

# Climate change and oceans: getting back to baselines

Science is starting from scratch when it comes to understanding climate change impacts on Australian marine ecosystems, according to CSIRO's Dr Anthony Richardson who is a member of the team behind the recent report, *Impacts of climate change on Australian marine life*.

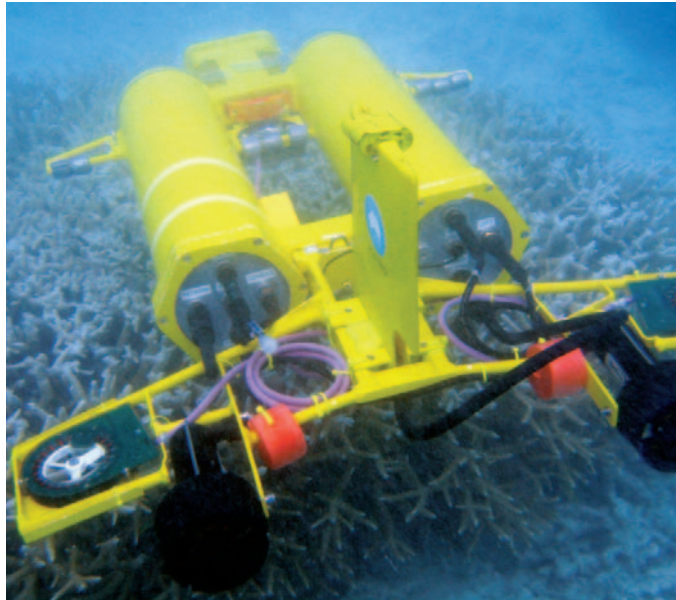
'Almost all the recorded significant changes linked to warming temperatures are from the Northern Hemisphere terrestrial systems, with very few from marine systems and almost none from Australia,' Dr Richardson says.

'You can't translate the impacts of change on land to what might happen to the coasts and oceans because there is greater interconnectivity in marine systems. We have also noted that the timing of life cycle events in marine groups is changing faster than animals and plants on land.'

Dr Richardson and other scientists from the CSIRO Wealth from Oceans National Research Flagship recently completed the key national report for the Australian Greenhouse Office (AGO), which combines the research of climate modellers, ecologists, and fisheries and aquaculture scientists.

The report projects a southward shift in the distribution of species, particularly along the east coast of Australia. The most affected marine groups are likely to be tropical coral reefs, cold water coral reefs, kelps, plankton and species that live on or near the sea floor.

Large ocean circulation patterns are also likely to be affected, with the East Australian Current most at risk. This current carries warm water southwards along the east coast from the tropics to temperate regions. CSIRO already has



Developed by the CSIRO Information and Communication Technology Centre, Starbug is an autonomous, miniature submarine for underwater monitoring and surveying of ecosystems such as the Great Barrier Reef. It is one of the first underwater vehicles in the world designed specifically with vision as the primary sensor for navigation and control. CSIRO

evidence that this current is strengthening.

In fact, general circulation models show that waters off south-east Australia are likely to exhibit the greatest warming in the Southern Hemisphere this century.

According to Jo Mummery, Executive Manager of the AGO's Greenhouse Policy Group, the report will help decision-makers determine the risks to Australia's multi-million dollar marine and coastal industries and the health of the marine ecosystem so that they can plan their responses.

Climate projections indicate that temperate fisheries will be more vulnerable than tropical fisheries. Scientists have already seen changes to the distribution and quantity of marine species and communities in areas such as the Tasman Sea.

'One lesson from this summary of research is that

information on Australian marine impacts of climate changes is sparse,' says report co-editor, Dr Alistair Hobday. 'To better predict future changes to Australian marine ecosystems, increased observational data coupled with enhanced modelling techniques are needed.'

'The Flagship is continuing to invest in targeted research activities to increase Australia's understanding of climate impacts on our marine ecosystems.'

As part of this coordinated research effort, the Wealth from Oceans Flagship and the Australian Greenhouse Office convened an 'In Hot Water' symposium in Brisbane in November, where international and Australian experts and decision-makers proposed the idea of a 'marine climate impacts report card' for Australia – an annual

report that details changes in the physical, chemical and biological environment around Australia, from tropical to polar seas.

CSIRO is also working with the University of Queensland and the Australian Institute of Marine Science to investigate ocean acidification in tropical regions. A research voyage in the Great Barrier Reef will be carried out in July next year to check baseline acidification conditions.

'Without baselines we will not know how the biology of the ocean is responding to climate change,' comments Dr Richardson.

'Research agencies have had strong physical and chemical monitoring programs in the Southern Ocean, but monitoring is more patchy around Australia itself. A comparison internationally shows that we know relatively very little about biological changes in Australia's marine systems compared with other regions.'

'Less than 0.3 per cent of the almost 29 000 significant climate change impacts that have been described for the Earth – such as species distributions moving towards the poles or plants flowering earlier with warming – have been found from marine systems.'

'This is due to the lack of baseline data, rather than the fact that no changes are occurring – because the few biological changes that have been recorded from marine systems have shown large impacts.'

**More information:**  
*Impacts of climate change on Australian marine life*, [www.greenhouse.gov.au/impacts/publications/marinelifelife.html](http://www.greenhouse.gov.au/impacts/publications/marinelifelife.html)