PALYNOLOGICAL INTERPRETATIONS FOR SUNFISH-1, GIPPSLAND BASIN, AUSTRALIA

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SUMMARY

5517 feet	Post-Latrobe	Probably Oligocene
5580 feet	Lower *M. diversus*	Early Eocene
5790 - 6140 feet	*L. balmei*	Paleocene
6510 - 7150 feet	*T. longus*	Paleocene
7371 - 7430 feet	*T. lilliei*	Late Cretaceous
7795 - 7895 feet	Indeterminate	Cretaceous
8000 - 8152 feet	*C. paradoxa?*	Early Cretaceous

DISCUSSION

Post-Latrobe - The palynomorph assemblage from SWC 20 at 5517 feet consists mostly of dinoflagellates with *Spiniferites ramosus* and *Operculodinium centrocarpum* being the commonly occurring species. Other dinoflagellates include *Lingulodinium machaerophorum, Leptodinium sp., Nematosphaeropsis sp.* and numerous "dinospheres." Spore-pollen are rare and no species indicative of post-Latrobe spore-pollen zones was found.

Lower *Malacipollis diversus* Zone -

The assemblage from SWC 19 at 5580 feet contains a sparse spore-pollen assemblage in which specimens of *M. diversus* are common and those of *Spinizonocolpites prominatus* are frequent. In comparison, the species listed below are rare:

Banksieaeidites arcuatus
Cupanieidites orthoteichus
Cyathidites gigantis
C. spendens
Ephedripites notensis
Haloragacidites harrisii
Lygistepollenites florinii
Polypodiaceoisporites varus
Proteacidites parvus
Tricolpites gillii

Dinoflagellates are common at 5580 feet and although their preservation is poor, it is possible to identify most specimens to the generic level and occasional specimens to the species level. Collectively, the dinoflagellates represent a typical association of Early Eocene forms including *Wetzeliella homomorpha, Adnatosphaeridium sp., Cordosphaeridium sp., Diphyes colligerum, Fibracysta bipolare, Muratodinium fimbriatum* and *Trichodinium sp.*

Lygistepollenites balmei Zone - Species indicative of this zone were obtained from SWC 18 at 5790 feet, SWC 17 at 5940 feet and SWC 16 at 6140 feet, and include:

Australopollis obscurus
Gambierina edwardsii
Gambierina rudata
Lygistepollenites balmei
Peromonolites densus
Polycolpites langstonii (5790 and 5940 feet)
Proteacidites angulatus (6140 feet only)

Rare dinoflagellates are present at 5790 feet *(Spiniferites spp.)*; a single specimen of *Ginginodinium sp.* was found at 5940 feet and microplankton were not identified at 6140 feet. Recycled Early Cretaceous spores occur at 5790 feet. In addition to the zone diagnostic species the following spore-pollen are present in the *L. balmei* zone in Sunfish-1.

Cyathidites splendens	
Haloragacidites harrisii	5790 feet only
Ceratosporites equalis	
Latrobosporites ohaiensis	
Lygistepollenites florinii	5790 feet only
Nothofagidites brachyspinulosus	
N. emarcidus	
N. endurus	5940 feet only
N. flemingii	5790 and 5940 feet
Periporopollenites polyoratus	
Phyllocladidites mawsonii	
P. reticulosaccatus	
Proteacidites parvus	
Stereisporites punctatus	
Tricolpites phillipsii	5790 feet only

Tricolpites longus Zone - The highest sample with species diagnostic of this zone is SWC 14 at 6510 feet from which specimens of *Proteacidites cleinei*, *Tricolpites confessus* and *T. waiparaensis* were recovered. *Tricolpites longus*, *Triporopollenites sectilis* and *Proteacidites amolosexinus* appear in SWC 13 at 6720 feet. *Tricolporites lilliei* and *Tetradopollis securus* are present in the lowest sample from the *T. longus* zone (SWC 10 at 7150 feet).

Specimens of *Nothofagidites spp.* are very rare between 6510 and 6880 feet and rare at 7150 feet; on the other hand, specimens of *Gambierina spp.* are common between 6720 and 7150 feet. Very poorly preserved dinoflagellates are associated with the well preserved spore-pollen at 6510 feet. Although specific identifications were not possible, the following dinoflagellate genera were recognized with reasonable certainty: *Achomosphaera*, *Adnatosphaeridium*, *Areoligera*, *Fibracysta* and *Kenleyia*. Listed below are the spore-pollen species recovered from the *T. longus* zone in Sunfish-1.

Cyathidites splendens	6720 feet only
Gambierina edwardsii	7150 feet only
G. rudata	all samples
Ceratosporites equalis	6880 and 7150 feet
Latrobosporites amplus	6720 to 7150 feet
L. ohaiensis	6880 feet only
Lygistepollenites balmei	6510, 6720, 7150 feet
Nothofagidites emarcidus	6510 and 7150 feet
N. senectus	7150 feet only
Periporopollenites polyoratus	6510 and 6720 feet
Phyllocladidites mawsonii	all samples
Proteacidites amolosexinus	6720 feet only
P. angulatus	6510 feet only
P. cleinei	6510 feet only
P. palisadus	6720 feet only
P. parvus	6510 and 6720 feet
P. pseudomoides	6510 feet only
P. reticuloconcavus	6880 and 7150 feet
Simplicepollis meridianus	6510 and 6880 feet
Stereisporites punctatus	6720 and 6880 feet
Tetradopollis securus	7150 feet only
Tricolpites confessus	all samples
T. gillii	all samples
T. longus	6720 and 7150 feet
T. waiparaensis	6510 and 7150 feet
Tricolporites lilliei	7150 feet only
Triporopollenites sectilis	6720 to 7150 feet

Tricolporites lilliei Zone - Samples from conventional cores 1 and 2 (7371.7-7385.5 feet and 7386.0-7410.5 feet, respectively) and SWC 8 at 7430 feet are assigned to the *T. lilliei* zone. Placement of these samples in the *T. lilliei* zone is based on the increased abundance of *Nothofagidites spp.* coupled with the occurrence of *Cicatricosisporites australiensis, Densoisporites velatus, Gephyrapollenites wahooensis, Ornamentifera sentosa, Phyllocladidites verrucosus, Sterisporites regium, Tricolpites pachyexinus,* and *T. renmarkensis.* None of these forms was found in the overlying *T. longus* zone in Sunfish-1. Specimens of *D. velatus* are frequent in some preparations from cores 1 and 2 where it is commonly associated with well preserved spores of the *Camerozonosporites/Latrobosporites* complex. A very sparse spore-pollen assemblage was recovered from SWC 8 at 7430 feet which is placed in the *T. lilliei* zone because of the occurrence of *Tricolpites confessus* and *Tetradopollis securus.* No microplankton present in samples from the *T. lilliei* zone. Spore-pollen from the zone in Sunfish-1 include:

Camerozonosporites/Latrobosporites amplus
C./H. ohaiensis
Ceratosporites equalis
Cicatricosisporites australiensis
Densoisporites velatus
Gambierina rudata

Gephyrapollenites wahooensis
Nothofagidites emarcidus
N. senectus
Ornamentifera sentosa
Phyllocladidites mawsonii
P. verrucosus
Proteacidites cleinei
P. palisadus
P. parvus
Stereisporites regium
Tetradopollis securus
Tricolpites confessus
T. gillii
T. longus
T. pachyexinus
T. renmarkensis
T. waiparaensis
Tricolporites lilliei
Triporopollenites sectilis

Samples from 7795 to 7895 feet - Palynomorph assemblages from SWC 7 at 7795 feet, SWC 5 at 7857 feet and SWC 3 at 7895 feet provide inconclusive determinations. SWC 7 was poorly fossiliferous with mainly broken specimens. The presence to small proteaceous pollen suggests the sample is probably from the *N. senectus* zone, but confirming evidence is lacking.

SWC 5 contains a mixture of contaminants, recycled Early Cretaceous spores, and a rather limited indigenous assemblage. At least some of the proteaceous pollen and specimens of *Nothofagidites* appear to be in place, and if this is true, then the sample is from the *N. senectus* zone. Obvious recycled Early Cretaceous forms are *Contignisporites sp.*, and *Rouseisporites reticulatus;* a specimen provisionally identified as *Krauselisporites sp.* may represent Permian reworking.

SWC 3 has common, poorly preserved gymnosperm pollen, abundant inaperturate grains (of which some might be marine cysts). It also has some well preserved Early Cretaceous spore-pollen, such as *Rouseisporites radiatus,* and *Classopollis sp.* as well as Permian bisaccate pollen *(Striatites sp.)*, and Tertiary dinoflagellates (contaminants). Zone diagnostic species are lacking, therefore no reliable age interpretation is possible.

Early - Cretaceous - SWC 2 at 8000 feet, SWC 1 at 8114 feet and conventional core 3 at 8138 - 8152 feet contain common and reasonably well preserved Early Cretaceous spore-pollen. Also present are very rare acritarchs (core 3 and SWC 2) whose presence suggests marginal marine depositional conditions. Based on the presence of *Dictyotosporites speciosus* and *Trilobosporites trioreticulosus*, the assemblages are assigned with low confidence to the *Coptospora paradoxa* zone; the nominate species was not identified. Spore-pollen from the Early Cretaceous interval in Sunfish-1 are:

Alisporites grandis
Araucariacites australis
Baculatisporites comaumensis
Cicatricosisporites australiensis
C. hughesii
Cingulitriletes clavus
Ceratosporites equalis
Classopollis sp.
Cycadopites sp.
Cyathidites australis
C. minor
Dictyotosporites speciosus
Foraminisporis asymmetricus
F. dailyi
Gleicheniidites sp.
Klukisporites scaberis
Krauselisporites sp.
Laevigatosporites sp.
Leptolepidites major
L. verrucatus
Lycopodiacidites asperatus
Lycopodiumsporites austraclavatidites
L. eminulus
L. nodosus
Microcachryidites antarcticus
Neoraistrickia truncata
Osmundacidites wellmanii
Podosporites microsaccatus
Rouseisporites radiatus
Sterisporites antiquasporites
Trilobosporites trioreticulosus
Triporites sp. (very small, single specimen)
Tsugaepollenites segmentatus

CONCLUSIONS

1. The highest sample from Sunfish-1 at 5517 feet is post-Latrobe, probably Oligocene, but the lack of diagnostic spore-pollen preclude a definitive zone assignment. Sample contains mainly a marine assemblage dominated by dinoflagellates.

2. A Lower *Malvacipollis diversus* assemblage with spore-pollen and dinoflagellates was recovered from 5580 feet; assignment to the *M. diversus* zone is made with very high confidence.

3. Zone diagnostic spore-pollen were identified in assemblages from the *Lygistepollenites balmei*, *Tricolpites longus* and *Tricolpites lilliei* zones, consequently, high confidence ratings are given to these zone assignments (5790 to 7430 feet).

4. Samples from 7795 to 7895 feet yielded inconclusive palynological data; the assemblages are placed provisionally and with low confidence into the *Nothofagidites senectus* zone. The interval, however, could be older.

5. Early Cretaceous palynomorphs occur from 8000 to 8152 feet, and the epoch-level determination can be accepted with confidence. The *Coptospora paradoxa* zone assignment, however, is much less certain and should be regarded as tenuous. Of possible significance is the presence of rare acritarchs in the Early Cretaceous section. The occurrence of these palynomorphs suggests marginal marine deposition.

6. Recycled Early Cretaceous forms are present in the *L. balmei* and *T. longus* zones and also in the interval between the *T. lilliei* zone and the Early Cretaceous. This latter interval also has rare Permian pollen.

7. Dinoflagellates are common in the post Latrobe and Lower *M. diversus* samples and rare in some *L. balmei* and the highest *T. longus* sample.

LIST OF SAMPLES

SWC	20	5515'	post-Latrobe	probably Oligocene	D
SWC	19	5580'	Lower *M. diversus*	Early Eocene	D
SWC	18	5790'	*L. balmei*	Paleocene	D
SWC	17	5940'	" "	"	D
SWC	16	6140'	" "	"	
SWC	15	6320'	indeterminate		
SWC	14	6510'	*T. longus*	Paleocene	D
SWC	13	6720'	" "	"	
SWC	12	6880'	" "	"	
SWC	10	7150'	" "	"	
CORE	1	7371.7'	*T. lilliei*	Late Cretaceous	
		7383'	" "	" "	
		7385.5	" "	" "	
CORE	2	7395'	" "	" "	
		7398'	" "	" "	
		7407'	" "	" "	
		7410.5'	" "	" "	
SWC	8	7430'	" "	" "	
SWC	7	7795'	*N. senctus?*	Late Cretaceous	
SWC	5	7857'	" " ?	" "	
SWC	3	7895'	indeterminate	Late Cretaceous?	
SWC	2	8000'	*C. paradoxa?*	Early Cretaceous	A
SWC	1	8114'	" " "	" "	
CORE	3	8138'	" " "	" "	A
		8147'	" " "	" "	
		8152'	" " "	" "	A

D = dinoflagellates
A = acritarchs