



APPENDIX-1

PALYNOLOGICAL ANALYSIS OF TRUMPETER-1  
GIPPSLAND BASIN.

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**INTERPRETED DATA**

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## INTRODUCTION

Thirty-seven sidewall core samples were processed from Trumpeter-1 and examined for spores, pollen and microplankton. Although oxidized organic residue yields were mostly moderate, palynomorph concentrations were mostly low to very low and palynomorph preservation in the majority of samples was poor to very poor. Average recorded diversity was a disappointing 11 palynomorph species per sample.

The low diversity is directly related to the poor preservation due mostly to pyrite pitting of the sporopollenin walls of the palynomorphs. Abundant finely disseminated pyrite throughout the kerogen also caused processing difficulties, particularly in separating and concentrating the kerogen and palynomorphs at the zinc bromide density separation step.

Lithological units and palynological zones from base of Lakes Entrance Formation to T.D. are given in the following summary. Interpretative data with identification of zones and confidence ratings are recorded in Table-1 and basic data on residue yields, preservation and diversity are recorded in Table-2. All species which can be identified with binomial names are tabulated on the accompanying range chart.

### PALYNOLOGICAL SUMMARY OF TRUMPETER-1

AGE	UNIT/FACIES	SPORE-POLLEN ZONES (Dinoflagellate Zones)	DEPTH RANGE (mKB)
Oligocene	Lakes Entrance Formation 2448.0m	<i>P. tuberculatus</i>	2444.0
Paleocene	Latrobe Group (coarse clastic facies)	Upper <i>L. balmei</i>	2480.0
Paleocene		Lower <i>L. balmei</i>	2826.5-2954.0
Maastrichtian		Upper <i>T. longus</i> <i>(M. druggii)</i>	3006.5-3432.5 (3006.5)
	T.D. 3465.8m		

## GEOLOGICAL COMMENTS

1. The consistently poor preservation of palynomorphs in almost all samples in the Latrobe Group in Trumpeter-1 is unusual for both the depth range of the samples and general geographic position of the well the basin. It is suggested there may be more induration or diagenetic alteration of the sediments in this well related to the location of the well close to a major fault.
2. Because of the poor preservation microplankton are under-represented in the sequence, and may not truly reflect the extent of marine influence on the section drilled. In particular it is noted that the key Early Paleocene dinoflagellate zones characterized by *Trithyrodinium evittii* and *Eisenackia crassitabulata* could not be identified even though there was relatively good sampling density and these zones are present in nearby wells.
3. Supporting the thesis that these zones should be present is the occurrence of the dinoflagellate *Palaeoperidinium pyrophorum* at 2914.5m. It's presence suggests a possible correlation to the acme of *P. pyrophorum* which occurs near the base of the Lower *L. balmei* Zone in Roundhead-1 (at 2793.3m) and Teraglin-1 (at 2788.5m).

## BIOSTRATIGRAPHY

Zone and age-determinations have been made using criteria proposed by Stover & Partridge (1973), Helby *et al.* (1987) and unpublished observations made on Gippsland Basin wells drilled by Esso Australia Ltd.

Author citations for most spore-pollen species can be sourced from Stover & Partridge (1973, 1982), Helby *et al.* (1987) and Dettmann & Jarzen (1988) or other references cited herein. Species names followed by "ms" are unpublished manuscript names. Zone names have not been altered to conform with recent nomenclatural changes to nominate species such as *Forcipites* (al. *Tricolpites*) *longus* (Stover & Evans) Dettmann & Jarzen 1988. Author citations for dinoflagellates can be found in Lentin & Williams (1985, 1989).

Upper *Tricolpites longus* Zone: 3006.8-3432.5 metres Maastrichtian.

The deepest sidewall core with reasonable recovery in the well is at 3432.5m, and is no older than the Upper *T. longus* Zone on the presence of a significant abundance of *Gambierina rudata*, even though the the calculated abundance of 22% is based on a low count of 46 specimens. A more confident and traditional pick of the base of the zone is at 3367.5m based on the FAD (First Appearance Datum) for *Stereisporites* (*Tripunctisporis*) spp.

The top of the zone is picked at 3006.8m principally on the presence of the dinoflagellate *Manumiella seelandica*, which is indicative of the *M. druggii* Zone. The only key spore-pollen species present are *Proteacidites clinei* and *Tricolpites confessus* whose LADs (Last Appearance Datums) are generally considered to indicate the top of the Upper *T. longus* Zone. It should be noted that *P. clinei* ms in association with *Beaupreaidites orbiculatus* (formerly *Proteacidites gemmatus* ms) are also recorded at 2994.0m. However, as these species are only represented by single specimens in a poor assemblage, it is considered prudent to leave this sample as indeterminate.

Other Upper *T. longus* Zone indicator species are *Forcipites longus* at 3191m, *Proteacidites otwayensis* ms at 3244m, and *P. reticuloconcavus* ms and *Tricolporites lilliei* in both sidewall cores at 3367.5m. In general the Upper *T. longus* Zone is best characterized by the abundance of *Gambierina* spp. in the samples between 3076.5m to 3432.5m (see Table-1).

Lower *Lygistepollenites balmei* Zone: 2826.5-2954.0 metres Paleocene.

Four samples are assigned to this zone, with variable confidence, and each on different criteria. The lowest sample at 2954m is dominated by gymnosperm pollen particularly *Podocarpidites* spp. (32%) and *Phyllocladidites mawsonii* (21%). An increase of the abundance of these pollen was clearly shown to correlate to the Lower *L. balmei* Zone in Roundhead-1 (Partridge, 1989). The sample at 2938.5m contains the only confident identification of *Proteacidites angulatus*, while the sample at 2914.5m contains rare specimens of the important dinoflagellate *Palaeoperidinium pyrophorum*. The shallowest sample at 2826.5m is assigned to the zone on the LAD for *Tetracolporites verrucosus* based on single poorly preserved specimen. All other samples over the interval contain assemblages which are too limited to be confidently assign to the zone.

Upper *Lygistepollenites balmei* Zone: 2480.0 metres Paleocene.

Only a single sample could be confidently assigned to the Upper *L. balmei* Zone. The sample contained the FADs for the key species *Cupanieidites orthoteichus* and *Malvacipollis subtilis* and is no younger than this zone based on the LADs for *Lygistepollenites balmei* and *Gambierina rudata*. The four samples separating this sample from the underlying Lower subzone contained assemblages which were too limited to confidently assign to either subzone.

*Proteacidites tuberculatus* Zone: 2446.0 metres Oligocene.

This sample is confidently assigned to the *P. tuberculatus* Zone based on the occurrence of the spore *Cyatheacidites annulatus*. The sample also contains a dinoflagellate assemblage characteristic of the Lakes Entrance Formation. Dominant in the assemblage are the undescribed species *Pyxidinospis mammilatus* ms and *P. simplex* ms. Other characteristic species include *Hystrichokolpoma rigaudiae*, *Operculodinium centrocarpum* and *Polysphaeridium pseudocolligerum*.

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TABLE 1: INTERPRETATIVE PALYNOLOGICAL DATA TRUMPETER-1, GIPPSLAND BASIN

Sheet 1 of 2

SAMPLE TYPE	DEPTH (M)	SPORE-POLLEN ZONE	DINOFLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENT
SWC 60	2444	Indeterminate			
SWC 59	2446	<i>P. tuberculatus</i>		0	<i>Cyatheacidites annulatus</i> present.
SWC 58	2447.5	Indeterminate			Barren of fossils.
SWC 56	2480	Upper <i>L. balmei</i>		1	FAD <i>Cupanieidites orthoteichus</i> .
SWC 55	2488	Indeterminate			
SWC 52	2552	Indeterminate			<i>Glaphrocysta retiintexta</i> present.
SWC 47	2711	<i>L. balmei</i>		1	
SWC 46	2721	<i>L. balmei</i>		2	<i>Lygistepollenites balmei</i> frequent.
SWC 40	2826.5	Lower <i>L. balmei</i>		4	
SWC 38	2914.5	Lower <i>L. balmei</i>	( <i>P. pyrophorum</i> )	1	
SWC 37	2925	<i>L. balmei</i>		2	
SWC 82	2938.5	Lower <i>L. balmei</i>		1	<i>Proteacidites angulatus</i> present.
SWC 35	2954	Lower <i>L. balmei</i>		2	<i>Phyllocladidites mawsonii</i> 21%.
SWC 81	2968	Indeterminate			
SWC 80	2982	Indeterminate			<i>Deflandrea speciosus</i> present.
SWC 79	2994	Indeterminate			<i>Breaupreaidites orbiculatus</i> present.
SWC 31	3001	Indeterminate			
SWC 78	3006.8	Upper <i>T. longus</i>	<i>M. druggii</i>	0	<i>Manumiella seelandica</i> present.
SWC 77	3011.5	Indeterminate			
SWC 28	3018	Indeterminate			
SWC 27	3028	Indeterminate			
SWC 76	3059.2	Indeterminate			
SWC 75	3076.5	Upper <i>T. longus</i>		2	<i>Gambierina</i> spp. abundant.
SWC 73	3114	Indeterminate			
SWC 72	3140	Indeterminate			
SWC 71	3166.5	<i>T. longus</i>		2	
SWC 69	3191	Upper <i>T. longus</i>		2	<i>Forcipites longus</i> present.
SWC 68	3224	Indeterminate			
SWC 15	3244	Upper <i>T. longus</i>		2	<i>Gambierina</i> spp. abundance 13%.



TABLE 1: INTERPRETATIVE PALYNOLOGICAL DATA TRUMPETER-1, GIPPSLAND BASIN (cont)  
Sheet 2 of 2

SAMPLE TYPE	DEPTH (M)	SPORE-POLLEN ZONE	DINOFLLAGELLATE ZONE (OR ASSOCIATION)	CONFIDENCE RATING	COMMENT
SWC 13	3277.5	Upper <i>T. longus</i>		1	<i>Gambierina</i> spp. abundance 12%.
SWC 10	3291	Indeterminate			
SWC 67	3344	Indeterminate			
SWC 7	3367.5	Upper <i>T. longus</i>		1	<i>Gambierina</i> spp. abundance 18%.
SWC 66	3367.5	Upper <i>T. longus</i>		1	<i>Gambierina</i> spp. abundance 20%.
SWC 65	3385	Indeterminate			
SWC 5	3470.2	Indeterminate			
SWC 64	3432.5	Upper <i>T. longus</i>		2	<i>Gambierina</i> spp. abundance 22%.

LAD - Last appearance datum.  
FAD - First appearance datum.

**BASIC DATA**

TABLE-2: BASIC DATA

RANGE CHART

TABLE 2: BASIC PALYNOLOGICAL DATA TRUMPETER-1, GIPPSLAND BASIN

Sheet 1 of 2

SAMPLE TYPE	DEPTH (M)	LAB NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBERS S-P SPECIES*	MICROPLANKTON ABUNDANCE	NO. SPECIES*
SWC 60	2444	78272 H	Calcareous Claystone	Low	Very Low	Fair	2		2
SWC 59	2446	78272 G	Glauconitic Claystone	Low	Very Low	Fair	9+	High	11+
SWC 58	2447.5	78272 F	Glauconitic Claystone	Very Low	Barren				
SWC 56	2480	78272 D	Siltstone	Low	Low	Poor	22+	Very Low	1+
SWC 55	2488	78272 C	Argillaceous Sandstone	Low	Very Low	Poor	3+		
SWC 52	2552	78271 Z	Argillaceous Sandstone	Low	Very Low	Poor	1+	Very Low	3
SWC 47	2711	78271 U	Carbonaceous/Coally Siltstone	Low	Low	Poor	6+		
SWC 46	2721	78271 T	Interbedded Sst./Siltst.	High	Moderate	Poor	11+		
SWC 40	2826.5	78271 N	Carbonaceous Sandstone	Moderate	Low	Very Poor	12+		
SWC 38	2914.5	78271 L	Argillaceous Very Fine Sst.	Low	Very Low	Poor	7+	Low	3+
SWC 37	2925	78271 K	Argillaceous Sandstone	Moderate	Moderate	Very Poor	15+		
SWC 82	2938.5	78273 D	Sandstone	Moderate	Low	Very Poor	12+		
SWC 35	2954	78271 I	Argillaceous Sandstone	High	Low	Poor	18+		
SWC 81	2968	78273 C	Mottled Very Fine Sandstone	Moderate	Very Low	Poor	5+		
SWC 80	2982	78273 B	Mottled Very Fine Sandstone	Moderate	Very Low	Poor	14+	Low	2+
SWC 79	2994	78273 A	Siltstone	Moderate	Very Low	Poor	16+		
SWC 31	3001	78271 E	Siltstone	Moderate	Low	Poor	10+		
SWC 78	3006.8	78272 Z	Argillaceous Very Fine Sst.	Moderate	Low	Poor	18+	Low	3
SWC 77	3011.5	78272 Y	Carbonaceous Silty Sandstone	Moderate	Low	Poor	9+		
SWC 28	3018	78271 B	Pyritic Siltstone/Claystone	Moderate	Very Low	Very Poor	5+		
SWC 27	3028	78271 A	Argillaceous Very Fine Sst.	Moderate	Low	Poor	8+	Very Low	1
SWC 76	3059.2	78272 X	Siltstone	Moderate	Very Low	Very Poor	7+		
SWC 75	3076.5	78272 W	Siltstone	Moderate	Low	Poor	13+		
SWC 73	3114	78272 U	Carbonaceous Very Fine Sst.	High	Low	Poor	5+		
SWC 72	3140	78272 T	Carbonaceous Siltstone	Moderate	Very Low	Poor	6+		
SWC 71	3166.5	78272 S	Carbonaceous Siltstone	Moderate	Low	Poor-Fair	13+	(Very Low)	(1)
SWC 69	3191	78272 Q	Carbonaceous Siltstone	Moderate	Low	Poor	8+		
SWC 68	3224	78272 P	Carbonaceous Sandstone	High	Very Low	Very Poor	1		
SWC 15	3244	78270 O	Carbonaceous Siltstone	Moderate	Moderate	Poor	16+		

TABLE 2: BASIC PALYNOLOGICAL DATA TRUMPETER-1, GIPPSLAND BASIN (cont.)

Sheet 2 of 2

SAMPLE TYPE	DEPTH (M)	LAB NO.	LITHOLOGY	RESIDUE YIELD	PALYNOMORPH CONCENTRATION	PRESERVATION	NUMBERS S-P SPECIES*	MICROPLANKTON	
								ABUNDANCE	NO. SPECIES*
SWC 13	3277.5	78270 M	Siltstone	Moderate	Moderate	Poor	13+		
SWC 10	3291	78270 J	Carbonaceous Siltstone	Moderate	Low	Poor	11+		
SWC 67	3344	78272 O	Carbonaceous Siltstone	Low	Barren				
SWC 7	3367.5	78270 G	Argillaceous Siltstone	High	Moderate	Poor-Fair	23+	(Very Low)	(1)
SWC 66	3367.5	78272 N	Argillaceous Sandstone	Moderate	Moderate	Fair	19+	(Very Low)	(1)
SWC 65	3385	78272 M	Carbonaceous Siltstone	Moderate	Very Low	Poor	4+		
SWC 5	3470.2	78270 E	Carbonaceous Siltstone	High	Very Low	Poor	5+		
SWC 64	3432.5	78272 L	Siltstone	Low	Low	Poor	10+		

Microplankton in (brackets) - probable contaminants.

\* Diversity: Very Low - 1- 5 species  
 Low - 6-10 species  
 Moderate - 11-25 species  
 High - 26-74 species  
 Very High - 75+ species