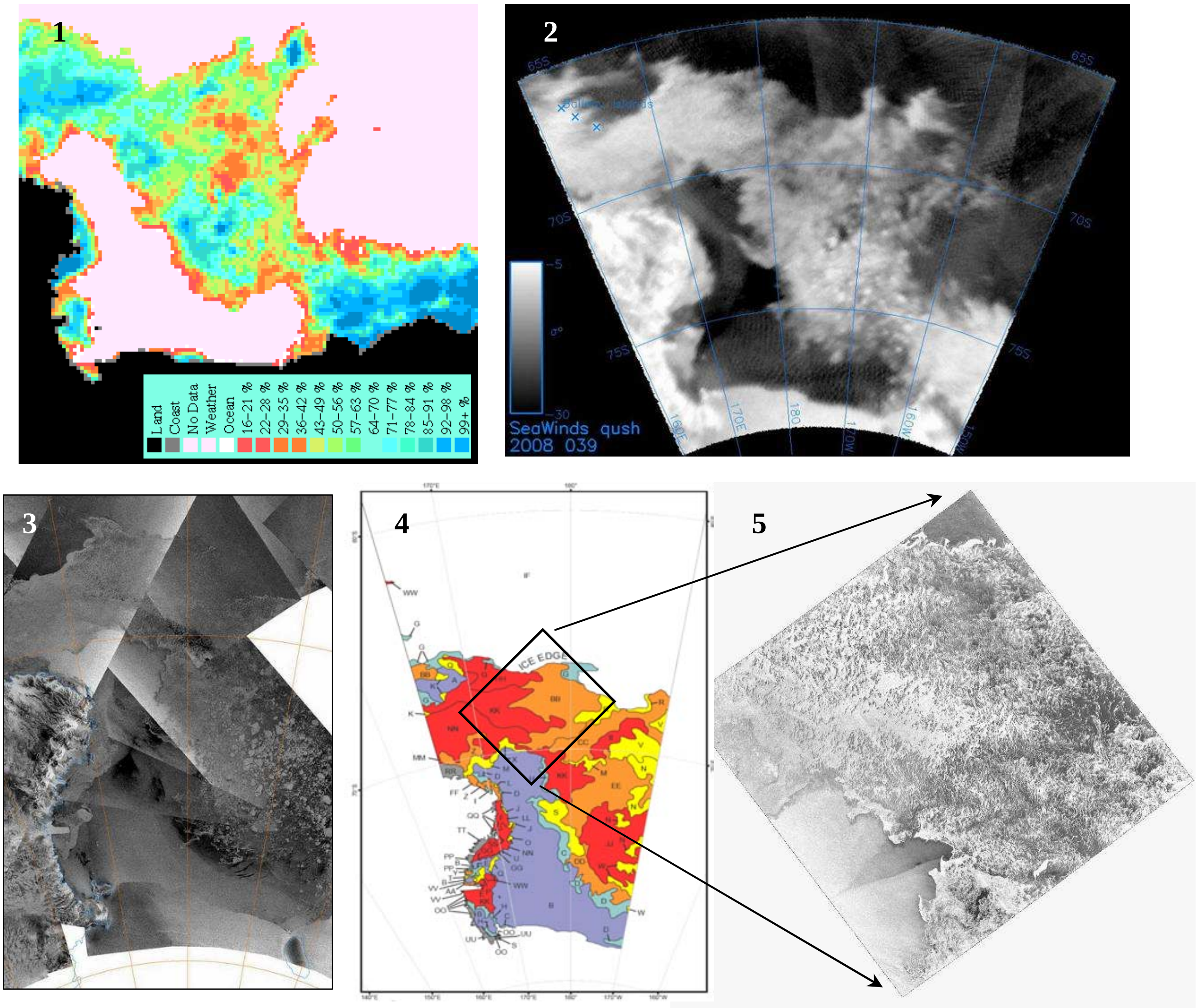
NZ IPY-CAML Voyage 2008
18-20 FEB Moving north again

Now that we have completed sampling the southern stations, the focus of the survey has moved north to the central area adjacent to Iselin Bank which lies east of Cape Adare.

The original survey plan had an extensive sampling program in this area but this year's ice conditions has resulted in the need to reassess and redistribute the sampling effort. This redesign is completed using all available satellite ice imagery we can access and interpretations we receive from a commercial company (Enfotec), who specialise in vessel navigation in the Arctic and Antarctic. Some of this data is readily available on the web and some has to be ordered in advance and are charged for. The higher the resolution required, then the higher the cost.



Figures above - Examples of information used to assess ice conditions, February 8th 2008.
1. SSMI chart from US National Weather Service showing percentage ice cover – it displays the sea ice concentration from a special sensor microwave/imager (SSMI) satellite. Each 25km by 25km pixel in this image shows a percentage of how much of the ocean is covered by ice. The pink is ice free, the black is land or permanent ice, and the other colours grade the ice cover from high density (blue) to low density (red).

2. QuikSCAT image from NASA Climate Record Pathfinder Program. This produces a blurry image of where the sea ice is in the Ross Sea. The ocean appears black and the sea ice and Antarctica white.

3. This shows a mosaic synthetic aperature radar image from EnviSAT satellite, produced with a powerful microwave instrument that 'sees' through cloud, allowing sea ice to be observed in all weather conditions. The darker the shade, the thinner the ice.

4. Part of an 'egg chart' showing areas with different sea ice characteristics – constructed from standardised information about different aspects of ice (age, density, percentage cover etc). Aptly named an egg chart, it is produced by the US National Ice Centre.

5. High resolution synthetic aperture radar image from Radarsat showing pack ice near the ice edge. Copyright Canadian Space Agency.

SCIENCE REPORT
They make them big down here (Malcolm Clark)

Benthic invertebrates in Antarctica are well known for their large size. This feature, known as "gigantism" is common amongst certain groups including sea spiders, sponges, isopods, starfish, and amphipods. The phenomenon is a subject of intense scientific investigation, but there are many contributing factors.

Slow growth rates, late reproductive maturation, prolonged periods of embryonic development, and low predation rates that are typical of Antarctic waters contribute to long life-spans for many species and can also result in large size animals. Animal physiology is thought to play a role as well, as those groups that require large amounts of calcium should not, in theory, grow well in Antarctic waters. This is because the calcium carbonate (needed for growth of shells, or starfish 'tests') has low solubility in very cold seawater. Yet starfish, which have a calcareous exoskeleton or 'test' which needs lots of calcium, can reach much larger sizes than found in New Zealand waters, as seen in Fig. 7.

Another crucial part of the story is that the low sea temperatures allow more oxygen to be dissolved in the sea water than in warmer latitudes. Sea spiders for example are not only larger, but reach more than 1000 times the weight of most temperate species. Amphipod crustaceans in the Southern Ocean are also large; more than five times as long as the largest temperate species.

Fig. 7. Two of the benthic team on board Tangaroa, Sadie and Niki, holding specimens of giant *Macroptychaster* starfish (Photo: John Mitchell).

Crocodile icefish lurk just below the surface (Richard O'Driscoll & Andrew Stewart)
The crocodile icefish (*Neopagetopsis ionah*) looks like the type of fish you would find close to the bottom, and indeed this species has been a common feature of our research trawl catches in the southern Ross Sea at bottom depths of 200 to 600 m. What is far more surprising for the fish scientists onboard is that we are also catching these adult-size fish within 80 m of the surface in midwater trawls targeted at catching krill. Examination of stomach contents suggests that these fish are also targeting the krill, and are prepared to swim up through several hundred metres of water to catch them.

A feature of many Antarctic fish species (including icefish and the Antarctic cods like toothfish) is that they don't have a gas-filled swim bladder. This enables them to change depth very rapidly and get to where the krill are without decompression problems such as swim bladder 'blow-out'.

More about swim bladders
Many fish have gas-filled swim bladders so that they can maintain neutral buoyancy by adjusting the amount of gas at a given depth. Some species have no swim bladder, and store lipids (fats) instead.

The absence of a swim bladder is particularly useful in fish that regularly swim up and down the water column to feed. The lack of swim bladder circumvents the problems associated with rapid gas expansion that occurs as the water pressure decreases nearer the surface. Resorption of the expanded gas in the swim bladder is a slow process, and fish would need to expend a lot of energy overcoming the added buoyancy of the expanded gas to get back down to greater depths where they are less visible to other predators. Other forms of buoyancy such as lipid droplets do not expand or contract in the same way that gas does. So fish like the crocodile icefish are still able to maintain buoyancy at depth, without suffering the problems of gas expansion when they swim up to shallower depths to feed.

Fig. 8. Crocodile icefish (*Neopagetopsis ionah*) (Photo: Peter Marriott)

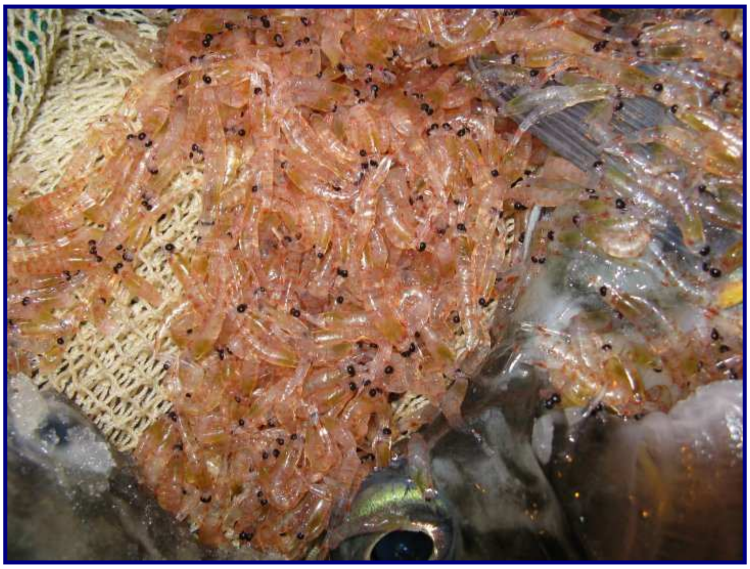


Fig. 9. Icefish lurking in amongst a midwater catch of crystal krill (*Euphausia crystallorophias*) (Photo: Richard O'Driscoll)