

VOYAGE PLAN SS04/2003

Title

Sources and sinks of terrigenous sediments in the southern Gulf of Carpentaria.

Itinerary

Depart Cairns 1000 hrs, Friday 9 May, 2003

Arrive Darwin 1000 hrs, Tuesday 10 June, 2003

Principal Investigator

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Scientific Objectives

The southern Gulf of Carpentaria contains Australia's largest shelf province of terrigenous-dominated sedimentation. It is an area of over 100,000 km² where surface sediments have an average terrigenous content exceeding 50%. The adjacent coastline is characterised by prograding depositional environments (deltas and chenier plains), indicative of large sediment discharge from the hinterland to the coast throughout the Holocene. Our objective is to identify and quantify sediment sources, sinks and the Late Quaternary history of terrigenous sedimentation in the southern Gulf of Carpentaria. This information is of fundamental importance for understanding the evolution of this shelf province, and for the successful management of regional river catchments and the adjacent offshore environment.

The strategy would be to conduct intensive swath bathymetry & Chirp sonar surveys and sediment coring in key selected areas: (A) inner shelf zone of low-energy, distal-deltaic sedimentation, off the Norman River; (B); inner mid-shelf zone of strong tidal currents adjacent to Mornington Island and (C) low energy Carpentaria Basin sedimentation. The sedimentary processes characterising each area are suggested by the results of wave and tide current modelling and a second aim of the study would be to validate the model predictions for this region. The total ship time requested is 27 days in the southern Gulf of Carpentaria.

Cruise Objectives

- To identify and quantify sediment sources, sinks and the Late Quaternary history of terrigenous sedimentation in the southern Gulf of Carpentaria,
- To locate and map areas on the shelf characterised by modern terrigenous deposition,
- To derive sediment budgets representative of the main depositional environments,
- To date the onset of Holocene, pro-deltaic to distal deltaic/open shelf terrigenous sediment deposition as a function of distance from the coast.
- To validate the GEOMAT sediment mobility model and its prediction of southward oriented maximum tidal current vectors adjacent to Mornington Island.

Cruise Track

The proposed survey track lines and detailed survey areas are shown in Figures 1, 2 and 3. There are approximately 440 miles of regional survey tracks plus detailed swath mapping surveys in 3 areas. Each of the detailed survey areas will be approximately 10km x 10km square. A port call is planned in Weipa at an appropriate time during the voyage to refuel Southern Surveyor.

Time Estimates

The survey will begin with a regional swath/seismic survey along track lines shown in Figure 1. Lines will be run in order from 1 to 5. The ship will stop every 20 nautical miles to conduct a station where the CTD, Camera and sediment grab sampler will be deployed. This track is a total of 440 nautical miles which at 5 knots requires 88 hrs. About 20 stations would be occupied along these lines requiring a further 12 hrs. Way points for the regional survey are as follows:

Line 1.	SOL	14° 10'S	140° 12'E
	EOL	17° 17.5'S	140° 12'E
Line 2.	SOL	17° 17.5'S	140° 12'E
	EOL	16° 51'S	140° 51'E
Line 3.	SOL	16° 51'S	140° 51'E
	EOL	16° 51'S	139° 47.5'E
Line 4	SOL	16° 51'S	139° 47.5'E
	EOL	16° 30'S	140° 56'E
Line 5.	SOL	16° 30'S	140° 56'E
	EOL	16° 30'S	139° 52.5'E

At the end of line 5, we will deploy the current meter frame (BRUCE), and conduct one further station (CTD, camera, grab), before proceeding to Area "A".

[Regional Tracks and Stations, Time subtotal = 4 days]

Exact selection of the survey areas will be based on the results of the long survey lines. However, indicative centre-point coordinates for the 3 survey areas are as follows:

Area A: 16° 51' S, 140° 16.5' E

Area B: 16° 30' S, 139° 55' E

Area C: 14° 56' S, 140° 12' E

The swath mapping surveys will include an average of 90, 10 km length (= 490 miles), equally spaced survey lines to give 100% sonar coverage. Survey speed is 5 knots, making a total of 4 days survey time per area. Sampling work at 20 stations per area will require an additional 72 hours (3 days). Three and a half hours per station is needed for deployment of equipment at each station (vibrocorer, grab, camera and CTD) to allow extra time to reposition the ship between stations plus to allow for 180 miles transit time between the 3 survey areas.

After swath mapping and sampling Area A, we will proceed to Area B. On completion of mapping and sampling Area B we will collect the current meter BRUCE. Details of surveys in Areas A and B are shown in Figure 2.

Proposed time for refuelling stop in Weipa.

After refuelling at Weipa, proceed to Area C and complete swath survey and sampling. Details of survey in Area C is shown in Figure 3. On completion of this work, the scientific part of the cruise is over — proceed to Darwin.

[3 Swath Surveys and Stations @ 7 days per area, Time subtotal = 21 days]

[Total science time on location = 25 days]

Southern Surveyor Equipment

CTD (including Transmissometer)

Smith-Macintyre Grab sampler

Underway data sets (T, S, Meteorology, bathymetry, etc.)

User Equipment

- Deployment of BRUCE instrumented frame (LISST laser particle sizer, Seabird CTD, Nortek acoustic current meter plus two OBS sensors).
- EG&G Boomer Seismic system
- Vibrocorer with 6m aluminium tower
- Bottom video camera system with armoured cable
- Chirp acoustic profiling (towed system)
- Hull-mounted swath bathymetry system

Personnel List

1. Peter Harris (GA) — Chief Scientist
2. Andrew Heap (GA) — Co-investigator
3. Vicki Passlow (GA) - Sedimentology, biological sampling
4. Laura Sbaffi (GA) - Sedimentology, biological sampling
5. Rick Smith (GA) - Computer support; bathymetry, water sample analysis
6. James Daniell (GA) - Computer support; swath bathymetry
7. Cameron Buchanan (GA) - Computer support; swath bathymetry
8. John Stratton (GA) Technician (sediment sampling, core operation)
9. Lyndon O'Grady (GA) Technician (sediment sampling, core operation)

10. Kevin Hooper (JCU) - Electronics Technician (Swath system and Chirper)
11. Pamela Brodie (CMR) Voyage Manager and Computing
12. Stephen Thomas (CMR) Electronics

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

Peter Harris
Chief Scientist

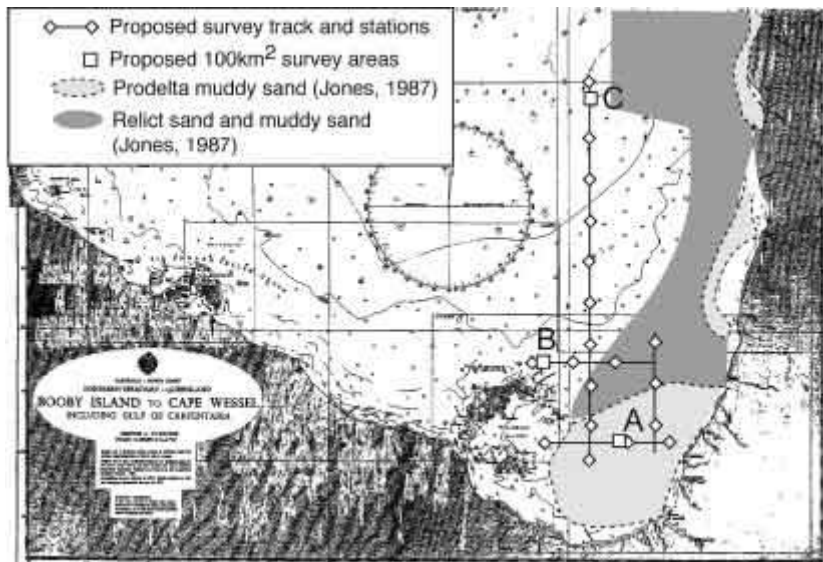


Figure 1. Aus Chart 410 showing the proposed survey areas in the southern Gulf of Carpentaria. Note each survey area will be approximately 10km x 10km square. Regional survey lines and surface grab samples will be collected along the lines as shown. Previously interpreted surface sediment facies of Jones (1987) are indicated.

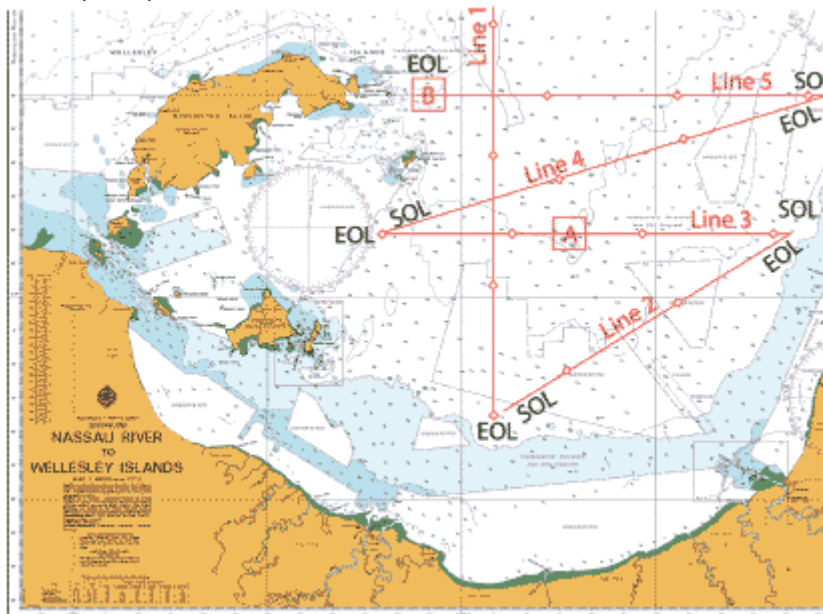


Figure 2. Details of proposed cruise track and mapping /sampling in areas A and B, on AUS Chart 303. The current meter mooring (BRUCE) will be deployed in area B.

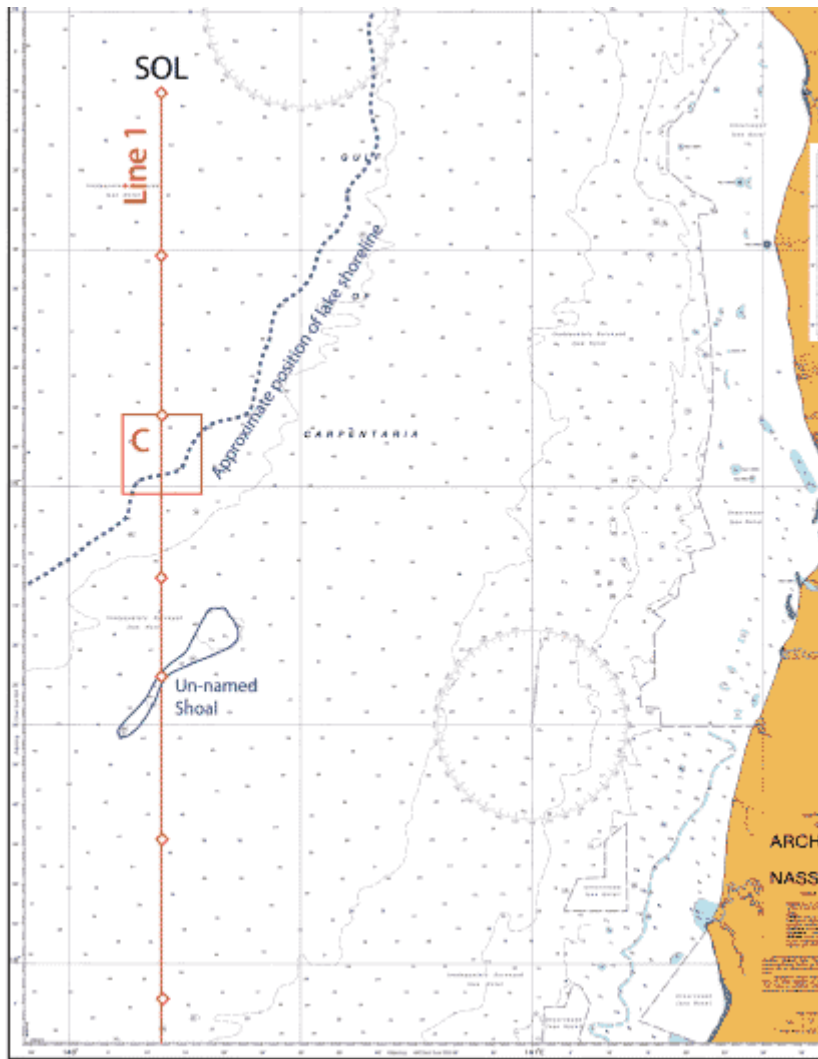


Figure 3. Details of proposed cruise track and mapping /sampling in area C on AUS Chart 302. The target area is the relict Lake Carpentaria shoreline, located in approximately 53 m water depth.