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Franklin Voyage Plan/Summary No. FR05/00

Title

Seismic structure and sedimentary setting of coral reef systems of the Northwest Shelf, Rowley Shoals, Scott and Seringapatam Reefs: implications for global sea level and climate during the Quaternary.

Itinerary

Depart Darwin, 1000 hours, Wednesday 12 July, 2000
Arrive Broome, 1000 hours, Tuesday 1 August, 2000

Principal Investigator

Dr Lindsay Collins
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Scientific Objectives

Little is known of the geological history and sedimentary setting of shelf-edge reefs on Australia's Northwest margin. This study will investigate the continental shelf substrate, in depths of 200-500m, from which the reefs arise, and the reef platforms themselves within the limits of available access.

- 1) Determine the sedimentary and structural setting of outer ramp reef systems of the Northwest Shelf;
- 2) Assess the Quaternary morphology, growth history and structure of the reef systems;

- 3) Determine the relationship and extent of Holocene versus Pleistocene phases of reef growth;
- 4) Assess the feasibility of obtaining 'long' Holocene stratigraphic, sea level and palaeoclimatic records from the reef systems, and
- 5) Record and map seabed roughness of sedimentary substrates using sidescan and sonar data equipment, in conjunction with ground truth obtained from geological traverses.

Cruise Objectives

- 1) Bottom samples at specific sites, using an epibenthic sled to acquire both sediment and living biota. Both soft-bodied (algae, sponges, ascidians) and calcareous organisms (bryozoans, molluscs, brachiopods, corals, echinoids, foraminifers) will be studied and contributed to the WA Museum collection.
- 2) Precision depth recorder profiles and seismic profiles to confirm seafloor and submerged reef morphology, pick paleostrandlines, determine lowstand sedimentary systems, and fix samples. Remotely sensed substrate data will also be collected in conjunction with seismic and PDR profiles.
- 3) Temperature and salinity profiles at all sites to obtain a picture of seawater structure and bottom conditions at the time of sampling; CTD profiles and ADCP records to monitor ocean dynamics.
- 4) Samples of seawater for chemical analysis, particularly organics, trace elements and isotopes (stable isotopes and Sr isotopes).
- 5) Bottom colour photographs and videos of specific sites to obtain substrate, biota and facies information.
- 6) The program for selected sites at reef systems will include seismic profiling and surface rock/reef and sand sheet investigation using a suitable small vessel carried on-board. Safe operating conditions and suitable weather will be critical.

Cruise Track and Time Estimates

The areas of operation are the region of Scott Reef/ Seringapatam Reef, the Rowley Shoals, and the shallow Continental Shelf west of Broome (see Fig. 1). The cruise can be subdivided into the following stages: -

- 1 Travel Darwin to 14° 30 S, 123 ° 30 E, near Browse Light, Chart Aus 314 (2 days).
- 2 Scott Reef/ Seringapatam Reef Project.

a) Outer Shelf traverses: - sediment sampling, seismic profiling, water sampling, shallow coring (3 days).

b) Reef platform seismic lines and sediment sampling – see Chart Aus 43. Franklin and deployed small vessel program: small vessel operations subject to weather and tides. Backup and communication support requested from Franklin and its emergency vessel. (4 days)

3 Travel Scott Reef to Rowley Shoals (17° 30S; 120° 30E; Aus 415) (1 day).

a) Outer Shelf sediment sampling, seismic profiling, shallow coring, water sampling (3 days).

b) Reef platform seismic lines and sediment sampling. Small deployed vessel program: operations subject to weather and tides. Backup requested from Franklin and its emergency vessel (5 days).

(Note: program flexibility is likely to be needed between a) & b) program components due to weather and operational limits to platform sampling (b).

4 Travel to nearshore Broome (18° 00S, 122° 00E) (0.5 days).

5 Nearshore sediment sampling program: sediment, water and shallow seismic sampling grid. (2 days).

6 Arrive at Broome. Total: 20.5 days.

Piggy-back Projects

Title: Sedimentation at the Browse Basin margin.

Principal Investigator: Dr Geoff O'Brien, AGSO.

Note: 1.5 days have been allowed for sediment sampling for AGSO, requiring a small deviation from the cruise track to collect sediment samples, en route from Darwin to Scott Reef.

Franklin Equipment

- Container laboratory
- Sediment gravity corer
- Epibenthic sled

- Smith-Macintyre sediment sampler
- CTD, ADCP, PDR, XBT

User Equipment

- Seismic - boomer & sparker (AGSO equipment) +5 Kva generator & fuel.
- Sampling equipment: U/W video & camera, camera, core liners, pipe dredge, van veen grab sampler, bins, shovels, trowels, stool, sieves.
- Hydro –1 litre bottles, reagents.
- Biol - sample storage drums, reagents.
- Small vessel, 5 m length with dry space, for reef platform seismic program (to be stored on deck during transit and deployed for reef investigations).
- Other: Binocular microscopes, island/platform sampling equipment, PVC core liners, charts, etc., GPS (hand held) sample storage bags reef sampling equipment (hammers, ridges), 5 KVA generator & fuel.

Personnel List

Lindsay Collins, Chief Scientist, Curtin University
Shirley Slack-Smith, Biologist, WA Museum
Jason McMullan, sedimentologist, Curtin University
James Tyrell, sedimentologist, Curtin University
Roslyn Wallace, geochemist/sedimentologist, Curtin University
Kriton Glen (or alternate), Seismic specialist, AGSO
Steve Thomas, Seismic specialist, AGSO
1 scientist - TBA
Don McKenzie, Cruise Manager, CSIRO Marine Research
Val Latham, Hydrochemistry, CSIRO Marine Research
Mark Underwood, Electronics, CSIRO Marine Research
Bernadette Heaney, Computing, CSIRO Marine Research

Lindsay Collins
April 2000



Figure 1. Proposed Cruise Track for FR05/2000 (shows location of Rowley Shoals, Scotts Reef, Seringapatam Reef and Northwest Shelf).

Updated: 31/01/03



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