RESEARCH SUMMARY
CRUISE FR 10/95

MODERN DISTRIBUTIONS AND CHEMISTRIES OF BENTHIC AND PLANKTONIC BIOTA TO SERVE AS ANALOGUES FOR PALAEOCEANOGRAPHIC RECONSTRUCTIONS

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Sail 1000 Thursday 7 December 1995
Arrive Fremantle 1600 Thursday 21 December 1995

Principal Investigators

Dr Patrick De Deckker
Department of Geology
Australian National University

Franklin cruise Fr 10/95
Cruise Report

"Modern distributions and chemistries of benthic and planktonic biota to serve as analogues for palaeoceanographic reconstructions"

Sailed Darwin 1000h December 7,1995
Docked Fremantle 1600h December 21, 1995

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Original scientific objectives of the cruise:

1. collect living planktonic and benthic organisms to build an ecological database on organisms of use for the reconstruction of past oceanic conditions
   - planktonic organisms will be collected at the water surface using plankton nets; we aim at collecting foraminifera, pteropods, diatoms, radiolarians. Calcareous nannoplankton will be collected by filtering 10L samples onboard.
   - benthic organisms will be collected using a multiple corer that gathers up to 8 tubes (10cm wide and 65cm long) at the sediment-water interface.

2. collect 6 m-long gravity cores from selected sites along a several transects ranging from 800m down to 2,500m water depth to study the history of oceanic changes offshore WA and detecting changes in physicochemical parameters of various water masses; emphasis will also be paid to the Holocene history to be obtained from the short, multiple cores.

3. collect water samples from specific depth profiles adjacent to the coring sites down to 2,500m for chemical analyses and for correlating water chemistry data with the chemistry of the calcareous microrganisms collected at the same sites.

Total sampling:

Gravity cores: 29 cores taken from a variety of depths ranging from 81m down to a maximum of 2472m water depth. Overall, 103.18 m of cores containing

marine sediments were recovered. Most of the cores were recovered from below 1000m water depth.

Multiple cores: 9 multiple cores were successfully retrieved from the sea floor. These cores permitted to sample the sediment/water interface, and most cores obtained permitted to sample the sedimentary column at one cm intervals, and preserve living epifaunal and infaunal organisms, principally foraminifers and ostracods.

CTD: a total of 12 CTD profiles , with the maximum water depth sampled at 2,470m down to 2,500m. Physicochemical data were obtained, and numerous water samples collected for alkalinity, nutrients, total carbon, trace elements and stable isotopes were subsequently collected from the Niskin bottles.

Numerous plankton tows and 10L water samples for filtration of calcareous nannoplankton and siliceous diatoms and radiolarians were taken along the cruise track. A total of 49 samples were taken during the voyage, and water samples were taken also at those sampling stations for stable isotope measurements and trace-element analyses. Salinity and temperature data were recorded at all stations.

Cruise track

The cruise track corresponded fairly well to the original itinerary despite the fact that 3 cyclones were present in the region. The enclosed figure shows the cruise track and location of gravity, multiple cores as well as CTD profiles. The plankton tows were systematically taken along the cruise track.
We went to Broome as planned to collect Dr B. Opdyke, and this permitted also the departure of 2 cruise participants (P. Burkle and D. Wheeler). [see comment below].

Results

The cruise proved extremely successful as we retrieved a greater quantity of cores and samples than anticipated. We returned with over 100m of sediment cores, and close to 50 plankton samples and associated water samples. The number of multicores obtained proved less abundant than anticipated, but this primarily resulted in the 'less-than-calm' seas making it too difficult to deploy the sampler which was on loan from a German institution. Nevertheless, the samples obtained at 9 stations will permit a study of the biota living within the upper 30cm of the sea floor from 9 sites spanning a good array of water depths.
Information relating to all the samples is presented in the Table included herewith. An additional table also presents the list of all gravity core location and length.
12 CTD profiles were also obtained, and Niskin bottles were used to collect additional water samples for chemical analyses. Alkalinity measurements were made on board, and additional analyses will be made in Canberra. The location of the profiles was well chosen, as we will be able to determine the link between watermass properties and the remains of the biota found on the sea floor. This information will help better delineate the ecological requirements of several taxa whose fossil remains can be found in the sediment cores, and which will permit palaeoenvironmental reconstructions.

Gravity core no.	Station no.	Latitude	Longitude	length (cm)	water depth(m)
GC1	5	12:02.34'S	128:09.17 E	432	124
GC2	9	12:32.86'S	126:14.84'E	234	81
GC3	13	13:14.53'E	124:00.20'E	491	182
GC4	16	13:55.18'E	122:01.51'E	462	470
GC5	17	14:00.55'S	121:01.58'E	497	2472
GC6	18	14:19.67'S	121:09.81'E	432	2177
GC7	19	14:42.58'S	120:32.74'E	493	1445
GC8	20	14:54.97'S	120:57.49'E	477	678
GC9	22	18:07.63'S	118:00.92'E	465	498
GC10	23	18:08.93'S	116:01.29'E	465	1462
GC11	24	17:38.57'S	114:59.93'E	482	2458
GC12	25	18:14.70'S	114:59.63'E	330	2034
GC13	26	18:49.26'S	113:58.26'E	350	1454
GC14	28	20:02.71'S	112:39.73'E	497	997
GC15	29	19:53.75'S	112:13.37'E	493	1393
GC16	30	20:59.83'S	112:59.35'E	479	1221
GC17	31	22:07.74'S	113:30.11'E	460	1093
GC18	32	22:59.64'S	112:49.86'E	447	1055
GC19	34	24:14.11'S	110:00.18'E	223	1974
GC20	36	24:44.67'S	111:49.75'E	418	841
GC21	37	25:59.78'S	111:38.09'E	154	982
GC22	38	26:59.52'S	112:00.31'E	138	1049
GC23	39	28:44.70'S	112:46.97'E	416	2470
GC24	40	28:45.04'S	113:03.87'E	80	1577
GC25	41	28:43.93'S	113:22.08'E	272	1010
GC26	43	29:14.42'S	113:33.48'E	198	1738
GC27	45	30:30.14'S	114:16.64'E	95	843
GC28	46	30:04.88'S	114:08.51'E	144	1440
GC29	47	30:59.51'S	114:35.37'E	218	1220

Personnel

I disappointingly have to report that 2 cruise participants decided to leave the vessel near Broome at a time we had to collect Dr B. Opdyke who was to join us for the rest of the cruise. Before this departure seas had been quite rough due to cyclonic activity in the area, and the 2 members of our group who decided at their own will to leave the ship had suffered from sea sickness. Their absence did not have a detrimental effect on the activities of the rest of the scientific staff, except that the work load had increased for the rest of the scientific personnel.

Cruise participants:

Dr Patrick De Decker,	ANU,	Chief Scientist
Dr Michael Ayress,	Postdoctoral Fellow, ANU	
Mr Paul Burkle,	Honours Student, ANU	
Mr Geoff Deacon,	Ph.D. Student, University of Western Australia	
Mr Alistair Hack,	Undergraduate Student, ANU	
Dr Paul Hesse,	Lecturer, Macquarie University	
Dr Ignacio Martinez,	Postdoctoral Fellow, ANU	
Dr Stefan Nees,	Research Fellow, GEOMAR, Kiel, Germany	
Dr Bradley Opdyke,	Lecturer, ANU	

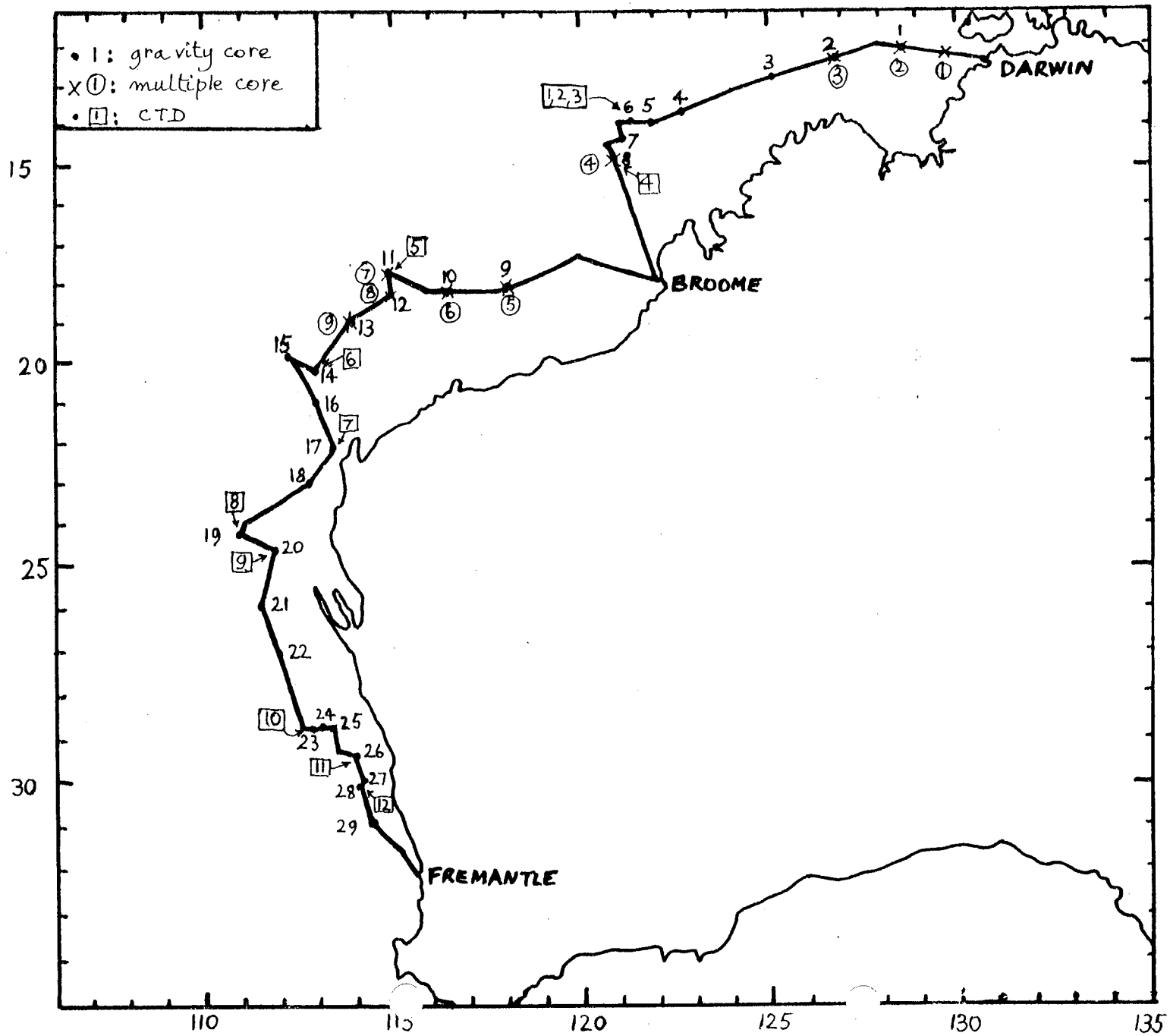
Mr David Wheeler,	Postgraduate Student, University of Wollongong	
Mr David Vaudrey	CSIRO ORV	Cruise Manager
Mr Erik Madsen	CSIRO ORV	

Crew:

Mr Ian Sneddon	Master
Mr Dick Dougal	Chief Officer
Mr Ian Menzies	1st Officer
Mr Mike Culpepper	Chief Engineer
Mr Lindsay Cale	1st Engineeer
Mr Don Roberts	Electrical Engineer
Mr Yannick Hansen	Bosun
Mr Peter Genge	AB
Mr Sam McCafferty	AB
Mr Wayne Browning	AB
Mr Phil French	Greaser
Mr John Tilley	Chief Steward
Mr Gary Hall	Chief Cook
Mr Peter Dux	1st Cook

Acknowledgments:

On behalf of the entire scientific party, I wish to thank the RV *Franklin* Steering Committee for having allowed us to participate on this very successful cruise. We have gained substantial experience at sea, and at data collecting. We now have numerous samples to work with for years to come. We are particularly grateful to David Vaudrey for his continuous support before and during the cruise, and also to Erik Masden for his willingness to help while at sea. We wish to also acknowledge all the crew members who were more than willing to help on every aspects of scientific data collection. We are particularly grateful to Mr Ian Sneddon, Master of the *Franklin*. His support and interest made our voyage a very successful one.


• 1 : gravity core
X ① : multiple core
• 1 : CTD
DARWIN
BROOME
FREMANTLE
15
20
25
30
110
115
120
125
130
135

The Australian Marine Quaternary Program

RV FRANKLIN - Cruise 10/1995, Darwin to Perth
December 7 1995 - December 22 1995

Station List

no	label	date	time (local)	lat (° S)	long (° E)	water depth (m, sound.)	water depth (m, cable)	s.sal (‰)	s.temp (°)	gear	penetration (m; ca.)	sed. recov. (m)	samples taken and remarks
S1		7.12.	16:00	12°14.70	129°56.97			34.65	31.58	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
			16:05-16:11	12°14.65	129°55.49			34.65	31.58	p	s-surface		1 pomade jar with alcohol
S2			18:00	12°13.08	129°38.39	58	58	34.73	31.40	muc	---	---	unsuccessfull attempt, empty
	MUC1		18:45	12°13.08	129°38.39	58	53	34.73	31.40	muc	0.30	max.: 0.28	3 cores sampled
S3			21:00-21:10	12°10.52	129°15.85			34.63	30.38	p	s-surface		1 pomade jar with alcohol
			21:00	12°10.52	129°15.85			34.63	30.38	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S4			23:45-23:50	12°07.21	128°46.86			34.60	30.64	p	s-surface		1 pomade jar with alcohol
			23:45	12°07.21	128°46.86			34.60	30.64	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S5		8.12.	03:00-03:05	12°02.30	128°09.17			34.40	30.74	p	s-surface		1 pomade jar with alcohol
			03:00	12°02.30	128°09.17			34.40	30.74	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S6	GC1		06:00	12°00.00	127°50.00	124	111	34.25	30.41	gc	5.00	4.32	cut into 5 sections (4x1m; 1x0.325m), cc sample
			06:25	12°00.09	127°49.80	118	110	34.25	30.42	muc	---	---	unsuccessfull attempt, empty
	MUC2		06:50	12°00.13	127°49.78	116	107	34.25	30.42	muc	0.40	max.: 0.30	3 cores sampled, surface for Mike
			07:15-07:20	12°00.17	127°49.67			34.28	30.42	p	s-surface		1 pomade jar with alcohol
			07:15	12°00.17	127°49.67			34.28	30.42	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S7			13:00	12°19.47	126°53.97			34.42	30.44	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
			13:00-13:05	12°19.47	126°53.97			34.42	30.44	p	s-surface		1 pomade jar with alcohol
S8			15:00	12°25.14	126°37.72			34.53	30.05	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
			15:00-15:05	12°25.14	126°37.72			34.53	30.05	p	s-surface		1 pomade jar with alcohol
S9	MUC3		18:00	12°32.81	126°14.70	81	73	34.74	29.80	muc	0.30	max.: 0.29	1 core sliced, 1 core as bulk sample
	GC2		18:30	12°32.86	126°14.84	80	71	34.74	29.76	gc	> 3.00	2.34	cut into 3 sections (2x1m; 1x0.34m), cc sample
S10			23:45-23:50	12°46.86	125°29.03			34.69	29.42	p	s-surface		1 pomade jar with alcohol
			23:45	12°46.86	125°29.03			34.69	29.42	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S11		9.12.	03:00-03:05	12°55.08	125°02.84			34.44	30.18	p	s-surface		1 pomade jar with alcohol
			03:00	12°55.08	125°02.84			34.44	30.18	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S12			06:00-06:05	13°02.69	124°38.17			34.30	29.80	p	s-surface		1 pomade jar with alcohol
			06:00	13°02.69	124°38.17			34.30	29.80	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S13	GC3		10:35	13°14.53	124°00.23	182	n.a.	34.55	29.80	gc	> 5.00	4.92	cut into 5 sections (4x1m; 1x0.92m), cc sample
			10:50-10:55	13°14.61	124°00.20			34.55	29.80	p	s-surface		1 pomade jar with alcohol
			10:50	13°14.61	124°00.20			34.55	29.80	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S14			16:00-16:05	13°23.65	123°29.08			34.53	29.72	p	s-surface		1 pomade jar with alcohol
			16:00	13°23.65	123°29.08			34.53	29.72	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S15			19:45-19:50	13°34.04	122°59.12			34.53	29.49	p	s-surface		1 pomade jar with alcohol
			19:45	13°34.04	122°59.12			34.53	29.49	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S16			18:30-18:35	13°54.59	122°00.69			34.47	28.67	p	s-surface		1 pomade jar with alcohol
			18:30	13°54.59	122°00.69			34.47	28.67	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
	GC4		18:45	13°55.18	122°01.51	470	477	34.49	28.72	gc	5.00	4.62	cut into 5 sections (4x1m; 1x0.62m), cc sample
S17	GC5	10.12.	16:15	14°00.55	121°01.58	2,472	2,504	34.50	28.60	gc	> 5.00	4.97	cut into 5 sections (4x1m; 1x0.97m), cc sample
			17:30-17:35	13°54.59	122°00.69			34.50	28.60	p	s-surface		1 pomade jar with alcohol
			17:30	13°54.59	122°00.69			34.50	28.60	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
	CTD1		17:55	13°54.59	122°00.69	2,174	---	34.50	28.60	ctd	---	---	unsuccessfull attempt, CTD failed
S18	CTD2		13:06	14°19.78	121°08.84	2,174	max.: 2,150	34.52	28.58	ctd	0->2,150		12 water samples taken
	CTD3		14:15	14°19.78	121°08.84	2,174	max.: 200	34.52	28.58	ctd	0->200		3 water samples taken
	GC6		23:40	14°19.67	121°09.81	2,177	2,218	34.49	28.56	gc	4.50	4.32	cut into 5 sections (4x1m; 1x0.32m), cc sample
			23:15	14°19.35	121°10.20	2,180	2,228	34.49	28.56	muc	---	---	unsuccessfull attempt, empty (1 sample taken fr. foot)

no.	label	date	time (local)	lat (° S)	long (° E)	water depth (m, sound.)	water depth (m, cable)	S sal (‰)	S temp (°)	gear	penetration (m; ca.)	sed. recov. (m)	samples taken and remarks
S19	GC7	11.12.	05:33	14°42.58	120°32.74	1,440	1,445	34.48	28.65	gc	> 5.00	4.93	cut into 5 sections (4x1m; 1x0.93m), cc samples + samples from the bomb
			05:30-05:35	14°42.58	120°32.74			34.48	28.65	p	s-surface		1 pomade jar with alcohol
			05:30	14°42.58	120°32.74			34.48	28.65	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S20	GC8		09:28	14°54.97	120°57.49	625	678	34.55	28.57	gc	> 5.00	4.77	cut into 5 sections (4x1m; 1x0.77m), cc sample
	MUC4		09:15	14°54.84	120°57.66	625	681	34.55	28.57	muc	0.30	max.: 0.29	1 core sliced, 1 core @ 1cm, 1 core @ 1cm + RB, 1 core as bulk samples, surface for Mike
	CTD4		11:10	14°54.58	120°58.04	670	max.: 660	34.60	28.61	ctd	0->660		11 water samples taken
													1 bottle lost
		12.12.	08:30	Stop over off Broome									
S21			21:15	17°20.22	120°00.21	312	324	34.50	28.94	muc	---	---	unsuccessfull attempt, empty (sediment too coarse)
			21:39	17°20.62	120°00.33	312	324	34.50	28.94	gc	---	---	unsuccessfull attempt, empty (sediment too coarse)
S22	GC9	13.12.	10:00	18°07.63	118°00.92	498	502	34.58	27.68	gc	> 5.00	4.65	cut into 5 sections (4x1m; 1x0.65m),cc sample
	MUC5		10:30	18°07.43	118°01.07	499	510	34.56	27.48	muc	0.30	max.: 0.26	1 core sliced, 1 core 1st 10 cm @ 1cm + RB
			10:55-11:00	18°07.40	118°01.40			34.58	27.89	p	s-surface		1 pomade jar with alcohol
			10:55	18°07.40	118°01.40			34.58	27.89	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S23	MUC6		23:15	18°09.16	116°01.29	1,462	1,477	34.72	26.73	muc	0.15	max.: 0.12	1 core sliced, 1 core 1st 10 cm @ 1cm + RB, 1 core taken as whole, 1 sample for Mike
	GC10		23:45	18°08.93	116°01.32	1,462	1,473	34.72	26.73	gc	> 5.00	4.65	cut into 5 sections (4x1m; 1x0.65m),cc sample
		14.12.	00:30-00:35	18°08.93	115°59.32			34.73	26.38	p	s-surface		1 pomade jar with alcohol
			00:30	18°08.93	115°59.32			34.73	26.38	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S24	CTD5		07:15	17°39.73	115°00.18	2,397	max.: 2,350	34.50	27.00	ctd	0->2,350		12 water samples taken
	GC11		08:45	17°38.57	114°59.93	2,458	2,470	34.50	27.00	gc	> 5.00	4.82	cut into 5 sections (4x1m; 1x0.82m),cc sample
	MUC7		10:15	17°38.32	114°59.91	2,456	2,472	34.57	27.65	muc	0.17	max.: 0.15	1 core sliced, 1 core @ 1cm, samples for Mike
			11:13-11:18	17°38.26	115°00.03			34.48	27.02	p	s-surface		1 pomade jar with alcohol
			11:13	17°38.26	115°00.03			34.48	27.02	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S25	GC12		15:35	18°14.70	114°59.63	2,034	2,076	34.61	27.38	gc	4.00	3.30	cut into 4 sections (3x1m; 1x0.30m),cc sample
	MUC8		17:00	18°14.21	114°58.64	2,041	2,066	34.53	27.38	muc	0.10	max.: 0.08	1 core @ 1cm, 1 sample for Mike
			17:50-17:55	18°13.84	114°58.31			34.53	26.94	p	s-surface		1 pomade jar with alcohol
			17:50	18°13.84	114°58.31			34.53	26.94	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S26	MUC9	15.12.	00:45	18°49.69	113°59.85	1,455	1,475	34.86	25.95	muc	0.30	max.: 0.24	2 cores sliced, 1 core @ 1cm + RB, 1 core @ 1cm, 1 core as whole, samples for Mike
	GC13		01:50	18°49.26	113°58.44	1,454	1,473	34.86	25.95	gc	4.00	3.50	cut into 4 sections (3x1m; 1x0.50m),cc sample
S27			13:00	20°14.41	113°00.20	832	950	34.91	25.91	gc	---	---	unsuccessfull attempt, empty
			13:40	20°14.41	113°00.20	835	950	34.91	25.91	gc	---	---	unsuccessfull attempt, empty
			13:50-13:55	20°14.41	113°00.20			34.91	25.91	p	s-surface		1 pomade jar with alcohol
			13:50	20°14.41	113°00.20			34.91	25.91	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S28	GC14		16:30	20°02.71	112°39.73	997	1,010	34.87	25.95	gc	> 5.00	4.97	cut into 5 sections (4x1m; 1x0.97m),cc sample
	CTD6		17:30	20°01.93	112°39.38	1,000	max.: 980	34.87	25.95	ctd	0 -> 980		12 water samples taken
S29	GC15		20:45	19°53.75	112°43.37	1,393	1,410	34.95	25.79	gc	> 5.00	4.93	cut into 5 sections (4x1m; 1x0.93m),cc sample
S30	GC16	16.12.	06:00	20°59.83	112°59.35	1,221	1,235	34.61	24.85	gc	> 5.00	4.79	cut into 5 sections (4x1m; 1x0.79m),cc sample
S31	GC17		16:25	22°07.74	113°30.11	1,093	1,113	34.55	25.70	gc	> 5.00	4.60	cut into 5 sections (4x1m; 1x0.60m),cc sample
	CTD7		16:50	22°07.74	113°30.11	1,093	max.: 500	34.55	25.70	ctd	0 -> 500		4 water samples taken
			17:40-17:45	20°07.20	113°30.77			34.70	25.61	p	s-surface		1 pomade jar with alcohol
			17:40	20°07.20	113°30.77			34.70	25.61	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S32	GC18	17.12.	03:05	22°59.64	112°49.86	1,055	1,064	35.02	24.47	gc	> 5.00	4.47	cut into 5 sections (4x1m; 1x0.47m),cc sample
			03:51-03:56	22°59.10	112°49.68			35.01	24.47	p	s-surface		1 pomade jar with alcohol
			03:51	22°59.10	112°49.68			35.01	24.47	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S33			15:27	23°58.37	111°07.72	2,724	2,762	35.38	22.95	gc	---	---	unsuccessfull attempt, empty
			16:20-16:25	23°51.34	111°07.46			35.38	22.87	p	s-surface		1 pomade jar with alcohol
			16:20	23°51.34	111°07.46			35.38	22.87	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S34	GC19		19:00	24°14.11	111°00.18	1,974	1,995	35.36	22.99	gc	2.50	2.23	cut into 3 sections (2x1m; 1x0.23m),cc sample
	CTD8		19:45	24°12.82	111°00.45	1,992	max.: 1,973	35.36	22.99	ctd	0 -> 1,973		6 water samples taken

no	label	date	time (local)	lat (° S)	long (° E)	water depth (m, sound.)	water depth (m, cable)	s-sal (‰)	s-temp (°)	gear	penetration (m; ca.)	sed. recov. (m)	samples taken and remarks
S34		17.12.	22:04	24°13.10	111°01.44	1,971	2,008	35.33	22.85	muc	---	---	unsuccessfull attempt, empty
S35		18.12.	01:00	24°22.17	111°11.85	1,532	1,557	35.35	23.03	gc	---	---	unsuccessfull attempt, empty
			02:00	24°22.96	111°13.41	1,444	1,487	35.35	23.03	gc	---	---	unsuccessfull attempt, empty
S36	GC20		07:45	24°44.67	111°49.75	837	841	34.13	24.13	gc	4.50	4.18	cut into 5 sections (4x1m; 1x0.18m),cc sample
	CTD9		08:30	24°44.71	111°49.40	837	max.: 830	34.13	24.13	ctd	---		no samples taken
			08:47-08:52	24°44.71	111°49.40			34.95	24.11	p	s-surface		1 pomade jar with alcohol
			08:47	24°44.71	111°49.40			34.95	24.11	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S37	GC21		16:30	25°59.78	111°38.09	982	1,002	35.28	23.53	gc	1.60	1.54	cut into 2 sections (1x1m; 1x0.54m),cc sample
			17:00-17:05	25°59.78	111°38.09			35.28	23.53	p	s-surface		1 pomade jar with alcohol
			17:00	25°59.78	111°38.09			35.28	23.53	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S38	GC22		23:53	26°59.52	112°00.31	1,049	1,059	34.99	23.81	gc	1.45	1.38	cut into 2 sections (1x1m; 1x0.38m),cc sample
		19.12.	00:20-00:25	25°59.78	111°38.09			34.99	23.81	p	s-surface		1 pomade jar with alcohol
			00:20	25°59.78	111°38.09			34.99	23.81	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S39	GC23		12:25	28°44.70	112°46.94	2,470	2,616	35.56	21.44	gc	4.50	4.16	cut into 5 sections (4x1m; 1x0.16m),cc sample
			12:30-12:35	28°44.70	112°46.94			35.56	21.44	p	s-surface		1 pomade jar with alcohol
			12:30	28°44.70	112°46.94			35.56	21.44	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
	CTD10		14:10	28°44.35	112°47.89	2,470	max.: 2,400	35.58	21.55	ctd	0 -> 2,400		11 water samples taken
S40	GC24		16:38	28°45.04	113°03.87	1,577	1,588	35.21	22.86	gc	1.00	0.80	cut into 1 section, cc sample + nozzle sample
			16:38-16:43	28°45.04	113°03.87			35.30	23.21	p	s-surface		1 pomade jar with alcohol
			16:38	28°45.04	113°03.87			35.30	23.21	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
S41	GC25		20:28	28°43.93	113°22.08	1,010	1,029	35.26	23.32	gc	3.00	2.72	cut into 3 sections (2x1m; 1x0.72m), cc sample
			21:15-21:20	28°43.93	113°22.08			35.26	23.31	p	s-surface		1 pomade jar with alcohol
S42			22:55	28°46.29	113°32.02	720	726	35.25	22.89	gc	---	---	unsuccessfull attempt, empty
	CTD11		23:50	28°46.29	113°32.02	720	max.: 680	35.25	22.89	ctd	0 -> 680		3 water samples taken
S43	GC26	20.12.	06:45	29°14.42	113°33.48	1,734	1,794	35.34	22.69	gc	2.40	1.98	cut into 2 sections (1x1m; 1x0.98m), cc sample
			07:14-07:21	29°13.94	113°33.84			35.35	22.47	p	s-surface		1 pomade jar with alcohol
S44			10:20	29°30.08	114°00.41	635	647	35.33	22.37	gc	---	---	unsuccessfull attempt, empty
			10:41-10:46	29°30.08	114°00.41			35.33	22.37	p	s-surface		1 pomade jar with alcohol
S45			14:20	30°00.14	114°16.64	829	853	35.57	20.96	gc	1.00	0.95	cut into 1 section (1x0.95m), cc sample
			14:40-14:45	30°00.14	114°16.64			35.56	21.33	p	s-surface		1 pomade jar with alcohol
			14:40	30°00.14	114°16.64			35.56	21.33	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.
	CTD12		14:40	30°00.14	114°16.64	853	max.: 800	35.56	21.33	ctd	0 -> 800		no sample taken
S46	GC28		17:15	30°04.88	114°08.51	1.440	1.456	35.64	20.65	gc	1.50	1.44	cut into 2 sections (1x1m; 1x0.44m), cc sample
S47	GC29	21.12.	00:30	30°59.59	114°35.37	1.200	1.224	35.43	21.46	gc	2.40	2.18	cut into 3 sections (2x1m; 1x0.18m), cc sample
			00:50-00:55	30°59.32	114°36.21			35.51	21.42	p	s-surface		1 pomade jar with alcohol
			00:50	30°59.32	114°36.21			35.51	21.42	bu	s-surface		d18O, diat. & nanno filter + res., 2 waters.

Abbreviations: muc - multi-corer; bu - bucket sample; p - plankton net tow; cc - core catcher; ctd - conductivity-temperature-depth device