

PE990493

PLANKTONIC FORAMINIFERAL ANALYSIS  
OF LUDERICK-1, GIPPSLAND BASIN

by

M.J. HANNAH

Esso Australia Ltd.  
Palaeontology Report 1983/27  
0576L

September, 1983

PART 1 - INTERPRETATIVE DATA

INTRODUCTION

GEOLOGICAL COMMENTS

BIOSTRATIGRAPHY

INTERPRETIVE DATA

DATA SHEET

SUMMARY: LUDERICK-1

AGE	FORMATION	ZONATION
LATE MIOCENE	GIPPSLAND LIMESTONE	Zone B2 860.6 - 922.0
		Zone C 944.9 - 1041.5
MID MIOCENE	.....1190.0.....	Zone D1 1100.0 - 1218.9
		Zone D2 1249.1 - 1339.9
EARLY MIOCENE	LAKES ENTRANCE FORMATION	Zone E2 1370.0
		Zone F 1398.5 - 1486.9
EARLY OLIGOCENE	(Strong reworking of Gurnard Formation) 1777.0	Zone G 1516.1 - 1665.0
		Zone H1 1694.9 - 1745.0
LATE EOCENE/ EARLIEST OLIGOCENE	GURNARD FORMATION	Zone Indeterminate 1754.0 - 1766.5 ( <u>P. tuberculatus</u> )
	1803.0	

## INTRODUCTION

Marine sediments from Luderick-1 range in age from Late Eocene (Zone K) to Late Miocene (Zone B2). Palaeontological and lithological evidence indicate that the Latrobe Group/Lakes Entrance Formation boundary should be placed at 1777.0m.

A disconformity occurs between sidewall cores 120 and 121 (at 1754.0m and 1745.0m respectively). The exact duration of the hiatus involved is uncertain due to extensive reworking of Gurnard material into the basal part of the Lakes Entrance formation. However, the best estimate is that the break is between the Early Oligocene and Early Miocene.

## GEOLOGICAL COMMENTS

### 1. GURNARD FORMATION

The Gurnard Formation in Luderick-1 is about 25m thick. Lithologically the basal sample contains a large percentage of both weathered and unweathered glauconite, which is in sharp contrast to the low glauconite levels of the underlying sands. The top of the unit is more difficult to define as it has been reworked into the basal Lakes Entrance Formation. The boundary is placed at 1777.0m and is reflected in a sudden decrease in glauconite content and a parallel increase in carbonate.

Lithologically the Gurnard Formation at Luderick-1 is not homogeneous. Levels of mica, carbonate and even glauconite fluctuate from sample to sample. Glauconite abundance, however, always remains high relative to samples from either side of the unit.

In situ foraminifera first appear in SWC 108, and consists of fragments of deepwater calcareous benthonics. Upsection (1801.5m) samples yield reasonable planktonic assemblages which are assigned to Zone K. Gurnard samples from below the last appearance upsection of Globigerinathecka index in SWC 115 at 1787.0m are almost certainly Late Eocene in age. Above this level, however, an earliest Oligocene age becomes a possibility. Palynology dates the Gurnard Formation as Upper Middle N. asperus which is consistent with a Zone K determination.

## 2. BASAL LAKES ENTRANCE FORMATION

Significant reworking appears to have occurred across the top of the Latrobe Group. The basal two samples from the Lakes Entrance Formation. (SWC's 120, 119 at 1754.0m and 1766.5m respectively) yield what appears to be a Zone K fauna. However, this is inconsistent with the younger P. tuberculatus age derived from palynology. Apparently reworked Zone K faunas are swamping the younger assemblage. Zone K. contaminants are still present in SWC 121 at 1745.0m which is undoubtedly Early Miocene in age.

Lithologically the higher than expected glauconite level in SWC's 120 and 119 also indicates reworking.

An Early Oligocene (? Zone J) age is assigned to the basal two SWC's because they lack any Late Oligocene/Miocene faunas. This age determination suggests that a significant hiatus exists between the Early Oligocene in SWC 120 at 1754.0m, and the Early Miocene in SWC 121 at 1745.0m.

### BIOSTRATIGRAPHY

#### 1. Zone K: Late Eocene/earliest Oligocene (1799.0 to 1777.0m)

The presence of Globigerina linaperta in most samples from the Gurnard Formation is a strong indication of Zone K. However, as G. linaperta is the only identifiable species in the basal part of the formation (SWC's 110 and 112, at 1799.0m and 1797.0m respectively), at this level the zonal determination carries only a low degree of confidence.

Upsection, faunal diversity improves-most samples yielding a moderate assemblage. Species present include Globigerina angiporoides, Globorotalia postcretacea, Chiloguembelina cubensis and Globigerinatheka index. Corresponding with increased faunal diversity is a similar increase in confidence in the age determination.

The last in situ appearance of Globigerinatheka index in SWC 115 at 1787.0m indicates that this sample, and those underlying it, are Late Eocene in age whereas those from the remainder of the Gurnard may be earliest Oligocene in age. Palynology dates this interval as Upper N. asperus in age in agreement with the foraminiferal determinations.

2. ? Early Oligocene; Zone: ? (1766.5 to 1754.0)

Reworking of the Gurnard Formation into the basal Lakes Entrance Formation makes dating of this interval imprecise. Comparison of foraminiferal and palynological dates shows the reworking of older Zone K faunas into younger P. tuberculatus zone sediments.

Because of the presence of so much Zone K faunas, it is impossible to recognise any Zone J faunas. However, the lack of marker species of Zones I and H indicate that Early Oligocene is the most likely age for the interval.

3. Zone H1. Early Miocene (1745.0m to 1694.9m)

The presence of Globigerina woodi connecta without Globigerinoides quadrilobatus trilobus is indicative of a Zone H1 age.

SWC 121 at 1745.0m contains elements of a reworked Zone K fauna (Globigernia linaperta and Globorotalia postcretacea). At this level, however, the appearance of Miocene species enables the age to be fixed and the reworking recognised.

Samples from Zone H1 yielded an assemblage of moderate to poor preservation and varying degrees of diversity. The most consistent members of the assemblage are, apart from the zonal species, Globorotalia mayeri, Globigerina euapentura and both the s.s. and s.l. forms of Globoquadrina dehiscens.

4. Zone G: Early Miocene (1665.0m to 1516.1m)

The appearance of Globigerinoides quadrilobatus trilobus in SWC 124 at 1665.0m marks the base of Zone G. Assemblages from this zone are, in general, moderately diverse and poorly preserved.

In previous wells Catapsydrax dissimilis has been reported only from the base of Zone G. In Luderick-1, however, this species is found throughout Zone G and also the basal part of Zone F.

5. Zone F. Middle Miocene (1486.9m to 1398.5m)

The addition of Globigerinoides sicanus to an otherwise unchanged assemblage in SWC 132 at 1425.0m indicates the base of Zone F. The zonal species is rare throughout the zone and is, in fact, absent from SWC 131 at 1453.4 which is listed as indeterminate on the Summary Chart.

The assemblages obtained from Zone F samples increase in both quality of preservation and diversity upsection. Diversity reaches a peak in SWC 132 at 1425.0m where 13 species are present.

As noted previously the presence of Catapsydrax dissimilis near the base of this zone is unusual.

6. Zone E2. Middle Miocene (1370.0m)

A single sample is assigned to this zone because it contains Praeorbulina glomerosa without either form of Orbulina. The absence of Zone E1 is probably the result of a sample gap.

7. Zone D. Middle Miocene

a) Zone D2. 1339.9m to 1249.0m

b) Zone D1. 1218.9m to 1100.0m

Samples assigned to Zone D contain Orbulina universa without Globorotalia miotumida miotumida. The presence of Globorotalia miozea, Globorotalia praescitula and Globorotalia conica in many of the Orbulina bearing samples confirms the age.

Globorotalia praemenardii is present throughout this interval often in unusually high numbers. Specimens of this species from this interval often have a highly inflated umbilical side.

The boundary between D2 and D1 is placed between SWC's 138 (at 1249.1) and 139 (at 1218.9m) based on the first appearance of Globorotalia peripheroacuta in the latter sample.

Zone C. Late Miocene. (1041.5m to 980.0m)

In Luderick-1 the base of Zone C is marked by the first appearance of Globorotalia miotumida miotumida. Samples are assigned to this zone if they contain this species and no Globorotalia acostaensis.

Zone B2. Late Miocene. (922.0m to 860.6m)

Samples yielding Globorotalia acostaensis but no convincing Globorotalia miotumida conomiozea are assigned to B2. Unfortunately upsection deterioration of the assemblages means only a low degree of confidence can be applied.

TABLE 2 INTERPRETATIVE DATA, LUDERICK-1

SIDEWALL CORE NO.	DEPTH (m)	MICROFOSSIL YIELD	MICROFOSSIL PRESERVATION	PLANKTON DIVERSITY	ZONE RATING	AGE
152	824.5	VERY LOW	VERY POOR	VERY LOW	INDETERMINATE	
151	860.6	VERY LOW	VERY POOR	LOW	B2 (2)	LATE MIOCENE
150	888.0	MODERATE	POOR	MODERATE	B2 (1)	LATE MIOCENE
149	929.0	VERY LOW	POOR	LOW	B2 (2)	LATE MIOCENE
148	944.9	MODERATE	POOR	MODERATE	C (1)	LATE MIOCENE
147	980.0	VERY LOW	ABYSSMAL	LOW	C (1)	LATE MIOCENE
146	1010.1	VERY LOW	ABYSSMAL	MODERATE	C (1)	LATE MIOCENE
145	1041.5	LOW	VERY POOR	LOW	C (1)	LATE MIOCENE
143	1100.0	MODERATE	LOW	MODERATE	D1 (1)	MID MIOCENE
142	1129.9	MODERATE	POOR	MODERATE	D1 (1)	MID MIOCENE
141	1160.9	HIGH	MODERATE	HIGH	D1 (1)	MID MIOCENE
140	1190.5	HIGH	MODERATE	HIGH	D1 (1)	MID MIOCENE
139	1218.9	HIGH	POOR	HIGH	D1 (1)	MID MIOCENE
138	1249.1	HIGH	GOOD	HIGH	D2 (0)	MID MIOCENE
137	1280.0	HIGH	GOOD	HIGH	D2 (0)	MID MIOCENE
136	1301.0	HIGH	GOOD	HIGH	D2 (0)	MID MIOCENE
135	1339.9	MODERATE	GOOD	MODERATE	D2 (1)	MID MIOCENE
134	1370.0	MODERATE	POOR	HIGH	E2 (0)	MID MIOCENE
133	1398.5	GOOD	GOOD	HIGH	F (0)	MID MIOCENE
132	1425.0	HIGH	MODERATE	HIGH	F (0)	MID MIOCENE
131	1453.4	LOW	POOR	HIGH	INDETERMINATE	
130	1486.9	MODERATE	POOR	MODERATE	F (1)	MID MIOCENE
129	1516.1	MODERATE	POOR	MODERATE	G (1)	EARLY MIOCENE

TABLE 2 INTERPRETATIVE DATA, LUDERICK-1

SIDEWALL CORE NO.	DEPTH (m)	MICROFOSSIL YIELD	MICROFOSSIL PRESERVATION	PLANKTON DIVERSITY	ZONE RATING	AGE
128	1545.0	MODERATE	GOOD	MODERATE	G (1)	EARLY MIOCENE
127	1574.0	MODERATE	POOR	MODERATE	G (1)	EARLY MIOCENE
126	1605.0	LOW	POOR	LOW	G (1)	EARLY MIOCENE
125	1635.0	LOW	POOR	MODERATE	G (1)	EARLY MIOCENE
124	1665.0	HIGH	GOOD	MODERATE	G (1)	EARLY MIOCENE
123	1694.9	LOW	POOR	MODERATE	H1 (1)	EARLY MIOCENE
122	1720.0	MODERATE	MODERATE	LOW	H1 (1)	EARLY MIOCENE
121	1745.0	MODERATE	MODERATE	HIGH	H1 (0)	EARLY MIOCENE
120	1754.0	MODERATE	GOOD	MODERATE	?	? EARLY OLIGOCENE
119	1766.5	LOW	VERY POOR	MODERATE	?	? EARLY OLIGOCENE
118	1777.0	VERY LOW	VERY POOR	LOW	K (1)	LATE EOCENE/EARLIEST OLIGOCENE
117	1780.0	POOR	POOR	VERY LOW	K (2)	LATE EOCENE/EARLIEST OLIGOCENE
116	1783.0	VERY LOW	POOR	VERY LOW	K (2)	LATE EOCENE/EARLIEST OLIGOCENE
115	1787.0	LOW	POOR	LOW	K (0)	LATE EOCENE
114	1791.0	LOW	POOR	LOW	K (1)	LATE EOCENE
112	1797.0	VERY LOW	VERY POOR	VERY LOW	K (2)	LATE EOCENE
110	1799.0	VERY LOW	VERY POOR	VERY LOW	K (2)	LATE EOCENE
108	1801.5	VERY LOW	VERY POOR	NIL	BENTHONICS ONLY	
107	1802.5	VERY LOW	VERY GOOD	LOW	INDETERMINATE CONTAMINANTS ONLY	
106	1803.5	NIL			NFF	
105	1810.4	NIL			NFF	

NFF: NO FORAMINIFERA FOUND

SWC 44: 1069.0m MISPLACED.

MICROPALAEONTOLOGICAL DATA SHEET

BASIN: GIPPSLAND

ELEVATION: KB: 21.0 GL: -52.0

WELL NAME: LUDERICK-1

TOTAL DEPTH: \_\_\_\_\_

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	
PLEISTOCENE	A <sub>1</sub>											
	A <sub>2</sub>											
PLIOCENE	A <sub>3</sub>											
	A <sub>4</sub>											
	B <sub>1</sub>											
	B <sub>2</sub>	860.0	2				922.0	2				
MIOCENE	LATE	C	944.9	1			1041.5	1				
		D <sub>1</sub>	1100.0	1			1219.0	1				
	MIDDLE	D <sub>2</sub>	1249.0	0			1339.9	1				
		E <sub>1</sub>										
		E <sub>2</sub>	1370.0	0			1370.0	0				
		F	1398.5	0			1486.9	1				
	EARLY	G	1516.1	1			1665.0	1				
		H <sub>1</sub>	1694.9	1			1745.0	0				
	OLIGOCENE	LATE	H <sub>2</sub>									
			I <sub>1</sub>									
I <sub>2</sub>												
EARLY		J <sub>1</sub>										
		J <sub>2</sub>										
Eocene	K	1777.0	1				1799.0	2	1791.0	1		
	Pre-K											

COMMENTS: SWC's 120 and 119 (at 1754.97 and 1766.5) are tentatively dated Early Oligocene. The lack of Zone E1 is probably a result of a sample gap.

- 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.

DATE: September, 1983.

DATA REVISED BY: \_\_\_\_\_

DATE: \_\_\_\_\_

PART 2

BASIC DATA

RANGE CHART

TABLE 2 BASIC DATA, LUDERICK-1

SIDEWALL CORE NO.	DEPTH (m)	MICROFOSSIL YIELD	MICROFOSSIL PRESERVATION	PLANKTON DIVERSITY
152	824.5	VERY LOW	VERY POOR	VERY LOW
151	860.6	VERY LOW	VERY POOR	LOW
150	888.0	MODERATE	POOR	MODERATE
149	929.0	VERY LOW	POOR	LOW
148	944.9	MODERATE	POOR	MODERATE
147	980.0	VERY LOW	ABYSSMAL	LOW
146	1010.1	VERY LOW	ABYSSMAL	MODERATE
145	1041.5	LOW	VERY POOR	LOW
143	1100.0	MODERATE	LOW	MODERATE
142	1129.9	MODERATE	POOR	MODERATE
141	1160.9	HIGH	MODERATE	HIGH
140	1190.5	HIGH	MODERATE	HIGH
139	1218.9	HIGH	POOR	HIGH
138	1249.1	HIGH	GOOD	HIGH
137	1280.0	HIGH	GOOD	HIGH
136	1301.0	HIGH	GOOD	HIGH
135	1339.9	MODERATE	GOOD	MODERATE
134	1370.0	MODERATE	POOR	HIGH
133	1398.5	GOOD	GOOD	HIGH
132	1425.0	HIGH	MODERATE	HIGH
131	1453.4	LOW	POOR	HIGH
130	1486.9	MODERATE	POOR	MODERATE
129	1516.1	MODERATE	POOR	MODERATE
128	1545.0	MODERATE	GOOD	MODERATE
127	1574.0	MODERATE	POOR	MODERATE
126	1605.0	LOW	POOR	LOW
125	1635.0	LOW	POOR	MODERATE
124	1665.0	HIGH	GOOD	MODERATE
123	1694.9	LOW	POOR	MODERATE
122	1720.0	MODERATE	MODERATE	LOW
121	1745.0	MODERATE	MODERATE	HIGH
120	1754.0	MODERATE	GOOD	MODERATE
119	1766.5	LOW	VERY POOR	MODERATE

TABLE 2 BASIC DATA, LUDERICK-1

SIDEWALL CORE NO.	DEPTH (m)	MICROFOSSIL YIELD	MICROFOSSIL PRESERVATION	PLANKTON DIVERSITY
118	1777.0	VERY LOW	VERY POOR	LOW
117	1780.0	POOR	POOR	VERY LOW
116	1783.0	VERY LOW	POOR	VERY LOW
115	1787.0	LOW	POOR	LOW
114	1791.0	LOW	POOR	LOW
112	1797.0	VERY LOW	VERY POOR	VERY LOW
110	1799.0	VERY LOW	VERY POOR	VERY LOW
108	1801.5	VERY LOW	VERY POOR	NIL
107	1802.5	VERY LOW	VERY GOOD	LOW
106	1803.5	NIL		NFF
105	1810.4	NIL		NFF

NFF: NO FORAMINIFERA FOUND

SWC 44: 1069.0m MISPLACED.