

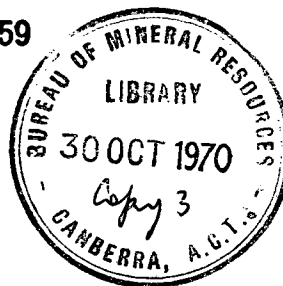
1970/59

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1970 / 59



Texture of Sediments of the Arafura Sea

by

D. Jongsma

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**BMR
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SUMMARY

Textural analysis of the surface sediment samples taken during the 1969 B.M.R. Arafura Sea survey, reveals the presence of relict Pleistocene sediments on the edge of the continental shelf. The sample distribution on the sand-silt-clay diagram for the Arafura Sea is almost identical to that of sediments from the Sahul shelf to the southwest. Areas of post-Pleistocene sedimentation off the coast of Arnhem Land extend as far as 120 miles out (222 km) to sea. The Recent sediments in the area are derived from the stable cratonic Australian continent. No sediments from the orogenic New Guinea mainland have been transported into the area during post-Pleistocene times. The Arafura Shelf is an area of slow sedimentation and a large part is nondepositional.

INTRODUCTION

This report deals with the texture and colour of surface sediment samples collected in the Arafura Sea by the Marine Geology Party of the Bureau of Mineral Resources during 1969. A more detailed account of the bathymetry of the Arafura Shelf based on seismic and echosounding profiles taken during this survey is at present in preparation. The area surveyed is the northern Australian continental shelf between longitudes 130°E and 136°E and between latitudes 8°S . and 12°S . (Fig. 1). From the 2nd of May to the 25th of May the Japanese research submersible "Yomiuri" and its mothership, a converted deepsea tug the m.v. "Yamato", were employed in this survey. The major part of the survey commenced on the 21st of September and finished on the 6th of December; during this period a chartered oil rig supply vessel the m.v. "San Pedro Sound" was used in the operations.

Sampling of the sediments in the Arafura Sea was chiefly carried out with a small conical dredge, a large box dredge and a triangular dredge. In addition a number of short gravity cores were obtained (see Appendix). Four hundred and fifteen stations were occupied, and 16 gravity cores together with 399 surface sediment samples were recovered from these stations. Station localities are shown in Figure 2. The sample traverses were run at a spacing of 10 to 15 miles (18.5 to 27.7 km) in a North-South direction. Stations were kept 10 to 12 miles (18.5 to 22.2 km) apart (1 hours steaming) on the traverse lines.

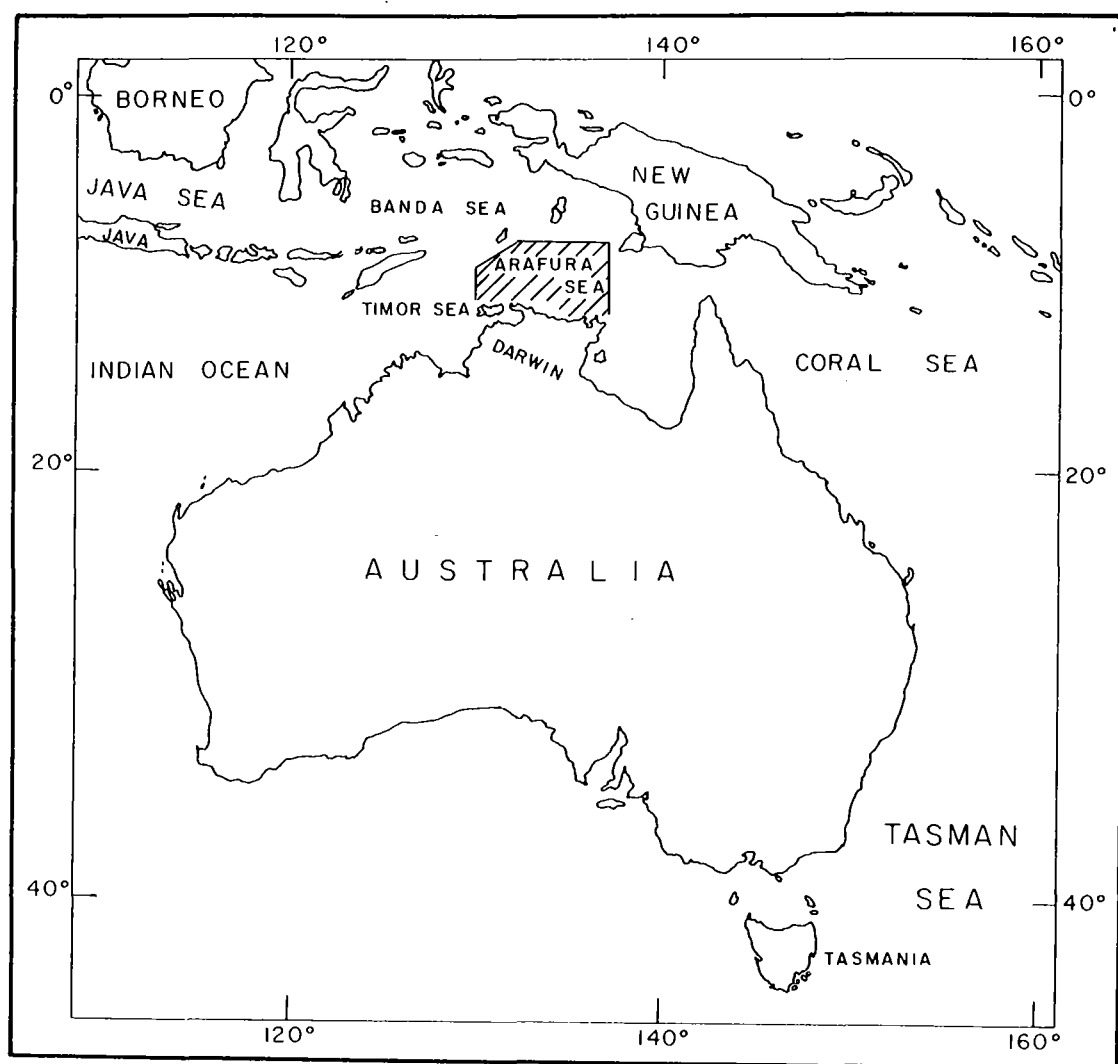
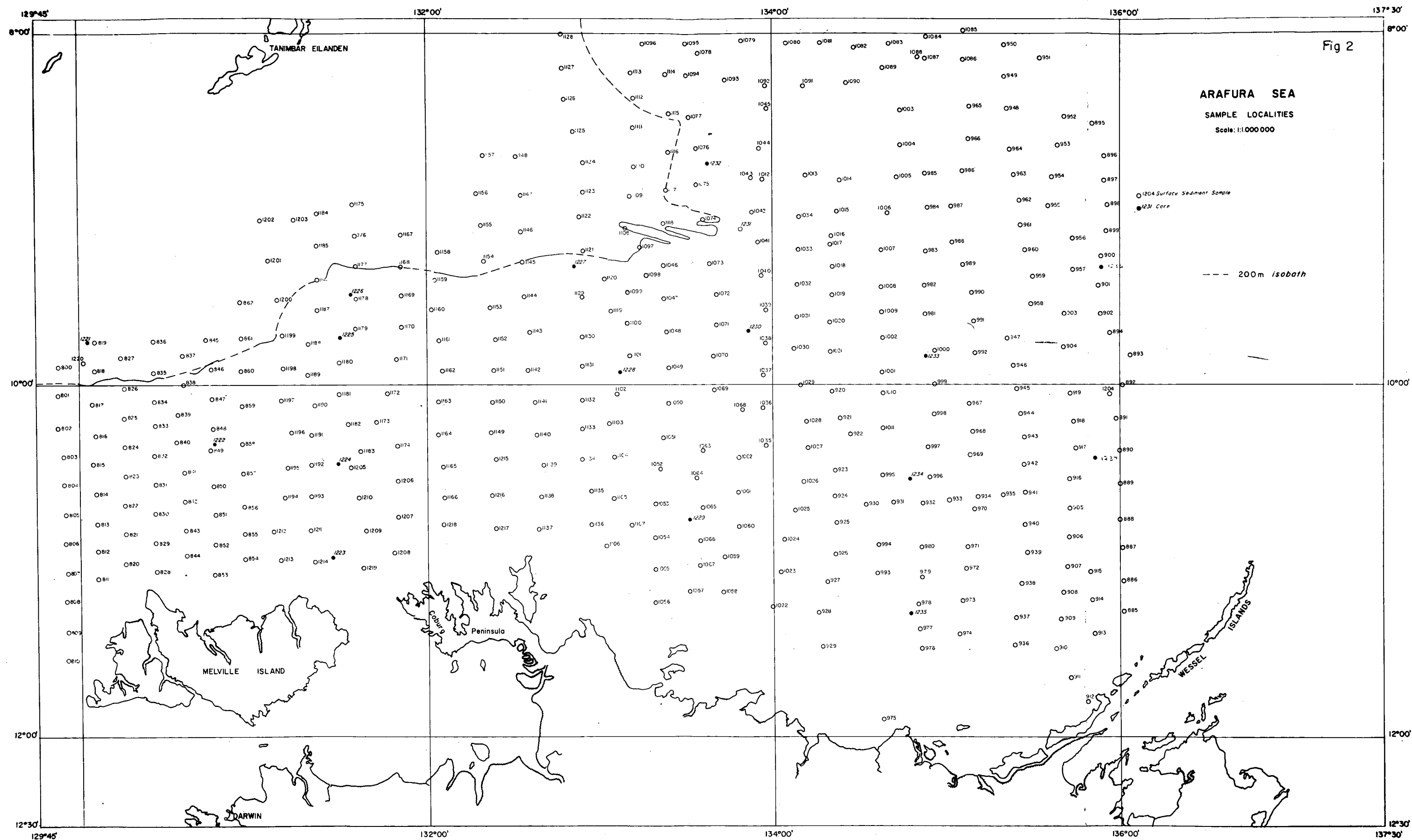


Fig 1. Location of area of study



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Navigation and positioning

Conventional methods of celestial navigation were used to determine the locations of the stations at sea, and near-shore stations were positioned by radar. Whenever possible an accurate fix (accuracy within 1 mile) was obtained at the beginning and end of a sampling traverse. These accurate fixes taken at dawn and dusk were from a landmark, crossbearing or 4 good celestial body observations. Sampling operations were carried out during the day and with the traverses running in a North-South direction position lines from the sun combined with dead reckoning determined the station locality. At noon a latitude obtained from the sun combined with a previously taken position line were used to find the position of the vessel. The appendix indicates the accuracy of the positions of the sample stations. The following classification has been adopted.

- A. Accuracy 1 mile (1.8 km) or better. Fix from landmark crossbearings, or top class celestial fix (4 good observations at least)
- B. Accuracy better than 3 miles (5.5 km). Short D.R. run from A class fix or good celestial fix (3 good observations and small cocked hat)
- C. Accuracy better than 5 miles (9.3 km). Short D.R. run from B class fix or standard celestial fix (often only 2 sights) or moderate to long D.R. run from last fix supported by position lines only.
- D. Accuracy poor. Position doubtful (error may be as much as 10 miles, 18.5 km). Up to 12 hours since last fix and drift not known with any certainty
- E. Position unknown, error 10 miles (18.5 km).

Most station positions fall within category 'C'.

Previous investigations

The morphology of the Arafura Shelf has been discussed by Fairbridge (1953). Sediments obtained by the Snellius expedition to the north of the survey area have been described by Kuenen and Neeb (1943). Tjia (1966) gives a short summary of the oceanography and geology of the Arafura Shelf. An earlier report by Trail & Jones (1969) records the field observations of the sediments collected on the Yamato. To the southeast of the area previous systematic mapping of the Australian Continental Shelf by the Bureau of Mineral Resources has been documented by Van Andel and Veevers (1967) and Jones (1968, 1970). The regional setting of the Arafura Shelf is treated by Boutakoff (1963) and Phipps (1967).

The hydrology and salinity of the Arafura Sea have been investigated by Rochford (1962, 1967), Wyrski (1962), and Van Riel et al. (1950).

HINTERLAND GEOLOGY AND COASTAL GEOMORPHOLOGY

The geology of the Arnhem Land and Darwin region is outlined in Figure 3. Walpole et al. (1968) describe the region as a Precambrian Shield area covered in places by a thin veneer of Cretaceous and Cainozoic sediments. The region has not been affected by severe diastrophism since Archean times (Walpole et al., 1968, Noakes, 1949). Vertical movements and injection of high level plutons, characteristic of a cratonic area have affected the region during the Upper Proterozoic. Small basins within the Arnhem Land region have resulted in epicratonic sediment deposition during Mesozoic times. Cainozoic sediments both marine and continental occur in the Arafura Basin (Dunnet, 1965), Coburg Peninsula, and on Bathurst Island.

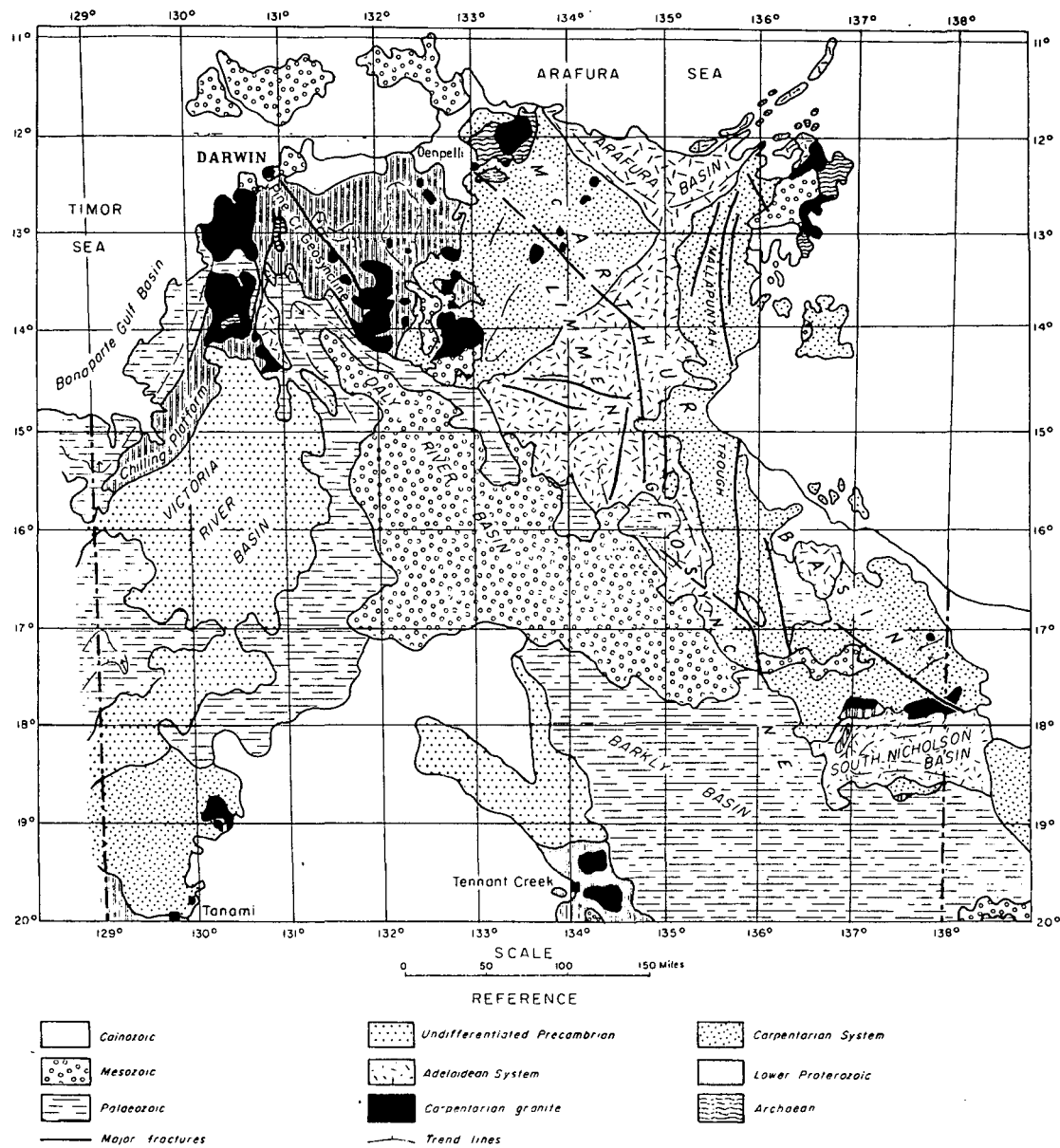


Fig. 3 Hinterland geology (after Walpole et al. 1968)

The morphology of the region is one of low relief up to 300 m (Hays, 1968). A number of erosion surfaces have been recognized in this area. On the coast a narrow coastal plain which represents an emergent coastline is dissected by consequent streams with a dendritic drainage pattern. Some low cliffs of Mesozoic sandstone are seen on Cape Wessel and Croker Island. Tidal flats, narrow bands of coastal sediments, are subjected to seasonal and tidal flooding around many parts of the coast of Arnhem Land and on many of the islands such as Bathurst and Melville Islands. Around the coast low sand and shell dunes are developed in places.

CLIMATE

From April to September the Arafura Sea is affected by the south east trade winds. The Australia Pilot Vol. 5, reports a steady influence of this wind both in strength and direction from June to August. During the B.M.R. survey on the Yamato/Yomiuri in May 1969 a continual swell created by the south east trade wind was experienced by the survey party. The average wind strength during the south east trade wind season is between force 4 and force 6 on the Beaufort scale.

During December the northwest monsoon spreads across the Timor and Arafura Seas, reaching Darwin by the beginning of January. Wind forces of between 1.5 and 4.4 prevail during this season. Squalls frequently associated with thunderstorms are common.

In the transition periods between the southeast trade winds and the northwest monsoons, quieter conditions prevail, with periods of calm except for the daily alternation of land and sea breezes. The survey party experienced optimum conditions with clear skies, and slight seas during the months of October and November.

The temperatures in the Arafura Sea are very high, this being one of the hottest maritime climates in the world. At Darwin the average day maximum temperature is 91°F in November while the corresponding

Fig 4

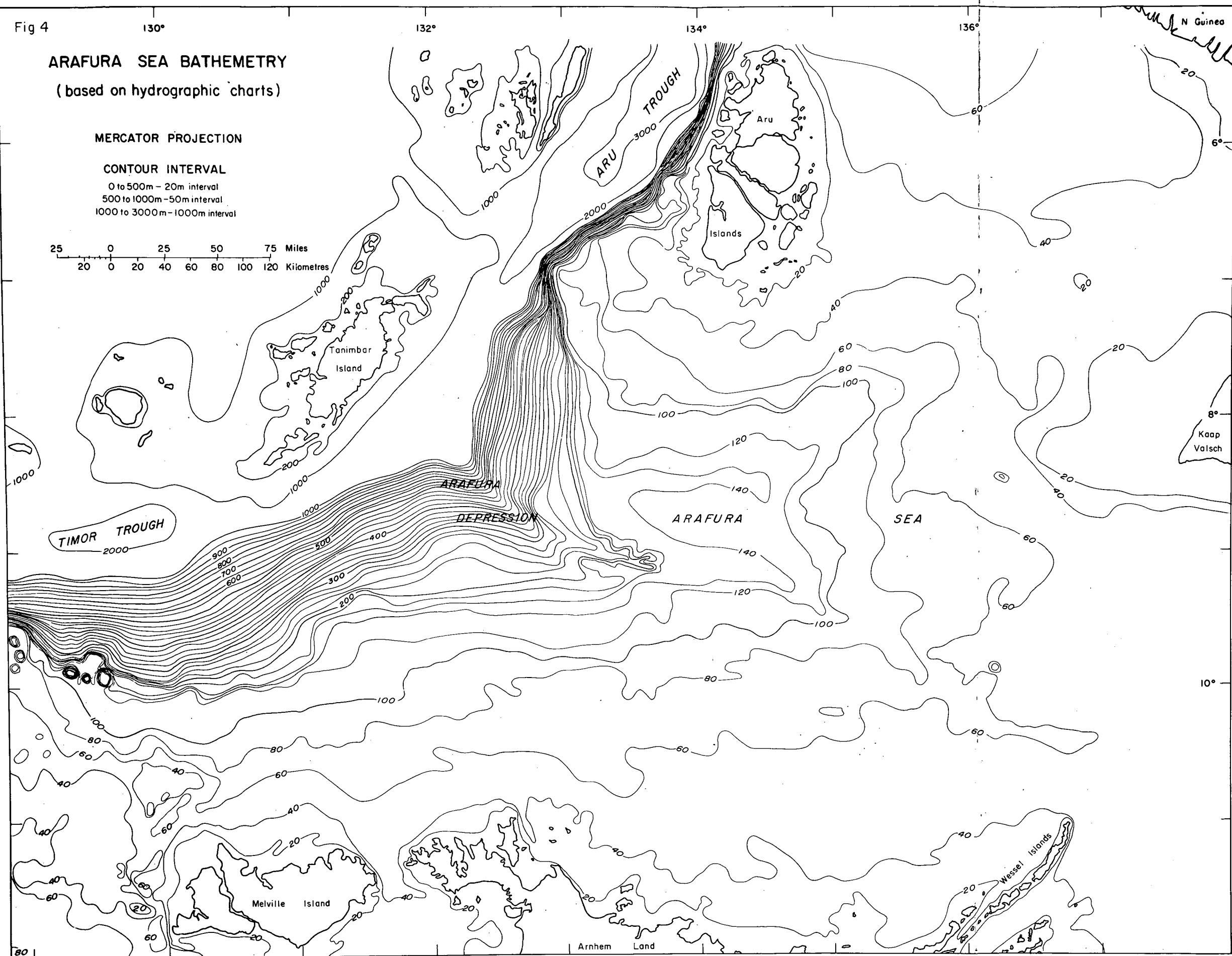
ARAFURA SEA BATHOMETRY (based on hydrographic charts)

MERCATOR PROJECTION

CONTOUR INTERVAL

0 to 500m - 20m interval
500 to 1000m - 50m interval
1000 to 3000m - 1000m interval

25 0 25 50 75 Miles
20 0 20 40 60 80 100 120 Kilometres



minimum is 68°F in July. Rainfall for the Arafura Sea is high (1500-2000 mm). Most of the precipitation takes place during the wet season, which lasts from November to April. During the dry season, especially in July and August, the rainfall is negligible.

OCEANOGRAPHY

Surface currents, according to the Australia Pilot Vol. 5, have no constant direction during the northwest monsoon season (December to March). The south Equatorial Current is not found east of 115°E to 120°E during these months, and hence does not affect the Arafura Sea. In the southwest and southeast parts of the Arafura Sea the currents are directed outwards into the Indian Ocean and Coral Sea respectively. A third system revolves around 10°S and 136°E (Tjia, 1966). Current speeds are less than 0.5 knots. During the remainder of the year, April to November, the South Equatorial Current causes a westerly set with a maximum rate of 1 to 2 knots.

Tides in the Arafura Sea are semidiurnal with a well marked diurnal inequality typical of tropical waters. Variations in range and phase are a result of the enclosed nature of the Arafura Sea. The mean spring range varies from 1.47 m at Cape Don to 4.15 m at Arnhem Bay (Easton, 1970). Tidal currents of less than 1 knot occur near the Australian coast; during flood these set eastward and southward while at ebb they set westward and northward (Australia Pilot Vol. 5).

Upwelling from the Indian Ocean occurs along the shelf and slope region of the eastern Arafura Sea (Rochford, 1962; Van Riel et al., 1950). The maximum upwelling occurs probably before August. Relatively high inorganic phosphate values and low oxygen values at the surface are reported to be present in the Arafura Sea (Rochford, 1962, Wyrteki, 1962). A review by Rochford (1967) has shown these values to be of minor importance with respect to phosphate deposition (See also

Van Andel and Veevers, 1967). The extensive slicks of microscopic planktonic algae seen in these waters during the survey are suggestive of high productivity, but fish and bird populations do not appear to be particularly high.

BATHYMETRY

The Arafura Shelf like most continental shelves in the world is a result of erosion processes during low sealevel stands in the Pleistocene (Shepard, 1963). The bathymetry of the Arafura Sea is shown in Fig. 4. Fairbridge (1953) put the edge of the Sahul Shelf at a depth of 550 m but it is evident from the bathymetric contours that the break in slope occurs at about 120 to 180m in the Arafura Sea. On the edge of the shelf and the upper slope submarine terraces down to 200 m have been observed in the sounding profiles taken during this survey (Jongsma, 1970b). No series of shallow banks rising from the upper slope occurs in the survey area. Two banks outside the survey area are shown on the bathymetric chart at 10°S and between 129°E and 130°E, which have been documented by Van Andel and Veevers (1967).

Over much of the Arafura Shelf depths range between 50 and 80 m. Bathymetric contours indicate the presence of a drowned fluvial pattern (Fairbridge 1951), which originated during low sealevel stands in the Pleistocene. South of latitude 9°S the shelf has a gently sloping smooth profile.

At about 133°E, 9°S. the edge of the shelf swings around to the north from an east west direction. At this point a well defined indentation, marking a steep sided bank is observed in the bathymetric contours. A reflection of this indentation continues to the southeast toward Cape Wessel indicating the axis of a submerged river system. To the northwest, away from the edge of the shelf, the slope increases into a trough termed the Arafura Depression by Fairbridge (1951); Fairbridge believes this feature to be of structural origin. The continental edge is reached at about 550 m and the bottom then drops

more steeply down to 1000 m south of Tanimbar Island into the extension of the Timor trough. West of Aru Island the depths exceed 3650 m in the Aru trough.

SURFACE SEDIMENTS

Chemical and mineralogical studies of the sediments from the 1969 B.M.R. cruises are still in progress, and only textural data are treated in any detail here.

Composition

The sediments from the Arafura Sea are composed of detrital and biogenic material. Study of the composition is in the early stages and the following is a brief tentative account.

The biogenic component in the samples consists of foraminifera, coral, molluscs, and bryozoans. Foraminiferal identification of the samples taken on the Yamato by Professor H. Niino of Tokyo has shown the most abundant planktonic species to be Globigerinoides ruber, Globoquadrina dutertrei, Globorotalia menardii, and Globigerinita glutinata. Planktonic foraminifera increase in number offshore. Benthonic foraminifera according to Professor Niino, are plentiful in samples taken between depths of 80 and 130 m where organic remains are most abundant. Miliolidae and Textularia are common in the sandy samples whereas muddy facies support the growth of Ammonia.

Detrital minerals in the samples are chiefly quartz with minor amounts of felspar. The quartz is subangular and usually grains are of fine sand or silt size. A cursory inspection of the heavy mineral fraction in some samples revealed the presence of much iron oxide and zircon. Traces of pyroxenes, amphiboles and epidote have also been observed in the heavy mineral fraction. Glauconite is abundant in samples taken from the northeast corner of the survey area. In this area the gravity cores indicated that sedimentation is slow or nonexistent. Samples taken near the Arnhem Land coast and off Cape Wessel contained many brown rock fragments composed of fine grained ferruginized sandstone.

Colour

The colour of the surface sediments was determined with the Rock Colour Chart (Geological Society of America, 1959).. No colour determinations were made of the samples collected during May on the Yamato (Nos 800 to 862). For the samples 885 to 1220 taken on the San Pedro Sound, the colour was determined immediately after recovery.

Of the 311 colour determinations, 75 percent of the samples are either dusky yellow green (5GY 5/2, 41%) or greyish green (10GY 5/2, 34%). Fig. 5 shows the sediment colour distribution in the Arafura Sea. The greenish hues are mainly due to the presence of glauconite in the samples. An increase in carbonate sand or gravel size particles imparts a lighter and more yellowish colour to the sediment. Compared with the colour of the Timor sea sediments (Van Andel and Veevers 1967) there is a similar predominance of dusky yellow green (5GY 5/2) sediment there, but the range of colour in the Arafura Sea appears to be smaller than that in the Timor sea.

Laboratory technique of textural analysis

A portion of the sediment sample (50 grams) was used for the textural analysis. The sample was wet sieved on a 240-mesh sieve. The coarse fraction retained on the sieve was dried and weighed, and the weight of gravel was found by sieving on a 10-mesh sieve. The fine fraction which passed on the 240-mesh sieve was transferred to a 1000 ml measuring cylinder, and the proportions of clay and silt were determined by the pipette method (Folk, 1965). Computation of the percentages of gravel, sand, silt, and clay was done with an electronic calculator.

Textural classification

For the description of the regional textural distribution in the Arafura Sea, Shepard's (1954) sand-silt-clay diagram was used (Fig. 6). The end members employed in this classification have a purely textural significance, as intended by Shepard. In this instance

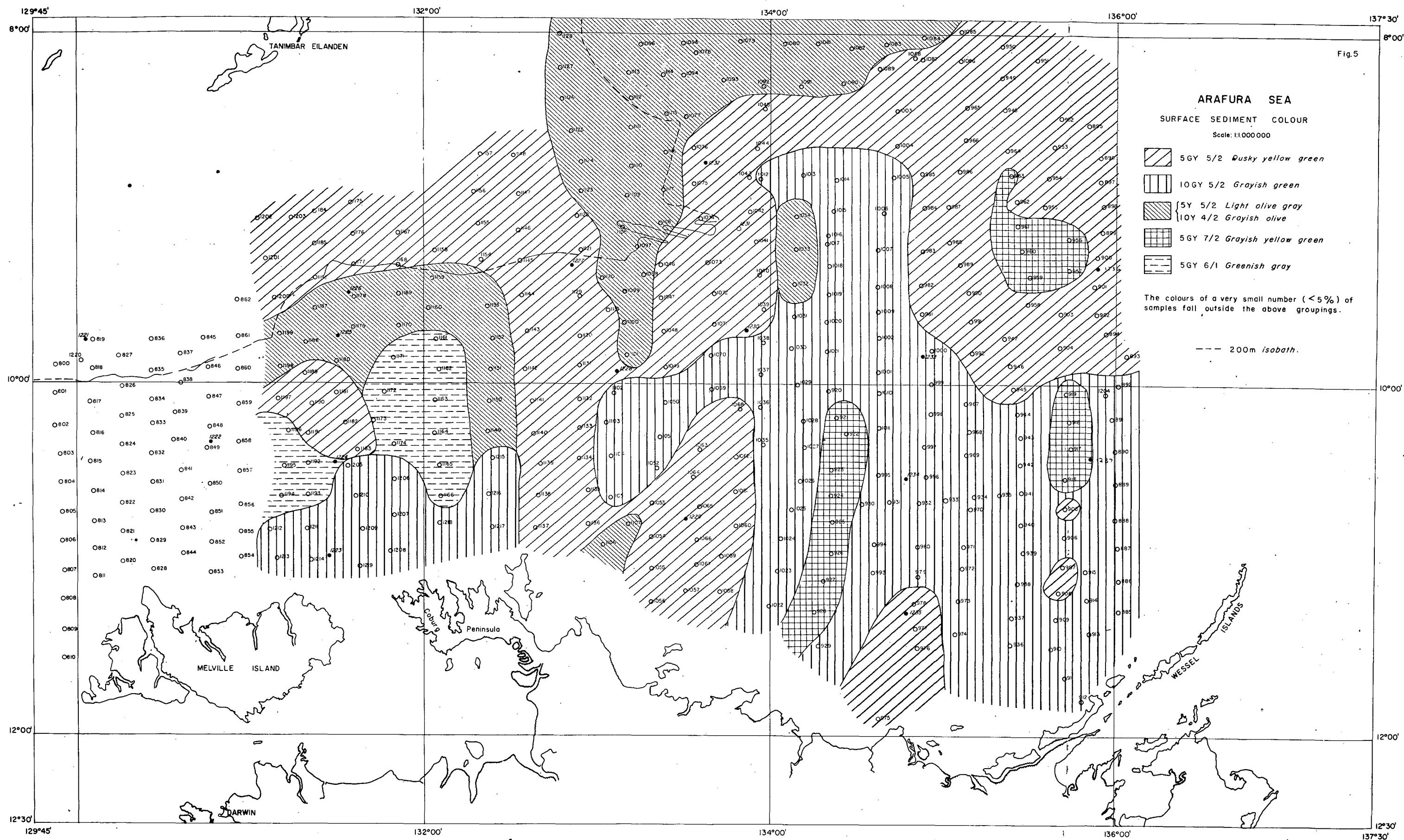
the Arafura Sea sediments are dominantly calcareous and hence the names of the end members ought strictly speaking to be calcarenite, calcisiltite and calcilutite (Pettijohn 1957). Shepard's classification refers only to the fraction finer than 2 mm. The material coarser than 2 mm has been expressed as percentage of the total sample and is plotted as a distribution map in Figure 9.

Textural description and distribution

The sediments of the Arafura Sea are deficient in silt-size particles and are chiefly coarse-grained. Figure 8a shows the distribution of the samples on Shepard's sand-silt-clay diagram. The texture of these samples range between sand and silty clay. The highest proportion of the samples (25 percent) lie in the sand-silt-clay range with a slightly higher clay than silt content. Sand and clayey-sand covers 24 percent and 22 percent respectively, while 18.2 percent of the samples are silty clays. The remaining samples are divided between sandy clay (4.9 percent), silty sand (3.1 percent), and clayey silt (2.6 percent). Only one sample plots on the diagram as a clay and one is sandy silt.

The distribution of the sediment textures in the Arafura Sea is shown in Figure 7. Sand or calcarenite covers the edge of the shelf in the eastern part of the survey area, and occurs close inshore east of Bathurst Island. Narrow bands of clayey sand or sand-silt-clay separate this sand from a broad band of fine silty clay covering the middle of the shelf. Towards the southwest corner near Arnhem Land the sediment has a medium grain-size being mostly sand-silt-clay and clayey sand. In the northeast corner dissected bottom topography is covered by sand, silty sand or clayey sand. Grading of the sediment is observed just west of 132°E. Sands on the edge of the shelf grade into clayey sand and sandy clay as the depth increases.

Compared with sediments from the Timor Sea (Van Andel and Veevers 1967), the sediments from the Arafura Shelf are not as coarse-grained. About 50 percent of the Arafura Shelf is covered by sand and clayey sand as compared with the Sahul Shelf's 90 percent. The lesser



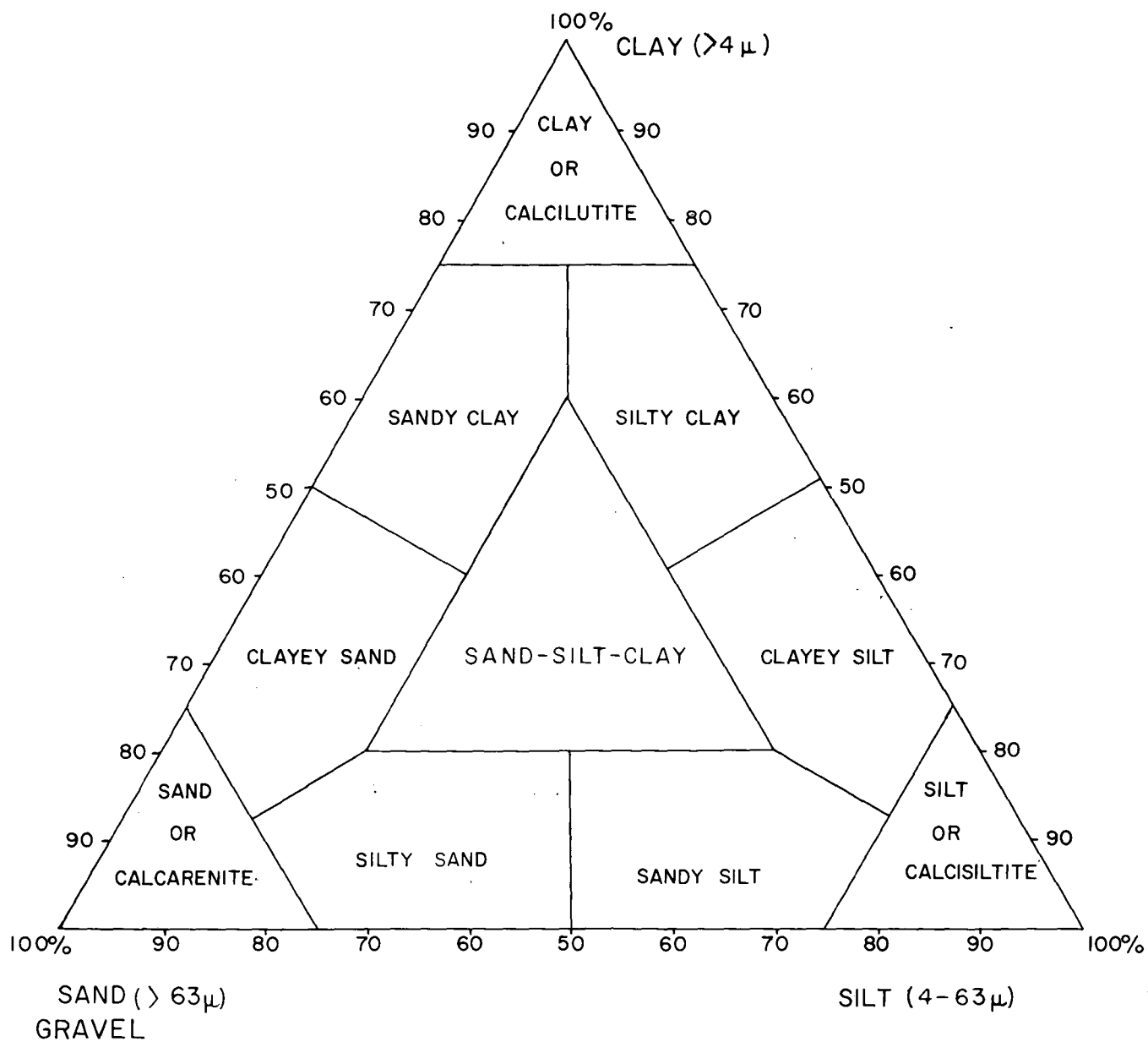
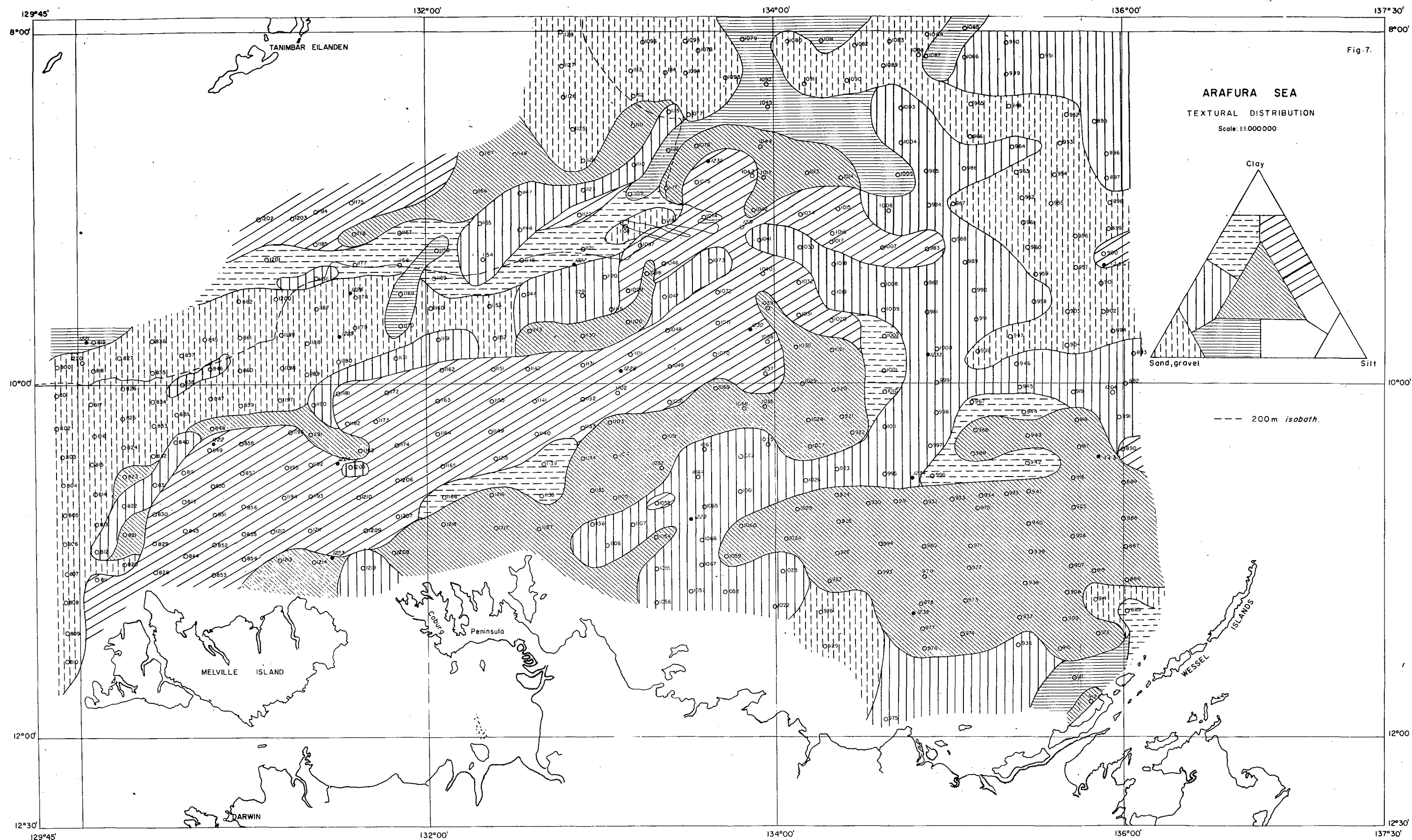


Fig 6. Textural classification of Arafura Sea Sediments
based on modification of system propose by Shepard (1954)



amount of sandy material on the Arafura Shelf is presumably due to the absence of banks, and the increase in sediments deposited during Recent times. Figure 8 shows the distributions of samples from different continental shelves in the world on the sand-silt-clay diagram (Van Andel and Veevers, 1967). The sample distribution of the Arafura and Sahul shelf are almost identical (Fig. 8 a,b) and in turn the distribution is similar to that of sediments from the northwestern gulf of Mexico (Fig. 8, a,b,c). Deltaic sedimentation in the Gulf of Paria and the Mississippi Delta results in a higher proportion of silt than found on the Arafura Shelf (Fig. 8 a,d,e). Similarly sediments described from New Guinea (Johgsma, 1970a; Walraven, 1969) have a much higher silt content (Fig. 8 f,g).

The sediments from the Arafura Sea can be considered as a continuous mixture of sand and silty clay containing about 25 to 35 percent silt, this is also the case in the Timor Sea (Van Andel and Veevers 1967). The relationship between texture and water depth noted by Van Andel and Veevers in the Timor Sea sediments is not evident in the Arafura Sea.

Gravel distribution

The distribution of material coarser than 2 mm is in Figure 9. The gravel component in the samples near the Arnhem Land coast consists of ferruginous siltstone and sandstone fragments derived from the weathering of rocks on the continent. On the edge of the shelf, and in the northwestern part of the survey area, the gravel component is largely shell material. Coral reef debris is common in the gravel fraction in the northwestern part of the area.

The pattern of the gravel distribution reflects that of the sand silt and clay components (Fig. 7). The gravel on the edge of the shelf is part of the relict shallow water Pleistocene sediment deposited during a low sealevel stand and is too far distant from present day sources of sediment supply to be buried by Recent fine-grained detritus.

Sedimentation rates

Radiocarbon dating of wood at the base of a core 130 cm long (station 1222) in water depth 99 m gave an age of $14,500 \pm 700$ yr BP (Jongsma 1970b). The wood was obtained from a possible soil horizon which was submerged by the latest Pleistocene eustatic sealevel rise and covered by post Pleistocene sediments. A thickness of 130 cm of sediment collected in the last 14,500 yrs gives a figure for the average sedimentation rate of less than 0.01 cm per year.

CONCLUSIONS

As demonstrated by Shepard (1963), many present-day continental shelves do not present a profile of equilibrium. The Arafura Shelf which adjoins the cratonic northern Australian region is no exception to this. Here the influence of Pleistocene transgressions and regressions is also evident in the character of the surface sediments. Instead of a gradation of sediment from well sorted sands nearshore to more poorly sorted fine clays on the edge of the shelf, it was found that no systematic decrease in grainsize with increasing depth and distance from shore takes place on the Arafura Shelf. The texture of near-shore sediments displays the normal gradation from coarse to fine but coarse sands occur on the edge of the shelf.

The limit of the influence of Recent sedimentation is the outer limit of the fine-grained silty clay covering the middle of the shelf (Fig. 7). Relict Pleistocene coarse sediments are present on the edge of the shelf and the upper slope below a depth of about 140 m. The maximum distance away from the coast of post Pleistocene silty clay is about 120 miles / ^(222 km) See Fig. 7) north of Arnhem Land.

The influence of terrigenous sedimentation from the New Guinea orogenic mainland is not noticeable in the area surveyed. Sediment discharged by the Digoel River does not reach the area since the distribution of the samples on the sand silt clay diagram is that commonly found on shelves away from large river deltas. The sediments are in many aspects identical with those of the Timor Sea and thus the source area for the terrestrial component is the Australian cratonic region. Sedimentation in the northeast corner of the area surveyed appears to be almost non-existent.

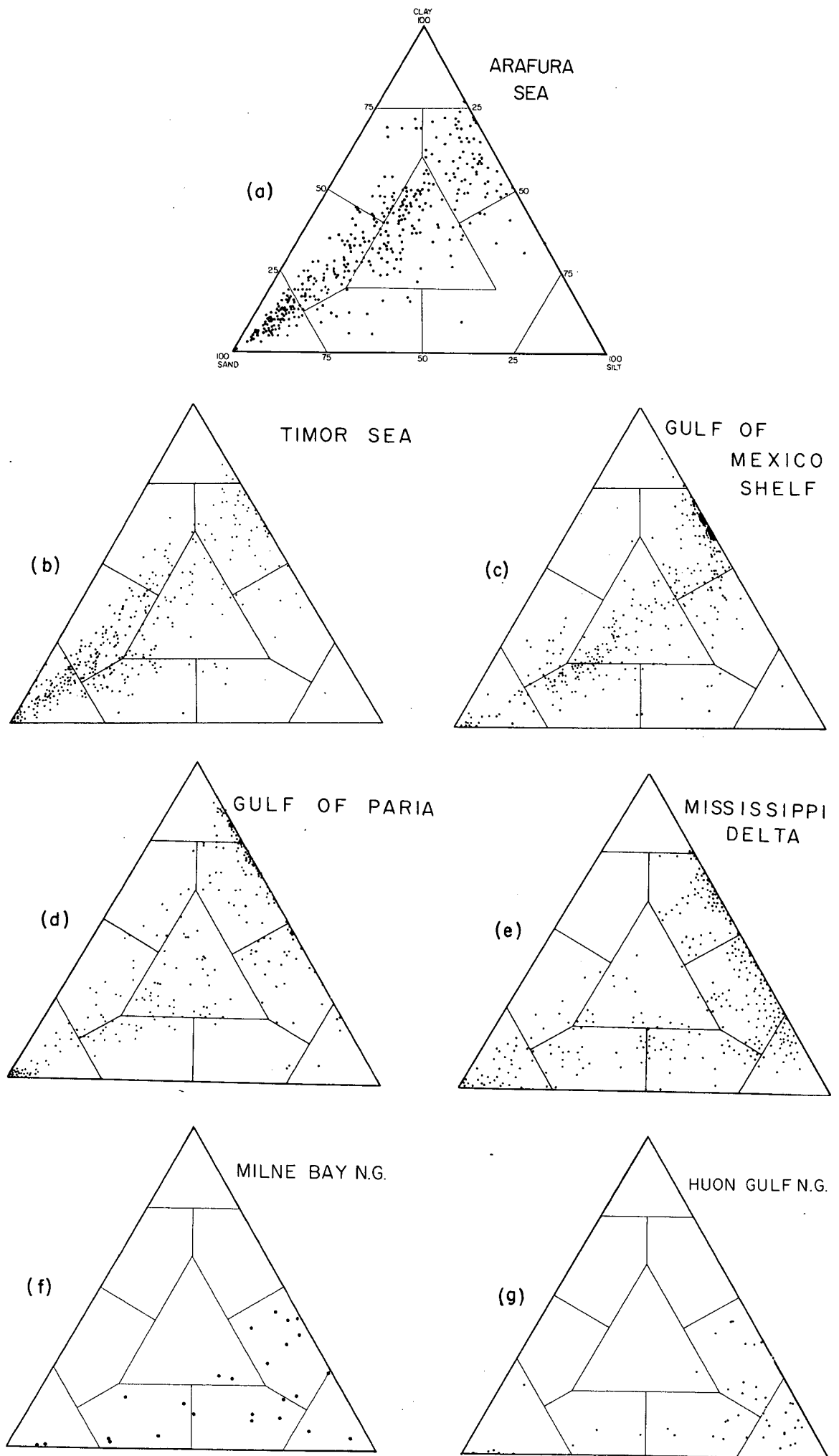
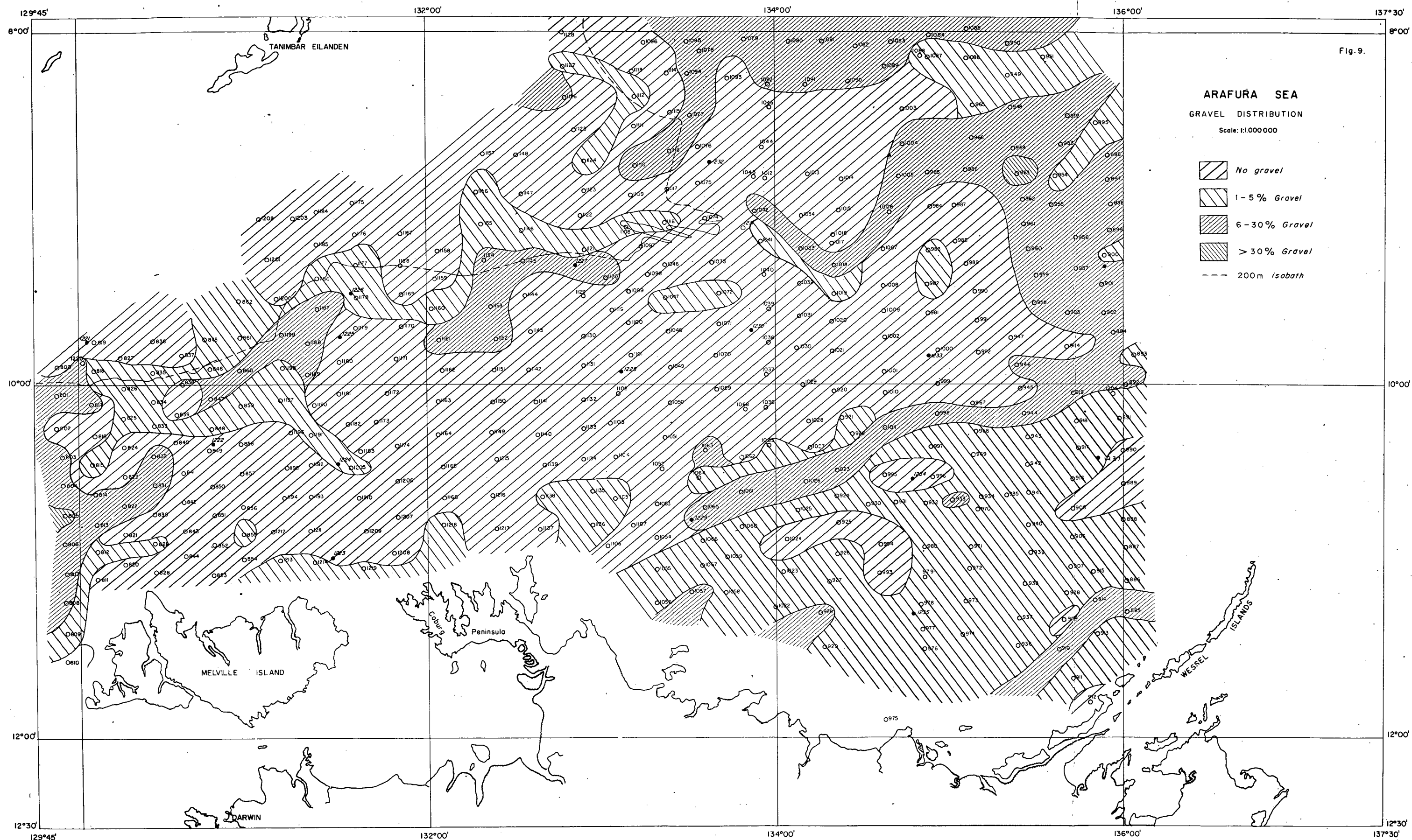


Fig 8 Comparison of surface sediment textures from different continental shelves



As more data from sample analysis and shallow seismic traverses taken in the Arafura Sea come to hand a more complete picture of the marine geology of the Arafura Sea should emerge.

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APPENDIX

STATION DATA AND TEXTURAL DESCRIPTION

Sample No.	Location		Category of Navigational Fix	Depth (m)	Sampling Method	Date	Time	Colour*	Percentage				Textural Description
	Latitude	Longitude							Gravel	Sand & Gravel	Silt	Clay	
Y69-800	09° 53.5'	129° 53.5'	Nil	220	Condred	3/5	0900						Sand
Y69-801	10° 03'	129° 53.5'		150	"	3/5	1030	11	88	4	8		Sand
Y69-802	10° 14'	129° 53'		114	"	3/5	1200	11	90	3	7		Sand
Y69-803	10° 24'	129° 55'		88	"	3/5	1320	16	87	7	6		Sand
Y69-804	10° 34'	129° 55'		57	"	3/5	1430	8	92	3	5		Sand
Y69-805	10° 44'	129° 56'		34	"	3/5	1540	35	100	0	0		Sand
Y69-806	10° 54'	129° 55'		37	"	3/5	1650	9	95	2	3		Sand
Y69-807	11° 04'	129° 56'		78	"	3/5	1750	12	91	4	5		Sand
Y69-808	11° 14'	129° 56'		85	"	3/5	1910	24	83	8	9		Sand
Y69-809	11° 22.5'	129° 54'		50	"	3/5	2020	3	93	3	4		Sand
Y69-810	11° 34'	129° 56'		42	"	3/5	2200	29	89	5	6		Sand
Y69-811	11° 06'	130° 06'		24	"	4/5	0610	0	0	49	51		Silty Clay
Y69-812	10° 57'	130° 06'		62	"	4/5	0720	4	53	16	31		Clayey Sand
Y69-813	10° 47'	130° 06'		80	"	4/5	0830	8	80	7	13		Sand
Y69-814	10° 37'	130° 06'		55	"	4/5	0942	8	72	10	18		Clayey Sand
Y69-815	10° 27'	130° 05'		94	"	4/5	1052	2	83	7	10		Sand
Y69-816	10° 16.8'	130° 06'		122	"	4/5	1201	0	81	8	11		Sand
Y69-817	10° 06'	130° 04.8'		156	"	4/5	1315	8	77	12	11		Sand
Y69-818	9° 55'	130° 05.5'		226	"	4/5	1505	4	85	7	8		Sand
Y69-819	9° 45'	130° 05.5'		298	"	4/5	1625	0	60	21	19		Silty Sand
Y69-820	11° 01'	130° 16'		35	"	5/5	0735	0	84	6	10		Sand
Y69-821	10° 51'	130° 16'		67	"	5/5	0847	1	28	25	47		Sand, Silt, Clay
Y69-822	10° 41'	130° 16'		82	"	5/5	0955	7	61	15	24		Clayey Sand
Y69-823	10° 31'	130° 16'		86	"	5/5	1100	0	28	27	45		Sand, Silt, Clay
Y69-824	10° 21'	130° 15.5'		114	"	5/5	1210	0	72	11	17		Clayey Sand
Y69-825	10° 11'	130° 15.5'		128	"	5/5	1325	6	93	3	4		Sand
Y69-826	10° 01'	130° 15.5'		200	"	5/5	1445	3	71	10	19		Clayey Sand
Y69-827	9° 50'	130° 15'		249	"	5/5	1600	0	80	8	12		Sand
Y69-828	11° 04'	130° 26'		36	"	6/5	0600	0	0	29	71		Silty Clay

* Colour determinations were carried out on samples P69-885 to P69-1237.

Sample No.	Location		Depth (m)	Sampling Method	Date	Time	Colour	Percentage				Textural Description
	Latitude	Longitude						Gravel	Sand & Gravel	Silt	Clay	
Y69-829	10° 54'	130° 26'	57	Condred	6/5	0710		2	5	23	72	Silty Clay
Y69-830	10° 44'	130° 26'	69	"	6/5	0820		0	0	28	72	Silty Clay
Y69-831	10° 34'	130° 26'	80	"	6/5	0930		9	42	17	41	Clayey Sand
Y69-832	10° 24'	130° 26'	88	"	6/5	1040		24	84	6	10	Sand
Y69-833	10° 14'	130° 26'	114	"	6/5	1155		5	76	11	13	Sand
Y69-834	10° 05'	130° 26'	160	"	6/5	1305		2	83	5	12	Sand
Y69-835	9° 55'	130° 26'	208	"	6/5	1427		2	78	11	11	Sand
Y69-836	9° 45'	130° 26'	272	"	6/5	1542		-	-	-	-	
Y69-837	9° 50'	130° 36'	216	"	8/5	0730		-	-	-	-	
Y69-838	10° 00'	130° 36'	158	"	8/5	095		0	65	16	19	Clayey Sand
Y69-839	10° 10'	130° 34'	107	"	8/5	1100		0	91	5	4	Sand
Y69-840	10° 20'	130° 33'	100	"	8/5	1215		0	61	18	21	Clayey Sand
Y69-841	10° 30'	130° 36'	86	"	8/5	1330		0	6	31	63	Silty Clay
Y69-842	10° 40'	130° 36'	73	"	8/5	1445		0	0	36	64	Silty Clay
Y69-843	10° 50'	130° 36'	60	"	8/5	1605		0	0	66	34	Clayey Silt
Y69-844	10° 59'	130° 35.5'	46	"	8/5	1720		0	2	33	65	Silty Clay
Y69-845	9° 45'	130° 44'	222	"	9/5	0705		3	91	4	5	Sand
Y69-846	9° 55'	130° 46'	174	"	9/5	0835		2	70	13	17	Clayey Sand
Y69-847	10° 05'	130° 46'	110	"	9/5	1000		20	93	3	4	Sand
Y69-848	10° 15'	130° 46'	104	"	9/5	1115		4	50	25	25	Sand Silty Clay
Y69-849	10° 23.3'	130° 45'	92	"	9/5	1230		0	5	37	58	Silty Clay
Y69-850	10° 35'	130° 46'	75	"	9/5	1355		0	14	32	54	Silty Clay
Y69-851	10° 45'	130° 47'	60	"	9/5	1515		0	5	26	69	Silty Clay
Y69-852	10° 55'	130° 46'	50	"	9/5	1635		0	4	35	61	Silty Clay
Y69-853	11° 05'	130° 46'	34	"	9/5	1750		0	7	28	65	Silty Clay
Y69-854	11° 00'	130° 56'	38	"	10/5	0910		0	16	29	55	Silty Clay
Y69-855	10° 49'	130° 56'	49	"	10/5	1025		1	43	17	40	Clayey Silt
Y69-856	10° 40'	130° 56'	54	"	10/5	1145		2	26	24	50	Sand Silty Clay
Y69-857	10° 30'	130° 56'	80	"	10/5	1310		0	2	28	70	Silty Clay

Sample No.	Location		Depth (m)	Sampling Method	Date	Time	Colour	Percentage			Textural	
	Latitude	Longitude						Gravel	Sand & Gravel	Silt	Clay	Description
Y69-858	10° 20'	130° 56'	92	Condred	10/5	1430		0	6	34	60	Silty Clay
Y69-859	10° 08'	130° 56'	102	"	10/5	1453		5	85	8	7	Sand
Y69-860	9° 56'	130° 56'	126	"	10/5	1715		8	88	5	7	Sand
Y69-861	9° 44'	130° 57'	158	"	10/5	1830		2	79	9	12	Sand
Y69-862	9° 32'	130° 58'	210	"	10/5	1950		3	77	9	14	Sand
P69-885	11° 17'	136° 02'	42	"	1/10	0800	10GY52	7	33	18	49	Sandy Clay
P69-886	11° 07'	136° 02'	44	"	1/10	0910	10GY52	3	32	22	46	Sand Silt Clay
P69-887	10° 50'	136° 02'	48	"	1/10	1018	10GY52	3	33	29	38	Sand Silt Clay
P69-888	10° 46'	136° 00'	51	"	1/10	1123	10GY52	4	36	26	38	Sand Silt Clay
P69-889	10° 34'	136° 00'	55	"	1/10	1235	10GY52	1	26	25	49	Sand Silt Clay
P69-890	10° 23'	136° 00'	59	"	1/10	1347	10GY52	0	10	30	60	Silty Clay
P69-891	10° 12'	135° 59'	66	"	1/10	1453	10GY52	5	53	15	32	Clayey Sand
P69-892	10° 01.5'	136° 01'	69	"	1/10	1601	10GY52	18	66	16	18	Clayey Sand
P69-893	9° 50'	136° 03.5'	64	"	1/10	1707	5GY52	3	72	10	18	Clayey Sand
P69-894	9° 42.5'	135° 56.5'	64	"	1/10	1814	5GY52	8	78	10	12	Sand
P69-895	8° 31'	135° 51'	64	"	2/10	0750	5GY52	5	69	6	25	Clayey Sand
P69-896	8° 42'	135° 55'	77	"	2/10	0910	5GY52	20	69	9	22	Clayey Sand
P69-897	8° 50'	135° 55'	77	"	2/10	1025	5GY52	12	39	19	42	Sandy Clay
P69-898	8° 58'	135° 56'	69	"	2/10	1135	5GY52	13	78	4	18	Sand
P69-899	9° 07'	135° 55'	71	"	2/10	1244	5GY52	17	75	14	11	Sand
P69-900	9° 16'	135° 54'	69	"	2/10	1353	5GY52	1	19	37	44	Silty Clay
P69-901	9° 26.5'	135° 52.5'	66	"	2/10	1504	5GY52	24	81	8	11	Sand
P69-902	9° 36'	135° 53.5'	65	"	2/10	1615	5GY52	6	82	8	10	Sand
P69-903	9° 36'	135° 40.5'	66	"	2/10	1725	5GY52	7	84	6	10	Sand
P69-904	9° 48'	135° 40'	69	"	2/10	1837	5GY52	0	81	11	8	Sand
P69-905	10° 42'	135° 43'	57	"	3/10	0540	5GY52	1	26	28	46	Sand Silt Clay
P69-906	10° 52'	135° 42'	54	"	3/10	0719	10GY52	5	36	24	40	Sand Silt Clay
P69-907	11° 02'	135° 42'	54	"	3/10	0828	5GY52	6	33	30	37	Sand Silt Clay

Sample No.	Location		Category of Navigational Fix	Depth (m)	Sampling method	Date	Time	Colour	Percentage				Textured Description
	Latitude	Longitude							Gravel	Sand + Gravel	Silt	Clay	
P69-908	11° 32'	135° 41'	G	49	Condred	3/10	0937	5 GY 52	5	42	27	31	Sand silt Clay
P69-909	11° 20.5'	135° 40'	B	44	"	3/10	1047	10 GY 52	0	40	38	22	Sand silt clay
P69-910	11° 31'	135° 38'	A	39	"	3/10	1155	10 GY 52	20	44	30	26	Sand silt clay
P69-911	11° 41'	135° 41.5'	A	36	"	3/10	1330	10 GY 52	2	52	32	16	Silty sand
P69-912	11° 42.5'	135° 49.5'	A	11	"	3/10	1430	10 GY 52	0	43	32	25	Sand silt clay
P69-913	11° 25'	135° 50'	B	35	"	4/10	0820	10 GY 52	1	27	43	30	Sand silt clay
P69-914	11° 13'	135° 49'	B	42	"	4/10	0935	10 GY 52	27	87	8	5	Sand
P69-915	11° 03'	135° 50'	C	42	"	4/10	1042	10 GY 52	6	45	27	28	Sand silt clay
P69-916	10° 32'	135° 43'	C	51	"	4/10	1450	5 GY 72	1	30	25	45	Sand silt clay
P69-917	10° 22.5'	135° 45.5'	D	59	"	4/10	1536	5 GY 72	3	31	22	47	Sand silt clay
P69-918	10° 12.5'	135° 44.5'		59	"	4/10	1643	5 GY 72	0	23	25	52	Sand silt clay
P69-919	10° 02.5'	135° 44'	C	70	"	4/10	1752	5 GY 72	13	54	13	33	Clayey sand
P69-920	10° 02.5'	134° 19.5'	B	72	"	5/10	0615	10 GY 52	0	33	22	45	Sand silt clay
P69-921	10° 11.5'	134° 22'	C	70	"	5/10	0730	5 GY 52	2	35	24	41	Sand silt clay
P69-922	10° 21'	134° 26'	C	65	"	5/10	0840	5 GY 72	3	43	28	29	Sand silt clay
P69-923	10° 29.5'	134° 21'	C	56	"	5/10	0945	5 GY 72	7	58	20	22	Clayey Sand
P69-924	10° 38.5'	134° 21'	C	58	"	5/10	1050	5 GY 72	5	41	30	29	Sand silt clay
P69-925	10° 47.5'	134° 20.5'	C	60	"	5/10	1158	5 GY 72	0	46	25	29	Sand silt clay
P69-926	10° 57'	134° 20.5'	C	53	"	5/10	1309	5 GY 72	3	50	23	27	Sand silt clay
P69-927	11° 08'	134° 18.5'	D	50	"	5/10	1418	5 GY 72	2	47	29	24	Sand silt clay
P69-928	11° 18.5'	134° 15.5'	D	48	"	5/10	1527	5 GY 61	37	91	6	3	Sand
P69-929	11° 30'	134° 16.5'	C	38	"	5/10	1637	10 GY 52	4	86	9	5	Sand
P69-930	10° 41.5'	134° 32'	C	53	"	11/10	1345	10 GY 52	2	33	28	39	Sand silt clay
P69-931	10° 40.5'	134° 41'	C	55	"	11/10	1455	10 GY 52	3	40	29	31	Sand silt clay
P69-932	10° 40'	134° 52'	C	50	"	11/10	1605	10 GY 52	5	42	26	32	Sand silt clay
P69-933	10° 39'	135° 01'	C	60	"	11/10	1710	10 GY 52	7	49	27	24	Sand silt clay
P69-934	10° 38'	135° 11'	C	55	"	11/10	1818	10 GY 52	3	34	25	41	Sand silt clay
P69-935	10° 37.5'	135° 20'	C	55	"	11/10	1925	10 GY 52	3	30	24	46	Sand silt clay
P69-936	11° 29'	135° 24'	A	33	"	12/10	0610	10 GY 52	2	55	20	25	Clayey sand

Sample No.	Location		Category of Navigational Fix	Depth (M)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Description
	Latitude	Longitude								Sand & Gravel	Silt	Clay	
P69-937	11° 19.5'	135° 23.5'	D	46	Condred	12/10	0730	10GY 52	4	34	29	37	Sand, Silt, Clay
P69-938	11° 08'	135° 26.5'	C	49	"	12/10	0837	10GY 52	3	26	25	49	Sand, Silt, Clay
P69-939	10° 57.5'	135° 28'	C	51	"	12/10	0945	10GY 52	4	32	23	45	Sand, Silt, Clay
P69-940	10° 48'	135° 27'	C	51	"	12/10	1055	10GY 52	2	25	25	50	Sand, Silt, Clay
P69-941	10° 37'	135° 27.5'	B	53	"	12/10	1204	10GY 52	3	28	22	50	Sand, Silt, Clay
P69-942	10° 27.5'	135° 27'	C	53	"	12/10	1318	10GY 52	5	36	20	44	Sandy Clay
P69-943	10° 18'	135° 27'	C	53	"	12/10	1425	10GY 52	3	29	21	50	Sand, Silt, Clay
P69-944	10° 10'	135° 26'	C	56	"	12/10	1532	10GY 52	11	36	16	48	Sandy Clay
P69-945	10° 01'	135° 25'	C	63	"	12/10	1640	5GY 52	0	54	12	34	Clayey Sand
P69-946	9° 53'	135° 23.5'	C	82	"	12/10	1747	5GY 52	18	74	7	19	Clayey Sand
P69-947	9° 44'	135° 22'	D	82	"	12/10	1858	5GY 52	0	79	5	16	Sand
P69-948	8° 26'	135° 22'	B	75	"	13/10	0610	5GY 52	28	83	6	11	Sand
P69-949	8° 15'	135° 20'	C	81	"	13/10	0724	5GY 52	5	62	12	26	Clayey Sand
P69-950	8° 04'	135° 25.5'	C	86	"	13/10	0833	5GY 52	7	70	11	19	Clayey Sand
P69-951	8° 09'	135° 32.5'	C	66	"	13/10	1013	5GY 52	4	68	7	25	Clayey Sand
P69-952	8° 29'	135° 41'	C	63	"	14/10	1300	5GY 52	7	76	5	19	Sand
P69-953	8° 39'	135° 39'	D	63	"	14/10	1410	5GY 52	21	84	4	12	Sand
P69-954	8° 50'	135° 37'	D	66	"	14/10	1518	5GY 52	3	83	5	12	Sand
P69-955	9° 01'	135° 35'	D	64	"	14/10	1625	5GY 52	15	81	5	14	Sand
P69-956	9° 11'	135° 43'	C	70	"	14/10	1734	5GY 72	14	76	7	17	Sand
P69-957	9° 21'	135° 43'	C	60	"	14/10	1843	5GY 72	22	84	6	10	Sand
P69-958	9° 33'	135° 30'	C	73	"	15/10	0800	5GY 52	7	73	10	17	Clayey Sand
P69-959	9° 24'	135° 30'	C	64	"	15/10	0910	5GY 72	16	80	7	13	Sand
P69-960	9° 14'	135° 27'	C	68	"	15/10	1020	5GY 72	22	84	6	10	Sand
P69-961	9° 05'	135° 26.5'	C	64	"	15/10	1130	5GY 72	22	75	12	13	Sand
P69-962	8° 56'	135° 25'	C	73	"	15/10	1240	5GY 52	15	85	5	10	Sand
P69-963	8° 48'	135° 23'	C	82	"	15/10	1325	5GY 72	46	91	3	6	Sand
P69-964	8° 39'	135° 21'	B	65	"	15/10	1505	5GY 52	6	69	9	22	Clayey Sand
P69-965	8° 25'	135° 08'	C	88	"	15/10	1715	5GY 52	6	77	6	17	Sand
P69-966	8° 36'	135° 08'	B	82	"	15/10	1860	5GY 52	10	78	6	16	Sand

Sample No.	Location		Category of Navigational Flt	Depth (m)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Description
	Latitude	Longitude								Sand	Silt	Clay	
P69-967	10° 07'	135° 08'	B	67	Core	16/10	0550	10GY52	1	34	19	47	Sandy Clay
P69-968	10° 16'	135° 09'	C	60	"	16/10	0701	10GY52	2	30	22	48	Sand Silt Clay
P69-969	10° 25'	135° 10'	C	59	"	16/10	0807	10GY52	2	30	20	50	Sand Silt Clay
P69-970	10° 43'	135° 08'	D	53	"	16/10	1015	10GY52	5	40	20	40	Sand Silt Clay
P69-971	10° 51'	135° 08'	D	53	"	16/10	1123	10GY52	5	32	24	44	Sand Silt Clay
P69-972	11° 02.5'	135° 07'	C	48	"	16/10	1235	10GY52	3	32	25	43	Sand Silt Clay
P69-973	11° 14'	135° 05.5'	D	45	"	16/10	1338	10GY52	0	9	33	58	Silty Clay
P69-974	11° 25.5'	135° 5'	C	40	"	16/10	1440	10GY52	5	37	26	37	Sand Silt Clay
P69-975	11° 54.5'	134° 38'	A	10	"	17/10	1130	5GY52	4	73	11	16	Clayey Sand
P69-976	11° 31'	134° 51'	C	34	"	17/10	1415	5GY52	4	46	23	31	Sand Silt Clay
P69-977	11° 23.5'	134° 50'	D	41	"	17/10	1525	5GY52	4	42	24	34	Sand Silt Clay
P69-978	11° 15'	134° 49'	C	48	"	17/10	1631	5GY52	7	45	20	35	Clayey Sand
P69-979	11° 06'	134° 51.5'	B	55	"	17/10	1737	10GY52	1	36	24	40	Sand Silt Clay
P69-980	10° 56'	134° 51'	C	54	"	17/10	1846	10GY52	5	41	22	37	Sand Silt Clay
P69-981	9° 35'	134° 52.5'	C	94	"	18/10	0535	5GY52	0	71	76	23	Clayey Sand
P69-982	9° 25'	134° 53'	C	115	"	18/10	0702	5GY52	2	45	22	32	Sand Silt Clay
P69-983	9° 14'	134° 53'	D	122	"	18/10	0809	5GY52	2	16	35	49	Silty Clay
P69-984	8° 59'	134° 54'	D	94	"	18/10	0935	5GY52	0	51	13	36	Clayey Sand
P69-985	8° 48'	134° 53'	C	100	"	18/10	1048	5GY52	0	71	8	21	Clayey Sand
P69-986	8° 47'	135° 05'	C	82	"	18/10	1223	5GY52	14	72	9	19	Clayey Sand
P69-987	8° 59'	135° 01'	C	86	"	18/10	1334	5GY52	0	77	7	16	Sand
P69-988	9° 10'	135° 02'	D	91	"	18/10	1444	5GY52	0	73	8	19	Clayey Sand
P69-989	9° 20'	135° 06'	D	88	"	18/10	1554	5GY52	0	53	15	32	Clayey Sand
P69-990	9° 28'	135° 09'	D	86	"	18/10	1701	5GY52	0	68	9	23	Clayey Sand
P69-991	9° 38'	135° 10'	C	70	"	18/10	1810	5GY52	0	59	18	23	Clayey Sand
P69-992	9° 49'	135° 10'	C	80	"	18/10	1919	5GY52	0	81	4	15	Sand
P69-993	11° 04'	134° 35'	B	50	"	19/10	0615	10GY52	0	47	21	32	Sand Silt Clay
P69-994	10° 54'	134° 36'	C	55	"	19/10	0730	10GY52	0	43	25	32	Sand Silt Clay
P69-995	10° 26'	134° 38'	D	54	"	19/10	0950	10GY52	0	47	19	34	Clayey Sand

Sample No.	Location		Category of Navigational Fix	Depth (M)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Description
	Latitude	Longitude								Sand	Silt	Clay	
P69-996	10° 31'	134° 54'	C	52	Contred	19/10	1135	10 GY 52	0	38	15	47	Sandy clay
P69-997	10° 21'	134° 54'	C	60	"	19/10	1245	10 GY 52	3	42	18	40	Clayey sand
P69-998	10° 10'	134° 55'	D	64	"	19/10	1352	10 GY 52	10	45	15	40	Clayey sand
P69-999	10° 00'	134° 55'	D	70	"	19/10	1500	10 GY 52	0	45	11	44	Clayey sand
P69-1000	9° 49'	134° 55'	C	72	"	19/10	1610	10 GY 52	0	45	12	43	Clayey sand
P69-1001	9° 56'	134° 38'	C	70	"	19/10	1820	10 GY 52	0	26	8	66	Sandy clay
P69-1002	9° 44'	134° 38'	B	80	"	19/10	1925	10 GY 52	0	33	13	56	Sandy clay
P69-1003	8° 28'	134° 44'	B	120	"	20/10	0540	5 GY 52	0	65	16	19	Clayey sand
P69-1004	8° 38'	134° 44'	C	115	"	20/10	0717	5 GY 52	7	67	11	22	Clayey sand
P69-1005	8° 50'	134° 43'	C	113	"	20/10	0850	10 GY 52	7	68	20	12	Silty sand
P69-1006	9° 02'	134° 40'	C	95	"	20/10	1003	10 GY 52	13	78	8	14	Sand
P69-1007	9° 13.5'	134° 38'	C	135	"	20/10	1122	10 GY 52	0	13	53	34	Clayey silt
P69-1008	9° 27'	134° 38'	D	128	"	20/10	1236	10 GY 52	0	39	13	48	Sandy clay
P69-1009	9° 35'	134° 38'	C	93	"	20/10	1330	10 GY 52	0	53	13	34	Clayey sand
P69-1010	10° 02'	134° 38'	C	68	"	20/10	1645	10 GY 52	0	37	20	43	Sandy clay
P69-1011	10° 14'	134° 38'	D	63	"	20/10	1805	10 GY 52	7	48	17	35	Clayey sand
P69-1012	8° 49'	133° 57'	C	168	"	21/10	0851	10 GY 52	0	20	41	39	Clayey silt
P69-1013	8° 49'	134° 12'	D	155	"	21/10	1028	10 GY 52	0	38	26	36	Sand silt clay
P69-1014	8° 50'	134° 23'	C	142	"	21/10	1140	10 GY 52	0	25	20	45	Sand silt clay
P69-1015	9° 00'	134° 22'	C	130	"	21/10	1252	10 GY 52	0	8	20	72	Silty clay
P69-1016	9° 09'	134° 29'	C	100	Boxdred	21/10	1350						
P69-1017	9° 11'	134° 21'	C	117	Condred	21/10	1435	10 GY 52	0	0	28	72	Silty clay
P69-1018	9° 19'	134° 21'	D	91	"	21/10	1554	10 GY 52	7	61	14	25	Clayey sand
P69-1019	9° 29'	134° 20'	D	119	"	21/10	1703	10 GY 52	5	58	12	30	Clayey sand
P69-1020	9° 38'	134° 20'	C	79	"	21/10	1819	10 GY 52	0	13	21	66	Silty clay
P69-1021	9° 49'	134° 20'	D	66	"	21/10	1930	10 GY 52	0	21	23	56	Sand silt clay
P69-1022	11° 15'	134° 00'	B	48	"	22/10	0555	10 GY 52	4	61	16	23	Clayey sand
P69-1023	11° 05'	134° 2.5'	C	55	"	22/10	0710	10 GY 52	3	64	12	24	Clayey sand
P69-1024	10° 54'	134° 05'	C	60	"	22/10	0820	10 GY 52	0	41	23	36	Sand silt clay

Sample No.	Location		Category of Navigational Fix	Depth (m)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Description
	Latitude	Longitude								Sand	Silt	Clay	
P69-1025	10°46'	134°07.5'	C	60	Condred	22/10	0930	10GY52	3	43	21	36	Sand Silt Clay
P69-1026	10°33'	134°10'	C	60	"	22/10	1040	10GY52	7	53	19	28	Clayey Sand
P69-1027	10°22'	134°11.5'	D	70	"	22/10	1150	10GY52	0	34	22	44	Sand Silt Clay
P69-1028	10°12'	134°11'	C	71	"	22/10	1300	10GY52	0	27	24	49	Sand Silt Clay
P69-1029	10°00'	134°09'	C	86	"	22/10	1408	10GY52	0	37	17	46	Sandy Clay
P69-1030	9°48'	134°07'	D	82	"	22/10	1517	10GY52	0	21	24	55	Sand Silt Clay
P69-1031	9°37'	134°08'	D	91	"	22/10	1628	10GY52	0	17	20	63	Silty Clay
P69-1032	9°26'	134°08'	C	124	"	22/10	1737	10Y62	0	6	24	70	Silty Clay
P69-1033	9°14'	134°08'	C	109	"	22/10	1845	10Y62	7	54	10	36	Clayey Sand
P69-1034	9°03'	134°08'	C	157	"	22/10	1954	10Y62	0	8	43	49	Silty Clay
P69-1035	10°21'	133°58'	B	60	"	23/10	0615	10GY52	3	50	19	31	Clayey Sand
P69-1036	10°08'	133°57.5'	C	65	"	23/10	0730	10GY52	0	36	21	43	Sand Silt Clay
P69-1037	9°57'	133°58'	C	70	"	23/10	0840	10GY52	0	9	24	67	Silty Clay
P69-1038	9°46'	133°58.5'	C	95	"	23/10	0950	10GY52	0	10	25	59	Silty Clay
P69-1039	9°35'	133°59'	D	98	"	23/10	1100	5GY52	0	22	23	55	Sand Silt Clay
P69-1040	9°23.5'	133°57'	C	168	"	23/10	1212	5GY52	0	5	47	45	Silty Clay
P69-1041	9°12'	133°50'	C	130	"	23/10	1325	5GY52	4	56	17	27	Clayey Sand
P69-1042	9°01.5'	133°54'	C	166	"	23/10	1436	5GY52	7	30	24	46	Sand Silt Clay
P69-1043	8°50'	133°54'	D	189	"	23/10	1554	5GY52	0	8	37	55	Silty Clay
P69-1044	8°40'	133°56'	C	175	"	23/10	1745	5GY52	0	30	36	34	Sand Silt Clay
P69-1045	8°26.5'	133°59'	B	164	"	23/10	1900	5GY52	0	72	19	9	Silty Sand
P69-1046	9°19'	133°22'	B	140	"	24/10	0610	5GY52	0	5	24	71	Silty Clay
P69-1047	9°30'	133°22'	C	122	"	24/10	0730	5GY52	4	42	17	41	Clayey Sand
P69-1048	9°42'	133°23'	C	98	"	24/10	0842	5GY52	0	3	23	74	Silty Clay
P69-1049	9°54'	133°24'	C	75	"	24/10	0952	5GY52	0	3	48	49	Silty Clay
P69-1050	10°06'	133°24'	D	75	"	24/10	1102	10GY52	0	14	37	49	Silty Clay
P69-1051	10°18'	133°22.5'	C	70	"	24/10	1215	10GY52	0	26	35	39	Sand Silt Clay
P69-1052	10°29'	133°21'	C	68	"	24/10	1325	10GY52	0	30	29	41	Sand Silt Clay
P69-1053	10°41'	133°19'	D	64	"	24/10	1432	5GY52	0	4	39	57	Silty Clay

Sample No.	Location		Category of Navigational Fix	Depth (m)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Description
	Latitude	Longitude								Sand	Silt	Clay	
P69-1054	10° 52'	133° 19'	D	58	Condred	24/10	1540	10G 42	0	38	28	34	Sand Silt Clay
P69-1055	11° 03'	133° 19'	D	47	"	24/10	1646	5GY52	3	58	17	25	Clayey Sand
P69-1056	11° 14'	133° 19'	B	37	"	24/10	1756	5GY52	2	65	13	22	Clayey Sand
P69-1057	11° 10.5'	133° 31'	B	44	"	31/10	0725	5GY52	7	65	15	20	Clayey Sand
P69-1058	11° 10.5'	133° 43'	C	47	"	31/10	0840	5GY52	2	57	18	25	Clayey Sand
P69-1059	10° 59.5'	133° 43'	C	47	"	31/10	0950	5GY52	3	47	22	31	Sand Silt Clay
P69-1060	10° 48.5'	133° 48'	D	60	"	31/10	1100	5GY52	1	50	22	28	Sand Silt Clay
P69-1061	10° 37'	133° 48'	C	58	"	31/10	1210	5GY52	10	57	17	26	Clayey Sand
P69-1062	10° 25'	133° 48'	C	64	"	31/10	1330	5GY52					
P69-1063	10° 23'	133° 36'	C	62	"	31/10	1530	5GY52	9	43	22	35	Clayey Sand
P69-1064	10° 32'	133° 34'	C	60	"	31/10	1642	5GY52	4	51	20	29	Clayey Sand
P69-1065	10° 42'	133° 36'	C	58	"	31/10	1752	5GY52	7	53	19	28	Clayey Sand
P69-1066	10° 53'	133° 35'	C	56	"	31/10	1915	5GY52	2	50	17	33	Clayey Sand
P69-1067	11° 02'	133° 35'	D	52	"	31/10	2015	5GY52	6	62	12	26	Clayey Sand
P69-1068	10° 08.5'	133° 50'	C	73	"	1/11	0615	5GY52	0	34	24	42	Sand Silt Clay
P69-1069	10° 1.5'	133° 40'	D	77	"	1/11	0800	10GY52	0	22	26	52	Sand Silt Clay
P69-1070	9° 50'	133° 46'	D	82	"	1/11	0910	10GY52	0	3	31	66	Silty Clay
P69-1071	9° 39.5'	133° 41'	D	112	"	1/11	1025	5GY52	0	12	24	64	Silty Clay
P69-1072	9° 28.5'	133° 41'	D	110	"	1/11	1138	5GY52	0	17	22	61	Silty Clay
P69-1073	9° 18'	133° 38'	D	135	"	1/11	1310	5GY52	3	48	11	41	Clayey Sand
P69-1074	9° 03'	133° 36'	C	170	"	1/11	1420	5GY52	0	10	30	60	Silty Clay
P69-1075	8° 51'	133° 34'	D	187	"	1/11	1540	5GY52	0	7	27	66	Silty Clay
P69-1076	8° 39'	133° 34'	D	192	"	1/11	1655	5GY52	0	39	29	32	Sand Silt Clay
P69-1077	8° 28'	133° 31'	C	164	"	1/11	1825	5 Y52	29	80	10	10	Sand
P69-1078	8° 06'	133° 35'	C	113	"	2/11	0610	10 Y42	11	79	13	8	Sand
P69-1079	8° 02'	133° 50'	C	108	"	2/11	0753	10 Y42	11	60	34	6	Silty Sand
P69-1080	8° 03'	134° 05'	C	91	"	2/11	0920	10 Y42	15	87	7	6	Sand
P69-1081	8° 04'	134° 16'	D	110	"	2/11	1045	10 Y42	13	66	28	6	Silty Sand
P69-1082	8° 05'	134° 28'	D	105	"	2/11	1207	5 Y52	11	86	7	7	Sand

Sample No.	Location		Category of C Navigational Fix	Depth (M)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Descriptions
	Latitude	Longitude								Sand	Silt	Clay	
P69-1083	8° 03'	134° 40'	C	109	Condred	2/11	1337	10Y 42	18	78	9	13	Sand
P69-1084	8° 01'	134° 53'	C	104	"	2/11	1510	10Y 42	7	76	11	13	Sand
P69-1085	7° 59'	135° 06'	C	92	"	2/11	1700	5GY 52	8	63	25	12	Silty Sand
P69-1086	8° 09'	135° 06'	C	94	"	2/11	1812	5GY 32	6	68	11	21	Clayey Sand
P69-1087	8° 09'	134° 53'	D	110	"	2/11	1940	5GY 52	4	58	30	12	Silty Sand
P69-1088	8° 09'	134° 50'	C	115	"	3/11	0630	5GY 52	2	79	8	13	Sand
P69-1089	8° 12'	134° 37'	C	121	"	3/11	0805	5GY 52	15	76	9	15	Sand
P69-1090	8° 17'	134° 25'	D	130	"	3/11	0945	10 Y 42	8	87	5	8	Sand
P69-1091	8° 18'	134° 11'	D	141	"	3/11	1110	10 Y 42	9	76	9	15	Sand
P69-1092	8° 18'	133° 58'	C	132	"	3/11	1242	10 Y 42	10	71	16	13	Silty Sand
P69-1093	8° 16'	133° 44'	C	112	"	3/11	1508	10 Y 42	0	76	13	11	Sand
P69-1094	8° 14'	133° 30' 8	D	118	"	3/11	1645	5 Y 52	7	84	9	7	Sand
P69-1095	8° 3.5'	133° 30'	B	88	"	3/11	1825	5 Y 52	14	88	8	5	Sand
P69-1096	8° 3.5'	133° 15'	D	100	"	3/11	1950	5 Y 52	0	86	7	7	Sand
P69-1097	9° 12.5'	133° 14'	C	168	"	4/11	0654		0	0	23	77	Clay
P69-1098	9° 22.5'	133° 16'	C	122	"	4/11	0816		0	35	24	41	Sand, Silt, Clay
P69-1099	9° 28.5'	133° 10'	C	130	"	4/11	0930		0	12	45	43	Clayey Silt
P69-1100	9° 39'	133° 10'	D	137	"	4/11	1040		0	23	27	50	Sand, Silt, Clay
P69-1101	9° 50'	133° 10.5'	C	73	"	4/11	1155		0	5	36	59	Clayey Silt
P69-1102	10° 03'	133° 06'	D	75	"	4/11	1302		0	14	31	55	Silty Clay
P69-1103	10° 13'	133° 03'	C	68	"	4/11	1418		0	28	27	45	Sand, Silt, Clay
P69-1104	10° 25'	133° 05'	C	66	"	4/11	1527		0	32	31	37	Sand, Silt, Clay
P69-1105	10° 39'	133° 05'	B	62	"	4/11	1640		4	43	25	32	Sand, Silt, Clay
P69-1106	10° 55'	133° 03'	A	30	"	5/11	1550	5 Y 52	0	61	14	25	Clayey Sand
P69-1107	10° 48'	133° 10'	B	62	"	5/11	1720	5 Y 52	0	50	15	35	Clayey Sand
P69-1108	9° 06'	133° 09'	C	119	"	6/11	0630	10YR 8/6	5	91	3	6	Sand
P69-1109	8° 55'	133° 11'	D	220	"	6/11	0745	5Y 5/2					
P69-1110	8° 41'	133° 12'	C	196	"	6/11	0902	10Y 4/2	9	71	12	17	Clayey Sand
P69-1111	8° 32'	133° 12'	D	220	"	6/11	1030	10Y 4/2	0	60	20	20	Sand, Silt, Clay

Sample No.	Location		Category of Navigational Fix	Depth (m)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Description
	Latitude	Longitude								Sand & Gravel	Silt	Clay	
P69-1112	8° 22'	133° 12'	D	180	Condred	6/11	1145	5Y72	5	87	6	7	Sand
P69-1113	8° 13'	133° 11'	C	162	"	6/11	1256	5Y52	0	87	7	6	Sand
P69-1114	8° 14'	133° 23'	D	125	"	6/11	1415	5Y52	0				
P69-1115	8° 27'	133° 24'	C	146	"	6/11	1600	5Y52	0	69	15	16	Clayey Sand
P69-1116	8° 40.5'	133° 23'	D	182	"	6/11	1715	5Y52	9	67	22	11	Silty Sand
P69-1117	8° 53'	133° 23'	C	227	"	6/11	1830	5Y52	0	26	35	39	Sand Silt Clay
P69-1118	9° 05'	133° 22'	D	165	"	6/11	1950	5Y52	4	34	56	10	Sandy Silt
P69-1119	9° 35'	133° 04'	C	126	"	7/11	0605	5GY52	0	65	7	28	Clayey Sand
P69-1120	9° 24'	133° 02'	C	125	"	7/11	0720	10Y62	7	45	11	44	Clayey Sand
P69-1121	9° 14'	132° 54'	C	145	"	7/11	0840	5GY52	3	34	18	48	Sandy Clay
P69-1122	9° 02.5'	132° 53'	B	205	"	7/11	1000	5GY52	0	3	23	74	Silty Clay
P69-1123	8° 54'	132° 54'	C	208	"	7/11	1115	5Y52	0	56	15	29	Clayey Sand
P69-1124	8° 44'	132° 54.5'	C	240	"	7/11	1230	5Y52	4	86	4	10	Sand
P69-1125	8° 33'	132° 51'	C	225	"	7/11	1410	5Y52	0	77	10	13	Sand
P69-1126	8° 22'	132° 48'	D	254	"	7/11	1525	5Y52	26	82	8	10	Sand
P69-1127	8° 11'	132° 47.5'	D	245	"	7/11	1710	5Y52	5	82	8	10	Sand
P69-1128	8° 00'	132° 48'	D	243	"	7/11	1828	5Y52	0	100	0	0	Sand
P69-1129	9° 30'	132° 54'	C	140	"	8/11	0745	5GY52	0	48	18	34	Clayey Sand
P69-1130	9° 43'	132° 54'	C	114	"	8/11	0905	5GY52	0	29	21	50	Sand Silt Clay
P69-1131	9° 54'	132° 54'	D	72	"	8/11	1015	5GY52	0	3	45	52	Silty Clay
P69-1132	10° 05'	132° 54'	C	75	"	8/11	1125	5GY52	0	8	37	55	Silty Clay
P69-1133	10° 15'	132° 54'	C	70	"	8/11	1235	5GY52	0	17	36	47	Silty Clay
P69-1134	10° 25'	132° 54'	C	66	"	8/11	1345	5GY52	0	28	28	44	Sand Silt Clay
P69-1135	10° 36'	132° 56.5'	A	62	"	8/11	1510	5GY52	2	43	24	33	Sand Silt Clay
P69-1136	10° 48'	132° 56.5'	A	53	"	8/11	1617	5GY52	6	70	14	16	Clayey Sand
P69-1137	10° 49'	132° 38.5'	A	51	"	8/11	1800	5GY52	0	28	24	48	Sand Silt Clay
P69-1138	10° 38'	132° 39.5'	C	62	"	9/11	0615	5GY52	4	31	15	54	Sandy Clay
P69-1139	10° 27'	132° 41'	C	60	"	9/11	0723	5GY52	0	25	6	69	Sandy Clay
P69-1140	10° 17'	132° 38'	C	65	"	9/11	0838	5GY52	0	15	35	50	Silty Clay

Sample No.	Location		Category	of	Navigation	Depth (m)	Sampling method	Date	Time	Colour	Gravel	Percentage		Textural Description
	Latitude	Longitude										Sand & Gravel	Silt Clay	
P69-1141	10° 06'	132° 37'	Category	C	Navigation	75	Condred	9/11	0958	5 GY 52	0	6	41 53	Silty clay
P69-1142	9° 55'	132° 35'				78	"	9/11	1107	5 GY 52	0	6	36 58	Silty clay
P69-1143	9° 42'	132° 36'				100	"	9/11	1216	5 GY 52	0	35	20 45	Sand silt clay
P69-1144	9° 30'	132° 34'				124	"	9/11	1230	5 GY 52	0	47	16 37	Clayey sand
P69-1145	9° 18'	132° 34'				146	"	9/11	1452	5 GY 52	6	37	19 44	Sandy clay
P69-1146	9° 07'	132° 33'	D	D		218	"	9/11	1022	5 GY 52	3	49	18 33	Clayey sand
P69-1147	8° 55'	132° 33'				256	"	9/11	1724	5 GY 52	0	42	16 42	Clayey sand
P69-1148	8° 42'	132° 31'				267	"	9/11	1900	5 GY 52	0	32	22 46	Sand silt clay
P69-1149	10° 16'	132° 22'				70	"	10/11	0745	5 GY 52	0	13	44 43	Clayey Silt
P69-1150	10° 05.5'	132° 23'				74	"	10/11	0900	5 GY 52	0	4	36 60	Silty clay
P69-1151	9° 55'	132° 23'	C	C		85	"	10/11	1010	5 GY 52	0	12	35 53	Silty clay
P69-1152	9° 44'	132° 24'				100	"	10/11	1121	5 GY 52	13	81	6 13	Sand
P69-1153	9° 33'	132° 24'				128	"	10/11	1230	5 GY 64	6	85	5 10	Sand
P69-1154	9° 17.5'	132° 20'				168	"	10/11	1355	5 GY 52	6	63	14 23	Clayey sand
P69-1155	9° 09'	132° 19'				168	"	10/11	1530	5 GY 52	4	67	11 22	Clayey sand
P69-1156	8° 54'	132° 17'	D	D		236	"	10/11	1645	5 GY 52	4	25	40 35	Sand silt clay
P69-1157	8° 41'	132° 20'				311	"	10/11	1820	5 GY 52	0	41	22 37	Sand silt clay
P69-1158	9° 14'	132° 04'				210	"	11/11	0500	5 GY 52	0	45	38 17	Silty sand
P69-1159	9° 24'	132° 03'				158	"	11/11	0630	5 B 51	0	16	12 72	Sandy clay
P69-1160	9° 34'	132° 02'				120	"	11/11	0745	5 Y 64	5	81	6 13	Sand
P69-1161	9° 45'	132° 04.5'	D	D		108	"	11/11	0903	5 GY 61	10	56	15 29	Clayey sand
P69-1162	9° 55'	132° 06'				84	"	11/11	1015	5 GY 61	0	8	35 57	Silty clay
P69-1163	10° 05'	132° 04'				78	"	11/11	1130	5 GY 61	0	5	29 66	Silty clay
P69-1164	10° 17'	132° 04'				73	"	11/11	1237	5 GY 61	0	11	37 52	Silty clay
P69-1165	10° 28'	132° 05.5'				64	"	11/11	1345	5 GY 61	0	7	41 52	Silty clay
P69-1166	10° 39'	132° 06'	C	C		55	"	11/11	1435	5 GY 61	0	17	14 69	Sandy clay
P69-1167	9° 09'	131° 51'				220	"	13/11	0945	5 GY 52	1	31	18 51	Sandy clay
P69-1168	9° 20'	131° 51'				198	"	13/11	1100	5 GY 52	0	21	10 69	Sandy clay
P69-1169	9° 30'	131° 51'				146	"	13/11	1215	5 GY 52	0	69	17 14	Silty sand

Sample No.	Location		Category of Navigation Fix	Depth (M)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Description
	Latitude	Longitude								Sand & Gravel	Silt	Clay	
P69-1170	9° 41'	131° 51'	D	119	Condred	13/11	1331	5Y 52	0	45	39	16	Silty Sand
P69-1171	9° 52'	131° 49'	D	110	"	13/11	1446	5GY 61	0	63	9	28	Clayey Sand
P69-1172	10° 03'	131° 46'	D	82	"	13/11	1558	5GY 61	0	8	30	62	Silty Clay
P69-1173	10° 14'	131° 42'	D	80	"	13/11	1710		0	6	33	61	Silty Clay
P69-1174	10° 21.5'	131° 49'	D	72	"	13/11	1820		0	21	32	47	Sand, Silt, Clay
P69-1175	8° 58'	131° 35'	C	340	"	14/11	0810	5GY 52	0	6	25	69	Silty Clay
P69-1176	9° 09'	131° 35.5'	C	242	"	14/11	0945	5GY 52	0	39	21	40	Sand, Silt, Clay
P69-1177	9° 19.5'	131° 36'	C	188	"	14/11	1100	5GY 52	3	39	18	43	Sandy Clay
P69-1178	9° 30'	131° 36'	C	130	"	14/11	1215	5 Y 64	3	77	9	14	Sand
P69-1179	9° 41'	131° 36'	C	119	"	14/11	1337	5 Y 64	0	82	7	12	Sand
P69-1180	9° 42'	131° 30'	D	117	"	14/11	1449	5 Y 61	0	80	7	13	Sand
P69-1181	10° 03'	131° 30'	D	112	"	14/11	1600	5GY 52	0	20	28	52	Sand, Silt, Clay
P69-1182	10° 13'	131° 33'	D	90	"	14/11	1714	5GY 52	0	8	31	61	Silty Clay
P69-1183	10° 22.5'	131° 37'	C	71	"	14/11	1824	5GY 52	0	31	22	47	Sand, Silt, Clay
P69-1184	9° 01'	131° 22'	C	358	"	15/11	0840	5GY 52	0	6	53	41	Clayey Silt
P69-1185	9° 12'	131° 22'	C	280	"	15/11	0957	5GY 52	0	7	62	31	Clayey Silt
P69-1186	9° 23'	131° 22'	C	215	"	15/11	1115	5GY 52	5	57	16	27	Clayey Sand
P69-1187	9° 34'	131° 22'	C	135	"	15/11	1237	5 Y 64	15	87	5	8	Sand
P69-1188	9° 45.5'	131° 19.5'	C	124	"	15/11	1350	5 Y 64	10	84	8	8	Sand
P69-1189	9° 56.5'	131° 19'	D	117	"	15/11	1500	5GY 52	10	78	7	15	Sand
P69-1190	10° 07'	131° 21'	D	102	"	15/11	1610	5GY 52	0	59	13	28	Clayey Sand
P69-1191	10° 17'	131° 20'	C	82	"	15/11	1720	5GY 52	3	43	24	33	Sand, Silt, Clay
P69-1192	10° 27'	131° 20'	C	75	"	15/11	1830	5GY 61	0	12	29	59	Silty Clay
P69-1193	10° 38'	131° 20'	C	71	"	15/11	1937	5GY 61	0	13	34	53	Silty Clay
P69-1194	10° 38'	131° 11'	C	74	"	16/11	0600	5GY 61	0	10	34	56	Silty Clay
P69-1195	10° 27'	131° 12'	D	80	"	16/11	0730	5GY 61	0	6	31	63	Silty Clay
P69-1196	10° 16'	131° 13.5'	C	90	"	16/11	0840	5GY 61	0	12	31	57	Silty Clay
P69-1197	10° 05'	131° 10'	C	98	"	16/11	0950	5GY 52	3	77	7	16	Sand
P69-1198	9° 54'	131° 11'	C	120	"	16/11	01100	5 Y 64	2	87	4	9	Sand

Sample No.	Location		Category of Navigational Fix	Depth (m)	Sampling Method	Date	Time	Colour	Gravel	Percentage			Textural Description
	Latitude	Longitude								Sand & Gravel	Silt	Clay	
P69-1199	9° 43'	131° 05'	C	148	Condred	15/11	1215		17	88	5	7	Sand
P69-1200	9° 30'	131° 08'	D	210	"	16/11	1330	5GY52	0	82	6	12	Sand
P69-1201	9° 17'	131° 05'	D	305	"	16/11	1450	5GY52	0	16	15	69	Sandy Clay
P69-1202	9° 03'	131° 03'	D	421	"	10/11	1030	5GY52	0	19	21	60	Silty Clay
P69-1203	9° 03'	131° 14'	C	353	"	10/11	1720	5GY52	0	12	17	71	Silty Clay
P69-1204	10° 03'	135° 56'	B	64	"	28/11	1430		5	67	14	19	Clayey Sand
P69-1205	10° 28.5'	131° 33.5'	C	72	"	1/12	0815	10GY52	3	48	13	39	Clayey Sand
P69-1206	10° 33'	131° 50'	D	66	"	1/12	0950	10GY52	0	5	30	65	Silty Clay
P69-1207	10° 45'	131° 50'	C	56	"	1/12	1108	10GY52	0	2	42	56	Silty Clay
P69-1208	10° 57.5'	131° 49'	C	56	"	1/12	1219	10GY52	0	21	27	52	Sand Silt Clay
P69-1209	10° 50'	131° 39'	D	60	"	1/12	1350	10GY52	0	10	45	45	Silty Clay
P69-1210	10° 39'	131° 37'	D	67	"	1/12	1500	10GY52	0	9	43	48	Silty Clay
P69-1211	10° 50'	131° 20'	D	64	"	1/12	1640	10GY52	0	16	31	53	Silty Clay
P69-1212	10° 50'	131° 06'	C	62	"	1/12	1748	10GY52	0	13	38	49	Silty Clay
P69-1213	11° 00'	131° 10'	B	46	"	1/12	1900	10GY52	3	42	20	38	Sand Silt Clay
P69-1214	11° 01'	131° 21'	B	57	"	1/12	2010	10GY52	2	52	20	28	Sand Silt Clay
P69-1215	10° 25'	132° 24'	B	65	"	2/12	0600	10GY52	0	19	45	36	Clayey Silt
P69-1216	10° 37'	132° 23'	C	58	"	2/12	0725	10GY52	0	21	43	36	Sand Silt Clay
P69-1217	10° 49'	132° 24'	A	48	"	2/12	0840	10GY52	2	32	33	35	Sand Silt Clay
P69-1218	10° 48'	132° 06'	B	52	"	2/12	1030	10GY52	1	22	39	39	Sand Silt Clay
P69-1219	11° 02'	131° 37'	A	55	"	2/12	1322		2	65	13	22	Clayey Sand
P69-1220	9° 53'	130° 02'	B	205	Tridred	5/12	0915		7	80	7	13	Sand
P69-1221	9° 45'	130° 03'	C	252	Bigcore	5/12	1038						
P69-1222	10° 20'	130° 46'	B	99	"	5/12	1800						
P69-1223	11° 00'	131° 27'	C	50	"	6/12	0710						
P69-1224	10° 27'	131° 29'	C	72	"	6/12	1100						
P69-1225	9° 44'	131° 30'	D	117	"	6/12	1445						
P69-1226	9° 29'	131° 34'	D	130	"	6/12	1645						
P69-1227	9° 19'	132° 51'	D	150	"	7/12	0325						
P69-1228	9° 56'	133° 07'		77	"	7/12	1300						
P69-1229	10° 46'	133° 31.5'	B	64	"	7/12	1830						
P69-1230	9° 37'	133° 52'	B	102	"	8/12	0545						
P69-1231	9° 07'	133° 52'	D	130	Tridred	8/12	0920						
P69-1232	8° 49'	133° 38'	C	2010	Bigcore	8/12	1230						
P69-1233	9° 50'	134° 53'	B	72	"	9/12	0530						
P69-1234	10° 32'	134° 47'	D	54	"	9/12	1015						
P69-1235	11° 18'	134° 47'	C	40	"	9/12	1430						
P69-1236	9° 19'	135° 54'	C	64	"	10/12	0550						
P69-1237	10° 30'	135° 52'	C	53	"	10/12	1215						