MONITORING AUSTRALIA'S OCEANS

As climate change and over-fishing take their toll on ocean ecosystems, an ambitious new five-year project is underway to monitor physical ocean changes and track the movement of sea creatures around Australia.

The IMOS will monitor physical ocean changes and track the movement of sea creatures around Australia. In the Southern Ocean - perhaps the most difficult of the world's oceans to observe and understand – monitoring will provide insights into the speed of change in ocean temperature, salinity and chemistry.
GBROOS – Great Barrier Reef Ocean Observing System; STIMOS – Subtropical IMOS; NSW IMOS – New South Wales IMOS; SAIMOS – South Australian IMOS; WAIMOS – West Australian IMOS

The $94 million Integrated Marine Observing System (IMOS), headquartered at the University of Tasmania, will use a battery of high-tech instruments and infrastructure to monitor Australia's coastal and 'bluewater' open oceans for information that will support research on critical marine issues facing Australia, including the role of oceans in climate variability and change, and the sustainability of marine ecosystems.

Among the instruments to be used are:

- A fleet of Argo robotic floats, to measure temperature, salinity and currents in the upper 2000 m of ocean;
- High frequency coastal radars to observe inshore currents;
- A fleet of 'gliders' – autonomous underwater vehicles – to monitor boundary currents such as the Leeuwin and East Australian currents;
- Lines or 'listening curtains' of acoustic receivers to monitor the movement, mortality and predator-prey interactions of fish tagged with acoustic transmitters, off the coasts of Western Australia, South Australia and New South Wales;
- Shallow water moorings around the country to measure temperature, salinity and other ocean properties.

IMOS Director, Dr Gary Meyers, said the technology will be delivered through 11 facilities, including Argo Australia, the Australian Coastal Ocean Radar Network, and the Australian Acoustic Tagging and Monitoring System. Information will be channelled through eMarine Information Infrastructure, based at the University of Tasmania, and will be freely available to researchers.

IMOS is being run in collaboration with CSIRO and involves 27 partners from Australian and international research institutions. Australian Antarctic Division scientists will contribute to the project through their involvement in related marine science activities, such as the Australian continuous plankton recorder survey (see page 13).

The project is supported by $55.2 million from the Australian Government's National Collaborative Research Infrastructure Strategy and a further $39 million from in-kind partner contributions.

WENDY PYPER
Information Services, AAD

More information www.imos.org.au

Southern Ocean plankton surveys are blooming

Since 1991 the Southern Ocean Continuous Plankton Recorder Survey (SO-CPR) has been monitoring changes in plankton distribution patterns, as an early warning indicator of changes in the health of Southern Ocean ecosystems.

The survey was initiated by Australian Antarctic Division scientists and initially operated between Hobart and Australia's three Antarctic stations. Since 1999 tows have also been conducted from Japanese research vessels, during resupply of Syowa station and other opportunistic voyages.
In 2004, Germany joined the survey effort with tows from their research vessel, *Polarstern*, between Cape Town and Antarctica (see map, page 14).

The importance of this work in detecting and monitoring natural and human-induced changes in the biological systems of the Southern Ocean was acknowledged in 2006, when the international Scientific Committee on Antarctic Science (SCAR) formally recognised the SO-CPR Survey as an official SCAR project. The Committee also established an Action Group on CPR research to oversee the development and expansion of the CPR Survey in Antarctica, and help to improve access for users of the data.

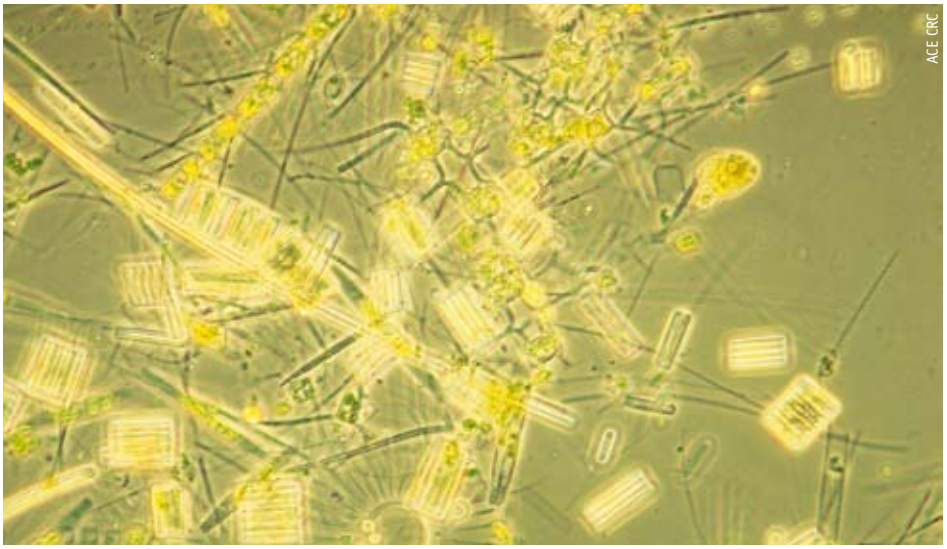
Already, New Zealand has joined the Survey, with tows between New Zealand and the Ross Sea, and the British Antarctic Survey is towing CPRs in the South Atlantic, to South Georgia and South Orkney. This extends the Survey range from Drake Passage east to Ross Sea, or about 70% of the Southern Ocean.

The Australian Antarctic Division is also working with France to add *l'Astrolabe* to the CPR fleet, in support of both SO-CPR and AusCPR (page 13). By the end of the International Polar Year in 2009, we plan to include the South American chapter of the Census of Antarctic Marine Life – the consortium of Brazil, Uruguay, Argentina, Chile, Peru and Ecuador – as regular CPR partners. The United States has also expressed its interest in towing CPRs.

GRAHAM HOSIE
Director SCAR SO-CPR Survey, AAD

Australian plankton survey

A new plankton survey will provide critical information on the current status of these important microscopic marine plants, in Australian waters.



Plankton, which includes phytoplankton (microscopic marine plants) are sensitive to small changes in the marine environment, making them useful early warning indicators of changes the health of ocean ecosystems.

Much of the Integrated Marine Observing System (IMOS) will be dependent on a suite of high technology instruments such as robotic floats, autonomous profiling gliders and mooring systems (see page 12). However, IMOS will also use 1930s technology in the form of continuous plankton recorders (CPR) towed behind ships, to monitor changes in plankton patterns.

Plankton are particularly sensitive to subtle changes in their environment, which makes them useful early warning indicators of the health of ocean systems. CPRs have proven to be the most cost effective and reliable methods for rapidly and repeatedly surveying large ocean systems. They have identified significant changes in the plankton of the North Sea, North Atlantic and North Pacific, long before indications were observed at other levels of the food web. The Southern Ocean CPR (SO-CPR) Survey (see page 12), developed by Australia and Japan, has been running since 1991 and has also detected substantial changes in the plankton.

There have been few plankton studies or monitoring programmes in Australian waters. Through IMOS, however, we have received AU$1.7 million over five years to support two new Australian CPR (AusCPR) runs – across the Tasman Sea, and between Hobart and the French Antarctic station Dumont d'Urville (see map, page 14).

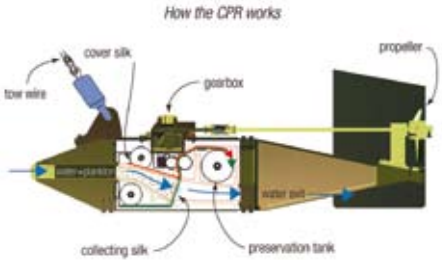
The Tasman Sea route will traverse the East Australia Current (of *Finding Nemo* fame). This region is forecast by global climate models to experience a high degree of warming in the Southern Hemisphere over the 21st century. For the Southern Ocean route we will use the French resupply ship l'Astrolabe, which makes numerous runs each season from October to March. This route will also support the SO-CPR Survey. AusCPR will also complement existing monitoring programmes on these routes that collect information on phytoplankton (via pigments), carbon dioxide, and chemical and physical oceanographic patterns.

It is hoped that AusCPR will forge strong collaborative links with the Sir Alister Hardy Foundation for Ocean Science, which coordinates the northern hemisphere surveys, and with the SO-CPR Survey, to produce a more effective global plankton monitoring programme.

Over the next five years AusCPR will produce unprecedented knowledge of the composition, distribution, seasonality and relationship of plankton to other oceanographic patterns in Australian waters. In the years to come, this information will provide a rare baseline in the region in order to assess the effects of climate change on the marine food web. The first tows are expected to commence by the end of 2007.

GRAHAM HOSIE
Co-director AusCPR, AAD

ANTHONTY RICHARDSON
Co-director AusCPR, CSIRO



When the Continuous Plankton Recorder is towed behind the ship, sea water and its associated plankton enters the device through a small opening in the nose cone. This opening expands into a wider collection tunnel, slowing down the water flow. The plankton are trapped between two layers of very thin (270 µm) mesh silk which then wind around a spool inside a chamber filled with a preserving fluid. Each tow represents 450 nautical miles (830 km) of continuous sampling. Back in the laboratory, the two layers of silk are unrolled and cut into sections representing five nautical mile samples. Plankton are then identified and counted under the microscope.