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THE PALYNOLOGY OF
FLOUNDER-4,
GIPPSLAND BASIN

by

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SUMMARY

The following spore-pollen zones are recognised in Flounder-4.

<u>Zone</u>	<u>Depth in Feet & Rating</u>		<u>Age</u>
	<u>Highest Data</u>	<u>Lowest Data</u>	
<u>Proteacidites tuberculatus</u>	6335 (2)	6400 (0)	Oligocene-Miocene
----- UNCONFORMITY -----			
<u>Proteacidites asperopolus</u>	6460 (1)	6550 (3)	Early Eocene
Upper <u>Malvacipollis diversus</u>	6560 (0)	6748 (0)	Early Eocene
----- DISCONFORMITY -----			
Lower <u>Malvacipollis diversus</u>	6774 (1)	6914 (0)	Early Eocene
----- UNCONFORMITY -----			
<u>Lygistepollenites balmei</u>	7008 (1)	8096 (2)	Paleocene
<u>Tricolpites longus</u>	8232 (1)	8560 (1)	Paleocene

The following two Wetzeliella dinoflagellate zones are also present in the Flounder Formation in Flounder-4.

<u>Zone</u>	<u>Highest Data</u>	<u>Lowest Data</u>
<u>Wetzeliella thompsonae</u> Zone	6450 (3)	6550 (3)
<u>Wetzeliella brachycysta</u> Zone	6560 (1)	6748 (0)

These two dinoflagellate zones represent finer subdivisions of the P. asperopolus and Upper M. diversus Zones.

SIGNIFICANT POINTS

1. Age of greensand

The sidewall cores between 6360 and 6400 feet from a greensand unit at the top of the Latrobe Group contain both spore-pollen and dinoflagellates diagnostic of the P. tuberculatus Zone, and are equivalent in age to the foraminiferal zone J1. The palynology assemblages also contain, reworked spore-pollen and dinoflagellates from the L. balmei Zone and from the immediately underlying Flounder Formation as well as reworked Middle Eocene (Lower N. asperus Zone A subdivision) dinoflagellates. Because these latter Middle Eocene dinoflagellates are characteristic of the greensands of the Gurnard Formation it is suggested that the greensand in Flounder-4 was originally deposited in the Middle Eocene and later reworked during the early Oligocene.

2. Wetzeliella Zones

Flounder-4 has only the middle two of the four Wetzeliella zones indentified in the adjacent Flounder-3 well. The two zones missing are the W. edwardsii Zone the youngest zone recognised in Flounder-3 and the W. parva Zone the oldest zone recognised. The W. edwardsii Zone shows a marked thinning from west to east from Flounder-1 to Flounder-3, so it is not surprising that it is absent in Flounder-4. The zone could possibly be present in the 40 feet sampling gap at the top of the Flounder Formation, between 6410 and 6450 feet, but this is considered unlikely as the zone species has not been observed in any of the cuttings examined. The W. parva Zone is absent because of a disconformity between the Upper M. diversus and Lower M. diversus Zones in Flounder-4.

3. Lower M. diversus Zone in the Flounder Formation.

Flounder-4 contains the oldest sediments which fall within the concept of the Flounder Formation. These sediments are referred to the Lower M. diversus Zone (6774 - 6914 feet) and are represented by similar lithologies and environments to the younger parts of the Flounder Formation belonging to the Upper M. diversus and P. asperopolus Zones. Dinoflagellates are found in all samples in the Lower M. diversus Zone in similar abundance to the younger parts of formation, and foraminifera were found in the sidewall cores at 6774 and 6806 feet. It is not possible to determine whether this Lower M. diversus section is from the upper or lower part of the zone. However its general similarity to the Lower M. diversus section in Tuna-3 raises the question of whether in that well the Lower M. diversus section is also part of the Flounder Formation.

4. Unconformities

The following unconformities are recognised in Flounder-4:

- a) At the base of the Tuna-Flounder Channel between the Lower M. diversus Zone and the 'Lower' subdivision of the L. balmei Zone representing the loss of part of the Lower M. diversus Zone and the 'Upper' L. balmei Zone.
- b) Within the Flounder Formation between the Lower M. diversus and Upper M. diversus Zones, between 6748 and 6774 feet, with the loss the lower part of the Upper M. diversus Zone.
- c) At the top of the Flounder Formation between 6400 and 6460 feet between Early Oligocene and Early Eocene.
- d) Between the foraminifera zone F and J1 at 6335 and 6345 feet respectively representing the loss of most of the Oligocene and early Miocene.

5. Reworking.

Aside from reworking found within the Early Oligocene greensand and already discussed, reworked Permian spore-pollen are present sporadically in the Flounder Formation and younger marine section and Early Cretaceous spores are present through the L. balmei and T. longus Zones.

COMMENTS ON ZONES

The top of the T. longus Zone (8232-8560 feet) is identified by the extinction of the species Proteacidites otwayensis, P. gemmatus, P. reticuloconcavus, Tricolpites longus, T. waiparaensis, T. confessus and Tricolporites lillicii which occur in the highest two samples referred to this zone. Samples from near the base of the overlying L. balmei Zone are very poorly preserved so it was not possible to find any of the species whose first appearance in the section can be taken as diagnostic of the L. balmei Zone. These latter samples are referred to the L. balmei Zone on the negative evidence of the lack of T. longus Zone indicator species. The L. balmei Zone also, is represented only by the 'Lower' subdivision.

The samples from the Flounder Formation, from the Lower M. diversus to P. asperopolus Zones all contain good spore-pollen and dinoflagellate assemblages. The only exception is that the zone fossil Wetzeliella thompsonae is only found in cuttings from 6450 - 60 feet and 6550 - 60 feet and not in the sidewall cores in this interval.

The P. tuberculatus Zone is identified principally by the presence of the spore Cyatheacidites annulatus. The highest sample from this zone lies within the foraminiferal zonule F which is usually referred to the T. bellus spore-pollen zone. However in this well no spore-pollen species were found that are diagnostic of the T. bellus Zone.

SAMPLE	DEPTH IN FEET	ZONE
Cuttings	6140-60*	<u>T. bellus</u> Zone
"	6240-60*	"
SWC 43	6335* P,B	<u>P. tuberculatus</u> Zone
Cuttings	6340-60*	"
SWC 42	6345*	"
SWC 41	6360* E,M	"
SWC 40	6385* B,E,M	"
SWC 39	6400* P,B,E	"
SWC 38	6410	Indeterminant
Cuttings	6450-60*	<u>P. asperopolus/W. thompsonae</u> Zones
SWC 37	6460* P,B	<u>P. asperopolus</u> Zone
SWC 36	6510*	"
Cuttings	6550-60*	<u>P. asperopolus/W. thompsonae</u> Zones
SWC 35	6560*	Upper <u>M. diversus/W. Brachycysta</u> Zones
SWC 34	6610*	Upper <u>M. diversus</u> Zone
SWC 33	6660*	"
Cuttings	6660-70*	"
SWC 32	6705*	"
SWC 31	6748*	Upper <u>M. diversus/W. brachycysta</u> Zones
Cuttings	6750-60*	"

SAMPLE	DEPTH IN FEET	ZONE
SWC 30	6774*	Lower <u>M. diversus</u> Zone
SWC 29	6806* K,B	"
SWC 28	6836* B	"
Cuttings	6870-90*	Indeterminant
SWC 27	6914*B	Lower <u>M. diversus</u> Zone
Cuttings	6960-70	Indeterminant
SWC 25	7008* K	<u>L. balmei</u> Zone
Cuttings	7010-20	"
SWC 24	7104*	"
SWC 22	7236	Barren
Cuttings (coal)	7360-70	<u>L. balmei</u> Zone
SWC 21	7408*K	"
SWC 20 (coal)	7501	"
SWC 19	7611*	"
Cuttings	7660-70	"
SWC 18	7778*	"
SWC 14	7984	"
SWC 13	8096*K?	"
SWC 12	8187*	Indeterminant
Core-1	8207*	"
Core-1	8232*K	<u>T. longus</u> Zone
SWC 10	8252	"
Core-1	8260	"
Core-3	8356*	"
SWC 2	8498*K	"
SWC1	8560	"

* Dinoflagellates present

Reworked spore-pollen and dinoflagellates present in the samples are indicated by the following letters given after the depth.

- P = Permian
- K = Early Cretaceous
- B = Reworked L. balmei Zone fossils
- E = Early Eocene fossils reworked from Flounder Formation
- M = Middle Eocene dinoflagellates reworked from Eocene greensand.

