

MARINE
NATIONAL FACILITY

voyageplan
SS01-2008

2008 RV *Southern Surveyor* program

Reconstruction of paleo-oceanography and
climate of SE Australia and the Southern
Ocean from analysis of deep-sea corals.

Itinerary

Depart Hobart 1000hrs, Friday 11 January 2008

Arrive Hobart 0800hrs, Friday 1 February 2008

Principal Investigator(s)

Dr. Ronald Thresher – CSIRO Marine and Atmospheric Research, GPO Box 1538,
Hobart, Tas. 7001 **Email:** Ron.Thresher@csiro.au; 03-62325378

Other Pis:

Dr. Jess Adkins – California Institute of Technology, 1200 E. California Road,
Pasadena California USA **Email:** jess@gps.caltech.edu; 1-626 395 8550

Dr. Alan Williams – CSIRO Marine and Atmospheric research, GPO Box
1538, Hobart, Tas. 7001 **Email:** alan.williams@csiro.au; 03-62325449



Scientific Objectives

Circulation of the Southern Ocean, its water mass distributions and their rates of production are key elements in the global climate system. However, there is only sparse historical information on the oceanography of the region that could be used to constrain and test models of regional and global climate change and variability, limited to a small number of ship-based observations widely scattered in space and time. To overcome this problem, we have developed proxies for deep-ocean conditions, based on the composition of deep-water corals. These proxies allow us to reconstruct temperature, possibly salinity, and ventilation rates in the deep-ocean at decadal and millennial time scales. However, our ability to apply these proxies to temperate Australian waters and the Southern Ocean is severely limited by a lack of coral specimens from known depths and locations. This is the first voyage of a joint Australian-US, two-vessel program to obtain coral samples from seamounts and associated habitats off southeast Australia, that will be used to fill in gaps in the paleo-oceanographic record and allow us to test directly for long term changes in ocean ventilation rates. As part of the project, we will also document in detail biodiversity in the recently established South-east Commonwealth Marine Reserve network, by photographing and sampling at depths to about 5000 m, covering the 80% of the marine protected areas about which we have little or no biological information. Plankton samples will also be collected opportunistically while sailing out of and into the port of Hobart, to assess cross-shelf distributions of coastal invertebrate larvae.

Voyage Objectives

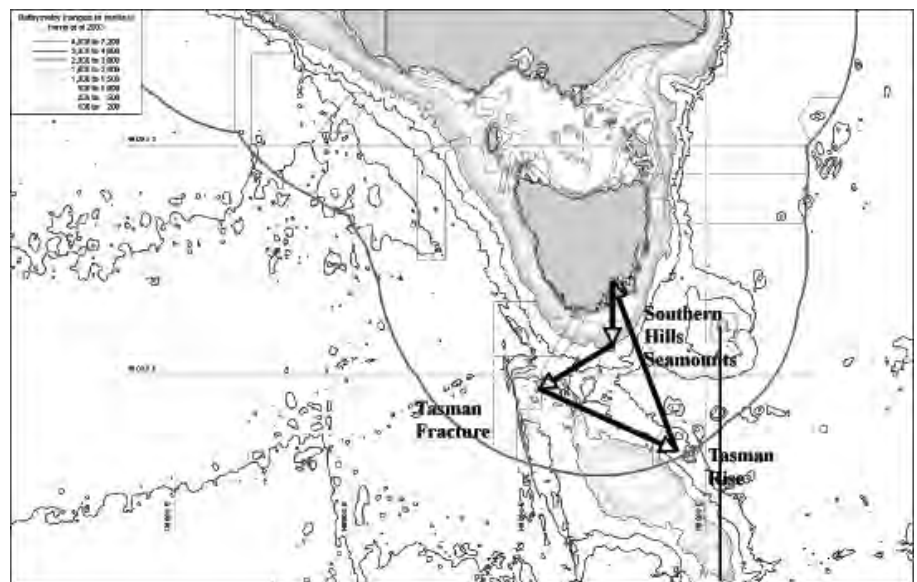
The major objective of the voyage is to determine the location of beds of high quality live, sub-fossil and fossil corals off SE Tasmania, that can subsequently be sampled on the follow-up US vessel voyage. This objective will be met by deploying the Woods Hole Autonomous Benthic Explorer (ABE), a non-tethered instrument specifically designed for survey work to depths of about 4000 m. We will do a preliminary identification of probable areas of interest based on analysis of high resolution topographic maps of the survey sites (already in hand), from results of previous trawl samples of the areas, and from existing CSIRO video from tethered underwater vehicle surveys. Three broad areas of interest have been identified: The Southern Seamounts, the Tasman Fracture Zone, and the South Tasman Rise, which will be sampled in that order and in that order of priority. At each site, the ABE will be deployed for up to 4 days, to undertake a series of 6-7 hour dives examining the substrate for suitable coral samples, the GPS locations of which will subsequently be recorded for subsequent benthic sampling.

The second major objective of the voyage will be to document biodiversity of the deep parts of the South-east Commonwealth Marine Reserve Network. Little or nothing is known about biodiversity for the more than 80% of the marine reserves

deeper than 1800 m, the current maximum depth for which there has been previous work. In part this objective will be achieved as an adjunct to the search for coral samples, as the video taken during that search will also be analysed for biodiversity. However, at least one day of ABE time will be allocated at each of the three primary sampling sites for surveys specifically to document biodiversity. Areas of particular interest will be located by their GPS coordinates, and sampled subsequently on the follow-up voyage. Depending on results, particular emphasis is likely to be placed on examining areas previously trawled scientifically or by fishers, to assess rates of reef growth and recovery, on assessing percent live coral cover in different locations and depths to assess reef health, and to comparing different video survey approaches (e.g., straight-line transects vs random point analyses, for example) to develop optimal strategies for future biodiversity surveys of the deep temperate reefs.

A third, and the lowest priority objective of the voyage is to collect surface plankton samples for invertebrate larvae while steaming across the shelf out of and back in to Hobart. No cross-shelf plankton sampling in the region has been done in over a decade, and the samples will be used to test hypotheses of the role of ocean currents on dispersal patterns of warmer water species moving spreading down the coast as an apparent response to global warming.

Voyage Track



Time Estimates

	No of days	Justification
Transit	2	Minimum travel time to Southern Hills from Hobart, and from South Tasman Rise to Hobart.
Research program	16	One day of equipment shakedown at first site (Southern Hills), followed by up to 5 days work at each of three sites, inclusive of travel time between sites Depending on his availability, the ship may divert to Maatsuyker Island 5 days into the cruise to drop off one participant (Alan Williams), before moving to the Tasman Fracture Zone.
Contingencies	3	“Extra” day at each site, as contingency for conditions too rough to deploy or retrieve the AOV
Mobilisation/demobilisation	4	3 days before and 1 day after the cruise to install and retrieve the ABE from <i>Southern Surveyor</i>

***Southern Surveyor* Equipment**

Equipment:

Simrad EA 500 sounder for bottom detection
ADCP
7.0 tonne knuckleboom crane
Trawl winch
Small epi-benthic sled

Services:

Echograms from the Simrad sounder
ADCP data
SWATH bathymetry
Swath seabed reflectance

User Equipment

The Woods Hole Autonomous Benthic Explorer and support container
0.5 m Bongo net

Personnel List

Ron Thresher	CMAR	Chief scientist
Jess Adkins	California Institute of Technology	Principal investigator
Karen Gowlett-Holmes	CMAR	Taxonomist
Alan Williams (first 5 days)	CMAR	Principal investigator
Dana Yoerger	Woods Hole Oceanographic Institution	ABE specialist
Andrew Billings	Woods Hole Oceanographic Institution	ABE specialist
Alan Duester	Woods Hole Oceanographic Institution	ABE specialist
Nithya Thiagarajan	California Institute of Technology	Student (Coral paleo-oceanography)
Anna Beck	California Institute of Technology	Student (Coral paleo-oceanography)
Anne Kennedy	Fugro	Swath Mapping Support
Robert Gurney (first 5 days)	CMAR	Principal investigator
Lisa Woodward (first 5 days)	CMAR	Observer
Drew Mills (MSIC ACM40503, ASO2348)	CSIRO MNF	Electronics Support/ Voyage Manager
Hiski Kippo (MSIC ACM40836, ASO2377)	CSIRO MNF	Computing support

This voyage plan is in accordance with the directions of the National Facility Steering Committee for the Research Vessel *Southern Surveyor*.

Ron Thresher
Chief Scientist