530250	140.039366	13-Jan-08	1816	1831	251	211

Appendix 7. List of Sidescan Data

StationNo	EventID	FileName	StartLatDeg	StartLonDeg	EndLatDeg	EndLonDeg	Date	StartTime	EndTime	StartDepth	EndDepth
CEAMARC-27	44	AA0320073570810	-66.019923	142.704637	-66.028989	142.721324	24-Dec-07	0810	0820	438	436
CEAMARC-27	44	AA0320073570810.001	-66.028989	142.721324	-66.038056	142.738500	24-Dec-07	0820	0831	436	444
CEAMARC-27	44	AA0320073570810.002	-66.038056	142.738500	-66.046455	142.755860	24-Dec-07	0831	0841	444	461
CEAMARC-27	44	AA0320073570810.003	-66.046455	142.755860	-66.048770	142.760887	24-Dec-07	0841	0844	461	455
CEAMARC-61	95	AA0320073591447	-66.328768	142.990415	-66.336079	143.005337	26-Dec-07	1447	1507	671	673
CEAMARC-61	95	AA0320073591447.001	-66.336079	143.005337	-66.338656	143.010848	26-Dec-07	1507	1515	673	685

Appendix 8. Acronyms and Abbreviations

AAD	Australian Antarctic Division
ABC	Australian Broadcasting Commission
ACECRC	Antarctic Climate and Ecosystems Co-operative Research Centre
ADCP	Acoustic doppler current profiler
ANU	Australian National University
ARP	Acoustic recording package
CAML	Census of Antarctic Marine Life
CASO	Climate of the Antarctic and Southern Ocean
CEAMARC	Collaborative East Antarctic Marine Census
CNRS	Centre National de la Recherche Scientifique
CPR	Continuous Plankton Recorder
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CTD	Conductivity, temperature, depth (profiler)
DUCII	Deep Underwater Camera II
GA	Geoscience Australia
GIS	Geographic Information System
IASOS	Institution of Antarctic and Southern Ocean Studies

INRA	Institut National pour la Recherche Agronomique
IRD	Institut pour la Recherche et le Développement
IPY	International Polar Year
JCU	James Cook University
JCVI	J. Craig Venter Institute
MAq	Melbourne Aquarium
MNHN	Muséum national d'Histoire naturelle
MVic	Museum Victoria
NTNU	Norges Tekniske og Naturvitenskapelige Universitet
OBIS	Ocean Biogeographic Information System
P&O	Peninsula and Oriental Steam Navigation Company
QCCCE	Queensland Climate Change Centre of Excellence
RAN	Royal Australian Navy
SAZC	Sub-Antarctic Zone Site C
SCAR	Scientific Committee on Antarctic Research
UMelb	University of Melbourne
UNE	University of New England
UNSW	University of New South Wales
UTAS	University of Tasmania
UW	University of Washington