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APPENDIX-1

MICROPALAEONTOLOGICAL ANALYSIS OF KAHAWAI-1

GIPPSLAND BASIN, VICTORIA

by

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PART-1

INTERPRETATIVE DATA

INTRODUCTION

GEOLOGICAL SUMMARY

GEOLOGICAL COMMENTS

BIOSTRATIGRAPHY

SUMMARY TABLE

DATA SHEET

INTRODUCTION:

The planktonic foraminiferal content of thirty-three sidewall cores has been examined. The greatest sample density occurs over the interval containing the top of the Latrobe Group and the basal Lakes Entrance Formation; nevertheless the remainder of the marine section, up to the base of the casing shoe is well sampled.

Except where affected by recrystallization, preservation and yield of microfossils was good to excellent throughout the well. This standard of preservation allowed, in most cases, zonal identifications to be made with a high degree of confidence. Recrystallization is only a problem immediately above the top of the Latrobe Group and for about 100 metres below final sample.

The planktonic assemblage, prior to Zone D1 is fairly diverse with a high proportion of keeled forms. This high diversity is probably a result of the deeper water environment through this part of the Tertiary. In this regard Kahawai-1 contrasts sharply with shallower water sections such as is found at Seahorse-2 which contains only a limited globigerinid fauna with no keeled forms. (Hannah in prep.).

As discussed below (Biostratigraphy Section) a general decline in species diversity is expected across the D2/D1 boundary. This combined with the poorer preservation of material accounts for the decrease in diversity at the top of the section.

Biostratigraphic dating reveals that most samples form a consistent pattern of ages ranging from the Early Miocene (Zone G) to the Mid Miocene (Zone C). The section appears to be continuous (see below - Geological Comments).

GEOLOGICAL SUMMARY

KAHAWAI-1

AGE	FORMATION/LITHOLOGY	ZONE	DEPTH (m)
RECENT TO MIOCENE	GIPPSLAND LIMESTONE Not sampled -----		Seafloor-950.0
MIDDLE MIOCENE	Recrystalization increasing and preservation decreasing up section	C	950.0-1070.1
?	LAKES ENTRANCE FORMATION Residues consist almost entirely of well preserved foraminiferal tests	D-1	1090.2-1110.0
		D-2	1130.0-1270.3
EARLY		E-2	1324.9
MIOCENE	----- Recrystalization of carbonate, preservation poor - distinct log signature.	F	1339.9-1376.2
		G	1379.2-1387.0
	LATROBE GROUP Gurnard Formation. Fine grained quartz sand - slightly glauconitic and micaceous	?	

Unfortunately two sidewall cores appear to be misplaced as their determined ages do not fit the perceived pattern (SWC Nos 112 and 113, see Summary Table 2 and Biostratigraphy Section). The misplacement of these two sidewall cores implies that the depths of the remaining samples must be treated with some degree of caution.

GEOLOGICAL COMMENTS

- (a) There appear to be no breaks in the section studied. The lack of Zone E1 and the thinness of E2 is probably a result of the large sampling interval in this part of the section.
- (b) The Gurnard Formation in Kahawai-1 consists of ten metres (1400.0 to 1390.0 metres) of fine grained quartz sand which is occasionally glauconitic and often contains pyrite and mica. It is not a greensand as is found in many other Gippsland Basin wells. This unit is marked, top and bottom by distinct log breaks.

No in situ planktonic foraminifera have been found in this interval, making age determination impossible. Very rare agglutinated foraminifera are found in sidewall core 110 at 1392.0 metres. Well preserved planktonic contaminants occur in sidewall cores 63 and 65 at 1396.1 and 1394.0 metres respectively. Two species are involved; Orbulina universa and Globoquadrina dehiscens, both are well below the base of their ranges.

- (c) The transition from Latrobe Group sediments to those of the Lakes Entrance Formation is marked by a change in lithology

of fine grained quartz sand to a strongly recrystallized carbonate. Recrystallization of material from sidewall core 71 at 1388.1 metres, immediately above top of Latrobe is so intense that no foraminifera could be recognised. Up section recrystallization ameliorates; first foraminifera are found in sidewall core 72 at 1387.0 metres, and by sidewall core 76 at 1379.2, a well preserved fauna was recovered. The whole interval is confidently dated as Early Miocene (Zone G - see Biostratigraphy Section). The recrystallization of the carbonate produces a distinct log signature which is most noticeable on the resistivity logs.

- (d) The distinction between the Lakes Entrance Formation and the Gippsland Limestone was impossible to pick using the washed residues. This boundary, however, is tentatively placed at the log break at 1086.0 metres. Above this level preservation deteriorates due to increasing recrystallization.

BIOSTRATIGRAPHY

The zonal scheme is that of Taylor currently in use in the Gippsland Basin.

Taxonomic note: Since the preparation of the range chart the taxonomic standing of two species used has altered. Both Globorotalia siakensis and Globorotalia continuosa are now considered junior synonyms of Globorotalia mayeri (Bolli and Sanders 1982). Whereas Globorotalia siakensis and Globorotalia continuosa are listed on the range chart, Globorotalia mayeri is used in this report.

Zone G - Early Miocene (1387.0 - 1379.0 metres)

The presence of Globigerinoides quadrilobatus trilobus without Globigerinoides sicanus in sidewall cores between 1387.0 and 1379.0 metres enable this interval to be assigned to Zone G (Early Miocene). Typical constituents of a Zone G Assemblage, including Globigerina woodi, Globigerina woodi connecta and both the sensu lato and sensu stricto forms of Globoquadrina dehiscens, are common throughout this interval.

Zone F, Early Miocene (1376.2 - 1339.9 metres)

There is little or no change in the foraminiferal assemblage between Zones G and F. The base of the latter zone is recognised by the first appearance of Globigerinoides sicanus in sidewall core 77 at 1376.2 metres. Most samples from this interval contain a highly diverse, well preserved fauna and the zonal assignment carries a high degree of confidence.

One exception to this is sidewall core 79 at 1369.0 metres which lacks Globigerinoides sicanus. If not for this sample's position in the section it would be assigned to Zone G. However the sample is considered to be in place since the preservation, yield, and diversity of its fauna is identical to samples on either side.

A similar non-appearance of Globigerinoides sicanus in sidewall core 113 offers an alternative explanation as to why this sample appears to be out of sequence. However, the diversity, yield and preservation of this sample's fauna sets it apart from other Zone F samples.

The patchy distribution of Globigerinoides sicanus is common in the Gippsland Basin. The late occurrence has, on some occasions caused the top of Zone G to be placed too high.

Zones E2, Early Miocene (1324.9 metres)

The occurrence of well developed Praeorbulina glomerosa in sidewall core 115 without Orbulina in either its universa or suturalis forms fixes this sample's age as Zone E2.

Zone D - Middle Miocene (1270.3 - 1090.2 metres)

Nine samples which contain Orbulina universa without Globorotalia miotumida miotumida are assigned to this zone.

This zone is subdivided using the evolutionary appearance of Globorotalia peripheroronda and/or a general decline in species diversity, especially among the Globierinoides. Unfortunately Globorotalia peripheroronda has not been recognised in Kahawai-1. However, a significant reduction in the number of species occurs between 1130.0 and 1110.0 metres and the D1/D2 boundary is, somewhat tentatively, placed accordingly.

Species usually present throughout Zone D (Globorotalia conica, Globorotalia praescitula and Globorotalia miozea) are, in Kahawai-1, confined to Zone D2 only.

Zone C - Middle Miocene (1070.1 - 950.0[?] metres)

The first occurrence of Globorotalia miotumida miotumida in sidewall core 128 at 1070.1 metres is used to designate the base of Zone C. The appearance of Globorotalia scitula at 1025.0 metres is consistent with this zonal assignment.

The top of this zone is marked by the extinction of Globorotalia mayeri and its replacement by Globorotalia acostaensis. Unfortunately, as preservation deteriorates towards the casing shoe, distinguishing between these two species becomes increasingly difficult. Hence the zonal determination of sidewall core 132 at 950.0 metres is only tentative.

BIBLIOGRAPHY

Bolli, H.M. & Saunders, J.B., 1982. Globorotalia mayeri and its relationship to Globorotalia siakensis and Globorotalia continuosa; J. Foram. Research 12,(1), 39-50.

Hannah, M.J. (in prep). Micropalaeontological analysis of Seahorse-2, Gippsland Basin, Victoria.

KAHAWAI-1 SUMMARY TABLE-2

INTERPRETATIVE DATA

SIDEWALL CORE NO.	DEPTH (METRES)	MICROFOSSIL YIELD	MICROFOSSIL PRESERVATION	PLANKTON DIVERSITY	ZONE (RATING)	AGE
132	950.0	Very Poor	Very Poor	Low	C (2)	late Middle Miocene
131	999.6	Poor	Poor	Low	C (1)	late Middle Miocene
130	1025.0	Good	Very Poor	Low	C (1)	late Middle Miocene
129	1050.0	Good	Good	Low	C (1)	late Middle Miocene
128	1070.1	Moderate	Poor	Moderate	C (1)	late Middle Miocene
127	1090.2	Good	Poor	Moderate	D1(1)	Middle Miocene
126	1110.0	Good	Poor	Moderate	D1(2)	Middle Miocene
125*	1130.0	Excellent	Excellent	High	D2(2)	Middle Miocene
124*	1150.3	Excellent	Good	Moderate	D2(2)	Middle Miocene
123*	1169.9	Poor	Good	High	D2(1)	Middle Miocene
121*	1210.1	Poor	Good	High	D2(1)	Middle Miocene
120*	1230.4	Good	Moderate	High	D2(1)	Middle Miocene
119*	1250.2	Excellent	Very Good	Moderate	D2(1)	Middle Miocene
118*	1270.3	Good	Poor	Low	D2(1)	Middle Miocene
115*	1324.9	Excellent	Excellent	Moderate	E2(1)	late Early Miocene
84*	1339.9	Excellent	Good	High	F (0)	late Early Miocene
83*	1352.0	Excellent	Good	High	F (0)	late Early Miocene
82*	1357.0	Good	Poor	Moderate	F (1)	late Early Miocene
114*	1361.3	Excellent	Good	Moderate	F (0)	late Early Miocene
81*	1365.0	Excellent	Excellent	High	F (0)	late Early Miocene
79*	1369.0	Excellent	Excellent	Moderate		Non diagnostic
113*	1373.0	Poor	Good	Low	G (1)	Misplaced
77*	1376.2	Excellent	Excellent	Moderate	F (0)	late Early Miocene
76*	1379.0	Excellent	Excellent	Low	G (1)	Early Miocene
112*	1379.2	Excellent	Excellent	High	D1(1)	Misplaced
75*	1382.1	Excellent	Good	Moderate	G (1)	Early Miocene
73*	1386.0	Poor	Very Poor	Low	G (2)	Early Miocene
72*	1387.0	Good	Poor	Moderate	G (1)	Early Miocene
71	1388.1	NFF				Indeterminate
70	1389.0	NFF				Indeterminate
110	1392.0	Very Low	Poor			Rare Agglutinated benthonics only
65*	1394.0	Very Low	Good	Very Low		Indeterminate - contaminants only
63	1396.1	Very Low	Good	Very Low		Indeterminate - contaminants only

*Slide Prepared.

M I C R O P A L E O N T O L O G I C A L D A T A S H E E T

B A S I N : GIPPSLAND
 WELL NAME : KAHAWAI-1

ELEVATION: KB: 21m GL: -81m
 TOTAL DEPTH: 2321 metres

A G E	FORAM. ZONULES	H I G H E S T D A T A				L O W E S T D A T A					
		Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
PLEIS-TOCENE	A ₁										
	A ₂										
PLIO-CENE	A ₃										
	A ₄										
MIOCENE	LATE	B ₁									
		B ₂									
		C	950.0	2	999.6	1		1070.1	1		
	MIDDLE	D ₁	1090.2	1				1110.0	2		
		D ₂	1130.0	2				1270.3	1		
		E ₁									
		E ₂	1324.9	1				1324.9	1		
	EARLY	F	1339.9	0				1376.2	0		
		G	1379.2	1				1387.0	1		
		H ₁									
OLIGOCENE	LATE	H ₂									
		I ₁									
	I ₂										
	EARLY	J ₁									
		J ₂									
EOC-ENE	K										
	Pre-K										

COMMENTS:

- CONFIDENCE RATING:
- 0: SWC or Core - Complete assemblage (very high confidence).
 - 1: SWC or Core - Almost complete assemblage (high confidence).
 - 2: SWC or Core - Close to zonule change but able to interpret (low confidence).
 - 3: Cuttings - Complete assemblage (low confidence).
 - 4: Cuttings - Incomplete assemblage, next to uninterpretable or SWC with depth suspicion (very low confidence).

NOTE: If an entry is given a 3 or 4 confidence rating, an alternative depth with a better confidence rating should be entered, if possible. If a sample cannot be assigned to one particular zone, then no entry should be made, unless a range of zones is given where the highest possible limit will appear in one zone and the lowest possible limit in another.

DATA RECORDED BY: M.J. HANNAH
 DATA REVISED BY: _____

DATE: 22 OCTOBER 1982
 DATE: _____

PART 2

BASIC DATA
SUMMARY TABLE
RANGE CHART

KAHAWAI-1 SUMMARY TABLE-3

BASIC DATA

SIDEWALL CORE NO.	DEPTH (METRES)	MICROFOSSIL YIELD	MICROFOSSIL PRESERVATION	PLANKTON DIVERSITY
132	950.0	Very Poor	Very Poor	Low
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127	1090.2	Good	Poor	Moderate
126	1110.0	Good	Poor	Moderate
125*	1130.0	Excellent	Excellent	High
124*	1150.3	Excellent	Good	Moderate
123*	1169.9	Poor	Good	High
121*	1210.1	Poor	Good	High
120*	1230.4	Good	Moderate	High
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83*	1352.0	Excellent	Good	High
82*	1357.0	Good	Poor	Moderate
114*	1361.3	Excellent	Good	Moderate
81*	1365.0	Excellent	Excellent	High
79*	1369.0	Excellent	Excellent	Moderate
113*	1373.0	Poor	Good	Low
77*	1376.2	Excellent	Excellent	Moderate
76*	1379.0	Excellent	Excellent	Low
112*	1379.2	Excellent	Excellent	High
75*	1382.1	Excellent	Good	Moderate
73*	1386.0	Poor	Very Poor	Low
72*	1387.0	Good	Poor	Moderate
71	1388.1	NFF		
70	1389.0	NFF		
110	1392.0	Very Low	Poor	
65*	1394.0	Very Low	Good	Very Low
63	1396.1	Very Low	Good	Very Low

*Slide Prepared.