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PALYNOLOGICAL ANALYSIS, GUMMY-1
GIPPSLAND BASIN

by

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PALAEOENVIRONMENTS

1. With the possible exception of SWC 8 at 2525.0m, all Upper T. longus Zone samples represent a coastal plain environment. This included swamps and probably a lake containing anoxic bottom water - represented by a coal at 2605.0m [not analysed] and pyrite-scarred spore-pollen at 2619.0m respectively. The absence of dinocysts are against the latter sample representing a marginal marine environment.
- 2.. Marginal marine conditions were established at the well-site in the Paleocene, most probably before or during the E. crassitabulata marine transgression and certainly by the time of the A. homomorphum marine transgression.

Similar conditions are represented by the Early Eocene, Lower M. diversus Zone sample at 2098.0m. The data are inadequate to determine when open marine conditions developed over the wellsite.

brossus but not Stereisporites punctatus. Although the relative abundance of Gambierina makes an Upper T. longus Zone probable, the presence of an undescribed species of Granelispora with simple not bifurcating processes suggests a position relatively low in the zonule.

Stereisporites punctatus first appears at 2549.0m, associated with Tricolporites lilliei and abundant Gambierina rudata, and in association with Forcipites longus at 2454.0m. The latter palynoflora contains very rare Late Cretaceous occurrences of Dryptopollenites semilunatus and Beaupreadites sp. cf B. verrucosus. Possible fragments of the Maastrichtian dinoflagellate Manumiella druggii are present at 2525.0m and minor pyrite scarring of spore-pollen occurs at 2619.5m.

The upper boundary is tightly defined by the simultaneous occurrence of Stereisporites punctatus, Forcipites longus, Quadruplanus brossus and Tripoporopollenites sectilis.

Lower Lygistepollenites balmei Zone 2259.0-2368.0m Paleocene

SWCs within this interval and the overlying Upper L. balmei Zone are dominated by Proteacidites spp. and gymnosperm pollen: the latter group usually includes frequent numbers of Lygistepollenites balmei and more rarely Araucariacites australis.

Although a Paleocene age is certain, the Lower L. balmei Zone date for the interval 2259.0-2368.0m is based on negative evidence, viz. the absence of species ranging no lower than the Upper L. balmei Zone.

It is noted that two lines of evidence indicate a 'Middle' Paleocene position, i.e. all samples were deposited close to upper boundary of the zonule. Similarly the lower of the two samples assigned to the Upper L. balmei Zone [2199.0m] also may be 'Middle' Paleocene.

1. The SWCs at 2318.5m, 2348.0m and 2368.0m contain a rare subspecies of the typically Upper L. balmei Zone dinoflagellate Apectodinium homomorphum. This form is characterized by short processes and, apart from having a narrow, high rather than low, wide archaeopyle, is virtually identical with the Late Eocene index species Gippslandica (Vozzhenikovia) extensa.

Whilst it is possible that occurrences of A. homomorphum at 2368.0m are due to mud-contamination or caving [the dinocyst is caved into the Upper T. longus Zone at

2454.0m], the dinoflagellate is common-abundant at 2318.5m and 2348.0m and both samples are likely to represent the same marine transgression. Interestingly, the dinocyst flora at 2318.5m also includes Alisocysta spp., including one cyst of A. crassitabulata, a species diagnostic of the Lower L. balmei, E. crassitabulata Zone (see Partridge, 1976).

Other dinoflagellates present in the interval include Deflandrea sp. cf D. delineata and Deflandrea medcalfii at 2318.5m and 2348.0m, and Cordosphaeridium inodes at 2348.0m and 2259.0m.

2. The palynoflora at 2318.5m includes Verrucosisporites kopukuensis and Rotverrusporites stellatus, spores more typically found no lower than the Upper L. balmei Zone whilst those at 2259.0m and 2259.0m include specimens of Tetracolporites verrucosus, a pollen rarely found above the Lower L. balmei Zone.

On present indications, the most probable explanation is that the interval 2199.5-2368.0m is a condensed sequence [see Geological Comments]. This explanation is supported by occurrences of reworked Early and Late Cretaceous spore-pollen, in particular at 2318.5m.

The upper boundary is provisionally picked at 2259.0m, a sample yielding both Tetracolporites verrucosus and multiple specimens of the typically Lower L. balmei Zone species, Proteacidites angulatus.

Upper Lygistepollenites balmei Zone 2128.0-2199.5m Paleocene

Two palynofloras are assigned to this zone. Both include frequent to common Deflandrea medcalfii and low numbers of a species resembling D. flounderensis but differ in terms of the spore-pollen component.

The lower palynoflora, at 2199.5m includes frequent-common Lygistepollenites balmei and Australopollis obscurus. In this case the Upper L. balmei Zone is based on wholly on Proteacidites annulatus (see above) and it is noted that the relative abundance of Proteacidites angulatus in the same sample is more typical of a Lower L. balmei Zone palynoflora.

Conversely Lygisteopollenites balmei is extremely rare in the upper palynoflora [2128.0m]. Nevertheless the sample can be confidently dated as Upper L. balmei Zone based on the association of Proteacidites annularis, P. differentipollis,

frequent P. grandis, Tricolporites moultonii, Banksieaidites lunatus, Ischyosporites gremius, I. irregularis, Gambierina rudata, and Camarozonosporites bullatus. Proteacidites angulatus and Tricolpites confessus are present.

Lower Malvacipollis diversus 2098.0m Early Eocene

One sample is provisionally assigned to this zone, based on occurrences of Spinizonocolpites prominatus and frequent-common specimens of Malvacipollis diversus and M. subtilis. An Upper L. balmei Zone date is possible if the specimen of Spinizonocolpites prominatus is bioturbated downwards.

Otherwise the palynoflora closely resembles the sample [2128.0m] picked as the top of the Upper L. balmei Zone, e.g. in the relative abundance of Proteacidites grandis and Deflandrea medcalfii. Gambierina edwardsii implies that at least portion of the palynoflora may be recycled from the underlying Paleocene interval.

The highest sample received, SWC 20 at 2082.0m, yielded a very sparse palynoflora comprising a mixture of Paleocene-Upper Cretaceous spore-pollen species and caved, mostly Oligo-Miocene, dinoflagellates. The former include Gambierina rudata and Triporopollenites sectilis; the latter include Phthanoperidinium sp., Pyxidinoopsis pontus and ?Apectodinium hyperacantha.

The palynoflora includes an as yet unexplained, perfect specimen of the Valanginian-Turonian dinoflagellate, Cribooperidinium edwardsii.

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TABLE 1: SUMMARY OF INTERPRETATIVE PALYNOLOGICAL DATA

SWC	DEPTH (m)	ZONE		CONF. RTG.	COMMENT
		S-P	DINO		
20	2082.5	Indet.	-	-	
19	2098.0	L. M.d.	-	2	S. prominatus
18	2128.0	U L.b.	-	1	C. bullatus
17	2199.5	U. L.b.		2	P. annularis
16	2259.0	L. L.b.		2	T. verrucosus
15	2279.0	L. L.b.	A. hom.	2	T. verrucosus
14	2318.5	L. L.b.	A. hom.	2	A crassitabulata
13	2348.0	L. L.b.	A. hom.?	2	C. inodes
12	2368.0	L. L.b.	A. hom.?	2	A. homomorpha
10	2423.5	U. T.l.	-	0	F. longus, S. punctatus
09	2454.0	U. T.l.	-	0	S. punctatus
08	2525.0	U. T.l.	-	2	S. punctatus
06	2549.0	U. T.l.	0	0	S. punctatus, T. lilliei
05	2577.0	U. T.l.	2	2	freq. Gambierina
03	2619.5	U. T.l.		1	Q. brossus, freq. Gambierina

TABLE 2: SUMMARY OF BASIC PALYNOLOGICAL DATA

SWC	DEPTH (m)	YIELD		DIVERSITY		PRES.	LITH.*
		S-P	DINO	S-P	DINO		
20	2082.5	negl	negl.	low	low	good	Slst., glc.
19	2098.0	high	med.	med.	med.	mod.	As above
18	2128.0	high	low	high	med.	mod.	Slst.
17	2199.5	high	low	med.	med.	poor	Slst.
16	2259.0	med.	low	med.	low	mod.	Slst.
15	2279.0	high	low	med.	low	mod.	Slst.
14	2318.5	high	med.	high	high	good	Ss., glc
13	2348.0	med.	med.	low	med.	mod.	Slst.
12	2368.0	med.	low	med.	low	mod.	Ss, glc
10	2423.5	med.	-	high	-	mod.	Slst.
09	2454.0	high	low#	high	low	good	Clyst.
08	2525.0	low	low?	med.	low	mod.	Slst., glc.
06	2549.0	med.	-	med.	-	mod.	Clyst.
05	2577.0	low	low#	med.	low	good	Ss.
03	2619.5	med.	-	high	-	mod.	Slst.

Caved Oligocene-Miocene species.

* Lithological descriptions [main rock type.qualifier] taken from hand-written sidewall core sample description sheets

SAMPLE TYPE OR NO. *	DEPTH (m)														
	2082.5	2098.0	2128.0	2199.5	2259.0	2279.0	2318.5	2348.0	2368.0	2423.5	2454.0	2525.0	2549.0	2577.0	2619.5
Myrtaceldites eucalyptoides															
M. parvus-mesonesus															
Myrtaceopollenites australis															
Nothofagidites brachyspinulosus															
N. emarcidus-heterus															
N. endurus															
N. flemingii															
N. senectus															
Peninsulapollis gillii															
Polypropollenites demarcatus															
P. polyoratus															
Peromonolites densus															
Phyllocladites mawsonii															
P. reticulosaccatus															
P. verrucosus															
Podocarpidites exiguus															
Podocarpidites spp.															
Podosporites microsaccatus															
Polyodiisporites s.p.															
Polycingulites pocockii															
Polycopites langstonii															
Proteacidites adenanthoides															
P. amolosexinus															
P. angulatus															
P. annularis															
P. cleinei ms															
P. dierama ms															
P. differentipollis															
P. grandis															
P. latrobensis															
P. otwayensis ms															
P. palisadus															
P. prepolus ms															
P. rectus															
P. reticuloconcavus ms															
P. reticulosabratus															
P. retiformis															
P. tenuexinus															
P. wahooensis ms															
P. spp. indet./undescribed															
Quadruplanus brossus															
Retitriletes australoclavatidites															
R. circolumenus															
R. facetus															
R. spp. indet./undescribed															
Rhoipites sphaerica															
Rotverrusporites stellatus															
Rugulatisporites mallatus															
Spinizonocolpites prominatus															
Stereisporites australis f. crassa															
S. antiquisporites															
S. (Tripunctisporis) sp.															
S. regium															
S. spp. indet./undescribed															
Tetracolporites multistrixis ms															
T. verrucosus															

* C= CORE S=SIDEWALL CORE
T=CUTTINGS J=JUNK BASKET

R = REWORKED SP.
C = CONTAMINANT

SAMPLE TYPE OR NO. *	DEPTH (m)														
	2082.5	2098.0	2128.0	2199.5	2259.0	2279.0	2318.5	2348.0	2368.0	2423.5	2454.0	2525.0	2549.0	2577.0	2619.5
FOSSIL NAMES															
<i>Tricolpites confessus</i>			•	•			•			•	•	•	•	•	•
<i>T. phillipsii</i>						•									
<i>T. walpawaensis</i>										•	•				•
<i>T. spp. indet./undescribed</i>		•	•	•	•	•	•	•	•	•	•	•	•	•	•
<i>Tricolporites lilliei</i>	•									•			•	•	•
<i>T. marginatus ms</i>											•				
<i>T. moultonii ms</i>			•												
<i>T. spp. indet./undescribed</i>		•	•	•	•	•	•	•	•	•	•	•	•	•	•
TRILETE SPORES indet./undescribed		•	•	•	•	•	•	•	•	•	•	•			
<i>Triletes tuberculiformis</i>				•			•								
<i>Triporetetes reticulatus</i>										•			•		
<i>Trisaccites spp.</i>							•								
<i>Triporopollenites sp. cf T. bellus</i>				•											
<i>T. scabratus</i>															
<i>T. sectilis</i>	•						•			•	•	•	•	•	•
<i>T. sp. indet./undescribed</i>			•												
<i>Verrucatosporites alienus</i>				•											
<i>Verrucosporites kopukuensis</i>		•	•			•	•								
<i>Peromonolites vellosus</i>															
<i>tetradopollis obscurus</i>													•		
DINOFLAGELLATES															
<i>Allisocysta (Eisenackia) crassitabulata</i>							•								
<i>A. sp. cf A. rugulolirata</i>							•								
<i>Apectodinium homomorphum (long processes)</i>							•								
<i>A. homomorphum (short processes)</i>	•						•	•	•		C				
<i>Cleistosphaeridium spp. C</i>	•							•							
<i>Delfandrea medcalfei</i>		•	•	•			•	•							
<i>D. sp. cf D. delineata</i>		•	•	•			•								
<i>Glaphyrocysta reticulatum</i>				•											
<i>Lingulodinium machaerophorum C</i>	•														
<i>Spiniferites spp.</i>	•	•	•					•			C				
<i>Phthanoperidinium comatum C.</i>	•														
<i>Paralecaniella indentata</i>	•														
<i>Cordosphaeridium inodes</i>		•	•		•			•							
<i>Crassosphaera sp.</i>															
<i>Cribroperidinium edwardsii R</i>	•														
<i>Indet./undescribed spp.</i>	•	•	•	•	•	•	•	•	•		C?		C		

* C=CORE S=SIDEWALL CORE
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