



PE990529

APPENDIX-1

PALYNOLOGICAL ANALYSIS OF MULLOWAY-1,
GIPPSLAND BASIN.

by

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INTRODUCTION

Twenty-four sidewall cores from Mulloway-1 were processed and their spore-pollen and dinoflagellate content examined. The section sampled appears to be continuous and ranges in age from Late Paleocene to Late Eocene.

Palynomorph preservation was, in general, fair to good. Only one sample was barren (see Basic Data Summary). Spore-pollen yield and diversity was almost uniformly moderate to high. Microplankton yield, on the other hand, was variable with the highest yielding samples coming from the Middle *Nothofagidites asperus* Zone.

SUMMARY DATA - MULLOWAY-1

AGE	UNIT	SPORE-POLLEN ZONES (MICROPLANKTON ZONES)	DEPTH (mKB)
Oligocene	Seaspray Group	Not sampled	
	1127 m		
Late Eocene	Gurnard Formation	Middle <i>N. asperus</i> (<i>C. incompositum</i>)	1137.1-1233.0 (1149.0-1137.1)
	1170 m		
Middle Eocene	Latrobe Group	Lower <i>N. asperus</i>	1252.2-1369.5
Early Eocene		<i>P. asperopolus</i>	1415.5
		Upper <i>M. diversus</i>	1439.3-1496.6
		Middle <i>M. diversus</i>	1565.0
		Lower <i>M. diversus</i>	1580.7-1634.6
Late Paleocene		Upper <i>L. balmei</i>	1696.5
	TD 1723 m		

GEOLOGICAL COMMENTS

- (1) The well bottomed in Late Paleocene Upper *Lygistepollenites balmei* Zone sediments. The sampled section ranges in age up to Late Eocene (Middle *Nothofagidites asperus* Zone).
- (2) The base of the Middle *Nothofagidites asperus* Zone is placed at 1233.0m (sidewall core 22) based on the presence of two poor specimens of *Triorites magnificus*. This represents a thicker Middle *Nothofagidites asperus* Zone than was recorded in Whiptail-1 and may indicate that some of the Lower *Nothofagidites asperus* Zone recorded in this latter well may be in fact Middle *Nothofagidites asperus* Zone in age.
- (3) Sidewall core 30 (at 1137.0m) and sidewall core 29 (at 1199.9m), both from the Gurnard facies, were the only samples to contain both a moderately diverse dinoflagellate assemblage and high dinoflagellate numbers.

Two other samples, sidewall cores 22 and 10 at 1233.0m and 1496.6m respectively, contain a low diversity assemblage with low dinoflagellate numbers.

BIOSTRATIGRAPHY

The zone boundaries have been established using the criteria of Stover & Partridge (1973). The author citations for most spore-pollen species recorded can be sourced from this publication or other references cited herein. Species names followed by "ms" are unpublished manuscript names. Author citations for microplankton can be found in Lentin & Williams (1985, 1989), or in Marshall and Partridge (1988).

UPPER LYGISTEPOLLENITES BALMEI ZONE

SWC 1 (1696.5m)

The presence of frequent *Lygistepollenites balmei* indicates that the sample is no younger than the *Lygistepollenites balmei* Zone in age. The presence of *Cupanieidites orthoteichus* and *Malvacipollis subtilis* further restricts the age to the Upper *Lygistepollenites balmei* Zone.

LOWER MALVACIPOLLIS DIVERSUS ZONE

SWC 4 to SWC 6

(1634.6m to 1580.7m)

A *Malvacipollis diversus* Zone assignment is indicated by the presence of *Malvacipollis diversus*, *Malvacipollis subtilis* and *Proteacidites grandis* and the lack of any *Lygistepollenites balmei* Zone indicators. The absence of any younger indicators such as *Myrtacidites tenuis* and *Proteacidites tuberculiformis* is indicative of the Lower *Malvacipollis diversus* Zone.

MIDDLE MALVACIPOLLIS DIVERSUS ZONE

SWC 7 (1565.0m)

The assemblage recovered from this sample is characterised by common *Malvacipollis diversus* and *Malvacipollis subtilis*, frequent *Haloragacidites harrisii* and *Cyathidites splendens*, together with *Proteacidites grandis* all consistent with broad *M. diversus* Zone. This sample is restricted to the Middle *Malvacipollis diversus* Zone on the first appearance, upsection, of *Proteacidites tuberculiformis*.

UPPER MALVACIPOLLIS DIVERSUS ZONE

SWC 10 and SWC 12

(1496.6m and 1439.3m)

Two samples are assigned to this zone. The lower, (sidewall core 10 at 1496.6m) contains a typical Upper *Malvacipollis diversus* Zone assemblage: common *Malvacipollis diversus* and *Malvacipollis subtilis*, frequent *Cupanieidites orthoteichus* and *Haloragacidites harrisii* together with *Proteacidites grandis*, *Proteacidites pachypolus* and *Myrtacidites tenuis*. Also common in this sample were *Micrhystridium* sp. plus other unidentified acritarchs and algal cysts indicating a lacustrine environment of deposition.

The upper sample (sidewall core 12 at 1439.3m) contains a similar spore/pollen assemblage. Significantly, however, the numbers of *Proteacidites pachypolus* in the sample are very high. Formally, samples with such a high count of this species were referred to the *Proteacidites asperopolus* Zone. Here, however, this assemblage is referred to the Upper *Malvacipollis diversus* Zone because it lacks typical *Proteacidites asperopolus* Zone indicators such as *Clavastephanocolporites melosus* ms,

Conbaculites apiculatus ms, *Proteacidites asperopolus* and *Sapotaceoidaepollenites rotundus*. Supporting this zonal assignment is the recognition of *Santalumidites cainozoicus* whose first appearance datum is in the upper part of the Upper *M. diversus* Zone. No acritarch species were recovered.

PROTEACIDITES ASPEROPOLUS ZONE

SWC 13 (1415.5m)

The assemblage from this sample is marked by the presence of *Sapotaceoidaepollenites rotundus*, *Myrtacidites tenuis*, frequent *Proteacidites asperopolus*, *Proteacidites leightonii* common *Cupanieidites orthoteichus* and common *Haloragacidites harrisii* this assemblage is indicative of the *Proteacidites asperopolus* Zone.

LOWER NOTHOFAGIDITES ASPERUS ZONE

SWC 14 to SWC 21

(1369.5m to 1252.2m)

Samples assigned to the *Nothofagidites asperus* Zone are characterised by an abundance of *Nothofagidites* species particularly of the *brassi/fusca* groups.

The basal sample from this interval (sidewall core 14 at 1369.5m) marks the first appearance upsection of several key zone species including *Nothofagidites asperus*, *Gothanipollis bassensis*, *Tricolpites thomasi*, and *Tricolporites leuros*.

Sidewall core 16 at 1320.0m marks the first appearance, upsection, of *Proteacidites recavus* and *Proteacidites leightonii*. Upsection, key indicator species became rare or absent and the samples assigned to the Lower *Nothofagidites asperus* Zone from this interval carry a lower degree of confidence.

Abundance of *Proteacidites asperopolus* fluctuate throughout the zone with samples from 1629.5m, 1320.9m and 1285.3m containing significant numbers of this species.

MIDDLE NOTHOFAGIDITES ASPERUS ZONE

SWC 22 to SWC 13

(1233.0m to 1137.0m)

The base of this zone is based on the first appearance of *Triorites magnificus* in sidewall core 22 at 1233.0m. Further occurrences of this and other key species such as *Proteacidites crassus* and *Proteacidites recavus* are sporadic over this interval leading to variable degrees of confidence.

The only significant occurrence of dinoflagellate species occurs within the Middle *Nothofagidites asperus* Zone. Sidewall cores 29 and 30 (at 1149.0m and 1137.0m respectively) both contain *Phthanoperidinium comatum*, *Corrudinium incompositum* and *Spiniferites ramosus*. In addition sidewall core 29 contained frequent occurrences of *Tritonites spinosus*. Both samples are assigned to the *Corrudinium incompositum* microplankton Zone.

REFERENCES

- LENTIN, J.K. & WILLIAMS, G.L., 1985. Fossil dinoflagellates: Index to genera and species, 1985 Edition. *Canadian Tech. Rep. Hydrog. Ocean Sci.* 60, 1-451.
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- MARSHALL, N.G. & PARTRIDGE, A.D., 1988. The Eocene acritarch *Tritonites* gen. nov. and the age of the Marlin Channel, Gippsland Basin, southeastern Australia. *Mem. Ass. Australas. Palaeontols* 5, 239-257.
- 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.

TABLE-1
INTERPRETED DATA SUMMARY MULLOWAY-1

SAMPLE NO.	DEPTH (M)	SPORE-POLLEN ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 30	1137.1	Middle <i>N. asperus</i> (<i>C. incompositum</i> *)	Late Eocene	0	Abundant dinoflagellates
SWC 29	1149.0	Middle <i>N. asperus</i> (<i>C. incompositum</i> *)	Late Eocene	0	Common dinoflagellates
SWC 27	1167.5	Middle <i>N. asperus</i>	Late Eocene	1	
SWC 26	1172.6	Middle <i>N. asperus</i>	Late Eocene	1	Good <i>Triorites magnificus</i>
SWC 25	1176.0	<i>N. asperus</i>	Late Eocene	2	
SWC 24	1180.5	<i>N. asperus</i>	Late Eocene	2	
SWC 22	1233.0	Middle <i>N. asperus</i>	Late Eocene	2	Poor <i>Triorites magnificus</i>
SWC 21	1252.2	Lower <i>N. asperus</i>	Middle Eocene	2	
SWC 20	1259.0	Lower <i>N. asperus</i>	Middle Eocene	1	
SWC 19	1271.8	Lower <i>N. asperus</i>	Middle Eocene	2	
SWC 18	1285.3	Lower <i>N. asperus</i>	Middle Eocene	1	
SWC 17	1295.0	Lower <i>N. asperus</i>	Middle Eocene	1	
SWC 16	1320.0	Lower <i>N. asperus</i>	Middle Eocene	1	Very diverse assemblage
SWC 15	1348.3	Lower <i>N. asperus</i>	Middle Eocene	2	
SWC 14	1369.5	Lower <i>N. asperus</i>	Middle Eocene	1	<i>Nothofagidites</i> abundant

SAMPLE NO.	DEPTH (M)	SPORE-POLLEN ZONE	AGE	CONFIDENCE RATING	COMMENTS
SWC 13	1415.5	<i>P. asperopolus</i>	Early Eocene	1	f.a. upsection <i>Sapotaceoidaepollenites rotundus</i>
SWC 12	1439.3	Upper <i>M. diversus</i>	Early Eocene	2	frequent <i>Proteacidites pachypollus</i>
SWC 10	1496.6	Upper <i>M. diversus</i>	Early Eocene	1	f.a. upseciton of <i>Myrtaceidites tenius</i>
SWC 8	1557.0	Indeterminate	?		Barren
SWC 7	1565.0	Middle <i>M. diversus</i>	Early Eocene	1	f.a. upsection of <i>Proteacidites tuberculiformis</i>
SWC 6	1580.7	Lower <i>M. diversus</i>	Early Eocene	2	
SWC 5	1603.0	Lower <i>M. diversus</i>	Early Eocene	1	
SWC 4	1634.6	Lower <i>M. diversus</i>	Early Eocene	1	
SWC 1	1696.5	Upper <i>L. balmei</i>	Late Paleocene/	1	Frequent <i>Lygistepollenites balmei</i>

* Dinoflagellate Zone

FAD - First appearance datum

PALYNOLOGY DATA SHEET

ASIN: Gippsland
 WELL NAME: Mullocky-1

ELEVATION: KB: 21.0m GL: -37.0m
 TOTAL DEPTH: 1723.0m

PALYNOLOGICAL ZONES	HIGHEST DATA					LOWEST DATA				
	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
T. pleistocenicus										
M. lipsis										
C. bifurcatus										
T. bellus										
P. tuberculatus										
Upper N. asperus										
Mid N. asperus	1137.1	0				1233.0	2	1172.6	1	
Lower N. asperus	1252.2	2	1259.0	1		1369.5	1			
P. asperopolus	1415.5	1								
Upper M. diversus	1439.3	2				1496.6	1			
Mid M. diversus						1565.0	1			
Lower M. diversus	1580.7	2	1603.0	1		1634.6	1			
Upper L. balmei	1696.5	1								
Lower L. balmei										
Upper R. longus										
Lower R. longus										
T. lilliei										
N. senectus										
T. apoxyexinus										
P. mawsonii										
A. distocarinatus										
P. pannosus										
C. paradoxa										
C. striatus										
C. hughesi										
F. wonthaggiensis										
C. australiensis										

REMARKS: All depths in metres. The following dinoflagellate zone was recorded:
C. incompositum Zone: 1149.0m to 1137.1m

- 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.

RECORDED BY: M. Hannah DATE: August 1989
 REVISED BY: _____ DATE: _____

BASIC DATA

BASIC DATA SUMMARY

PALYNOMORPH DISTRIBUTION CHART

MULLOWAY-1 - BASIC DATA SUMMARY

SAMPLE NO.	DEPTH (M)	LAB CODE	PALYNOMORPH PRESERVATION	SPORE/POLLEN		MICROPLANKTON	
				YIELD	DIVERSITY*	YIELD	NO. OF SPECIES
SWC 30	1137.0	78227D	Good	Moderate	High	High	6
SWC 29	1149.0	78227C	Fair	Moderate	Moderate	Low	10
SWC 27	1167.5	78227A	Fair	Moderate	Moderate	Low	5
SWC 26	1172.6	78226Z	Good	High	Moderate	Low	3
SWC 25	1176.0	78226Y	Fair	High	High	Nil	-
SWC 24	1180.5	78226X	Good	High	High	Low	2
SWC 22	1233.0	78226V	Good	Moderate	High	Low	5
SWC 21	1252.2	78226U	Poor	Low	Moderate	Low	1
SWC 20	1259.0	78226T			Low	Nil	-
SWC 19	1271.8	78226S	Good	Moderate	Moderate	Nil	-
SWC 18	1285.3	78226R	Fair	Moderate	High	Nil	-
SWC 17	1295.0	78226Q	Good	High	High	Very Low	1
SWC 16	1320.9	78226P	Good	High	High	Nil	-
SWC 15	1348.3	78226Q	Fair	Low	Low	Nil	-
SWC 14	1369.5	78226N	Good	High	High	Nil	-

SAMPLE NO.	DEPTH (M)	LAB CODE	PALYNOMORPH PRESERVATION	SPORE/POLLEN		MICROPLANKTON	
				YIELD	DIVERSITY*	YIELD	NO. OF SPECIES
SWC 13	1415.5	78226M	Fair	High	High	Nil	-
SWC 12	1439.3	78226L	Good	High	High	Nil	-
SWC 10	1496.6	78226J	Good	High	High	Moderate	6
SWC- 8	1557.0	78226H	-	Barren	-	Nil	-
SWC 7	1565.0	78226G	Fair	Moderate	Moderate	Nil	-
SWC 6	1580.7	78226F	Fair	Moderate	Moderate	Nil	-
SWC 5	1603.0	78226E	Fair/Good	Moderate	High	Nil	-
SWC 4	1634.6	78226D	Fair/Good	Moderate	Moderate	Nil	-
SWC 1	1696.5	78226A	Fair/Poor	Moderate	High	Nil	-

* Diversity: Very Low - 1-5 species
 Low - 6-10 species
 Moderate - 11-23 species
 High - 26-74 species
 Very High - 75+ species

(mh78)