

VOYAGE PLAN SS03/2003

Title

A New Mechanism for Supply of Sand to Deep Water: The Eastern Australian Longshore Transport System

Itinerary

Depart Brisbane 1000 hours, Saturday 12 April 2003
Arrive Cairns 1000 hours, Saturday 26 April 2003

Principal Investigator

Assoc. Professor Ron Boyd
Geology Building
School of Environmental and Life Sciences
University of Newcastle
New South Wales Australia 2308
Phone: (02) 4921 5744, Fax: (02) 4921 6925
Email: ron.boyd@newcastle.edu.au

Scientific Objectives

The objective of this project is to evaluate the ability and capacity of the Eastern Australian longshore sediment dispersal system to supply sand to deep water at the Fraser Island (northern) end of the system. An associated aim is to determine the suitability of this mechanism as a model for deepwater hydrocarbon exploration. Subordinate objectives include determining the bed-load sediment dispersal system around Breaksea Spit and Shoal by surveying the bed-forms by swath mapping, seismic and core sampling, and investigating the presence of submarine canyon systems that penetrate to less than 50 m water depth on the upper continental shelf. Taken together these surveys will establish a linked sediment dispersal system from shoreline, across the shelf and down the slope. Deeper surface sediment sampling will determine the extent of the system down the slope and onto any potential submarine fans.

Voyage Objectives

The voyage will satisfy the scientific objectives by:

1. Collecting a grid of sediment samples that characterise the sand on Breaksea Spit and Breaksea Shoal and adjacent continental shelf through grain-size analysis and grain composition (e.g. by establishing sediment tracers through distinctive mineralogy). This will build on earlier shoreline sampling on Fraser Island and in shallow water < 20 m on an earlier voyage.
2. By collecting an associated grid of sediment samples from the upper continental slope and any deep water submarine canyon systems and comparing the sediment texture and composition to the shallow water samples collected in #1.
3. By collecting a detailed grid of ADCP current measurements to indicate the strength and direction of the currents in the study area and to infer the direction of bed-load sediment transport from the current measurements.

4. By collecting a grid of swath mapping transects in the area between Breaksea Spit and Shoal and the upper continental shelf to map the distribution of bed-forms, their scale and migration and the presence and character of any canyons on the upper slope.
5. To collect a grid of seismic profiles to detail the thickness of the sediment bodies in the area and their internal character to indicate sediment transport capability.
6. To collect a small number (5-10) of vibro-cores up to 6 m long to detail the subsurface character of the sediment deposits in the area, the internal character of the bed-forms and to locate materials suitable for dating to determine the age of the deposits and how long the system has been operating for.

Voyage Track

See attached 3 figures.

Time Estimates

The voyage should require 11 days of data collection, plus one day of transit either side of the voyage. The majority of voyage time will be taken up with collecting a tight grid of swath mapping and seismic transects parallel and perpendicular to the shelf to determine the bed morphology and at the same time collect a detailed set of ADCP current data.

All data collection on Southern Surveyor will be undertaken in water depths greater than 20 m but substantial time will be spent in water depths of 20-50 m. In addition to swath mapping, most transects will also collect boomer seismic data and Chirp Sonar data at the same time. This will be the approach if the swath mapper and the ADCP can be deployed simultaneously. If not, some of the track lines will need to be re-run with just ADCP and boomer/chirp data sources operational. Each track line will be approximately 10 km long and 100m apart with 6 days of data collection required for a detailed survey grid of approximately 150 square km. Ideal cruising speed for swath mapping and seismic data collection will be approximately 5-6 knots or 10 km/hr.

The other 4 days of the voyage will be taken up by a grid of Smith MacIntyre grab samples and vibro-cores ranging over the 15 km zone but also (for grab samples only) up to 100 km radially seaward into water depths of 4000m. If we are unsuccessful in locating the sand deposits in the initial survey area we may widen our search up to 100 km north or south along the slope from Breaksea Spit.

At present, after consultation with CSIRO personnel, we plan 3 days of installation for the swath mapping system in Hobart prior to departure on the ship for Brisbane and the commencement of the voyage.

Note that a detailed timetable for the voyage is not possible prior to arriving in the area. Much of the work is weather dependent. Hence if weather is rough on the ocean side, we will work in the channels or behind Breaksea Spit. Core sites and sample sites will only be chosen after bathymetric and seismic surveys are completed. Hence bathymetric and seismic surveys will be interspersed with sediment sampling throughout the voyage depending on conditions. Due to high current velocities expected in the region, sampling may only be conducted at slack water at either high or low tide at some locations. When conditions are unsuitable for bathymetric and seismic surveying we will conduct bottom sediment sampling as this can be done in rougher weather and deeper water.

Southern Surveyor Equipment

The majority of equipment required on this voyage is standard. We require grab samplers and the ADCP current metering system together with detailed GPS navigation (high accuracy required for swath mapping). Ideally we would request a number of Smith MacIntyre grab samplers and a range of AGSO style dredges. One possible additional requirement would be for sufficient cable to enable bottom samples to be taken in at least 3500m water depth. With the potential for fast East Australian Current in this area, 5000m of cable would be a minimum requirement on the sample winch and it may be an advantage to have some additional cable available to add to the winch, perhaps an extra 1-2000 m. We understand that there will be 7000 m of cable available on the hydrographic winch. We note that a log of bathymetry is recorded every 1-3 minutes but request that a more frequent log be kept and recorded in the survey areas, perhaps every 10 seconds.

User Equipment

We will be using the JCU Reson swath mapping system as deployed previously on Franklin. We will also take along the JCU Chirp Sonar sub-bottom profiler and a surface towed seismic boomer system. For sub-bottom sample collection we will be taking the JCU vibro-core. If CSIRO has no dredge samplers on board Southern Surveyor, we will bring at least one sediment dredge.

In addition we will be bringing two desktop computers and two laptop computers to log data and write reports, a scanner, printer and associated peripherals. The swath mapping system requires room to operate several electronics boxes, as does the Chirp profiler. The boomer system requires 240 volt power and around 7 Kva power supply. The seismic system requires space for an associated EPC graphic recorder, ideally situated in a vented area (the fume cupboards were previously utilized on Franklin). The swath mapper requires deployment from the moon pool as discussed with CSIRO staff. The seismic system requires deployment from booms on both sides of the ship capable of extending the equipment beyond the ship wake approximately 20 m aft of the stern. The vibro-corer requires 415 volt power and deployment from the back deck through the A frame. Note vibro-core and boomer deployment to be confirmed after logistics discussions between Kevin Hooper (JCU) and CSIRO during November 2002.

Personnel List

Ron Boyd, University of Newcastle, Chief Scientist
Ian Goodwin, University of Newcastle, Research Scientist
Kevin Ruming, University of Newcastle, Research Scientist
Jason Roberts, University of Newcastle, Research Student
Kevin Hooper, James Cook University, Technician
Simon Lang, NCPGG, Research Scientist
Gavin Mantle or Michael Aird, University of Newcastle, Research Student
Ron Plaschke, Voyage Manager, CMR (CSIRO Marine and Atmospheric Research)
Mark Underwood, Electronics, CMR
Bob Beattie, Computing, CMR

Please note that this is a preliminary list and student participants are subject to change. We request at least one electronics technician to relieve Kevin Hooper.

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

Ron Boyd
Chief Scientist

Figure 1.
Location Map - Breaksea Cruise Area

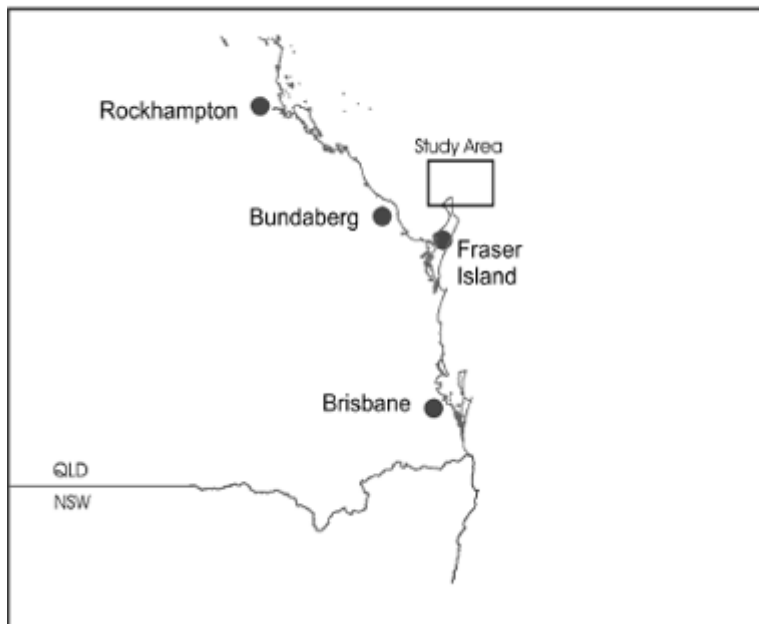


Figure 2.
Breaksea Spit Cruise Areas

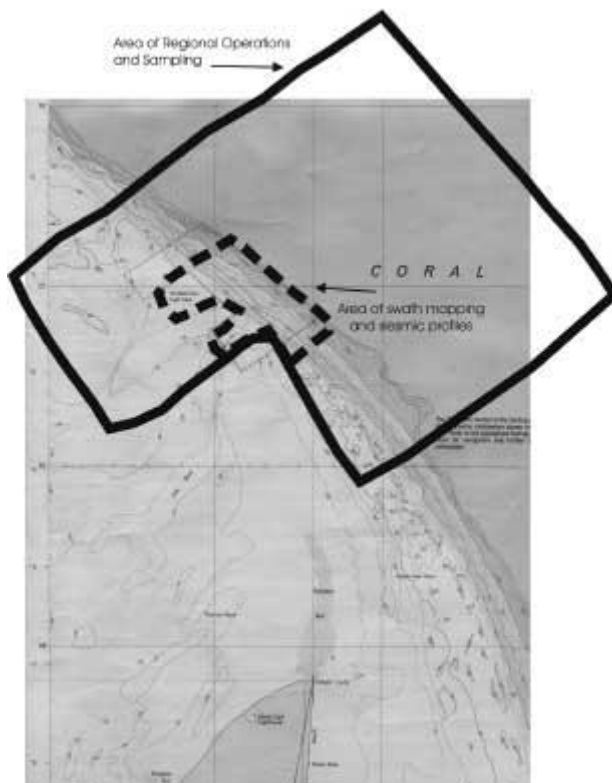


Figure 3.
Breaksea Spit Study Area - Swath Mapping/ Seismic Profiles

