

## RESEARCH SUMMARY

CRUISE FR 7/95

Sailed Fremantle 1115 hrs Monday 10th July 1995  
Docked Fremantle 0745 hrs Tuesday 1st August 1995

### COOL-WATER CARBONATE SEDIMENTATION, GREAT AUSTRALIAN BIGHT & PHYTOPLANKTON PRODUCTIVITY

Chief Scientist

Dr Yvonne Bone  
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Principal Investigators

Dr Yvonne Bone  
University of Adelaide

Dr Noel P. James  
Queens University, Canada

Dr. Jim Mitchell  
Prof. Chris C. von Der Borch  
Flinders University

Dr Dave Feary  
AGSO, Canberra

## RV FRANKLIN

### RESEARCH SUMMARY FR 07/95

#### 1. Itinerary

The vessel departed Fremantle at 1115 hrs, July 10th (local time). The cruise ended with the vessel docking at Fremantle at 0745 hrs on 1st August (local time).

#### 2. Scientific Program

Cruise objectives were to:

- (a) Increase understanding of cool-water carbonates on a high-energy, open shelf.
- (b) Characterise the Holocene sedimentary facies.
- (c) Document the nature of the shelf margin.
- (d) Endeavour to sample mounds, located by seismic, on the shelf slope.
- (e) Ascertain controls governing the distribution of warmer-water large foraminifers and green calcareous algae.
- (f) Document the distribution and systematics of the bryozoans, molluscs, foraminifers, sponges and deep-water corals present.
- (g) Collect biota for screening for active metabolites.
- (h) Ascertain the chemical characteristics of the bottom waters across the shelf and down the slope margin.
- (i) Determine the extent to which phytoplankton species in this area show deterministic population dynamics.
- (j) Determine linkage among phytoplankton biomass, productivity and species composition.
- (k) Determine the extent to which discrete station samples are representative of continuous biomass and productivity measurements.

The cruise was multi disciplinary, but with the emphasis on geoscientific aspects. It utilised a number of different techniques, including precision depth profiling; rock, sediment and biota sampling by means of pipe dredging, epibenthic sled dredging, beam trawling and Smith-McIntyre grabbing; water sampling and analysis by means of CTD and flow-through fluorometry; ADCP and sea-floor photography.

This is the fourth cruise investigating such parameters along Australia's southern margin. It will be followed by a further cruise next year into the transition zone between the temperate and tropical environments, northwards of Perth.

### 3. Principal Investigators

Dr Yvonne Bone, Dept. of Geology and Geophysics, University of Adelaide was the only principal investigator able to be aboard for the cruise. Dr Noel James, Queens University, Ontario, Canada and Dr Jim Mitchell, Dept. of Marine Biology, Flinders University were actively involved in pre-cruise preparations and will be involved with post-cruise laboratory work and interpretation. They sent participating personnel aboard in their stead. Dr Chris von der Borch, School of Earth Sciences, Flinders University and Dr David Feary, AGSO, Canberra were unable to participate, partially due to non-availability of needed seismic equipment.

The non-CSIRO contribution to the cruise was provided by the Australian Research Council and the Natural Sciences and Engineering Research Council of Canada.

### 4. Results

Sea-floor and water samples were obtained from 142 sites, ranging from nearshore (depths of ~30 m) to downslope depths of 2997 m. These were obtained by:-

pipe dredge (Bleys Dredge)	33	samples
epibenthic sled	104	samples
beam trawl	9	samples
CTD	122	samples
XBT	5	samples
Smith-McIntyre grab	4	samples

These samples were augmented by the deployment of the underwater camera at 19 sites.

Flow-through fluorometry recordings were made at regular intervals.

Bathymetric depth profiling was continuously recorded, along with surface temperature and surface salinity recordings. Bottom water temperature and bottom salinity were recorded at all the CTD stations.

### 5. Cruise Narrative

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

DAY 1 (Mon. July 10) Departed Fremantle at 11.15h on July 10th, 1995. Talks held for all scientists in Operations Room, by the Captain, procedures outlined and goals and activities discussed. Site prefix of GAB xxx was chosen, with same number to be given to all samples from all activities at site. Proceeded 140 nm to Station A/Site 1 off Cape Mentelle where the epibenthic sled was deployed, returning a large haul of benthic biota and sediment. Mouth of sled was bent and needed minor repairs. The CTD was deployed, with a bottom-water sample collected. Wind rising.

DAY 2 (Tues. July 11) Hove to all day, with wind gusting to 50 knots. No sampling. Most scientists sea-sick to varying degree. Decision taken at 21.15h to steam to Head of Bight area, as forecast for no easing of gales before July 14th.

DAY 3 (Wed. July 12) Continued to slowly steam eastwards. No change in weather or forecast. Scientists getting their sea-legs.

DAY 4 (Thurs. July 13) Continued to slowly steam eastwards. Weather forecast more promising. ETA at Site 2 of 15.00h on Friday 14.

DAY 5 (Fri. July 14) Sea much calmer. Sled deployed at 12.30h, with excellent return. CTD deployed at all sites. Team approach worked well. A further 4 sites sampled, with the latter 3 using the pipe dredge.

DAY 6 (Sat. July 15) Successful day, with 9 sites sampled. Camera deployments successful but camera itself not operating reliably, with automatic winding mechanism not always functioning, especially with Fuji colour film.

DAY 7 (Sun. July 16) Successful day, with first of slope mounds delineated and sampled. Planned coring of mound abandoned, as two essential parts of corer not aboard. 14 sites sampled.

DAY 8 (Mon. July 17) Weather deteriorating, but 7 sites sampled.

DAY 9 (Tues. July 18) Slope mound 2 delineated and sampled. Successful deployment of beam trawl, with abundant living sponges and bryozoans retrieved. 9 sites sampled.

DAY 10 (Wed. July 19) Slope mound 3 delineated and sampled. Another 9 sites sampled.

DAY 11 (Thurs. July 20) Weather making sampling difficult, but 9 sites sampled.

DAY 12 (Fri. July 21) Hove to all day off Pt Culver due to rough weather.

DAY 13 (Sat. July 22) Proceeded to station at 08.00h, after rough night. Still too rough to deploy equipment. Deployed sled at 0900h. Weather improved and allowed sampling of further 10 sites, including a spectacular haul of bryozoans with the beam trawl.

DAY 14 (Sun. July 23) Trawls at 200 m and 300 m did not return large hauls of calcareous epibenthos or sponges, so proposed 1500 m trawl was cancelled. The calm weather allowed a transect into deeper water. The first attempt with Smith-McIntyre Grab to 1500 m was marginally successful; the latter to 3000 m was unsuccessful and it was decided not to try again, as the material at 1500 m was not that sought.

DAY 15 (Mon. July 24) Excellent sled returns of living bryozoans and sponges on outer shelf south of Recherche Archipelago. Beam trawl lost at Site GAB 093, with wire breaking on each bridle. Steamed south whilst repairs made to wire, then continued sampling with sled and CTD. Forecasted gusts of 50 knots did not eventuate until after midnight.

DAY 16 (Tues. July 25) Continued sampling towards Causeway Channel off Esperance. After two sites, weather deteriorated rapidly. CTD cable twisted during latter deployment, necessitating repairs. Hove to at 04.00 h. Weather worsened, so steamed to Esperance for shelter, dropping anchor just on 17.00 h, in the lee of Woody Island. Deployed Smith-McIntyre grab and CTD.

DAY 17 (Wed. July 26) Weighed anchor at 09.00 h, and commenced sampling in Causeway Channel at 10.30 h, in moderate seas. Forecasted gales did not eventuate and a good day's sampling was achieved, although the sled blades were bent on two deployments.

DAY 18 (Thurs. July 27) Weather perfect for successful sampling. ADCP activated on southward transect on long.119, to monitor possible Leeuwin Current flow. Running short of plastic sample bags - <2000 used!

DAY 19 (Fri. July 28) Minor problems with the read-out on the main A-frame cable. Weather deteriorating, but sampling continued all day.

DAY 20 (Sat. July 29) High swells necessitated abandoning CTD deployment at Site 131, but ADCP shows that strong current is down to bottom, so assumption that bottom temperature is similar to that at surface. Increasing winds led to decision to move to at 01.30 h, off C. Leeuwin.

DAY 21 (Sun. July 30) Weather continued at gale force, waning slightly later in morning. One station occupied at 15.04 hrs, but pipe only deployed. Abandoned planned stations and steamed northwards, 3 sites samples.

DAY 22 (Mon. July 31) Sampling completed at 12.35 hrs. Steaming to Fremantle, whilst scientists packing up equipment and samples.

DAY 23 (Tues. Aug 1) Continued steaming to Fremantle, docking at 07.45 hrs.

## 6. Summary

The anticipated loss of time through bad weather, common at this time of the year in the region, eventuated. Nevertheless, Cruise 07/95 was highly successful, with all objectives achieved to varying degrees. Follow-up work will undoubtedly provide much new information and allow increased reliability in our interpretation of the characteristics of the southern margin of Australia. It is to be hoped that the metabolite screening program reveals compounds that will benefit medical drug research, especially in view of the exciting discovery from one sample from Cruise 06/94.

Specific topic summaries are:-

### SEDIMENTOLOGY (7/95) (Lindsay Collins)

A total of 142 sediment stations were occupied, using an epibenthic sled or pipe dredge, accompanied by CTD or XBT. 19 camera stations were also selected from associated sites. Samples were obtained in depths of 30 to 500 metres. Of 2 deep stations (1500&3000m), using a Smith-MacIntyre Grab, only the shallower was successful. Bathymetric profiles were run on all traverses, and shelf-edge mounds were also profiled and sampled.

ADCP data were collected over the western half of the study area.

Major findings were:-

- relict sediments with well developed rhodolith pavements dominated inshore (<30m) areas;
- a drowned rhodolith zone at -100 to -150m will, on dating, give important sea level history information;
- a wide, sandy shelf is characterised by an association of bryozoans, sponges and ascidians; this is frequently found as a semi-consolidated "firmground" substrate, and as such it has an inhibiting effect on sediment movement, and a "binding" role;

-a sandy (rather than muddy ) continental margin, where bryozoan communities are active in sediment production, often extending to -300m before muds are encountered; pointing towards greater Leeuwin Current influence;  
-ADCP data indicating significant (>0.5m/sec) bottom currents to depths of at least 200m; these (Leeuwin ) currents have the potential to transport sandy sediment across the width of the shelf, and to reinforce wave action at the bottom, a factor not fully appreciated previously.

The information collected , covering almost half the southern continental margin, is an important addition to knowledge of Australian continental margin sedimentation and history.

#### LIVING BRYOZOA FROM CRUISE Fr07/95 (Steve Hageman)

Bryozoans are the major skeletal components of carbonate sands in cool-water settings of Southern Australia. The majority of stations sampled contained living bryozoans. Samples ranged from low to very high diversity. It is estimated that for about 30 - 40 samples, the local diversity of bryozoans exceeds 60 species, and in several cases, single samples contain more than 100 species. High diversity samples usually contain bryozoans of many different growth forms, occupying a wide range of microhabitats. Upper slope samples contain few or no living bryozoans; sediments from a few shelf stations contain numerous dead or relict bryozoans.

The prominent groups include several species of *Adeona*, *Adeonellopsis*, *Celleporaria*, many catenicellids, the vagrant forms (species of *Lunularia*, *Selenaria* and *Otionella*), *Sphaeropora*, *Parmularia*, and the fenestrate colonies of phidoloporid bryozoans. A large number of colonies occur encrusting rocks, shells, algae, and rhodoliths, but the majority of these will not add significant amounts to the calcareous sediment. In addition, several other weakly calcified colonies are present which have no preservation potential. These include species of *Bugula*, and *Amathia*. Several examples were separated for testing for biologically active metabolites.

Most of the easily identifiable groups are similar to forms collected from elsewhere in southern Australia, including the Lacepede Shelf and Bass Strait. At least two forms are of interest because they have not been recorded previously from non-tropical waters. These are a species of *Hippopetraliella*, and a species of *Cigclisula* (not *C.verticalis*). It may be expected that detailed, specific identification will show the presence of other elements related to the tropical Indo-Pacific fauna.

Because of the dominant role bryozoans play in the ecology of the Great Australian Bight, a detailed analysis of their habitats and distributions will aid in the understanding of this ecosystem as a whole. In addition, information about these Bryozoa will provide valuable insights for paleoenvironmental analysis of carbonate rocks from related settings throughout the Cenozoic of Australia.

#### SURFACE WATER STUDIES (Peter Strutton)

##### Spatial Distribution of Phytoplankton

The aim of this section was to measure phytoplankton abundance and productivity in conjunction with temperature and salinity in order to relate the biological and physical factors influencing the spatial distribution of phytoplankton.

Phytoplankton abundance was measured as Chlorophyll a using the on board underway Turner Fluorometer. Productivity (photochemical efficiency of Photosystem II) was estimated using dark-adapted samples with and without Dichlorophenyl Methylurea (DCMU). Temperature and salinity were measured using the ship's underway thermosalinograph. Fluorescence was logged at 1 second intervals, temperature and salinity at 3 seconds, and the DCMU analysis was performed roughly every 3 hours (while steaming for extended periods) or while on station. Inspection of the daily plots of temperature / salinity / fluorescence show that the main region of variation was the continental shelf region of the Great Australian Bight. Subsequent analysis should reveal the relative contributions of biological and physical factors to the observed spatial structures.

### Microbial studies

The aim of this section was to determine the ability of marine bacteria to chemotactically respond to nutrient gradients. Seawater samples from 10 stations were placed in one side of a sterile chamber, separated from a nutrient source by a thin, permeable membrane. As the nutrient source diffused through the membrane, a nutrient gradient was established. In order to estimate the rate at which bacteria were capable of responding to such a gradient, samples were left for 15 min, 6 hr and 12 hr and fixed with formaldehyde. Bacterial counts conducted in the laboratory will determine the extent to which natural marine bacteria may respond to nutrient gradients encountered in their natural habitat.

### METABOLITE SCREENING (Lisa Hobbs)

Samples of macrobenthic fauna, predominantly sponges, tunicates and the more common bryozoa and algae were collected during the cruise for the Marine Natural Product Research Group, Department of Chemistry, University of Melbourne whose main interests are the discovery of new organic chemical compounds occurring naturally in marine life forms. Research conducted by the group is directed by the antibiotic activity of the extracts from these organisms. Incidentally the antibiotic/antiparasitic properties of these products are of increasing interest to pharmaceutical researchers.

Material was collected both by means of beam trawl (net dimensions 3.5m x 12m x 3cm mesh), deployed at a range of depths at 9 stations across the Bight shelf, and by epibenthic sled (1m x 0.25m gape), deployed at all sites along the cruise track where possible. Samples collected were photographed for identification purposes and then frozen for transport to Melbourne in order to preserve the nature of the chemistry.

The beam trawl, being the most effective method for obtaining a representative collection of the macrobenthic fauna, unfortunately made an untimely departure to the sea floor at Station 94 (34°31.8'S 122° 35.9', depth 95m) due south of the Recherche Group. The greatest diversity of sponges (approx. 70 species) was trawled at Station 33, at a depth of 80m, 90Nm SW of Eucla. Larger numbers of sponges were caught consistently by the sled at depths between 50-100m but this was by no means a quantitative sampling programme.

Following taxonomic identification, representatives of the animal species collected will be deposited at the Museum of Victoria.

## 7. Personnel

Dr Yvonne Bone (Chief Scientist)	Dept. of Geology and
Dr Steve Hageman	Geophysics
Mr Jason Gultjaeff	University of Adelaide
Dr Lindsay Collins (2IC)	Dept. of Applied Geology
	Curtin University
Dr Phil Bock	Dept. of Engineering and Geology
	Royal Melbourne Institute of Technology
Dr Frank Brunton	Dept. of Geological Sciences
Mr Jeff Lukasik	Queens University, Canada
Mr Peter Strutton	Dept. of Marine Biology
Ms Michelle Hale	Flinders University
Ms Lisa Hobbs	Dept. of Organic Chemistry
	Melbourne University
Mr Dave Vaudrey (Cruise Manager)	CSIRO - ORV
Mr Erik Madsen	CSIRO - ORV

## 8. Follow-up Laboratory Work (brief outline)

(a) Bulk sediment samples: These will be cleaned and dried, and a qualitative analysis of the composition of the bulk sample and the coarse fraction from each sample will be made by Bone, Collins and Dr Noel James, Dept. of Geological Sciences, Queens University, Canada. They will produce a facies map, based on sediment composition. Selected samples will be dated, to enable sea-level history interpretation.

(b) Bryozoa: The living bryozoans have been separated aboard and will be further taxonomically identified by Brock and Hageman. Bone, Hageman and Brock plan to produce a semi-pictorial publication on the Bryozoa of Southern Australia, and all living species collected on this cruise will be photographed for inclusion. Ms Pat Cook and Dr Robin Wass will be invited to participate in this project. Hageman and Bone will continue their comparative studies with other areas and fossil bryozoans in onshore Tertiary basins. Gultjaeff and Hageman will try to determine which species have paleoenvironmental predictive value. Bone will continue her geochemical studies.

Brachiopods: Dr Joyce Richardson, Museum of Victoria, will be involved in identifying all species collected. Bone, James and Dr Kurt Kyser, Dept of Geological Sciences, Queens University, Canada will continue their geochemical studies.

Echinoids: Dr Ken McNamara, Museum of Western Australia, will identify all living samples collected.

Molluscs: Lukasik will identify the more conspicuous molluscs, particularly those that are also common in the Tertiary.

Sponges: Hobbs will section all samples and identify them prior to their being screened for active metabolites by Dr Rob Capon, Dept. of Organic Chemistry, Melbourne University.

Crustacea et al.: All samples will be given to Dr Gary Poore, Museum of Victoria.



**Foraminifera:** Dr Li Qianyu, Dept. of Geology and Geophysics, University of Adelaide, will analyse distribution of modern and relict specimens of both benthic and planktic species in all samples, and determine Holocene environments.

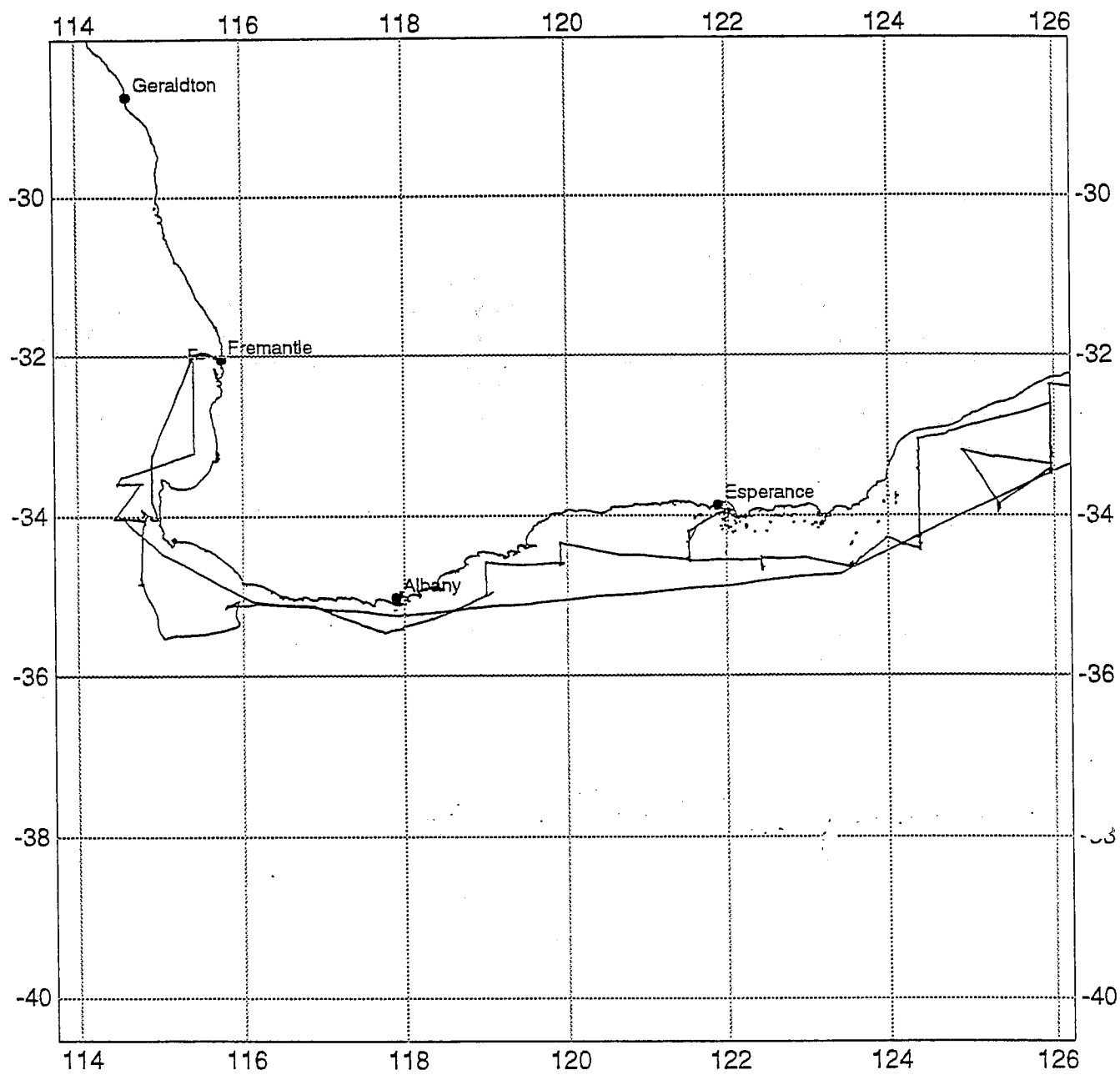
**Water Samples:** Kyser will analyse samples for stable isotopes and selected trace elements. These results will be integrated with work on phytoplankton productivity by Strutton, Hales and Dr Jim Mitchell, Dept. of Marine Biology, Flinders University.

**Phytoplankton:** Mitchell, Strutton and Hales will interpret their data on phytoplankton productivity in relation to oceanographic parameters.

## 9. Acknowledgements.

The scientific party would like to acknowledge the professional expertise of Captain I. Sneddon, and all officers and crew of RV *Franklin*, and thank them for their unstinting and friendly help at all times. This is the fourth cruise in this series wherein the *Franklin* has proven itself to be an excellent research vessel, well suited to this type of geo- and bio-scientific work. The CSIRO personnel (Cruise Manager, Dave Vaudrey, and Electronics Specialist, Erik Madsen) were thoroughly competent and co-operative. Their continuous cheerfulness and skill in all situations enabled non-stop data-gathering. Special compliments must be given to the Chefs, Gary and Tom, for their excellent culinary delights throughout the voyage.

Dr Yvonne Bone  
Chief Scientist



			GREAT	AUSTRALIAN	BIGHT	-	R.V. FRANKLIN CRUISE 07/95
Station	Day	Time - Local	Water	Actual Lat	temp	Description - Remarks	
Station	Date	Time - GMT	Depth m	Actual Long	salinity	Description - Remarks	
GAB-001	M-10-7	12:52 L	42.0	34°02' S		sled	four species of sil. sponges in sled
				114°57' E			med grade skel sand; sponges and bryozoans as
GAB-001		1:30 L	47.0	34°03' S	18.07	ctd	scattered benthos: Adeona common
				114°56' E	35.78		
GAB-002	F-14-7	12:32 L	49.5	32°42' S		sled	substrate: sandy, scattered sponges and Adeona sp.
		04:32 GMT		127°31' E			many small infaunal bivalves in crs. fract.
GAB-002		12:51 L	49.0	32°42' S	16.1	ctd	sediment: m - c skel sand, mod well rounded
		04:41 GMT		127°31' E	36.06		artic coralline algae, bryoz frags in bulk & crs. fract
GAB-003	F-14-7	3:11 L	30.0	32°19' S	15.19°	sled	meadow of diverse soft red algae
		07:11 GMT		127°30' E	36.16		diverse bryozoan and ascidian fauna on algal stems
GAB-003		3:29 L	20.0	32°20' S	15.1	ctd	uniform, coarse to v. c. sand;
		07:29 GMT		127°30' E	36.33		20% qtz, forams, black bits, 4 sponges
GAB-004	F-14-7	5:55 L	36.0	32°15' S	15.24°	pipe	soft red algae, but less diverse & frequent as 003
		9:57 GMT		128°00' E	36.29		much fewer bryoz & lower diversity than 003
GAB-004		6:10 L	35.5	32°15' S	15.14	ctd	still many ascidians
		10:09 GMT		128°01' E	36.39		uniform, coarse to v. c. sand
GAB-005	F-14-7	20:32 L	40.0	32°06' S	15.29°	pipe	c - vc grade sand, numerous & div. molluscs, minor
		12:31 GMT		128°29' E	36.31		brachs & rhodoliths, mod. bryo diversity
GAB-005		20:41 L	40.0	32°06' S	15.17	ctd	no red algae or sponges
		12:41 GMT		128°29' E	36.51		
GAB-006	F-14-7	21:08 L	40.0	32°04' S	15.11°	pipe	c - vc grade sand, little living material,
		13:08 GMT		128°29' E	36.42		more broken & fragmented molluscs & bryoz
						no ctd	no red algae or sponges
GAB-007	15-Jul	00:30 L	42.0	31°50' S	15.42	sled	m - c grd skel sand, little living, many mollusc. & bryoz
		16:30 GMT		129°00' E	36.3		
GAB-007		00:40 L	42.0	31°51' S	15.34	ctd	
		16:40 GMT		129°01' E	36.49		
GAB-008	15-Jul	03:30 L	43.0	31°43' S	15.56	pipe	f grd. sand, cream color, well sorted, bryo. frags,
		19:30 GMT		129°30' E	36.33		small pectinids, no living, very small crse fract.
GAB-008		03:40 L	44.0	31°43' S	15.41	ctd	
		19:40 GMT	[35]	129°31' E	35.54		

GAB-009	14-Jul	07:54 L	45.5	31°40' S	pipe	15.15 f	grd. sand, cream color, minor pigmented grains
		23:54 GMT		130°00' E		36.49	crs. fract br frags, & min. bivalves
GAB-009		08:03 L	47.~	31°40' S	ctd	15.19	Beam trawl - s sponges, Pinna/irreg. echinoid
		00:03 GMT	[40]	130°00' E		36.65	camera (color) — beam trawl
GAB-010	15-Jul	11:00 L	54.0	32°00' S	sled	15.97	m. grade ang skel. sand; bryoz abndt in crs fract &
		03:00 GMT		130°00' E		36.21	small bivalves,
GAB-010		11:14 L	55.5	32°00' S	ctd	15.68	
		3:14	[48]	129°59' E		36.56	camera (bw)
GAB-011	15-Jul	14:00 L	60.0	32°25' S	sled	16.35	crs -vc sand, abundant bryoz, div. molluscs
		06:06 GMT		130°00' E		35.98	little living, some corallines & Marginopora,
GAB-011		14:20 L	58.5	32°25' S	ctd	16.25	everything fragmented and abraded, paleostrand line?
		06:20 GMT	[57.1]	129°59' E		36.14	camera (color)
GAB-012	15-Jul	16:22 L	70.0	32°42' S	sled	16.5	crs -vc sand, abundant bryoz, div. molluscs
		08:24 GMT		130°00' E		35.84	living vagrants, some corallines, everything
GAB-012		16:42 L	69.5	32°42' S	ctd	16.46	fragmented and abraded
		08:42 GMT	[65.2]	130°00' E		35.99	camera (bw)
GAB-013	15-Jul	19:17 L	101.0	33°06' S	sled	16.57	abd. living cats & vagrants, crs. fract = bryoz & minor
		11:17 GMT		130°00' E		35.74	molluscs, brachs & corals, some living bryoz &
GAB-013		19:36 L	102.0	33°06' S	ctd	16.55	coralline algae, large rhodoliths relic
		11:36 GMT	[99.2]	130°00' E		35.89	camera (color)
GAB-014	15-Jul	21:34 L	153.0	33°16' S	sled	16.6	meager crs fract of delicate bryoz, mostly delicate
		13:34 GMT		130°00' E		35.72	cyclostomes, large mud & fine sand fraction
GAB-014		21:55 L	155.0	33°17' S	ctd	16.65	
		13:55 GMT	[152]	130°00' E		35.86	camera (bw)
GAB-015	15-Jul	23:34 L	200.0	33°20' S	pipe	16.59	f - m. sand, bryo frag abundt.; fewer molluscs,
		14:54 GMT		130°00' E		35.72	very little living material
GAB-015		23:50 L	202.5	33°20' S	ctd	16.03	
		15:50 GMT	[197.6]	129°58' E		35.76	camera (color)
GAB-016	16-Jul	12:50 L	308.5	33°21'34" S	sled	16.59	cream col. , fine - vf. skel mud, very little crs fract.
		16:47 GMT		129°58' E		35.71	few dead delicate bryoz, pteropods, sil. sponge
GAB-016		13:06 L	320.0	33°21' S	ctd		spicules
		17:06 GMT		129°59' E			
GAB-017	16-Jul	1:44 L	400.5	33°23' S	pipe	16.58	cream color. sand to vry f. sand. plus mud, small
		17:44 G		129°59' E		35.71	coarse fraction. few delicate bryoz, sm. bivalves,
GAB-017		2:13 L	415.0	33°23' S	ctd	10.59	worm tubes, scaphopods

		18.13 GMT	[400.5]	129°59' E		34.88	
GAB-018	16-Jul	2.56 L	498.0	33°24' S	pipe	16.54	cream, f-vf sand, plus mud; gastropods, scaphopods,
		18.56 GMT		129°59' E		35.71	forams and pteropods.
GAB-018		3.27 L	505.0	33°24' S	ctd	9.53	
		19.27 GMT	[513.5]	129°59' E		34.73	
GAB-019	16-Jul	7.45 L	301.0	33°22' S	sled	16.81	cream, f-vf sand plus mud, delicate bryoz, relict grains
		23.45 GMT		129°19' E		35.69	including Marginopora, rooted sand fauna with
GAB-019		8.17 L	304.0	33°22' S	ctd	16.32	common bryos and irreg. echinoids
		00.17 GMT	[289.1]	129°19' E		35.85	
GAB-020	16-Jul	09.00 L	156.5	33°20' S	sled	16.8	m. bryozoan sand, relict grains 10%
		01.00 GMT		129°18' E		35.7	plus relict dend. rhodoliths (date these) and bryos
GAB-020		9.14 L	155.0	33°20' S	ctd	16.75	
		1.14 GMT	[140.8]	129°18' E		35.9	
GAB-021	16-Jul	13.43 L	492.5	33°22' S	pipe	16.74	none
		05.43 GMT		128°28' E		35.7	
GAB-021		14.19 L	518.0	33°22' S	ctd		
		06.19 GMT		128°28' E			
GAB-022	16-Jul	17.43 L	347.0	33°20' S	pipe	16.26	mostly mud, with sponge spicules, few scaph & ptero,
		09.43 GMT		128°28' S		35.6	1 live ostracod, no live bryoz or sponges
GAB-022	16-Jul	18.20 L	382.5	33°20' S	ctd		
		10.20 GMT		128°28' S			
GAB-023	16-Jul	19.15 L	343.0	33°19' S	pipe	16.18	mostly mud, with abnd. sil. spnge spic, planktic &
		11.15 GMT		128°28' S		35.59	benthic forams, crust. fragments, few sol. corals.
GAB-024	16-Jul	19.48 L	305.0	33°20' S	pipe	16.18	mostly mud, with abnd sil. spnge spic, planktic &
		11.48 GMT		128°28' S		35.59	benthic forams, crust. fragments, few sol. corals.
GAB-025	16-Jul	20.35 L	295.0	33°19' S	pipe	16.28	silly mud, with more diverse benthic fauna
		12.35 GMT		128°29' S		35.56	more bryoz, echinoids, spnge spic, sol. corals
GAB-026	16-Jul	21.22 L	309.0	33°19' S	pipe	16.17	silly mud, with more diverse benthic fauna; more
		13.22 GMT		128°29' S		35.57	bryoz, echinoids, sponge spic, sol.corals, worm tubes
GAB-027	16-Jul	22.04 L	358.0	33°20' S	pipe	15.81	silly mud, with more diverse benthic fauna; more
		14.04 GMT		128°29' S		35.51	bryoz, echinoids, sponge spic, sol.corals, worm tubes
GAB-028	16-Jul	23.07 L	205.0	33°18' S	pipe	16.52	silly mud, with more diverse benthic fauna; more
		15.07 GMT		128°29' S		35.57	bryoz, echinoids, sponge spic, sol.corals, worm tubes
GAB-029	17-Jul	01.13 L	148.0	33°16' S	pipe	16.44	crm, f-vf sand, small bryo frags & pteropods, crs has
		17.13 GMT		28°32' S		35.69	small bivalves

GAB-030	17-Jul	02.32 L	137.0	33°13	sled	16.69	m gr skel sand, barren, but fenestrate & lunuliform
		18.32 GMT		28°29		35.69	bryos
GAB-030	17-Jul	03.27 L	129.0	33°13	ctd	16.12	
		19.27 GMT	[120]	128°28		35.75	
GAB-031	17-Jul	04.47 L	90.5	33°03	sled	16.49	m. grain sand w/ relict rhodoliths & bryoz; some living
		20.47 GMT		128°29		35.75	Adeona, brwn frag. sea grass; small sponge frags & fans
GAB-031	17-Jul	05.08 L	92.5	33°03	ctd	16.53	6 sponges were collected
		21.08 GMT	[81.5]	128°29		35.98	
GAB-032	17-Jul	08.01 L	54.0	32°40	trawl	16.05	large bryoz, 8 sponges, minor ascidians
		00.01 GMT		128°29		36.12	
GAB-032	17-Jul	07.48 L	54.5	32°40	pipe	16.17	m. sand, poorly sorted, mixed shell hash; crs.
		23.48 GMT		128°29		35.86	fraction Adeona, bivalves and few lithoclasts.
GAB-032	17-Jul	08.30 L	51.0	32°41	ctd	16.06	
		00.30 GMT	[45.7]	128°28		36.12	
GAB-033	17-Jul	12.52 L	83.0	32°59	trawl	16.6	abundant sponges (68 sp.), rooted bryozoans,
		04.52 GMT		128°00		35.75	crinoids, holothurians, Adeona.
GAB-033	17-Jul	13.26 L	87.0	33°00	pipe	16.6	m-c skel sand, lots of bryozoans & molluscs.
		05.26 GMT		128°00		35.75	camera (bw)
GAB-033	17-Jul	13.45L	87.5	33°00	ctd	16.62	
		05.45 GMT	[84.3]	128°00		35.99	
GAB-035	17-Jul	19.07 L	153.5	33°16	pipe	16.67	f-m skel sand; sm. del bryoz & mollusc
		11.07 GMT		127°30		35.66	and infaunal echinoids
GAB-036	17-Jul	20.14 L	100.0	33°10	sled	16.47	m skel sand, bryoz, molluscs; a few living bryoz.
		12.14 GMT		127°30		35.67	
GAB-036	17-Jul	20.33 L	107.0	33°10	ctd	16.57	
		12.33 GMT		127°29		36.02	
GAB-037	17-Jul	23.11 L	76.5	32°59	sled	16.58	m - c skel sand, lots bryoz & molluscs; some vagrants
		15.11 GMT		127°11		35.76	& Adeona
GAB-037	17-Jul	23.30 L	79.0	32°59	ctd	16.19	
		15.30 GMT	[78]	127°11		36.06	
GAB-038	18-Jul	03.14 L	51.0	32°41	sled	15.81	m sand with litho clasts, brwn fragmented ls clasts
		19.14 GMT		126°39		35.91	coralline algae, bryoz dead, relict sediment.
GAB-039	18-Jul	05.58 L	42.5	32°28	trawl		bryozoans, 16 sponges sp., Adeona, rhodoliths
		21.58 GMT		126°22			
GAB-039	18-Jul	05.40 L	43.0	32°28	sled	15.04	m gr. lithoclastic sand, rounded lithoclasts, bivalves,

		21.40 GMT		126°23		36.0.	rhodoliths, Adeona frags., angular bivalves.
GAB-040	18-Jul	07:05 L	40.0	32°24	pipe	14.9	muddy, silty, m. grade skeletal sand with dend rholiths
		23:05 GMT		126°14		36.02 (= reworked Wilson Bluff Ls?)	
GAB-040	18-Jul	07:13 L	41.0	32°24	cld	14.91	camera b/w
		23:13 GMT	[35.7]	126°14		36.21	
GAB-041	18-Jul	8:59 L	36.0	32°22'	sled	14.77	dendritic rhodolith gravel, common pectens, brachs;
		00:59 GMT		125°57'		35.98	minor sand, one ascidian
GAB-041	18-Jul	9:11 L	35.0	32°22'	cld	14.8	
		01:11 GMT	[29.4]	125°57'		36.18	
GAB-042	18-Jul	16:49 L	234.0	33°26'	sled	16.62	m-crs skel. sand, living vagrant bryos, solitary
		8:49 GMT		125°58'		35.64	corals
GAB-043	18-Jul	18:07 L	227.0	33°26'	sled	16.52	m-crs skel. sand
		10:07 GMT		125°58'		35.64	
GAB-043	18-Jul	18:40 L	160.0	33°25'	cld	16.79	
		10:40 GMT	[155.4]	125°58'		35.89	camera cp
GAB-044	18-Jul	19:43 L	163.0	33°25'	sled	16.48	m-crs bryos sand
		11:43 GMT		125°58'		35.64	
GAB-044	18-Jul	L	42-44 st.	33°25'	trawl		rays, holothurians, star fish, small shark, a few dead fish,
		GMT		125°58'			reddish-orange fish with yellow & black wings
GAB-045	18-Jul	21:33 L	143.5	33°25'	sled	16.49	lots of dead bryos with live encrusters
		13:33 GMT		125°58'		35.67	
GAB-046	18-Jul	22:11 L	136.5	33°25'	sled	16.59	lots of live bryos, very crs sand, abundant bryos,
		14:08 GMT		125°58'		35.7	
GAB-046	18-Jul	22:35 L	136.5	33°24'	cld	16.79	
		14:35 GMT	[130.1]	125°58'		35.88	
GAB-047	19-Jul	5:36 L	310-345	33°54'	sled	16.89	med. gr. skel. sand, abund. small bryo frags,
		21:36 GMT		125°22'		35.72	juvenile mollusc, miliolid forams, scaphopods,
GAB-047	19-Jul	7:25 L	305.0	33°54'	cld	15.36	c. grey bryo sand, fragmented skeletons, pteropods,
		23:25 GMT	[288.7]	125°22'		35.53	scaphopods, small molluscs, mud clots - MD#1
GAB-048	19-Jul	8:13 L	182.0	33°53'	sled		med. skel. sand, bryos, 15% relict grains,
		11:50 GMT		125°22'			some living lunulitiform bryos
GAB-049	19-Jul	8:43 L	156.0	33°53'	sled	16.99	f-med. skel. sand, comminut., Homotrema on Adeon.
		00:43 GMT		125°22'		35.87	coarse bryo = Adeoneleopsis, Membraniporella
GAB-049	19-Jul	8:43 L	156.0	33°53'	cld	16.99	
		00:43 GMT	[151.5]	25°22'		35.87	

GAB-050	19-Jul	9:30 L	118.5	33°52'	sled	16.89	v.small sample-same as station 49
		1:30 GMT		25°21'		35.74	
GAB-051		L					This station was unsuccessful, the number was retained
		GMT					
GAB-052	19-Jul	12:38 L	71.5	33°36'	sled	16.8	f-m. skel. sand, Adeona in coarse fract.,
		4:36 GMT		125°11'		35.79	one large bored/encrusted lithoclast
GAB-052	19-Jul	12:59:00 L	70.5	33°36'	ctd	16.9	3 sponges, one was calcareous species
		4:59 GMT	[61.8]	125°11'		35.94	
GAB-053	19-Jul	15:11 L	62.0	33°26'	ctd	16.61	
		7:11 GMT		125°05'		35.98	
GAB-054	19-Jul	17:41 L	54.0	33°12'	sled	16.01	abund. bryos, many living, molluscs, dendritic rhods,
		9:41 GMT		124°55'		35.87	serpuid masses with fluorescent tunicates, few brachs
GAB-054	19-Jul	17:58 L	53.5	33°11'	ctd	15.97	med.-crs sand grade sand.
		9:58 GMT	[50.5]	124°55'		36.08	
GAB-055	19-Jul	20:25 L	61.5	33°17'	sled	16.36	crs sand - abund. rhods & molluscs, few lithoclasts,
		12:25 GMT		125°18'		35.79	fewer living bryos, lots of Cats & Marginopora, 1 spnge
GAB-055	19-Jul	20:44 L	59.5	33°16'	ctd	16.39	
		12:44 GMT	[55.6]	125°18'		36	
GAB-056	19-Jul	23:40 L	72.5	33°19'	sled	16.69	creamy grey f-grade skel. sand, crs fract. lunulitids
		15:40 GMT		125°43'		35.75	
GAB-056	19-Jul	00:04 L	72.0	33°19'	ctd	16.7	
		16:04 GMT	[67]	125°43'		35.94	
GAB-057	20-Jul	2:27 L	112.0	33°22'	sled	16.81	med. byo sand, Stegenoporella/Celloporaira
		18:27 GMT		125°59'		35.67	ascidians common, small bivalves, rare echinoids &
GAB-058	20-Jul	7:00 L	65.0	33°08'	sled	16.56	m.g well-sorted, ang skeletal sand,
		23:00 GMT		125°58'		35.8	13 spnge, Adeona, Siliquaria association, ascidians,
GAB-058	20-Jul	7:15 L	65.5	33°08'	ctd	16.2	large bored, calcitized, encrusted ls slab.
		23:15 GMT	[55.2]	125°57'		35.9	ascidian bound substrate
GAB-059	20-Jul	10:37 L	57.0	32°50'	sled	16.9	f-m gr. skel. sand, 20% pigmented skel. grains
		2:37 GMT		125°58'		35.92	(lithoclasts), 5 sponges, Adeona, bivalves, Triph. bryos
GAB-059	20-Jul	10:51 L	56.0	32°50'	ctd	16.18	rare Cell. bryos, bored calcitized ls clasts with
		2:51 GMT	[45.6]	125°58'		36.07	Marginopora (relatively fresh).
GAB-060	20-Jul	12:35 L	49.5	32°36'	sled	15.55	f-med. brown, well-sorted, rounded lithoclastic sand,
		4:35 GMT		125°58'		35.95	barren substrate, small crs fraction, bivalves abund.,
GAB-060	20-Jul	12:50 L	48.0	32°27'	ctd	15.55	minor rhodoliths, brachs, echinoids (relict sed.).



		4:50 GMT	[41.1]	125°57'		36.1	
GAB-061	20-Jul	14:46 L	46.0	32°42'	sled	15.41	large rhodoliths, diverse mollusc fauna, crs sand grade
		06:46 GMT		125°43'		35.92	
GAB-061	20-Jul	15:02 L	46.0	32°42'	ctd	15.42	no water sample taken
		7:02 GMT		125°43'		36.11	
GAB-062	20-Jul	17:43 L	50.0	32°47'	sled	15.42	rhodoliths, low diversity molluscs, crs sand but finer
		9:43 GMT		125°25'		35.92	than St#061, rhodoliths smaller more alive than 061,
GAB-062	20-Jul	17:58 L	47.5	32°47'	ctd	15.42	lots of live cideroids, bryos
		9:58 GMT	[41.8]	125°25'		36.11	
GAB-063	20-Jul	20:35 L	46.0	32°52'	sled	14.92	Smaller rhodoliths, fewer living, m-crs skel. sand,
		12:35 GMT		125°04'		35.96	plus mud fraction, live echinoids & scallops, abund.
GAB-063	20-Jul	21:03L	46.0	32°52'	ctd	14.93	but low diversity molluscs
		13:03 GMT	[41.6]	125°04'		36.13	no water sample taken
GAB-064	20-Jul	23:28 L	42.0	32°57'	sled	14.88	m-crs skel. sand with big rhodoliths that are
		15:28 GMT		124°47'		35.95	similar to st#061, less mud fract., FRB (flat
GAB-064	20-Jul	23:44 L	42.0	32°57'	ctd	14.92	robust branching) bryos, few Cat bryos.
		15:44 GMT	[37.6]	124°46'		36.13	no water sample taken
GAB-065	21-Jul	13:26 L	42.5	33°03'	sled	14.9	md- skel. sand, well-rnded lithoclasts 60%, sand 40%,
		05:24 GMT		124°23'		35.93	crs - abund. pectenids, rare rhods, bivalves & ascids.
GAB-065	21-Jul	13:39 L	42.5	33°04'	ctd	14.96	
		05:39 GMT	[39.8]	124°23'		36.12	
GAB-066	21-Jul	15:38 L	46.0	32°13'	sled	15.5	f-m well-rounded skel. sand, 30% black lithoclasts,
		07:38 GMT		124°23'		35.83	(coralline algae), plus fresh skel. grains, one large
GAB-066	21-Jul	15:54 L	47.0	33°13'	ctd	15.51	Clypeaster, one small sponge
		07:54 GMT	[43.4]	124°23'		36.04	no sample taken
GAB-067	22-Jul	08:46 L	50.0	33°22'	sled	16.29	m-crs skel. sand, abund. molluscs - dead, large relict
		00:46 GMT		124°23'		35.76	rhods minor, many living vagrant and soft-rooted bryos,
GAB-067	22-Jul	09:04 L	50.5	33°22'	ctd	16.42	one sponge
		01:04 GMT	[40.4]	124°23'		35.96	
GAB-068	22-Jul	12:13 L	59.0	33°38'	sled	16.59	m-sand, much relict, small crs fraction, bivalves, few
		04:13 GMT		124°23'		35.74	bryos, brachs, fewer vagrants than expected.
GAB-068	22-Jul	12:30 L	59.0	33°38'	ctd	16.62	
		04:30 GMT	[51.4]	124°23'		35.95	camera b/w
GAB-068	22-Jul	13:04 L	60-62	33°39'	trawl		15 min. trawl at 3 knots
		05:04 GMT		124°23'			

GAB-069	22-Jul	14:11 L	64.0	33°43'	sled	16.6	f-md skel. sand, 60% lithoclasts, 40% skel.,
		06:11 GMT		24°23'		35.72	brown-stained astis abund., crs-Adeona common,
GAB-069	22-Jul	14:27 L	65.5	33°43'	ctd	16.64	small bivalves abund., rhods rare, 11 sponges
		06:27 GMT	[60.9]	124°23'		35.95	
GAB-070	22-Jul	16:28 L	73.5	33°55'	sled	16.9	m skel/litho-50%each mix, bored lithoclasts abund.,
		08:28 GMT		124°23'		35.75	crs-abund. bivalves, lunuliform bryos, common brachs,
GAB-070	22-Jul	16:43 L	72.0	33°55'	ctd	16.88	trace rhodoliths
		08:43 GMT	[68.2]	124°23'		35.93	
GAB-071	22-Jul	18:51 L	79.0	34°07'	sled	17.21	m-gr lithoclast skel. sand, f-m brown pigmented clasts
		10:51 GMT		124°23'		35.68	30%, angular skel. 70%, crs-abund. Adeona, lunulits,
GAB-071	22-Jul	19:05 L	79.0	34°07'	ctd	17.26	reteporform bryos, small bivalves,
		11:05 GMT	[75.1]	124°23'		35.91	2 sponges & ascidians
GAB-072	22-Jul	20:11 L	87.5	33°14'	sled	17.13	m-skel. sand, minor lithoclasts, crs-abund.
		12:11 GMT		124°23'		35.63	6 sponges, ascidians, bryos & bivalves
GAB-072	22-Jul	20:28 L	99.0	34°14'	ctd	17.32	
		12:28 GMT	[97.5]	124°23'		35.89	
GAB-073	22-Jul	20:48 L	101.0	34°14'	sled	17.2	sampling unsuccessful
		12:48 GMT		124°24'		35.65	but no. retained
GAB-074	22-Jul	21:02 L	117-125	34°15'	sled	17.11	m-gr. skel. sand, crs- abund. Turitella, erect branch.
		13:02 GMT		124°24'		35.61	bryos, e.g., Adeonellopsis
GAB-074	22-Jul	21:22 L	145.0	34°15'	ctd	17.07	
		13:22 GMT	[138.2]	124°24'		35.81	
GAB-075	22-Jul	21:25 L	140-180	34°15'	sled	17.15	m-gr. skel. sand, 10% relict, crs-abund. Adeo. (L&D) &
		13:45 GMT		124°25'		35.65	Adeonell., fenest., common Cell., relict dendrit. rhods.
GAB-076	22-Jul	22:11 L	182-200	34°15'	sled	17.21	crs skel. sand, crs-relict bored/encrust. lithoclasts,
		14:11 GMT		124°24'		35.65	abund., abund. dead bryos & rhodoliths, 4 sponges
GAB-076	22-Jul	22:34 L	204.0	34°15'	ctd	16.23	
		14:34 GMT	[198.7]	124°24'		35.71	
GAB-076	22-Jul	22:54 L	173.0	34°15'	trawl		trawl was empty, just fish
		14:54 GMT		124°24'			
GAB-077	23-Jul	01:24 L	311.0	34°17'	sled	16.91	mud and f-sand, lots of sil. spnge spicules, most bryos
		17:24 GMT		124°23'		35.56	relict, few live encrusters, 3 sponges
GAB-077	23-Jul	02:09 L	297.5	34°17'	ctd	15.42	
		18:09 GMT	[292]	124°22'		35.58	
GAB-077	23-Jul	02:27 L	250-300	34°16'	trawl	16.91	living corals, 3 sponges and tunicates

		18:27 GMT		124°24'		35.57	
GAB-078	23-Jul	04:32 L	380.0	34°16'	grab	16.92	ls mud + sil. sponges, soft clear worm tubes
		20:32 GMT		124°23'		35.58	
GAB-078	23-Jul	04:53 L	327.0	34°17'	ctd	14.01	
		20:53 GMT	[320.3]	124°23'		35.36	
GAB-079	23-Jul	06:23 L	1430.0	34°22'	grab	15.61	m-f sand fraction in mud, v. small sample attained
		22:23 GMT		124°24'		35.44	
GAB-079	23-Jul	07:16 L	1292.3	34°22'	ctd	2.99	
		23:16 GMT	[1289.5]	124°24'		34.51	
GAB-080	23-Jul	09:07 L	2997.0	34°26'	grab	15.03	v. fine mud, little recovery - filtered sample
		01:07 GMT		124°23'		35.31	
GAB-080	23-Jul	10:55 L	3041.0	34°26'	ctd	1.64	
		02:55 GMT	[2940]	124°24'		34.74	
GAB-081	23-Jul	13:16 L	403.0	34°22'	sled	17.29	grey mud, foram rich, crs-small, common juvenile
		05:16 GMT		124°11'		35.6	bivalves, worm tubes, pteropods, scaphopods, crabs,
GAB-081	23-Jul	13:45 L	453.0	34°22'	ctd	11.54	rare brachs, abund. spicules in mud
		05:45 GMT	[446.8]	124°11'		35.01	
GAB-082	23-Jul	14:38 L	291.0	34°21'	sled	17.31	cream f-vf skel. sand, forams + skel. debris abund.,
		06:38 GMT		124°09'		35.6	small sample only
GAB-082	23-Jul	15:03 L	314.0	34°21'	ctd	13.66	
		07:03 GMT	[313.8]	124°09'		35.31	
GAB-083	23-Jul	15:39 L	180.0	34°21'	sled	17.31	f-med, skel. sand, pred. ang., <10% relict sand, sub-
		07:39 GMT		124°08'		35.62	rounded skel. sand grains, crs-Turella,
GAB-083	23-Jul	16:20 L	155.0	34°21'	ctd	16.36	Adeonellopsis, common Stegeroporella,
		8:20 GMT		124°08'		35.72	Sphaeropora, Celleporaria
GAB-084	23-Jul	16:40 L	96.0	34°20'	sled	17.27	m-angular skel. sand, crs-small bivalves, abund.
		08:40 GMT		124°08'		35.61	erect branching bryos, Adeonellopsis, fenestrates
GAB-084	23-Jul	16:57 L	95.0	34°20'	ctd	17.37	
		08:57 GMT	[92.5]	124°07'		35.87	
GAB-085	23-Jul	18:14 L	80.0	34°16'	sled	17.3	m-gr. angular skel. sand, 10% brown lithoclasts, crs-
		10:14 GMT		124°00'		35.65	abund. small bivalves, lunulitiform bryos, common
GAB-085	23-Jul	18:25 L	80.0	34°16'	ctd	17.35	Adeona frags & ls lithoclasts, brachs rare
		10:25 GMT	[76.3]	124°00'		35.91	
GAB-086	23-Jul	20:01 L	90.0	34°26'	sled	17.25	m-gr. skel. sand, 30% brown pigmented lithoclasts,
		12:01 GMT		23°49'		35.61	crs-abund. small bivalves, Adeona, bryos, 1 sponge,

GAB-086	23-Jul	20:15 L	92.5	34°26'	ctd	17.33	clasts of ascidians, seafloor cemented grnstone
		12:15 GMT	[85.4]	23°49'		35.86	
GAB-087	23-Jul	21:30 L	90.0	34°33'	sled	17.13	f-gr. coralline sand, 10% relict skel. grains,
		13:30 GMT		123°40'		35.59	lithoclasts of skel. grnst. common, eolianite?
GAB-087	23-Jul	21:49 L	90.5	34°32'	ctd	16.93	crs-8 sponges, Adeona abund.,
		13:49 GMT	[87.7]	123°40'		35.77	
GAB-088	23-Jul	22:39 L	98.0	34°35'	sled	17.02	f-gr. coralline sand, coralline algal sticks abund.,
		14:39 GMT		123°38'		35.62	forams common, crs-abund. Adeona, lunulitiform bryos
GAB-088	23-Jul	22:52 L	96.5	34°34'	ctd	17.12	living, small bivalves common, fenestrates abund.
		14:52 GMT	[90.7]	123°38'		35.79	
GAB-089	24-Jul	00:41 L	210.0	34°37'	sled	17.22	f-gr. coralline sand, coralline sticks abund., forams
		16:41 GMT		123°32'		35.61	common, crs-abund. Adeona, 11 sponges, bryos
GAB-089	24-Jul	01:12 L	171.0	34°37'	ctd	15.6	common, Adeonellopsis
		17:12 GMT	[165.8]	123°32'		35.63	
GAB-090	24-Jul	03:07 L	403.0	34°38'	pipe	17.19	mud, sil. sponge spicules, live brach, scaphopods,
		19:07 GMT		123°32'		35.6	worm tubes
GAB-090	24-Jul	04:01 L	433.0	34°39'	ctd	11.26	
		20:01 GMT	[427]	123°34'		34.96	
GAB-091	24-Jul	05:12 L	293.0	34°38'	pipe	17.46	mud, sil. sponge spicules, relict bivalves & bryos
		21:12 GMT		123°28'		35.63	
GAB-091	24-Jul	05:43 L	283.0	34°38'	ctd	14.62	
		21:43 GMT	[276]	123°28'		35.46	
GAB-092	24-Jul	06:20 L	154.0	34°37'	sled	17.55	m-crs skel. sand, abund. living & relict bryos, relict
		22:20 GMT		123°25'		35.64	molluscs, few brachs, 2 sponges
GAB-092	24-Jul	06:43 L	155.0	34°37'	ctd	16.39	
		22:43 GMT	[149]	123°24'		35.77	
GAB-093	24-Jul	09:07 L	95.0	34°32'	sled	17.62	m-crs skel. sand, many octocorals, bryos, 9 spnges
		01:07 GMT		122°58'		35.61	
GAB-093	24-Jul	09:40 L	95.0	34°32'	trawl	17.66	few bryozoa, no sponges
		01:40 GMT		122°57'		35.64	
GAB-093	24-Jul	09:28 L	95.0	34°31'	ctd	17.69	
		01:28 GMT	[84]	122°58'		35.83	
GAB-094	24-Jul	12:32 L	97.0	34°32'	trawl	17.52	1 sponge
		04:32 GMT		122°36'		35.68	trawl left us at this station : (both bridges snapped)
GAB-095	24-Jul	15:53 L	430.0	34°40'	sled	17.76	grey f-vc skel. sand, crs-mixed relict/living assem.

		07:53 GMT		122°27'		35.63	scaphopods, solitary corals, bivalves, pteropods	
GAB-095	24-Jul	16:46 L	603.0	34°41'	ctd	8.52	common, agglutinated worm tubes & robust forams	
		08:46 GMT	[580]	122°27'		34.59	common (sample prob. winnowed)	
GAB-096	24-Jul	17:47 L	292.0	34°39'	sled	17.78	grey sandy mud, crs-abund. bivalves, gastropods,	
		09:47 GMT		122°26'		35.62	tubeworms, common dead solitary corals, ostracods	
GAB-096	24-Jul	18:21 L	338.0	34°40'	ctd	12.79	pteropods, brachs are rare	
		10:22 GMT	[315]	122°26'		35.17		
GAB-097	24-Jul	18:53 L	190.0	34°39'	sled	17.78	m-f angular skel. sand, rhods, relict skel. <10%,	
		10:53 GMT		122°26'		35.61	crs-abund. coralline algae, ascidians, Stegenoporella,	
GAB-097	24-Jul	19:22 L	234.0	34°39'	ctd	16.65	and erect branching bryos, 2 sponges, common	
		11:22 GMT	[229]	122°26'		35.74	Adeona frags & bivalves, brachs & echinoids rare.	
GAB-098	24-Jul	19:45 L	156.0	34°39'	sled	17.78	f-m angular skel. sand, coralline algal rods, forams	
		11:45 GMT		122°26'		35.61	common, relict <10%, crs-abund. ascidians,	
GAB-098	24-Jul	20:06 L	145.0	34°39'	ctd	17.74	Adeonellopsis, Membranoporella, fenestrates,	
		12:06 GMT	[139]	122°26'		35.88	common bivalves, brachs rare, 2 sponges	
GAB-099	24-Jul	20:56 L	105.0	34°34'	sled	17.52	f-med angular skel. sand, abund. forams, angular &	
		12:56 GMT		122°25'		35.66	relict skeletal grains, crs-impooverished, abund.	
GAB-099	24-Jul	21:28 L	106.0	34°33'	ctd	17.53	bryos, Adeona frags, fenestrates, small bivalves,	
		13:28 GMT	[102]	122°25'		35.89	other shell debris, lunulitids living common	
GAB-100	25-Jul	02:24 L	335.0	34°33'	sled	17.61	m-crs sand, with large mud clumps bearing spnge	
		18:24 GMT		121°32'		35.59	spicules, diverse and abund. relict bryos, only worms	
GAB-100	25-Jul		3:38	430.0	34°34'	ctd	9.76	pteropods, scaphopods
		19:38 GMT	[418]	121°32'		34.75		
GAB-101	25-Jul	04:07 L	236.0	34°33'	sled	17.67	m-crs sand, no mud, more living bryos, lots of relict	
		20:07 GMT		121°33'		35.62	bryos and bivalves, more diverse molluscs, worms	
GAB-101	25-Jul	20:18L	288.5	34 33'	ctd	14.26		
		12:18GMT		121°31'		35.42		
GAB-102	25-Jul	17:40 L	35.5	33°57'	grab	16.02	fine sand with high quartz content, no tropical fauna	
		09:40 GMT		122°02'		35.09		
GAB-102	25-Jul	17:33 L	35.5	33°57'	ctd	16.14		
		09:33 GMT		122°02'		35.94		
GAB-103	26-Jul	10:30L	55.0	33°58'	sled	16.64	vc-rudaceous skel. sand, diverse molluscs, small	
		02:30GMT		121°56'		35.67	dendritic rhods (living & dead), abund. crinoids, bryos,	
GAB-103	26-Jul	10:50:00 L AM	53.0	33°58'	ctd	16.68	sponges, Adeona, Cellaria, Adeonellopsis, Cats, ascids	
		02:50 GMT	[45.6]	1°55'		35.92	common, some rhoclasts, approx. 20 sponge species	

GAB-104	26-Jul	11:28 L	67.0	34°00'	sled	16.67	same as 103 but with fewer bryos, lithoclasts, and
		03:28 GMT		21°51'		35.69	crinoids, apr. 10 sponges species
GAB-104	26-Jul	11:42 L	66.5	34°00'	ctd	16.69	
		03:42 GMT	[58]	121°51'		35.93	
GAB-105	26-Jul	12:42 L	78.0	34°04'	sled	17.25	c-vc skel. sand, many relict carb. grains, diverse moll.
		04:42 GMT		121°44'		35.66	& bryos, abund. crinoids & sponges, 6 sponge spec.,
GAB-105	26-Jul	13:00 L	79.5	34°04'	ctd	16.93	living & dead rhodoliths common, worm tubes,
		05:00 GMT	[70.4]	121°44'		35.92	Adeona & lunulitiforms
GAB-106	26-Jul	14:52 L	87.0	34°12'	sled	17.54	m-angul.-rdd skel. sand, 50% brown-stained lithos
		06:52 GMT		121°32'		35.65	(corall. algal), crs-sponges common, Adeona & small
GAB-106	26-Jul	15:09 L	84.5	34°12'	ctd	17.32	bivalves abund., bored ls clasts common, 12 sponges
		17:09 GMT	[81.6]	121°32'		35.89	
GAB-107	26-Jul	16:15 L	90.0	34°20'	sled	17.8	f-ang. skel. sand, 10% relict grains incl. Marginopora,
		08:15 GMT		121°32'		35.58	skel. frags are corallines & forams, crs-Adeona, lunulits.,
GAB-107	26-Jul	16:43 L	89.0	34°20'	ctd	17.73	small bivalves.
		08:43 GMT	[84.3]	121°32'		35.86	
GAB-108	26-Jul	17:52 L	101.0	34°29'	sled	17.39	f-m skel. sand, ~10% relict grs., ls clasts large, corall.
		09:52 GMT		121°32'		35.57	algal sticks & forams abund., crs- sponges, Adeona,
GAB-108	26-Jul	18:10 L	102.5	34°29'	ctd	17.24	bryos
		10:10 GMT	[101]	121°32'		35.78	
GAB-109	26-Jul	18:53 L	123.0	34°32'	sled	15.51	m-c bryo skel. sand, ls blocks common (poorly lithified
		10:53 GMT		121°32'		34.4	bryo-skel. grnstone), bored & encrusted,
GAB-109	26-Jul	19:12 L	118.0	34°32'	ctd	14.97	crs-abund. Adeona, common Adeonellopsis, various
		11:12 GMT	[115.6]	121°32'		35.54	bryos
GAB-110	26-Jul	19:34 L	154.0	34°32'	sled	15.51	f-m bryo skel. sand, crs-Adeona, Adeonellopsis abund.,
		11:34 GMT		121°32'		35.41	Tubiporella abund., sponges & ascids abund., ascid.-
GAB-110	26-Jul	19:55 L	150.0	34°33'	ctd	15.19	bound substrate abund., brachs common
		11:55 GMT	[146.7]	121°31'		35.6	
GAB-111	27-Jul	01:16 L	95.0	34°23'	sled	17.51	vc-rud. skel. sand, large crs fract., minor molluscs, abund.
		17:16 GMT		120°39'		35.62	octocorals & ascids, sponges 20 species, abund. living
GAB-111	27-Jul	01:39 L	103.5	34°33'	ctd	17	& diverse bryos, large lithoclasts, relict Celloporaria,
		17:39 GMT	[97]	120°39'		35.76	worm tubes, 2 comatulids
GAB-112	27-Jul	05:47 L	65.0	34°20'	sled	17.37	crs skel. sand, abund. living lunulitiforms & Parmularia &
		21:47 GMT		119°55'		35.6	small bivalves, otherwise sparse fauna with rare crabs
GAB-112	27-Jul	06:03 L	61.5	34°20'	ctd	17.39	and echinoids, no sponges

		22:03 GMT	[55.5]	119°55'		35.82	
GAB-113	27-Jul	07:54 L	106.0	34°36'	sled	17.92	crs skel. sand, abund. Adeona & sponges, very diverse
		23:54 GMT		119°55'		35.63	bryos, common hydroids & comatulids, rare molluscs,
GAB-113	27-Jul	08:15 L	115.0	34°36'	ctd	18	relict Celloporaria
		00:15 GMT	[106.6]	119°55'		35.84	
GAB-114	27-Jul	08:53 L	190.0	34°37'	sled	17.93	crs skel. sand, abund. Adeonellopsis & sponges,
		00:53 GMT		119°55'		35.65	Adeona on sponges, fewer Cats & hydroids,
GAB-114	27-Jul	09:28 L	192.0	34°37'	ctd	15.43	10 sponges species
		01:28 GMT	[190.5]	119°55'		35.61	camera cp18 pics (110 ASA instead of 200)
GAB-115a	27-Jul	10:15 L	350.0	34°37'	sled	17.94	little recovery -- poorly sorted mud, rudac. relict bryos,
		02:15 GMT		119°55'		35.64	living horn corals, brachs, large ostracods
GAB-115a	27-Jul	10:53 L	341.5	34°37'	ctd	13.16	
		02:53 GMT	[329]	119°55'		35.17	camera b/w 20 photos
GAB-115b	27-Jul	11:08 L	440.0	34°37'	pipe	18.05	sponge-spic. bearing mud, m-sand fraction -delicate
		03:08 GMT		119°55'		35.64	branching bryos & forams, live soft worm/tubes & corals
GAB-116	27-Jul	14:57 L	66.0	34°37'	sled	18.07	f-m skel. sand, 60% skel., 40% brown lithoclasts, crs-
		01:57 GMT		119°21'		35.63	sparse, Adeona frags, fenes., small bivalves, one rhod.
GAB-116	27-Jul	14:39 L	65.0	34°37'	ctd	17.55	
		06:39 GMT	[61.6]	119°22'		35.82	
GAB-117	27-Jul	16:55 L	65.0	34°35'	sled	17.74	m-subbrnded skel.-lithoclast-qtz sand (40%-40%-20%),
		08:55 GMT		119°		35.57	ls & granitic clasts abund., crs-relict assemblage, corall.
GAB-117	27-Jul	17:11 L	65.5	34°35'	ctd	17.32	encrusted Adeona, common bivalves, rhods
		09:11 GMT	[60.3]	119°		35.82	
GAB-118	27-Jul	19:54 L	87.0	34°59'	sled	18.38	f-m ang. skel. sand, crs-abund. Sphaeropora, lunulitids,
		11:54 GMT		119°		35.64	& Stegenoporella, common Adeona, Membraniporella,
GAB-118	27-Jul	20:10 L	85.0	34°59'	ctd	18.21	
		12:10 GMT	[80.1]	119°		35.84	
GAB-119	27-Jul	20:38 L	149.0	35°	sled	18.48	f-m ang. skel. sand, crs-abund. sponges, Celloporaria,
		12:38 GMT		119°		35.66	Tubiporella, and others, common ascids
GAB-119	27-Jul	21:02 L	163.0	35°	ctd	17.72	(ACDP 1.7kn to 038°)
		13:02 GMT	[159.9]	119°		35.81	
GAB-120	27-Jul	21:29 L	325.0	35°	sled	18.47	crs bryo skel. sand, abund. angular bryo sticks,
		13:29 GMT		119°01'		35.66	common forams, crs fract. same as bulk (no crs taken)
GAB-120	27-Jul	22:01 L	295.5	34°59'	ctd	13.19	(ADCP 2kn to 041° top 100 m, whole 250 m water
		14:01 GMT	[292.8]	19°03'		35.22	column mov' to east)

GAB-121	28-Jul	1:59 L	82.0	35°18'	sled	18.52	crs-vc skel. sand, 2 living vagrants, 2 large coral colonies,
		17:59 GMT		118°20'		35.66	one living, 1c diverse mollusc assemblage - all dead,
GAB-121	28-Jul	02:12 L	80.0	35°18'	ctd	18.62	some hydrozoans, 2 living Adeona, 6 sponge species
		18:12 GMT	[70]	118°20'		35.85	
GAB-122	28-Jul	04:55 L	109.5	35°25'	sled	18.71	c-vc to rid. skel. sand, no living, molluscs abund.-fresh
		20:55 GMT		117°58'		35.67	appearance, diverse bryos, more robust + bilaminar
GAB-122	28-Jul	05:10 L	113.5	35°25'	ctd	18.6	fenestrates, mix of rooted mid-shelf & shelf-break fauna,
		21:10 GMT	[103.5]	117°58'		35.84	no sponges or corals (ADCP-1kn to east to bottom)
GAB-123	28-Jul	06:27 L	147.0	35°27'	sled	18.53	m-c skel. sand, abund. dead bryos, few living encrusters,
		22:27 GMT		117°48'		36.65	lots of small sponges & brachs, some living gastropods,
GAB-123	28-Jul	06:47 L	152.0	35°27'	ctd	18.55	few bivalves, 10 sponge species
		22:47 GMT	[142]	117°48'		35.84	(ADCP .5 kn to east to bottom)
GAB-124	28-Jul	08:02 L	303.0	35°28'	sled	18.56	c-vc skel. sand - rud., abund. relict bryos, few molluscs,
		00:02 GMT		117°46'		35.65	small corals, living soft forams, pteropods, 2 sponges,
GAB-124	28-Jul	08:40 L	280.0	35°28'	ctd	13.82	very small mud fraction (ADCP 1.5 kn to east to 125m,
		00:40 GMT	[276.5]	117°45'		35.4	decreasing to zero at bottom)
GAB-125	28-Jul	10:11 L	230.0	35°26'	pipe	18.64	vc skel. sand, minor mud, crs-relict bryos, small bivalves,
		02:11 GMT		117°40'		35.69	and scaphopods (small recovery sample)
GAB-125	28-Jul	10:37 L	186.0	35°26'	ctd	15.56	(ADCP 1.6 kn to 096° to 170 m)
		02:37 GMT	[179]	117°39'		35.6	
GAB-126	28-Jul	12:15 L	86.5	35°21'	sled	18.55	c-skel. sand, abund. Adeona (living & mostly dead),
		04:15 GMT		117°27'		35.64	vagrants abund. (alive&dead), common bivalves & moll.,
GAB-126	28-Jul	12:37 L	86.5	35°21'	ctd	18.35	few gastropods, corals present, also f.g. skel. sand fract.),
		04:37 GMT	[83]	117°27'		35.79	few brachs, 10 sponge species (ADCP .5kn to 078°)
GAB-127	28-Jul	14:54 L	86.0	35°13'	sled	18.52	c-lithoclastic skel. sand, brown skel. 50%, lithoclast 30%,
		06:54 GMT		117°05'		35.63	qtz 20%, crs-ls clast bryos abund., qtz common, ang.
GAB-127	28-Jul	15:11 L	88.0	35°13'	ctd	18.19	bryos & molluscs frags abund.
		07:11 GMT	[80.6]	117°05'		35.78	(ADCP 0.3kn to 081°)
GAB-128	28-Jul	16:42 L	59.0	35°07'	sled	18.28	m-lithoclastic-qtz-skel. sand, crs lithocl. 40%, qtz 30%,
		08:42 GMT		116°52'		35.6	skel. 30%, crs - sponges abund., ls pebble clasts comm.,
GAB-128	28-Jul	16:57 L	59.0	35°07'	ctd	18.13	coralline algal bndstone, (hdgrnd) abund., Adeona
		08:57 GMT	[54.4]	116°52'		35.77	and other bryos common (ADCP 0.2kn to 085°)
GAB-129	28-Jul	19:57 L	70.0	35°07'	sled	18.38	f-m lithoclastic qtz sand, brown lithoclasts 50%, qtz 30%,
		11:57 GMT		116°20'		35.54	skel. 20%, crs - relict molluscan ? abund., bryos abund.,
GAB-129	28-Jul	20:15 L	69.5	35°07'	ctd	17.83	sponges abund., ls clasts abund.



		12:15 GMT	[64.3]	116°20'		35.75 (ADCP 0.6kn to 100°)	
GAB-130	28-Jul	23:24 L	100.0	35°07'	sled	18.58 m-well rnded skel. sand 60%, lithoclastic sand 40%,	
		15:24 GMT		115°59'		35.54 coralline algal sticks abund., crs-gorgonians abund.,	
GAB-130	28-Jul	23:47 L	100.5	35°07'	ctd	18.72 sponges abund., large ls clasts abund., Adeona and	
		15:47 GMT	[96.1]	115°58'		35.77 bryos abund. (ADCP 1.0kn to 106°)	
GAB-131	29-Jul	01:15 L	160.0	35°07'	sled	18.78 m-crs skel. sand, Parmularia, Adeona, bryos abund., min.	
		17:15 GMT		115°51'		35.54 bivalves & gastros), bryos living /dead, 2 sponges,	
						(ADCP 0.7kn to 112° to bottom)	
GAB-132	30-Jul	15:04 L	416-476	34°51'	pipe	18.79 No Sample - bad weather no CTD	
		07:04 GMT		114°46'		35.53 (ADCP 0.5kn to 234°)	
GAB-133	30-Jul	16:27 L	222-237	34°47'	pipe	18.8 cream f-gr. angular skel. sand	
		08:27 GMT		114°46'		35.5 (ADCP 0.8kn to 201°)	
GAB-134	30-Jul	23:24 L	51.0	34°02'	sled	18.64 m-gr. rned coralline algal sand, ls clasts >10cm abund.,	
		15:24 GMT		114°48'		35.55 coated by corallines, hard coralline algal substrates,	
GAB-134	30-Jul	23:40 L	52.5	34°03'	ctd	18.7 crs - common sponges E., radiata, Sargassum, bryos,	
		15:40 GMT	[44.1]	114°48'		35.75 boulder pavement	
GAB-135	31-Jul	00:57 L	103.0	34°02'	sled	18.79 m-crs skel. sand, abund. & diverse living bryos, many	
		16:57 GMT		114°44'		35.53 encrusting abund. & diverse sponge fauna - 30 species,	
GAB-135	31-Jul	01:15 L	105.5	34°02'	ctd	18.92 common relict rhods & hydroids, rare molluscs, crustac.,	
		17:15 GMT	[100]	114°44'		35.77 and soft corals (ADCP 0.3kn to 116°)	
GAB-136	31-Jul	03:15 L	145.0	34°02'	sled	19.32 m-crs skel. sand, abund. & diverse bryos, encrusting	
		19:15 GMT		114°33'		35.54 sponges and ascids, rare molluscs, comatulids and	
GAB-136	31-Jul	L			XBT	ophiurids, rare hydroids & soft corals, common Adeona,	
		GMT				Adeonellopsis, rare vagrants	
GAB-137	31-Jul	04:25 L	204.5	34°02'	pipe	19.32 crs sand, relict bryos, rare living encrusters & bivalves,	
		20:25 GMT		114°28'	XBT	35.54 common pteropods, no mud fraction	
GAB-138	31-Jul	04:50 L	318.0	34°02'	pipe	19.31 mud with silt-fine sand, relict bryo frags, sponge	
		20:50 GMT		114°28'	XBT	35.54 spicules in mud	
GAB-139	31-Jul	08:45 L	49.0	33°35'	sled	19.02 live rhodoliths cobbles, with soft red algae, and	
		00:45 GMT		114°46'		35.47 coarse skel. sand, diverse & abundant, encrusted and	
GAB-139	31-Jul	09:01 L	56.5	33°35'	ctd	19.08 rooted bryozoans, 12 species sponges, ascids abund.	
		01:01 GMT	[46]	114°46'		35.74	
GAB-140	31-Jul	09:49 L	99.0	33°35'	pipe	19.3 vc-rudac. skel. sand, 70 % stained relict grains,	
		01:49 GMT		114°42'		35.52 abund. relict bryos, and rare molluscs	
GAB-140	31-Jul	10:06 L	105.0	33°35'	ctd	19.33	

		02:06 GMT	[94]	114°42'		35.77	
GAB-141	31-Jul	11:21 L	146.0	33°36'	pipe	19.34	c skel. sand, with relict particles; dead Sphaeropora,
		03:21 GMT		114°35'		35.5	Parmularia, and vagrants
GAB-142	31-Jul	12:35 L	195-215	33°36'	pipe	18.68	crs sand grade, relict bryozoans, 1 sponge specimen,
		04:35 GMT		114°30'		35.58	small recovery sample