RV *Investigator* Voyage Scientific Highlights and Summary

Voyage #:	IN2019_V04
Voyage title:	Hotspot dynamics in the Coral Sea: connections between the Australian plate and deep Earth
Mobilisation:	Cairns, 6th August, 2019
Depart:	Cairns 0700 7th August, 2019
Return:	Brisbane 0800 3rd September, 2019
Demobilisation:	Brisbane 3rd September, 2019
Voyage Manager:	J Hooper
Chief Scientist:	J Whittaker
Affiliation:	University of Tasmania
Principal Investigators:	E Woehler
Project name:	Spatial and temporal variability in the distribution and abundance of seabirds
Affiliation:	Birdlife Australia
Principal Investigators:	V Lucieer
Project name:	Understanding the spatial links between geomorphology and biodiversity in the Coral Sea Australian Marine Park
Affiliation:	University of Tasmania

SCIENTIFIC HIGHLIGHTS

Scientific Highlights

The Chief Scientist

Associate Professor Jo Whittaker joined the Institute for Marine and Antarctic Science (IMAS) at the University of Tasmania in January 2013. Her research interests are predominantly in plate tectonics, marine geophysics and geodynamics. Jo completed a combine science/commerce undergraduate degree with Honours in Geophysics from the University of Sydney in 2003, followed by a Masters in Geophysics from Victoria University, Wellington, New Zealand. She received her PhD, on the tectonic consequences of mid-ocean ridge formation, evolution and subduction, from the University of Sydney in 2008. Following graduation, she worked both for industry (GETECH in the UK) and academia (post-doc, University of Sydney). For more information, go to http://www.utas.edu.au/profiles/staff/imas/joanne-whittaker

Title

Hotspot dynamics in the Coral Sea: connections between the Australian plate and deep Earth

Purpose

In a handful of locations on Earth, hot material rises from deep within the Earth to create lines of volcanoes. We aim to test if the Tasmantid and Lord Howe Seamount chains, hidden in the seas off eastern Australia, should be included in this rare group and if the Louisiade Plateau to the north could have formed from the massive flood of basaltic lava triggered when a plume of material, rising from deep within the Earth, reached the surface. Another mystery is whether there is continental crust from Australia lying beneath the Louisiade Plateau. Identifying the sites of mantle plume eruptions allows us to make connections between the surface and deep Earth with global scientific significance for understanding our planet's geodynamic and climatic history and biotic evolution.

The voyage consists of three main projects with the following objectives:

1. To map and sample the seamounts, plateaus, and other seafloor regions of the Coral Sea
2. To understanding the spatial links between geomorphology and biodiversity in the Coral Sea Australian Marine Park
3. To understand the spatial and temporal variability in the distribution and abundance of seabirds in the Coral Sea

Contribution to the nation

Our research addresses high profile research questions maintaining Australia's world leading reputation in marine geoscience. Understanding the history of volcanism hidden in the seas around Australia will provide significant new knowledge to inform policies related to natural hazards, resources and habitats both within Australian waters and throughout the SW Pacific. The project aims to leverage significant investment by Australia in state-of-the-art computational resources, and will directly lead to benefits for Australia and our Pacific Island neighbours, an area of renewed

foreign policy focus. These benefits include an understanding of the volcanogenic tsunami hazard in the region, informing Australian disaster management policy and practice; an assessment of marine mineral resources, potentially contributing to Australia's economic growth

Currently, only a small percentage of the seas around Australia are mapped. Our swath mapping program helps to increase multibeam coverage of the seafloor, particularly focussing on seamounts, which naturally important habitats for open-ocean ecosystems, and may help identify areas of important conservation value. Our survey data will greatly improve knowledge of the environmental assets in the Coral Sea Marine Park. There is a critical need to establish national marine baselines and monitoring, facilitate coordinated national studies of marine ecosystems and develop marine science research training.

This project delivers further training and development of PhD/Masters/Honours students, which will promote a diverse skill base critical to securing Australia's future scientific capability, training the next-generation of marine scientists and educators and inspiring STEM activities in schools.

As a result of this voyage

1. We have a better understanding of the formation and evolution through time of the seamounts of the Tasmantid and Lord Howe seamount chains, and how these are related to each other and the Louisiade Plateau
2. We retrieved the first ever seafloor rock samples from the Louisiade Plateau and Pocklington Trough, allowing us to investigate the nature and formation history of these features.
3. We have mapped previously unmapped seamounts and collected rock samples from 55 seafloor sites in the Coral Sea.
4. We have commenced a program of geochronology and geochemistry to understand the timing of seamount formation, formation mechanism and timing of subsequent erosion and/or sedimentation.