NZ IPY-CAML Voyage 2008

28 FEB – 2 MAR Ice and more ice John Mitchell

Having left the inner Ross Sea, we passed through the ever-thickening ice barrier between the open water in the polynya to the south and the open ocean to the northeast. In the ice barrier, we had to push through ribbons of thick pack ice with relatively open ‘leads’ that were filled with grease ice and newly formed soft pancake ice. Although our progress was slow at times, it was only about 24 hours before we arrived at our first seamount site, dubbed South Scott Seamount.

As Scott South seamount had never been surveyed or mapped before, we began by mapping enough of the area with the multibeam system to be able to plan our sampling programme of benthic sled and DTIS camera transects. Although the ice cover was quite thick, we had enough open water to proceed with sampling. Overnight and the next morning was very calm, providing all on board beautiful views of the ever-changing sea ice. Unfortunately, it also meant that the seawater, which was sitting at -1.8°C, started to form new ice rapidly. We quickly finished sampling and moved off to more open waters and our next station, to sample at a depth of 3350 m on the abyssal plain.

Fig. 1. *Tangaroa* proceeding through close pack ice towards an open lead in the distance.

Fig.2.Working on South Scott Seamount. DTIS wire cutting through thin new ice.

Now that we’re in more open waters on the edge of the ice pack, we hope to see more in the way of Antarctic wildlife. Adelie penguins have been seen in isolated groups on ice floes, but not in great numbers. Whale sightings have been uncommon, but at the abyssal station in more open ocean waters we were treated to a very rare sighting: a pair of blue whales.

Fig.3. Adelie penguins on a newly formed ice floe.
(Photos 1-4: John Mitchell)

Fig.4. Pair of blue whales passing close by the *Tangaroa* – half a mile away.

SCIENCE REPORT

The shape of the deep (John Mitchell & Arne Pallentin)

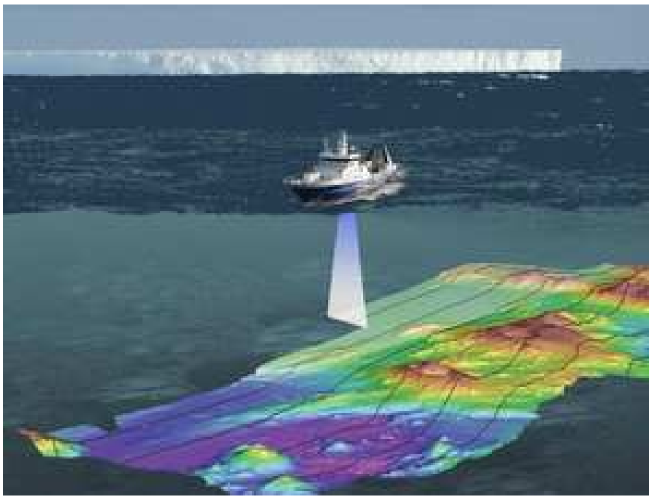

Fig. 5. Diagrammatic representation of the *Tangaroa* multibeaming the seabed of Ross Sea (Image: Erika Mackay, modified John Mitchell).

Mounted on *Tangaroa's* hull, the EM-300 multibeam echosounder maps the seafloor using a fan of 135 acoustic beams, providing 100% coverage of the seabed out to a maximum swath width of five kilometres (Fig.5). The swath-map surveys show far greater detail and accuracy about the bathymetry and topography of the seabed than the methods that use single-beam sounders (Fig.6). The increased beam width of the multibeam system over a single beam sounder also greatly reduces the time to survey a given area.

As most of the Ross Sea has not been mapped in this way, the multibeam is an important tool to provide 3D context for gear deployment at sample stations. This is most evident when sampling steep or rugged features such as seamounts.

Most major seamounts in the Ross Sea have been poorly mapped to date, using information from satellites and data from the occasional vessel which sounds across them opportunistically or when fishing.

For the NZ IPY-CAML project the multibeam is being used at each sample station to measure seabed depth and roughness and to map features such as bottom type, iceberg scouring, seamounts, as well as identify suitable ground for sampling.

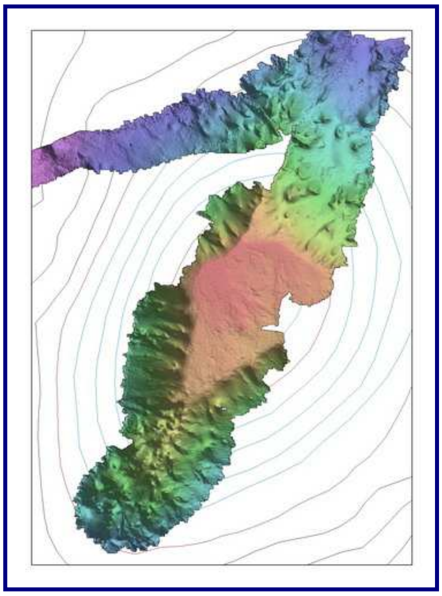

Fig. 6. Sun illuminated image of South Scott Seamount. Pre-survey depth contours shown in background.

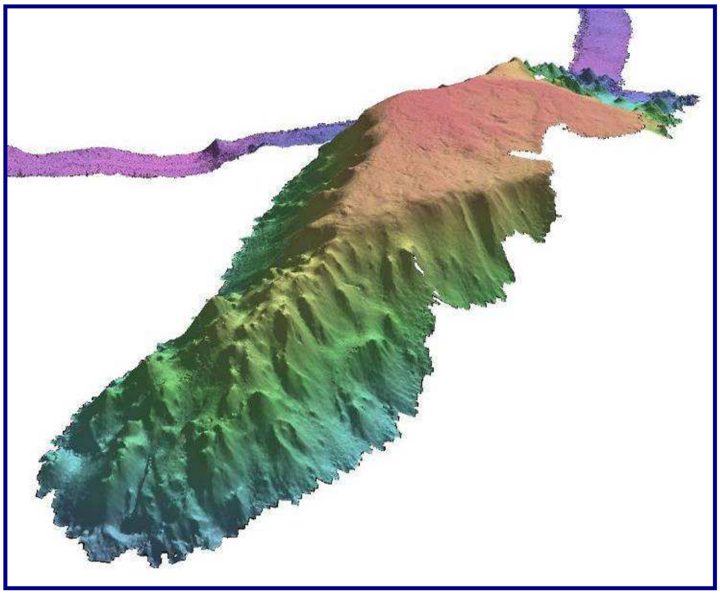

Fig.7. Three dimensional perspective view of South Scott Seamount viewed from the southwest. Colour range: 400-3500 m (Images: Arne Pallentin)

Some rare fish finds (Andrew Stewart, Museum of New Zealand – Te Papa Tongarewa)

We're half-way through the expedition and have so far collected 69 fish species from the Ross Sea, including some rare specimens and even some that have never been seen before.

Among the more common species of mesopelagic fishes – lanternfish, deep-sea smelt, and barracudinas – taken in the mid-water tows, has been a single specimen of a rare lanternfish, the slender pearleye, *Benthalbella elongata* (Fig. 8). The fish was caught at a depth of more than 1300 m at 72ºS, making it one of the southern-most specimens ever collected for the species. At only 240 mm long the slender pearleye seems small (although 240 mm is quite large for the species) yet it is a well adapted predator armed with an impressive array of hooked and barbed teeth in both jaws. If that weren't enough, the tongue also has a single row of teeth in a rip-saw band. To assist prey capture, the slender pearleye's large eyes look upward and forward. This layout gives the fish binocular vision, enabling it to accurately judge distances to its prey. Meals can be hours or even days apart, so it is important not to miss! Lanternfish live in the twilight zone, and have a characteristic a cup-like structure at the base of their eyes – the 'lantern' that gives the family its common name. This acts to enhance and re-focus light going into the eye acting like night vision goggles.

Fig. 8. The slender pearleye (*Benthalbella elongata*) a midwater predator (Photo: Peter Marriott).

Plunderfishes (Family Artedidraconidae) have also been caught occasionally. These pug-headed fishes are endemic to the Southern Ocean, where 25 species are known. They're characterised by the barbel on the tip of the chin and flattened curved hook-like spines on the gill cover (Fig. 9). On this survey, we've been able to confirm that the specimens we have caught are a valid species and we have recorded their fresh colour for the first time. We also collected tissue samples for on-going taxonomic work on the evolution of this group of fishes.

Fig. 9. The plunderfish (*Pogonophryne marmorata*) a benthic predator (Photo: Peter Marriott).

The deepest tow at 2300 m depth also caught four specimens of Scott's dragonfish, *Bathydraco scotiae*, a first for this expedition.

Fig. 10. Dragonfish, *Bathydraco scotiae* (Photo: Peter Marriott)

Mystery invertebrate identification remains to be solved (Kareen Schnabel)

At our first site deeper than 2000 m, (station C18) in the northern Ross Sea, the DTIS camera recorded a number of unusual-looking quite large gelatinous invertebrates (Fig. 11). The animals are nearly transparent, in excess of half a metre in length, and are anchored into the soft sediment with a flexible stem. Based on the images, our best guess is that these are a type of predatory tunicate (sea squirt), a deep-sea adaptation of the otherwise passive filter-feeding mode of the sea squirt commonly found in shallow waters. Unfortunately, our hopes of getting a closer look at these creatures were dashed, as no specimens were caught in the benthic sleds used to sample the seabed after the camera deployment.

Fig. 11. Mystery animal of the deep. Possibly a predatory tunicate, photographed by DTIS camera system at a depth of 2200 m. A small isopod crustacean is using it as a perch. (Photo: Dave Bowden/DTIS)