



2005 RV Southern Surveyor program

voyageplan

SS10/2005

Mapping benthic ecosystems on the deep continental shelf and slope in Australia's "South West Region" to understand evolution and biogeography and support implementation of the SW Regional Marine Plan and Commonwealth Marine Protected Areas.

Itinerary

Leg 1:

Depart Fremantle 1000 hrs, Friday 18th November 2005

Arrive Fremantle 1700 hrs, Wednesday 30th November 2005

Leg 2:

Depart Fremantle 0800 hrs, Thursday 1st December 2005

Arrive Dampier 1300 hrs, Wednesday 14th December 2005

Principal Investigators

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Scientific Objectives

The aims of the project are: 1) to apply targeted field-based observation to develop, test, refine and validate multiple use management frameworks developed for the SW Region as part of Regional Marine Planning under Australia's Oceans Policy, and 2) explore and characterise marine ecosystems of the SW Region.

Ecosystem-based, integrated regional marine planning for the Australian marine environment depends on the identification of natural regions as planning units. Therefore, there are near-term requirements for regionalisation and mapping at a range of relatively fine scales throughout the Australian Marine Jurisdiction (AMJ). Given the vast size of the AMJ and the cost of marine surveys, Australia needs to develop the most efficient and cost-effective suite of methods for surveys, and to establish a national mapping program using an optimal methodology. It has been argued for some time that the most cost-efficient way to conduct such surveys will be by using multibeam acoustics (swath mapping) together with an optimally-designed, targeted program of geological and biological 'ground-truth' sampling. However, despite the already-demonstrated benefits of multibeam acoustics for mapping the physical seabed at fine resolution (10s m) over intermediate scales (10s to 100s of sq km), there are still technical and methodological issues to investigate before a multibeam-based, optimised method for predictive and reliable habitat assessment is fully developed.

The data for this project are being collected during two surveys. Survey 1 was completed in July/ August (SS07/2005) when all the survey sites were mapped using multibeam acoustics, surveyed with the towed, high-resolution video system and sampled with sediment grabs. This second survey will run a reciprocal course and collect the complementary benthic invertebrate epifauna and infauna using benthic sleds. Two sled designs will be used: a robust, heavy design for rocky terrains and a light beam-sled for sediment terrains. There will be an emphasis of taxonomic effort on taxa that can be worked up to named species within 12 months (enabling comparison to pre-existing data); taxa that will be highly informative to biogeographic analysis (e.g. with limited dispersal mechanisms); taxa amenable to CO1 gene analysis "Bar-coding"; and commercial species. Surrogate-based metrics of biodiversity will be investigated based on morphotypes, and there will be a focus on those taxa amenable to monitoring (e.g. by non-destructive photographic sampling for MPA performance assessment).

Sampling is targeted at nested spatial scales of habitat – terrains of sediment and rocky substrata comprising features (mostly canyons and sediments terraces of the continental slope), within depth zones, across latitudes – to determine how biodiversity is distributed at particular scales. At the highest level, samples are allocated to enable comparison of the benthic bioregions off the west and southwest coasts of Western Australia: the Northwest Province, Central Western Transition Zone,

Central Western Province, South-western Transition Zone and Southern Province. To the extent possible, sampling will target sites that may become candidate sites for MPAs, or suited to the establishment of scientific reference sites, and that will demonstrate the different outcomes from alternative conservations strategies.

The survey program (two voyages) will address four primary objectives:

- 1) test hypotheses on the evolution and biogeography of Australia's biodiversity, in particular relating to species composition, distribution patterns and taxonomic surrogacy
- 2) validate and refine CSIRO's optimised methodology for mapping deep water benthic ecosystems on the western continental margin and in sub-tropical locations to enhance its application to natural resource management at a national scale
- 3) document the benthic biodiversity and identify areas of high conservation values in the context of Commonwealth MPA declaration
- 4) validate, and permit refinement of, a marine bioregionalisation during the development of the SW Regional Marine Plan by the National Oceans Office

Voyage Objectives

At depths of 100 m, 200 m, 400 m, 700 m and 1000 m on transects in focus areas, and 100 m and 400 m at latitude sites, sampling will:

1. Collect benthic invertebrate epifauna and infauna using benthic sleds
2. Fill gaps in the sediment sampling program from SS0705
3. Fill gaps in the swath mapping program from SS0705

Secondary objectives:

4. Collect water column acoustic backscatter at multiple frequencies
5. Process catches of benthic fishes taken by small trawler fishing in tandem (in the proximity of the T4 transect off Perth only, and subject to feasibility as a piggy-back project)

Voyage Track

Upper slope (~400 m isobath) between transects and focus survey areas, Fremantle to Fremantle via Albany, and Fremantle to Dampier (see Figure 1).

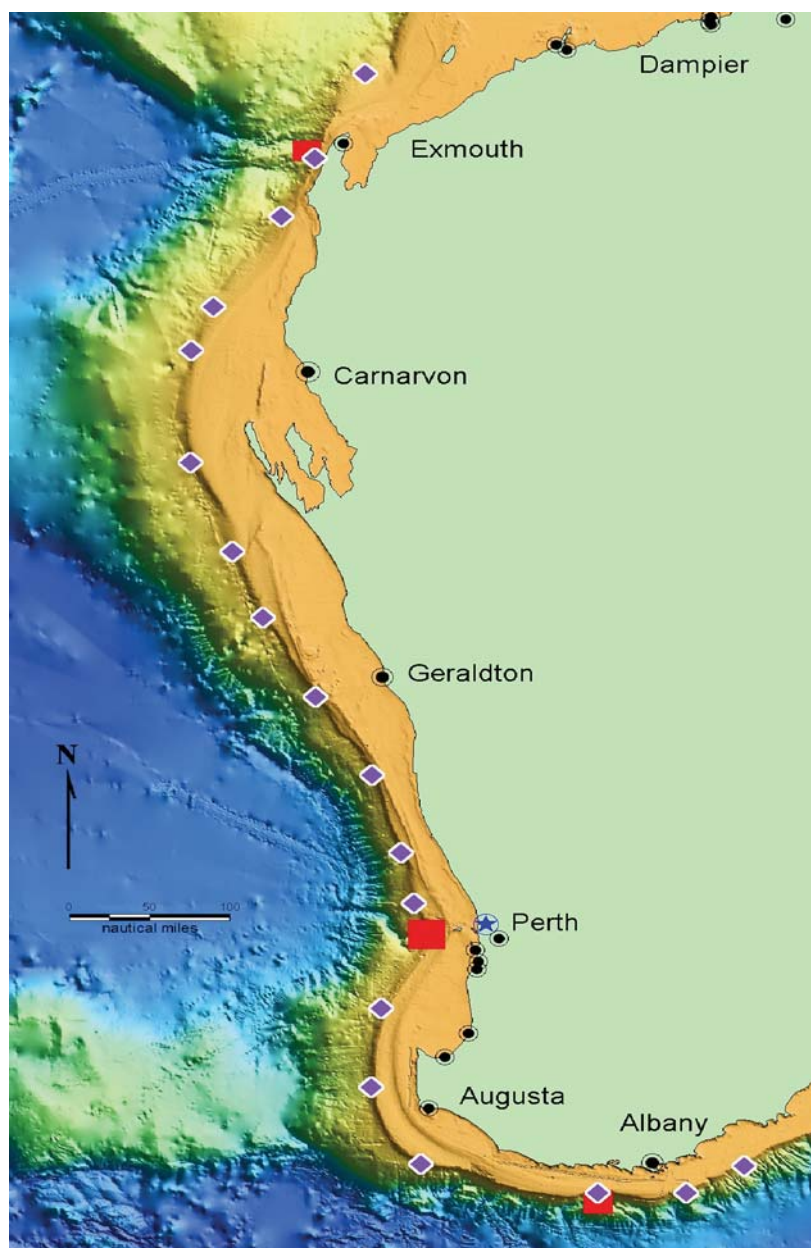


Figure 1: Map showing sample locations for “latitude” sites (purple diamonds) and “focus” sites (red boxes) as sampled during SS07/2005 and to be repeated during SS10/2005. Sampling is mostly within ~100 to 1000 m depth range, and at selected study sites (~100 to 1500 m depth). Individual samples will be targeted at different bottom types within key features of interest.

Time Estimates

Sampling strategy for SS10/2005	Distance or area (nm)	Time (days)
Leg 1		
Fremantle to Fremantle via Albany region	755	13
Staff transfer at Fremantle (Day 13)		
Sub-total (days)		13
Leg 2		
Fremantle to Dampier	940	14
Staff depart at Dampier (Day 27)		
Total (days)		27

Southern Surveyor Equipment

- Inmarsat B & C, Minisat M, Optus Mobilesat, CDMA - Voice/Data/Fax
- Navigation – One minute archiving of the underway data including Time, GPS position and bottom depth (plus DGPS within Optus mobiles at footprint)
- 3DGPS (for accurate heading, pitch and roll)
- Meteorological Data (temp, humidity, wind speed & dir, barometric pressure)
- Endeavour Navigation package
- Simrad EK 500 sounder (12, 38 and 120KHz)
- Simrad EM300 multibeam swath mapper
- TOPAS sub-bottom profiler
- Sea Surface Temperature and Salinity
- Sea Surface Fluorescence
- ADCP
- Lowered ADCP
- Smith-McIntyre grabs (2)
- Rock dredges (2)
- Woods Hole sleds (2)
- CTD (Seabird SBE 911 plus)
- Wet and Dry Laboratory Spaces
- Photo/Preservation Lab
- Walk-in Freezer
- Laboratory Fridges and Freezer
- UNIX Computers, Personal Computers
- Trawl winches with 4,500m of 24mm wire
- CTD/Hydro winches each with 7,000m of 8mm single core conducting cable
- Hydrographic A-frame (stbd)
- Stern A-frame (SWL 15 tonnes)
- 7 tonne knuckleboom crane
- Gilson winches (15 tonne, 5 tonne)
- Tugger winch (5 tonne)
- Sonardyne tracking system
- Scanmar net monitoring system (for use with benthic sled)

User Equipment

- Multifrequency acoustic pod on SS pole
- Sleds (Sherman and Beam)
- Biological sample preservation chemicals (alcohol and formaldehyde)
- Dewar with liquid nitrogen

Personnel List

Staff changeover is in Fremantle on Nov 30/Dec 1.

Leg 1

Alan Williams	CMAR	Chief Scientist
Mark Lewis	CMAR	Gear operations
Don McKenzie	CMAR	Gear operations/ Voyage manager (SST)
Bernadette Heaney	CMAR	Computing support (SST)
Andrea Cortese	GAS	Swath mapping
Peter Dunn	CMAR	NF electronics support
Karen Gowlett-Holmes	CMAR	Invertebrate taxonomy coordination
Penny Berents	AM	Invertebrate taxonomy coordination
Corey Whisson	WAM	Invertebrate taxonomy
Jane Fromont	WAM	Sponges
Jerome Mallefet	MV	Echinoderms
Tim O'Hara	MV	Echinoderms
Robin Wilson	MV	Polychaetes
Anna Syme	MV	Invertebrate taxonomy

Leg 2

Rudy Kloser	CMAR	Chief Scientist
Mark Lewis	CMAR	Gear operations
Don McKenzie	CMAR	Gear operations/ Voyage manager (SST)
Hiski Kippo	CMAR	Computing support (SST)
Andrea Cortese	GA	Swath mapping
Lindsay MacDonald	CMAR	NF electronics support (SST)
Gary Poore	MV	Decapods
Karen Gowlett-Holmes	CMAR	Invertebrate taxonomy coordination
Steve Keable	AM	Invertebrate taxonomy coordination
Mark Salotti	WAM	Sponges
John Keesing	CMAR	Echinoderms
Shirley Slack-Smith	WAM	Molluscs
Anna McCallum	MV	Invertebrate taxonomy
David Staples	MV	Invertebrate taxonomy

Note: CMAR, CSIRO Marine and Atmospheric Research; GA, Geoscience Australia; MV, Museum Victoria; WAM, Western Australian Museum; AM, Australian Museum; SST, System Support Technician.

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

Alan Williams/ Rudy Kloser
Chief Scientists