

FRANKLIN

National Facility
Oceanographic Research Vessel

RESEARCH SUMMARY

CRUISE FR 6/94

Sailed Adelaide 0930 hrs Thursday 23 June 1994
Arrived Adelaide 0915 hrs Tuesday 5 July 1994

SOUTHERN AUSTRALIAN MARGIN

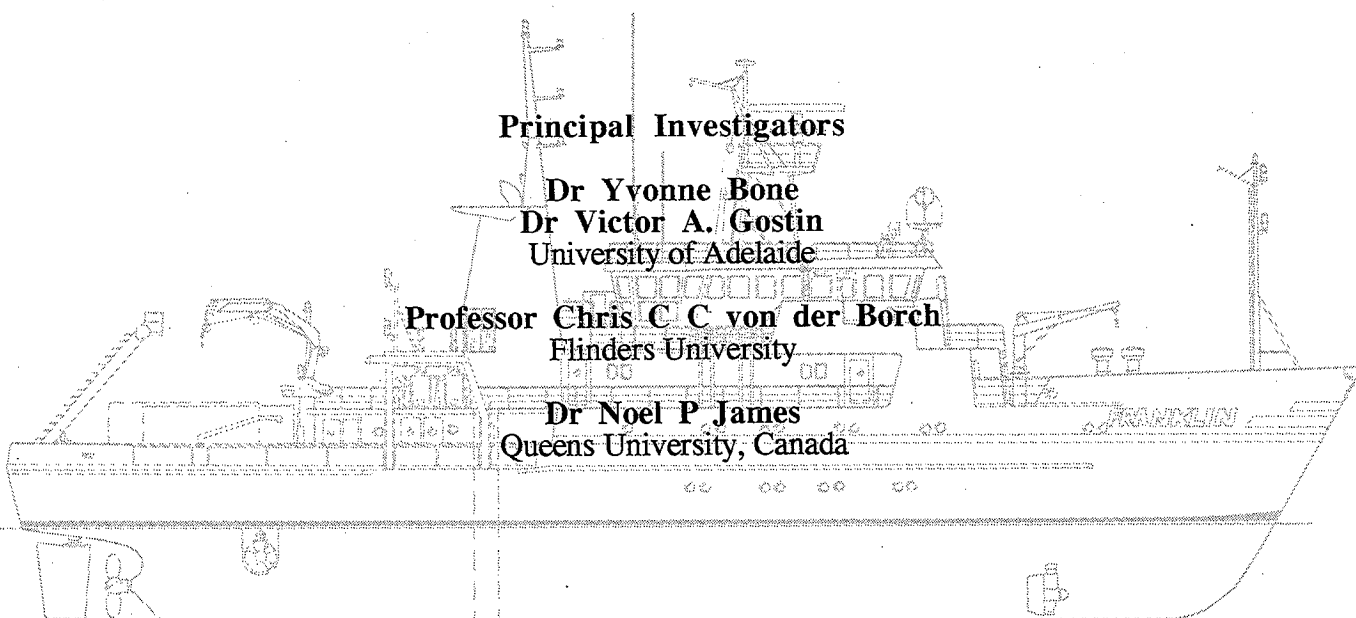
COOL-WATER CARBONATES AND GEOLOGICAL HISTORY

Principal Investigators

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RESEARCH SUMMARY FR 6/94

1 Itinerary

The vessel departed Berth 5, Port Adelaide, at 0000h, June 23rd [local time 0930h, June 23rd]. The cruise ended with the vessel docking at Port Adelaide, at 2345h, July 4th [local time 0915h, July 5th].

2 Scientific Program

Cruise objectives were to:

- 1 Increase understanding of cool-water carbonates.
- 2 Obtain high-resolution sub-bottom profiles to determine Neogene and Quaternary structures and geological history.
- 3 Determine sediment distribution and dynamics on a major east-west oriented open-platform continental shelf fronting a long-fetch open ocean viz. the Southern Ocean.
- 4 Determine distribution of bryozoans, sponges and other invertebrates, and catalogue bryozoan species present.
- 5 Obtain basic physical oceanographic measurements [CTD and XBT] for the continental margin to gain insight into oceanographic parameters that may affect biofacies distribution.

The cruise was geoscientific, and utilized various techniques including precision depth recording, seismic profiling with a multi-electrode sparker unit, rock and sediment dredging and grabbing, water sampling, temperature profiling and seafloor photography.

This is the third cruise investigating these parameters along Australia's southern margin, and shall be followed by a fourth, further westwards in the Great Australian Bight, in 1995.

3 Principal Investigators

Dr. Y. Bone, Department of Geology and Geophysics, University of Adelaide. and Prof. N.P. James, Department of Geology, Queens University, Ontario.

The non-CSIRO contribution to the cruise was provided by the Aust.Res.Council, the Australian Geological Survey, Canberra, and the Natural Sciences and Engineering Research Council of Canada.

4 Results

A total of 69 dredge seafloor samples were collected, as well as 7 camera tows, and 23 XBT and 8 CTD deployments. Some 325 nautical miles of high resolution seismic data were obtained along five transects. The above data will be cross-linked onshore; for example, seafloor samples and camera stations will be plotted on bathymetric profiles and related to other datasets.

Much of the data analysis for cruise FR 06/94 will be carried out onshore by several research groups. This will include detailed morphological analysis using the bathymetric and seismic profiles, and detailed lithofacies and biofacies analysis will be done using samples obtained with the pipe dredges, epibenthic sled, analysis of the deep-sea camera results; analysis of δO^{18} , δC^{13} , sediment geochemistry, brachiopod geochemistry; and identification of animals collected.

The pipe dredge and epibenthic sled samples already have added considerably to our knowledge of surface facies distribution in the critical and dynamic zone of the outer shelf and shelf break. It is now possible to characterize the boundary between outer shelf bryozoan grainstones, upper slope bryozoan wackestones, and the more basinward pelagic ooze. In addition, samples of actual carbonate rock were dredged from ~200m which hopefully will allow interpretation of the previously observed prograding clinoforms and unexplained mounds or ridges on the outer shelf. However, the source of the large volumes of bryozoal debris has not yet been clearly identified. The biological specimens from the dredge and sled are important additions, particularly of small animals, to the collections of the South Australian Museum.

The multi-electrode sparker unit, operated by Dave Feary and Claude Saroch proved a great success. Records were excellent and should provide a geological history of the shelf and shelf margin. The location of shelf-margin sealevel lowstands was not clearly defined on any of the five transects.

The deepsea camera [Benthos], on loan from AGSO, apparently operated well, although final results will depend upon onshore film development.

XBT casts were run on all transects (23 in total). Eight CTDs, with 8-12 water samples per cast were taken near the ends of the transects. Phosphate and silica were analysed on all samples and isotope analyses will be performed onshore.

Finally, weather conditions in the Southern Ocean provided the greatest challenge for data gathering. Conditions were sometimes too rough camera deployments, resulting in the dependence upon sediment dredging and bathymetric profiling, which nevertheless provided very useful data.

5 Cruise Narrative

The following narrative and all cruise records data were recorded in local South Australian time for both times and dates.

DAY 1 [June 23] Departed Port Adelaide at 0930h on June 23, 1994. Proceeded towards the most distant point of the research program. Progress was slow due to very strong winds and high seas.

DAY 2 [June 24] Continued to sail. No change in weather.

DAY 3 [June 25] Weather still too rough for any sampling or geophysical work. At 1700h the weather had improved and we deployed the sparker at Point A and proceeded to profile.

DAY 4 [June 26] Weather improved greatly. Completed profiling at 1200h. Began dredging back along the same profile, on sites determined by the seismic profile. The effective pipe dredge lived up to its reputation and delivered sediment samples on virtually every deployment.

DAY 5 [June 27] Continued dredging until 1230h, then returned to Site 8 at 250-300m to photograph the sea floor with its prolific biota. Sailed to the next seismic line and started profiling at 1800h. The weather continued to improve.

DAY 6 [June 28] Seismic profiling continued until 0900h, and dredging commenced. The Smith-McIntyre sediment grab was found to be invaluable for collecting relatively undisturbed samples of the sediment-water interface. Seismic profiling was done overnight along the next transect.

DAY 7 [June 29] Seismic profiling ended in Sleaford Bay in the early morning. The weather was perfect. Seafloor sampling was carried out, back along the same profile.

DAY 8 [June 30] Superb weather all day. Seismic profiling along the next transect until 1500h. Seafloor sampling then took place. Given that the weather report was of an approaching change, it was decided to continue sampling all the remaining sites. Seafloor photographs were also obtained.

DAY 9 [July 1] Weather became more windy. Sea floor sampling continued until late when rough seas stopped all operations. Sailed north towards Investigator Strait

DAY 10 [July 2] Very Rough seas and strong northerly winds. At midday, the Captain decided to head for Port Lincoln so as to exchange the Chief Engineer due to ill health. A rendezvous with the Pilot Boat occurred at 2015h. We then sailed to a site within Marion Bay, in the lee of Yorke Peninsula.

DAY 11 [July 3] The weather improved and several more sites in Investigator Strait were sampled. Decide to attempt a return to sampling and profiling the original and last transect. Took several successful samples from the upper continental slope.

DAY 12 [July 4] Ran a seismic profile back along the transect. Weather reasonably good but with high swell. Excellent seismic profile of the shelf edge. Seismic profiling ended at 1700h and dredge sampling began off the northern coast of Kangaroo Island.

DAY 13 [July 5] The vessel then sailed to Port Adelaide, to offload the scientific party.

6. Summary

In spite of the winter setting, and the loss of several days through bad weather, cruise FR 06/94 was a definite success. Most of the objectives were met, and post-cruise analysis should add considerably to our geological knowledge of the southern continental margin. The scientific party would like to acknowledge the Captain, mates and crew of *Franklin* for their thorough professionalism and friendly co-operation. *Franklin* has once again proven to be an excellent and well-designed research vessel, well suited to this type of geoscientific work. The CSIRO personnel [Cruise manager and electronics specialist], Bob Beattie and Phil Adams, were thoroughly competent and co-operative. Their skill and help, both in the Operations Room and on deck, made data gathering possible. Special compliments must be made to both chefs for their excellent food during this voyage.

7 Personnel

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Jeff Lukasik		Department of Earth Science Dalhousie University Halifax, Nova Scotia, Canada
Bob Beattie Phil Adams	[Cruise Manager]	CSIRO - ORV CSIRO - ORV

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Y. Bone
Chief Scientist
5th July 1994, Adelaide, South Australia .

Franklin cruise 6/94

