FRANKLIN

National Facility
Oceanographic Research Vessel

RESEARCH SUMMARY

CRUISE FR 2/91

Sailed Adelaide 0815 Tuesday 15 January 1991
Called Portland Monday 28 January 1991
Arrived Hobart 1045 Wednesday 30 January 1991

Principal Investigators

Professor Chris von der Borch
Flinders University of South Australia

Drs Yvonne Bone and Vic Gostin
Adelaide University

Dr Noel James
Queens University, Toronto

SOUTH AUSTRALIAN MARGIN: COOL-WATER CARBONATES AND GEOLOGICAL HISTORY

17 February 1991

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AUSTRALIA

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RV FRANKLIN
RESEARCH CRUISE FR 02/91

CRUISE SUMMARY

1. Itinerary

Sailed Berth 29, Port Adelaide,	at 2115h, Jan. 14th [local time 0815h, Jan 15th].
Arrived Portland	at 2100h, Jan 27th. [local time 0800h, Jan. 28th]
Sailed Portland	at 0100h, Jan 28th [local time 1200h Jan 28th]
Arrived Hobart	at 2330h, Jan 29th [local time 1030h Jan30th.].

2. Scientific Program

Cruise FR 02/91 concentrated on a GLORIA sidescan and SEABEAM bathymetry database, encompassing the Beachport Plateau, Sprigg Canyon and surrounds, and the Murray Canyon, South Australia [Fig.1]. This database was collected by HMAS Cook in 1989.

The present cruise was geoscientific, and utilized various techniques including 3.5 kHz seismic profiling, precision depth recording, piston and gravity coring, rock and sediment dredging and grabbing,water sampling, temperature profiling and seafloor photography. Cruise objectives were to:

1. Define surface sediment facies distribution and control in the critical transition zone across the outer continental shelf and upper slope.
2. Outline shelf-margin depositional and erosional processes in a coolwater carbonate shelf setting, including the problem of lowstand sediment transfer.
3. Ground-truth the GLORIA and SEABEAM mosaics.
4. Characterize possible shelf-margin sealevel lowstands.
5. Gather piston core data for palaeoceanographic studies.
6. Obtain basic physical oceanographic measurements [XBT] for the continental margin to gain insight into oceanographic parameters that may affect biofacies distribution.

3. Principal Investigators

Prof. C.C. von der Borch, School of Earth Sciences, Flinders University,
Dr. V.A. Gostin and 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 National University, and the Natural Sciences and Engineering Research Council of Canada.

4. Results

At the completion of cruise FR 02/91, complete computer spreadsheet records of all the data were completed by R.(Bobbie) Rice. These include: seismic and bathymetric sounding lines; dredge and grab sample locations; core and camera stations; XBT stations. Dredge and grab samples were described aboard ship by Drs. James and Bone, assisted by T. Boreen and M. Fuller, and a comprehensive report completed.

A total of 59 dredge samples were collected, as well as 10 grab samples, 1 gravity core, 6 attempted piston cores with 2 successes, 10 camera tows, and 19 XBT deployments, 36 bathymetry transects were also run. 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 02/91 will be carried out onshore by several research groups. This will include detailed morphological analysis using the bathymetric profiles and the GLORIA and SEABEAM data [von der Borch, Gostin, Belperio]; detailed lithofacies and biofacies analysis using samples obtained with the pipe dredge and the Smith-McIntyre grab [James, Bone, Boreen, Drapala, Fuller]; analysis of the deep-sea camera results [scientific party]; and palaeoceanographic analysis (dO18, dC13, sediment geochemistry, ostracod geochem) of sediment cores [Bone, Boreen, Drapala].

During the actual cruise, considerable inroads were made into many of the cruise objectives. The precision bathymetric data has considerably upgraded the physiographic interpretation of the GLORIA and SEABEAM data. Accurate location of the axes of Sprigg and Murray canyons has been possible, and features such as the east-west trending structures on the main GLORIA record have been identified as possible fault scarps which in turn may relate to the Otway Basin margin.

The dredge, core and grab 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 key localities which hopefully will allow interpretation of the previously observed prograding clinoforms and unexplained mounds or ridges on the outer shelf. Vast fields of large sand waves were identified on the echosounder records, coinciding with the outer shelf bryozoal grainstone facies, thus explaining the origin of this current-sorted facies which may actually constitute the prograding clinoforms. However, the source of the large volumes of bryozoal debris has not yet been clearly identified and will require an analysis of the seafloor photographs.

Minor problems and setbacks were encountered in a few areas, but these did not detract from the overall success of the cruise. One of these was the failure of the piston corer. Two of these corers were built to the same design as the one that was successfully deployed on a previous RV Franklin cruise [FR 05/90] in the Coral Sea. On the present cruise, although the corer tripped in virtually every case, in most cases the barrel came up empty, or

with only a catcher sample. In one case it did not arm itself but succeeded in collecting a useful 2m gravity core.

Possible reasons for the failure include: steep seafloor, strong bottom currents, faulty tripping. Further experiments on corer deployment, aimed to aleviate faulty tripping, were thwarted by continuously high seas during the final week of the cruise. These experiments were to include (i) shortening the trip rope by 1m, as previously it was made equal in length to the piston strop; (ii) taping the coiled piston strop less robustly, to allow it to unwind.

The 3.5 kHz pinger unit, on loan to CSIRO from the R.A.N., did not prove a success. Records were noisy, and the outgoing waveform tended to obliterate the upper portion of the record. Causes of this are unknown, but could have been due to ship noise or lack of acoustic filtering of the return signal. There is no doubt that an operational 3.5 kHz system would have added considerably to this project.

The deepsea camera [Benthos], on loal from O.S.I., apparently operated well, although final results will depend upon onshore film development. A problem arose however, with the O.S.I. 12k Hz pinger that was attached to the camera frame. It was not synchronized with Franklin's 12 kHz Simrad echo sounder. This problem was solved when a CSIRO pinger was used to replace the O.S.I. pinger.

The 19 XBT launchings which collected oceanographic water-column data which will be subsequently analysed on shore.

Finally, weather conditions in the Southern Ocean provided the greatest problem for data gathering. Apart from one or two days early in the cruise, the sea state was was never calm enough to collect useable records using the Geopulse "boomer" seismic profiler. The instrument was not deployed on these calmer days, on the assumption that another "calm cycle" would appear in mid cruise. Unfortunately this did not eventuate. Conditions were also mostly too rough in the later stages of the cruise for safe piston core and camera deployments, resulting in the dependance 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 GMT for both times and dates. GMT was 11 hours behind Australian Eastern Summer Time throughout the cruise.

DAY 1 [Jan.15] Departed Port Adelaide at 2115h on Jan.14, 1991. Deployed the 3.5 kHz towfish at ship speed of 5knots soon after departure, for underway adjustments.

DAY 2 [Jan.16] Assembled the piston corer [3m barrel, 700kg weights] for a successful test core in mid Gulf St. Vincent, recovering 1m of core. Redeployed the towfish and continued south and east via Backstairs Passage to successfully test the Smith-McIntyre grab.
At 2022h, we began a 3.5 kHz and Simrad echosounder survey [first line SO 32] from near

eastern Kangaroo Island to the GLORIA survey area [Fig.1]. Secured the towfish at the upper slope location due to very poor records, possibly due to lack of appropriate acoustic filters or to interference by ship's noise. Continued the bathymetric survey [lines SO 32 to 36] across the shelf-slope transition zone along the northern limit of the GLORIA image, using only the Simrad echo sounder.

The bathymetric survey grid was designed (i) to illustrate in detail the shelf to slope morphology along the northern margin of the GLORIA survey, (ii) to fill in some bathymetric gaps in the associated SEABEAM survey, (iii) to accurately define locations and morphologies of canyon axes, and (iv) to characterize subsequent dredging, coreing and deepsea photography sites.

DAY 3 [Jan.17] Continued the bathymetric survey [lines SO 36-42].

DAY 4 [Jan.18] Completed the first phase of the bathymetric survey [lines SO 42-47].

DAY 5 [Jan.19] Began the sediment and rock dredging and seafloor photography program, at sites selected from the bathymetric survey and from 3.5 kHz profiles collected previously by HMAS Cook. The first two deepsea camera tows [Camera stations 1 and 2] were apparently successful, pending onshore film development. A Benthos camera system, on loan from the Ocean Sciences Institute (OSI) of Sydney University was used.

The effective pipe dredge lived up to its reputation and delivered sediment samples on virtually every deployment. Large scale sandwaves were noted on the echosounder, presumably formed by the strong boundary current near the shelf edge. The presence of these bedforms probably explains the existence of the dominant outer-shelf sediment facies, a mature bryozoal grainstone in the very coarse to granule size range. A Simrad echo sounder traverse [SO 48] was conducted across the shelf break to the upper slope in order to charachterize further dredge and camera stations.

DAY 6 [Jan.20] Camera Stations 3 and 4 were successfully completed. Several dredge stations were occupied, however the two box-shaped rock dredges were lost when the weak link cable parted. The Smith-McIntyre sediment grab was found to be invaluable for collecting relatively undisturbed samples of the sediment-water interface. Four piston cores designed to sample pelagic slope sediments were attempted, with a low success rate. Two of the 3m core barrels were retrieved empty, and one was also bent. Another attempt resulted in 0,33m recovery and a final attempt yielded a catcher sample only. Two Simrad echo sounding lines [SO 49 and 50] were run in order to further characterize the platform margin, followed by camera station 5.

DAY 7 [Jan.21] Camera station 6 was occupied, followed by a Smith-McIntyre grab deployment and barrel dredging. One of the key targets was a distinctive ridge or knoll which appears on several bathymetric profiles near the shelf edge, at depths of about 250m. Dredging and photography had the task of characterizing such "highs", testing hypotheses about their origins [ie. lowstand beach ridge or dune, or shelf-edge bryozoal buildup?]. A 2m core was collected from the upper slope when the trip-arm on the corer failed to work,

with the result that the corer acted as a gravity corer. Bathymetric survey lines SO 51 and 52 were completed in order to define further dredging and deepsea camera sites on the upper slope.

DAY 8 [Jan.22] Several dredge stations were successfully occupied on this day. Particular effort was devoted to sampling rock from what appear to be cuesta-like features on the outer shelf. These are thought to reflect the upper portions of prograding "clinoforms". A bathymetric line [SO 53] was run across the shelf-break, followed by further dredging and then deepsea camera station 7.

DAY 9 [Jan.23] Deepsea camera stations 8,9 and 10 were occupied during this day. Bathymetric line S0 54 was then run across the axis of one of the largest submarine canyons in the region, Murray Canyon, in order to provide bathymetric information to add to the HMAS Cook GLORIA image. Bathymetric line SO 55 was then run normal to the shelf-break and two dredge stations successfully occupied, despite strong winds, a heavy, confused sea, and difficult currents.

DAY 10 [Jan.24] Deployed a final pipe dredge near the shelf edge at the head of Murray Canyon. Then carried out bathymetric sounding lines SO 56 and 57 across the morphologically complex head of Murray Canyon, and line SO 58 across the head of Sprigg Canyon. At this stage, conditions were still too rough for piston coring, seafloor photography, or "boomer" seismic profiling, so a long bathymetric sounding traverse [SO 59] was commenced, to provide a cross-section from the abyssal plain [4973m], across the Beachport Plateau, to the coastline between Robe and Beachport.

DAY 11 [Jan.25] Continued bathymetric survey line SO 59, including underway XBT deployments at regular intervals. Line SO 59 was chosen to provide a continuous bathymetric profile from the abyssal plain to the inner margin of the relatively narrow continental shelf south of Robe. Five dredge samples were then collected at selected locations along the line, aiming particularly at what appear to be drowned coastal barriers. The high quartz sand content in most of these samples created surprise, because a plausible source of terrigenous sediment was not immediately apparent. Lines SO 60 and 61 were run next, in order to provide additional morphological sections across the shelf in southeastern South Australia, in particular to map the drowned barriers.

DAY 12 [Jan.26] Bathymetric line SO 61 was run in to Beachport, followed by a sries of dredge deployments back across the shelf to below the shelf-break. This was followed by lines SO 62 and 63, the latter providing a cross-section of the shelf in to Cape Banks. The line SO 64 was then run south, across and beyond the shelf, to water depths of about 2500m, in order to obtain several sediment grabs.

DAY 13 [Jan.27] Smith-McIntyre grab samples were successfully taken at depths of 2450m, 1880m, and 1523m and 995m, to provide material for biogeochemical and other studies. A final bathymetry traverse [SO 66] was then run to a location near the Glenelg River mouth, followed by several dredge stations. The vessel then steamed to Portland,

Victoria, to offload the scientific party.

6. Summary

Considered overall, cruise FR 02/91 was undoubtedly a 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 R.V.Franklin for their thorough professionalism and friendly co-operation. The Franklin has once again proven to be an excellent and well-designed research vessel, well suited to this type of geoscientific work, including lightweight piston coreing. The CSIRO personnel [Cruise manager and electronics specialist], Dave Vaudrey and Erik Madsen, 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

Chris von der Borch [Chief Scientist] Graham Evans	School of Earth Sciences Flinders University Bedford Park, S.A. 5062
Vic Gostin Yvonne Bone Bobbie Rice Margaret Fuller	Department of Geology & Geophysics University of Adelaide P.O. Box 498 Adelaide, S.A. 5000
Noel James Tom Boreen	Department of Geological Sciences Queen's University Kingston, Ontario, Canada K7L 3N6
Tony Belperio	S.A. Department of Mines and Energy Greenhill Road Parkside, S.A.
Vicki Drapala	Department of Geology Australian National Uni. Box 4 GPO Canberra, ACT 2600

Dave Vaudrey	[Cruise Manager]	CSIRO - ORV
Erik Madsen		CSIRO - ORV

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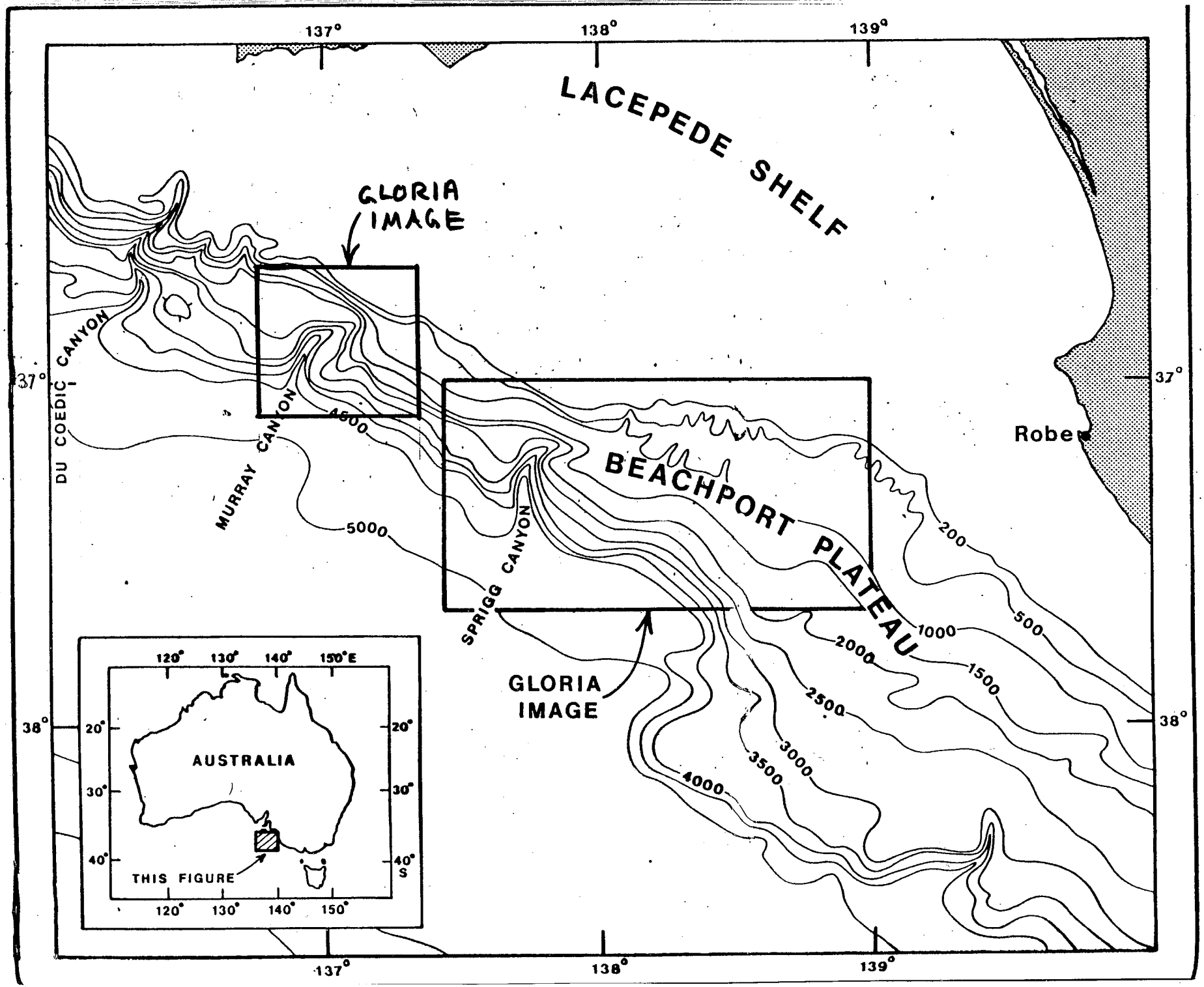
C. von der Borch
Principal Investigator
Chief Scientist

V. Gostin
Principal Investigator

Y. Bone
Principal Investigator

N.P. James
Principal Investigator

28th January 1991, Portland, VICTORIA .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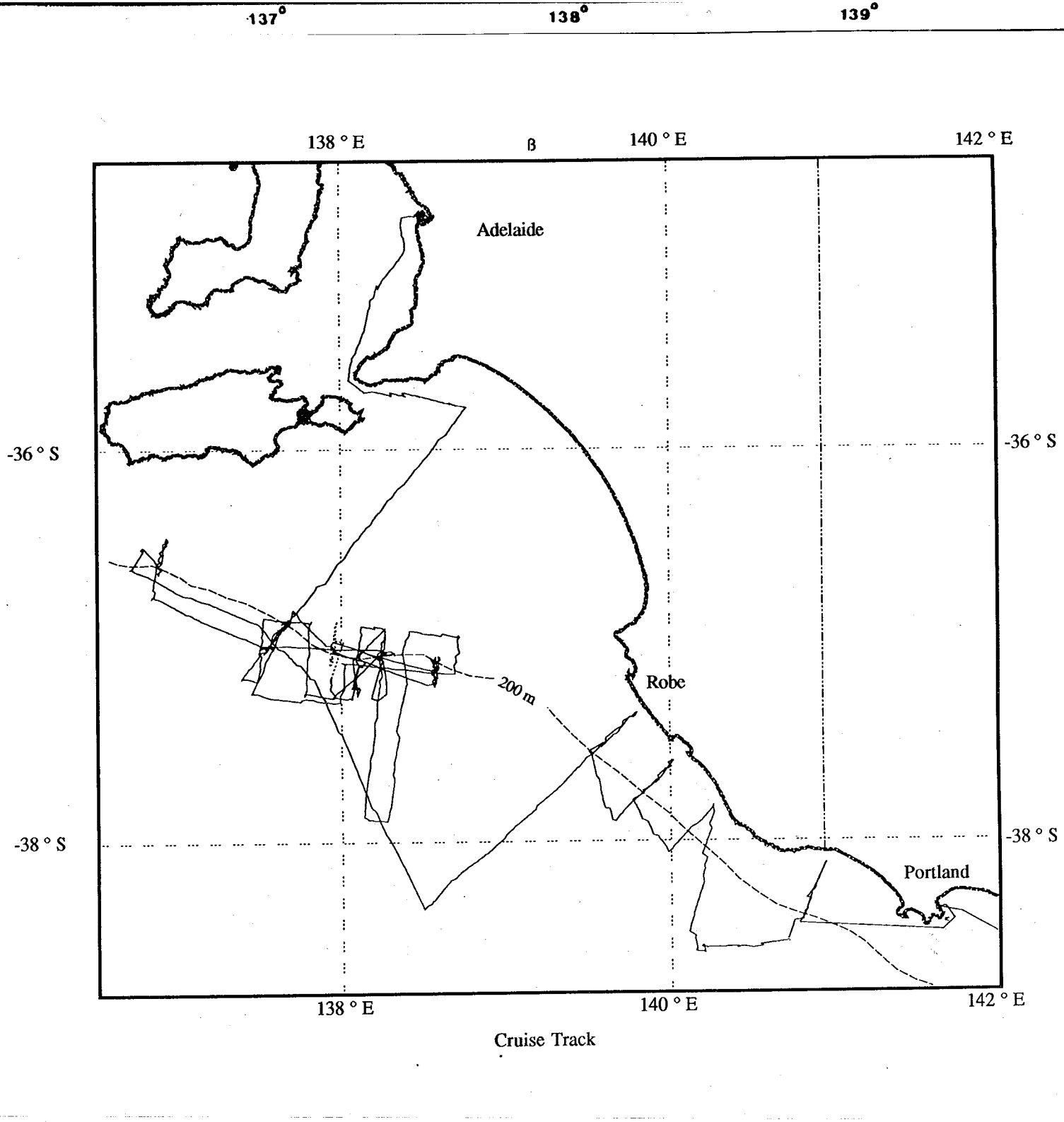

Cruise Track

Computing report.
Fr02/91
Dave Vaudrey

Micro 1:

Software Problems.

MET

The baud rate for TT14: is still not set to (9600:9600) on boot and has to be manually set.

NAV

Changes to the NAV logging enabling either Intech of Shipmate to be logged has the confusing effect of running through the startup of both logging form simultaneously making thing very confusing. See Electronics report.

TERMC:

This still disables TT1: when run from a logging micro and only option left is to reboot.

Micro 3:

Micro 3 fell over 4-5 times a day and finally would not reboot. The CPU board was replaced with the board from the spare 11/73 in the Computer Room and Micro 3 worked faultlessly for the rest of the cruise.

Micro 7:

See Electronics report.

VAX :

The VAX performed perfectly.

EXABACK

The Backup of the data tapes to the Exabyte drive worked smoothly until it was time to carry the end of cruise VAX backup. Following changes made by Jeff Dunn the normal TAPVAX initiated by MTSPOL was not initiated and an attempt was made to run EXABACK on the 'V' version. Following an attempt to move on to the 'V' from 'G' tapes a number of savesets where created automatically with the nomenclature of F9102V... on each drive. Processing was terminated at this stage and lists of files backed up in those type 'V' savesets was examined. None contained any files. EXABACK was rerun with an error code. Normal end-of-cruise procedures where carried out manually, creating type 'V', 'E' ands type 'H' files.

RV FRANKLIN ELECTRONICS REPORT
CRUISE FR02/91
E. MADSEN 29th January 1991.

Only equipment and instruments which required attention before, or during the cruise are reported on, all other equipment can be assumed to have performed correctly.

CTD AND ROSETTE SYSTEM

As the ctd system wasn't required for this cruise, the cable termination was removed and 15m of rusty cable discarded, the cable was then spooled onto the drum, rinsed with fresh water, oiled and wrapped with glad wrap.

RAYTHEON SOUNDER.

The towed body was deployed shortly after the port pilot had disembarked, after some initial confusion, a bottom trace with about 10-15m penetration was obtained, however the trace was very noisy and the sounder was switched off after the depth exceeded 2500m.

SIMRAD EK400.

The faulty recorder amplifier board was repaired with spares received from hobart, however the board failed again after a short while.
Due to the simrad being used as survey sounder for best part of the cruise no further repair attempts could be made.

TRICYCLE.

This was mounted on the towing winch spooling gear in Adelaide and apart from excessive battery consumption, electronically worked well, however, some mechanical problems required attention during the cruise and a new heavy duty anchor point was made to improve the support of the tricycle when idle.

MET STATION

Work done on the pressure interface in Adelaide pointed towards standing waves in the pressure inlet pipe, being to blame for the frequent PLL unlock, this was fixed by fitting rubber grommets in all the digiquartz mounting bracket holes.
Daily checks on the met station indicated a pressure offset of about -10.5mBar. with respect to the bridge barometer and a temperature offset of +1.1 C° with respect to the monkey island mercury thermometers.

THERMOSALINOGRAPH.

A noisy trace on the Linseis recorder caused me to clean board contacts and tighten terminations to this instrument

BENTHOS 12KHZ PINGER.

The pinger supplied with the UNSW camera gear had a repetition rate of 1 sec., which is incompatible with our sounder, hence a decision was made to use our own 12Khz. pinger. On unpacking, this was found to have substantial corrosion in the battery container, due to being stored with batteries over a long period, The pinger also had the ribbon cable replaced, due to some intermittency between the signal generator and our divider board.
The ping rate which should have been 1.20158 sec. was 1.20135 sec., this caused the trace to creep up on the display, a remedy for this is to load the 32.768 Khz xtal oscl. by means of a small trimmer capacitor.

COMPUTERS, PRINTERS AND SOFT WARE.

MICRO1.

The Met soft ware should be modified to set port TT14: to 9600 Baud on start up, rather than the current 2400 Baud, this caused problems on last cruise as well.

The new Nav. soft ware attempts to run both Intech and Shipmate simultaneously with resultant rapid scrolling that causes confusion as to which questions are being asked or answered.

The "termc" soft ware disables TT1: when run from a logging micro, with only option left being re-booting.

MICRO3.

After numerous crashes I replaced the processor board in this micro with that of the spare pdp11/73 in the computer room, this cured the crash problem.

MICRO7.

This micro crashed 24th Jan. with clock error messages on re-boot, the fault was traced to a faulty oscillator chip in the external time reference, which was replaced.

SHIP EQUIPMENT.

The new mess room short wave radio was installed in a tamper proof bracket, supplied by 2nd engineer R. Parrott. As there are no radio antenna facilities in the non smokers lounge, the Eddystone radio was, after repair, installed in the masters suite.

TALK BACK SYSTEM.

The instrumentation operations room microphone failed towards the end of the cruise, I suspect it might have suffered a few drops. A replacement Codan microphone will have to be obtained prior to the next cruise. Additional spares should also be kept.