

Life in Antarctic waters

An update from New Zealand's International Polar Year Census of Antarctic Marine Life Project (IPY-CAML)

Research vessel Tangaroa going into pack ice in the Ross Sea.

© PHOTO GLEN WALKER, NZ IPY-CAML

BACKGROUND

Already a year has passed since RV Tangaroa returned from the 50-day voyage to the Ross Sea in Feb-Mar 2008.

The crew on board set out to explore marine life in the Southern Ocean and Ross Sea as part of an international circumpolar research effort carried out during International Polar Year. The voyage was known as NZ IPY-CAML: International Polar Year – Census of Antarctic Marine Life.

The survey aimed to investigate the abundance and diversity of marine life from the microbes (bacteria and microscopic phytoplankton) right up to megafauna (large fish and whales) across three habitat zones in the Ross Sea region:

- 1) The Ross Sea shelf – a relatively shallow habitat characterised by iceberg scars, that is contained within the Antarctic shelf zone
- 2) The Ross Sea continental slope around the outer reaches of the Ross Sea Shelf where the toothfish longline fishery operates in depths of 500–1200 m
- 3) The seamounts and abyssal plains north of the Ross Sea, in the vicinity of Scott Island and the Admiralty Seamount.

Sampling was carried out from sea surface to sea floor and used a wide range of assorted equipment to view the different sizes of sea-life and the composition of the seawater itself.

Despite the iciest summer in a long time, RV Tangaroa succeeded in accessing the Ross Sea through a stubborn 200 km ice barrier that normally disperses in summer.

INITIAL RESULTS FROM THE VOYAGE

The voyage recorded over 31,000 sample lots of fish and invertebrate species, some of which are new to science. Many of the animals have unusual adaptations that have evolved because of the extreme polar and deep-sea environments they live in.

There were examples of giant-sized animals – starfish as large as a serving dish, large sea-spiders, jellyfish and shellfish, and fish with exotic names such as daggertooth, star-eater, and pearleye. Scientists also sampled some unusual octopus species as well as several juvenile colossal squid.

While initial data sparked a lot of media interest, much of the real value of the data lies in its subsequent analysis and application. And the progress to date is already proving its worth.

HOW THE INFORMATION HAS BEEN USED SO FAR

The abundance of several bycatch species in the Ross Sea toothfish fishery has been estimated for the first time and was used as part of the CCAMLR stock assessment process in October 2008. [CCAMLR is a Commission made up of 25 member states responsible for ensuring the sustainability of the Antarctic toothfish fisheries.]

The abundance of the Antarctic silver fish, which underpins the Ross Sea food web, was estimated from acoustic data collected during the voyage and again, this is a first. The estimates will inform the ecosystem model being developed by New Zealand for managing the effects of fishing on the ecosystem.

Data from deepwater camera work that has revealed the range



PHOTO: PETER MARRIOTT, NZ IPY-CAML

Above: The entire crew gathered on the bow of RV Tangaroa in the Ross Sea.

of species in the different parts of the Ross Sea is not only relevant for biodiversity projects but also provides valuable insight to connections with different habitat types and their vulnerability to the effects of commercial longline fishing.

The information collected will eventually contribute to 'bioregionalisation' of the Ross Sea region, which is essentially a way of mapping the ecological character of the area on a broad scale to locate areas of scientific interest, vulnerability or uniqueness that may require particular management responses or protection.

Specimens of squid and octopus collected during the voyage have also yielded some interesting results – particularly for the octopuses which reveal a new family as well as a new species (this is big news in the world of taxonomy, given that new families are rarely found).

EMERGING RESULTS

It seems that bacterial microbes may be more important than phytoplankton at driving ocean primary productivity, contrary to what has been traditionally believed by scientists.

Recent studies have shown that the bacterial biomass in the ocean is greater than the combined biomass of all the other types of sea-life, including whales, seals and penguins. The ecological role of this unseen living mass of material is to control the breakdown processes of other living material and has a strong influence on the release of nutrients and minerals back into the system. It is therefore a key driver of ocean productivity.

Experiments were conducted during the voyage to assess the effects of acidification on bacteria. Increased acidity affected the bacterial biomass, and possibly the type of bacteria able to function.

BIODIVERSITY AND FUNCTION

In addition to the diversity of the marine organisms in the sea, the project investigated the role that different groups of organisms

play in the Ross Sea ecosystem. For example, various scientific methods were used to get a better understanding of the long-term feeding interrelationships in the region.

Genetic analyses are being used to determine the connectivity of the Ross Sea ecosystems with other parts of the Southern Ocean. This has important implications for new understanding about how well marine creatures can disperse themselves and populate areas from one area of Antarctic waters to another.

EXPEDITION ANTARCTICA – THE DOCUMENTARY

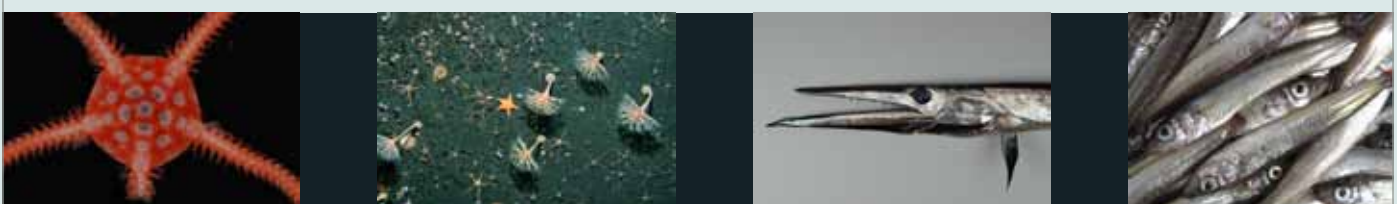
New Zealand's IPY-CAML Voyage also had an important outreach focus – with a particular emphasis on ensuring that the New Zealand public and science community, as well as schools and international participants in IPY, could track progress.

The Ministry seized an opportunity to showcase New Zealand science and placed film maker Max Quinn of NHNZ on board to film events as they unfolded.

With a shoestring budget, NHNZ managed to obtain full sponsorship on their return from the voyage and the film Expedition Antarctica recently screened on the National Geographic Channel on 28 June 2009.

The documentary highlighted the icy conditions and showed the crew's single-minded commitment to the project, despite adverse conditions. Mixed with touches of humour and drama, and set amidst spectacular scenery, the documentary does not disappoint.

NZ IPY-CAML is a multi-agency project funded by the New Zealand Government. Key governance agencies include LINZ (Oceans Survey 20/20), MFish (Lead Agency for the science), ANT.NZ (IPY Project sponsors), MFAT (Antarctic Strategy implementation), FRST (Science advice and strategy). NIWA had the major role in implementation of the project and along with researchers from Te Papa, and universities throughout New Zealand and overseas, will be analysing the results for a further two years.



From left to right: A brittle star central disk, found in great numbers throughout the Ross Sea; abundant sea pens and ophiuroids (brittle stars) at 150 m depth; daggertooth – a fearsome predatory midwater fish; Antarctic silverfish, a key component of the foodweb in the Ross Sea ecosystem.

© PHOTOS STEFANO SCHIAPARELLI, PETER MARRIOTT, AND RICHARD O'DRISCOLL, NZ IPY-CAML