FRANKLIN

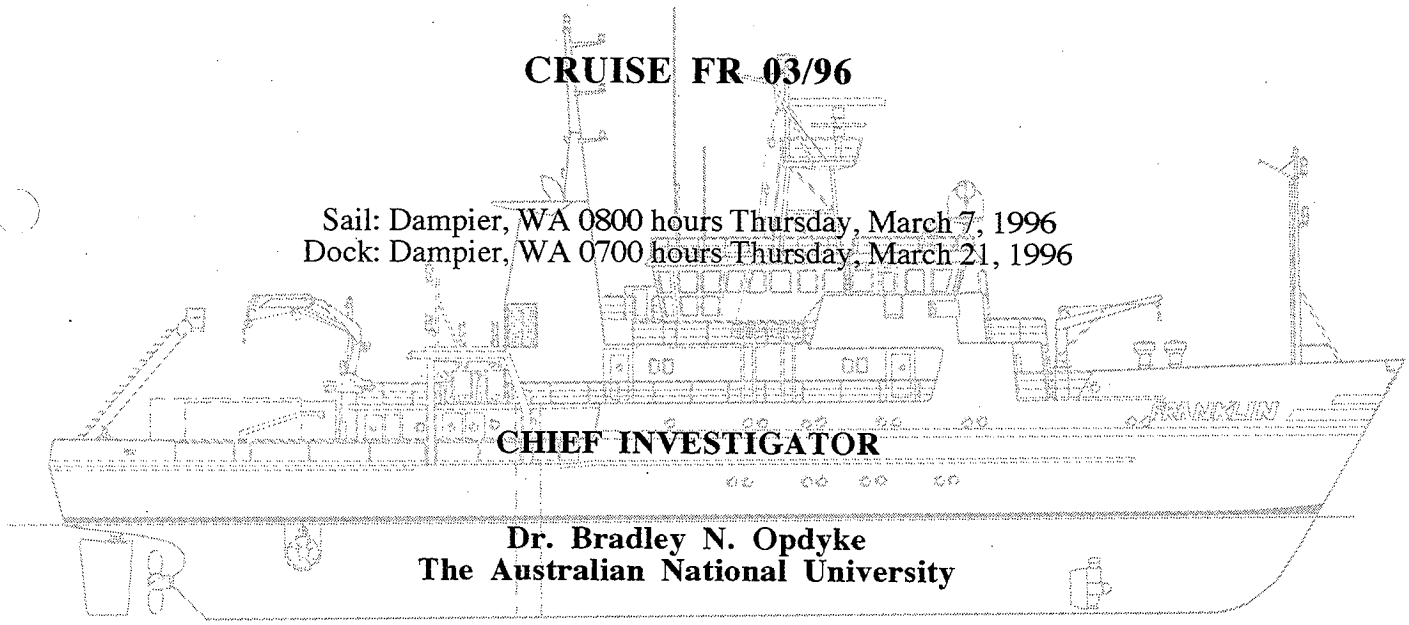
National Facility
Oceanographic Research Vessel

SEARCH FOR SEDIMENTS FROM THE LAST GLACIAL MAXIMUM, NORTHWEST SHELF AUSTRALIA

RV FRANKLIN

CRUISE FR 03/96

Sail: Dampier, WA 0800 hours Thursday, March 7, 1996
Dock: Dampier, WA 0700 hours Thursday, March 21, 1996



CHIEF INVESTIGATOR

Dr. Bradley N. Opdyke
The Australian National University

April 96

For further information contact:

ORV Operations Manager
CSIRO Division of Oceanography
GPO Box 1538, Hobart, Tasmania 7001

Phone (002) 32 5222
Fax (002) 32 5000
Telex AA 57182

AUSTRALIA

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RV Franklin Cruise 3/96
Cruise Report

"Search for Sediments from the Last Glacial Maximum, Northwest Shelf Australia"

and geochemical influences on and tracers of modern neritic carbonate sedimentation

Sailed Dampier0800h, 7 March 1996
Arrived Dampier 0700h, 21 March 1996

Principal Investigator

Dr. Bradley N. Opdyke, Cruise leader

The Australian Marine Quaternary Program
The Australian National University
Department of Geology, Canberra ACT 0200
Tel: (06) 249-4205
FAX: (06) 249-5544
e-mail: BNO@Basins.anu.edu.au

Original Scientific Objectives of the Cruise

The original goal of this project was to look for proxies for and tracers of coral "reef" environments 20, 000 years ago, during the last glacial maximum. Paleoclimate research is based largely on the chemical and isotopic analysis of the calcium carbonate preserved in the skeletal material of marine microfossils. Earlier studies suggest that, based on estimates of paleotemperatures from the last glacial maximum that coral reef habitats would have retreated dramatically towards the equator during glacial times. This study sets out to see if we can determine whether these environments were extant in the Rowley Shoals area and further north. The specific objectives, both additional and original are as follows.

1) Look for mineralogic and fossil evidence of coral reef growth around the Rowley Shoals, Scott Reef and Ashmore Reef in surrounding glacial aged sediments.

2) Look for evidence of neritic carbonate dissolution within the oceanic water column around the reefal areas studied.

3) Look for geochemical reasons why coral reefs are not as abundant on the northwest shelf of Australia in contrast to the northeast margin. Particularly focussing on the nutrient data.

4) Look for datable horizons in shallow water for the sea level change that occurred after the last glacial maximum.

5) Investigate the nature of the transition between the "coral reefs" at Ashmore reef and the "Halimeda" banks of the Sahul shoals.

6) Take vibracores on the Ashmore Reef Platform in order to try and determine the rate and timing of sand buildup on this important platform.

Sampling

Gravity cores: A total of 33 gravity cores were taken from the Rowley shoals region, north to the Ashmore reef area, up to and along the Indonesian EEZ. Cores were taken from 3560m to 161m water depth. The successful cores ranged in length from 146 cm to 712 cm! For a total of 138 m of Gravity cores.

Vibra Cores: A total of 12 sites were cored on Ashmore Reef with the range of core lengths from 0 to 2.4 m. A total of 14 m of core was recovered.

Grab samples: In many cases, particularly in shallow water, the bottom sediment is too sandy for recovery by gravity core. A total of 15 sites were sampled in this manner.

CTD profiles: A total of 23 CTD profiles were taken. Selected samples were collected for trace element and total carbon analyses back in Canberra. Alkalinity measurements were carried out on board the ship. We would like to thank Val Latham for doing the ship-board dissolved oxygen, salinity, phosphate, nitrate, and silicate analyses!

Collection Dives: Two dives were organised to examine the nature of the surface of two "Halimeda" banks north of Ashmore Reef. To our surprise both the Conan Site (north of Hybernia Reef) and Fantome bank supported diverse coral communities. The Conan Bank site was in approximately 26 m of water, with corals plates, 80% living. The shallower site (13m) at the Fantome Bank had more rubble, less Halimeda and about 60% living coral. One of the questions we sought to answer was "What was holding up the shallow rims of these banks?" I believe we have a partial answer.

Cruise Track

Our cruise plan was dramatically altered early in the cruise by what was to become cyclone Kirsty. Kirsty started forming right over us as we sampled our first site at the Rowley Shoals. We sped north to the Indonesian EEZ and hove-to for a day and a half. In spite of this we covered most of the planned itinerary, with the exception of the planned deep cores to the west of the Scott Plateau, which were out of range anyway because the available cable length would not allow coring in 4600m of water.

Results

The core recovery was excellent. We had good recovery in deep water and spotty recovery shallower than 1000m, though in a few places we recovered cores up to 160m water depth! Therefore our major objective of determining the nature of sedimentation around these reefs during the last glacial maximum is in our grasp. CTD sampling was very successful. The sediments of the Timor Trough and proximal Scott plateau indicate high productivity and presumably high nutrient flux. The nutrient data in the past had not caught the high nutrient levels in the surface water. We did this time, thanks to Val. This goes a long way in explaining the patchy nature of coral reefs in this region (corals don't like it if the nutrients get too high). We suspect some of our cores have very high pelagic sedimentation rates, but this will have to await conformation with shore-based work.

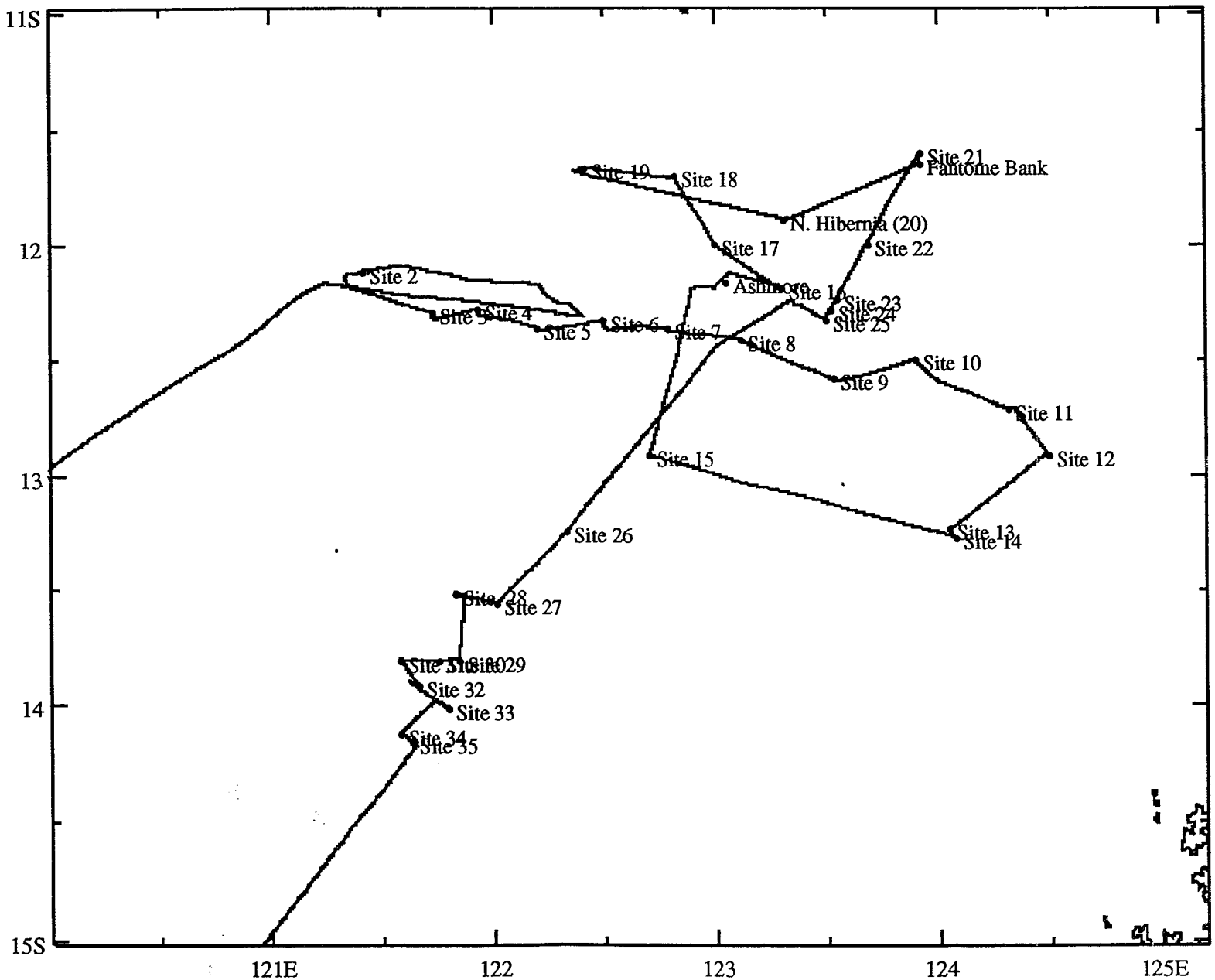
Personnel

Both the CSIRO personnel and the ships crew carried out their jobs professionally and courteously. In spite of the storm I believe all involved enjoyed the cruise. The good weather at the end certainly helped!

Cruise Participants

Dr. Bradley Opdyke	ANU	Chief Scientist
Mr. Yusuke Yokoyama	ANU	
Mr. Norm Frasier	ANU	
Mr. Damien Kelleher	ANU	
Mr. Kriton Glenn	ANU	
Mr. Michael Wilson	ANU	
Mr. David Vaudrey	CSIRO ORV	Cruise Manager
Mr. Phillip Adams	CSIRO ORV	
Ms. Val Latham	CSIRO ORV	

Acknowledgments
On behalf of the scientific crew I would like to thank the steering committee for giving us this chance to undertake this project. I would personally like to thank the CSIRO personnel, Dave Vaudrey, Phil Adams, and Val Latham for all their help. The entire ships crew was great, but I'd like to particularly thank the Master, Dick Dougal, for working with me and accepting the new cruise plan as it evolved.


11S
12
13
14
15S
121E
122
123
124
125E
Site 21
Pantome Bank
Site 19
Site 18
N. Hibernia (20)
Site 17
Site 22
Site 2
Site 3
Site 4
Site 5
Site 6
Site 7
Site 8
Site 10
Site 9
Site 11
Site 12
Site 15
Site 13
Site 14
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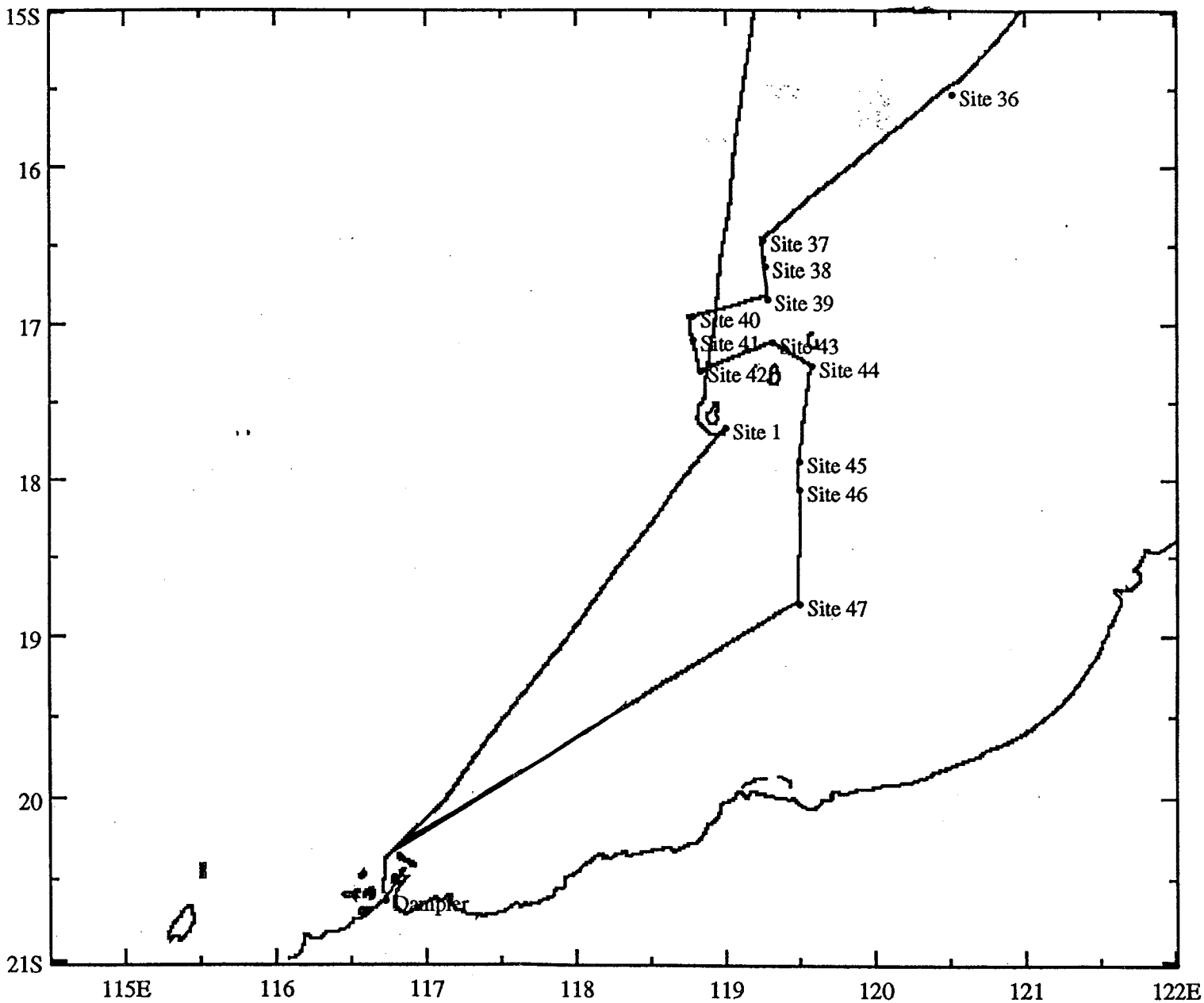
Site 35


15S
16
17
18
19
20
21S
115E
116
117
118
119
120
121
122E
Site 36
Site 37
Site 38
Site 39
Site 40
Site 41
Site 43
Site 42
Site 44
Site 1
Site 45
Site 46
Site 47
Dampier

RV Franklin - Cruise 3/96, Dampier to Dampier
March 7 1996 - March 21 1996

The Australian Marine Quaternary Program

Station List

Station	date	Time	time (UTC)	lat.	long.	Water Depth	SSS	SST	Corer	recovery	CTD	Remarks
	(local)	(local)				(sounder, m)				(cm)		
1	7.3.96		21.00	17 39.44	118 59.69	313	34.7	29.51	GC-1	400	Station 1	Check core length
2	11.3.96		15.31	12 10.71	121 21.52	3560.5	34.22	28.2	GC-2	641	Stations 2-4	
3	11.3.96		19.04	12 18.54	121 43.94	2891	34.36	28.02	GC-3	712		
4	11.3.96		21.52	12 17.48	121 56.01	2069	34.33	28.12	GC-4	593		
5	12.3.96		00.30	12 22.3	122 12.03	1462	34.37	28.27	GC-5	641		
6	12.3.96		03.16	12 21.28	122 30.15	1132	34.45	28.49	GC-6	654	Station 5	
7	12.3.96		06.32	12 22.59	122 47.23	559	34.45	28.71	GC			Bare Rock, Fragments recovered
8	12.3.96		10.24	12 25.01	123 6.85	475.5	34.46	28.54	GC		Station 6	Bare Rock with thin venear of sand
9.1	12.3.96		13.31	12 35.50	123 31.89	270.5	34.45	28.96	GC			No Recovery
9.2	12.3.96		13.52	12 35.62	123 32.00	270.5	34.44	29.08	Grab-1			Sand recovered
10.1	12.3.96		16.19	12 30.1	123 54.01	135.5	34.52	28.93	GC			No Recovery
10.2	12.3.96		16.42	12 30.32	123 54.10	136.5	34.51	28.93	Grab-2			Sand with Cal. Algae and coral
11A	13.3.96		19.3	12 42.99	124 19.02	151.5	34.52	28.93	GC		Station 7	No Recovery
11A-2	13.3.96		20.09	12 43.01	124 19.07	150	34.51	28.93	Grab-3			Sand recovered
11B	13.3.96		21.31	12 42.78	124 21.37	108	34.5	28.93	Grab-4			Sand Recovered
11C	13.3.96		21.52	12 42.80	124 21.00	108.5	34.5	28.93	GC			Sand traces
11C	13.3.96		22.15	12 42.90	124 20.82	119.5	34.51	28.85	Grab-5			Sand Recovered
12A	13.3.96		00.21	12 54.74	124 30.28	98	34.45	28.67	Grab-6		Station 8	Sand Recovered
12B	13.3.96		00.37	12 55.00	124 30.08	90	34.49	28.79	Grab-7			Sand
12C	13.3.96		01.03	12 54.96	124 28.89	129	34.45	28.9	Grab-8			Gravel
13	13.3.96		04.54	13 14.31	124 03.07	171.5	34.54	29	GC-7	438		
14	13.3.96		05.58	13 16.57	124 04.66	152	34.46	29.18	GC-8	0		Probable sandy bottom
15	13.3.96		14.25	12 54.9	122 42.26	586.5	34.43	29.08	GC-9	458		Blueish grey silt
Ashmore Reef	14.3.96		00.14	12 11.48	123 00.05	19.5	34.48	28.75	Vibra-Coring	1400		
16	14.3.96	15.45	07.47	12 11.49	123 17.69	180	34.4	29.86	GC-10,Grab-9	0	Station 9	Pleistocene Gravels recovered
17	14.3.96	18.35	10.33	11 59.98	123 00.02	330.5	34.35	29.53	GC-11	0	Station 10	
18	15.3.96	10.53	14.2	11 42.27	122 45.30	723	34.15	29.58	GC-12	16		Olive Gray Silt
19	16.3.96	00.32	16.28	11 40.17	122 24.45	1731	34.26	29.3	GC-13	0	Station 11	Strong Current to west, Core Barrel landed on its side, Good Ooze
Conan Bank	16.3.96	08.13	00.13	11 53.17	123 19.05	26	34.18	29.16			Station 12	Coral and sand samples recovered
Fantome Bank (20)	16.3.96	16.30	08.30	11 38.08	123 55.30	162	34.39	29.56			Station 13	Coral and sand samples recovered
21	16.3.96	17.17	09.16	11 36.27	123 55.27	329	34.4	29.53	GC-14	234		Some reddish silt here (with the carbonate)
22	16.3.96	20.15	12.15	11 59.99	123 41.54	146.1	34.37	29.54	Grab-10			Sand and shells
23	16.3.96	22.06	14.06	12 14.50	123 32.92	160.2	34.53	29.26	Grab-11			Fine sand
24	16.3.96	22.4	14.36	12 17.12	123 31.30	165.8	34.41	29.17	Grab-12			Silty Sand
25	16.3.96	23.15	15.15	12 19.86	123 30.00	132	34.41	29.19	Grab-13			Fine well sorted sand
26	17.3.96	08.20	00.17	13 15.14	122 20.	621	34.47	28.93	GC-15	26		3 m of silty sand penetrated, most had washed out, poor seal.

The Australian Marine Quaternary Program

Station List

Station	date (local)	Time (local)	time (UTC)	lat.	long.	Water Depth (sounder, m)	SSS	SST	Corer	recovery (cm)	CTD	Remarks
27	17.3.96	12.5	04.50	13 33.70	122 00.86	704	34.54	29.21	Grab-14			Medium sand,well sorted
28	17.3.96	15.46	06.42	13 31.79	121 52.36	957.5	34.54	29.83	GC-16	626		
29	17.3.96	17.07	09.04	13 48.72	121 50.99	750	34.59	29.63	GC	0	Station 15	Traces on medium sand
30	17.3.96	19.05	11.02	13 48.77	121 45.54	1010.5	34.57	29.34	GC-17	515	Station 16	
31	17.3.96	22.43	14.39	13 48.27	121 35.11	2096	34.54	29.21	GC-18	619	Station 17	
32	18.3.96	02.15	18.12	13 55.21	121 38.74	2007	34.53	28.95	GC-19	616	Station 18	
33	18.3.96	05.35	21.35	14 01.30	121 47.83	650	34.54	28.92	GC-20	8	Station 19	Plugged a piece of coral rubble
34	18.3.96	0743	00.43	14 07.70	121 35.06	1753	34.49	28.7	GC-21	0		Core Catcher Failed
34	18.3.96	0945	0145	14 07.42	121 34.83	1979	34.54	28.9	GC-21	640		Bottom very soft, and hummucky
35	18.3.96	11.35	0313	14 11.19	121 39.68	1062.5	34.45	28.93	GC-22	600	Station 20	Check length!
36	18.3.96	22.33	14.3	15 29.66	120 29.11	823	34.32	29.22	GC-23	0	Station 21	Bare rock...chunks recovered
37	19.3.96	08.16	00.16	16 27.66	119 14.98	1168	34.43	29.07	GC-24	635	Station 22	
38	19.3.96	10.4	02.40	16 35.30	119 15.59	912	34.45	29.2	GC-25	640		
39	19.3.96	12.46	04.46	16 50.08	119 16.94	601	34.52	30.15	GC-26	432		
40	19.3.96	16.16	08.13	16 57.31	118 46.17	1216	34.52	29.22	GC-27	646		
41	19.3.96	17.55	09.51	17 05.84	118 46.95	760	34.51	30.15	GC-28	656		
42	19.3.96	19.38	11.34	17 17.86	118 50.29	531	34.53	29.79	GC-29	660	Station 23	
43	19.3.96	23.16	15.14	17 07.12	119 19.12	458.5	34.48	29.18	GC-30	146		Mostly Silt
44	20.3.96	01.26	17.23	17 15.91	119 34.96	387	34.55	28.98	GC-31	681		
45	20.3.96	05.30	21.3	17 52.84	119 30.10	180	34.61	28.77	GC-32	408		
46	20.3.96	07.32	23.32	18 04.59	119 30.64	161	34.59	28.92	GC-33	436		
47	20.3.96	11.31	03.36	18 47.90	119 29.46	106	34.74	28.74	Grab-15			
												151.77 m of Core, 137.77m GC, 14m VC, 15 Grabs