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FORAMINIFERAL ANALYSIS, YELLOWTAIL-2

GIPPSLAND BASIN

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INTRODUCTION

Fifty six (56) sidewall core samples were processed for foraminiferal analysis in Yellowtail-2 from 845 to 2423 metres. Only the planktonic foraminifera have been scrutinized in detail. An agglutinated benthonic foraminiferal fauna has been noted at the base of the Lakes Entrance Formation and its palaeoenvironmental implications are discussed in the section dealing with geological comments. Adequate planktonic foraminiferal faunas occur in most samples with the exception of the Gippsland Limestone (in samples between 920 and 1560m), the lower most sample of the Lakes Entrance Formation (at 2413m) and the Gurnard Formation (between 2413.9 and 2423m). Preservation of planktonic foraminifera (if present) within these intervals is generally very poor owing to recrystallization.

Tables 1 and 2, provide a summary (Basic and Interpretive) of the palaeontological analysis in Yellowtail-2. A summary of the biostratigraphic breakdown of the stratigraphic units in Yellowtail-2 is given below.

SUMMARY

DEPTH(m)	ZONE	AGE	UNIT
845	A-4 to B-2	Mid Pliocene - Late Miocene	Gippsland Limestone
920-1635	Indeterminate	-	
1710 - 1790	C	Mid Miocene	
1865 - 2090	D-1 to D-2	Mid Miocene	Lakes
2169 - 2258	F	Early Miocene	Entrance
2271 - 2355	G	Early Miocene	Formation
2365 - 2409	H-1	Early Miocene	
2410 - 2411	H-1 to I-1	Late Oligocene/ Early Miocene	
2412 - 2413	Indeterminate	-	
2413.9- 2423	Indeterminate	-	Gurnard Formation

GEOLOGICAL COMMENTS

- 1) The Gurnard Formation in Yellowtail-2 has been strongly limonitized and is barren of foraminifera.
- 2) Two units are recognized within the base of the Lakes Entrance Formation in Yellowtail-2: a thin lower unit of calcareous siltstone (approximately 2m thick : 2412 to 2413m) and an upper foraminiferal biomicrite or planktonic foraminiferal ooze. The basal calcareous siltstone contains a foraminiferal fauna dominated by deep water, fine grained agglutinated benthonics including opaline Ammodiscus. There is a low yield of very poorly preserved planktonic foraminifera in the unit. The fauna is not age diagnostic. This calcareous siltstone has also been recognized in Yellowtail-1 where it is thicker (approximately 9 metres thick). This lithology is not represented on the erosional high intersected in Opah-1. The facies is tentatively interpreted as being a deep water turbidite which has been sourced from a north-northwest direction (Rexilius, in prep.).
- 3) The planktonic foraminiferal ooze which overlies the calcareous siltstone was also deposited in deep water (planktonic foraminiferal percentage 95-98 percent). The presence of pelletal glauconite (constituting about 10 percent of the unit) at the base of the unit indicates slow depositional rates. The glauconite content decreases upsection. The age of the base of the ooze in Yellowtail-2 (SWC 36 - 2410m) can be no older than Zone I-1 and from 2409 to 2365m is assignable to Zone H-1. The planktonic foraminiferal ooze has also been recognized in Yellowtail-1 (Taylor, 1982) where it overlies the calcareous siltstone facies and in Opah-1 where it overlies a sand.
- 4) There is evidence of reworking at the base of the Lakes Entrance Formation in Yellowtail-2. Foraminiferal faunas of Zone I-1 age and possibly Zone H-2 age have been reworked during Zone H-1 time as high as 2395m. Reworking of Early and Late Oligocene planktonic foraminiferal assemblages during the Early Miocene (Zone H-1 time) has also been recorded in Yellowtail-1 and Opah-1 (Rexilius, in prep.).

DISCUSSION OF ZONES

The Tertiary biostratigraphy in Yellowtail-2 is based on the Gippsland Basin planktonic foraminiferal zonal scheme of Taylor (in prep.). Studies by Jenkins (1960, 1971), Blow (1969, 1970), Postuma (1971), Stainforth et al (1975) and Hornibrook (1982) have also been consulted.

ZONES A-4 to B-2: 845m

The association of Globorotalia acostaensis with G. miozea conoidea and G. scitula indicates that SWC 153 at 845m can be assigned to zones A-4, B-1 or B-2.

INDETERMINATE INTERVAL : 920 - 1635m

The poor preservation and low to moderate yield of planktonic foraminifera in the Gippsland Limestone between 920 and 1560m hampers biostratigraphic determinations. Although the lowermost sample of Gippsland Limestone in Yellowtail-2 (SWC 140-1635m) contains a well preserved planktonic foraminiferal assemblage, there are no biostratigraphically useful species present. The sporadic occurrence of Globorotalia conomiozea within the interval 920 - 1635m would normally indicate assignment to Zone B-1 or younger using the planktonic foraminiferal zonal scheme of Taylor (in prep.). Taylor's zonal scheme defines the base of Zone B-1 (6MA - latest Late Miocene) by the first uphole appearance of Globorotalia conomiozea. However in Yellowtail-2, Globorotalia conomiozea is associated with Globorotalia mayeri, a species whose extinction defines the top of Zone C. Recent work by Hornibrook (1982) on faunas from DSDP site 258 off the western coast of New Zealand, indicates that conical forms of Globorotalia miozea conoidea, which are indistinguishable from Globorotalia conomiozea, are common in the Tongaporutuan New Zealand stage (6 - 12MA). The use of Globorotalia conomiozea as a defining event for the base of Zone B-1 at 6MA is now considered invalid. In Yellowtail-2 there is good evidence that the species makes its first appearance earlier within Zone C.

ZONE C : 1710 - 1790m

The base of Zone C is defined by the extinction of Globorotalia miozea miozea which abruptly vanishes uphole at 1865m. The top of the zone in Yellowtail-2 is defined by the extinction of Globorotalia mayeri at 1710m.

ZONES D-1 to D-2 : 1865 - 2090m

The appearance of Orbulina universa uphole at 2090m and the extinction uphole of Globorotalia miozea miozea at 1865m defines the interval as Zone D-1 to D-2 in age.

ZONE F : 2169 - 2258m

The interval is assigned to Zone F on the basis of the presence of Globigerinoides bisphericus and the absence of the Praeorbulina - Orbulina plexus.

ZONE G : 2271 - 2355m

The appearance uphole of Globigerinoides trilobus at 2355m defines the base of Zone G in Yellowtail-2. The top of the zone is defined by the evolutionary appearance uphole of Globigerinoides bisphericus from G. trilobus at 2258m. Zone G planktonic foraminiferal faunas in Yellowtail-2 are diverse and very well preserved.

ZONE H-1 : 2365 - 2409m

The appearance uphole of Globigerina woodi connecta at 2409m defines the base of Zone H-1 in Yellowtail-2. The top of Zone H-1 in Yellowtail-2 is defined by the uphole first appearance of Globigerinoides trilobus at 2355m. There is evidence of reworking of Zone I-1 and possibly Zone H-2 faunas during Zone H-1 time. This is confirmed by the common occurrence of Globigerina euapertura in SWC 40 at 2406m and sporadic occurrences of Globorotalia opima and Globigerina tripartita between 2395 and 2409m.

ZONES H-1 to I-1 : 2410 - 2411m

The interval contains very poorly preserved (recrystallized) planktonic foraminifera. The presence of Globoquadrina dehiscens sl. indicates an age no older than Zone I-1.

INDETERMINATE INTERVAL : 2412 - 2423m

The lowermost record of planktonic foraminifera in Yellowtail-2 is at 2412m where only rare indeterminate globigerinids were recovered. The lowermost sample of Lakes Entrance Formation (2413m) contains only agglutinated foraminifera. No foraminifera were found in the Gurnard Formation between 2413.9 and 2423m.

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MICROPALAEONTOLOGICAL DATA SHEET

BASIN: GIPPSLAND

ELEVATION: KB: 21M GL: 78M

WELL NAME: Yellowtail - 2

TOTAL DEPTH: 2566

AGE	FORAM. ZONULES	HIGHEST DATA					LOWEST DATA					
		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	845	2									
MIOCENE	LATE	B ₁										
		B ₂						845	2			
		C	1710	1					1790	1		
	MIDDLE	D ₁	1865	1								
		D ₂							2090	0		
		E ₁										
		E ₂										
	EARLY	F	2169	0					2258	0		
		G	2271	0					2355	0		
		H ₁	2365	1					2409	1		
OLIGOCENE	LATE	H ₂										
		I ₁										
		I ₂										
	EARLY	J ₁										
		J ₂										
		K										
EOC- ENE	Pre-K											

COMMENTS: There is evidence of reworking of I-1 and ?H-2 planktonic foraminiferal faunas in Zone H-1 up to 2395 metres. Preservation of faunas in the interval 2410 to 2411 m. is very poor, however, the presence of *Globoquadrina dehiscens* s.1 indicates an age no older than Zone I-1. The lower most samples of Lakes Entrance Formation (2412-2413m) contain foraminiferal faunas dominated by agglutinated benthonics. Very rare and very poorly preserved planktonics are restricted to 2412 m. and no age assignment is possible. The Gurnard Formation between 2413.9 and 2423 m. is

CONFIDENCE RATING: 0: SWC or Core - Complete assemblage (very high confidence). barren of foraminifera.
 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: J.P. Rexilius

DATE: 27th July 1982.

DATA REVISED BY: J.P. Rexilius

DATE: 9th September, 1982.

TABLE - 1
 SUMMARY OF PALAEOLOGICAL ANALYSIS
 YELLOWTAIL-2, GIPPSLAND BASIN
 INTERPRETATIVE DATA

NATURE OF SAMPLE	DEPTH (METRES)	MICRO- FOSSIL YIELD	PRESERVATION	DIVERSITY	ZONE	RATING	AGE
SWC 153	845	High	Good	Moderate	A-4 to B-1	2	Mid Pliocene - Late Miocene
SWC 152	920	Moderate	Poor	Low	Indeterminate	-	-
SWC 151	995.1	Moderate	Moderate	Low	Indeterminate	-	-
SWC 150	1070	Low	Poor	Very Low	Indeterminate	-	-
SWC 149	1145	Low	Poor	Very Low	Indeterminate	-	-
SWC 148	1219.9	Low	Poor	Very Low	Indeterminate	-	-
SWC 147	1295	Moderately Low	Poor	Low	Indeterminate	-	-
SWC 146	1367.9	Low	Poor	Very Low	Indeterminate	-	-
SWC 145	1376	Moderately Low	Poor	Very Low	Indeterminate	-	-
SWC 144	1381	Low	Poor	Low	Indeterminate	-	-
SWC 143	1409.9	Low	Poor	Low	Indeterminate	-	-
SWC 142	1485	Moderate	Poor	Low	Indeterminate	-	-
SWC 141	1560	Moderate	Moderately Poor	Moderate	Indeterminate	-	-
SWC 140	1635	High	Good	Moderate	Indeterminate	-	-
SWC 139	1710	High	Good	Moderate	C	1	Mid Miocene

TABLE - 1 (2)
SUMMARY OF PALAEOONTOLOGICAL ANALYSIS
YELLOWTAIL-2, GIPPSLAND BASIN
INTERPRETATIVE DATA

NATURE OF SAMPLE	DEPTH (METRES)	MICRO-FOSSIL YIELD	PRESERVATION	DIVERSITY	ZONE	RATING	AGE
SWC 138	1790	High	Good	High	C	1	Mid Miocene
SWC 137	1865	High	Moderately Good	Moderate	D-1/D-2	1	Mid Miocene
SWC 136	1940	High	Moderately Good	High	D-1/D-2	1	Mid Miocene
SWC 84	2014.9	Moderately High	Moderate	Low	D-1/D-2	0	Mid Miocene
SWC 135	2090	Low	Moderate-Poor	Low	D-1/D-2	0	Mid Miocene
SWC 134	2169	Moderately High	Moderate	Moderate	F	0	Early Miocene
SWC 133	2258	High	Good	Moderate	F	0	Early Miocene
SWC 132	2271	Moderate	Moderate-Poor	Moderate	G	0	Early Miocene
SWC 131	2283	High	Good	High	G	0	Early Miocene
SWC 129	2305	High	Good	High	G	0	Early Miocene
SWC 128	2315	High	Moderate	Moderate	G	0	Early Miocene
SWC 127	2324.9	Moderate	Moderate-Poor	Moderate	G	0	Early Miocene
SWC 126	2335	High	Moderate	Moderate	G	0	Early Miocene
SWC 125	2345	High	Moderate	Moderate	G	0	Early Miocene
SWC 47	2355	High	Good	High	G	0	Early Miocene

TABLE - 1 (3)
SUMMARY OF PALAEOONTOLOGICAL ANALYSIS
YELLOWTAIL-2, GIPPSLAND BASIN
INTERPRETATIVE DATA

NATURE OF SAMPLE	DEPTH (METRES)	MICRO-FOSSIL YIELD	PRESERVATION	DIVERSITY	ZONE	RATING	AGE
SWC 46	2365	Low	Poor	Low	H-1	1	Early Miocene
SWC 124	2370	High	Good	High	H-1	1	Early Miocene
SWC 45	2375	High	Good	High	H-1	1	Early Miocene
SWC 123	2380	High	Moderate	Moderate	H-1	1	Early Miocene
SWC 44	2385	High	Moderate	Moderate	H-1	1	Early Miocene
SWC 122	2390	Moderate	Moderate	Moderate	H-1	1	Early Miocene
SWC 43	2395	Moderate	Moderate	Low	H-1	1	Early Miocene *
SWC 121	2400	High	Moderate-Poor	Moderate	H-1	1	Early Miocene *
SWC 41	2405	Moderate	Poor	Low	H-1	1	Early Miocene *
SWC 40	2406	High	Moderate	Moderate	H-1	1	Early Miocene *
SWC 39	2407	High	Moderate	Moderate	H-1	1	Early Miocene *
SWC 38	2408	High	Poor	Low	H-1	1	Early Miocene *
SWC 37	2409	High	Moderate-Poor	Moderate	H-1	1	Early Miocene *

* = Reworking of Late Oligocene (Zone I-1) and ?Early Miocene (Zone H-2) planktonic foraminifera.

TABLE - 1 (4)
 SUMMARY OF PALAEONTOLOGICAL ANALYSIS
 YELLOWTAIL-2, GIPPSLAND BASIN
 INTERPRETATIVE DATA

NATURE OF SAMPLE	DEPTH (METRES)	MICRO- FOSSIL YIELD	PRESERVATION	DIVERSITY	ZONE	RATING	AGE
SWC 36	2410	High	Poor	Low	I-1 or younger	2	Early Miocene/ Late Oligocene
SWC 35	2411	Low	Very Poor	Very Low	I-1 or younger	2	Early Miocene/ Late Oligocene
SWC 34	2412	Low	Very Poor	Very Low	Indeterminate	-	-
SWC 33	2413	N.F.F.	-	-	-	-	-
SWC 32	2413.9	N.F.F.	-	-	-	-	-
SWC 120	2415.9	N.F.F.	-	-	-	-	-
SWC 119	2417	N.F.F.	-	-	-	-	-
SWC 118	2418	N.F.F.	-	-	-	-	-
SWC 117	2419	N.F.F.	-	-	-	-	-
SWC 116	2419.9	N.F.F.	-	-	-	-	-
SWC 115	2421	N.F.F.	-	-	-	-	-
SWC 114	2421.9	N.F.F.	-	-	-	-	-
SWC 113	2423	N.F.F.	-	-	-	-	-

N.F.F. = No foraminifera found (planktonics).

BASIC DATA

TABLE - 2 : FORAMINIFERAL DATA - YELLOWTAIL - 2.

RANGE CHART : TERTIARY PLANKTONIC FORAMINIFERA.

TABLE - 2
FORAMINIFERAL DATA
YELLOWTAIL - 2, GIPPSLAND BASIN
BASIC DATA

SAMPLE No.	DEPTH (Metres)	MICRO FOSSIL YIELD	PRESERVATION	DIVERSITY
SWC 153	845	High	Good	Moderate
SWC 152	920	Moderate	Poor	Low
SWC 151	995.1	Moderate	Moderate	Low
SWC 150	1070	Low	Poor	Very Low
SWC 149	1145	Low	Poor	Very Low
SWC 148	1219.9	Low	Poor	Very Low
SWC 147	1295	Moderately Low	Poor	Low
SWC 146	1367.9	Low	Poor	Very Low
SWC 145	1376	Moderately Low	Poor	Very Low
SWC 144	1381	Low	Poor	Low
SWC 143	1409.9	Low	Poor	Low
SWC 142	1485	Moderate	Poor	Low
SWC 141	1560	Moderate	Moderately Poor	Moderate
SWC 140	1635	High	Good	Moderate
SWC 139	1710	High	Good	Moderate
SWC 138	1790	High	Good	High
SWC 137	1865	High	Moderately Good	Moderate
SWC 136	1940	High	Moderately Good	High
SWC 84	2014.9	Moderately High	Moderate	Low
SWC 135	2090	Low	Moderate-Poor	Low
SWC 134	2169	Moderately High	Moderate	Moderate
SWC 133	2258	High	Good	Moderate
SWC 132	2271	Moderate	Moderate-Poor	Moderate
SWC 131	2283	High	Good	High
SWC 129	2305	High	Good	High
SWC 128	2315	High	Moderate	Moderate
SWC 127	2324.9	Moderate	Moderate-Poor	Moderate
SWC 126	2335	High	Moderate	Moderate
SWC 125	2345	High	Moderate	Moderate
SWC 47	2355	High	Good	High
SWC 46	2365	Low	Poor	Low
SWC 124	2370	High	Good	High

TABLE - 2 (2)
FORAMINIFERAL DATA
YELLOWTAIL - 2, GIPPSLAND BASIN
BASIC DATA

SAMPLE No.	DEPTH (Metres)	MICRO FOSSIL YIELD	PRESERVATION	DIVERSITY
SWC 45	2375	High	Good	High
SWC 123	2380	High	Moderate	Moderate
SWC 44	2385	High	Moderate	Moderate
SWC 122	2390	Moderate	Moderate	Moderate
SWC 43	2395	Moderate	Moderate	Low
SWC 121	2400	High	Moderate-Poor	Moderate
SWC 41	2405	Moderate	Poor	Low
SWC 40	2406	High	Moderate	Moderate
SWC 39	2407	High	Moderate	Moderate
SWC 38	2408	High	Poor	Low
SWC 37	2409	High	Moderate-Poor	Moderate
SWC 36	2410	High	Poor	Low
SWC 35	2411	Low	Very Poor	Very Low
SWC 34	2412	Low	Very Poor	Very Low
SWC 33	2413	N.F.F.	-	-
SWC 32	2413.9	N.F.F.	-	-
SWC 120	2415.9	N.F.F.	-	-
SWC 119	2417	N.F.F.	-	-
SWC 118	2418	N.F.F.	-	-
SWC 117	2419	N.F.F.	-	-
SWC 116	2419.9	N.F.F.	-	-
SWC 115	2421	N.F.F.	-	-
SWC 114	2421.9	N.F.F.	-	-
SWC 113	2423	N.F.F.	-	-

N.F.F. = No foraminifera found (planktonics)