PALYNOLOGICAL ANALYSIS OF KIPPER-2
GIPPSLAND BASIN

By

M.J. Hannah

Esso Australia Ltd.

Palaeontology Rept. 1987/10

September, 1987

PART 1
INTERPRETED DATA

- Introduction
- Summary Table
- Geological Comments
- Biostratigraphy
- References
- Interpreted Data Summary
- Data Sheet

INTRODUCTION

Forty-eight sidewall cores and four conventional core samples were processed and their spore-pollen and dinoflagellate content examined. The ages obtained ranged from Santonian (Tricolporites apoxyexinus Zone) to Miocene (Proteacidites tuberculatus Zone).

The section encountered is basically similar to Kipper-1 except

(1) Sediments assignable to P. mawsonii Zone were not encountered.

(2) All Late Cretaceous zones are considerably thicker in Kipper-2.

All species encountered in Kipper-2 are listed on the enclosed range charts.

SUMMARY DATA KIPPER-2

AGE	UNIT	SPORE POLLEN ZONES MICROPLANKTON ZONES	DEPTH (mKB)
MIOCENE	SEASPRAY GROUP	P. tuberculatus	1523.9-1538.1
	1539.0m		
MIDDLE EOCENE	GURNARD FM.	Lower N. asperus (T. tricornus)	1544.0
	1544.0m		
EARLY EOCENE		P. asperopolus K. thompsonae	(1550.1)
		P. asperopolus	1555.1-1565.0
	LATROBE	Lower M. diversus	1577-1585.5
PALEOCENE	GROUP	Upper L. balmei (A. homomorphum)	1603.0-1809.5 (1623.5-1809.5)
		Lower L. balmei	1871.5
MAASTRICHTIAN		Upper T. longus (M. druggii)	1880.0 (1880.0)
		Upper T. longus	1888.0-1944.0
	(Volcanics- 2070.0-2211.0)	Lower T. longus	1954.0-2055.1
CAMPANIAN		N. senectus	2211.0-2293.0
CAMPANIAN-SANTONIAN		T. apoxyexinus (C. porosa)	2315.0-2590.1 (2491.0-2544.0)

GEOLOGICAL COMMENTS

1) The oldest sediments encountered in Kipper-2 were Santonian/Campanian (Tricolporites apoxyexinus Zone) in age. This implies that the older shales encountered in Kipper-1 was not penetrated in Kipper-2. The Tricolporites apoxyexinus Zone is approximately 200m thicker in Kipper-2 than Kipper-1.

2) The Chatangiella porosa (=Chatangiella perforata Zone in Kipper-1) Association reported by Marshall and Partridge (1986) as being of possible use in correlating deep Latrobe sediments is recognised in Kipper-2. As in Kipper-1 the association is restricted to the basal part of the Tricolporites apoxyexinus Zone, however, the dinoflagellate zone is considerably thicker in Kipper-2 than Kipper-1.

   The Chatangiella porosa Assemblage and its' distribution has been documented further by Marshall (in prep.).

3) The volcanics between 2070.0-2211.0m in Kipper-2 cannot be dated with complete accuracy. Sediments above the unit are Maastrichtian (Tricolpites longus Zone) and those below are Campanian (Nothofagidites senectus Zone). No Tricolporites lilliei Zone age sediments were encountered.

4) The age of the reservoir section in Kipper-1 was dated, on the basis of cuttings, to be Nothofagidites senectus Zone in age. In the well sampled Kipper-2 section, however, most sediments proved to be Tricolporites apoxyexinus Zone in age.

5) Two significant unconformities were recognised. Both were previously recognised in Kipper-1.

   a) Between 1565.0 and 1577.0 metres where Proteacidites asperopolus Zone sediments rest directly on Lower Malvacipollis diversus Zone sediments. A similar event was also noted in Tuna-3.

   b) Between 1538.1 and 1544.0 metres at the top of the Latrobe Group. Here, Miocene Proteacidites tuberculatus Zone sediments rest on Middle Eocene. Lower Nothofagidites asperus Zone sediment.

BIOSTRATIGRAPHY

The zone boundaries for the Tertiary section have been established using the criteria of Stover and Partridge (1973) with subsequent proprietary revisions. Cretaceous zone boundaries follow Helby, Morgan and Partridge (1987).

Tricolporites apoxyexinus Zone
2315.0-2590.1 metres
CAMPANIAN/SANTONIAN

The base of this zone is defined as the first appearance of the eponymous species (Partridge 1987). Unfortunately Tricolporites apoxyexinus was not recorded in Kipper-2. Marshall and Partridge (1986) report that the first appearance of Tricolporites labrum (ms) can be used as a local base of this zone albiet with a reduced degree of confidence. In Kipper-2, however, Tricolporites labrum occurs near the top of the interval assigned to the Tricolporites apoxyexinus Zone. Nevertheless, the occurrence of Tricolpites gillii and Latrobosporites amplus throughout the interval together with the absence of Nothofagidites senectus means that the zonal assignment carries a high degree of confidence.

The Chatangiella porosa dinoflagellate Assemblage recorded between 2187.5 and 2192.0m in Kipper-1 (as the Chatangiella perforata Assemblage) is also present in Kipper-2 where it was recognised between 2491.0 and 2544.1m. This represents about a 10 fold increase of thickness between Kipper 1 and Kipper 2. In both cases however the assemblage is restricted to the lower part of the Tricolporites apoxyexinus Zone.

Marshall (in prep.) also records this assemblage from Tuna-4 and dredge samples from seafloor in the Bass Canyon.

Nothofagidites senectus Zone:
2211.0-2293.0 metres
CAMPANIAN

The addition of Nothofagidites senectus to an otherwise unchanged flora in Core 3 at 2293.0m marks the base of the Nothofagidites senectus Zone.

Lower Tricolpites longus Zone.
1954.0-2055.1 metres
MAASTRICHTIAN

The presence of a variety of Proteacidites species, including Proteacidites palisadus, Proteacidites reticuloconcavus and Proteacidites otwayensis without Stereisporites (Tripunctisporis) punctatus (ms) suggest a Lower Tricolpites longus Zone age for this interval. The generally low numbers of Gamberina spp. and the almost complete absence of Lygistepollenites balmei, support the zonal assignment.

Upper Tricolpites longus Zone
1880.0-1944.0 metres
MAASTRICHTIAN

The base of the Upper Tricolpites longus Zone is picked at the oldest occurrence of Stereisporites (Tripunctisporis) punctatus (ms) in sidewall core 33 at 1944.0m. The topmost sample in this interval (sidewall core 37 at 1880.0m) is also assigned to the Manumiella druggii Zone on the presence of specimens of that species.

Lower Lygistepollenites balmei Zone
1871.5 metres
PALEOCENE

The presence of the dinoflagellate species Cladopyxidium saeptum, Deflandrea speciosa, and Glaphyrocysta rettintexta indicates a age no younger than the Lygistepollenites balmei Zone for the sample. This, coupled with the non-appearance of any Tricolpites longus or Upper Lygistepollenites balmei Zone elements in an abundant and moderately diverse spore/pollen flora suggest the Lower Lygistepollenite balmei Zone assignment.

Upper Lygistepollenites balmei Zone
1603.0-1809.5 metres
PALEOCENE

The base of both the Upper Lygistepollenites balmei Zone and the Apectodinium homomorphum Zone are both recognised in sidewall core 39 at 1809.5m on the first appearance of the short spined variety of Apectodinium homomorphum. The oldest appearance of Proteacidites adenanthoides in the same sample supports the zonal assignment.

Apectodinium homomorphum is recognised up to sidewall core 48 at 1623.5m confirming the Upper Lygistepollenites balmei/Apectodinium homomorphum, zonal determination for this interval. Sidewall core 49 at 1603.0m is also assigned to the Upper Lygistepollenites balmei Zone, despite the lack of Apectodinium homomorphum, because it contained a abundant and moderately diverse spore-pollen assemblage and lacked any Malvacipollis diversus Zone indicators.

Lower Malvacipollis diversus Zone
1577.0 - 1585.5 metres
EARLY EOCENE

The base of the Lower Malvacipollis diversus Zone is recognised on the first appearance of Proteacidites grandis with consistant Malvacipollis diversus in sidewall core 51 at 1585.5m.

The two samples assigned to this zone contain a distinctly different spore-pollen assemblage to those of the underlying Upper Lygistepollenites balmei Zone. Species appearing for the first time in the Lower Malvacipollis diversus Zone include Intratriporopollenites notabilis, Spinizonocolpites prominatus and Tetracolporites textus (ms).

Proteacidites asperopolus Zone
1550.1-1565.0 metres
EARLY EOCENE

Sidewall core 56 at 1550.1m, the topmost sample in this interval can be assigned to the Proteacidites asperopolus Zone with a high degree of confidence on the appearance of the dinoflagellate species Kisselovia thompsonae (ms) and a diverse spore-pollen assemblage including Myrtaceidites tenuis, Proteacidites pachypolus and Santalumidites cainozoicus.

Sidewall cores 55 and 54 at 1555.1 and 1565.1 metres respectively are also assigned to the Proteacidites asperopolus Zone because (1) They contain Gemmatricolporites divaricatus (ms), Santalumidites cainozoicus Tricolpites incisus and Myrtaceidites tenuis. All these species themselves only indicate an age of no older than Upper Malvacipollis diversus Zone. However, they are all more consistently found in the Proteacidites asperopolus Zone: and (2) Sediments of the Upper Malvacipollis diversus Zone were not found in Kipper-1.

The pick of the base of the Proteacidites asperopolus Zone in Kipper-2 carries a lower degree of confidence.

Lower Nothofagidites asperus Zone
1544.0 metres
MIDDLE EOCENE

The recognition of the acritarch Tritonites tricornus (ms) in this sample indicates a Lower Nothofagidites asperus Zone determination for this sample.

Proteacidites tuberculatus Zone.
1523.9-1538.1 meters
MIOCENE

The appearance of Cyatheacidites annulatus in both these samples indicates a confident Proteacidites tuberculatus Zone assignment and as with Kipper-1 the presence of Foveotriletes lucunosus and a diverse dinoflagellate assemblage suggest that we are dealing with the middle or upper part of this zone.

REFERENCES

Helby, R., Morgan, R. & Partridge, A.D., 1987. A palynological zonation of the Australian Mesozoic. Mem. Ass. Australas. Palaeontols 4, 1-94.

Marshall, N., (in prep.). A Santonian dinoflagellate assemblage from the Gippsland Basin, southeastern Australia.

Marshall, N. & Partridge, A.D., 1986. Palynological analysis of Kipper-1, Gippsland Basin EAL. Palaeontology Report 1986/16.

Partridge, A.D., 1987. Tricolporites apoxyexinus sp. nov., nominate species for a late Cretaceous spore-pollen zone in Australia. Mem. Ass. Australas. Paleontols 4, 337-340.

Stover, L.E. & Partridge, A.D., 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. Proc. R. Soc. Vict. 85, 237-286.

PART 2

BASIC DATA

- Basic Data Summary

- Palynomorph Distribution Chart

Sample Type	Depth (m)	Spore-Pollen Zone	Dinoflagellate Assemblage	Geologic Age	Confidence Rating	Comments
SWC 60	1523.9	P. tuberculatus		Miocene	0	
SWC 58	1538.1	P. tuberculatus		Miocene	0	
SWC 57	1544.0	Lower N. asperus	T. tricornus	Middle Eocene	0	
SWC 56	1550.0	P. asperopolus	K. thompsonae	Early Eocene	1	
SWC 55	1555.1	P. asperopolus		Early Eocene	2	
SWC 53	1565.0	P. asperopolus		Early Eocene	2	
SWC 52	1577.0	Lower M. diversus		Early Eocene	1	
SWC 51	1585.5	Lower M. diversus		Early Eocene		
SWC 50	1591.4	?		Indeterminate		
SWC 59	1603.0	Upper L. balmei		Paleocene	2	
SWC 48	1623.5	Upper L. balmei	A. homomorphum	Paleocene	1	
SWC 47	1652.5	Upper L. balmei	A. homomorphum	Paleocene	0	
SWC 46	1675.5	?		Indeterminate		Contaminants from Gippsland Limestone dominate
SWC 44	1699.5	Upper L. balmei	A. homomorphum	Paleocene	1	
SWC 42	1742.5	Upper L. balmei	A. homomorphum	Paleocene	0	
SWC 41	1754.0	Upper L. balmei		Paleocene	2	
SWC 39	1809.5	Upper L. balmei	A. homomorphum	Paleocene	1	
SWC 38	1871.5	Lower L. balmei		Paleocene	2	

Sample Type	Depth (m)	Spore-Pollen Zone	Dinoflagellate Assemblage	Geologic Age	Confidence Rating	Comments
SWC 37	1880.6	Upper *T. longus*	*M. druggii*	Maastrichtian	1	
SWC 36	1888.0	*T. longus*		Maastrichtian	1	
SWC 35	1899.5	?		Indeterminate		
SWC 33	1944.0	Upper *T. longus*		Maastrichtian	2	Coal sample
SWC 32	1954.0	Lower *T. longus*		Maastrichtian	1	
SWC 31	1969.0	Lower *T. longus*		Maastrichtian	2	
SWC 30	1982.5	Lower *T. longus*		Maastrichtian	1	
SWC 29	1999.0	Lower *T. longus*		Maastrichtian	2	
SWC 28	2015.5	Lower *T. longus*		Maastrichtian	2	
SWC 27	2030.0	Lower *T. longus*		Maastrichtian	2	
SWC 26	2041.5	Lower *T. longus*		Maastrichtian	1	
SWC 25	2055.1	Lower *T. longus*		Maastrichtian	1	Contamination
SWC 21	2211.6	*N. senectus*		Campanian	2	
SWC 20	2235.6	*N. senectus*		Campanian	1	
SWC 19	2242.1	*N. senectus*		Campanian	1	
SWC 16	2267.6	*N. senectus*		Campanian	1	
CORE 3	2287.0-2287.05	*N. senectus*		Campanian	1	
CORE 3	2292.6-2293.0	*N. senectus*		Campanian	1	
CORE 5	2315.0	*T. apoxyexinus*		Campanian/Santonian	1	
CORE 6	2330.0	*T. apoxyexinus*		Campanian/Santonian	2	
SWC 15	2364.4	?		Indeterminate		
SWC 14	2385.0	?		Indeterminate		

Sample Type	Depth (m)	Spore-Pollen Zone	Dinoflagellate Assemblage	Geologic Age	Confidence Rating	Comments
SWC 13	2403.6	?		Indeterminate		
SWC 12	2413.5	?		Indeterminate		Barren
SWC 10	2461.0	?		Indeterminate		
SWC 9	2475.0	?		Indeterminate		
SWC 8	2491.0	T. apoxyexinus	C. porosa	Campanian/Santonian	1	
SWC 7	2503.5	T. apoxyexinus	C. porosa	Campanian/Santonian	1	
SWC 6	2517.0	T. apoxyexinus	C. porosa	Campanian/Santonian	1	
SWC 5	2528.5	T. apoxyexinus	C. porosa	Campanian/Santonian	1	
SWC 4	2544.1	T. apoxyexinus	C. porosa	Campanian/Santonian	1	
SWC 3	2564.0	?		Indeterminate		
SWC 2	2580.1	?		Indeterminate		
SWC 1	2590.1	T. apoxyexinus		Campanian/Santonian	2	

PALYNOLOGY DATA SHEET

BASIN: GIPPSLAND ELEVATION: KB: 22.3m GL: -107.3m

WELL NAME: KIPPER-2 TOTAL DEPTH: 2601.5m

AGE	PALYNOLOGICAL ZONES	HIGHEST DATA					LOWEST DATA				
		Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
NEOGENE	*T. pleistocenicus*										
	M. lipsis										
	C. bifurcatus										
	T. bellus										
PALEOGENE	*P. tuberculatus*	1523.9	0				1538.1	0			
	Upper *N. asperus*										
	Mid *N. asperus*										
	Lower *N. asperus*	1544.0	0								
	P. asperopolus	1550.1	1				1565.0	2			
	Upper *M. diversus*										
	Mid *M. diversus*										
	Lower *M. diversus*	1577.0	1				1585.5	2			
	Upper *L. balmei*	1603.0	2	1623.5	1		1809.5	1			
	Lower *L. balmei*						1871.5	2			
LATE CRETACEOUS	Upper *T. longus*	1880.0	1				1944.0	2			
	Lower *T. longus*	1954.0	1				2055.1	1			
	T. lilliei										
	N. senectus	2211.0	2	2235.6	1		2293.0	1			
	T. apoxyexinus	2315.0	2				2590.1	2			
	P. mawsonii										
	A. distocarinatus										
EARLY CRET.	*P. pannosus*										
	C. paradoxa										
	C. striatus										
	C. hughesi										
	F. wonthaggiensis										
	C. australiensis										

COMMENTS: Dinoflagellate Zones
Kisselovia thompsonae 1550.1
Apectodinium homomorphum 1623.5-1809.5m
Manumiella druggii 1880.0m
Chatangiella porosa 2491.0-2544.1m

CONFIDENCE RATING:
0: SWC or Core, Excellent Confidence, assemblage with zone species of spores, pollen and microplankton.
1: SWC or Core, Good Confidence, assemblage with zone species of spores and pollen or microplankton.
2: SWC or Core, Poor Confidence, assemblage with non-diagnostic spores, pollen and/or microplankton.
3: Cuttings, Fair Confidence, assemblage with zone species of either spores and pollen or microplankton, or both.
4: Cuttings, No Confidence, assemblage with non-diagnostic spores, pollen and/or microplankton.

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: MICHAEL HANNAH DATE: August 1987

DATA REVISED BY: _____ DATE: _____

Sample Type	Depth (m)	Residue Yield	Preservation	Spore-Pollen Diversity	Microplankton Yield	No. species	Sample Code
SWC 60	1523.9	Fair	Poor	Low	Low	3	78089L
SWC 58	1538.1	Poor	Fair-good	Moderate	Low-Mod.	6	78089J
SWC 57	1544.0	Fair	Good	High	Low	2	78089M
SWC 56	1550.1	Good	Good	High	Low	1	78089H
SWC 55	1555.1	Good	Fair	Moderate	Low-Mod	1	78089G
SWC 53	1565.0	Good	Good	High	Low-Mod	2	78089F
SWC 52	1577.0	Fair	Poor	Moderate	Low	1	78089E
SWC 51	1585.5	Poor	Fair	Low	Low	1	78089D
SWC 50	1591.4	Poor	Poor	Low	Low	1	78089C
SWC 49	1603.0	Fair	Fair	Moderate	Nil	0	78089B
SWC 48	1623.5	Good	Good	Moderate	Moderate	1	78089A
SWC 47	1652.5	Fair	Fair	Moderate	Moderate	1	78088Z
SWC 46	1675.5	Poor	Good	Low	Moderate	3	78088Y
SWC 44	1699.5	High	Good	Moderate	Moderate	1	78088X
SWC 42	1742.5	Good	Good	Moderate	Moderate	3	78088V
SWC 41	1754.0	Fair	Fair	Moderate	Nil	0	78088U
SWC 39	1809.5	Good	Good	Moderate	Low	1	78088S
SWC 38	1871.5	Fair	Fair	Low	Moderate	5	78088R
SWC 37	1880.0	Fair	Fair	Low	Low	1	78088Q
SWC 36	1888.0	Fair	Fair	Low	Nil	0	78088P
SWC 35	1899.5	Poor	Fair	V.low	Nil	0	78088O

Sample Type	Depth (m)	Residue Yield	Preservation	Spore-Pollen Diversity	Microplankton Yield	No. species	Sample Code
SWC 33	1944.0	Good	Good	Moderate	Nil	0	78088L
SWC 32	1954.0	Fair	Fair	Moderate	Nil	0	78088L
SWC 31	1969.0	Good	Good	High	Nil	0	78088K
SWC 30	1982.5	Fair	Fair	Low	Nil	0	78088J
SWC 29	1999.0	Fair	Good	Low	Nil	0	78088I
SWC 28	2015.5	Fair	Fair	Moderate	Nil	0	78088H
SWC 27	2030.0	Fair	Fair	Moderate	Nil	0	78088G
SWC 26	2041.5	Fair	Good	Moderate	Nil	0	78088F
SWC 25	2055.1	Good	Fair	Moderate	Nil	0	78088E
SWC 21	2211.6	Poor	Fair	Moderate	Nil	0	78088G
SWC 20	2235.6	Good	Good	Moderate	Nil	0	78087Z
SWC 19	2242.1	Fair	Fair	Low	Nil	0	78087Y
SWC 16	2267.6	Fair	Fair	Moderate	Nil	0	78087V
CORE 3	2787-2787.5						
CORE 3	2297.6-2293.0						
CORE 5	2315.0	Good	Fair-Good	Low	Nil	0	78103E
CORE 6	2330.0	Good	Moderate	Low	Nil	0	78013D
SWC 15	2364.4	Poor	V.Poor	V.Low	Nil	0	78087U
SWC 14	2385.0	Fair	Poor	V.low	Nil	0	78087T

Sample Type	Depth (m)	Residue Yield	Preservation	Spore-Pollen Diversity	Microplankton Yield	No. species	Sample Code
SWC 13	2403.6	Fair	Poor	V.low	Nil	0	78087S
SWC 12	2413.5	Barren					78087R
SWC 10	2461.0	Fair	Poor	Low	Nil	0	78087P
SWC 9	2475.0	Poor	Poor	Low	Nil	0	78087O
SWC 8	2491.0	High	Good-fair	Low	Low	1	78087N
SWC 7	2503.5	Fair	Moderate	Low	Low	1	78087M
SWC 6	2517.0	Good	Good	Low	Moderate	3	78087L
SWC 5	2528.5	Good	Good	Low	Moderate	2	78087K
SWC 4	2544.1	Fair	Poor	Low	Moderate	2	78087J
SWC 3	2564.0	Fair	Moderate	Low	Nil	0	78087I
SWC 2	2580.1	Poor	Poor	Low	Nil	0	78087H
SWC 1	2590.1	Poor	Poor	Low	Nil	0	78087G

2796L:13-15