RV *Investigator* Voyage Scientific Highlights

Voyage #:	**IN2019_V01**		
Voyage title:	The availability of Antarctic krill to large predators and their role in biogeochemical recycling in the Southern Ocean (ENRICH voyage)		
Mobilisation:	17th and 18th January 2019		
Depart:	19th January 2019		
Return:	4th March 2019		
Demobilisation:	5th and 6th March 2019		
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The Chief Scientist - Dr. Michael Double

From inter-tidal snails to great whales (with a lot of birds in between) my research has been diverse but started with a degree in genetics and zoology at Leeds University, UK, that was quickly followed by PhD research at Leicester University then several postdocs at the Australian National University. There I employed detailed field observations with genetic analyses to describe the fascinating reproductive shenanigans of co-operatively breeding superb fairy-wrens. An opportunity to apply my genetic skills to the identification of albatross bycatch introduced me to marine conservation, which in turn led to a position as the Australian Antarctic Division to study baleen whales. I now lead a section within the Division's Science Branch that delivers strategic applied science on whales and seabirds. My role includes advising the Environment Department on marine conservation and management and I represent Australia at the International Whaling Commission.

Title

The availability of Antarctic krill to large predators and their role in biogeochemical recycling in the Southern Ocean.

Also known as the **ENRICH voyage**: **E**uphausiids and **N**utrient **R**ecycling **I**n **C**etacean **H**otspots.

Purpose

The purpose of this voyage was to characterise the distribution of Antarctic krill swarms and determine whether krill swarm characteristics influence the distribution and behaviour of large Antarctic predators, including the endangered Antarctic blue whale.

Contribution to the nation

Krill is considered to be the keystone species in Antarctica because it is the principal and sometimes only prey species for most Antarctic predators including, fish, squid, penguins, seals, seabirds and whales. Krill display complex behaviours migrating through the water column and sometimes aggregate into huge, dense swarms. The data from this voyage, collected using the sophisticated echosounders of the *RV Investigator*, will provide not only the most detailed description of Antarctic krill swarms to date, but also provide this information in the context of physical and biological oceanography and the distribution of key predators such as whales.

This information will provide new insights into the predator-prey relationships in the Antarctic. It will also inform the management of the Antarctic krill fishery and help ensure the fishery does not affect the availability of krill to Antarctic wildlife when setting catch quotas.

As a result of this voyage

1. We have a better understanding of how krill swarm characteristics affects the distribution and foraging behaviour of Antarctic whales. This information will inform the future management of krill fisheries in Antarctica with the aim of minimising the impact of human activities on Antarctica's wildlife.

2. We found that the distribution, composition and form of Antarctic krill swarms within the study area were extremely variable. It is likely the drivers of this variability are the temporal and spatial interactions between ocean currents, ice, primary productivity and predation. Our physical, chemical and biological measurements taken during this voyage will help resolve this complexity.

3. We have mapped the distribution of Antarctic krill swarms relative to measures of oceanography, productivity and predators such as Antarctic blue whales and fin whales. This voyage generated the highest quality data to date on Antarctic krill swarms and the relative distribution of their largest predators – Antarctic baleen whales.

4. We have commenced a program of analysis to discover if the distribution and behaviour of Antarctica's whales can be predicted by the form and distribution of krill swarms. These data will inform risk assessments developed by the Convention on the Conservation of Marine Living Resources (CCAMLR) with the aim of managing Antarctica's krill fisheries in manner that has no long-term impact on Antarctica's ecosystem.