


PE990460

STRATIGRAPHY
of the
FORAMINIFERAL SEQUENCE
in
HERMES # 1,
GIPPSLAND BASIN.

for: PHILLIPS AUSTRALIAN OIL COMPANY

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INTRODUCTION.

Forty eight sidewall cores were submitted for examination from HERMES # 1 well between 2943.0 and 1340.0 metres. Foraminiferal fauna were infrequent between 2514.5 and 2943.0m with foraminifera being present in only seven of the thirty six samples examined. Planktic specimens were recorded only in three samples; namely Mid Eocene assemblages at 2525.0 and 2542.0m and a Mid Paleocene assemblage at 2575.0m. This sporadic vertical distribution illustrates the transient nature of marine ingressive events and emphasises the necessity of close sampling for paleontological investigations.

The following Tables accompany this report:-

- TABLE 1:- INTERPRETED FORAMINIFERAL SEQUENCE based on Tables 3 & 4: on Page 1.
- TABLE 2:- Interpretative:- BIOSTRATIGRAPHIC DATA with reliability of Zonal picks: at back of text.
- TABLE 3:- Factual data:- PLANKTONIC FORAMINIFERAL DISTRIBUTION: at back of text.
- TABLE 4:- Factual data:- BENTHONIC FORAMINIFERAL DISTRIBUTION & SEDIMENT GRAIN ANALYSIS: at back of text.

The HERMES # 1 sequence is briefly discussed in ascending biostratigraphic order (i.e. uphole).

LATEST CRETACEOUS to MID PALEOCENE - ? to 2943.0 to 2583.0m.

Age based solely on playnology by Helene Martin as planktonic foraminifera were not found in this interval.

The two deepest samples examined (at 2943.0 and 2924.0) contained assemblages of arenaceous, benthonic foraminifera, indicating weak marine ingressions at these levels. Dr. Martin found dinoflagellates in these two samples which were within the *Tricolpites longus* spore/pollen Zone. A similar arenaceous foraminiferal fauna, within the *T. longus* Zone was found at 3020.0m in SELENE # 1.

MID PALEOCENE at 2575.0m:-

A poorly preserved, limonitic stained planktonic fauna was recovered from the sidewall core at 2575.0m. This assemblage includes *Globorotalia pusilla pusilla*, *G. chapmani* and *G. angulata*, indicating a mid Paleocene age, biostratigraphically correlating with Blow Zone P3 and the *G. pusilla pusilla* Zone of Stainforth et al.

This is only the second Paleocene fauna definitely identified from the Gippsland Basin. A very similar mid Paleocene fauna was reported from a sidewall core at 2804.8m in ALBACORE # 1. This mid Paleocene assemblage is present in the Otway Basin, being documented from the "greensand" unit near the top of the Pebble Point Formation (McGowran, 1965). In Hermes # 1, Dr. Martin found that samples near 2575.0m were within the *Lycistepollenites balmei* spore/pollen Zone and contained the dinoflagellate *Eisenackia crassitabulata*. These determinations confirm correlation with the Pebble Point Formation.

Precise correlation with the New Zealand sequence is not possible, but a similar mid Paleocene, *G. pusilla pusilla* fauna was recorded by Webb (1973) from D.S.D.P. Site 208 from the Tasman Sea.

The mid Paleocene sample at 2575.0m was within a lithological unit from 2625.0m to 2541.0m, which contained frosted and fractured quartz sand, features probably caused by eolian processes. This could be evidence of a barrier/dune system adjacent to the depositional site. The benthonic, arenaceous foraminiferal fauna at 2515.0m in Hermes suggests a marginal marine, estuarine situation, which is also shown by the fact that planktonic foraminifera were absent from sidewall cores vertically contiguous to 2575.0m. Thus this sample may be indicative of a high sea level event on the coastal onlap curve; probably near the peak of Cycle TP2-1 on Figure 9 of Loutit & Kennett (1981). The limonite stained nature of the planktonic specimens suggests that they were stranded above the normal high tide level, as this sample was some 27m below the top of the unit and thus was not oxidised during an erosional hiatus. This interpretation of an instantaneous high sea level event could also explain the sporadic record of this faunal event in the Tasman Sea region.

MID EOCENE - 2541.0m to 2545.0m (2548.0 to 2508.0m on E-logs):-

The presence of *Globigerina frontosa* at both 2541.0 and 2525.0m suggests a position low in the Mid Eocene (= Blow Zone P10 & P11) with a concurrence of range with *Globorotalia centralis*, suggesting a more precise placement within Blow Zone P11. The presence of *G. collactea* confirms a Mid Eocene age. In North Africa, the same association of *G. frontosa* (= *G. cerroazulensis frontosa*), *G. centralis* (= *G. cerroazulensis pomeroli*) and *G. collactea* are placed at the base of the *G. lehnei* Zone of Stainforth et al and thus in a medial position within the Mid Eocene (refer for example, Boukhary et al, 1982). Similar associations were found in both the HELIOS # 1 and SELENE # 1 sequences.

Environmentally the Mid Eocene sequence was similar to that discussed for the Mid Paleocene. It was at the top of the unit containing quartz, probably transported by eolian processes. The samples also contained estuarine arenaceous, benthonic foraminifera. There must have been an hiatus of some 10 to 12 million years within the unit; between the Mid Paleocene and Mid Eocene (at 2548.0m on E-logs). However, absence of planktonic faunas in samples between 2575.0 and 2541.0m makes this assumption speculative.

LATEST EOCENE to EARLIEST OLIGOCENE - 2505.0 to 2499.0m (2508.0 to 2475.0m on E-logs):-

The only sidewall cores available were at the base of the unit and both (at 2505.0 and 2499.0m) consisted of calcareous cemented, quartz sandstones. The samples contained similar planktonic assemblages, apart from the presence of *Globigerina linaperta* at 2505.0m and the presence of *G. brevis* at 2499.0m;

the former represented the highest Eocene Zone K, whilst the latter the lowest Oligocene Zone J-2. Both samples were deposited on an inner continental shelf platform.

EARLY MIOCENE - 2371.0 to 2163.0m (?2475.0 to 2160.0m on E-logs):-

Unfortunately, neither the top of the underlying Oligocene unit nor the base of this Miocene unit are represented by sidewall cores (Sample Gap = 124m). The deepest Early Miocene sample at 2371.0m contains a Zone G fauna, but it is suspected that Zone H-1 was present below 2371.0m and above 2475.0m. This leads to an assumption that the regional Oligocene hiatus, of some 12 million years, occurred within Hermes at approximately 2475.0m.

The Early Miocene unit was deposited in deep water (upper slope paleoenvironment) up to Zone E-2 times.

MID MIOCENE - 2077.0m to 1950.0m (2160.0 to 1879.0m on E-logs):-

Zone D-1 faunas were present at 2077.0 and 1950.0m. Once again, an hiatus is suspected due to the possible absence of the basal Zones of the Mid Miocene (i.e. Zones E-1 & D-2). A sample gap of 86m between the top Early Miocene sample and the basal Mid Miocene one. However, the E-logs show a sudden character change at 2160.0m and the sediment at and above 2077.0m have most of the features of a carbonate, submarine carbonate fill. The hiatus, if present, would have been caused by canyon scouring. Carbonate diagenesis in canyon fill sediments at and above 1845.0m precluded a biostratigraphic designation for the interval between 1845.0 to 1341.0m.

REFERENCES.

- BOUKHARY, M., et al, 1982 - Étude biostratigraphique à l'aide des Foraminifères planctoniques et des Ostracodes de l'Éocène de Beni Mazar, vallée du Nil, Égypte. *Cahiers de Micropaléontologie*, 1-1982. 8^e Colloque Africain de Micropaléontologie, Paris, 18-19 Juillet, 1980. 53-64.
- LOUTIT, T.S. & KENNETT, J.P., 1981b - New Zealand and Australian Cenozoic Sedimentary Cycles and Global Sea-Level Changes. *AAPG Bull.* 65(9); 1586-1601.
- MCGOWRAN, B., 1965 - Two Paleocene Foraminiferal Faunas from the Wangerrip Group, Pebble Point Coastal Section, Western Victoria. *Proc. Roy. Soc. Victoria*, 79(1); 9-74.
- WEBB, P.N., 1973 - Upper Cretaceous-Paleocene Foraminifera from Site 208 (Lord Howe Rise, Tasman Sea), D.S.D.P., Leg 21. *Burns, R.D., Andrews, J.E. et al, I.R.D.S.D.P., 21; 541-573.*

SIDEWALL CORES Depth in metres	BENTHONIC FORAMINIFERA	Estuarine	Inner Shelf	Upper Slope	Slope/Shelf Break	RESIDUE GRAIN LITHOLOGY					
							MAJOR COMPONENTS	MINOR COMPONENTS			
							ΨΨ recrystallised micrite ..C calcareous qtz sdst mm calc silt marl & micrite ∇Δ frosted & fractured qtz C glauconite -L f qtz micaceous lignitic sdst OO c-m ang qtz p pyrite ... f qtz sdst	c-m ang qtz pyrite mica carbonaceous material limonitic clay glauconite pyritic spheres & tubes echinoid spines sponge spicules molluscan frags ostracods worn bryozoal frags.	foram count	planktonic %	
1341.0 ₊	indet					ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ	r			?	?
1537.0 ₊	indet					ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ	r		r	?	?
1731.0 ₊	indet					ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ	r			?	?
1845.0 ₊						ΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨΨ	r			?	?
1950.0 ₊						mmmmmmmmmmmmmmmmmmmmmm	A			1000	90
2077.0 ₊						mmmmmmmmmmmmmmmmmmmmmm	A			500	90
2163.0 ₊						mmmmmmmmmmmmmmmmmmmmmm	A		r	500	90
2251.0 ₊						mmmmmmmmmmmmmmmmmmmmmm	rA		r r r	100	90
2375.0 ₊						mmmmmmmmmmmmmmmmmmmmmm	A			1000	95
2499.0 ₊						..C..C..C..C..C..	A	r	r	500	98
2505.0 ₊						.C.C.C.C.C.C.C.C	A	r	r	100	80
2514.5 ₊	N.F.F.				 ∇Δ∇Δ∇Δ∇Δ	C		r	-	-
2525.0 ₊						A A A			20	80
2534.0 ₊						A A			-	-
2537.5 ₊	N.F.F.					∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A A			-	-
2540.0 ₊						A C A			-	-
2541.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	mm	A	A	50	80
2542.5 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		10	-
2543.5 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A	A	-	-
2548.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		-	-
2549.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	r	r		-	-
2550.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		-	-
2551.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		-	-
2552.0 ₊	N.F.F.					∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		-	-
2555.5 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		-	-
2561.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		-	-
2562.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		-	-
2567.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	r	A		-	-
2568.5 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		5	-
2573.0 ₊	N.F.F.					∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		-	-
2575.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	A		50	80
2583.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	A	r		-	-
2600.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	r			-	-
2625.0 ₊						∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ∇Δ	C	A A		-	-
2682.0 ₊					 GGGG	A			-	-
2700.0 ₊					 PPP				-	-
2703.0 ₊					 OOO	A A			-	-
2716.5 ₊	N.F.F.					C A			-	-
2726.0 ₊						A C C			-	-
2733.0 ₊					 OOO				-	-
2744.0 ₊						..-L.-L.-L ooo PPP				-	-
2751.5 ₊						..-L.-L.-L ooo PPP				-	-
2759.0 ₊						A			-	-
2787.0 ₊						A r			-	-
2854.0 ₊					 OOO				-	-
2881.0 ₊						..-L.-L.-L.-L. OOO				-	-
2924.0 ₊					 PPP	A	A		5	-
2943.0 ₊						..-L.-L oooooooooo				20	-

KEY: ° = <20 specimens
 x = >20 specimens
 N.F.F. = no foraminifera found
 indet = indeterminate due to preservation

A = 1-5% of grains
 C = >20 grains
 r = <20 grains

TABLE 4: BENTHONIC FORAMINIFERAL DISTRIBUTION and SEDIMENT GRAIN ANALYSIS - HERMES # 1.