

Getting our feet wet: 25 years of Antarctic marine research

The importance of shipboard scientific research to the Australian Antarctic programme was reinforced by a number of events in the 1990s. The first amongst these was the delivery in 1990 of the *Aurora Australis* which, despite its hybrid nature, was the first purpose-designed research vessel that we had used. The ship contained laboratories and a suite of advanced instrumentation that greatly widened the possibilities for marine research and which has been the backbone of our marine science effort ever since. The second major event was the creation of the Antarctic and Southern Ocean Cooperative Research Centre (CRC) in 1991, which had a focus on oceanography and sea ice, therefore requiring access to a marine research vessel. Finally, in the mid 1990s, Australian companies began fishing around Macquarie Island and the Heard and MacDonald islands, highlighting the need for more research to underpin sustainable management of Southern Ocean resources.

Until the 1990s most of the marine research carried out by the Australian Antarctic programme had been marine biology. However, there had been repeated recommendations from a number of reviews that an oceanography programme was

urgently needed to address climate-related issues and underpin the ecological research. The CRC was funded as a climate-focussed institute specialising in physical sciences, and it brought the CSIRO Division of Marine Research into the Antarctic programme as a partner. Significantly, the funding for the CRC included almost a month's scientific ship time per year, enabling a considerable expansion in Antarctic marine research.

In the lifetime of the CRC, marine science voyages investigated the oceanography, biogeochemistry, glaciology, marine biology and geology of the waters off the Australian Antarctic Territory. These voyages included a series of oceanographic transects which contributed to the World Oceanographic Circulation Experiment, and which put the Australian Antarctic programme's marine effort firmly on the international map.

The *Aurora* was also sent deep into the sea ice in autumn, winter and spring, to investigate sea ice processes and their effects on ocean circulation. This period saw several interdisciplinary surveys which built up a picture of the Southern Ocean ecosystem, from the oceanography to the

The *Aurora Australis* has formed the backbone of the AAD's marine science programme since its maiden southern voyage (to Heard Island) out of Hobart on 7 May 1990. The 3900 tonne vessel is capable of breaking ice 1.2 m thick at a continuous speed of three knots, and can accommodate 133 people, including crew. Facilities include a state-of-the-art hydroacoustic system for assessment of fish and krill stocks, a wet laboratory for the processing of net samples, hydrographic, meteorological and multi-purpose laboratories, a fish freezer and a photographic dark room.



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whales. In addition to the CRC-related research, there was a continued focus on fisheries. Three major surveys were conducted around Heard Island in the early 1990s and in 2001, the Pack Ice Seals Programme provided a benchmark survey of the sea ice zone.

The Antarctic Climate and Ecosystems CRC, which replaced the Antarctic and Southern Ocean CRC in 2003, also has a major marine focus. Voyages examining ocean circulation and ecosystem structure have already been completed. Future voyages may include interdisciplinary studies of the sea ice, repeated oceanographic transects, and biogeochemical studies investigating the Southern Ocean's ability to take up carbon dioxide. The CRC has a truly multi-disciplinary research focus, and a feature of its output will be a much more holistic approach to the issue of climate change and its effects on marine ecosystems.

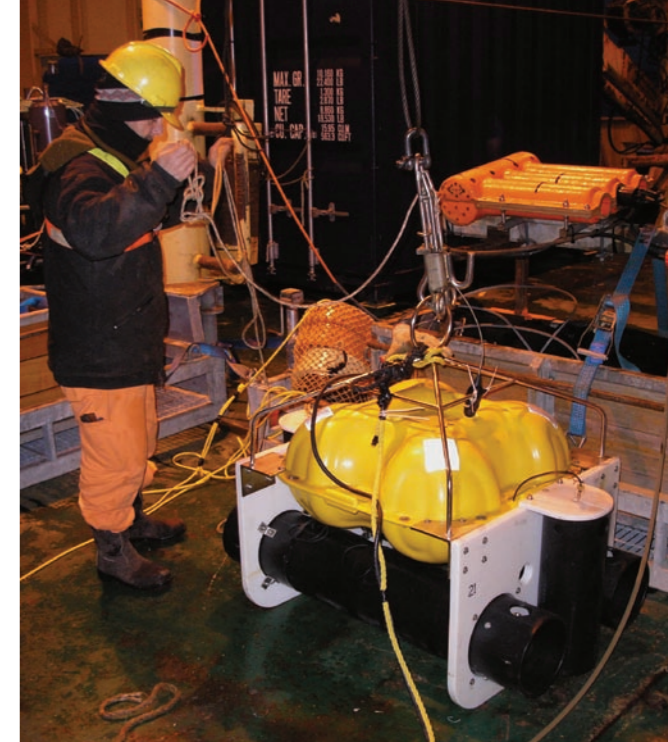
Marine research in the Southern Ocean is likely to remain a high priority for the Australian Antarctic programme for the foreseeable future. Every review of the science programme over the last two decades has emphasised the importance of marine research for climate studies and its contribution to the sustainable use of the region's fisheries. Emerging issues are likely to encompass marine protected areas, and the growing requirement to conduct strategic, non-lethal whale research. All of this research will continue to depend on the use of research vessels. However, the trend will be towards smarter use of the resources available and a more flexible approach.

Not all research will require an icebreaker; some research is best carried out off small vessels which can be deployed for long periods at low cost. Air transport may allow scientific groups to fly in and join a research vessel for discrete pieces of research, reducing the length of the sometimes epic voyages of the past. More use will be made of remote sensing and of moored instruments that can collect time-series data. Smarter ship-based equipment may eliminate the need to stop so often on surveys.

This year, the *Aurora* returned to the site of the first marine research voyage undertaken on the *Nella Dan* 25 years ago. Like the 1981 voyage, the focus of the 2006 'BROKE-West' voyage is on the krill biomass in the South West Indian Ocean sector (*Australian Antarctic Magazine* 8: 12). However this time, thanks to the progress made over the last two decades, the voyage sailed with an international scientific party of 61, and investigated every aspect of the physics and biology of this region using the most up-to-date equipment available; a fitting way to celebrate 25 years of Australian Antarctic science at sea.

—STEVE NICOL

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JASON GEDAMKE



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Technology that enables the remote collection of scientific data, such as this autonomous acoustic recording package used to capture underwater sounds, will play an increasingly important role in future marine research.

During the 1990s the Antarctic and Southern Ocean Cooperative Research Centre supported projects investigating sea ice processes and their effects on ocean circulation, to address climate-related issues and underpin ecological research.



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