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## **Australian Antarctic Science Program: highlights of the 2014/15 season**



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Information paper submitted by Australia

## 1. Introduction

Research within the Australian Antarctic Program is guided by the “[Australian Antarctic Science Strategic Plan 2011-12 to 2020-21](#)”. The Plan focuses efforts within four research themes:

- Theme 1 Climate Processes and Change
- Theme 2 Terrestrial and Nearshore Ecosystems: Environmental Change and Conservation
- Theme 3 Southern Ocean Ecosystems: Environmental Change and Conservation
- Theme 4 Frontier Science

Themes 1- 3 address the priority science needs articulated by government policy and resource management agencies, whereas Theme 4 encourages excellent science that is not required to have current relevance to policy. The majority of research undertaken within the program falls within themes 1-3.

2014/15 is the fourth year of the Australian Antarctic Science Strategic Plan. Public summaries of all projects, past and present, in the Australian Antarctic program are available on the Australian Antarctic Division (AAD) website at <https://secure3.aad.gov.au/public/projects/>

The Australian Antarctic Science Program welcomes and supports involvement by Australian and international scientists willing to undertake research in accordance with the Strategic Science plan. The majority of projects include international collaborations with six projects led by Chief Investigators based at overseas institutions. The most recent count of collaborations revealed there are 97 international institutions from 22 countries participating in Australian Antarctic science projects.

This year marks the mid-point of the Australian Antarctic Science Strategic Plan and as such it will undergo a mid-term review.

## 2. Selected research highlights from the 2014/15 season

In 2014/15 the Australian Antarctic Science major field programs focussed on oceanographic and ecological marine research, in themes 1 and 3.

Research on Australia’s icebreaker *Aurora Australis* conducted two research voyages, one to conduct oceanographic research at the Totten and Mertz glaciers and a second conducted marine ecosystem research offshore from Australia’s Davis and Mawson stations. A third voyage was undertaken as a joint New Zealand Australia research effort to study blue whales in the Southern Ocean and Ross Sea region.

In addition to the ship based projects, two major experimental projects were undertaken on the impacts of ocean acidification at Casey and Davis research stations.

### *Oceanographic Research*

A team of 23 scientists and technicians on the RV *Aurora Australis* used a combination of oceanographic methods to assess how much ocean heat is available to melt the base of the Totten Glacier.

The Totten Glacier is one of the world's largest and least understood glacial systems. It drains 538,000 square kilometres of East Antarctica and is grounded on bedrock below sea level. While satellite data has shown that the Totten has been thinning faster than other glaciers in East Antarctica the reason for this has not been clear.

A key part of the voyage was the recovery of US and Australian instruments moored on the sea bed for up to two years at six different locations adjacent to the Totten glacier. These instruments were deployed by the US icebreaker *Nathaniel B. Palmer* and recovered by the Australian icebreaker *Aurora Australis* as part of an ongoing international collaboration. A further 3 oceanographic moorings were recovered at the Mertz glacier.

The seven week marine science voyage was funded through the Australian Research Council's Special Research Initiative for Antarctic Gateway Partnership, the AAD, the Antarctic Climate and Ecosystem Cooperative Research Centre (ACE CRC).

### *Blue Whale Research*

A blue whale research voyage was supported by the New Zealand National Institute of Water and Atmospheric Research (NIWA), Antarctica New Zealand and the Australian Antarctic Division this summer. The six-week voyage studied top predators in the Ross Sea region, including blue and humpback whales, and Antarctic toothfish. The Australian scientists onboard successfully tracked and located blue whales using passive acoustic methods.

### *Ocean Acidification*

At Davis research station experiments were performed in tanks (mesocosms) to study the effects of elevated pCO<sub>2</sub> on cell physiology and community composition of Antarctic marine microbes.

At Casey research station a team of divers and technicians from Australia, USA, UK and Switzerland combined to undertake a "Free Ocean CO<sub>2</sub> Enrichment Experiment" (FOCE) to estimate effects of ocean acidification on marine and seafloor communities. The team drilled holes through the sea ice to deploy four acrylic two-metre long chambers onto the seafloor. Carbon dioxide-enriched seawater mimicking future ocean conditions was then pumped into two of the chambers through a series of 40m long ducts. Regular seawater was pumped through the other two chambers for comparison. The four chambers were fitted with underwater flow meters, thrusters, pH and temperature sensors and time-lapse cameras to record all the changes in the carbon dioxide-enriched environment, including the growth and behaviour of seafloor invertebrates and marine-plants.