THE QUATERNARY GEOLOGY
OF UPPER SPENCER
GULF

by
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This thesis is submitted as partial fulfilment of the course requirements of the Honours Degree of Bachelor of Science in Geology at the University of Adelaide, South Australia.

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ABSTRACT

Using seismic reflection profiles and core data a thin sequence of Holocene and Pleistocene sediment was studied in Spencer Gulf, between Whyalla and Port Pirie, and again near Port Augusta. Six seismic sequences were recognized and these were related to stratigraphic units deposited with changing Pleistocene sea levels in the Gulf. Facies recognized within the Pleistocene sediments include aeolian, supratidal, beach and subtidal sediments. The marine Holocene sediments within the cores consist of basically one facies: the subtidal facies generally coarsening upwards. Detailed sediment particle analyses were carried out on the top 2 cm. of the Holocene. It was noted that a reciprocal relationship exists between the proportion of quartz and bivalves, quartz and foraminifera, and between quartz and total calcium carbonate. A positive relationship is noted between bivalves, foraminifera and total carbonate. It was also observed that the sedimentary assemblage, both organic and non-organic, differed within the two regions studied, with the northern Gulf being richer in quartz and poorer in biota than the southern Gulf. Studies of the foraminifera indicated that different assemblages lived in different depths of water. It would seem, therefore, that water depth, and the factors associated with water depth, have a great influence on the distribution of fauna within Spencer Gulf.

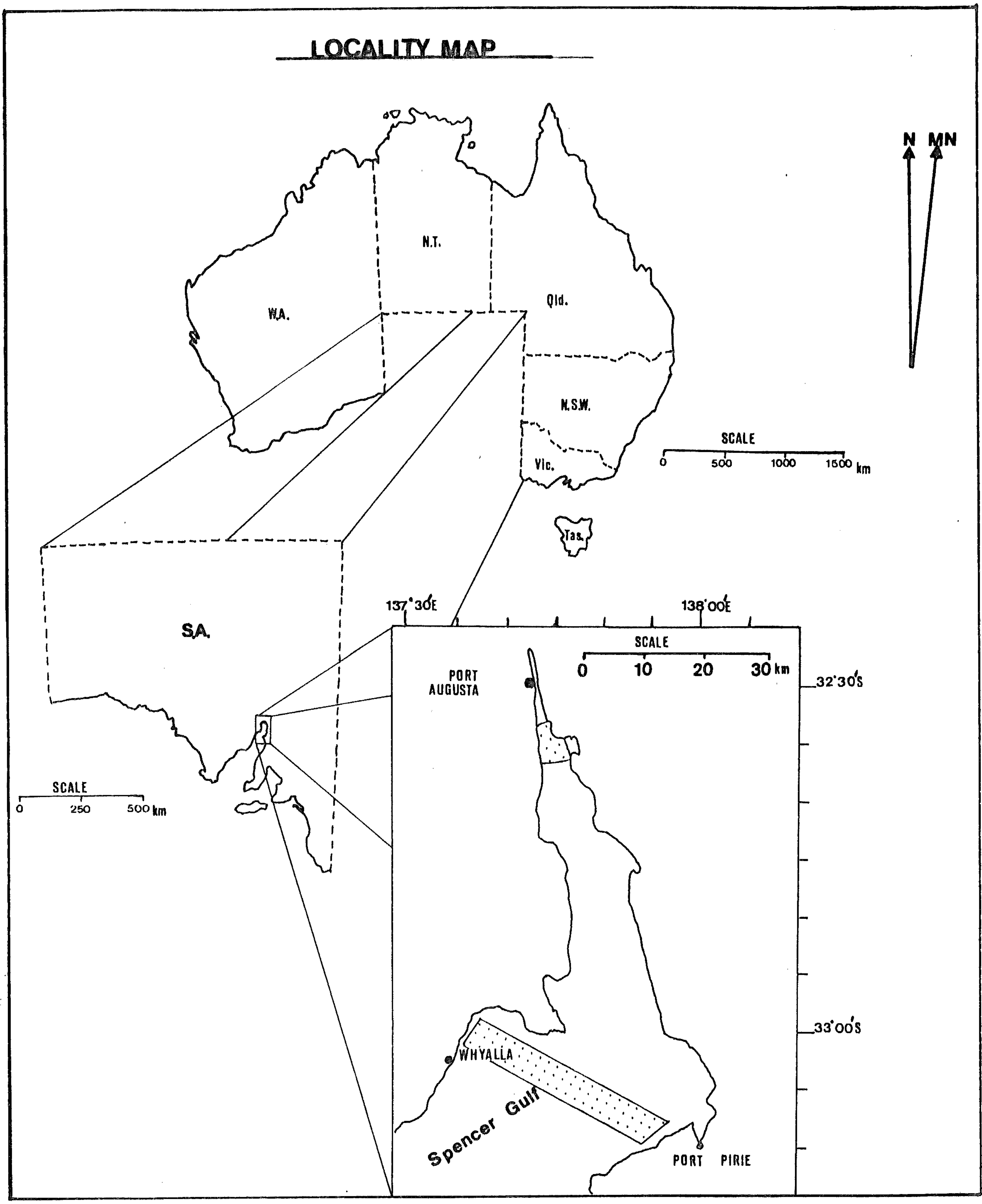


FIGURE 1: LOCALITY MAP.

1. INTRODUCTION

This study has been prompted by work done by the Environmental Studies Department and Sedimentologists at the Geology Department of Adelaide University, within Spencer Gulf over the last four years.

Two areas were chosen for comparison. One within the waters of the Gulf near Whyalla and the other within the waters of the Gulf near Port Augusta. Fig.1.

The purposes of this study were to interpret seismic reflection profiles and core data taken from the Gulf. A study of the data enabled a stratigraphy of the Holocene and Pleistocene sediments to be constituted. Six sequences were observed. The oldest, sequence V, is only noted in the seismic record, not in the cores, and is an unknown quantity, but from its seismic characteristics is probably similar to sequence IV. Sequence IV is red-coloured sediment of intertidal, supratidal, subtidal, and estuarine facies. Sequences II and III are identical in being basically of sabkha and intertidal facies with minor subtidal deposits. Sequence I is divided in two. Sequence IA is grey and of subtidal facies. Sequence IB is reworked sequence II, III or IV. Sequence VI is alluvial material of various ages. Ages are suggested for these transgressive sequences.

Further research was carried out on the Holocene sediment. The two regions observed showed obvious differences in sediment type. The Port Augusta region shows a greater terrigenous and lower marine biota content. The Whyalla region showed the opposite. The foraminiferal distribution was also studied and the assemblages changed from one region to the other and from shoal to trough within the regions. Variables associated with water depth are thought to control this distribution.

2. REGIONAL GEOLOGY AND ENVIRONMENT

2.1 REGIONAL GEOLOGY

The study area lies within the Torrens Sunkland, a major downfaulted block, lying between two horsts, the Flinders Ranges and the Stuart Shelf.

The horst blocks on either side of the Gulf have an equivalent lithology and stratigraphic sequence, i.e. formations mapped can be related in time and rock type. The lithology is a Proterozoic sequence of sandstones, shales and quartzites and minor dolomite and limestone members.

Structurally, however, the blocks are quite different. The Flinders Ranges, including Mt. Grainger, are strongly folded whereas the Stuart Shelf plateau is flat bedded. There is evidence from bore log data and previously published maps that a minor horst block exists within the graben. The associated faults probably run in a north-south direction along the edges of the coastal monadnocks, Mt. Grainger, Mt. Gullet, and Mt. Mambray.

Within the sunkland of Spencer Gulf a thick sequence of Tertiary sediment is overlain by Quaternary piedmont sandy clays and gravels. Superimposed on this is a relatively thin veneer of sediment which is the subject of this study.

2.2 ENVIRONMENT

2.21 Climate

Records are available at Port Pirie (95 years), Port Augusta (100 years)and Whyalla (68 years) for rainfall and temperature.

Rainfall in these areas is quite low. Mean rainfall at Port Augusta is 242 mm., at Port Pirie 342 mm. and at Whyalla 269 mm. The influence of the Flinders Ranges on the rainfall of these coastal areas is very significant. Records show that most of the rain falls during the months April to October, coinciding roughly to the winter months. Winter rains are more noticeable at

Port Pirie than at Port Augusta and Whyalla where the spread of rainfall is more even over the year. Summers are generally dry.

Mean maximum and minimum temperature trends at Port Augusta and Port Pirie are similar and within 1°C throughout the year. The summer months are very hot; Port Pirie having a mean of 31.8°C and Port Augusta a mean of 32.1°C for the month of January. Winters are generally cool; Port Pirie having a mean of 16.3°C and Port Augusta a mean of 17.1°C for the month of July.

Wind directions measured at the Port Augusta Power Station from the period 1961 to 1965 inclusive, at 9.00 a.m. and 3.00 p.m., show the following trends. During the months of June, July, and August the winds are dominantly north-north-west to north, whereas for the rest of the year, the winds are dominantly south-south-east to south. The strength of these winds varies considerably, but is on the average between 3.5-8 km./hr. and always stronger in the afternoon than in the morning.

In conclusion, it can be seen that combined with high summer temperatures and low rainfall these areas have high evaporation rates (b/w 150 and 175 cm. per year). In summer there would be a consequent lowering of the water table in the sediments and an upward movement of water.

2.22 Tides

Tides are strongly affected by winds. At Port Augusta additional sea-level rises of up to 1.3 m. accompany south-west to south winds, while north winds lower the sea level up to 0.5 m. Mean tidal range is in the order of 1.5 m., while spring tides (range 3.6 m.) can raise the sea level more than 0.5 m. above mean high-tide level.

2.23 Marine Flora

The flora of the sublittoral zone is dominated by marine angiosperms, which exist as extensive banks. These seagrasses grow in shallow water in fine sand and silt sediments. Two dominant species of seagrass grow in the sublittoral zone and their distribution is related to water movement and light penetration.

Zostera muelleri grows at depths slightly above mean low tide to 1 m. below. The plant is very thin-leaved, between 1-2 mm. broad and 6-15 cm. long, and grows in very dense patches. It has a large rhizome-root system. *Hormosira banksii* is occasionally found growing with *Zostera muelleri*.

Posidonia australis grows generally in a monospecific community but sometimes it is seen associated with *Amphibolis antartica* and *Cymodocea griffithsi*. The leaves are from 3-8 mm. wide and up to 1 m. long. *P.australis* grows only in areas which are permanently submerged and at depths of 0.3-4 m. below mean low water. At greater depths the broad leaf *P.australis* is replaced by a narrow-leaved species showing distinct morphological differences. Mixed communities of the two forms occur in transitional zones. *P.australis* is supported by a very large rhizome-root system.

2.24 Fauna

In the sublittoral zone the seagrasses *Posidonia sp.* and *Cymodocea sp.* support many epiphytes which grow on the broad leaves. The epibiota include foraminifera, gastropods, coralline algae and calcareous worm tubes. When the epiphytes die they accumulate in the sediments and are redistributed and broken by burrowing organisms.

The fauna within the Recent sediment is diverse. Comprehensive lists of gastropods and bivalves occurring in South Australian waters are given by CHILD (1968), COTTON (1959, 1961 1964), VERCO (1904-1918) and WILSON AND GILLET (1971).

Gastropods identified include *Gazameda iredalei*, *Lemintina sipho*, *Floraconus compressus*, *Zeacumanbus sp.*, *Truncatella vincentiano*, *Argaliste fugitiva*, *Phasionella australis*, *Vexillum plicarium*, *Philine beachportensis* and *Triphora sp.*. The turreted gastropods are much more numerous than non-turreted and the species *Zeacumantus* is the most prolific of the gastropods.

Bivalves identified include *Anadara trapezia*, *Glycymeris radeans*, *Chama ruderalis*, *Katelysia peroni*, *Austromytilus erosus*, *Pinna dolobrata*, *Notochlamys tasmanicus*, *Macla australis*, *Mytilus sp.*, and *Limopsis sp.*.

The foraminifera for statistical purposes have been divided up into groups determined by Genera. The species identified are included.

Group 1	*SPIROLOCULINA*	*angusteoralis*,
		antillarum,
		communis,
	and *QUINQUELOCULINA*	*tropicalis*.
Group 2	*TRILOCULINA*	*oblonga*,
		rotunda,
		striatotrigonula,
		and *trigonula*.
Group 3	*ELPHIDIUM*	*macellum*,
		and *pseudonodosum*.
Group 4	*PENEROPLIS*	*planatus*,
	and *SPIROLINA*	*aciculoris*.
Group 5	*DISCORBIS*	*dimiadatus*,
		vesicularis,
	and *ROSALINA*	*kennedyi*.
Group 6	*NUBECULARIA*	*lucifuga*.

Other foraminifera not included in the groupings but which are found in minor numbers in the recent sediment include *Cribrobulima polystoma*, *Miliolinella subrotunda*, *Bolivina sp.*, *Guttulina pacifica*, *Amphicoryna scalaris*, *Lagena sp.*, and *Glabratella sp.*. No planktonic nor agglutinated foraminifera were observed within the study area, only benthic forms. Thus the assemblage within the study area is totally different to that found in Investigator Strait where both agglutinated, planktonic and benthic foraminifera are found. (pers.comm. J.Cann, 1981)

Aragonite needles are prolific within the study area. Lowenstam and Epstein (1957) observed that the organic tissue of living calcareous algae contains abundant needles of aragonite that are similar to those found in the bottom sediments of the Bahama Platform. The needles found on the Bahama Platform are similar to those found within the Gulf. Therefore it is highly possible that the aragonite needles found within the sediments studied are from the organic tissue of calcareous algae found within the Gulf.

Also found within the recent sediment are fragments of echinoids, both plates and spines, coralline algae, sponge spicules and bryozoans. All of these faunas mentioned here appear in minor numbers within the sediment.

No whole brachiopods were found within the recent sediments. Even within the fragments of shell no brachiopod detritus was observed. It would seem therefore that brachiopods are either small in numbers or non-existent within the study area.

The above list of organisms identified are neither comprehensive nor definitive and much further work needs to be done to complete the lists of all species of biota occurring in the area.

3. SEISMIC REFLECTION AND CORE DATA -- INTERPRETATION

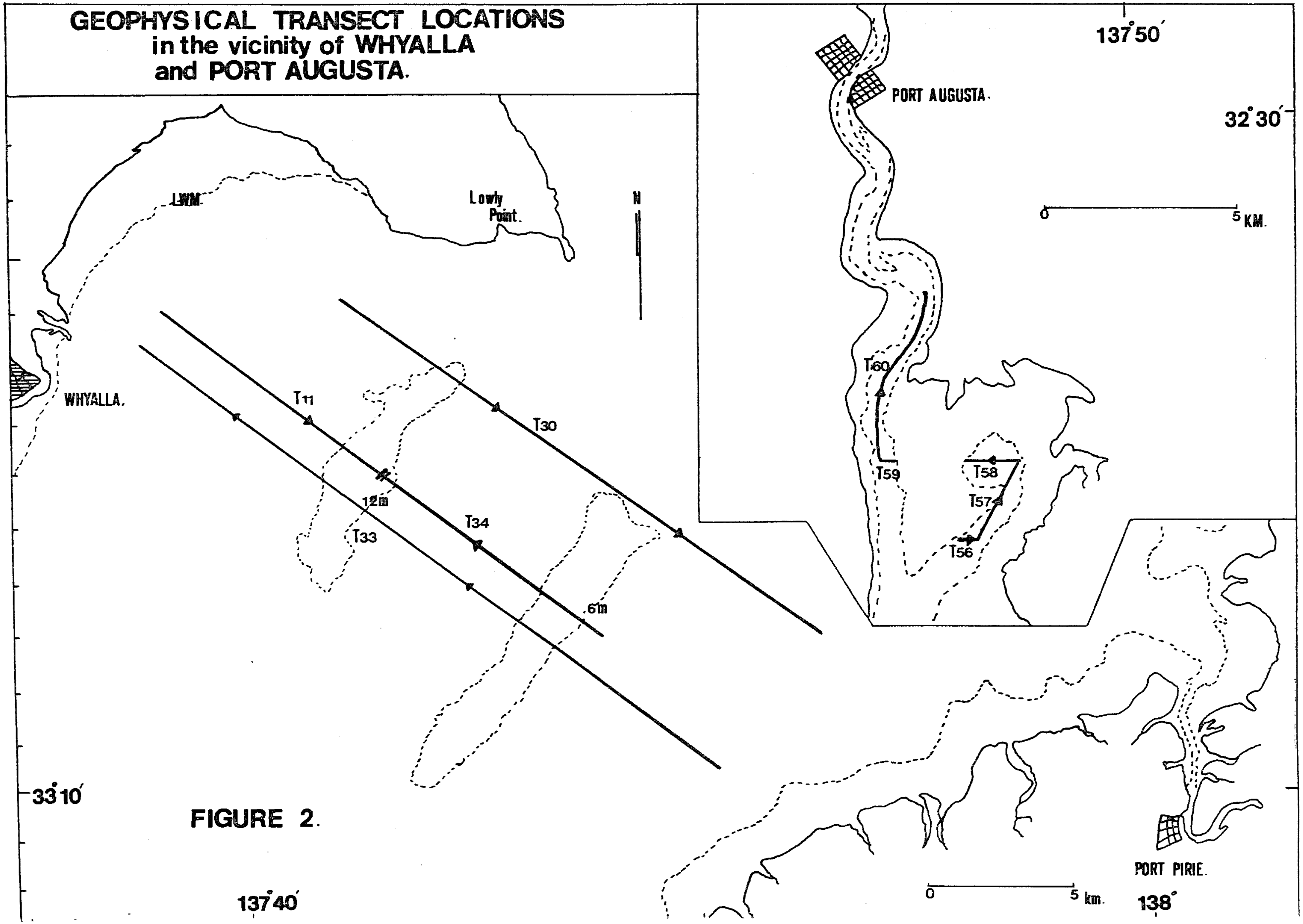
Marine seismic reflection methods were used in the study area. Using seismic reflection methods the structure of subsurface formations may be mapped by measuring the times required for a seismic wave (or pulse), generated in the water by a boomer, to return to the surface after reflection from interfacies between formations having different physical properties. In effect the seismic reflection method delineates subsurface geological structures. DOBRIN (1976).

The geophysical transects focused upon in this study are shown in Fig.2. For equipment used during the geophysical programme see APPENDIX 1.A.

VAIL et al. (1977) look in particular at seismic stratigraphy and much of the following general comments are from their work.

The depositional sequence is an objectively defined stratigraphic unit composed of genetically related strata and bounded by unconformities and their correlative conformities. Using seismic reflection methods the depositional sequences in the subsurface can be delineated. This method can be employed because seismic reflections are composites of the individual reflections generated by surfaces separating strata of differing acoustical properties. Hence reflectors usually correspond with horizons marking the boundary between rocks of markedly different lithology. However, such a boundary does not always occur exactly at a geological horizon of major chronostratigraphic importance, such as the base or top of a system or series, but may be simply a seismic marker horizon which occurs close to the boundary. This problem is overcome by the correlation of seismic and core data.

But, on the whole, the reflectors tend to parallel stratal surfaces and have the same chronostratigraphic significance as stratal surfaces. Therefore it is possible to make chronostratigraphic correlations using seismic reflection patterns.



GEOPHYSICAL TRANSECT LOCATIONS in the vicinity of WHYALLA and PORT AUGUSTA.

FIGURE 2.

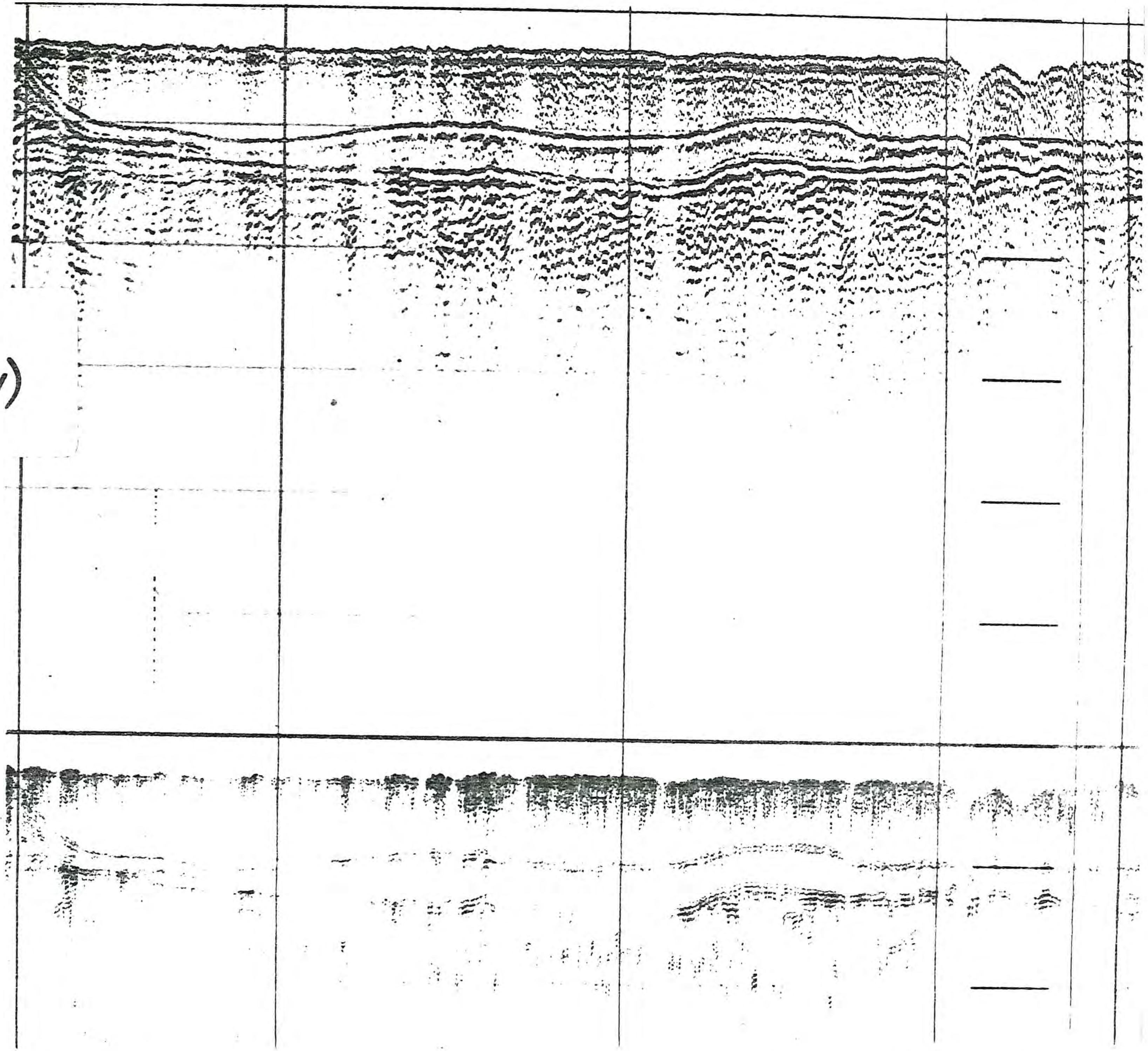
When a depositional sequence is identified within a seismic section it is labelled a seismic sequence. It is a relatively conformable succession of reflectors within a seismic section interpreted as genetically-related strata. This succession is bounded at its top and base by surfaces of discontinuity marked by reflection terminations and interpreted as unconformities or their correlative conformities.

Reflection terminations are the principal factors for recognition of seismic sequence boundaries. Reflection terminations interpreted as stratal terminations include erosional truncation, toplap, onlap and downlap.

Seismic transects 58 and 56 (Figs. 3 and 4 respectively) are examples of the seismic reflection records, and transparencies overlain show the interpretation.

Transect 58 shows 3 sequences. The surface of the Gulf floor is marked by the first strong reflector (a). The next strong reflector (b) marks the base of the first sequence and the initiation of the second sequence. The second sequence is extremely narrow for a third strong reflector (c) marks the base of this sequence within a short period. Below reflector (c) a series of reflectors of a concordant nature and of identical strength are observed lying at angles to reflector (c). Here an actual unconformity can be recognized. Three sequences are delineated each marked at top and base by strong reflectors. The reflective pattern within sequences I and II is basically reflection-free. Within sequence III the reflective pattern is strong and concordant.

Knowing that strong reflectors mark the top and base of sequences and that different sequences usually have different reflective patterns the depositional sequences can be identified. With erosional truncation between the sequences, as seen between sequences II and III, the task of interpretation becomes easier and with cores through these sequences correlations of data can be made and a definite stratigraphy indicated provided there are



LINE
58 (REV)

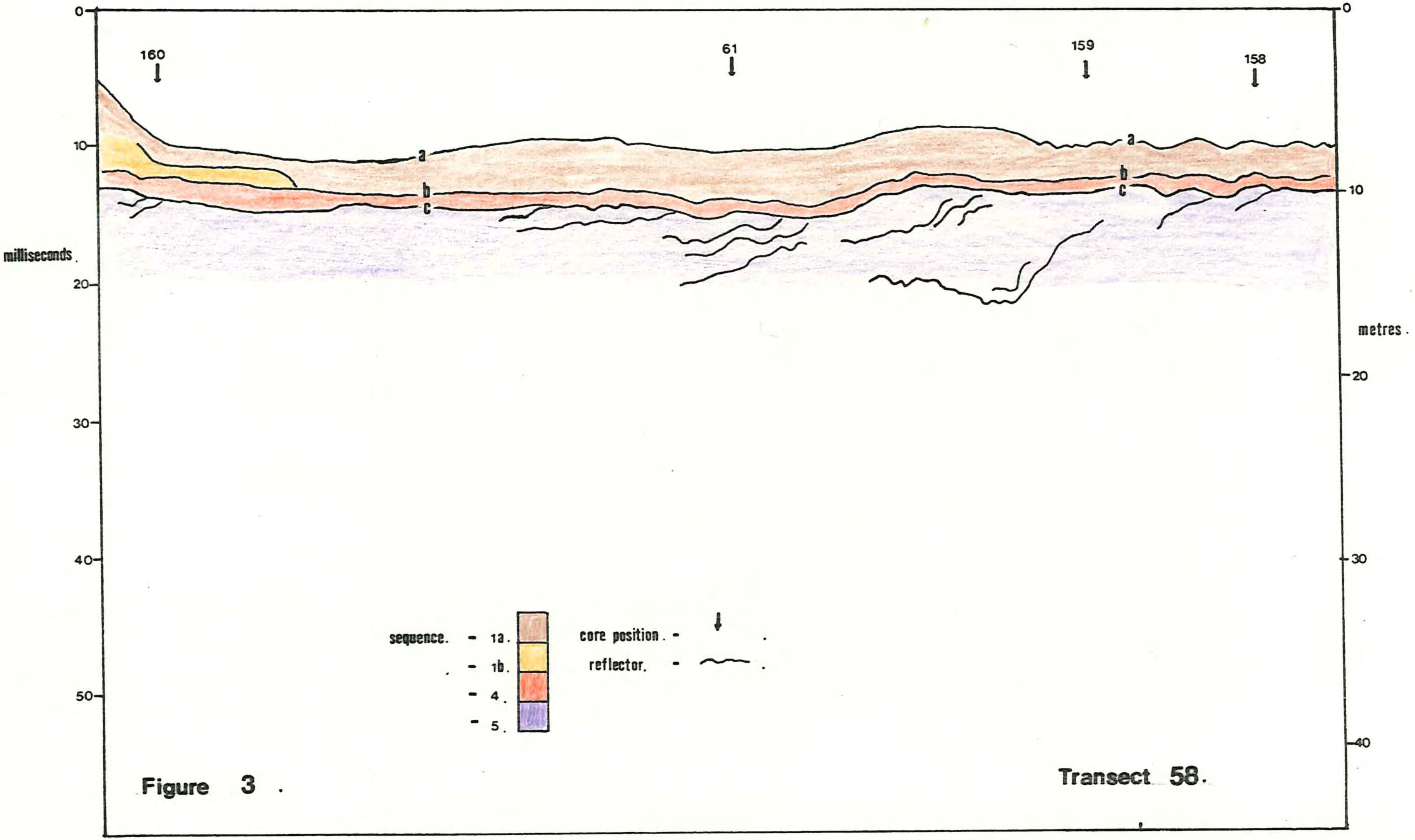
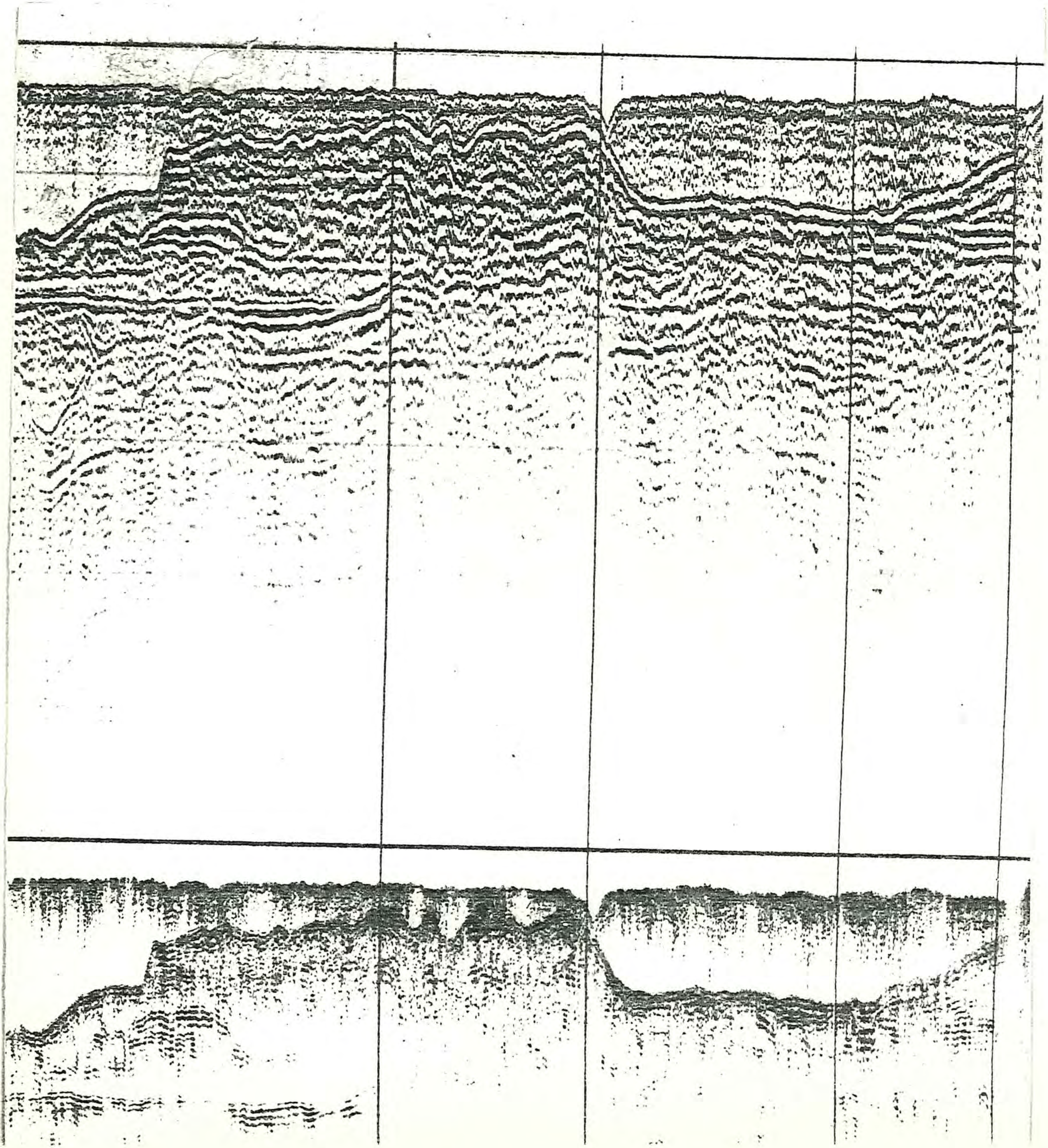


Figure 3.

Transect 58.



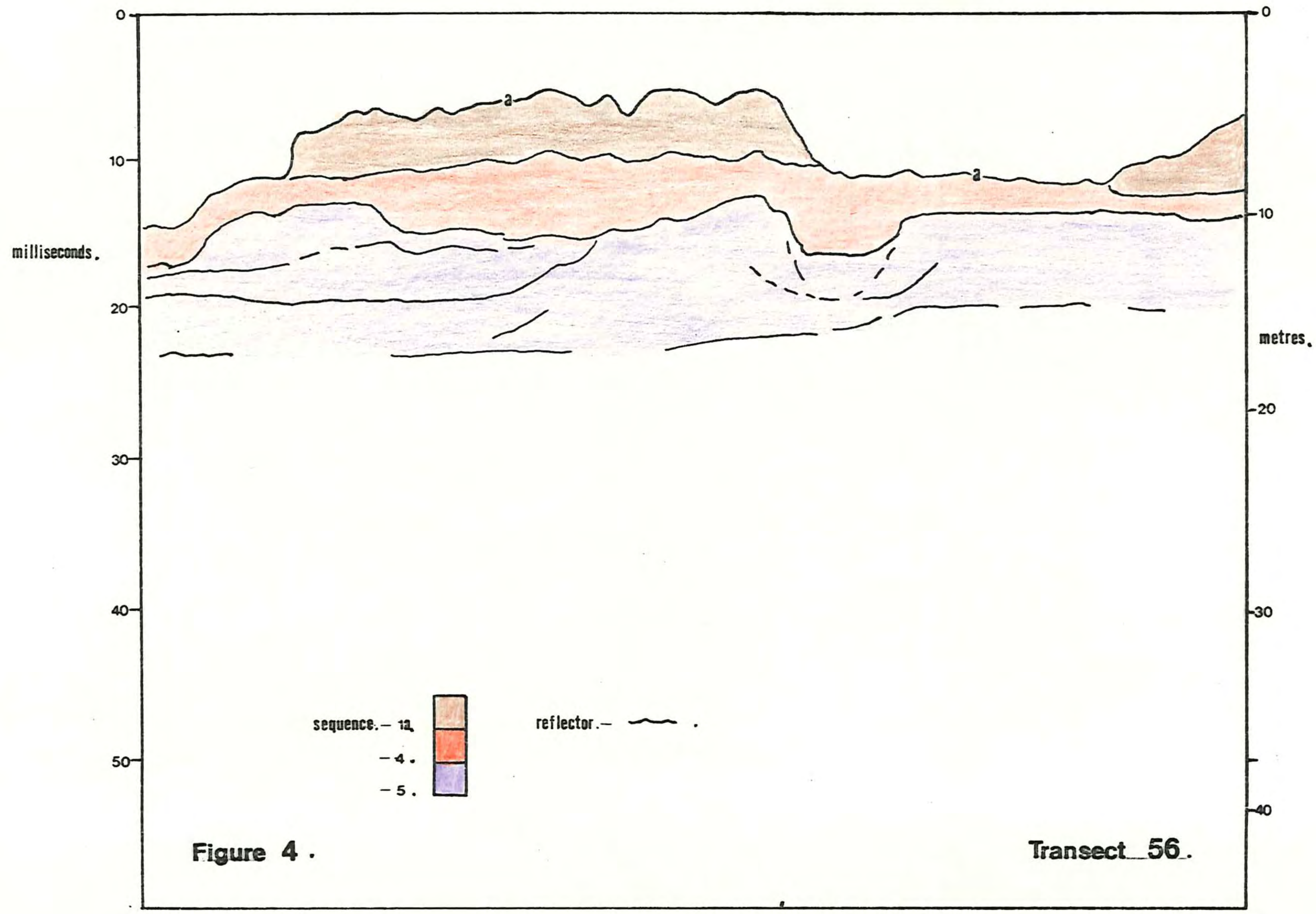


Figure 4.

Transect 56.
milliseconds.
0
10
20
30
40
50
metres.
0
10
20
30
40
a
a
sequence.– 1a
– 4.
– 5.
reflector.–

enough cores.

The seismic reflection profiles available give two modes. The upper profile is a low resolution/high penetration profile while the lower is a high resolution/low penetration profile. The lower profile may look too reflection-free to be of any use but in Transect 56 and others it is invaluable. The low resolution/high penetration profile 56 is extremely hard to interpret as there are many strong reflectors in close proximity and no differential patterns are observed. Using the high resolution/low penetration profile, boundaries between sequences are identified. Reflector (a) is again strong but so are all the reflectors beneath it. Using the lower profile, sequence I is marked by a darker granular haze. Where this reflective pattern ends, sequence I ends. Using the lower profile again, strong thick reflectors are identified. Using this interpretation and overlaying this on the upper profile a series of sequences can be identified.

Using both high resolution/low penetration and low resolution/high penetration methods sequences can be interpreted within the section and with a number of cores pushed through into these sequences the stratigraphy and facies of the sediments can be identified.

Figure 5 illustrates the position of the cores taken within the study area. The vibrocoring transects are as near as possible to the geophysical transects, in position. The cores were taken using a Vibrocorer (see APPENDIX 1.B.). Cores of up to 4.5 m. in length were taken. Many cores are of shorter lengths. The cores were cut in half and one side used for sampling, the other described and interpreted. For description and interpretation of selected cores see APPENDIX 2.A.

The facies identified within the study area are of a very flat, shallow water, depositional, coastal origin. The facies can be divided into 3 groups, Supratidal, Intertidal and Subtidal.

The facies classified as Supratidal include dune, sabkha, and supratidal flat. Dunes

VIBROCORE LOCATIONS in the vicinity of WHYALLA and PORT AUGUSTA.

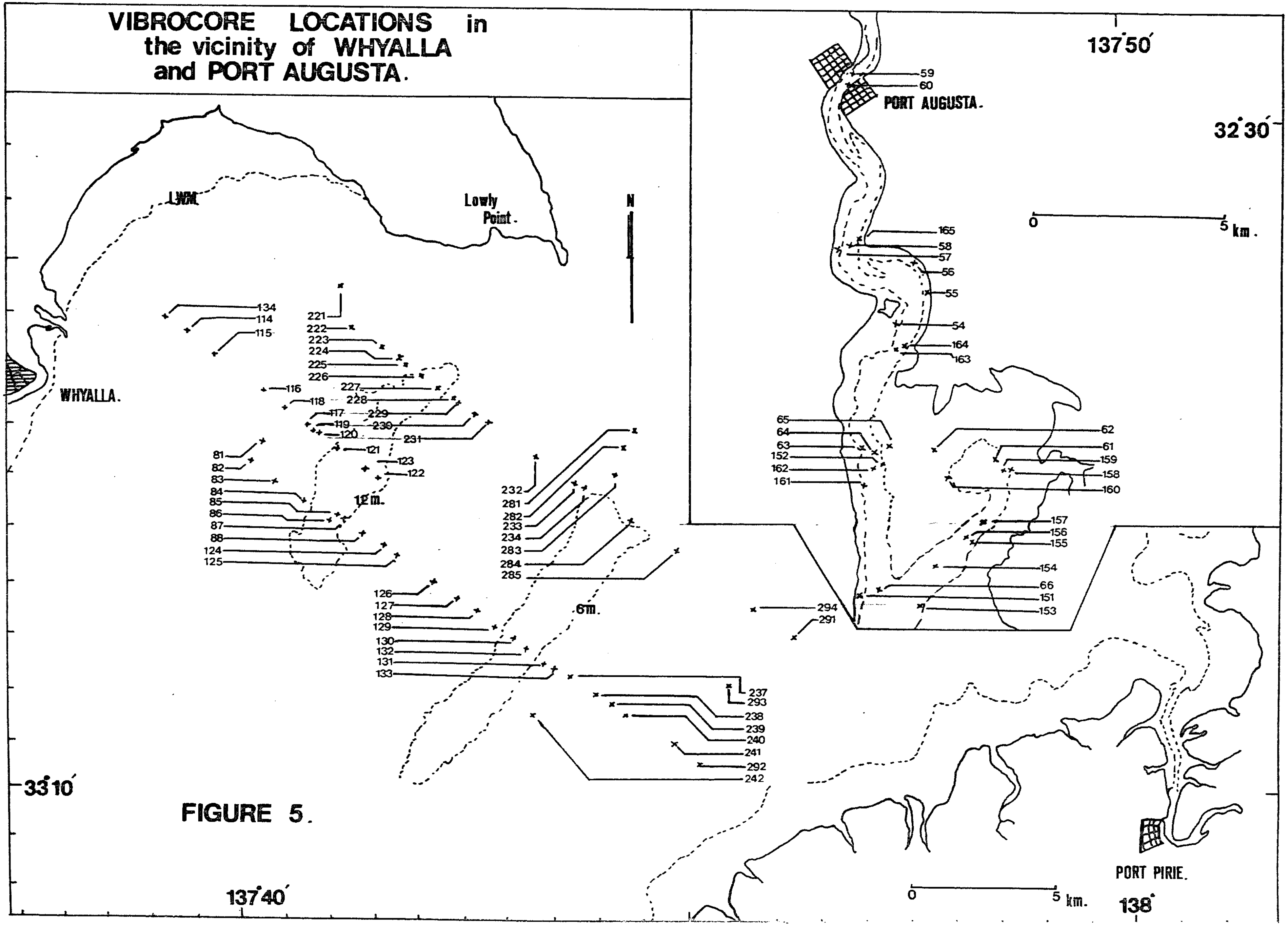


FIGURE 5.

are recognized usually because of the high proportion of well-rounded, medium- to well-sorted, frosted quartz. The quartz is usually stained an iron-oxide orange to red. Clay dunes are also identified, consisting of a very fine silt. Often the silt is in pellets. Supratidal flat deposits consist of mainly silt with small percentages of quartz and shell. Sabkhas form in an area of unconsolidated sediment at the margin of a large body of water where the ground water lies at or very close to, the land surface. These conditions permit loss of ground water to the atmosphere by upward transpiration and evaporation, causing ground-water solutes to be deposited at or near the surface (RENFRO, 1974). Both supratidal flats and sabkhas are a grey, cream to green colour and consist of calcareous mud. Within the sabkha sediment gypsum crystals are found.

The facies within the Intertidal division include intertidal flats and beaches. A beach deposit is identified by a well-sorted sand either shell or quartz or both. An intertidal flat deposit has a higher percentage of silt and less quartz and shell than a beach deposit. Usually these facies are oxidized a yellow-to-cream colour.

Within the Subtidal division basically 2 facies are identified, the subtidal and the estuarine. The subtidal deposit is very similar to the intertidal deposit except material, shell and quartz, is less well-sorted and whole organisms such as bivalves should be found. The estuarine deposit consists of mud with small percentages of shell and quartz. Again whole organisms should be found.

Besides these facies alluvial fan material is identified. This consists of red-to-brown muds with quartz. The discerning factor is that it is non-calcareous.

Indicators of breaks, diastems, erosional truncation within the cores are many. Often between depositional sequences, nodules, often large nodules, taking up the whole core-width, are found. The nodules are formed of quartz, shell and carbonate cement and are extremely hard. The nodulous sequence may be up to 20 cm. thick. The nodules are formed by the movement of calcium carbonate, within water, up through the sediment through capillary action. The carbonate is left at the near surface as the water is evaporated off. Because of the predominance of quartz within these nodules it could be that, of the nodules formed within dunes and then with transgressive seas, only the nodules were left. Soils quite often form beneath these nodules. BILLINGS (1981) interprets the nodules as pedogenic types of deposits formed in coastal dune situations where they cap weakly-developed truncated soils.

Repetition of a sequence is another indicator of the development of a second sequence. For instance, core 225 (APPENDIX 2.A). At the base of the core a sabkha deposit is identified covered by dune, quartz sand. On top of this another sabkha deposit is identified covered by a dune deposit again. For this sequence to form there has had to have been a regression from sabkha to dune and then a transgression to sabkha facies and then a regression to dune facies again. A transgression has occurred but the only factor identifying this is the repetition of sequences.

Also colour change can be used. The recent material, for instance, is always grey within the Spencer Gulf. Deposits beneath are always of a different colour hence the break is always indicated. Also if one bed is oxidized then it can be definitely said that the oxidized deposit has experienced very shallow water cover to non-existent water cover. If the deposit above is of intertidal-to-subtidal facies, for example, and of a different colour then it obviously has had greater water cover, hence the deposit can be labelled a transgressive deposit, while the red-to-brown oxidized deposit has felt the effects of regression. With regression of the sea the marine sediments of the upper Gulf were left stranded above water level. These deposits were then sub-aerially weathered and with the addition of terrigenous sand and clay by both fluvial and aeolian agencies became soils. All of the soils found within the cores today are of a light-brown to dark-brown colour. Some of the soils have developed only on the marine sediment as depicted by shells within the soils but other soils show a bimodal quartz distribution whereby on fraction is obviously aeolian and the other of beach or fluviatile origin.

Another factor is the identification of alluvial material between facies. This means that the sea had regressed and alluvial material from the slopes had been washed down on to the marine deposits.

One last factor is the identification of reworking of the sediment indicating, again, a transgression. Regression of the sea leaves the sediments open to weathering and erosion and transgression of the sea also causes erosion hence the breaks between the transgressive sequences are marked by weathering and erosional effects.

Through the use of seismic reflection profiles the stratigraphy of the Gulf can be approximated. With the use of the core data descriptions and interpretations the stratigraphy is not approximated but definite where there are enough cores.

Seismic transects 30, 33, 34, 11, 56, 57, 58, 59 and 60, FIGURES 6, 7, 8, 9, 10, 11, 12, 13, 14 respectively, display the seismic interpretation of the transects in the Port Augusta region, the Whyalla North and Whyalla Central regions. This breakup of the study area can be seen in FIGS. 2 and 5. Along with the seismic interpretation information from the cores has been added and the various depositional sequences indicated by a different colour. Over all, 6 depositional sequences have been recognized using seismic stratigraphy and core information.

Descriptions of the sequences follow. More information can be obtained from selected core descriptions in APPENDIX 2A.


LINE 30
Ships Wake


Transect 30.
Metres.
0
10
20
30
40
milliseconds
0
10
20
30
40
50
seabed
221
222
223
224
225
226
227
228
229
230
231
232
233
234
284
285
294
sequence.
1a
2
3
4
core position.
reflector.

Figure 6.


LINE
33 (REV)

Figure 7.

Transect 33.

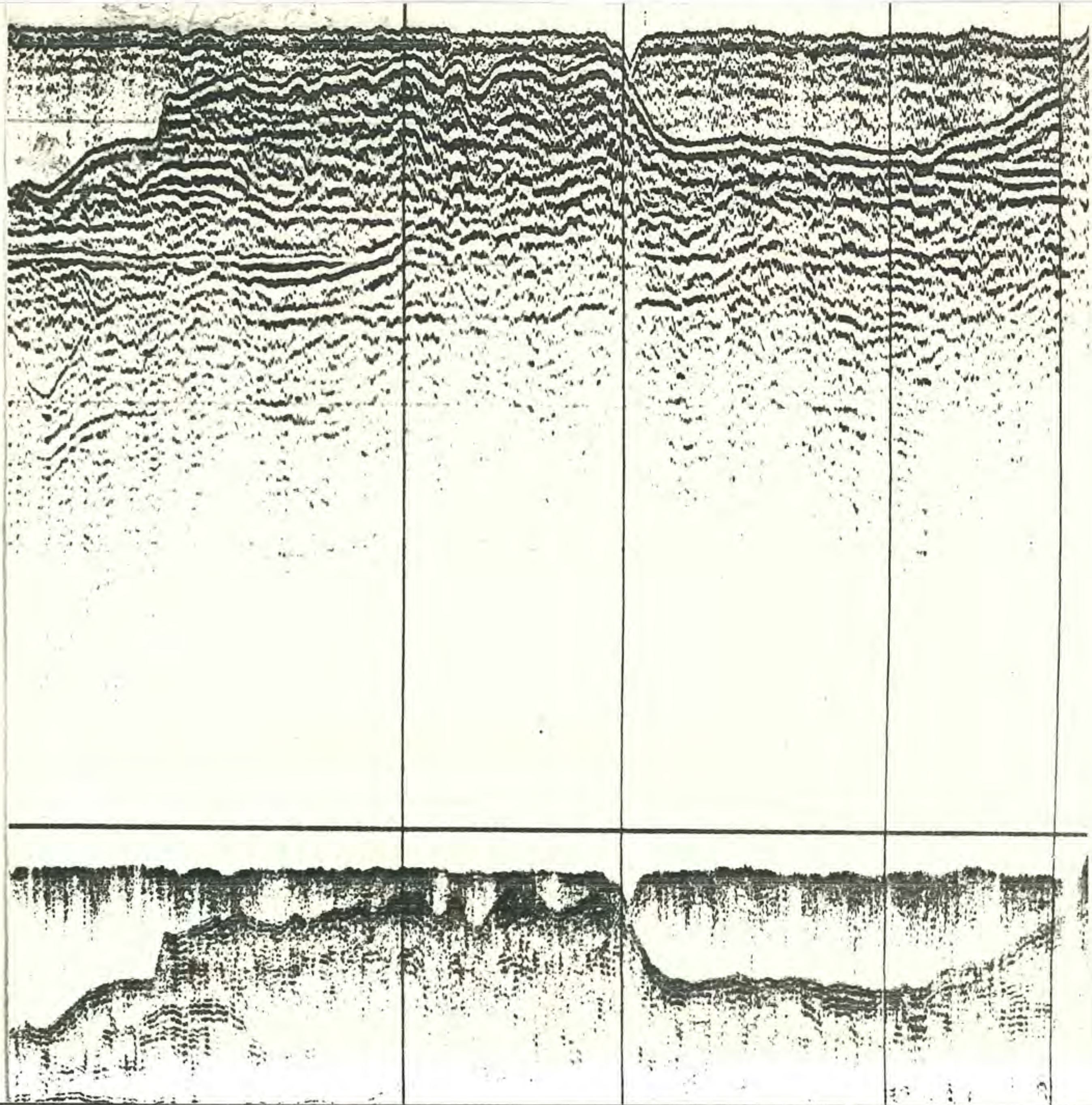

34
(REV)

Transect 34.
Metres.
0
10
20
30
40
milliseconds .
0
10
20
30
40
50
seabed
sequence .
1a.
2.
3.
4.
5.
REFLECTOR .

Figure 8.

Figure 9.

Transect 11.



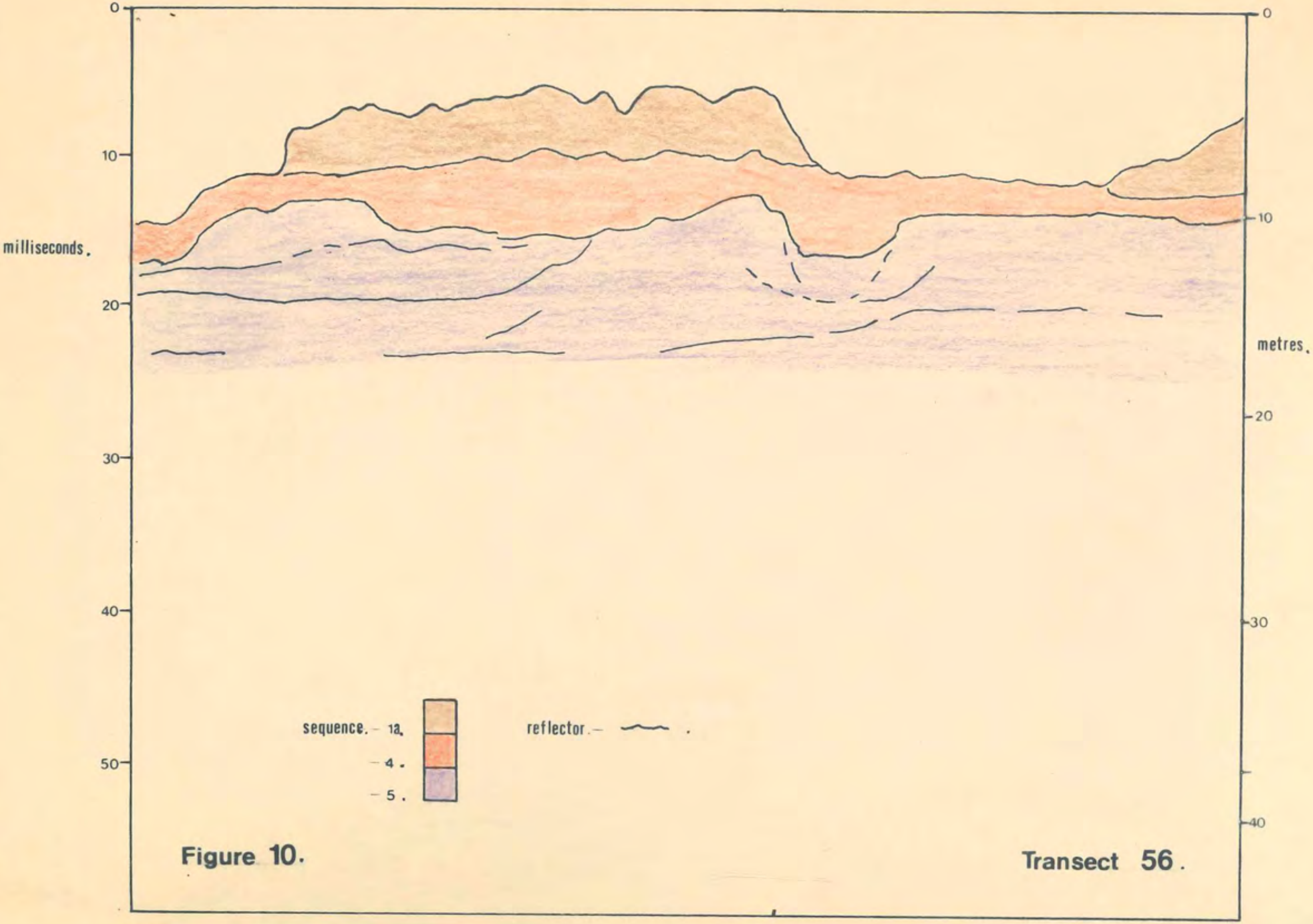
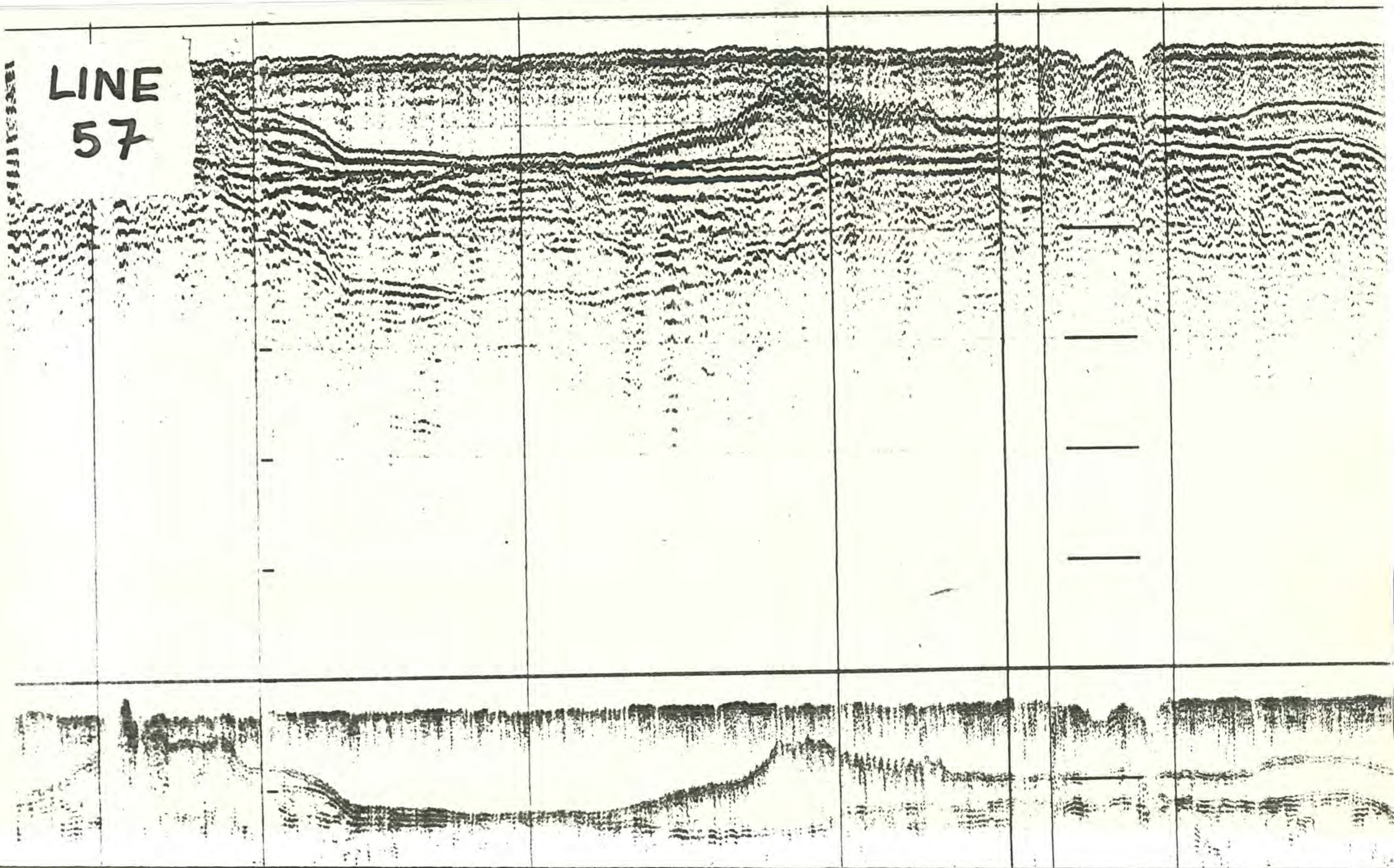


Figure 10.

Transect 56.


LINE
57

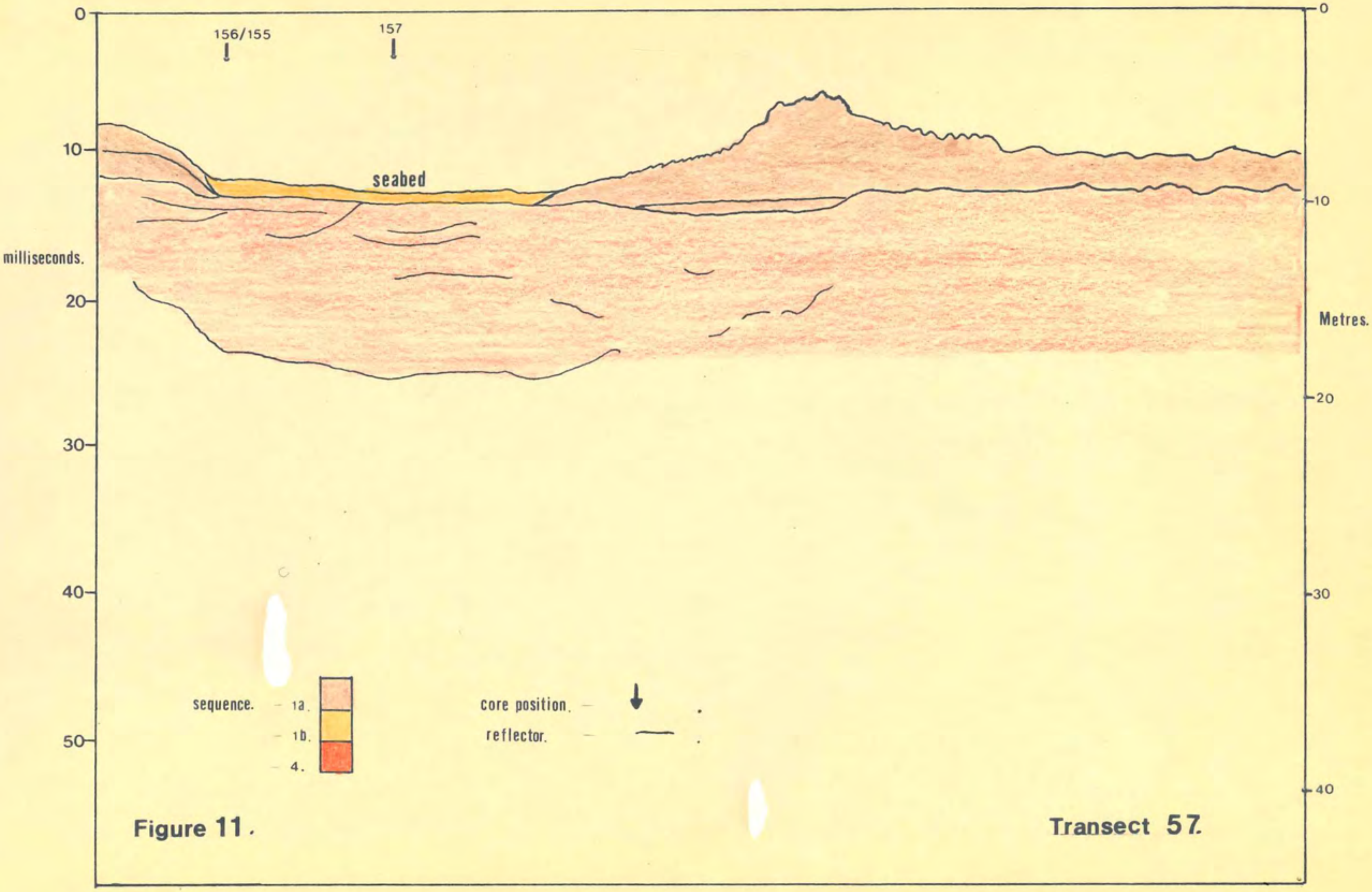
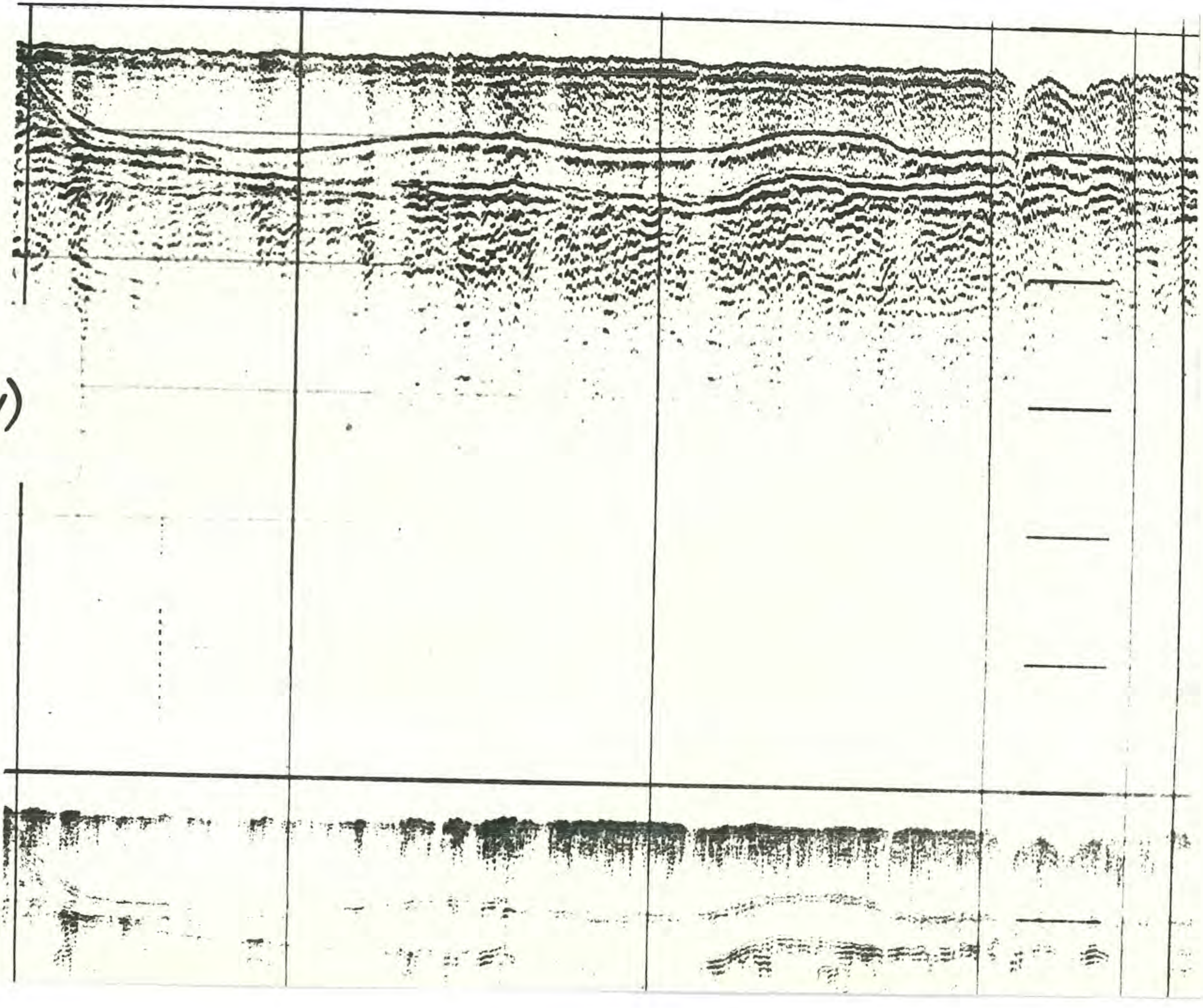


Figure 11.

Transect 57.

LINE
58 (REV)



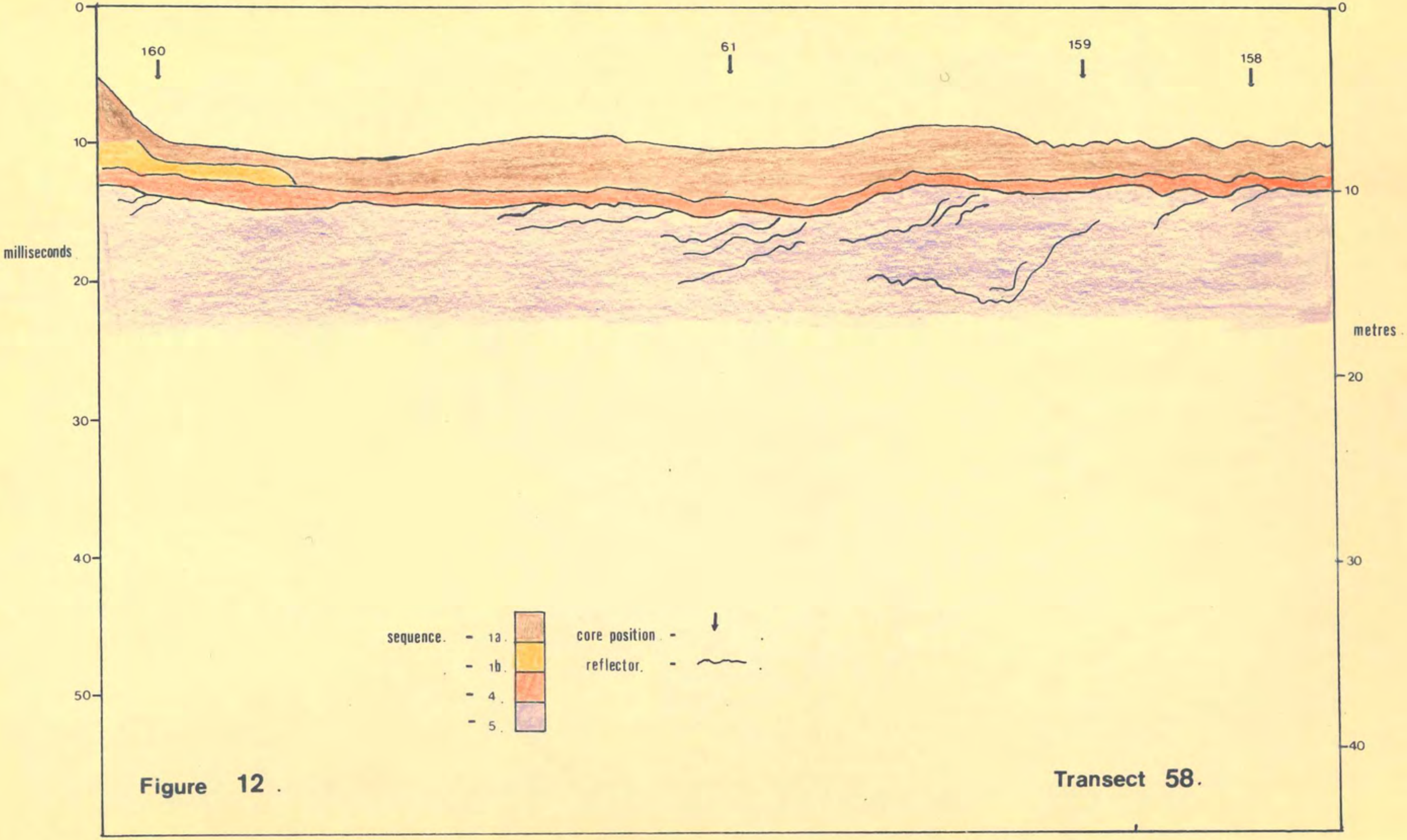
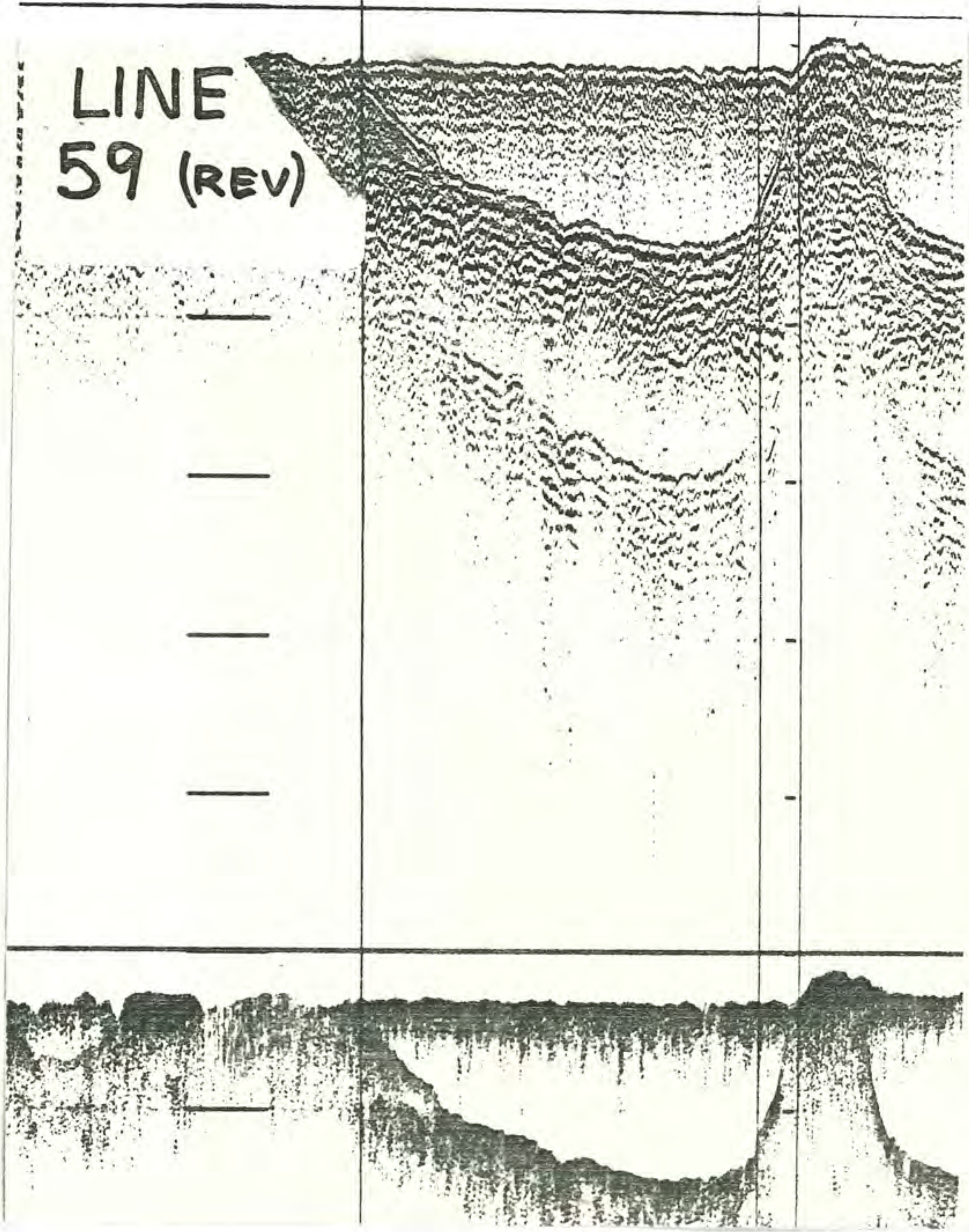


Figure 12.

Transect 58.


LINE
59 (REV)

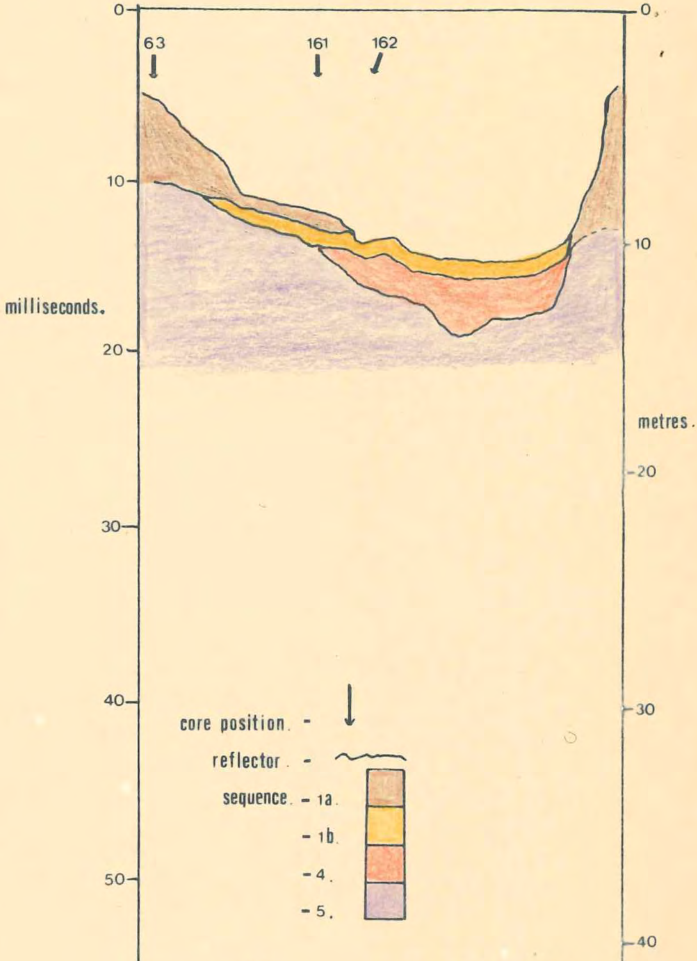
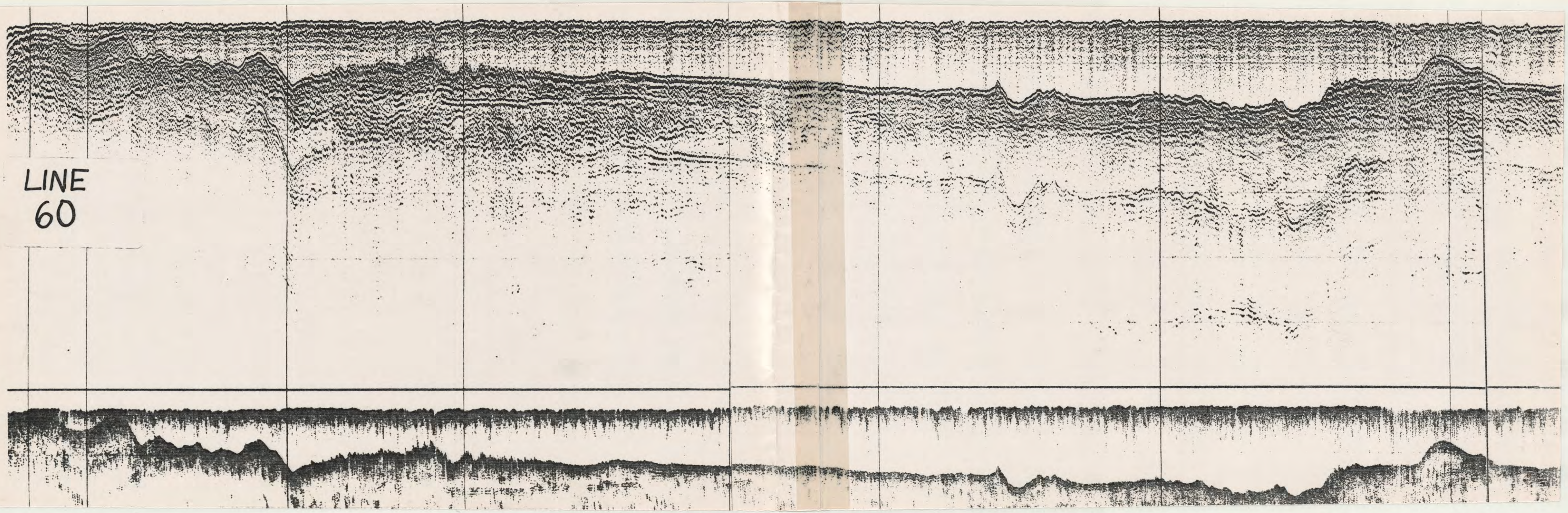


Figure 13. Transect 59.


LINE
60

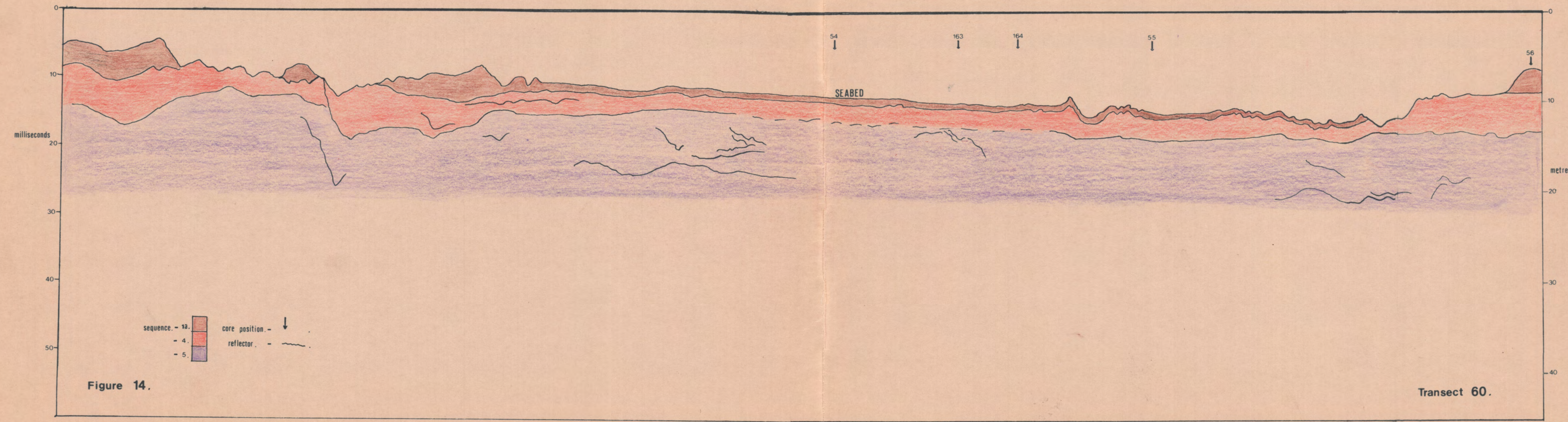


Figure 14.

Transect 60.

LEGEND FOR THE SAND AND ORGANISM DISTRIBUTION

FIGURES: 17, 18 and 19

🟦	Quartz
🟧	Bivalves
⬛	Gastropods
🟩	Foraminifera
A	Aragonite needles
🟨	Coralline algae
🟪	Bryozoans
🟥	Miscellaneous
🟫	Echinoid spines and plates
- - - -	Line representing sea-floor topography

Distribution of Sand and Organisms.

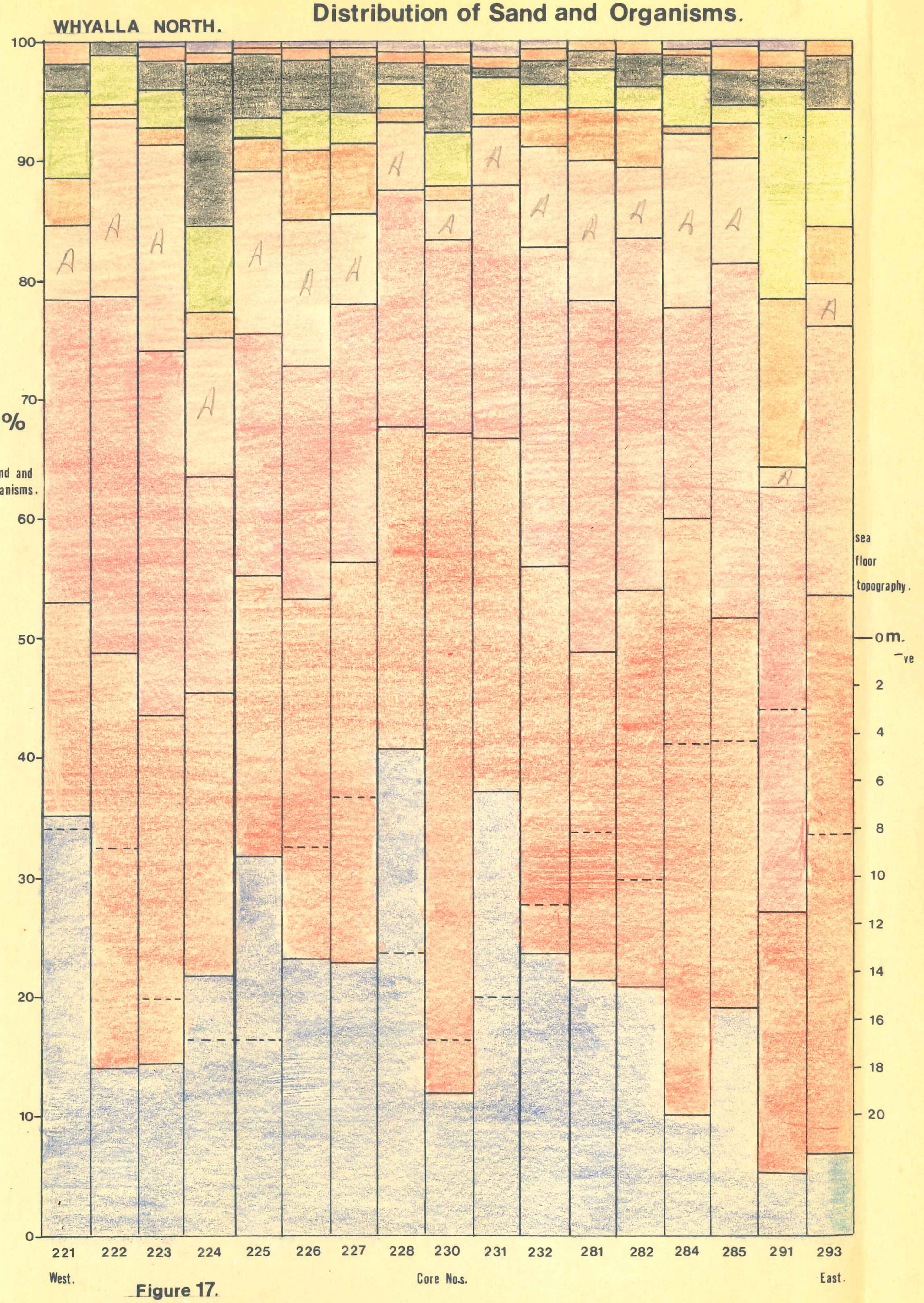


Figure 17.

SEQUENCE V (OLDEST)

Within every region sequence V is known only by its seismic record because few cores pierce into this sediment. In the Port Augusta region sequences IV and V are often separated by alluvial material. Beneath this alluvial material various facies of sediment are observed. On one occasion an extremely well-sorted, polished and frosted, rounded, quartz deposit is noted. This is probably a dune. On another occasion a deposit of 80% quartz and 20% fine silt is identified. This could be dune material again but a few fragments of bivalves are found and it is thought to be a beach deposit. An intertidal deposit is identified elsewhere within the record. So definitely aeolian and intertidal deposits exist but possibly more facies would be identified with more and deeper cores. Dipping beds, channels and series of contorted beds are observed within the sequence. The sediment is always dark red to orange in colour. Only in sequence V, particularly transect 58, FIG.12, of the Port Augusta region, are beds seen to lie at a dip, an obvious dip, to younger sediments. It would seem that before sequence IV was deposited there was movement within the study area causing the dip on the beds in sequence V. No other strongly dipping beds are seen in the geophysical sections implying tectonic activity stopped before the deposition of sequence IV.

SEQUENCE IV WHYALLA NORTH

Sequence IV within this region is mostly brown to red shelly silts. Shell fragments including bivalves, gastropods and foraminifera, with the bivalves dominant, is at its greatest 25% of the deposit as is quartz which is polished, subrounded and of mediocre sorting. The silt content ranges from 50% to 100% so once again a sequence is predominantly shelly silts and silts. The facies are subtidal, intertidal, supratidal and estuarine. On occasions the top of sequence IV is reduced. A marine transgression after a regression would initiate this reduction. The thickness of this sequence is unknown.

Sequence IV is the oldest sequence defined in Whyalla Nth. Within the sequence relict channels and monadnocks are observed hence differential erosion has occurred in the past. The boundaries between the various sequences also show differential erosion with a small-scale ridge and valley outline apparent. More channels appear within sequence IV than in today's topography. Actually, since only the top of sequence IV can be identified and not the base, it is quite possible that sequence V is also being studied in this case. Nodules and burrows are common.

WHYALLA CENTRAL

Sequence IV consists of intertidal, subtidal, supratidal and estuarine deposits. Again shelly silts and silts predominate. The supratidal deposits within this sequence have up to 50% subrounded to sub-angular, poorly-sorted, polished, iron-oxide-stained quartz. Little shelly material is present while silt again makes up at least 50% of the deposit.

Fauna within the subtidal, intertidal deposits include both turreted and non-turreted gastropods, coralline algae, echinoid spines, bivalves, foraminifera, aragonite needles, worm tubes, etc., with Marginopora present in the intertidal deposits.

Again silt within this sequence is a dark-red to brown colour. Nodules are found throughout and silt attaches itself to the quartz and shell on many occasions. Everything is iron-oxide stained.

As for the Whyalla North region, channels and monadnocks are apparent within the fourth sequence. Within Whyalla Central, the base of Sequence IV has been identified using seismic stratigraphy in several areas. The boundary between sequences IV and V is erosional as are the boundaries between other sequences.

PORT AUGUSTA

Within this region sequence IV is again either subtidal, intertidal, supratidal or estuarine. Intertidal deposits are prominent with a predominance of quartz, rock fragments and silt with a very small percentage of shell. The quartz and rock fragments are very coarse. Quartz is sub-angular to mainly subrounded, polished and poorly sorted to well sorted where possibly a dune exists rather than an intertidal deposit. The thickness of sequence IV is variant. Channels and monadnocks are apparent. Beneath the intertidal deposits usually the supratidal facies is found. The estuarine deposits are mainly muds with some coarse shell.

Sequence IV is extremely extensive and is the major factor in the topography of the Gulf today for it makes up most of the sub-marine ridges and the channels of today, although not as prolific as those of old, are usually in close proximity to sub-surface relict channels. Within the Port Augusta region, sequence V is extensive and is a major factor in the production of today's topography. However, it is not just sequence V for sequence IV changes the topography of sequence V to a topography reminiscent of today's. Certainly sequence V has had its effects but it is the topography of sequence IV, or better, what is left of sequence IV that is the producer of today's topography.

SEQUENCE III WHYALLA NORTH

Sequence III within this region is very similar to sequence II in that it is predominantly intertidal and sabkha deposits with minor aeolian and subtidal deposits. Simply, shelly, sandy silts and silts with dune quartz. Descriptions are identical to that of sequence II but greater quartz exists than in sequence II. Sequence III within this region can be up to 15 m. thick but the mean thickness is 3 to 4 m.

WHYALLA CENTRAL

Sequence III in this region is identical to the above region and hence to sequence II except for the fact that often at the top of the sequence oxidation has taken place to varying degrees giving a yellow to brown colour to the sediment. Thickness is on average 3 to 4 m.

Again, as for sequence II,

sequence III is basically only found in the troughs but also it makes up some of the lower terraces of the Gulf floor.

PORT AUGUSTA

No core was emplaced into sequence III sediment within this region but again it is found at the base of troughs so it is probably subtidal, intertidal and/or a sabkha deposit. Sequence III in fact is only observed in the deepest of the trenches and only up to a thickness of 2 to 3 m. within restricted areas, because there are only a few deep trenches within the region. Sequence III, hence, is not as prolific here as it is in other regions.

SEQUENCE II

WHYALLA NORTH

Sequence II consists of basically intertidal and supratidal deposits, in particular sabkhas. Again, simply, shelly, sandy silts and silts. The intertidal deposits are usually oxidized to a faint yellow colour. Quartz and the various faunas are present. Quartz proportions average out at 20% and bivalves predominate mainly as fragments within the sediment. Benthic foraminifera, turreted gastropods, aragonite needles, coralline algae, echinoid spines and other faunas are also observed. The quartz is predominantly sub-angular to subrounded, polished with some frosted, and poorly sorted. When the quartz percentage increases above 20% it usually steps up to 80% and greater. Here it becomes difficult to decide whether a dune or a beach is being observed.

The sabkha deposits of sequence II are white to green in colour. Usually less than 5% quartz and less than 5% shell fragments are noted within the sabkha. Where pockets of greater shell or quartz are noted it is thought that these pockets are but storm-water deposits on the sabkha surface. Often gypsum crystals are found.

WHYALLA CENTRAL

Sequence II in this region is basically a shelly silt, the question being whether it is of intertidal and/or subtidal origin. A white to yellow calcareous silt predominates, usually averaging greater than 50% of the deposit. Shelly hash on occasions is more predominant. Quartz proportions at their greatest approximate 10%. Whole turreted gastropods and rarely whole bivalves are found. Benthic foraminifera, echinoid spines, aragonite needles, etc., are observed but again bivalve fragments predominate the shelly fraction of the sediment. The subtidal and/or intertidal deposits are up to 4 m. thick. Sabkha deposits are described as above. Clay-dune material of very fine silt is also observed.

Within the Whyalla region, overall, intertidal and supratidal (sabkha) deposits are the most prominent, with some subtidal deposits within what were then deeps.

PORT AUGUSTA

Sequence II within this region is non-existent for reasons that will be discussed later.

HOLOCENE SEQUENCE I (A and B) WHYALLA NORTH AND CENTRAL

Core descriptions indicate that sequence I consists of a shelly sand, basically of subtidal origin. Usually the percentage of silt increases downwards. The distinguishing factor is that sequence I is always grey. Molluscs are the major fauna with smaller proportions of benthic foraminifera, aragonite needles, echinoid spines and plates, coralline algae, etc.. Seagrass fibre is quite common within the sediment. Grey staining on shell is present quite often and is best seen on the foraminifera, echinoid spines and bivalve fragments. Quartz is always present. Silt is either brown or grey. The thickness of sequence I is variable but the mean thickness is 1 m.

PORT AUGUSTA

Sequence I in the Port Augusta region is of two types. Sequence IA is identical to sequence I found in both Whyalla North and Central regions.

Sequence IB consists of approximately 70 to 80% sub-rounded, polished and poorly-sorted quartz with little silt or shell. The shell is highly weathered and an orange iron-oxide colour, as is the small percentage of silt. The quartz is also iron-oxide-stained. It would appear that this material, sequence IB, is purely reworked sediment of an older age, Pleistocene age, as will be explained.

SEQUENCE VI

Sequence VI is of various ages being located between sequence I and IV and IV and V. It consists of alluvial material, a deep red/brown silt with polished, rounded to sub-rounded, poorly-sorted quartz. Alluvial material when observed between sequences I and IV is only seen as a small proportion of dark-brown clay with minor quartz. It is thought that a major proportion of the alluvial deposit has been reworked into sequence I. However, the tell-tale factor in recognizing alluvial material is the non-calcareous nature of the sediment. Care must be taken, however, as it is possible for decalcification of the sediment to take place making an intertidal, or any, deposit non-calcareous.

In summary, the major differences between the sequences are that sequence I is grey and subtidal. Sequence II and III are identical basically consisting of intertidal and supratidal (sabkha) deposits with minor aeolian and subtidal deposits. Sequence IV is red and has coarse intertidal deposits and has subtidal and estuarine deposits. Sequence V is little known and also is red but is probably identical to sequence IV. Sequence VI is non-calcareous alluvial material.

4. QUATERNARY SEDIMENT DESCRIPTION

HOLOCENE

The Recent sediment within the Gulf is, on average, 1 m. thick. Typically it is grey in colour. The flora and fauna within this sediment are described in sections 2.23 and 2.24, respectively. Often the Holocene sediments may be divided into two parts.

Firstly, the top 10 to 30 cm. often is coarser than the underlying sediment. Usually there is a greater proportion of coarse shell and a minor percentage of quartz. The coarse shell consists of whole or fragmentary bivalves and gastropods. Mostly the shell is fragmented and weathered. On occasions coarse coralline algae is prominent and is so prolific that a speckled effect results with white dots (coralline algae) on a grey background. Foraminifera, echinoid spines, bryozoans, aragonite needles and coralline algae amount to only minor fractions of the sediment. Sea-grass fibre may be observed. The proportion of shell usually ranges from 60 to 90%. Quartz is only found in minor proportions, 10 to 20%, in the Recent sediment, except in the Port Augusta Region as mentioned before. The quartz is poorly sorted, angular to rounded, polished and frosted, clear or green to red in colour and of a very fine sand grain-size. Brown or grey silt makes up the rest of the deposit.

The second, basal, section of the Holocene is finer in character with much greater grey silt and organic matter than the top section. Shell is less prolific and is comminuted. Certainly, bivalve and gastropod fragments are still observed but there is an increase in proportions of aragonite needles and organic matter. Foraminifera may occur in greater numbers as well. The silt proportion may build up to 70%. Less quartz is observed in this section.

This sequence of sediments described above is observed in most cores, but in some areas only one of the two may be found. Where the Holocene sequence is thin it is noted that only the coarser deposit is present. In other parts of the Gulf only the finer sequence can be found. However, often a coarsening upwards in grain-size is seen within these sequences, whether there be only one or both types.

Another noticeable factor is that the faunal assemblage within the Holocene often changes from the basal section through to the top. Core 83 (see APPENDIX 2A) is a good example. The basic faunas are bivalves, turreted gastropods and foraminifera of the genera Quinqueloculina and Spiroloculina. Aragonite needles are also common. These biota are found in the top 10 cm. of the Holocene. In the basal 10 cm. a greater prominence of foraminifera is noted. Foraminifera of the genera Elphidium, Peneroplis, Spirolina, Quinqueloculina and Spiroloculina are observed. The basal section within this core also has more bivalves, turreted and non-turreted gastropods. This change in faunal assemblage must mean there has been a change in conditions in the Gulf over the Holocene period. To find out what these changes were, further work is required.

Often, also, the shell, in particular bivalves, foraminifera and echinoid spines, have a grey to black stain on their surfaces. It is possible that this staining is caused by in situ reduction within the sediment.

PLEISTOCENE

Within the Pleistocene several facies are present. These facies are aeolian, supratidal flat, sabkha, intertidal flat, beach, subtidal and estuarine. The factors used to discriminate between these facies have been mentioned before. Typical examples of these facies are listed below.

Aeolian: Greater than 80% quartz. The quartz is well sorted, sub-rounded, polished and frosted, and stained an iron-oxide red. No shell is apparent. Red silt makes up the rest. Core 225 .

Supratidal flat: 2% fragmentary shell consisting of bivalves, turreted gastropods and foraminifera. 30% moderately-sorted, sub-angular to sub-rounded, polished, fine-grained quartz. 68% pale-green calcareous clay Core 233 .

Sabkha: Calcareous white clay Core 225 . Gypsum is often found.

Intertidal flat: 40% shell including aragonite needles, bivalves, and turreted gastropods, both whole and fragmentary. 20% moderately-sorted, sub-rounded to rounded, polished quartz. 40% nodular white calcareous silt Core 227 .

Beach: Quartz and shell. The shell consists of foraminifera, echinoid spines, turreted gastropods and bivalves. The quartz is moderately sorted, subangular to sub-rounded, polished and iron-oxide stained. The deposit is pale yellow in colour to pink at the base Core 231 . A beach deposit may be all shell or all quartz or both but there is little silt.

Subtidal: 70% shell consisting of foraminifera, bivalves, non-turreted gastropods and echinoid spines. Whole bivalves and gastropods are observed. Only a small proportion of quartz is noted. The rest is creamy-white silt Core 83 .

Estuarine: Grey, calcareous, fine quartz sand-rich clay. One Anadara trapezia noted Core 162 .

The above are only examples and the percentages of quartz, shell and silt vary for each facies. The Pleistocene sediments are of various facies but the discriminating factor between them and the Holocene sediment is colour and organic matter. The Holocene is always grey and always has some organic matter while the Pleistocene has no organic matter and is never grey except where estuarine deposits are noted, but there is a great difference in the physical character of the Holocene and the Pleistocene estuarine deposit, the Pleistocene being harder. The Pleistocene ranges from white, cream, buff, khaki, green, brown to red in colour. Pedogenic nodules and burrows often are observed in the Pleistocene in the study area.

The fauna of both the Holocene and Pleistocene are very similar and there are few species seen in the Pleistocene and not in the Holocene.

Reduction is common in the Holocene but oxidation is more common in the Pleistocene, and this oxidation is apparent in the yellow-to-red marine deposits that now are noted as paleosols.

A major factor that has contributed to the Pleistocene sediment is the level of the sea during the formation of these specific facies, whereas the Holocene sediment seen in the submarine cores is entirely subtidal estuarine sea-grass bank facies . Further information on the sediments can be obtained from APPENDIX 2A.

5. DATING

Amino acid racemization and thermoluminesence dating of the pre-Holocene sequences is in the initial stages and so far the dates have proved inconclusive, only indicating ages of approximately 100,000 years plus or minus 20,000 years. Therefore other methods must be found.

Over the years, more and more work has been focused on sea levels throughout time, especially the relatively recent changes in sea level. Within the Southern hemisphere work by CHAPPELL, J. (1974) and BLOOM et al. (1974) and CHAPPELL, J. and VEEH (1978) on sea levels is extensive. It is known that sequence I is of Holocene age but sequences II to V are of unknown ages. Each of these sequences represents a transgressive unit of sediment, hence if the transgressive sea level periods are known and dated then surely approximate dates can be associated with each sequence.

CHAPPELL and BLOOM et al. (1974) have focused their attention on the Huon Peninsula in New Guinea. Emerged coral reefs form terraces along the coastline. Interpretation of sea level oscillations superimposed on a rising land rests on a principle of reef morphology identified by DARWIN (1842, pp.76-78) viz., a barrier and a lagoon association implies a sea-level rise relative to the land. Contrarywise, a fringing reef reflects relatively stable juxtaposition of land and sea, and descending flights of reef terraces, their fronts cut by low cliffs and notches, indicate emergence. Using this information along with C^{14} and Th^{230}/U^{234} dating methods, the terraces on the Huon Peninsula were studied. Tectonic movements were subtracted using methods explained by CHAPPELL, J. (1974). Results to date (1974) indicate sea level maxima at about the following times: 30,000, 40,000 to 50,000, 60,000, 80,000, 120,000, 140,000, 185,000, 220,000 in addition to the recent maxima. Further dating in 1974 confirmed these ages and found an additional high sea level at 105,000 years. These dates correspond with dated upper Quaternary terraces elsewhere, especially Barbados, and correspond to EMILIANI'S (1966) paleotemperature curve.

Along with these dates the sea levels were calculated and the two plotted against each other. FIG.15 illustrates the final product.

Later work by CHAPPELL, J. and VEEH (1978) has changed the heights of the sea level highs but not the ages. The 80,000, 100,000, and 120,000 transgressive sea levels reached maximums of -20 m., -14 m., and 6.5 m., respectively in comparison to today's sea levels. These sea levels were identified from work on Atauro Island and Timor and correlate well with work from New Guinea and Barbados. However, within the Gulf it is thought that the maximum sea levels for these periods are slightly greater, -15 m. and -8 m. for the 80,000- and 100,000-year transgressions, respectively (pers.comm., T. BELPERIO, 1981). No definite levels have been calculated, but certainly within the Gulf the maximum sea levels for the transgressive periods are greater than those levels calculated by Chappell and Veeh.

Within the Gulf, sequences II to V are basically transgressive sequences. The sequences, as mentioned, are identified by using both seismic reflection profiles and core interpretation. The breaks between the sequences are recognizable. These breaks, representing the maximum heights of the sequences, are at levels that correspond to the maximum sea levels of the various transgressive seas. For example, sequence II is only found where the water depth is now greater than 15 m., approximately. Sequence III is only found in areas where the water depth is now greater than 8 m., approximately. Sequences IV and V are prolific and are observed in any depth of water. Hence it is suggested that sequence II is the equivalent of the 80,000-year-old transgressive event, and sequence III, IV and V also are equivalent transgressive deposits to the coral reefs of New Guinea. Therefore, an age of 80,000 years is suggested for sequence II, 100,000 years for sequence III, 120,000 years for sequence IV and an older age, possibly 220,000 years, for sequence V.

The distribution of sequences I to V within the Gulf, then, is controlled by transgressive

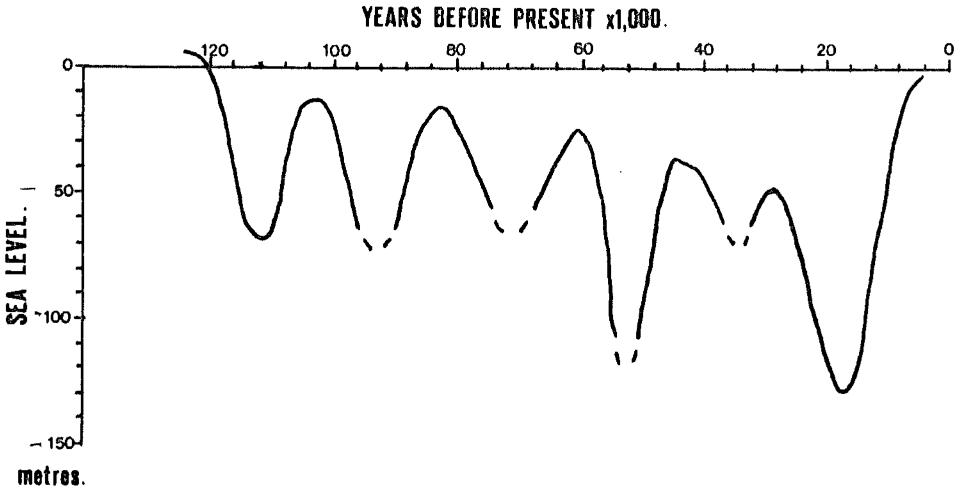


FIGURE 15. EUSTATIC CHANGES.
CHAPPELL and BLOOM et.al. (1974).

seas and because of the shallow nature of the Gulf it is only the pronounced sea-level rises that had a depositional effect. It would be true to say that the two regions studied have been more often exposed to the atmosphere than covered by water.

6. ANALYSES OF THE HOLOCENE SEDIMENT

A sample of 5 to 10 grams was randomly chosen from the top 2 cm. of Holocene sediment within the core, for each core. The sand fraction was then separated from the whole fraction by a wet-sieving procedure. (See APPENDICES I.C. and 2.B.) The sand fraction was then studied under a binocular microscope.

To minimize any bias the sand fraction was thoroughly mixed and then divided into quarters. One quarter was randomly selected and then a count of 500 particles was carried out. Counts of 1000 were taken and the figures were identical to that of a count of 500. Counts less than 500 disclosed a marked divergence in proportions to those calculated using counts of 500 or 1000. Hence, a count of 500 was used, being the smallest count possible which gave reproducible figures.

The series of non-organic and organic particles were divided into the following types:

Coralline algae
Bryozoa
Gastropods
Bivalves
Quartz
Aragonite needles
Echinoid spines
and plates
Miscellaneous

Foraminifera - genus *Spiroloculina* and *Quinqueloculina*
genus *Triloculina*
genus *Elphidium*
genus *Peneroplis* and *Spirolina*
genus *Discorbis* and *Rosalina*
genus *Nubecularia*

The miscellaneous division included material that was of a very fine sand grain-size and its origin could not be recognized. It is believed that most of the material within the miscellaneous division is of bivalve, gastropod and foraminiferal origin. Also organic or non-organic matter not in the above divisions, for example, rock fragments, were put into this division.

Results from the counts are found in APPENDIX 2.D.

From the counts, percentages for each division were calculated and plotted for each sample. Transparencies depicting the percentages of each division were used to perceive relationships, if any, existing between the various organisms and non-organic matter. The calcium carbonate percentage per sample was also calculated. See APPENDICES I.D and 2.C.

Distinct reciprocal relationships exist between the proportion of quartz and the proportion of bivalves and also quartz and $CaCO_3$. FIG.16. That is, the greater the proportion of quartz, the less the proportion of bivalves and $CaCO_3$ and vice versa. Between bivalves and $CaCO_3$ a positive relationship exists. This reciprocal relationship is expected, for the greater the terrestrial influence, the greater the quartz; the less the marine influence, the less the marine fauna, e.g., bivalves. Bivalves are so prominent within the Gulf, within the faunal assemblage, that the $CaCO_3$ curve and the bivalve proportion of the whole fauna, when graphed, are very close to identical. Hence the relationship being examined here is one depicting the proportion of terrestrial and/or marine influence.

However, a reciprocal relationship exists between the proportion of foraminifera, in particular the genus Elphidium, and quartz and a mutual relationship exists between bivalves, $CaCO_3$ and foraminifera. The proportions are not identical but the pattern of distribution between bivalves and foraminifera is identical. Where the proportion of bivalves increases so does the proportion of foraminifera, etc.. See FIG.16.

This would indicate that the degree of marine influence is marked by not only bivalves but by foraminifera. It would seem that the conditions conducive to bivalve numbers increasing are the conditions that benthic foraminifera also prefer, especially the genus Elphidium.

No other relationships can be observed.

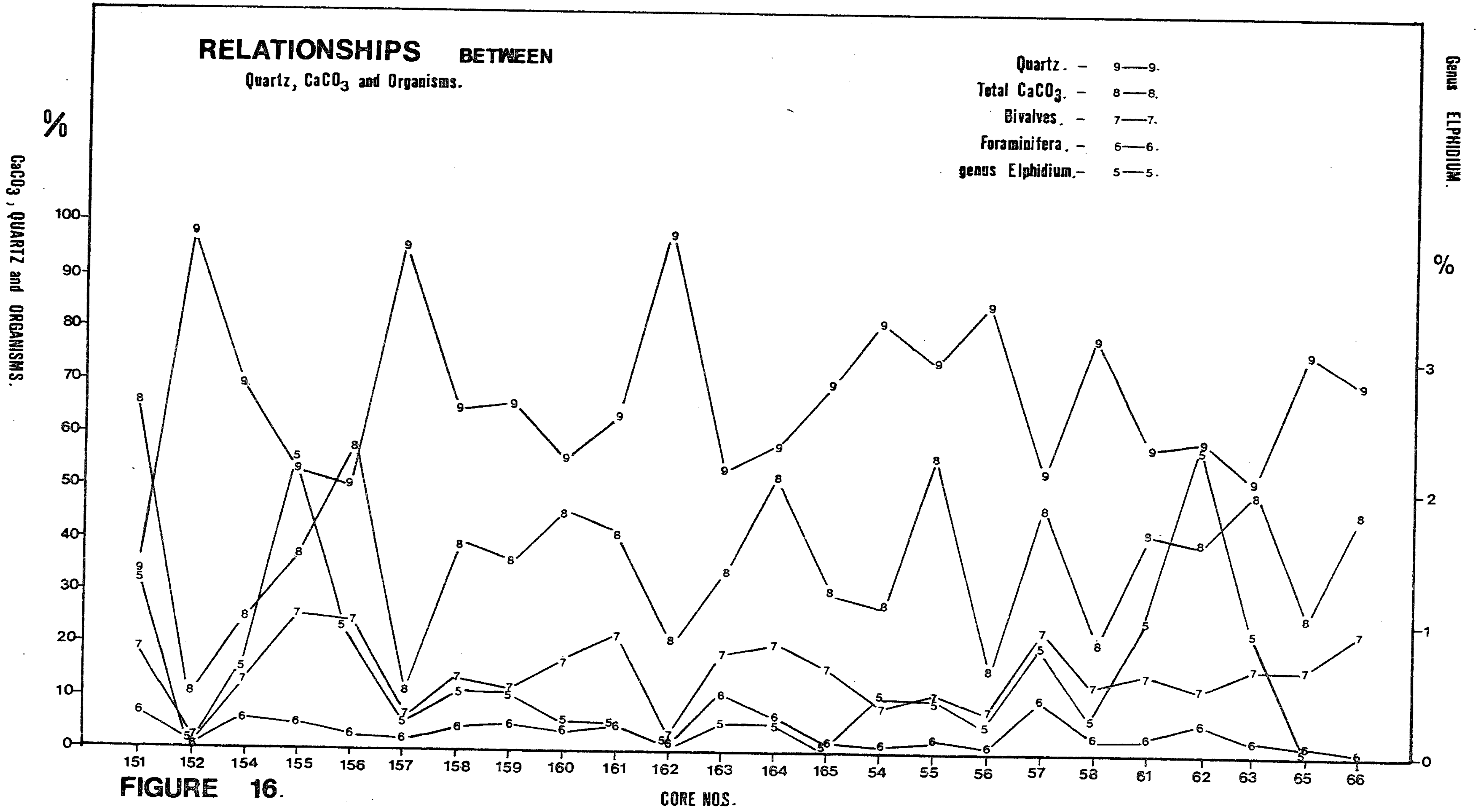

RELATIONSHIPS BETWEEN
Quartz, $CaCO_3$ and Organisms.
Quartz. – 9—9.
Total $CaCO_3$. – 8—8.
Bivalves. – 7—7.
Foraminifera. – 6—6.
genus Elphidium.– 5—5.
%
$CaCO_3$, QUARTZ and ORGANISMS.
0
10
20
30
40
50
60
70
80
90
100
%
Genus ELPHIDIUM.
0
1
2
3
CORE NOS.
151
152
154
155
156
157
158
159
160
161
162
163
164
165
54
55
56
57
58
61
62
63
65
66

FIGURE 16.

Bar graphs were used to show the proportion of organisms and non-organic matter within the sample for each core. Each column represents a core. The various foraminiferal genera were summated and the total figure used. A separate graph was used to show the proportions of various foraminiferal genera within the samples. The variation from one core to another and across all the cores discloses the distribution of the species or genera through the Gulf. FIGURES 17, 18, and 19 show this distribution for Whyalla North, Whyalla Central and Port Augusta regions, respectively.

There are definite variations between the northern part of the Gulf and the southern section. From the diagrams it is quite clear that in the Port Augusta region (FIG.19), a greater terrigenous component, quartz, exists, while in the Whyalla region, FIGS.17 and 18, bivalves are the major component within the sand fraction. In fact, in the Port Augusta region, quartz makes up to 95% of the sediment, averaging 65% of the sediment. In the Whyalla region, quartz averages approximately 20% of the sediment and with bivalves summates to an average of 65%. Hence it can be stated that quartz is extremely dominant in the northern part of the Gulf, having a greater dominance than bivalves do in the south.

In the northern region, FIG.19, there are fewer bivalves, echinoid spines, coralline algae, gastropods, bryozoans, and in particular aragonite needles in comparison with the southern region. FIGS.17 and 18.

Also, along the Whyalla Central transect, FIG.18, a definite variation in Holocene sediment can be seen. Looking at the diagram, it is quite obvious that from core 85 to 134 a different sediment-type exists to that of the east. The major change is in the aragonite-needle proportions which have at least doubled and which show a consistent proportion within the western part of the Gulf. Also, a decrease in the proportions of coralline algae, bryozoans, gastropods, echinoid spines and foraminifera exists in this regions compared to the eastern

Distribution of Sand and Organisms.

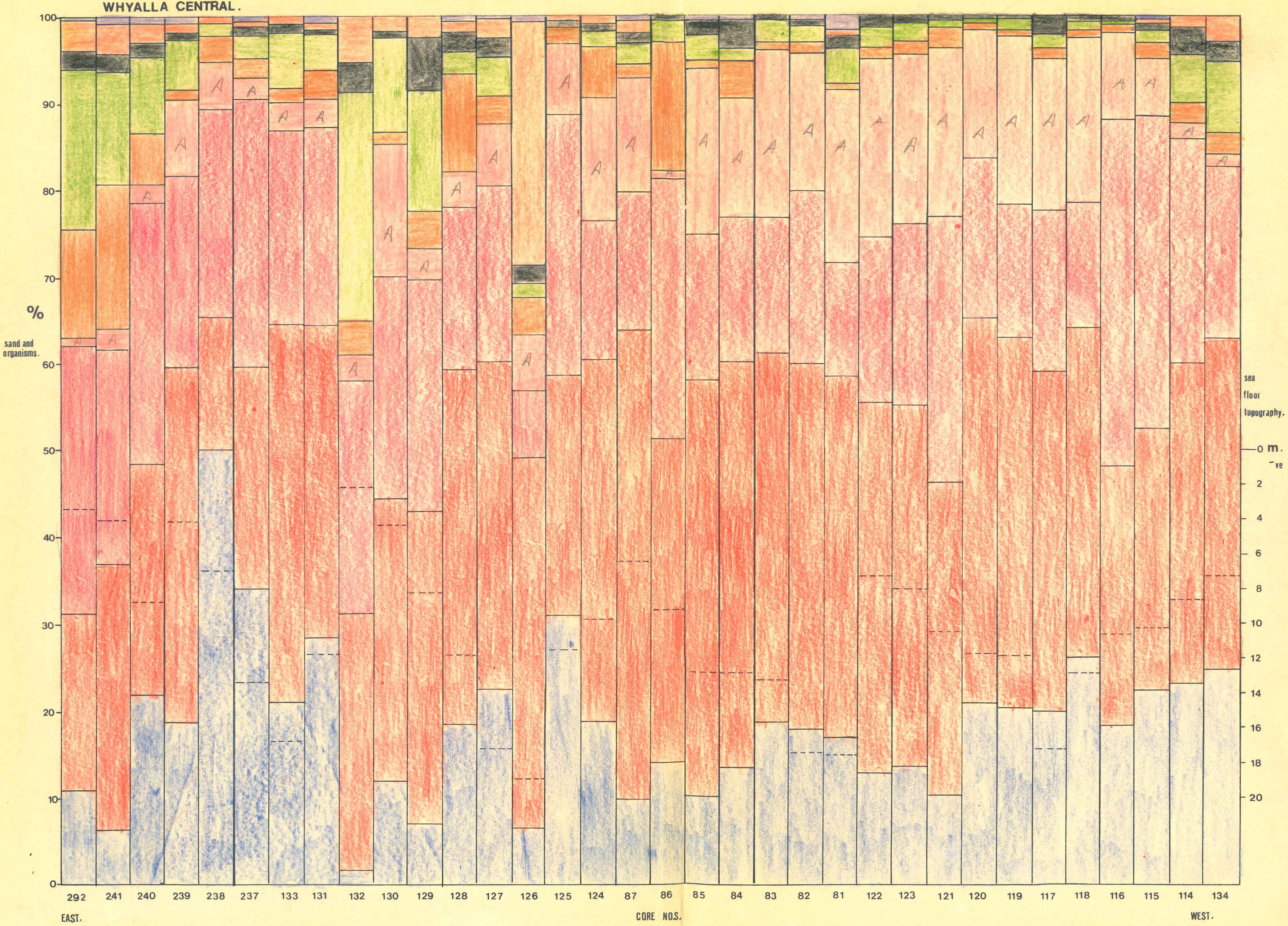
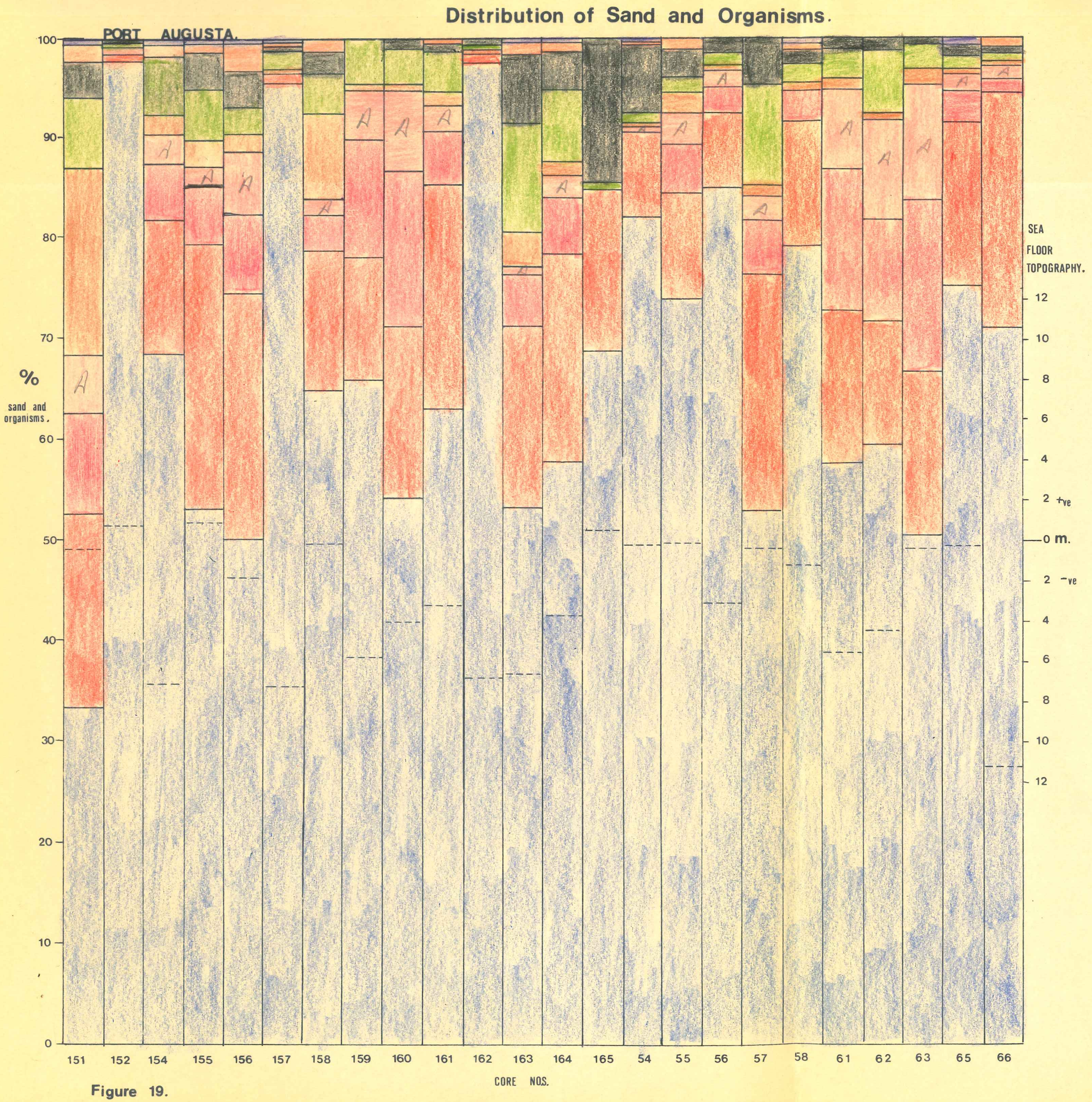


Figure 18.



Distribution of Sand and Organisms.
PORT AUGUSTA.
%
sand and organisms.
100
90
80
70
60
50
40
30
20
10
0
A
151
152
154
155
156
157
158
159
160
161
162
163
164
165
54
55
56
57
58
61
62
63
65
66
CORE NOS.
SEA FLOOR TOPOGRAPHY.
12
10
8
6
4
2 +ve
0 m.
2 -ve
4
6
8
10
12

Figure 19.

region.

The reason for the significant difference between one side of the Gulf and the other is unknown. Salinity and temperature are the vital factors which usually govern the distribution of organisms, but as no detailed information is available, such conclusions await further research.

However, it is noticeable that the Port Augusta region is shallower than the Whyalla region. FIGS.17, 18, and 19. Also, a large proportion of the sediment designated Holocene in the Port Augusta region is definitely reworked from Pleistocene sediment. From microscope studies it was observed that some foraminifera, bivalves and echinoid spines are an orange, iron-oxide stained, colour. Also, most of the quartz in each sample has an orange-to-red stain. On occasions, the fauna mentioned are half orange, half black, demonstrating a history of oxidation and reduction.

Now, if a transgression is rapid, then hardly any reworking will take place; but if the sea level rises very slowly, then there will be greater reworking. Hence, one can safely say that, with the reworking present in the northern part of the Gulf, the last transgression must have been a slow one.

The reason for this difference between the two regions studied, Port Augusta and Whyalla, may be greater runoff in the northern region, hence greater quartz in the north. With greater terrestrial influence in the north, less fauna will be observed and greater quartz and silt will be noted. The greater reworking in the north also influences the differences in the overall sediment. It would seem that at first the transgression must have been rapid up to a depth that included the Whyalla Central and North region, and then it must have slowed down so that sea level only gradually increased in the northern part of the Gulf. Hence the greater reworking in the northern Gulf and less in the southern Gulf.

The distribution of the foraminifera is displayed using bar graphs. From the counts, foraminifera were split up into divisions based on genera. On this occasion, the sum of foraminifera is 100%. The percentage of each division of genera is graphed. The cores again are represented by a column on the graph. FIGURES 20, 21, and 22 show the foraminiferal distribution for Whyalla North, Whyalla Central and Port Augusta, respectively.

Again it was observed that the foraminifera differed from one region to another. In the Port Augusta region, FIG.22, there is a greater preponderance of Peneroplis planatus and Spirolina aciculoris than in the Whyalla region, FIGS.20, 21, where they are almost non-existent.

Also, it was noticed that the foraminiferal assemblages varied with the topography. FIG.21 exemplifies this very well. When the topography of the sea-bed is transformed on to the foraminifera distribution, it is obvious that the banks have a different foraminiferal assemblage to the troughs. Foraminifera of the genera Elphidium, Discorbis and Nubeculoria are the prominent foraminifera on the banks while foraminifera of the genera Quinqueloculina, Spiroloculina and Triloculina are the prominent genera within the troughs. It has been suggested that the distribution of the foraminifera is associated with the distribution of sea-grass. However, while the distribution of foraminifera changes, the sea-grass distribution, which does vary, does not correlate with the foraminiferal change.

From the analyses it would seem plausible that water depth is an important factor in the distribution of foraminifera for there is a distinct variation in foraminiferal assemblage from troughs to banks and from the deeper waters of the Whyalla region to the shallow waters of the Port Augusta region.

The question must be raised as to whether the foraminiferal assemblage being

LEGEND FOR THE FORAMINIFERAL DISTRIBUTION

FIGURES: 20, 21 and 22

Foraminifera of the genera:

▨	Quinqueloculina and Spiroloculina
▷	Triloculina
▧	Elphidium
✕	Peneroplis and Spirolina
✓	Discorbis and Rosalina
☒	Nubecularia
- - - -	Line representing sea-floor topography

WHYALLA NORTH. **FORAM. DISTRIBUTION.**

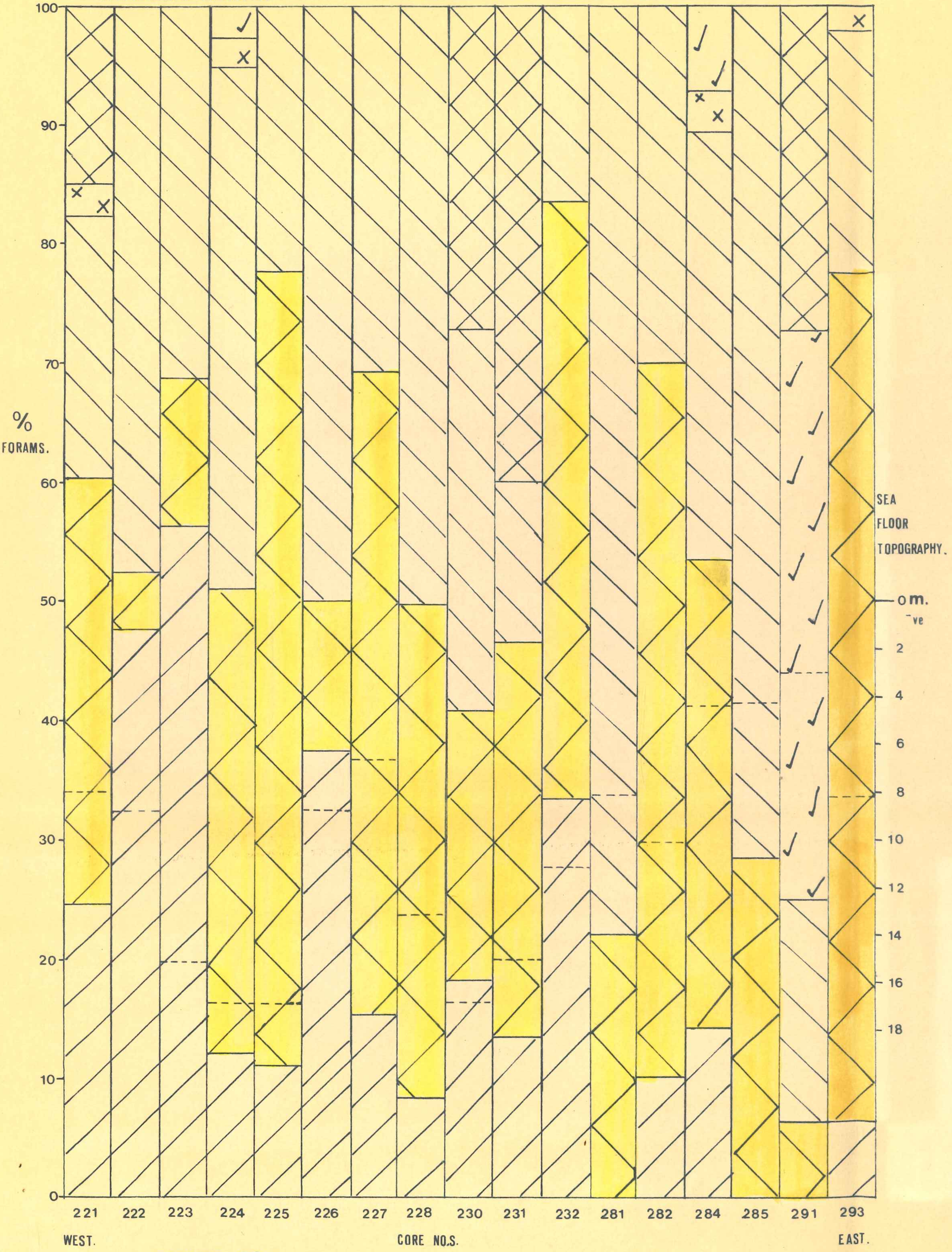


FIGURE 20.

FORAM. DISTRIBUTION.

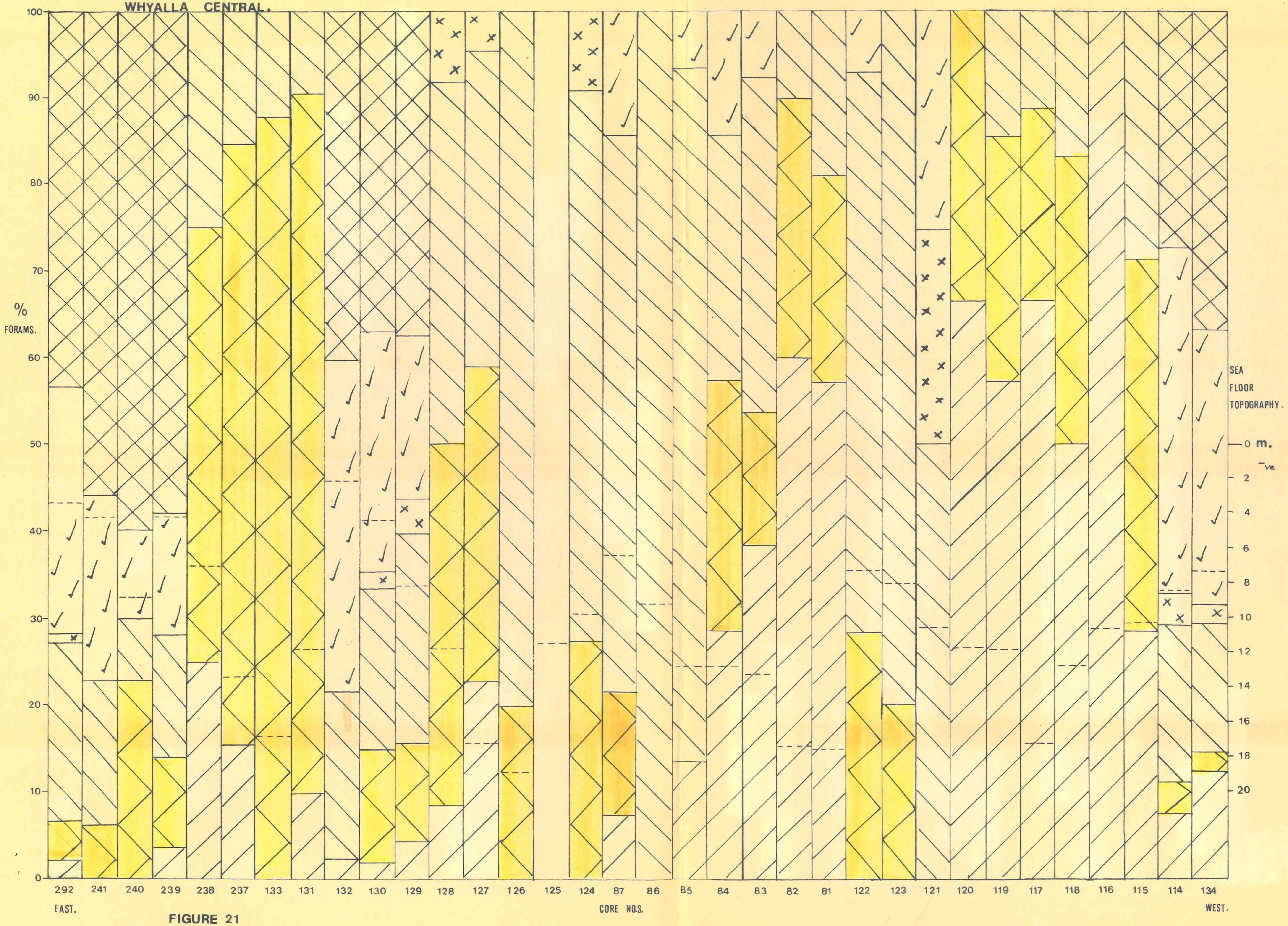


FIGURE 21

PORT AUGUSTA.

FORAM. DISTRIBUTION.

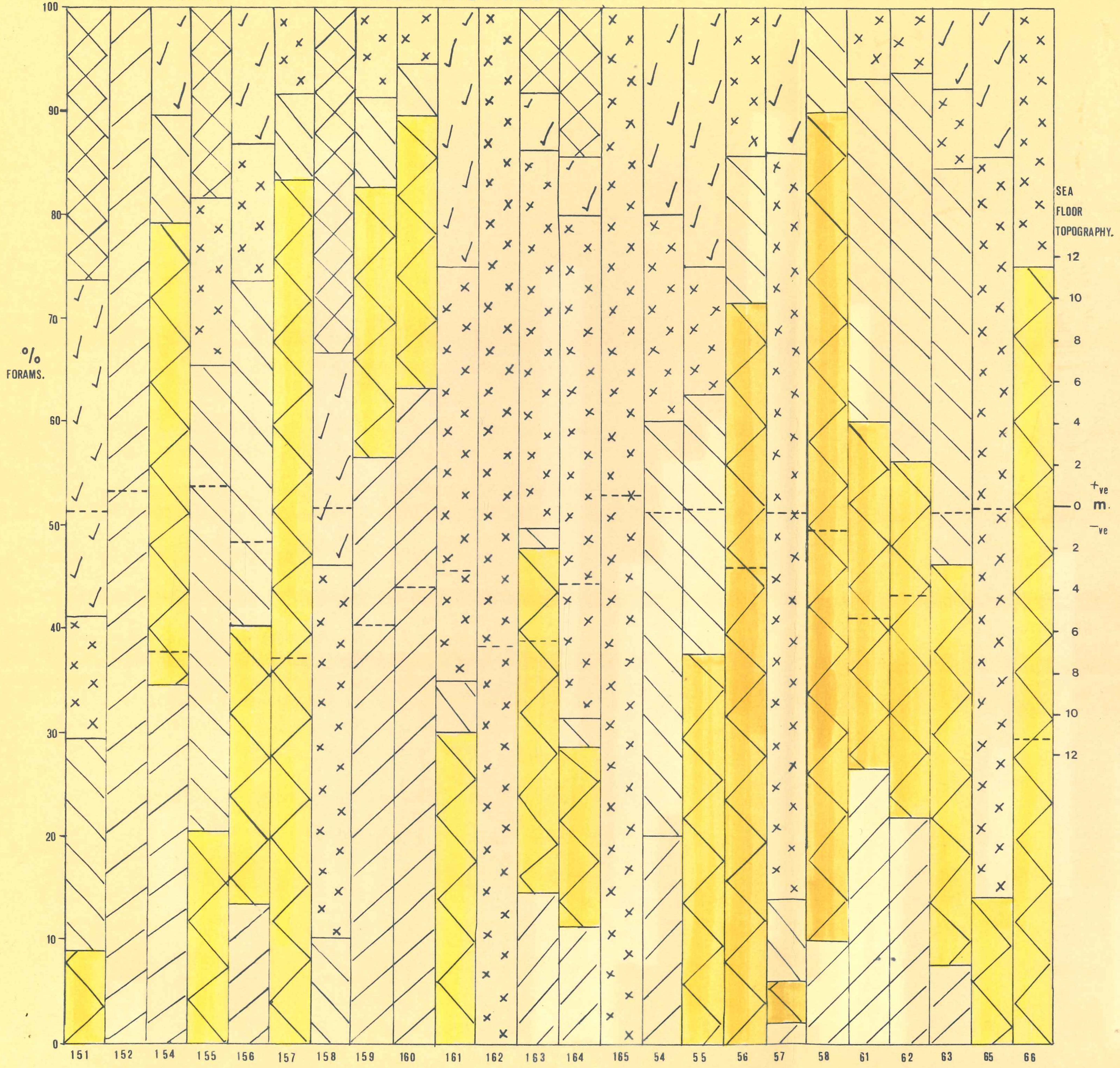


FIGURE 22.

CORE NOS.

studied is the life assemblage or an assemblage of foraminifera thrown together through differential sorting upon transport. To some degree it must be the life assemblage as most of the forms are fresh with no staining, pitting or scouring. Certainly forms with staining, pitting, etc., are present but the fresh forms are more numerous than the fragmentary or weathered forms, especially in the Whyalla region. It is possible that the differential distribution of foraminifera with water depth is actually caused by differential shape-sorting upon transport of the foraminifera within the Gulf. However, as many of the forms are fresh it would seem likely that little transport has taken place and that the foraminifera are in life-assemblage position. It is only in the Port Augusta region where the distribution of foraminifera is biased by the much greater degree of reworking.

It has already been cited, within this paper, that the whole faunal assemblage, to a degree, changes from one region to another. Looking at the depths of water within the two regions, it is obvious that the Port Augusta region is very much shallower, and possibly it is this difference in water depths that is behind at least part of the difference in fauna from one region to another, the difference being in species and genera proportions of fauna, in particular foraminifera.

However, in the study, depth is the only physical parameter known. According to MURRAY, J.W. (1973), it is most probable that depth is not the limiting factor, but perhaps one of the many factors related to depth: hydrostatic pressure, density, light penetration, temperature, pH, oxygen content and carbon dioxide content. Although throughout the literature there are correlations between depth and the distribution of fauna in restricted geographical areas, on a world-wide scale individual species do not appear to be controlled by depth alone.

Within the Gulf, therefore, there are variables associated with depth which govern the distribution of fauna, mainly foraminifera. Hence these variables associated with depth vary from Port Augusta to Whyalla.

7. CONCLUSION

Using the seismic profiles and core data from the Gulf, six sequences have been identified. The oldest, sequence V, is only noted in the seismic record, and only to a minor extent in the core data, but is probably similar to sequence IV. Sequence IV is red in colour and consists of supratidal, intertidal, subtidal and estuarine deposits. The intertidal deposits are coarser than those found in the other sequences. Sequences II and III are identical in that both are basically of sabkha and intertidal facies, with minor subtidal deposits. Sequences V and IV are prolific with III, II and I less so, and II is certainly the least abundant. Sequence IA is grey and of subtidal origin. Sequence IB, only found in the Port Augusta region, is reworked Pleistocene sediment usually consisting of mainly quartz and iron-oxide-stained shell and silt. Sequence VI is non-calcareous, brown, alluvial sediment. Using CHAPPELL (1974) and BLOOM'S et al. (1974), and CHAPPELL and VEEH'S (1978) work, dates of 80,000, 100,000, and 120,000 are suggested for sequences II to IV respectively. It is suspected that sequence V is representative of the 220,000-year transgression. Sequence I is Recent in age, and sequence VI, alluvium of various ages. All of the sequences, except for VI, are transgressive sequences and are dated using this fact.

A study of the Holocene sediment reveals that statistical relationships existing within the fauna and non-organic matter are few. A reciprocal relationship exists between the quartz proportion and the bivalve or foraminifera or $CaCO_3$ proportion. This relationship probably depicts the degree of marine $CaCO_3$ or terrestrial Quartz influence. Both foraminifera, especially the genus Elphidium, and bivalves have a distribution which correlates well with the overall $CaCO_3$ distribution within the Gulf. Hence either of these forms can be used to give an indication of $CaCO_3$ content or marine influence.

Further work carried out on the Holocene sediment showed that the Port Augusta region sediment is dominantly quartz with minor fauna, while the

Whyalla region has greater fauna, in particular bivalves. The reason for the greater quartz content in the north is thought to be greater runoff into the area. Also, greater reworking of the sediment within this region could increase the quartz content with the fines being transported away. It would seem also that, with the smaller percentage of fauna, that the Port Augusta region is not as favourable for faunal life as is the Whyalla region. The greater reworking in this area was probably caused by a slow rise in sea level, yet this reworking is not seen in the Whyalla region. Hence, sea level must have risen at a rapid rate to a point above Whyalla and then slowed down to cause the greater reworking in the Port Augusta region.

Finally, the foraminiferal distribution was studied. The Port Augusta region, with shallower water, has a higher proportion of Peneroplis planatus, while the Whyalla region has few. Within the Whyalla region two assemblages of foraminifera are noted. One assemblage consisting of the genera Elphidium, Discorbis and Nubecularia is prominent on the shoals, while an assemblage of the genera Quinqueloculina, Spiroloculina and Triloculina is prominent in the deeps. This distribution can be related to water depth, but it is thought that one or more of the variables associated with water depth controls the foraminiferal distribution.

ACKNOWLEDGEMENTS

I am indebted to Dr. V.A. Gostin, Dr. J.R. Hails and Dr. A. Belperio who have been funded by the A.R.G.C. I would especially like to thank Dr. V.A. Gostin, my supervisor, for his invaluable assistance and guidance throughout the year. Thanks must also go to Prof. G.E.G. Sargent (Univ.of Qld.) for providing the seismic profiles.

Special thanks must go to my mother, father and sister Ruth who have helped considerably, in many ways, during the year.

Fellow students, Mike Busbridge and Steve Mann must be thanked for their help throughout the year. Special thanks to Frosty, whose help was invaluable, and to J. Cann for his help with the foraminifera.

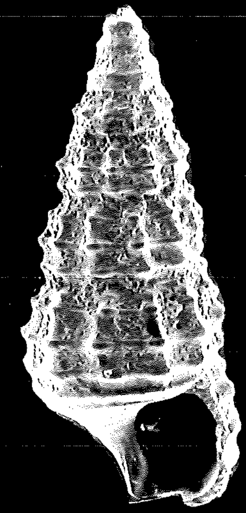
Finally, thanks to Mrs. Sangster for the typing of this thesis.

PLATE 1

on the plate?

the scale bars

			Magnification
1.	Gastropods	*Zeacumantus* sp.	20 x
2.		*Vexillum plicarium*	10 x
3.		*Truncatella vincentiano*	40 x
4.		*Argaliste fugitiva*	50 x
5.	Aragonite needle		70 x
6.	Aragonite needles		10 x
7.	Aragonite needles		20 x
8.	Bryozoan		10 x
9.	Bryozoan		10 x
10.	Echinoid spine		60 x
11.	Echinoid spine		30 x
12.	Echinoid plate		70 x
13.	Coralline algae		10 x
14.	Coralline algae		40 x
15.	Coralline algae		20 x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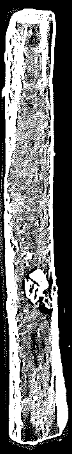
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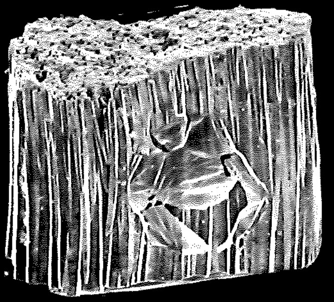
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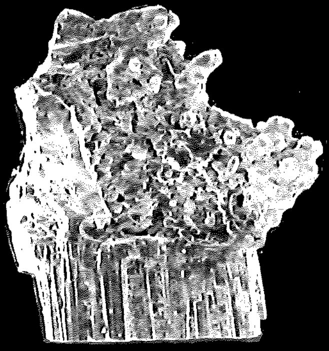
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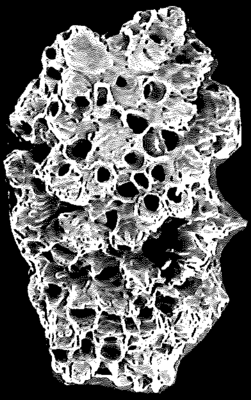
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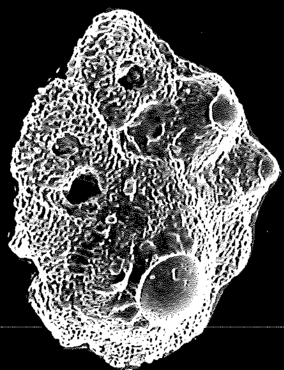
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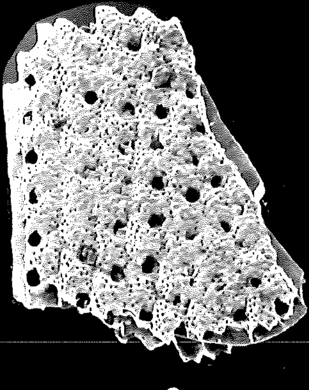
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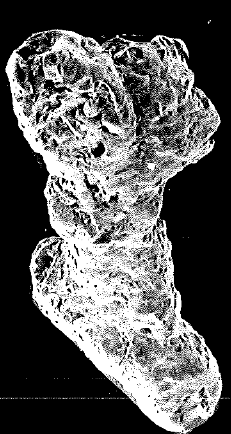
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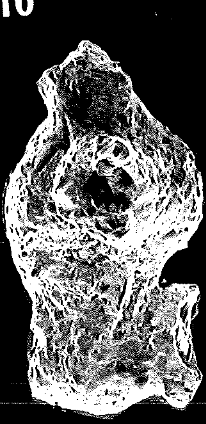
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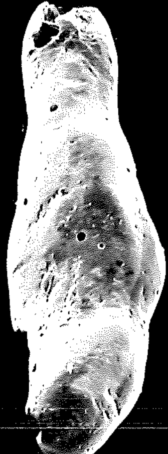
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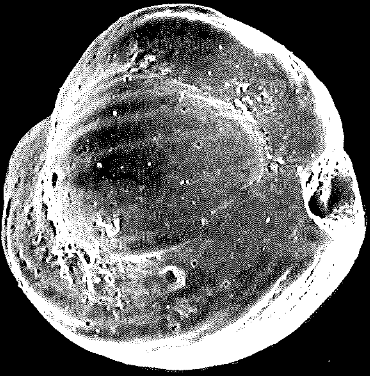
PLATE 2

Foraminifera			Magnification
	1.	*Triloculina striatotrigonula*	100 x
	2.	*Triloculina striatotrigonula*	80 x
	3.	*Triloculina trigonula*	50 x
	4.	*Triloculina oblonga*	70 x
	5.	*Discorbis vesicularis*	50 x
	6.	*Rosalina kennedyi*	60 x
	7.	*Discorbis dimiadatus*	40 x
	8.	*Guttulina pacifica*	60 x
	9.	*Nubecularia lucifuga*	40 x
	10.	*Nubecularia lucifuga*	30 x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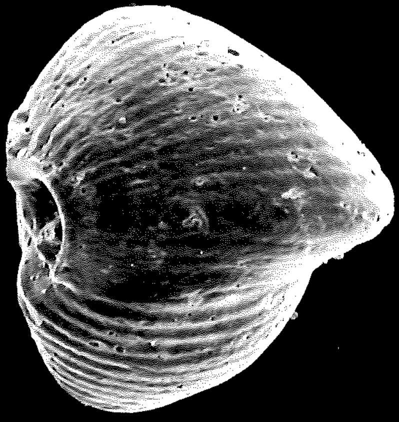
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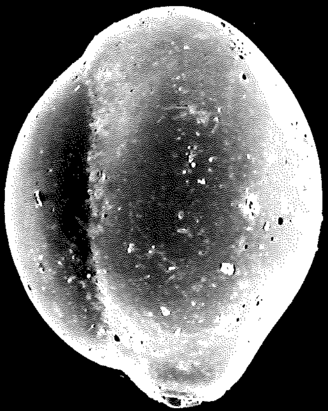
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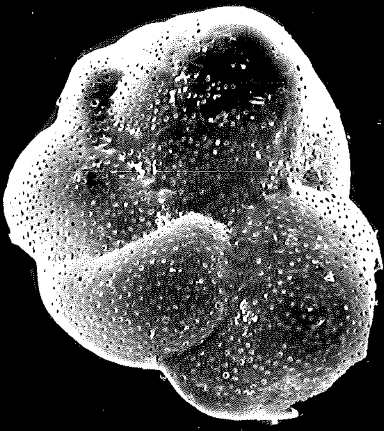
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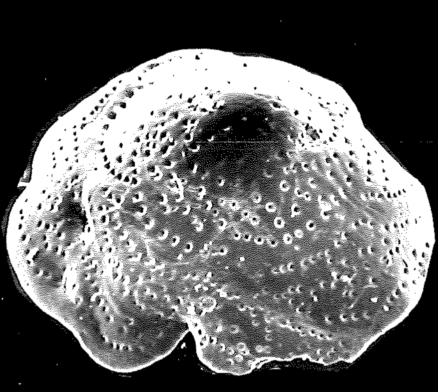
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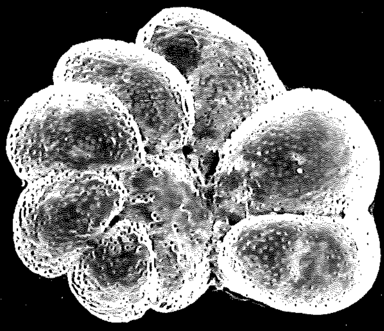
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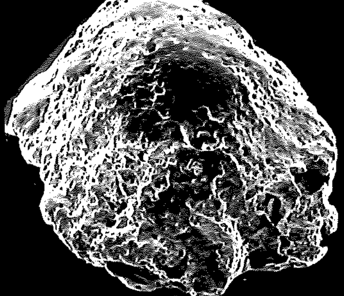
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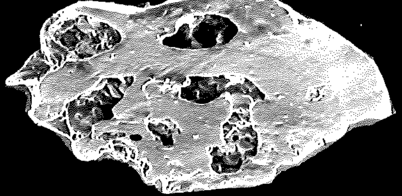
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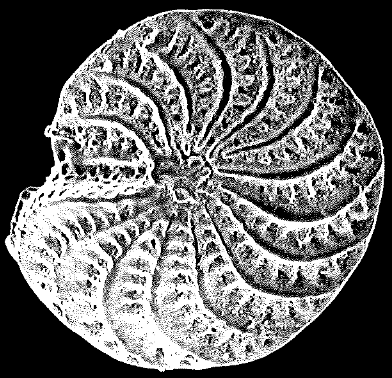
PLATE 3

			Magnification
Foraminifera	1.	Elphidium macellum	80 x
	2.	Elphidium macellum	70 x
	3.	Elphidium pseudonodosum	80 x
	4.	Quinqueloculina tropicalis	50 x
	5.	Spiroloculina angusteoralis	50 x
	6.	Spiroloculina communis	50 x
	7.	Spirolina aciculoris	40 x
	8.	Peneroplis planatus	30 x
	9.	Cribrobulima polystoma	40 x
	10.	Miliolinella subrotunda	110 x



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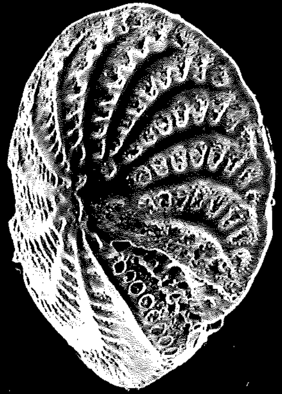

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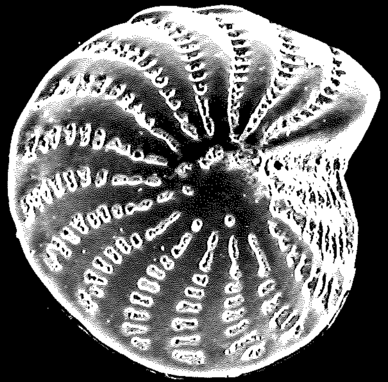

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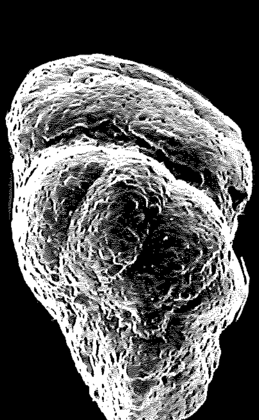

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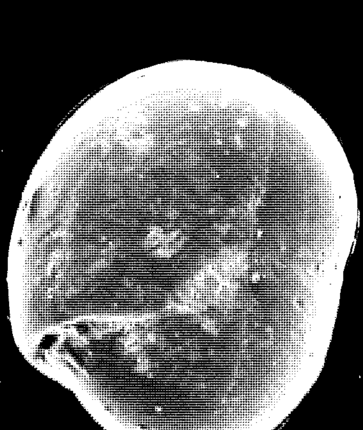

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APPENDIX 1: METHODS OF STUDY

1.A.	Geophysical equipment and technique
1.B.	Vibrocoring and core preparation
1.C.	Size analysis
1.D.	$CaCO_3$ analysis

APPENDIX 1.A.

GEOPHYSICAL EQUIPMENT AND TECHNIQUE

1) An E.P.C. 4100 seismic reflection profiling recorder.

2) A MAG 30V. transducer with baffle.

3) A SR555 transmitter on 185 joules setting, firing 2 per second.

4) A recorder set positive phase, 1 of 4 on 125 ms. sweep speed; gain 100.

5) A channel splitter SRCS Mk2 - Channel A positive phase 132 gain and Channel B rectified signal 55 gain (filters Ch.A 240 H_z; Ch.B 430 H_z).

6) A hydrophone 20 element 45 OB pre-amplifier; 300 H_z high pass filter.

The energy source used in this study was the Boomer. Energy is produced when two plates are driven apart suddenly by a heavy surge of electrical current through a coil on one of the plates which generates eddy currents in the other plate, resulting in it being suddenly repelled. The Boomer is a Scheidegg Monopulse Acoustic Generator, type MAG 30V as mentioned in (2) above.

The hydrophones are mounted in a long streamer towed behind the seismic ship at a depth between 1 and 2 m.

Shooting takes place at a speed of the order of 6 knots. The transects where shooting took place are on FIG.2.

APPENDIX 1.B.

VIBROCORING AND CORE PREPARATION

The vibrocorer used for obtaining undisturbed samples consists of a submersible coring rig with power unit which, in operation, is linked to the surface by a power cable from a shipboard generator and lifting cable. A T-shaped frame maintains the core barrel in an upright position during coring.

The vibrocorer used is capable of procuring 4.5 m. cores. The plastic liner tubes containing vibrocores were cut into 1 m. lengths in the field and transported in a vertical position to the laboratory in order to minimize disturbance.

In the laboratory, they were opened by making longitudinal cuts through the plastic liner with a machine especially designed just to cut the plastic liner and not the sediment. The sediment itself is then cut with a pallette knife. The two halves of the core are treated differently according to the information required from sedimentological analysis. Usually, one half is used for grain-size and $CaCO_3$ analysis, whilst the other half is used for descriptive and photographic purposes. 75 cores were analyzed and described.

APPENDIX 1.C.

SIZE ANALYSIS

1. PREWEIGHED AND NUMBERED 250 ML. BEAKERS.
2. DRIED AND PREWEIGHED 15.0 CM. AND 12.5 CM. NO.54, HARDENED, FILTER PAPER.
3. PLACE IN BEAKERS APPROX. 5 TO 10 GRAMS OF SAMPLE.
4. ADD DISTILLED WATER, ALLOW TO STAND 2 HOURS, SIPHON OFF, AND DRY IN OVEN SET AT APPROX. 100°C.
5. COOL AND WEIGH (SAMPLE WEIGHT).
6. ADD 110 TO 150 ML. OF Na.HEXA.META.PHOSPHATE, STIR UNTIL SAMPLE WELL DISPERSED AND THEN WARM IN OVEN OVERNIGHT. OVEN AT APPROX.80°C.
7. SIEVE THROUGH SAND 63 . AND COARSE SILT 38 . SIEVES. COLLECT FINE SILT AND CLAY IN BEAKER, STIR AGAIN AND ALLOW TO SETTLE HALF AN HOUR.
8. THEN FILTER FINER FRACTION THROUGH 15 CM. NO.54. FILTER PAPER (FINE SILT).
9. DRY FILTER PAPER WITH SEDIMENT, IN OVEN AT APPROX. 100°C. WEIGH.
10. ADD WEIGHTS OF SAND, COARSE SILT AND FINE SILT AND THEN SUBTRACT THIS FIGURE FROM SAMPLE WEIGHT. THIS LEAVES WEIGHT OF CLAY.

NOTE: Samples were taken from the top and bottom of cores and also from lithological units in which the author was interested. From the sample, 5 to 10 grams was used for grain-size analysis, and 2 to 3 grams was used for carbonate analysis.

APPENDIX 1.D.

$CaCO_3$ ANALYSIS

1. PREWEIGHED AND NUMBERED 50 ML. BEAKERS.
2. PLACE 2 TO 3 GRAMS IN BEAKERS.
3. ADD DISTILLED WATER, ALLOW TO STAND FOR 2 HOURS, SIPHON OFF AND LET DRY IN OVEN AT APPROX. 100°C.
4. COOL AND WEIGH TO 2 DECIMAL PLACES. (WEIGHT OF SAMPLE).
5. ADD H.CL. UNTIL DIGESTED, AND THEN SIPHON OFF.
6. WASH AND ALLOW TO STAND FOR 2 HOURS AND THEN SIPHON SAMPLE 3 TIMES.
7. DRY AND REWEIGH.
8. PERCENTAGE $CaCO_3$ = WEIGHT LOSS/ORIGINAL WEIGHT X 100.

APPENDIX 2: RESULTS FROM METHODS OF STUDY

2.A.	Selected descriptions of submarine vibrocores
2.B.	Grain-size analysis
2.C.	$CaCO_3$ analysis
2.D.	Sand and organism count results

APPENDIX 2.A.

SELECTED DESCRIPTIONS OF SUBMARINE VIBROCORES

ABBREVIATIONS USED

FORAMS.	FORAMINIFERA
T.	GENUS TRILOCULINA
E.	" ELPHIDIUM
D.	" DISCORBIS
Q.	" QUINQUELOCULINA
S.	" SPIROLOCULINA
P.	" PENEROPLIS
N.	" NUBECULARIA
BI.	BIVALVE
T.G.	TURRETED GASTROPOD
N.T.G.	NON-TURRETED GASTROPOD
ECH.SPINE	ECHINOID SPINES
COR.ALG.	CORALLINE ALGAE
BRY.	BRYOZOA
A.NEEDLES	ARAGONITE NEEDLES
COMM.SHELL	COMMINUTED SHELL
QTZ.	QUARTZ
P.S.	POORLY SORTED
M.S.	MODERATELY SORTED
W.S.	WELL SORTED
R.	ROUNDED
S.R.	SUB-ROUNDED
S.A.	SUB-ANGULAR
A.	ANGULAR
POL.	POLISHED
FeOx	IRON OXIDE
CALC.	CALCAREOUS
>	GREATER
<	LESS
THRU	THROUGH
%	PERCENTAGE
↓	WITH DEPTH, OR, TOWARDS BASE
HOL.	HOLOCENE
PLEIS.	PLEISTOCENE

APPENDIX 2.A.

SELECTED DESCRIPTIONS OF SUBMARINE VIBROCORES

LINE II WHYALLA CENTRAL

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG115			
0-15	FORAMS.-T., Q.AND S., COARSE BI.HASH c̄ T.G.HASH AND ECH. SPINES, A.NEEDLES, COR.ALG., AND COMM.SHELL. SMALL % GREY STAINING. PALE GREY/BROWN SILT. SHELLY SILT. ORGANIC MATTER PRESENT.	PRESENT BED LOAD	HOL.
15-105	FORAMS.-FEW-Q.AND S. AND BI. HASH. COARSE SHELL.MAINLY GREY SILT. ORGANIC MATTER PRESENT.	SUBTIDAL	
105-165	FORAMS.-T., Q.AND S. MAINLY, WITH FEW E. COARSE BI.HASH AND T.G.s, ECH.SPINES AND COMM.SHELL 60% SHELL, 5% QTZ. GREY/GREEN IN COLOUR. NODULES THRU.OUT. > SILT ↓ NO WHOLE SHELLS.	INTERTIDAL	PLEIS.
165-240	MAINLY COARSE SHELL. BI. HASH, T.G.'s, N.T.G.'s, ECH. SPINES AND COMM.SHELL. WHOLE BI.s. SILT CHANGES COLOUR FROM GREEN/BROWN AT TOP TO PALE BROWN/WHITE AT BASE. NODULOSE.	SUBTIDAL	
240-400	QTZ.CONTENT VARIES FROM 10% AT TOP TO 40% AT BASE. M.S., S.R.-S.A., POL., FeOx STAIN. PLUS SILT. GREEN/WHITE AT TOP TO YELLOW/BROWN AT BASE. COMM.SHELL-5% MAXIMUM. MAINLY SILT. OXIDIZED.	SUPRATIDAL	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG117			
0-170	FORAMS.-Q.AND S. BI.HASH, T.G.s AND A.NEEDLES PLUS COMM.SHELL. GREY STAINING ON SHELL. AVERAGE OF 70% SILT-GREY. SHELLY SILT.	SUBTIDAL	HOL.
170-247	FORAMS.-Q.AND S. VERY COARSE BI.HASH AND T.G.s AND COMM. SHELL. QTZ-P.S., S.A.-S.R., POL AND FROSTED, FeOx STAIN SILT-OXIDIZED, YELLOW/ORANGE COLOUR. MEAN PERCENTAGES OF 35% SHELL, 25% QTZ., 40% SILT WHOLE BIVALVES.	SUBTIDAL	PLEIS.
247-260	COARSE BI.HASH c̄ WHOLE VALVES AND COMM.SHELL. FINE, OFFWHITE SILT.	BEACH	
260-315	EXTREMELY FINE CALC. SILT SLIGHTLY OXIDIZED.	SUPRATIDAL	
315-330	5% SHELL, 55% QTZ.-P.S., S.A.-S.R., POL.AND FROSTED, FeOx STAINED RED. WHITE SILT.	INTERTIDAL	
330-345	IDENTICAL TO 260-315	SUPRATIDAL	
345-365	IDENTICAL TO 315-330	INTERTIDAL	

NOTE: 347 to 365 ONE SEQUENCE. SUPRATIDAL WITH INTERTIDAL PROBABLY SPRING OR STORM-TIDE DEPOSITS ON SUPRATIDAL FLAT.

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG119			
0-100	FORAMS.-Q.AND S. MAINLY BI. HASH c̄ FEW T.G.s. 10% SHELL 90% FINE GREY SILT.	PRESENT BED LOAD	HOL.
100-130	FORAMS.-T.,Q.,S.,E., AND P. ECH.SPINES, T.G.s, AND BI. HASH. SEA GRASS PRESENT. 50% SHELL, 50% SILT.	SUBTIDAL	
130-160	FORAMS.-FEW-E., Q., AND S. BI.AND T.G.HASH, COR.ALG., AND BRY.		
	QTZ. - P.S., S.R.-S.A., POL. FeOX STAINING ON QTZ AND SILT. SILT-VERY FINE, GREY/WHITE. 45% SHELL, 15% QTZ, AND 40% SILT.	INTERTIDAL	PLEIS.
160-185	VERY COARSE BI.HASH AND T.G.s. VERY PALE, ORANGE/BROWN, NODULAR, SILT ADHERES TO THE SHELL. 50% SHELL, 50% SILT.	INTERTIDAL	
185-215	FORAMS.-MANY-T.,Q., AND S. WITH BI.HASH AND T.G.s. 30% SHELL.70% VERY FINE, OFF WHITE SILT.	SUPRATIDAL/ INTERTIDAL	
215-295	FORAMS.-T.,Q.AND S. COARSE BI. AND T.G.HASH AND COMM.SHELL. QTZ.-P.S., S.R.-S.A., POL.AND FROSTED, FeOX STAIN. SILT-SLIGHTLY OXIDIZED,ORANGE/ YELLOW COLOUR. 40% SHELL, 20% QTZ., AND 40% SILT.	SUBTIDAL/ INTERTIDAL	
295-335	SIMILAR TO 215-295 BUT > SILT AND NO COARSE SHELL. > QTZ. AND > FINE SHELL. OXIDIZED PINKY/BROWN COLOUR.	INTERTIDAL	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG121			
0- 20	FORAMS.-T.,S.AND Q. ECH.SPINES, BI.HASH AND FEW T.G.s.AND COMM. SHELL. OFFWHITE, PALE BROWN SILT. MAINLY SHELL. SHELLY SILT.	DUMPED AFTER DREDGING	PLEIS.
20-100	COARSE T.G.s, BI.HASH, ECH. SPINES AND COR.ALG. 70% GREY SILT. ORGANIC MATERIAL PRESENT. COARSE NODULES AT BASE.	ESTUARINE	HOL.
100-200	FORAMS.-T.,S.AND Q. ECH.SPINES, COARSE BI.AND T.G.HASH AND COMM.SHELL. OFFWHITE, PALE BROWN SILT. MAINLY SHELL, COARSE SHELL. NODULOSE.	SUBTIDAL	PLEIS.
200-345	MARGINOPORA, T.G.s, N.T.G.s., ECH.SPINES, BI.HASH AND AN ANADARA TRAPEZIA (BROKEN) AND COMM.SHELL. 20% QTZ., P.S.ALTHOUGH MAINLY FINE GRAIN-SIZE, S.R.-S.A., POL.AND FeOx STAINED. > COARSE SHELL↓, < SILT ↓	INTERTIDAL	

LINE 33 WHYALLA CENTRAL

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG83			
0-125	FORAMS.-Q.AND S. BI.HASH, T.G.s AND A.NEEDLES. 30% VERY FINE SHELL HASH. 70% GREY/BROWN SILT, PLUS ORGANIC MATERIAL.	SUBTIDAL	
125-145	PROLIFIC FORAMS.-E.,P.,Q.AND S. BI, T.G.AND N.T.G.HASH. BLUE/GREY STAIN ON SHELL. 70% SHELL AND 30% ORGANIC RICH SILT. GREY COLOUR.	SUBTIDAL	HOL.
145-375	FORAMS.-T.,Q.AND S. VERY COARSE BI.HASH AND MINOR T.G.s AND ECH. SPINES. MEAN % OF 70% SHELL. SMALL % QTZ. CREAMY/WHITE SILT. MEAN % OF 30% SILT.	SUBTIDAL	PLEIS.
375-395	SMALL % SHELL. 50% QTZ. REST WHITE SILT.	INTERTIDAL	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG85			
0- 35	FORAMS.-T.,E.,Q.AND S. BI.HASH, T.G.s, N.T.G.s, ECH.SPINES, AND COR.ALG. COR.ALG.VERY PROMINENT. GREY STAINING ON SHELL. SEAGRASS. 5% GREY SILT. SHELLY SILT.	SUBTIDAL	HOL.
35-120	25% BI.HASH, N.T.G.s AND ECH. SPINES. 50% QTZ., P.S.,S.A.-S.R., POL. 25% ORANGE/BROWN SILT. SMALL % ORGANIC MATTER.	INTERTIDAL (BEACH)	PLEIS.
120-240	APPROX.5% QTZ., REST FINE SHELL AND SILT. NODULOUS. ORANGE/BROWN ↓ RED/BROWN SILT.	SUPRATIDAL	
240-310	BI.HASH, T.G.s, N.T.G.s, COR. ALG., AND ECH.SPINES. APPROX.50% SHELL AT TOP TO 80% SHELL AT BASE. COARSE SHELL. REST A PALE OFFWHITE COLOURED SILT.	INTERTIDAL? SUBTIDAL	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG86			
0-158	FORAMS.-E.,T.,S.AND Q. BI.HASH, T.G.s, ECH.SPINES, AND COR.ALG. PLUS LIGHT GREY↓DARK GREY. >SILT AND > ORGANIC MATTER ↓ .	SUBTIDAL	HOL.
158-200	NODULAR PALE BROWN SILT. FEW COARSE FRAGMENTS.	SUPRATIDAL	PLEIS.
200-225	E.,Q,AND S. BI, T.G.AND N.T.G. HASH. PLUS ECH.SPINES AND COR. ALG. REST KHAKI/GREEN SILT. 40% SHELL. SILT ADHERES TO SHELL.	INTERTIDAL/ SUBTIDAL?	
225-260	FORAMS.-E.,S.AND Q. BI., T.G.s, ECH.SPINES AND COR.ALG. 100% SHELL. COARSE SHELL. NODULES.	INTERTIDAL	
260-283	ORANGE/BROWN NODULAR SILT.	SUPRATIDAL	
SG126			
0- 15	FORAMS.-T.,Q.AND S. BI.HASH PLUS COR.ALG., ECH.SPINES AND A.NEEDLES. BASICALLY BI.HASH AND FINE, LIGHT BROWN SILT. SHELLY SILT.	DUMPED AFTER DREDGING	PLEIS.
15- 90	FORAMS.-T. BI.HASH AND FEW T.G.s 30% SHELL 70% GREY SILT. BURROWS PRESENT.	SUBTIDAL	HOL.
90-105	CALC.FINE, PALE, YELLOW SILT.	SUPRATIDAL	PLEIS.
105-204	FORAMS.-T.,Q.AND S. BI.HASH, T.G.s, N.T.G.s, COR.ALG., ECH. SPINES AND BRY. 70% SHELL. 10% QTZ. M.S., S.R., POL.AND FeOx STAINED. 20% ORANGE/BROWN SILT. CALCAREOUS CRUST AT BASE. NODULES THRU.OUT.	INTERTIDAL	
204-280	WHITE CALC.CLAY.	SUPRATIDAL	
280-360	99% QTZ. W.S., S.R., POL.AND FROSTED. SLIGHTLY OXIDIZED	AEOLIAN	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
	COARSE NODULES AT 315 CM. TOWARDS BASE QTZ.BECOMES LESS WELL SORTED AND SILT PROPORTIONS BUILD UP TO 20%. GREEN SILT.		
SG129			
0-160	FORAMS.-T.,E.,Q.AND S. COARSE BI.HASH AND T.G.s. COR.ALG.AND A.NEEDLES. SEAGRASS FIBRE PRESENT. 65% SHELL. REST GREY SILT. SILT % INCREASES ↓ .		HOL.
160-200	FORAMS.-T. BI., T.G., A.NEEDLE, COR.ALG., AND WORM TUBE SHELL HASH. 60% SHELL AND ORGANIC MATERIAL. GREY/BROWN SILT. SHELLY SILT.	INTERTIDAL	PLEIS.
200-270	FORAMS.-T.AND E. COARSE T.G.s, BI.s, COR.ALG.AND FINE COMM. SHELL. NODULOSE. A.NEEDLES ALSO PROMINENT. 50% SHELL. 50% BROWN SILT.	INTERTIDAL	
270-390	FORAMS.-T. BI., T.G., A. NEEDLE, COR.ALG.HASH. SHELL % 40% AT TOP BUT AT BASE IS LESS THAN 5%. QTZ.-2 POPULATIONS. FINE, S.R.-S.A., POL., AND COARSE S.R.-R. POL. 10% QTZ.AT TOP INCREASES TO 30% AT BASE. ORANGE TO RED/BROWN SILT. NODULOSE. OXIDIZED.	SUPRATIDAL	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG132			
0-130	FORAMS.-E.,T.,Q.AND S.-FEW. MAINLY SHELL HASH-BI., T.G.s, COR.ALG., A.NEEDLES, AND WORM TUBES. SEA GRASS PRESENT. SMALL % PALE-GREY SILT. SILT AND ORGANIC CONTENT INCREASE TO AN EXTENT THAT AT BASE 5% SHELL, 10% ORGANIC MATTER, 85% GREEN/GREY SILT.	SUBTIDAL	HOL.
130-155	10% SHELL HASH-FORAMS., A. NEEDLES AND WORM TUBES ARE PROMINENT. 10% QTZ.-P.S., S.R.-S.A., POL. ORGANIC MATTER PRESENT. 80% ORANGE/BROWN SILT.	PALEOSOL -SUBTIDAL	PLEIS.
155-202	≥ 40% SHELL HASH-SIMILAR TO ABOVE BUT COR.ALG. PROLIFIC. SILT ADHERES TO SHELL AND QTZ. LARGE T.G. BROWN SILT.	SUBTIDAL	
202-300	FORAMS.-T.,E.,S.AND Q. SIMILAR TO 155-202 BUT > SHELL. A.NEEDLES-PROLIFIC. LARGE BI.s. AND T.G.s. COR.ALG. ALSO PROMINENT. SMALL T.G.s & N.T.G.s ALSO. NOLULES. QTZ.-P.S., S.A.-S.R., POL.-10%. 10% SILT. 80% SHELL. OFFWHITE COLOUR. BROKEN ANADARA TRAPEZIA PRESENT.	INTERTIDAL	
300-360	30% SILT AT TOP INCREASING TO 70% AT BASE. QTZ.VERY FINE. SHELL AND QTZ. %5 DECREASE c̄ DEPTH. BOTH SILT AND QTZ.OXIDIZED. DEPOSIT GREEN AT TOP, BROWN/GREEN	SUPRATIDAL	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG132 CONTD.	AT BASE. SMALL % OF BLACK-STAINED SHELL AT TOP. NO COARSE SHELL.		
SG237			
0- 25	FORAMS.-T.,BI.,N.T.G.AND T.G. HASH AND A.NEEDLES. QTZ.-P.S. S.A.-S.R., POL., SOME FROSTED. 10% MAXIMUM. 10% GREY SILT. 80% SHELL.	SUBTIDAL	HOL.
25-100	FORAMS.-T.-FEW. BI & T.G.HASH. ALSO A.NEEDLES ARE PROMINENT. NODULAR. 70% SHELL AT TOP DOWN TO 30% SHELL AT BASE. 0% QTZ. AT TOP INCREASING TO 40% QTZ. AT BASE. PALE ORANGE AT TOP, THRU TO PALE GREY AT BASE.	INTERTIDAL	PLEIS.
100-140	10% SHELL HASH. 35% QTZ., P.S., S.R.-S.A., POL. AND REST CALC. GREEN CLAY. PINKY-BROWN COLOUR AT BASE. NODULES.	SUPRATIDAL/ INTERTIDAL BOUNDARY	
140-255	10% SHELL HASH MAXIMUM. ECH. SPINES AND A.NEEDLES. 40-50% QTZ.-M.S., S.A.-R., POL.AND FeOx STAINED. REST WHITE, CALCAREOUS, NODULAR SILT.		
255-340	FORAMS.-T.,A.NEEDLES AND BI. HASH. 30% SHELL. 60% QTZ.-P.S., S.R., POL., FeOx STAINED. -10% PALE-ORANGE SILT. FINE ROCK FRAGMENTS ALSO PRESENT.	INTERTIDAL	
340-415	BROWN/RED NON-CALCAREOUS CLAY. NO FAUNA NOR QTZ. NOTE: ALLUVIAL FAN OR DECALCIFIED SUPRATIDAL DEPOSIT. 100-140: OXIDIZED AND THEN REDUCED SECTION OF 100-255 SUPRATIDAL/INTERTIDAL DEPOSIT.	ALLUVIAL FAN	

LINE 30 WHYALLA NORTH

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG225			
0-105	FORAMS., T.G.s, ECH.SPINES, A.NEEDLES AND BI.HASH. GREY SILT. > SILT ↓.	SUBTIDAL	HOL.
105-180	FORAMS., T.G.s, A.NEEDLES AND BI.HASH AND 15% P.S., S.R., POL.AND FROSTED, FeOx-STAINED QTZ. OFFWHITE AT TOP TO YELLOW/BROWN AT BASE. GREATER OXIDATION WITH DEPTH.	INTERTIDAL	PLEIS.
180-225	GREATER THAN 80% QTZ.-W.S., S.R., FeOx STAINED. RED SILT. NO SHELL.	AEOLIAN	
225-240	FEW FORAMS. AND 25% QTZ.-M.S., R., POL. 75% WHITE SILT.	SUPRATIDAL	
240-270	SMALL % SHELLY MATERIAL. < 5% QTZ. LARGE S.A. ROCK FRAGMENTS. REST NODULOSE. PALE-GREEN SILT.	SABKHA	
270-310	HIGHLY CALC., WHITE CLAY.	SABKHA	
310-342	COARSE BROKEN SHELL AND 50% P.S., S.R.-S.A., FROSTED AND POL. AND FeOX-STAINED QTZ. SLIGHTLY OXIDIZED. LESS CLAY ↓.	BEACH	
342-375	80% W.S., S.R. FeOx-STAINED QTZ. 20% SILT AND ECH.SPINES. PINK IN COLOUR.	AEOLIAN	
375-425	COARSE ROCK FRAGMENTS AT BOUNDARY. WHITE CALC.CLAY. SMALL % QTZ.	SABKHA	
425-430	IDENTICAL TO 342-375.	AEOLIAN	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG227			
0-100	FORAMS.-T.,E.,Q.AND S. WHOLE T.G.s AND BI.s AS WELL AS BI. AND T.G.HASH. GREY STAINING ON SHELL. 10% M.S., S.R.-R., POL.QTZ. 80% SHELL. 10% GREY SILT. > SILT, < QTZ. ↓ .	SUBTIDAL	HOL.
100-140	< 5% SHELLY MATERIAL AND ORGANIC MATERIAL. 40% P.S., S.R.-R., POL.QTZ. FeOx STAINED. REST GREY/BROWN SILT.	PALEOSOL	PLEIS.
140	AVERAGE OF 40% SHELL INCREASING AT BASE. A.NEEDLES, BI.s AND T.G.s, WHOLE AND HASH. MEAN OF 20% M.S., S.R.-R., POL., QTZ. REST NODULAR, WHITE, CALC.CLAY.	INTERTIDAL	
SG231			
0-100	FORAMS., BI.s, T.G.s WHOLE AND HASH, AND GREY SILT. GREY SHELLY SILT.	SUBTIDAL	HOL.
100-135	SMALL % SHELL HASH-BI.s AND T.G.s. REST QTZ. W.S., S.R.-S.A., FROSTED QTZ. BROWN IN COLOUR.	AEOLIAN	PLEIS.
135-160	5% QTZ. REST WHITE, CALC., NODULOSE SILT.	SABKHA	
160-295	QTZ. AND SHELL. SHELL-FORAMS., ECH.SPINES, T.G.s AND BI.s. QTZ.-M.S., S.A.-S.R., POL.AND FeOx STAINED. PALE YELLOW COLOUR AT TOP TO PINK AT BASE.	BEACH	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG233			
0- 40	COARSE SHELL HASH-FORAMS., BI.s, A.NEEDLES, T.G.s. HIGH % OF SHELL STAINED BLACK, AND SILT. GREY SHELLY SILT.	SUBTIDAL	HOL.
40-120	LARGE NODULES PROMINENT.-QTZ., SHELL AND CALC.CEMENT. 50% QTZ. SHELL-BI.s, T.G.s, AND FORAMS. MAINLY, AND YELLOW/BROWN SILT. BROWN IN COLOUR.	INTERTIDAL	PLEIS.
SG284			
0-110	COARSE SHELL HASH-BI.s, FORAMS., T.G.s, WHOLE AND HASH. SEA GRASS, AND SILT. > SILT ↓ . GREY SHELLY SILT.	SUBTIDAL	HOL.
110-380	COMM.SHELL AND FINE-GRAINED QTZ. MOSTLY CALC.CLAY. 110-275: WHITE IN COLOUR. 275-380: YELLOW/BROWN WITH RED PATCHES.	SABKHA	PLEIS.
SG285			
0-150	COARSE SHELL-FORAMS., T.G.s, N.T.G.s, BI.s, AND A.NEEDLES. BLACK STAINING ON SHELL. SEA GRASS PRESENT, AND SILT. SHELLY GREY SILT. NOTE: ZONES WHERE BROWN IN COLOUR AND NODULES PRESENT.	SUBTIDAL	HOL.
150-320	2% SHELL HASH-BI.s, T.G.s, AND FORAMS. 30% M.S., S.A.-S.R., POL., FINE QTZ. BURROWS. BEST SILT-GREEN IN COLOUR. 150-255. GREATER OXIDATION TO A RED COLOUR 255-320. NOTE: ORIGINALLY OXIDIZED CLAY (RED) REDUCED AT TOP TO GREEN COLOUR.	SUPRATIDAL	PLEIS.

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG294			
0- 13	60% SHELL. FORAMS.-T.,E.,S. AND Q. BI.HASH AND T.G.s. 40% GREY SILT.	SUBTIDAL	HOL.
13- 40	25% SHELL HASH-BI.s, T.G.s AND FEW FORAMS. 25% P.S., S.R.-R., POL.QTZ. 50% RED SILT. BEDS AS DESCRIBED ABOVE WITH BEDS OF JUST RED SILT IN BETWEEN.	INTERTIDAL	PLEIS.

LINES 56, 57, 58, 59, 60 PORT AUGUSTA

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG 54			
0- 20	10% BI., T.G. AND N.T.G. HASH. 80% QTZ.-W.S., R.-S.R. AND POL. AND 10% SEA GRASS.	PRESENT BED LOAD	
20-150	20% BI., T.G. AND N.T.G. HASH. 60% FINE QTZ.-W.S., R.-S.R. POL. 15% BROWN SILT & 5% SEA GRASS.	ESTUARINE	HOL.
150-250	10% BI.HASH. > SHELL AT BASE, INCLUDING COARSE BI.s, N.T.G.s, T.G.s, AND ANADARA TRAPEZIA. AT TOP 50% QTZ., 40% RED SILT. THESE %s DECREASE WITH DEPTH. QTZ.-P.S., R.-S.R., POL.AND FROSTED AND FeOx STAINED.	INTERTIDAL	PLEIS.
250-310	FORAMS.-E. 10% SHELL INCLUDING ECH.SPINES, BI.AND T.G.HASH. 45% QTZ.-FeOx STAINED AND 45% GREEN SILT. HEAVILY BURROWED IN SECTIONS.	SUPRATIDAL or ESTUARINE or INTERTIDAL	
310-330	FORAMS.-Q.AND S. BI.HASH, COR. ALG., ECH.SPINES AND ANADARA TRAPEZIA AND MARGENOPORA. 50% SHELL. 25% QTZ. AND 25% CREAM-COLOURED SILT.	INTERTIDAL	
330-380	PALE-GREEN AND YELLOW SILT WITH COMM.SHELL. ROOTIETS PRESENT.	SUPRATIDAL	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG 55			
0- 60	FORAMS.-E.,P. AND D. BI.HASH, ECH.SPINES AND T.G.s. 40% SHELL, MOSTLY COMM.SHELL. 20% SEA GRASS. 40% QTZ.-W.S., S.R.AND POL.	SUBTIDAL	HOL.
60-110	FORAMS.-P. BI.HASH. 5% SHELL. 50% QTZ.-P.S., R.-S.A., POL. AND FROSTED AND FeOx STAINED, AND 50% PALE-ORANGE/BROWN SILT.	INTERTIDAL	PLEIS.
110-165	SIMILAR TO ABOVE BUT > SHELL. LARGE BI.s, T.G.s AND N.T.G.s. WHOLE FORMS FOUND.	SUBTIDAL	
165-200	FORAMS.-Q.AND S. 10% FINE SHELL HASH OF BI.s, N.T.G.s AND T.G.s. 45% QTZ.-P.S., R.-S.A., POL. AND FROSTED AND FeOx STAINED. 45% YELLOW SILT.	SUPRATIDAL or ESTUARINE or INTERTIDAL	
200-360	5% COARSE SHELL-BI.HASH AND WHOLE T.G.s. 40% FINE QTZ.AND 60% FINE YELLOW SILT AND COMM. SHELL.	INTERTIDAL	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG 56			
0- 15	BROWN, QTZ.-RICH, SILTY, SHELLY DEPOSIT. SHELL GREY-STAINED. ROCK FRAGMENTS PRESENT.	WASH FROM CLIFFS	
15- 23	SLIGHTLY CALCAREOUS, QTZ.-RICH, AQUA-GREEN CLAY.		
23- 40	70% ROCK FRAGMENTS AND QTZ.-P.S., R., POL. AND FROSTED AND FeOx STAINED. PALE SILT AND 5% SHELL MAKE UP REST OF DEPOSIT. ORANGE AT TOP TO PALE BROWN AT BASE.		
40-195	FORAMS.-T.,Q.AND S. WHOLE BI.s AND BI.AND T.G. HASH. 55% SHELL. SEA-GRASS FIBRE PRESENT. SOME SHELL HIGHLY STAINED. 25% FINE QTZ. AND 20% FINE BROWN SILT. GREY/BROWN COLOUR. >QTZ. AND SILT ↓ .		HOL.
195-223	5% SHELL, 70% QTZ. AND ROCK FRAGMENTS. QTZ.-P.S., R., POL. AND FROSTED AND FeOx STAINED. SILT YELLOW AT TOP TO PALE OFFWHITE AT BASE.	WASH FROM CLIFFS OR BEACH	PLEIS.
223-235	5% SILT. NO SHELL. ONLY QTZ. AND ROCK. DARK-ORANGE COLOUR.	WASH FROM CLIFFS OR BEACH	
235-360	80% PEBBLES AND 20% QTZ.	WASH FROM CLIFFS OR BEACH	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG156			
0- 10	60% BI.HASH AND WHOLE BI.s AND N.T.G.s. 20% BROWN SILT. 20% DARK ORANGE/RED FeOx-STAINED QTZ. QTZ.-W.S., R. AND POL.	PRESENT BED LOAD	
10- 50	SIMILAR TO 0-10 BUT < SHELL AND > SILT. GREY/BROWN SILT. GREY STAINING ON SHELL.	SUBTIDAL	HOL.
50- 83	60% W.S., S.R., POL., QTZ. (SILT SIZE) AND 40% BROWN SILT.	AEOLIAN	PLEIS.
83-100	SIMILAR TO 50-83 PLUS AQUA-GREEN CLAY NODULES WHICH BREAK UP TO CAUSE GREY COLOUR. 2% BI.		
100-110	SIMILAR TO 50-83 BUT > SILT.		
110-125	AQUA-GREEN IN COLOUR OVERALL, OTHERWISE IDENTICAL TO 50-83.		
125-330	LIGHT-GREEN AND ORANGE SILT WITH UP TO 5% COMM.SHELL. POCKETS OF COARSE SHELL - ANADARA AND OTHER BI.s.	ESTUARINE	
SG159			
0- 15	40% FINE COMM.SHELL, GREY STAINED. 20% FINE QTZ. 40% PALE-BROWN/GREY SILT.	PRESENT BED LOAD	
15-145	FORAMS.-S.AND Q. 20% SHELL-5% BI.HASH, 15% FORAMS., 2% SEA GRASS. 20% FINE QTZ. REST GREY SILT.	SUBTIDAL	
145-175	> SEA GRASS, > SILT. NO QTZ.	SUBTIDAL	
175-200	BLUE/GREY AND LIGHT-BROWN SILT WITH ORGANIC MATERIAL.		HOL.
200-220	VERY FINE QTZ.-RICH CLAY.	DUNE	PLEIS.
220-310	90% W.S., S.R., POL., FeOx-STAINED QTZ. 10% PALE-BROWN SILT.-ADHERES TO QTZ.	INTERTIDAL	
310-353	50% P.S., R.-A., POL.AND FROSTED QTZ. AND 50% RED SILT.	ALLUVIAL FLAT	

DEPTH (CM.)	DESCRIPTION	ENVIRONMENT	AGE
SG160			
0- 70	FORAMS.-Q.,S.,E.AND P. BI.HASH AND T.G.s. 40% SHELL AND 60% GREY SILT AND ORGANIC MATERIAL. WITH DEPTH THE SHELL % DECREASES, SILT AND QTZ. %.s INCREASE.	SUBTIDAL	HOL.
70-100	FORAMS.-E.,P.,D.,S.AND Q. AND BI.HASH. 15% SHELL. 70% W.S., R., POL., QTZ. AND 15% PALE-BROWN SILT. COARSE BI.HASH.	INTERTIDAL	PLEIS.
100-240	10% SHELL AT MOST. COMM.SHELL MAINLY WITH FEW WHOLE BI.s. 30% QTZ.-MAXIMUM. REST FINE CALCAREOUS SILT. COLOUR CHANGES FROM PALE GREEN AT TOP TO YELLOW-GREEN TO KHAKI AT THE BASE.	ESTUARINE	
SG162			
0-130	20% SHELL-ECH.STEMS, COR.ALG., T.G.s, AND BI.HASH. 70% P.S., S.A.-S.R., POL.AND FROSTED AND FeOx-STAINED QTZ. 10% SILT. ORANGE/BROWN SAND WITH ROCK FRAGMENTS. NON-CALC., QTZ.-RICH, RED SILT AT BASE-ALLUVIAL.	SUBTIDAL	
	POSSIBILITY THAT HOL.HERE FORMED PARTLY BY REWORKED ALLUVIAL FLAT MATERIAL.		HOL.
130-220	GREY, CALCAREOUS, FINE QTZ.-RICH CLAY. ONE ANADARA TRAPEZIA FOUND. ONLY SHELL NOTED.	ESTUARINE	PLEIS.
220-233	10% SHELL-BI.HASH. 80% P.S., R.-S.A., POL.AND FROSTED. FeOx-STAINED QTZ. AND ROCK FRAGMENTS. 10% YELLOW SILT. POCKET OF NON-CALC.AQUA-GREEN CLAY.	INTERTIDAL	

APPENDIX 2. B. GRAIN SIZE ANALYSIS. WHYALLA NORTH.

wt. in grams.

Beaker NO.	Beaker Wt.	Sample No.	Beaker &Samp Wt	Sample Wt.	F.P.	F.P.+ Sand	Sand	F.P.	F.P.+ C.Silt	C.Silt	F.P.	F.P. + F.Silt	F.Silt	Clay
1	21.59	SG224 400	28.31	6.71	1.12	7.50	6.38	1.12	1.16	0.044	1.44	1.64	0.20	0.08
2	19.87	" 360	25.94	6.07	1.10	6.56	5.46	1.12	1.17	0.051	1.64	1.93	0.29	0.26
3	21.61	" 330	28.32	6.70	1.09	6.83	5.74	1.10	1.18	0.083	1.41	1.72	0.31	0.56
4	19.89	" 315	29.27	9.38	1.07	5.23	4.16	1.10	1.37	0.27	1.58	3.66	2.08	2.86
5	20.23	" 300	24.95	4.71	1.08	4.76	3.68	1.11	1.22	0.11	1.42	1.68	0.26	0.65
6	20.58	" 240	23.95	3.37	1.07	3.56	2.49	1.09	1.15	0.06	1.58	1.83	0.25	0.56
7	20.28	" 195	25.10	4.82	1.09	4.59	3.50	1.09	1.30	0.21	1.43	2.11	0.68	0.42
8	21.60	" 150	29.12	7.52	1.09	6.75	5.66	1.06	1.21	0.15	1.66	2.33	0.67	1.03
9	20.16	" Top	28.93	8.76	1.08	7.48	6.40	1.10	1.47	0.37	1.40	2.70	1.30	0.67
10	20.58	SG223 270	26.99	6.40	1.07	6.16	5.09	1.10	1.30	0.20	1.57	2.00	0.43	0.67
11	21.61	" 222	28.01	6.40	1.10	5.69	4.59	1.09	1.27	0.18	1.41	2.29	0.88	0.73
12	20.21	" 180	25.88	5.67	1.10	5.36	4.26	1.10	1.29	0.19	1.61	2.19	0.58	0.62
13	20.18	" 130	26.09	5.90	1.11	6.24	5.13	1.09	1.21	0.12	1.45	1.97	0.52	0.12
14	20.68	" Top	28.00	7.23	1.08	5.25	4.17	1.08	1.45	0.37	1.57	3.62	2.05	0.72
15	20.72	SG222 Bot	28.83	8.11	1.10	7.54	6.44	1.09	1.55	0.46	1.60	2.33	0.73	0.46
16	20.26	" 140	27.35	7.08	1.11	5.82	4.71	1.06	1.34	0.28	1.40	2.52	1.12	0.97
17	19.83	" 130	25.51	5.68	1.07	5.19	4.12	1.11	1.49	0.38	1.61	2.48	0.87	0.29
18	19.88	" Top	25.79	5.90	1.09	3.26	2.17	1.08	1.78	0.70	1.42	3.62	2.20	0.82

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19	19.87	SG221	Bot	26.36	6.49	1.11	5.01	3.90	1.09	1.38	0.29	1.62	3.28	1.66	0.62
20	21.62	"	Top	26.70	5.07	1.08	4.32	3.24	1.07	1.36	0.29	1.42	2.61	1.19	0.35
1	21.59	SG225	Top	27.73	6.13	0.97	5.61	4.64	0.89	1.15	0.26	1.46	2.56	1.10	0.11
2	19.87	"	160	26.54	6.67	0.95	5.94	4.99	0.90	1.04	0.14	1.39	2.14	0.75	0.78
3	21.61	"	210	28.26	6.65	0.89	6.16	5.27	0.97	1.37	0.40	1.47	2.00	0.53	0.43
4	19.89	"	250	26.92	7.03	0.90	6.25	5.35	0.96	1.19	0.23	1.48	2.46	0.98	0.45
5	20.23	"	300	27.06	6.82	0.89	2.60	1.71	0.96	1.24	0.28	1.44	4.43	2.99	1.83
6	21.56	"	360	29.00	7.43	0.90	8.00	7.00	0.97	1.02	0.05	1.46	1.74	0.28	0.08
7	20.28	"	415	29.16	8.88	0.97	3.24	2.27	0.88	1.09	0.21	1.37	5.51	4.14	2.24
8	21.60	SG226	Top	29.39	7.78	0.97	6.13	5.16	0.90	1.47	0.57	1.45	3.19	1.74	0.30
9	20.16	"	190	27.26	7.09	1.07	5.81	4.74	0.88	1.12	0.24	1.47	3.11	1.64	0.45
10	20.25	"	370	27.80	7.55	1.08	6.93	5.85	1.06	1.35	0.29	1.37	2.24	0.87	0.53
11	21.61	SG227	Top	28.68	7.06	1.05	7.31	6.26	1.10	1.35	0.25	1.41	1.92	0.51	0.02
12	20.21	"	155	26.55	6.33	1.08	5.84	4.76	1.06	1.36	0.30	1.39	2.40	1.01	0.24
13	20.18	"	Bot	26.07	5.88	1.07	6.15	5.08	1.07	1.22	0.15	1.48	1.97	0.49	0.14
14	20.68	SG228	Top	26.56	5.88	1.07	5.55	4.48	1.06	1.31	0.25	1.43	2.46	1.03	0.11
15	20.72	"	210	27.40	6.67	1.07	7.31	6.24	1.08	1.17	0.09	1.40	1.65	0.25	0.07
16	20.26	"	250	26.16	5.89	1.08	6.30	5.22	1.09	1.22	0.13	1.49	1.96	0.47	0.06
17	19.83	"	390	27.09	7.25	1.06	7.50	6.44	1.06	1.13	0.07	1.42	2.05	0.63	0.10
18	19.88	SG230	Top	25.88	5.99	1.08	5.50	4.42	1.09	1.40	0.31	1.43	2.53	1.10	0.14
19	19.87	"	170	26.08	6.20	1.06	4.07	3.01	1.09	1.18	0.09	1.49	3.67	2.18	0.90

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20	21.62	SG230	220	28.14	6.51	1.08	6.24	5.16	1.05	1.12	0.07	1.41	2.43	1.02	0.25
1	21.59	SG231	Top	30.29	8.69	0.97	8.15	7.18	0.92	1.12	0.20	1.47	2.61	1.14	0.15
2	19.87	"	155	27.76	7.89	0.95	5.88	4.93	0.93	1.06	0.13	1.49	3.52	2.03	0.78
3	21.61	SG232	Top	28.79	7.18	0.97	6.68	5.71	0.95	1.13	0.18	1.38	2.51	1.13	0.14
4	19.89	"	250	27.17	7.28	0.97	2.50	1.53	0.92	1.61	0.69	1.46	4.68	3.22	1.83
5	20.23	"	380	28.30	8.06	0.93	3.04	2.11	0.97	1.30	0.33	1.48	5.48	4.00	1.61
6	21.56	SG281	Top	29.27	7.70	0.92	7.39	6.47	0.91	1.13	0.22	1.40	2.25	0.85	0.14
7	20.28	"	120	28.79	8.50	0.97	7.77	6.80	0.95	1.13	0.18	1.46	2.62	1.16	0.35
8	21.60	"	160	28.08	6.48	0.90	5.52	4.62	0.96	1.18	0.22	1.47	2.65	1.18	0.45
9	20.16	SG282	Top	27.79	7.62	0.91	7.74	6.83	0.92	1.08	0.16	1.41	1.98	0.57	0.05
10	20.58	"	205	24.19	3.60	0.97	2.91	1.94	0.96	1.17	0.21	1.38	2.51	1.13	0.03
11	21.61	"	320	25.25	3.64	0.94	1.93	0.99	0.90	1.44	0.544	1.46	2.96	1.50	0.59
12	20.21	SG291	Top	25.89	5.67	0.97	5.97	5.00	0.93	1.19	0.26	1.37	1.64	0.27	0.13
13	20.18	"	220	25.26	5.07	0.91	1.73	0.82	0.97	1.47	0.50	1.38	3.88	2.50	1.24
14	20.68	"	310	26.84	6.15	0.91	4.87	3.96	0.94	1.17	0.23	1.43	2.70	1.27	0.68
15	20.72	SG285	Top	28.25	7.52	0.97	7.50	6.53	0.97	1.17	0.20	1.38	2.03	0.65	0.12
16	20.26	"	200	25.94	5.67	0.98	3.91	2.93	0.92	1.12	0.20	1.39	2.98	1.59	0.94
17	19.83	"	303	26.28	6.44	0.99	2.77	1.76	0.91	1.20	0.29	1.45	4.16	2.71	1.67
18	19.88	SG284	Top	23.38	3.49	0.91	2.82	1.91	0.99	1.49	0.50	1.39	2.34	0.95	0.12
19	19.87	"	230	25.30	5.42	0.91	3.60	2.69	0.98	1.68	0.70	1.42	2.87	1.45	0.57
20	21.62	"	320	28.40	6.77	0.91	5.31	4.40	0.96	1.38	0.42	1.44	2.94	1.50	0.44

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1	21.59	SG293	Top	28.86	7.26	1.13	7.41	6.28	1.11	131	0.20	1.47	2.01	0.54	0.23
2	19.87	"	80	27.11	7.24	1.14	2.61	1.47	1.15	1.42	0.27	1.51	5.79	4.28	1.21
3	21.61	"	100	28.13	6.25	1.14	2.88	1.74	1.07	1.38	0.31	1.69	4.93	3.24	1.21
4	19.89	"	150	28.66	8.76	0.95	7.87	6.92	1.10	1.52	0.42	1.43	2.37	0.94	0.46
5	20.23	"	Bot	26.83	6.59	0.90	4.71	3.81	0.96	1.93	0.97	1.42	2.98	1.56	0.23

WHYALLA CENTRAL.

Beaker No.	Beaker Wt.	Sample No.	Beaker &Samp Wt	Sample Wt.	F.P.	F.P.+ Sand	Sand	F.P.	F.P. + C.Silt	C. Silt	F.P.	F.P. + F.Silt	F. Silt	Clay
1	21.60	SG132 Top	26.29	4.69	1.10	5.12	4.02	1.09	1.47	0.38	1.48	1.72	0.24	0.04
2	19.87	" 140	24.29	4.42	1.09	2.29	1.20	1.10	1.28	0.18	1.46	3.73	2.27	0.77
3	21.61	" 170	26.99	5.38	1.10	4.99	3.89	1.09	1.31	0.22	1.42	2.46	1.04	0.22
4	19.89	" 210	26.33	6.44	1.11	6.00	4.89	1.11	1.39	0.38	1.51	2.50	0.99	0.17
5	20.24	" 280	25.49	5.25	1.11	5.02	3.91	1.08	1.35	0.27	1.52	2.27	0.75	0.32
6	21.57	" 310	26.50	4.93	1.11	2.24	1.13	1.08	1.47	0.39	1.45	3.46	2.01	1.40
7	20.28	" 350	26.18	5.90	1.09	1.80	0.71	1.12	1.51	0.39	1.54	4.31	2.77	2.02
8	21.60	SG130 Top	26.54	4.94	1.06	5.13	4.07	1.09	1.55	0.46	1.48	1.82	0.34	0.07
9	20.16	" 50	25.19	5.03	1.08	4.81	3.73	1.11	1.53	0.42	1.46	2.12	0.66	0.22
10	20.25	" 133	24.50	4.25	1.08	4.21	3.13	1.06	1.29	0.23	1.40	1.99	0.59	0.30
11	21.61	" 175	26.40	4.79	1.07	4.53	3.46	1.10	1.42	0.32	1.49	2.24	0.75	0.26
12	20.22	SG129 Top	24.53	4.31	1.07	4.96	3.89	1.11	1.24	0.13	1.45	1.67	0.22	0.07
13	20.18	" 190	25.08	4.90	1.08	4.85	3.77	1.09	1.35	0.26	1.42	2.01	0.59	0.27
14	20.68	" 250	26.22	5.54	1.10	5.73	4.63	1.11	1.27	0.16	1.49	1.95	0.46	0.29
15	20.73	" 310	25.70	4.97	1.11	3.77	2.66	1.09	1.60	0.51	1.47	2.55	1.08	0.72
16	20.27	" 350	24.99	4.72	1.07	4.30	3.23	1.09	1.39	0.30	1.45	2.13	0.68	0.51
17	19.83	" 390	25.54	5.71	1.07	3.61	2.54	1.08	1.33	0.25	1.49	2.54	1.05	1.86
18	19.88	SG128 Top	25.00	5.12	1.08	5.86	4.78	1.11	1.17	0.06	1.42	1.62	0.20	0.08

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19	19.87	SG128	150	24.20	4.33	1.08	4.27	3.19	1.10	1.42	0.32	1.45	2.12	0.67	0.15
20	21.63	"	250	27.27	5.64	1.09	4.69	3.60	1.11	1.70	0.59	1.50	2.47	0.97	0.48
1	21.60	"	Bot	27.58	5.98	1.09	4.94	3.85	1.12	1.56	0.44	1.51	2.65	1.14	0.55
2	19.87	SG127	Top	25.79	5.92	1.10	5.64	4.54	1.09	1.41	0.32	1.45	2.40	0.95	0.11
3	21.61	"	50	25.98	4.37	1.07	1.79	0.72	1.10	1.29	0.19	1.41	3.45	2.04	1.42
4	19.89	"	120	25.60	5.71	1.09	4.93	3.84	1.10	1.43	0.33	1.51	2.68	1.17	0.37
5	20.24	"	Bot	26.54	6.30	1.10	6.60	5.49	1.12	1.27	0.15	1.40	1.92	0.52	0.13
6	21.57	SG131	Top	27.42	5.85	1.09	6.38	5.29	1.11	1.27	0.16	1.50	1.89	0.39	0.00
7	20.28	"	100	27.23	6.95	1.08	5.87	4.79	1.12	1.38	0.26	1.53	2.63	1.10	0.80
8	21.55	"	150	28.19	6.64	1.11	5.71	4.60	1.11	1.36	0.25	1.42	2.25	0.83	0.96
9	20.16	"	Bot	26.84	6.68	1.12	6.01	4.89	1.12	1.28	0.16	1.46	1.88	0.42	1.21
10	20.25	SG133	Top	27.22	6.97	1.10	6.92	5.82	1.11	1.28	0.17	1.52	2.39	0.87	0.11
11	21.61	"	90	27.20	5.59	1.08	6.03	4.95	1.10	1.21	0.11	1.47	1.93	0.46	0.07
12	20.22	"	Bot	26.57	6.35	1.08	2.97	1.89	1.10	1.37	0.27	1.51	4.38	2.87	1.32
13	20.18	SG237	Top	26.74	6.56	1.08	6.83	5.75	1.11	1.28	0.17	1.47	2.03	0.55	0.08
14	20.63	"	40	26.24	5.61	1.12	4.90	3.78	1.08	1.53	0.44	1.46	2.40	0.94	0.44
15	20.73	"	190	27.00	6.27	1.09	5.06	3.97	1.11	1.41	0.30	1.46	2.67	1.21	0.79
16	20.27	"	Bot	26.42	6.15	1.10	1.19	0.09	1.13	1.34	0.21	1.49	4.83	3.34	2.51
17	19.83	SG238	Top	26.55	6.72	1.12	6.83	5.71	1.14	1.35	0.21	1.52	2.21	0.69	0.11
18	19.88	"	20	25.73	5.85	1.10	4.78	3.68	1.15	1.43	0.28	1.66	3.03	1.37	0.51
19	19.87	"	54	25.53	5.66	1.11	3.62	2.51	1.13	1.42	0.29	1.67	3.51	1.84	1.02

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20	21.63	SG238	70	27.85	6.22	1.10	5.23	4.13	1.11	1.44	0.33	1.66	2.75	1.09	0.67
1	21.60	"	90	28.85	7.25	1.15	6.97	5.82	1.14	1.35	0.21	1.68	2.48	0.80	0.42
2	19.87	"	105	27.13	7.26	1.15	7.35	6.20	1.09	1.23	0.14	1.63	2.17	0.54	0.38
3	21.61	"	130	27.41	5.80	1.15	4.03	2.88	1.16	1.54	0.38	1.50	2.91	1.41	1.13
4	19.89	"	190	26.18	6.29	1.15	3.15	2.00	1.10	1.24	0.14	1.61	3.48	1.87	2.27
5	20.24	SG241	Top	25.60	5.36	1.19	6.04	4.85	1.17	1.33	0.16	1.55	1.79	0.24	0.11
6	21.57	"	150	26.57	5.00	1.17	3.55	2.38	1.17	1.47	0.30	1.64	3.19	1.55	0.77
7	20.28	"	200	26.50	6.22	1.17	5.85	4.68	1.18	1.63	0.45	1.54	2.12	0.58	0.50
8	21.55	"	Bot	27.44	5.89	1.16	4.04	2.88	1.16	1.50	0.34	1.65	3.12	1.47	1.20
9	20.16	SG239	Top	25.58	5.42	1.14	5.61	4.47	1.15	1.35	0.20	1.49	1.94	0.45	0.30
10	20.25	"	250	29.95	9.70	1.10	5.79	4.69	1.18	1.64	0.46	1.66	4.83	3.17	1.38
11	21.61	"	370	27.22	5.61	1.15	5.81	4.66	1.18	1.29	0.11	1.53	1.40	0.37	0.47
12	20.22	SG240	Top	27.24	7.02	1.15	7,19	6.04	1.10	1.35	0.25	1.65	2.02	0.37	0.36
13	20.18	"	70	25.80	5.62	1.18	4.05	2.87	1.16	1.84	0.68	1.49	2.67	1.18	0.88
14	20.63	"	100	26.48	5.85	1.14	5.67	4.53	1.14	1.35	0.21	1.61	2.29	0.68	0.43
15	20.73	"	Bot	25.60	4.87	1.17	5.06	3.89	1.15	1.27	0.12	1.47	1.87	0.40	0.46
16	20.27	SG292	Top	25.58	5.31	1.16	5.39	4.23	1.13	1.53	0.40	1.60	1.96	0.36	0.32
17	19.83	"	200	25.68	5.85	1.15	4.39	3.24	1.14	1.52	0.38	1.54	2.59	1.04	1.19
18	19.88	"	250	25.39	5.51	1.16	4.81	3.65	1.10	1.61	0.51	1.54	2.27	0.73	0.62
19	19.87	"	310	26.97	7.10	1.14	2.04	0.90	1.15	1.33	0.18	1.62	5.09	3.47	2.55
20	21.63	SG125	Top	28.35	6.72	1.14	6.14	5.00	1.15	1.41	0.26	1.41	2.28	0.87	0.59

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1	21.55	SG125	170	27.39	5.84	1.14	4.95	3.81	1.12	1.37	0.25	1.63	2.84	1.21	0.57
2.	19.87	"	230	26.39	6.52	1.17	4.44	3.27	1.15	1.95	0.80	1.53	3.11	1.58	0.87
3	21.61	"	320	27.80	6.19	1.15	2.02	0.87	1.16	1.71	0.55	1.60	5.19	3.59	1.18
4	1989	"	Bot	25.05	5.16	1.15	1.43	0.28	1.15	1.58	0.43	1.53	4.09	2.56	1.89
5	20.24	SG124	Top	27.19	6.95	1.15	7.18	6.03	1.15	1.37	0.22	1.53	2.13	0.60	0.10
6	21.03	"	90	27.11	6.08	1.13	5.28	4.15	1.13	1.54	0.41	1.48	2.57	1.09	0.43
7	20.28	"	140	28.73	8.45	1.16	7.95	6.79	1.13	1.38	0.25	1.59	2.59	1.00	0.40
8	21.08	"	210	26.72	5.64	1.13	4.69	3.56	1.16	1.55	0.39	1.47	2.83	1.36	0.33
9	19.76	"	Bot	27.71	7.95	1.14	4.98	3.84	1.16	1.62	0.46	1.56	3.83	2.27	1.38
10	20.19	SG 87	Top	26.34	6.15	1.13	6.39	5.26	1.19	1.47	0.28	1.50	1.87	0.47	0.14
11	21.61	"	150	26.05	4.44	1.11	4.07	2.96	1.13	1.40	0.27	1.59	2.52	0.93	0.28
12	20.22	"	250	25.09	4.87	1.15	4.78	3.63	1.16	1.37	0.21	1.48	2.51	1.03	0.00
13	20.18	"	350	27.06	6.88	1.15	6.27	5.12	1.10	1.42	0.32	1.59	2.52	0.93	0.51
14	20.54	"	Bot	26.22	5.68	1.17	6.18	5.01	1.13	1.40	0.27	1.48	1.69	0.21	0.19
15	20.73	SG 86	Top	28.61	7.88	1.16	8.04	6.88	1.13	1.51	0.38	1.57	2.05	0.48	0.1
16	20.27	"	190	25.16	4.89	1.14	4.47	3.33	1.12	1.46	0.34	1.49	2.34	0.85	0.37
17	19.83	"	220	26.07	6.24	1.12	4.27	3.15	1.13	1.49	0.36	1.58	3.36	1.78	0.94
18	19.88	"	245	25.80	5.92	1.14	5.78	4.64	1.11	1.36	0.25	1.48	2.26	0.78	0.25
19	19.87	SG 85	Top	26.90	7.03	1.14	7.10	5.96	1.12	1.37	0.25	1.58	2.20	0.62	0.20
20	19.94	"	90	26.59	6.65	1.13	6.88	5.75	1.13	1.33	0.20	1.52	2.10	0.58	0.12

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1	21.55	SG 85	180	27.31	5.76	1.11	2.72	1.61	1.08	1.38	0.30	1.63	4.32	2.69	1.16
2	19.87	"	250	25.82	5.95	1.09	4.04	2.95	1.06	1.56	0.50	1.45	3.15	1.70	0.80
3	21.61	"	Bot	26.64	5.03	1.09	4.83	3.74	1.07	1.31	0.24	1.58	2.33	0.75	0.30
4	19.89	SG 82	Top	23.93	4.04	1.09	2.46	1.37	1.07	1.53	0.46	1.41	3.11	1.70	0.51
5	20.19	"	160	27.21	7.02	1.07	5.99	4.92	1.06	1.30	0.24	1.56	3.04	1.48	0.38
6	19.84	"	Bot	28.07	8.23	1.10	7.60	6.50	1.06	1.21	0.15	1.46	2.44	0.98	0.60
7	20.28	SG120	Top	25.99	5.71	1.09	2.89	1.80	1.08	1.93	0.85	1.56	3.85	2.29	0.77
8	20.59	"	210	27.41	6.82	1.09	7.49	6.40	1.07	1.18	0.11	1.44	1.75	0.31	0.00
9	20.17	"	270	28.85	8.68	1.01	6.61	5.60	1.09	1.45	0.36	1.59	3.65	2.06	0.66
10	19.85	"	Bot	26.43	6.57	1.06	4.65	3.59	1.05	1.45	0.40	1.49	3.01	1.52	1.06
11	21.61	SG121	Top	28.45	6.84	1.07	5.42	4.35	1.01	1.35	0.34	1.51	3.22	1.71	0.43
12	20.22	"	160	25.58	5.36	1.11	5.13	4.02	1.07	1.37	0.30	1.45	2.17	0.72	0.32
13	20.18	"	280	25.73	5.55	1.12	5.61	4.49	1.06	1.22	0.16	1.57	2.09	0.52	0.38
14	21.61	"	Bot	25.90	4.29	1.02	4.76	3.74	1.11	1.20	0.09	1.45	1.75	0.30	0.16
15	20.73	SG122	Top	28.21	7.48	1.10	8.11	7.01	1.05	1.23	0.18	1.58	1.85	0.27	0.02
16	20.20	"	100	24.78	4.58	1.02	4.50	3.48	1.11	1.36	0.25	1.42	2.09	0.67	0.18
17	19.83	SG123	Top	25.65	5.82	1.06	5.50	4.44	1.00	1.34	0.34	1.58	2.37	0.79	0.25
18	19.88	"	101	25.35	5.47	1.11	4.41	3.30	1.09	1.52	0.43	1.43	2.95	1.52	0.22
19	19.87	"	150	27.06	7.19	1.14	5.92	4.78	1.10	1.57	0.47	1.55	2.89	1.34	0.60
20	20.61	"	201	25.31	4.70	1.11	4.50	3.39	1.09	1.35	0.26	1.44	2.10	0.66	0.39

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1	21.55	SG126	Top	27.89	6.34	1.16	6.34	5.18	1.11	1.30	0.19	1.61	2.23	0.62	0.35
2	19.87	"	95	25.81	5.94	1.17	1.84	0.67	1.14	1.44	0.30	1.48	4.47	2.99	1.97
3	21.61	"	190	28.20	6.59	1.13	7.27	6.14	1.14	1.16	0.02	1.70	1.92	0.22	0.21
4	19.89	"	250	24.76	4.87	1.14	1.21	0.07	1.12	1.13	0.01	1.43	3.15	1.72	3.07
5	20.19	"	290	26.19	6.00	1.11	6.81	5.70	1.10	1.11	0.01	1.69	1.71	0.02	0.27
6	19.84	"	340	26.28	6.44	1.12	5.53	4.41	1.12	1.29	0.17	1.43	2.51	1.08	0.78
7	20.28	SG 81	Top	25.54	5.26	1.12	4.03	2.91	1.12	1.54	0.42	1.69	3.00	1.31	0.62
8	20.59	"	190	25.14	4.55	1.14	4.30	3.16	1.11	1.23	0.12	1.44	2.18	0.74	0.53
9	20.17	"	260	25.61	5.44	1.09	4.68	3.59	1.14	1.30	0.16	1.66	2.30	0.64	1.05
10	19.85	"	310	25.89	6.03	1.12	5.48	4.36	1.13	1.35	0.22	1.47	1.99	0.52	0.93
11	21.61	"	350	28.42	6.81	1.12	6.19	5.07	1.13	1.43	0.30	1.66	2.49	0.83	0.61
12	20.22	"	Bot	26.68	6.46	1.13	5.46	4.33	1.14	1.31	0.17	1.47	2.75	1.28	0.68
13	20.18	SG 83	Top	24.73	4.55	1.15	3.46	2.31	1.12	1.76	0.64	1.65	2.76	1.11	0.49
14	21.61	"	210	28.09	6.48	1.13	5.77	4.64	1.15	1.27	0.12	1.46	1.97	0.51	1.21
15	20.73	"	280	25.23	4.50	1.13	4.62	3.49	1.13	1.30	0.17	1.64	2.01	0.37	0.47
16	20.20	"	Bot	25.45	5.25	1.16	5.25	4.09	1.11	1.33	0.22	1.47	1.88	0.41	0.53
17	19.83	SG 84	Top	26.44	6.61	1.14	6.13	4.99	1.14	1.36	0.22	1.65	2.53	0.88	0.52
18	19.88	"	95	26.29	6.41	1.15	5.28	4.13	1.12	1.40	0.28	1.50	2.74	1.24	0.76
19	19.87	"	120	25.72	5.85	1.15	5.74	4.59	1.12	1.43	0.31	1.62	2.15	0.53	0.42
20	20.61	"	Bot	28.97	8.36	1.17	8.44	7.27	1.12	1.39	0.27	1.45	1.92	0.47	0.35

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1	21.55	SG123	Bot	27.10	5.55	1.12	6.24	5.12	1.13	1.19	0.06	1.67	1.84	0.17	0.20
2	19.87	SG119	Top	25.22	5.35	1.14	3.24	2.10	1.13	1.80	0.67	1.49	3.29	1.80	0.78
3	21.61	"	150	29.28	7.67	1.12	7.75	6.63	1.17	1.29	0.12	1.64	2.32	0.68	0.24
4	19.89	"	170	26.00	6.11	1.14	5.94	4.80	1.15	1.43	0.28	1.43	2.09	0.66	0.37
5	20.19	"	200	27.90	7.71	1.11	4.77	3.66	1.16	1.58	0.42	1.63	3.33	1.70	1.92
6	19.84	"	Bot	27.41	7.57	1.16	6.31	5.15	1.14	1.54	0.40	1.46	2.30	0.84	1.18
7	20.28	SG118	260	28.39	8.11	1.13	7.43	6.30	1.12	1.32	0.20	1.67	2.62	0.95	0.66
8	20.59	"	top	27.46	6.87	1.12	3.29	2.17	1.14	1.86	0.72	1.50	4.19	2.69	1.29
9	20.17	"	290	29.64	9.47	1.13	9.06	7.93	1.17	1.35	0.18	1.64	2.51	0.87	0.49
10	19.85	SG117	Top	24.79	4.93	1.14	3.99	2.85	1.13	1.41	0.28	1.46	2.67	1.21	0.59
11	21.61	"	325	30.55	8.94	1.16	8.20	7.04	1.13	1.21	0.08	1.49	2.76	1.27	0.55
12	20.22	"	335	28.74	8.52	1.16	5.79	4.63	1.11	1.36	0.25	1.63	3.63	2.00	1.64
13	20.18	"	Bot	27.41	7.23	1.16	7.29	6.13	1.09	1.16	0.07	1.61	2.25	0.64	0.39
14	21.61	SG116	Top	26.26	4.65	1.15	2.67	1.52	1.12	1.61	0.49	1.45	3.24	1.79	0.85
15	20.73	SG115	Top	26.99	6.26	1.15	6.44	5.29	1.12	1.29	0.17	1.62	2.00	0.38	0.4
16	20.20	"	150	25.53	5.33	1.13	4.34	3.21	1.11	1.31	0.20	1.44	2.31	0.87	1.05
17	19.83	"	180	25.30	5.47	1.16	5.97	4.81	1.16	1.39	0.23	1.67	1.86	0.19	0.24
18	19.88	"	Bot	25.34	5.46	1.13	2.44	1.31	1.16	1.22	0.06	1.43	2.58	1.15	2.94
19	19.87	SG114	Top	25.09	5.22	1.11	5.33	4.22	1.13	1.29	0.16	1.64	2.14	0.50	0.34
20	20.61	"	Bot	27.14	6.53	1.12	5.93	4.81	1.14	1.21	0.07	1.59	2.03	0.44	1.21

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1	21.22	SG134	Top	27.85	6.63	1.11	6.82	5.71	1.17	1.35	0.18	1.64	2.01	0.37	0.37
2	19.46	"	110	26.29	6.83	1.10	7.07	5.97	1.12	1.24	0.12	1.59	1.81	0.22	0.52
3	19.04	"	170	25.14	6.10	1.11	4.70	3.59	1.13	1.40	0.27	1.58	2.54	0.96	1.28

PORT AUGUSTA.

Beaker No.	Beaker W Wt.	Sample No.	Beaker &Samp Wt	Sample Wt.	F.P.	F.P.+ Sand	Sand	F.P.	F.P. + C.Silt	C.Silt	F.P.	F.P. + F.Silt	F.Silt	Clay
1	21.55	SG151 Top	27.90	6.35	1.09	6.32	5.23	1.12	1.56	0.44	1.54	1.97	0.43	0.25
2	19.87	" Bot	25.42	5.55	1.16	3.09	1.93	1.05	1.29	0.24	1.51	3.83	2.32	1.06
3	21.61	SG152 Top	28.93	7.32	1.10	7.82	6.72	1.08	1.22	0.14	1.56	1.83	0.27	0.19
4	19.89	SG154 Top	27.14	7.25	1.11	7.71	6.60	1.12	1.15	0.03	1.50	1.91	0.41	0.21
5	20.19	" Bot	29.45	9.26	1.10	8.93	7.83	1.10	1.32	0.22	1.50	1.84	0.34	0.87
6	19.84	SG155 Top	26.69	6.85	1.12	6.39	5.27	1.09	1.21	0.12	1.63	1.89	0.25	1.20
7	20.28	SG156 Top	27.74	7.46	1.14	7.94	6.80	1.08	1.16	0.08	1.53	1.88	0.35	0.23
8	20.59	" 112	26.51	5.92	1.11	2.28	1.17	1.10	1.32	0.22	1.52	2.69	1.17	3.36
9	20.17	SG157 Top	27.44	7.27	1.09	6.39	5.30	1.15	1.69	0.54	1.50	2.34	0.84	0.59
10	19.85	" 150	28.68	8.82	1.08	9.56	8.48	1.15	1.18	0.03	1.49	1.66	0.17	0.14
11	21.61	SG158 Top	28.88	7.27	1.09	7.46	6.37	1.14	1.36	0.22	1.50	1.93	0.43	0.25
12	20.22	SG159 Top	25.79	5.57	1.06	2.92	1.86	1.14	1.75	0.61	1.51	3.70	2.19	0.91
13	20.18	" Bot	29.77	9.59	1.08	7.05	5.97	1.16	1.27	0.11	1.49	3.46	1.97	1.54
14	21.61	SG160 Top	28.23	6.62	1.10	4.85	3.75	1.15	1.57	0.42	1.47	3.31	1.84	0.61
15	20.73	SG161 Top	27.74	7.01	1.06	6.73	5.67	1.12	1.35	0.23	1.46	2.17	0.71	0.40
16	20.20	SG162 Top	28.38	8.18	1.08	8.60	7.52	1.14	1.20	0.06	1.50	1.85	0.35	0.25
17	19.83	" 150	25.79	5.96	1.08	1.15	0.07	1.14	1.24	0.10	1.51	3.72	2.21	3.58
18	19.88	SG163 Top	27.29	7.41	1.08	7.69	6.61	1.08	1.15	0.07	1.51	1.85	0.34	0.39

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19	19.87	SG163	80	28.00	8.13	1.16	5.69	4.53	1.06	1.37	0.31	1.51	2.30	0.79	2.50
20	20.61	"	Bot	29.15	8.54	1.13	9.27	8.14	1.08	1.07	0.01	1.53	1.66	0.13	0.26
1	21.55	SG164	Top	28.07	6.52	1.14	5.92	4.78	1.08	1.25	0.17	1.67	2.49	0.82	0.74
2	19.87	"	Bot	24.80	4.93	1.14	5.13	3.99	1.08	1.17	0.09	1.43	1.52	0.09	0.76
3	21.61	SG165	Top	27.26	5.65	1.16	5.92	4.76	1.11	1.27	0.16	1.44	1.75	0.31	0.42
4	19.89	SG 54	Top	25.65	5.76	1.17	5.81	4.64	1.11	1.41	0.30	1.68	2.08	0.40	0.42
5	20.19	"	180	26.48	6.29	1.16	4.41	3.25	1.10	1.47	0.37	1.44	2.39	0.95	1.72
6	19.84	"	Bot	25.26	5.42	1.13	3.02	1.89	1.10	1.39	0.29	1.62	2.96	1.34	1.90
7	20.28	SG 55	Top	25.57	5.29	1.13	4.94	3.81	1.10	1.38	0.28	1.43	2.17	0.74	0.45
8	20.59	"	Bot	28.51	7.92	1.10	4.81	3.71	1.13	1.87	0.74	1.64	2.82	1.18	2.28
9	20.17	SG 56	Top	25.67	5.50	1.15	4.97	3.82	1.10	1.34	0.24	1.42	2.19	0.77	0.67
10	19.85	SG 57	Top	25.47	5.62	1.15	4.92	3.77	1.12	1.42	0.30	1.64	2.47	0.83	0.72
11	21.61	"	Bot	27.62	6.01	1.14	2,13	0.99	1.13	1.39	0.26	1.41	2.95	1.54	3.2
12	20.22	SG 58	Top	25.76	5.54	1.16	5.67	4.51	1.11	1.24	0.13	1.44	1.78	0.34	0.56
13	20.18	SG 61	Top	26.15	5.97	1.12	4.46	3.34	1.10	1.47	0.37	1.65	2.87	1.22	1.04
14	21.61	SG 62	Top	28.08	6.47	1.14	3.50	2.36	1.12	1.72	0.60	1.49	3.70	2.21	1.3
15	20.73	SG 63	Top	25.81	5.08	1.12	1.96	0.84	1.13	1.99	0.86	1.62	3.45	1.83	1.55
16	20.20	SG 65	Top	27.61	7.41	1.11	7.76	6.65	1.11	1.23	0.12	1.42	1.70	0.28	0.36
17	19.83	SG 66	Top	26.48	6.65	1.14	5.77	4.63	1.12	1.27	0.15	1.64	2.38	0.74	1.13

APPENDIX 2. C. CaCo$_3$ PERCENTAGES. WHYALLA NORTH.

Beaker No.	Beaker Wt.	Sample No.	(m)	Beaker & Samp	Sample Wt.	Wt. After Digestion	Wt. Loss	CaCo$_3$% Wt. Loss /Wt x100
						wt. in GRAMS.		
21	32.04	SG 221	Top	33.95	1.90	32.755	1.195	62.89%
22	32.45	"	Bot	34.405	1.955	33.56	0.845	43.22%
23	32.01	SG 222	Top	33.76	1.75	32.29	1.47	84.00%
24	32.25	"	130	34.09	1.84	32.61	1.48	80.43%
25	31.48	"	140	33.29	1.81	32.36	0.93	51.38%
26	32.76	"	Bot	34.72	1.96	33.33	1.39	70.91%
27	32.11	SG 223	Top	33.875	1.765	32.60	1.275	72.23%
28	32.63	"	130	34.67	2.04	34.29	0.38	18.62%
29	32.02	"	180	34.00	1.98	33.16	0.84	42.42%
30	32.35	"	222	34.30	1.95	34.23	0.07	03.58%
31	32.26	"	270	34.21	1.95	34.17	0.04	02.05%
32	32.615	SG 224	Top	34.625	2.01	33.07	1.555	77.36%
33	30.90	"	150	32.97	2.07	31.93	1.04	50.24%
34	31.935	"	195	33.94	2.005	32.81	1.13	56.35%
35	31.90	"	240	33.86	1.96	32.83	1.03	52.55%
36	32.365	"	300	34.33	1.965	34.21	0.12	06.10%
37	32.26	"	315	34.115	1.855	33.10	1.015	54.71%
38	32.59	"	330	34.69	2.10	34.40	0.29	13.30%
39	31.64	"	360	33.52	1.88	33.355	0.165	08.77%
40	31.89	"	400	33.905	2.015	33.67	0.235	11.66%
69	32.17	SG 225	Top	34.11	1.94	32.69	1.42	73.19%
70	30.84	"	160	32.905	2.065	32.20	0.705	34.14%
71	32.39	"	210	34.66	2.27	34.48	0.18	07.92%
72	31.865	"	250	33.96	2.095	32.79	1.17	55.84%
73	31.91	"	300	33.72	1.81	32.46	1.26	69.61%
74	32.39	"	360	34.73	2.34	34.41	0.32	13.67%
75	30.68	"	415	32.76	2.08	31.65	1.11	53.36%

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76	31.81	SG 226	Top	33.93	2.12	32.50	1.43	67.45%
77	31.95	"	140	34.34	2.35	33.265	1.075	42.55%
78	31.355	"	370	33.46	2.105	33.07	0.39	18.52%
79	31.72	SG 227	Top	33.90	2.18	32.32	1.58	72.47%
80	31.23	"	155	33.25	2.02	32.28	0.97	48.01%
4M	29.66	"	Bot	32.07	2.41	30.78	1.29	53.52%
107	31.83	SG 228	Top	34.24	2.41	32.44	1.80	74.68%
108	29.75	"	210	32.41	2.66	32.16	0.25	09.39%
3T	29.875	"	250	32.40	2.525	31.855	0.545	21.58%
103 (6M)	32.58	"	390	34.92	2.34	34.73	0.19	08.11%
5M	29.79	SG 230	Top	31.88	2.09	30.155	1.725	82.53%
3B	30.28	"	170	32.51	2.23	31.34	1.17	52.46%
5B	30.63	"	220	32.85	2.22	32.50	0.35	15.76%
11	31.07	SG 231	Top	33.00	1.93	31.77	1.23	63.73%
12	32.30	"	155	34.38	2.08	33.05	1.33	63.94%
13	32.24	SG 232	Top	34.24	2.00	32.72	1.52	76.00%
14	32.32	"	250	34.32	2.00	32.575	1.745	87.25%
15	32.015	"	380	33.94	1.925	32.62	1.32	68.57%
16	32.17	SG 281	Top	34.05	1.88	32.61	1.44	76.59%
17	31.60	"	120	33.54	1.94	32.54	1.00	51.54%
18.	31.16	"	160	32.95	1.79	31.58	1.37	76.53%
19	32.02	SG 282	Top	33.95	1.93	32.495	1.455	75.38%
20	32.06	"	205	33.88	1.82	32.60	1.28	70.32%
41	30.04	"	320	31.84	1.80	30.555	1.285	71.38%
42	30.45	SG 291	Top	32.38	1.93	30.62	1.76	91.19%
43	29.94	"	220	31.85	1.91	31.05	0.80	41.88%
44	30.02	"	310	31.755	1.735	31.515	0.24	13.83%
45	30.85	SG 284	Top	32.76	1.91	31.12	1.64	85.86%
46	29.50	"	230	31.435	1.935	29.59	1.845	95.34%
47	30.07	"	320	31.99	1.92	31.03	0.96	50.00%

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48	30.08	Sg 285	Top	31.995	1.915	30.505	1.49	77.80%
49	30.43	"	200	32.525	2.095	32.30	0.225	10.73%
50	29.65	"	305	31.66	2.01	31.45	0.21	10.44%
6T	30.715	SG 293	Top	32.88	2.165	30.93	1.95	90.06%
5T	29.10	"	80	31.09	1.99	30.56	0.53	26.63%
7B	30.14	"	100	32.25	2.11	31.39	0.86	40.75%
6B (102)	31.74	"	150	34.12	2.38	32.545	1.575	66.17%
7T (101)	28.77	"	Bot	31.06	2.29	29.46	1.60	69.86%

WHYALLA CENTRAL.

Beaker No.	Beaker Wt.	Sample (m) No	Beaker & Samp	Sample Wt.	Wt. After Digestion	Wt. Loss	$CaCo_3$% Wt Loss/ Wt x100
1B(104)	30.15	SG 132 Top	31.85	1.70	30.27	1.58	92.94%
1M(110)	32.04	" 140	33.80	1.76	32.96	0.84	47.72%
7T(101)	28.77	" 170	30.82	2.05	29.51	1.31	63.90%
4T(7)	30.74	" 210	33.42	2.68	31.49	1.93	72.01%
4B(9)	29.912	" 280	32.07	2.158	30.49	1.58	73.21%
1T(105)	31.88	" 310	34.04	2.16	33.02	1.02	47.22%
6B(102)	31.74	" 350	33.75	2.01	32.88	0.87	43.28%
7M(106)	29.58	SG 130 Top	31.38	1.80	29.80	1.58	87.77%
3M(106) (6)	30.624	" 50	32.97	2.346	31.31	1.66	70.75%
7B(109)	30.14	" 133	31.75	1.61	30.74	1.01	62.73%
4M(8)	29.66	" 175	31.81	2.15	30.45	1.36	63.25%
108	29.75	SG 129 Top	31.79	2.04	30.03	1.76	86.27%
6M(103)	32.58	" 190	34.45	1.87	33.09	1.36	72.72%
3B (2)	30.28	" 250	32.31	2.03	31.04	1.27	62.56%
6T (5)	30.715	" 310	34.13	3.415	32.60	1.53	44.80%
107	31.83	" 350	35.43	3.60	33.89	1.54	44.77%
3T (1)	29.875	" 390	33.06	3.185	32.14	0.92	28.88%
5M (4)	29.79	SG 128 Top	32.28	2.49	30.45	1.83	73.49%
5B(10)	30.63	" 150	32.54	1.91	30.91	1.63	85.34%
5T(3)	29.10	" 250	31.63	2.53	29.55	2.08	82.21%
77	31.95	" Bot	34.63	2.68	33.44	1.19	44.40%
75	30.68	SG 127 Top	33.19	2.51	31.32	1.87	74.50%
78	31.355	" 50	33.09	1.735	32.08	1.01	58.21%
36	32.365	" 120	33.93	1.565	32.53	1.40	89.45%
76	31.81	" Bot	33.72	1.91	32.51	1.21	63.35%
80	31.23	SG 131 Top	33.82	2.59	31.97	1.85	71.42%
38	32.59	" 100	34.82	2.23	34.12	0.70	31.39%
37	32.26	" 150	35.91	3.65	35.03	0.88	24.10%
31	32.26	" Bot	34.71	2.45	34.59	0.12	04.89%

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73	31.91	SG 133	Top	33.64	1.73	32.17	1.47	84.97%
50	29.65	"	90	33.23	3.58	32.67	0.56	15.64%
49	30.43	"	Bot	33.33	2.90	31.88	1.45	50.00%
48	30.08	SG 237	Top	32.29	2.21	30.68	1.61	72.85%
47	30.07	"	40	32.37	2.30	30.72	1.65	71.73%
46	29.50	"	190	31.64	2.14	30.70	0.94	43.92%
45	30.85	"	Bot	33.77	2.92	33.38	0.39	13.35%
44	30.02	SG 238	Top	32.16	2.14	30.86	1.30	60.74%
43	29.94	"	20	32.03	2.09	30.83	1.20	57.41%
42	30.45	"	54	32.36	1.91	31.35	1.01	52.87%
41	30.04	"	70	32.40	2.36	31.12	1.28	54.23%
11	31.07	"	90	34.06	2.99	32.49	1.57	52.50%
12	32.30	"	105	34.92	2.62	33.81	1.11	42.36%
13	32.24	"	130	35.32	3.08	34.03	1.29	41.88%
14	32.32	"	190	34.60	2.28	34.23	0.37	16.22%
15	32.015	SG 241	Top	33.83	1.815	32.31	1.52	83.74%
16	32.17	"	150	34.18	2.01	32.99	1.19	59.20%
17	31.60	"	200	33.61	2.01	32.24	1.37	68.15%
18	31.16	"	Bot	33.75	2.59	33.11	0.64	24.71%
19	32.02	SG 239	Top	33.66	1.64	32.35	1.31	79.87%
20	32.06	"	250	34.67	2.61	33.49	1.18	45.21%
21	32.04	"	370	34.60	2.56	33.04	1.56	60.93%
22	32.45	SG 240	Top	34.48	2.03	32.96	1.52	74.87%
23	32.01	"	70	34.67	2.66	32.80	1.87	70.30%
24	32.25	SG 240	100	35.17	2.92	33.34	1.83	62.67%
25	31.48	"	Bot	34.77	3.29	32.90	1.87	56.83%
26	32.76	SG 292	Top	34.42	1.66	32.98	1.44	86.74%
27	32.11	"	200	34.48	2.37	33.29	1.19	50.21%
28	32.63	"	250	34.56	1.93	33.15	1.41	73.05%
29	32.02	"	310	34.45	2.43	34.05	0.40	16.46%
30	32.35	SG 125	Top	34.54	2.19	33.03	1.51	68.95%
1B	30.15	"	170	32.45	2.30	31.07	1.38	60.00%

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4T	30.74	SG	125	230	32.66	1.92	31.38	1.28	66.66%
6B	31.74	"		320	33.66	1.92	32.12	1.54	80.20%
1T	31.88	"		Bot	33.40	1.52	32.375	1.025	67.43%
7B	30.14	SG	124	Top	32.52	2.38	30.58	1.94	81.51%
7M	29.58	"		90	31.76	2.18	30.215	1.545	70.87%
1M	32.04	"		140	34.26	2.22	33.07	1.19	53.60%
7T	28.77	"		210	31.07	2.30	30.43	0.64	27.82%
4B	29.91	"		Bot	32.51	2.60	32.03	0.48	18.46%
3M	30.62	SG	87	Top	32.82	2.20	30.81	2.01	91.36%
21	32.04	"		150	34.68	2.64	32.68	2.00	75.75%
22	32.45	"		250	34.38	1.93	32.98	1.40	72.53%
23	32.01	"		350	34.57	2.56	33.29	1.28	50.00%
24	32.25	"		Bot	35.23	2.98	33.86	1.37	45.97%
25	31.48	SG	86	Top	34.42	2.94	31.83	2.59	88.09%
26	32.76	"		190	34.555	1.795	33.26	1.295	72.14%
27	32.11	"		220	34.18	2.07	32.81	1.37	66.18%
28	32.63	"		245	36.14	3.51	33.79	2.35	66.95%
29	32.02	SG	85	Top	33.88	1.86	32.24	1.64	88.17%
30	32.35	"		90	35.63	3.28	35.06	0.57	17.37%
41	30.04	"		180	32.32	2.28	31.215	1.105	48.46%
42	30.45	"		250	32.34	1.89	30.865	1.475	78.04%
43	29.94	"		Bot	31.79	1.85	30.45	1.34	72.43%
44	30.02	SG	82	Top	32.535	2.515	30.49	2.045	81.31%
45	30.85	"		160	33.44	2.59	32.19	1.25	48.26%
46	29.50	"		Bot	32.11	2.61	31.72	0.39	14.94%
47	30.07	SG	120	Top	33.37	3.30	30.765	2.605	78.94%
48	30.08	"		210	32.82	2.74	31.88	0.94	34.30%
49	30.43	"		270	33.32	2.89	31.735	1.585	54.84%
50	29.65	"		Bot	32.58	2.93	30.44	2.14	73.03%
11	31.07	SG	121	Top	33.92	2.85	31.45	2.47	86.66%
12	32.30	"		160	35.305	3.005	33.23	2.075	69.05%
13	32.24	"		280	34.38	2.14	33.29	1.09	50.93%

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14	32.32	SG 121	Bot	34.57	2.25	33.45	1.12	49.77%
15	32.015	SG 122	Top	34.67	2.655	32.47	2.20	82.86%
16	32.17	"	100	34.74	2.57	32.93	1.81	70.43%
17	31.60	SG 123	Top	33.60	2.00	31.98	1.62	81.00%
18	31.16	"	101	33.92	2.76	32.06	1.86	67.39%
19	32.02	"	150	33.98	1.96	32.82	1.16	59.18%
20	32.06	"	201	34.28	2.22	33.27	1.01	45.49%
3T	29.875	SG 126	Top	32.74	2.865	30.23	2.51	87.60%
3B	30.28	"	95	32.82	2.54	30.77	2.05	80.70%
5T	29.10	"	190	32.28	3.18	30.15	2.13	66.98%
5M	29.79	"	250	33.105	3.315	30.70	2.405	72.55%
6T	30.715	"	290	33.715	3.00	32.675	1.04	34.66%
108	29.75	"	340	32.11	2.36	31.73	0.38	16.10%
6M	32.58	SG 81	Top	34.46	1.88	32.91	1.55	82.44%
4M	29.66	"	190	34.57	4.91	32.80	1.77	36.05%
107	31.83	"	260	34.56	2.73	32.935	1.625	59.52%
5B	30.63	"	310	34.82	4.19	33.49	1.33	31.74%
31	32.26	"	350	33.98	1.72	32.64	1.34	77.90%
32	32.615	"	Bot	36.02	3.405	34.05	1.97	57.85%
33	30.90	SG 83	Top	32.92	2.02	31.30	1.62	80.20%
34	31.935	"	210	34.10	2.165	32.82	1.28	59.12%
35	31.90	"	280	33.93	2.03	32.24	1.69	83.25%
36	32.365	"	Bot	34.87	2.505	33.535	1.335	53.29%
37	32.26	SG 84	Top	34.88	2.62	32.68	2.20	83.97%
38	32.59	"	95	34.69	2.10	33.32	1.37	65.24%
39	31.64	"	120	34.67	3.03	32.28	2.39	33.00%
40	31.89	"	Bot	35.35	3.46	33.43	1.92	55.49%
11	31.07	SG 123	Bot	34.53	3.46	33.07	1.46	42.19%
12	32.30	SG 119	Top	34.29	1.99	32.71	1.58	79.39%
13	32.24	"	150	35.915	3.675	33.595	2.32	63.13%
14	32.32	"	170	35.39	3.07	32.72	2.67	86.97%
15	32.015	"	200	35.05	3.035	32.67	2.38	78.42%

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16	32.17	SG 119	Bot	34.79	2.62	34.07	0.72	27.48%
17	31.60	SG 118	Top	35.095	3.495	32.54	2.555	73.10%
18	31.16	"	260	33.69	2.53	31.45	2.24	88.54%
19	32.02	"	290	34.77	2.75	32.75	2.02	73.45%
20	32.06	SG 117	Top	35.295	3.235	32.72	2.575	79.60%
21	32.04	"	325	34.39	2.35	33.43	0.96	40.85%
22	32.45	"	335	34.70	2.25	32.915	1.785	79.33%
23	32.01	"	Bot	34.69	2.68	33.27	1.42	52.98%
24	32.25	SG 116	Top	36.175	3.925	33.00	3.175	80.89%
25	31.48	SG 115	Top	34.29	2.81	32.40	1.89	67.26%
26	32.76	"	150	34.72	1.96	33.70	1.02	52.04%
27	32.11	"	180	35.41	3.30	32.76	2.65	80.30%
28	32.63	"	Bot	35.53	2.90	34.72	0.81	27.93%
29	32.02	SG 114	Top	34.405	2.385	32.73	1.675	70.23%
30	32.35	"	Bot	34.93	2.58	34.84	0.09	03.49%
31	32.26	SG 134	Top	34.105	1.845	32.70	1.405	76.15%
32	32.615	"	110	34.89	2.275	33.31	1.58	69.45%
33	30.90	"	170	34.65	3.75	33.55	1.10	29.33%

PORT AUGUSTA.

Beaker No.	Beaker Wt.	Sample (m) No.	Beaker & Samp	Sample Wt.	Wt. After Digestion	Wt. Loss	CaCo$_3$% Wt.Loss/ Wt.x100
11	31.07	SG 151 Top	32.94	1.87	31.70	1.24	66.31%
12	32.30	" Bot	34.38	2.08	33.61	0.77	37.01%
13	32.24	SG 152 Top	34.44	2.20	34.175	0.265	12.04%
14	32.32	SG 154 Top	34.09	1.77	33.64	0.45	25.42%
15	32.015	" Bot	34.73	2.715	34.69	0.04	1.47%
16	32.17	SG 155 Top	34.35	2.18	33.54	0.81	37.15%
17	31.60	SG 156 Top	33.39	1.79	32.355	1.035	57.82%
18	31.16	" 112	33.85	2.69	33.825	0.025	0.92%
19	32.02	SG 157 Top	35.265	3.245	34.88	0.385	11.86%
20	32.06	" 150	36.54	4.48	36.43	0.11	2.45%
21	32.04	SG 158 Top	34.18	2.14	33.345	0.835	39.01%
22	32.45	SG 159 Top	34.29	1.84	33.62	0.67	36.41%
23	32.01	" Bot	36.925	4.915	35.93	0.995	20.24%
24	32.25	SG 160 Top	34.47	2.22	33.47	1.00	45.04%
25	31.48	SG 161 Top	33.655	2.175	32.76	0.895	41.15%
26	32.76	SG 162 Top	35.95	3.19	35.30	0.65	20.37%
27	32.11	" 150	35.03	2.92	33.85	1.18	40.41%
28	32.63	SG 163 Top	34.64	2.01	33.96	0.68	33.83%
29	32.02	" 80	34.65	2.63	34.62	0.03	1.14%
30	32.35	" Bot	37.38	5.03	37.37	0.01	0.20%
31	32.26	SG164 Top	34.935	2,675	33.56	1.375	51.40%
32	32.615	" Bot	34.58	1.965	34.55	0.03	1.52%
33	30.90	SG 165 Top	33.29	2.39	32.59	0.70	29.29%
34	31.935	SG 54 Top	34.01	2.075	33.44	0.57	27.47%
35	31.90	" 180	34.37	2.47	33.79	0.58	23.48%
36	32.365	" Bot	36.075	3.71	34.47	1.605	43.26%
37	32.26	SG 55 Top	34.575	2.315	33.29	1.285	55.50%
38	32.59	" Bot	35.53	2.94	34.755	0.775	26.36%
39	31.64	SG 56 Top	34.74	3.10	34.285	0.455	14.68%

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(50) 40	29.65	SG 57	Top	32.05	2.40	30.94	1.11	46.25%
41	30,04	"	Bot	32.38	2.34	32.19	0.19	8.12%
42	30.45	SG 58	Top	32.53	2.08	32.105	0.425	20.43%
43	29.94	SG 61	Top	32.05	2.11	31.16	0.89	42.18%
44	30.02	SG 62	Top	32.53	2.51	31.525	1.005	40.04%
45	30.85	SG 63	Top	32.48	1.63	31.675	0.805	49.38%
46	29.50	SG 65	Top	31.17	1.67	30.75	0.42	25.15%
47	30.07	SG 66	Top	33.83	3.76	32.12	1.71	45.48%

APPENDIX 2 D.

RESULTS FROM ORGANIC AND NON ORGANIC PARTICLE COUNTS.

WHYALLA NORTH.

Core No.	Core Alg.	BYT.	T.G.+ N.T.G	BI.	FORAMS. S+Q	T.	E.	P.	D.	N.	QTZ.	A. needles	ECH. Spines	MISC.	TOT. Forams
221	1.1	-	2.0	17.8	1.8	2.0	1.6	0.2	-	1.1	35.2	6.0	4.0	25.6	7.3
222	-	-	1.0	34.8	2.0	0.2	2.0	-	-	-	14.0	15.0	1.0	30.0	4.2
223	1.2	0.2	2.4	29.2	1.8	0.2	1.0	-	-	-	14.40	17.0	1.6	30.8	3.2
224	0.9	0.9	13.44	23.63	0.9	2.54	3.27	0.18	0.2	-	21.81	11.63	2.18	18.8	7.45
225	0.19	0.39	5.44	23.52	0.19	0.58	0.39	-	-	-	31.76	13.52	2.94	20.39	1.74
226	1.2	0.2	4.2	30.2	1.2	0.4	1.6	-	-	-	23.2	12.2	6.0	19.6	3.2
227	0.6	0.6	4.6	33.4	0.4	1.2	0.8	-	-	-	23.0	9.6	4.0	21.6	2.6
228	0.18	0.36	2.72	26.9	0.18	0.90	1.09	-	-	-	40.90	6.36	1.09	19.27	2.17
230	1.2	0.8	5.8	55.2	0.8	1.00	1.4	-	-	1.2	12.0	3.0	1.0	16.6	4.4
231	1.2	1.2	0.6	29.6	0.4	0.8	0.4	-	-	1.2	37.2	5.0	1.0	21.2	3.0
232	1.04	0.34	2.08	32.34	0.69	0.86	0.34	-	-	-	23.65	8.52	3.13	26.78	2.06
281	0.72	-	1.26	27.45	-	0.54	2.54	-	-	-	21.45	11.63	4.72	29.45	3.26
282	1.0	-	2.6	33.2	0.2	1.2	0.6	-	-	-	20.8	5.8	5.0	29.6	2.0
284	-	-	1.6	50.0	0.8	1.4	2.0	0.2	0.4	-	10.2	14.6	0.4	17.6	5.6
285	1.92	0.19	3.06	32.69	-	0.19	0.96	-	-	-	19.23	8.65	3.26	29.61	1.34
291	2.36	-	1.99	21.81	-	0.54	3.09	-	8.36	4.72	5.45	1.63	14.00	35.45	17.25
293	1.0	-	4.6	46.60	0.6	7.0	2.0	0.2	-	-	7.0	3.40	5.0	22.60	9.8

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WHYALLA CENTRAL.

Core	Core	BRY.	T.C.+	BI.	FORAMS						QTZ.	A.	ECH.	MISC.	TOT.
No.	Alg.		N.T.C		S+Q.	T.	E.	P.	D.	N.		Needles	Spines		Forams
292	4.0	0.2	1.8	20.4	0.4	0.8	3.8	0.2	5.2	8.0	10.8	1.0	12.6	30.8	18.4
241	3.6	0.8	1.8	30.6	-	0.8	2.2	-	2.8	7.3	6.4	2.2	16.8	24.6	13.1
240	2.6	0.4	1.6	26.4	-	2.0	0.6	-	0.8	5.3	22.0	2.0	6.0	30.2	8.7
239	1.6	0.4	0.6	40.8	0.2	0.6	0.8	-	0.8	5.3	18.8	8.6	1.2	22.2	5.7
238	0.6	-	-	15.4	0.4	0.8	0.4	-	-	-	50.0	5.4	3.0	24.0	1.6
237	0.6	0.4	1.2	25.6	0.4	1.8	0.4	-	-	-	34.0	2.4	2.2	31.0	2.6
133	0.8	-	1.0	43.6	-	5.6	0.8	-	-	-	21.0	3.0	1.8	22.4	6.4
131	1.0	0.6	0.4	36.0	0.4	3.4	0.4	-	-	-	28.4	3.2	3.2	23.0	4.2
132	5.3	-	3.4	29.4	0.6	-	5.0	-	10.0	10.6	1.8	2.8	4.0	27.0	26.2
130	2.0	-	0.6	32.4	0.2	1.4	2.0	0.2	3.0	4.0	12.0	15.0	1.4	25.8	10.8
129	2.6	-	5.8	36.0	0.6	1.6	3.4	0.6	2.6	5.3	7.0	3.4	4.4	26.6	14.1
128	1.4	0.4	2.4	40.8	0.2	1.0	1.0	0.2	-	-	18.4	4.2	11.4	18.6	2.4
127	2.4	0.2	2.2	37.8	1.0	1.0	1.6	0.2	-	-	22.4	7.2	3.2	20.2	4.4
126	28.0	0.3	2.3	42.5	-	-	1.4	-	-	-	6.5	6.3	4.1	7.8	1.8
125	0.3	-	0.9	27.6	-	-	-	-	-	-	30.9	8.1	2.0	30.0	-
124	0.7	-	0.9	41.6	-	0.5	1.2	0.1	-	-	18.7	14.3	5.8	15.8	2.0
87	1.4	0.2	1.2	54.0	0.2	0.4	1.8	-	0.4	-	9.8	12.6	1.8	16.2	2.8
86	-	-	0.4	37.2	-	-	2.6	-	-	-	14.0	0.8	15.0	30.0	2.6

WHYALLA CENTRAL Cont.

85	-	-	1.8	48.0	0.4	-	2.4	-	0.2	-	10.2	19.0	1.0	16.8	3.0
84	-	0.2	3.6	46.6	0.4	0.40	0.4	-	0.2	-	13.6	13.6	4.2	16.8	1.4
83	-	0.2	0.4	42.4	1.0	0.40	1.0	-	0.2	-	18.8	19.2	0.8	15.8	2.6
82	-	-	0.6	42.0	1.2	0.6	0.2	-	-	-	18.0	15.6	1.4	20.0	2.0
81	0.6	0.4	1.6	41.6	2.4	1.0	0.8	-	-	-	17.0	19.8	0.6	13.2	4.2
122	-	1.4	1.27	42.73	-	0.72	1.64	-	0.18	-	12.91	20.36	1.09	19.09	2.5
123	-	-	0.8	41.6	-	0.4	1.6	-	-	-	13.6	14.40	1.6	21.0	2.0
121	-	-	0.4	36.0	-	-	0.4	0.2	0.2	-	10.4	19.4	2.4	30.6	0.8
120	-	-	0.4	44.2	0.4	0.2	-	-	-	-	21.0	14.6	0.6	18.6	0.6
119	-	-	0.3	42.6	0.8	0.4	0.2	-	-	-	20.4	19.4	0.6	15.4	1.4
117	-	-	2.0	39.0	1.2	0.4	0.2	-	-	-	20.0	17.4	1.0	18.8	1.8
118	-	-	0.4	37.8	0.6	0.4	0.2	-	-	-	26.2	19.0	0.8	14.6	1.2
116	-	-	0.2	30.0	0.6	-	-	-	-	-	18.2	10.0	1.0	40.0	0.6
115	0.2	0.2	1.2	30.0	0.4	0.6	0.4	-	-	-	22.4	6.6	1.8	36.2	1.4
114	1.5	-	2.8	36.8	0.4	0.2	1.0	0.2	2.2	1.5	23.2	1.6	2.6	26.0	5.5
134	3.0	-	2.2	38.0	1.0	0.2	1.2	0.2	2.6	3.0	24.8	1.4	2.4	20.0	8.2

PORT AUGUSTA.

Core No.	Core Alg.	BRY.	T.G.+ N.T.C	BI.	FORAMS.						QTZ.	A. Needles	ECH Spines	MISC.	TOT. Forams
					S+Q	T.	E.	P.	D.	N.					
151	1.8	0.4	3.4	19.2	-	0.6	1.4	0.8	2.2	1.8	34.0	5.8	18.6	10.0	6.8
152	-	-	0.2	0.6	0.2	-	-	-	-	-	98.0	1.0	-	-	0.2
154	-	0.2	1.4	13.4	2.0	2.6	0.6	-	0.6	-	68.8	2.8	2.0	5.6	5.8
155	0.9	0.2	4.0	26.4	-	1.0	2.2	0.8	-	0.9	53.4	1.6	2.8	5.8	4.9
156	2.9	0.18	3.58	24.36	0.36	0.73	0.9	0.36	0.36	-	50.3	6.0	1.8	8.0	2.7
157	0.4	0.2	0.2	1.0	-	2.0	0.2	0.2	-	-	95.6	-	0.2	-	2.4
158	1.3	-	2.2	13.8	-	-	0.4	1.4	0.8	1.3	65.2	1.6	8.4	3.6	3.9
159	-	-	-	12.0	2.6	1.2	0.4	0.4	-	-	66.2	5.0	0.4	11.8	4.6
160	-	-	1.0	16.8	2.4	1.0	0.2	0.2	-	-	54.6	8.0	0.4	15.4	3.8
161	0.2	-	1.0	22.4	-	1.2	0.2	1.6	1.0	-	63.2	2.6	1.4	5.2	4.0
162	-	-	0.8	0.8	-	-	-	0.4	-	-	97.8	-	0.2	-	0.4
163	0.9	0.4	7.0	18.0	1.6	3.6	0.2	4.0	0.6	0.9	53.4	0.8	3.4	5.2	10.9
164	1.0	0.4	3.8	20.6	0.8	1.2	0.2	3.4	0.4	1.0	58.0	2.2	1.4	5.6	7.0
165	-	-	14.2	16.4	-	-	-	0.4	-	-	69.0	-	-	-	0.4
54	0.2	-	7.2	8.6	0.2	-	0.4	0.2	0.2	-	82.2	0.6	0.2	-	1.0
55	1.0	-	2.8	10.6	-	0.6	0.4	0.2	0.4	-	74.0	3.0	2.0	5.0	1.6
56	-	-	1.4	7.6	-	1.0	0.2	0.2	-	-	85.2	1.0	0.4	3.0	1.4

/Cont.

PORT AUGUSTA Cont.

57	-	-	4.6	23.4	0.2	0.4	0.8	7.2	1.4	-	53.0	2.4	1.0	5.6	10.0
58	0.6	0.4	1.4	12.6	0.2	1.4	0.2	0.2	-	-	79.4	-	0.8	2.8	2.0
61	-	-	1.0	15.0	0.8	1.0	1.0	0.2	-	-	57.8	8.0	1.0	14.2	3.0
62	-	-	1.0	12.4	1.4	2.2	2.4	0.4	-	-	59.4	10.0	0.6	10.2	6.4
63	-	-	0.4	16.4	0.2	1.0	1.0	0.2	0.2	-	50.4	11.4	1.6	17.2	2.6
65	-	0.2	1.6	16.4	-	0.2	-	-	0.2	-	75.2	1.6	0.4	3.2	1.4
66	0.8	-	0.8	23.6	-	0.6	-	0.2	-	-	71.0	1.6	0.2	1.2	0.8

ABBREVIATIONS USED.

Cor. Alg. - Coralline Algae
T.C.+ N.T.C. ? Turreted and Non Turreted Castropods
Forams - Foraminifera
Q. - Quinqueloculina
E. - Elphidium
D. - Discorbis and Rosalina
QTZ. - Quartz
ECH. Spines - Echinoid Spines and Plates
TOT. Forams - Total Foraminifera

BRY. - Bryozoa
BI. - Bivalves
S. - Spiroloculina
T. - Triloculina
P. - Peneroplis and Spirolina
N. - Nubecularia
A. Needles - Aragonite Needles.
MISC. - Miscellaneous

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