



PE990302

PALYNOLOGICAL ANALYSIS

BARRACOUTA-4,
GIPPSLAND BASIN,

by

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INTRODUCTION

Forty-two sidewall core and conventional core samples and ten samples of coal separated from cuttings were examined from Barracouta-4. The good sampling in Barracouta-4 makes it the best well for documenting the palynology of the upper part of the Latrobe Group of the Barracouta Structure. The zones recognised in the well are summarised below while all the samples examined are listed on Table-1 and confidence ratings for the zone intervals are given on the accompanying Data Sheet.

SUMMARY

<u>UNIT</u>	<u>SPORE-POLLEN ZONE</u>	<u>DEPTH IN FEET</u>
Lakes Entrance Formation	<u>P. tuberculatus</u>	3323 to 3412
	UNCONFORMITY	
Gurnard Formation	Middle <u>N. asperus</u> *	3430 to 3450
Latrobe Coarse Clastics	Middle <u>N. asperus</u> *	3454 to 3482
	Lower <u>N. asperus</u>	3642 to 4006
	<u>P. asperopolus</u>	4251 to 4615
	Upper <u>M. diversus</u>	4739 to 4780
		T.D. 4783

*Deflandrea extensa

Dinoflagellate Zone 3430 to 3454 feet.

GEOLOGICAL COMMENTS

1. All samples from the greensand at the top of the Latrobe Group gave Middle N. asperus Zone spore-pollen assemblages and Deflandrea extensa Zone dinoflagellate assemblages. This unit is therefore younger than the main development of the Gurnard Formation in the central part of the basin where it is generally thicker and has a Lower N. asperus Zone age.
2. The Upper N. asperus Zone is either absent in Barracouta-4 or present in the 18 feet sampling gap between 3412-3430 feet. It could lie within this gap, since in Swordfish-1 this zone is only present in two sidewall cores separated by 4 feet, and because of good sample control can only have a maximum thickness of 10 feet.
3. There is no recognisable age break between the greensand in Barracouta-4 and the underlying coarse clastics as both spore-pollen and dinoflagellate assemblages fall within the same zone on either side of this boundary. There is however a noticeable reduction in abundance and diversity among the dinoflagellates across this boundary which is consistent with the change in environment implied by the lithologies.
4. The Lower to Middle N. asperus Zone boundary falls within the top 150 feet of the coarse clastics, where it corresponds to the unconformity separating the N-1.1 and N-1.2 reservoir units (Threlfall et al 1976) which lies at 3503 feet.

5. The Lower N. asperus and P. asperopolus Zone boundary is particularly hard to relate to a distinct unconformity or lithological change even though this boundary has been correlated with the time of cutting of the Marlin Channel deeper in the basin (Partridge 1976). The boundary in Barracouta-4 appears to lie within the unit containing several thick coal seams between the samples at 4006 and 4251 feet which contain good assemblages of the respective zones. However, assemblages from the coals would favour putting the boundary at the base of this coaly interval.

6. With the good sampling in Barracouta-4 it has been possible to demonstrate clearly that the abundance of the pollen Proteacidites pachypolus and/or P. asperopolus is only found in certain samples in the P. asperopolus Zone, and further that it is not necessarily even restricted to that zone. The latter is demonstrated by the abundance of P. pachypolus and especially P. asperopolus in two samples from the Lower N. asperus Zone (see Table-1). Obviously the "abundances" are partially environmentally controlled and considering the geographic position of Barracouta-4 that control appears to be related to the position of the shoreline in the Early and Middle Eocene.

DISCUSSION OF ZONES

The species identified in the samples examined are given on Table-1 and the attached distribution sheets. The basis for choosing the zone intervals is discussed in the following.

Upper Malvacepollis diversus Zone 4739 to 4780 feet

Barracouta-4 reached total depth within the Upper M. diversus Zone which is identified by the presence of Proteacidites ornatus, P. tuberculiformis and in the upper portion of the zone by Proteacidites pachypolus and Myrtaceidites tenuis. No dinoflagellates were observed in any samples from this zone.

Proteacidites asperopolus Zone 4251 to 4615 feet

The base of the P. asperopolus Zone is taken at the base of the abundant occurrence of Proteacidites pachypolus. This occurs in core-2 within the shale section above the M-1 oil reservoir. Analysis of a number of samples from core-2 clearly shows that the P. pachypolus abundance is not characteristic of all samples in this zone and this implies that the abundance is ecologically controlled as well as age controlled. This partial environmental control is further highlighted by the occurrence within the Lower N. asperus Zone of abundant Proteacidites asperopolus (31%) at 3834 feet and an abundance of both P. asperopolus and P. pachypolus (3.2%) at 3912 feet.

As in Swordfish-1 (Partridge 1977) the first appearance of the species Proteacidites asperopolus, Santalumidites cainozoicus, Sapotaccoidaepollenites rotundus and Conbaculites apiculatus used to mark the base of the P. asperopolus Zone in the absence of a P. pachypolus abundance were found to occur slightly above or later (the order of 100 feet or 0.75 to 1.0 million years) than the first samples containing the P. pachypolus abundance.

The top of the P. asperopolus Zone is taken at the last appearance of Intratropipollenites notabilis and Conbaculites apiculatus at 4251 feet. Other species which can be used to mark the top of the P. asperopolus Zone become extinct in Barracouta-4 below this level.

Only a single sample in the P. asperopolus Zone contained dinoflagellates. This sample at 4498 feet contained 22.1% dinoflagellates relative to the associated spore-pollen. Of the dinoflagellates 93% were of the species Homotryblium tasmanensis. Unfortunately the dinoflagellate assemblage was not sufficiently diverse to refer it to either of the Wetzeliella zones

recognised within the P. asperopolus Zone (Partridge 1976).

Lower Nothofagidites asperus Zone 3642 to 4006 feet

The base of this zone is taken at 4006 feet which contains first appearances of Tricolpites simatus, Nothofagidites falcatus, N. asperus and Proteacidites reflexus. This is supported by the conspicuous occurrence of the dinoflagellate Areosphaeridium diktyoplokus (although total dinoflagellate count is less than 1%) which has not been recorded from below the Lower N. asperus Zone.

There is a 245 feet sampling gap in which no sidewall cores were shot between the base of this zone and the top of the P. asperopolus Zone.

Coal however was extracted from cuttings samples at three levels within this sampling gap. These coal samples are thought to be fairly reliable as to depth, since the coal tends to be washed out quickly from the drilling mud (see sample descriptions) and can be readily separated from other lithologies by flotation in carbon tetrachloride. The assemblages from the coals because they are environmentally controlled were unfortunately not diagnostic of a particular zone. However, the presence of Proteacidites recavus and particularly its common occurrence in the sample from 4120-4130 feet would favour a Lower N. asperus Zone rather than P. asperopolus Zone age for this section.

Dinoflagellates occur sporadically in samples from the Lower N. asperus Zone. They are most abundant in the sidewall core at 3704 feet where they make up 6.4% of the assemblage, consisting mainly of the species Thalassiphora pelagica. However, aside from the presence of Areosphaeridium diktyoplokus at 4006 feet none of the other species identified are of age significance.

The top of the Lower N. asperus Zone is based on the negative evidence of absence of Middle N. asperus Zone indicator species.

Middle Nothofagidites asperus Zone 3430 to 3482 feet

The occurrence of Tricolpites thomasii at 3482 feet, Aglaoreidia qualumis at 3468 feet and Anacolosidites sectus and Triorites magnificus at 3454 feet are the reasons for placing the base of the Middle N. asperus Zone within the upper part of the coarse clastic facies of the Latrobe Group. This age dating is supported by the dinoflagellates although their diversity within the coarse clastic facies is rather low.

The samples between 3430 to 3450 feet from the "Gurnard greensand facies" contain the same diagnostic species and the assemblages are much more diverse. Among the dinoflagellate assemblages the presence of Eisenackia ornata and absence of Schematophora speciosus in the greensand suggests that the section correlates with the "Notostrea Greensand" and overlying section of the Browns Creek Clay in the Otway Basin.

The top of the Middle N. asperus Zone is placed at the sample at 3430 feet which contains the diagnostic dinoflagellates Corrundinium incompositum and Deflandrea extensa. The immediately overlying sample at 3412 feet is referred to the Proteacidites tuberculatus Zone based on the presence of the spore Cyatheacidites annulata. The Upper N. asperus Zone was not recognised in the section and is probably not present even in the 18 feet sample gap between 3412 to 3430 feet.

REFERENCES

PARTRIDGE, A.D., 1976, The geological expression of eustacy in the Early Tertiary of the Gippsland Basin: APEA, Jour., Vol. 16, pt. 1, p. 73-79.

PARTRIDGE, A.D., 1977, Palynological analysis Swordfish-1, Gippsland Basin: Esso Australia Ltd., Palaeo. Report 1977/13.

THRELFALL, W.F., BROWN, B.R., and GRIFFITH, B.R., 1976, Gippsland Basin, Off-shore: Aust.Inst. Mining & Metallurgy Monograph Series No. 7, p. 41-67.

TABLE-1: SUMMARY OF PALYNOLOGICAL ANALYSES, BARRACOUTA-4, GIPPSLAND BASIN

SAMPLE AND DEPTH	ZONE	AGE	CONFIDENCE RATING	YIELD	DIVERSITY	COMMENTS
SWC 88 3323'	<u>P.tuberculatus</u>	Late Oligocene	2	Very low	Low	
SWC 87 3377'	<u>P.tuberculatus</u>	Early Oligocene	1	Low	Low	
SWC 84 3412'	<u>P.tuberculatus</u>	Early Oligocene	1	Moderate	Moderate	
SWC 83 3430'	Middle <u>N.asperus</u>	Late Eocene	1	Moderate	Moderate	<u>D.extensa</u> Dino.Zone
SWC 82 3438'	" "	" "	0	Moderate	High	" "
SWC 81 3443'	" "	" "	0	" "	High	" "
SWC 80 3447'	" "	" "	0	Low	High	" "
SWC 79 3450'	" "	" "	1	Moderate	Low	" "
SWC 78 3454'	" "	" "	0	Low	Moderate	" "
SWC 77 3456'	" "	" "	1	Low	Low	" "
SWC 76 3460'	" "	" "	1	Moderate	Moderate	" "
SWC 75 3468'	" "	" "	1	Moderate	Moderate	" "
SWC 74 3482'	" "	" "	1	Moderate	High	" "
Cuttings 3490-3500'	Indeterminant	" "	-	Moderate	Low	Coal fraction of cuttings
Cuttings 3550-3570'	" "	" "	-	Very low	Low	Coal fraction of cuttings
SWC 70 3642'	Lower <u>N.asperus</u>	Middle Eocene	1	Moderate	Low	
SWC 69 3704'	" "	" "	1	Moderate	Moderate	
SWC 68 3734'	" "	" "	1	Moderate	Moderate	
SWC 67 3797'	" "	" "	1	Moderate	High	
SWC 66 3834'	" "	" "	1	Moderate	Low	<u>P.asperopolus</u> abundant 31%
SWC 65 3841'	" "	" "	1	Moderate	High	
SWC 64 3858'	Indeterminant	" "	-	Very low	Low	Virtually barren
Cuttings 3850-3860'	Indeterminant	" "	-	Moderate	Low	Coal fraction of cuttings
Cuttings 3900-3910'	Lower <u>N.asperus</u>	" "	3	Moderate	Low	Coal fraction of cuttings
SWC 63 3912'	Lower <u>N.asperus</u>	" "	1	Moderate	High	<u>P.pachypolus</u> and <u>P.asperopolus</u> 3.2%
SWC 62 3948'	Lower <u>N.asperus</u>	" "	1	Moderate	Moderate	
SWC 61 4006'	Lower <u>N.asperus</u>	" "	0	High	High	Occurrence of <u>A.diktyoplokus</u>
Cuttings 4010-4020'	Indeterminant	" "	-	Moderate	Moderate	Coal fraction of cuttings
Cuttings 4050-4060'	" "	" "	-	Moderate	Moderate	Coal fraction of cuttings
Cuttings 4120-4130'	" "	" "	-	Moderate	Moderate	Coal fraction of cuttings
SWC 119 4251'	<u>P.asperopolus</u>	Early Eocene	1	Moderate	Moderate	Top occurrence of <u>I.notabilis</u>
SWC 117 4274'	" "	" "	1	Moderate	Moderate	" "
Cuttings 4270-4280'	Indeterminant	" "	-	Low	Low	Coal fraction of cuttings
SWC 116 4306'	<u>P.asperopolus</u>	" "	1	Moderate	Moderate	<u>P.pachypolus</u> abundant 23%
SWC 115 4308'	" "	" "	1	Low	Moderate	<u>P.pachypolus</u> abundant 14%
SWC 113 4384'	" "	" "	1	High	High	<u>P.pachypolus</u> abundant 6%
SWC 112 4459'	" "	" "	1	Moderate	Moderate	Top occurrence of <u>M.tenuis</u>
SWC 111 4498'	" "	" "	0	High	High	Common <u>Homotryblium tasmanense</u>
Cuttings 4490'-4500'	<u>P.asperopolus</u>	" "	3	Moderate	Moderate	Coal fraction of cuttings
SWC 110 4511'	Barren	" "	-	-	-	
SWC 109 4516'	Indeterminant	" "	-	Very low	Low	Virtually barren
SWC 108 4550'	<u>P.asperopolus</u>	" "	1	Moderate	Moderate	<u>P.pachypolus</u> 10%
Core-2 4602'	" "	" "	1	Moderate	Moderate	Coal, depth adjusted
Core-2 4604'	" "	" "	1	Moderate	Moderate	<u>P.pachypolus</u> 22% depth adjusted
Core-2 4606'	" "	" "	1	Moderate	Moderate	Depth adjusted
Core-2 4615'	" "	" "	1	Moderate	Moderate	Coal, depth adjusted
Core-2 4618'	Indeterminant	" "	-	Very low	Very low	Virtually barren
Cuttings 4730-4740'	Upper <u>M.diversus</u>	Early Eocene	3	Moderate	High	Coal fraction of cuttings
SWC 95 4739'	" "	" "	1	High	High	" "
SWC 94 4753'	" "	" "	1	High	Moderate	Abundant <u>Cyathidites splendens</u>
SWC 93 4756'	Indeterminant	" "	-	Very low	Very low	Virtually barren
SWC 91 4780'	Upper <u>M.diversus</u>	" "	1	Low	Moderate	

BASIN GIPPSLAND BASIN

DATE _____

LL NAME BARRACOUTA-4

ELEVATION K.B. + 83 feet

AGE	PALYNOLOGIC ZONES	HIGHEST DATA					LOWEST DATA				
		Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time	Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time
MIO.	<u>P. tuberculatus</u>	3323	2	3377	1		3412	1			
	<u>U. N. asperus</u>										
EOCENE	<u>M. N. asperus</u>	3430	1	3438	0		3482	1			
	<u>L. N. asperus</u>	3642	1				4006	0			
	<u>P. asperopolus</u>	4251	1				4615	1			
	<u>U. M. diversus</u>	4739	1				4780	1			
	<u>M. M. diversus</u>										
	<u>L. M. diversus</u>										
PALEOCENE	<u>U. L. balmei</u>										
	<u>L. L. balmei</u>										
	<u>T. longus</u>										
LATE CRETACEOUS	<u>T. lilliei</u>										
	<u>N. senectus</u>										
	<u>C. trip./T.pach.</u>										
	<u>C. distocarin.</u>										
	<u>T. pannosus</u>										
EARLY CRETACEOUS											
PRE-CRETACEOUS											

COMMENTS: Deflandrea extensa Dinoflagellate Zone 3430 to 3454 feet

- RATINGS: 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 spore and pollen or microplankton, or both.
 4; CUTTINGS, NO CONFIDENCE, assemblage with non-diagnostic spores, pollen and/or microplankton.

NOTE: If a sample cannot be assigned to one particular zone, then no entry should be made. Also, if an entry is given a 3 or 4 confidence rating, an alternate depth with a better confidence rating should be entered, if possible.

DATA RECORDED BY: Alan Partridge DATE July 20, 1977

DATA REVISED BY: _____ DATE _____

Well Name BARRACOUTA-4

Basin GIPPSLAND

Sheet No. 2 of 7

SAMPLE TYPE *	DEPTHS																													
	3323'	3377'	3412'	3430'	3438'	3443'	3447'	3450'	3454'	3456'	3460'	3468'	3482'	3490-500'	3550-570'	3642'	3704'	3734'	3797'	3834'	3841'	3858'	3850-560'	3900-010'	3912'	3948'	4006'	4010-120'		
<i>M. subtilis</i>																														
<i>M. ornamentalis</i>																														
<i>M. hypolaenoides</i>																														
<i>M. homeopunctatus</i>																														
<i>M. parvus/mesonesus</i>																														
<i>M. tenuis</i>																														
<i>M. verrucosus</i>																														
<i>M. australis</i>																														
<i>N. asperus</i>																														
<i>N. asperoides</i>																														
<i>N. brachyspinulosus</i>																														
<i>N. deminutus</i>																														
<i>N. emarcidus/heterus</i>																														
<i>N. endurus</i>																														
<i>N. falcatus</i>																														
<i>N. Flemingii</i>																														
<i>N. goniatus</i>																														
<i>N. senectus</i>																														
<i>N. vansteenisii</i>																														
<i>O. sentosa</i>																														
<i>P. ochesis</i>																														
<i>P. catastus</i>																														
<i>P. demarcatus</i>																														
<i>P. magnus</i>																														
<i>P. polyoratus</i>																														
<i>P. vesicus</i>																														
<i>P. densus</i>																														
<i>P. velosus</i>																														
<i>P. morganii/fubatus</i>																														
<i>P. mawsonii</i>																														
<i>P. reticulosaccatus</i>																														
<i>P. verrucosus</i>																														
<i>P. crescentis</i>																														
<i>P. esobalteus</i>																														
<i>P. langstonii</i>																														
<i>P. reticulatus</i>																														
<i>P. simplex</i>																														
<i>P. varus</i>																														
<i>P. adenanthoides (Prot.)</i>																														
<i>P. alveolatus</i>																														
<i>P. amolosexinus</i>																														
<i>P. angulatus</i>																														
<i>P. annularis</i>																														
<i>P. asperopolus</i>																														
<i>P. biornatus</i>																														
<i>P. clarus</i>																														
<i>P. cleinei</i>																														
<i>P. confragosus</i>																														
<i>P. crassis</i>																														
<i>P. delicatus</i>																														
<i>P. formosus</i>																														
<i>P. grandis</i>																														
<i>P. grevillaensis</i>																														
<i>P. incurvatus</i>																														
<i>P. intricatus</i>																														
<i>P. kopiensis</i>																														
<i>P. lapis</i>																														
<i>P. latrobensis</i>																														
<i>P. leightonii</i>																														
<i>P. obesolabrus</i>																														
<i>P. obscurus</i>																														
<i>P. ornatus</i>																														
<i>P. otwayensis</i>																														
<i>P. pachypolus</i>																														
<i>P. palisadus</i>																														
<i>P. parvus</i>																														
<i>P. plimmelus</i>																														
<i>P. prodigus</i>																														
<i>P. pseudomoides</i>																														
<i>P. recavus</i>																														

*C=core; S=sidewall core; T=cuttings.

SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	T	S	S	S	S	T	T	S	S	S	T						
DEPTHS	3323'	3377'	3412'	3430'	3438'	3443'	3447'	3450'	3454'	3456'	3460'	3468'	3482'	3490-500'	5550-570'	5642'	5704'	5734'	5797'	5834'	5841'	5858'	5850-560'	5900-010'	5912'	5949'	4006'	4010-120'	
PALYNOMORPHS																													
<i>P. rectomarginis</i>																													
<i>P. reflexus</i>																													
<i>P. reticulatus</i>																													
<i>P. reticulocavus</i>																													
<i>P. reticulosabratus</i>																													
<i>P. rugulatus</i>																													
<i>P. scitus</i>																													
<i>P. stipplatus</i>																													
<i>P. tenuixinus</i>																													
<i>P. truncatus</i>																													
<i>P. tuberculatus</i>																													
<i>P. tuberculiformis</i>																													
<i>P. tuberculotumulatus</i>																													
<i>P. xestiformis</i> (Prot.)																													
<i>O. brossus</i>																													
<i>R. boxatus</i>																													
<i>R. stellatus</i>																													
<i>R. mallatus</i>																													
<i>R. trophus</i>																													
<i>S. cainozoicus</i>																													
<i>S. rotundus</i>																													
<i>S. digitoides</i>																													
<i>S. marlinensis</i>																													
<i>S. rarus</i>																													
<i>S. meridianus</i>																													
<i>S. prominatus</i>																													
<i>S. uvatus</i>																													
<i>S. punctatus</i>																													
<i>S. regium</i>																													
<i>T. multistrixis</i> (CP4)																													
<i>T. textus</i>																													
<i>T. verrucosus</i>																													
<i>T. securus</i>																													
<i>T. confessus</i> (C3)																													
<i>T. gillii</i>																													
<i>T. incisus</i>																													
<i>T. longus</i>																													
<i>T. phillipsii</i>																													
<i>T. renmarkensis</i>																													
<i>T. sabulosus</i>																													
<i>T. sinatus</i>																													
<i>T. thomasii</i>																													
<i>T. waiparaensis</i>																													
<i>T. adelaidensis</i> (CP3)																													
<i>T. angurium</i>																													
<i>T. delicatus</i>																													
<i>T. geraniodes</i>																													
<i>T. leuros</i>																													
<i>T. lillier</i>																													
<i>T. marginatus</i>																													
<i>T. moultonii</i>																													
<i>T. paenestriatus</i>																													
<i>T. retequetrus</i>																													
<i>T. scabratus</i>																													
<i>T. sphaerica</i>																													
<i>T. magnificus</i> (P3)																													
<i>T. spinosus</i>																													
<i>T. ambiguus</i>																													
<i>T. chnosus</i>																													
<i>T. helosus</i>																													
<i>T. scabratus</i>																													
<i>T. sectilis</i>																													
<i>V. attinatus</i>																													
<i>V. cristatus</i>																													
<i>V. kopukuensis</i>																													

*C=core; S=sidewall core; T=cuttings.

SAMPLE TYPE *	DEPTHS																							
	T	T	S	S	T	S	S	S	S	S	T	S	S	C	C	C	T	S	S	S	S			
PALYNOFORMS	4050'-60'	4120'-50'	4251'	4274'	4270'-80'	4306'	4308'	4384'	4459'	4498'	4490'-500'	4516'	4550'	4602'	4604'	4606'	4615'	4618'	4730'-40'	4739'	4753'	4756'	4780'	
<i>A. qualumis</i>																								
<i>A. acutillus</i>																								
<i>A. luteoides</i>																								
<i>A. oculatus</i>																								
<i>A. sectus</i>																								
<i>A. triplaxis</i>																								
<i>A. obscurus</i>																								
<i>B. disconformis</i>																								
<i>B. arcuatus</i>																								
<i>B. elongatus</i>																								
<i>B. mutabilis</i>																								
<i>B. otwayensis</i>																								
<i>B. elegansiformis</i>																								
<i>B. trigonalis</i>																								
<i>B. verrucosus</i>																								
<i>B. bombaxoides</i>																								
<i>B. emaciatus</i>																								
<i>C. bullatus</i>																								
<i>C. heskermensis</i>																								
<i>C. horrendus</i>																								
<i>C. meleosus</i>																								
<i>C. apiculatus</i>																								
<i>C. leptos</i>																								
<i>C. striatus</i>																								
<i>C. vanraadshoovenii</i>																								
<i>C. orthoteichus/major</i>																								
<i>C. annulatus</i>																								
<i>C. gigantis</i>																								
<i>C. splendens</i>																								
<i>D. australiensis</i>																								
<i>D. granulatus</i>																								
<i>D. tuberculatus</i>																								
<i>D. delicatus</i>																								
<i>D. semilunatus</i>																								
<i>E. notensis</i>																								
<i>E. crassixinus</i>																								
<i>F. balteus</i>																								
<i>F. crater</i>																								
<i>F. lucunosus</i>																								
<i>F. palaequetrus</i>																								
<i>G. edwardsii</i>																								
<i>G. rudata</i>																								
<i>G. divaricatus</i>																								
<i>G. gestus</i>																								
<i>G. catathus</i>																								
<i>G. cranwellae</i>																								
<i>G. wahoensis</i>																								
<i>G. bassensis</i>																								
<i>G. nebulosus</i>																								
<i>H. harrisii</i>																								
<i>H. astrus</i>																								
<i>H. elliotii</i>																								
<i>I. anguloclavatus</i>																								
<i>I. antipodus</i>																								
<i>I. notabilis</i>																								
<i>I. gremius</i>																								
<i>I. irregularis</i>																								
<i>J. peiratus</i>																								
<i>K. waterbolkii</i>																								
<i>L. amplus</i>																								
<i>L. crassus</i>																								
<i>L. ohaiensis</i>																								
<i>L. bainii</i>																								
<i>L. lanceolatus</i>																								
<i>L. balmei</i>																								
<i>L. florinii</i>																								
<i>M. diversus</i>																								
<i>M. duratus</i>																								
<i>M. grandis</i>																								
<i>M. perimagnus</i>																								

*C=core; S= sidewall core; T= cuttings.

SAMPLE TYPE #	T		S		T		S		T		S		T		S		T		S						
	4050-60'	4120-30'	4251'	4274'	4770-80'	4306'	4308'	4384'	4459'	4498'	4490-500'	4516'	4550'	4602'	4604'	4606'	4615'	4618'	4730-40'	4739'	4753'	4756'	4780'		
DEPTHS																									
PALYNOMORPHS																									
<i>M. subtilis</i>						A			A	A		A	A	A	A	A		A	A						
<i>M. ornamentalis</i>																									
<i>M. hypolaenoides</i>														A											
<i>M. homeopunctatus</i>																									
<i>M. parvus/mesonesus</i>													A			A									
<i>M. tenuis</i>									A	A	A														
<i>M. verrucosus</i>																									
<i>M. australis</i>																									
<i>N. asperus</i>																									
<i>N. asperoides</i>																									
<i>N. brachyspinulosus</i>																									
<i>N. deminutus</i>																									
<i>N. emarcidus/meterus</i>																									
<i>N. endurus</i>																									
<i>N. falcatus</i>																									
<i>N. flemingii</i>																									
<i>N. goniatus</i>																									
<i>N. senectus</i>																									
<i>N. vansteenisii</i>																									
<i>O. sentosa</i>																									
<i>P. ochesis</i>																									
<i>P. catastus</i>																									
<i>P. demarcatus</i>																									
<i>P. magnus</i>																									
<i>P. polyoratus</i>																									
<i>P. vesicus</i>																									
<i>P. densus</i>																									
<i>P. velosus</i>																									
<i>P. morgani/jubatus</i>																									
<i>P. navsonii</i>			A																						
<i>P. reticulosaccatus</i>																									
<i>P. verrucosus</i>																									
<i>P. crescentis</i>																									
<i>P. esobalteus</i>																									
<i>P. langstonii</i>																									
<i>P. reticulatus</i>																									
<i>P. simplex</i>																									
<i>P. varus</i>																									
<i>P. adenanthoides (Prot.)</i>														A											
<i>P. alveolatus</i>																									
<i>P. amoloxinus</i>																									
<i>P. angulatus</i>																									
<i>P. annularis</i>																									
<i>P. asperopolus</i>																									
<i>P. biornatus</i>																									
<i>P. clarus</i>																									
<i>P. cleinei</i>																									
<i>P. confragosus</i>																									
<i>P. crassus</i>																									
<i>P. delicatus</i>																									
<i>P. formosus</i>																									
<i>P. grandis</i>																									
<i>P. grevillaensis</i>																									
<i>P. incurvatus</i>																									
<i>P. intricatus</i>																									
<i>P. kopiensis</i>																									
<i>P. lapis</i>																									
<i>P. latrobensis</i>																									
<i>P. leightonii</i>																									
<i>P. obesolabrus</i>																									
<i>P. obscurus</i>																									
<i>P. ornatus</i>																									
<i>P. otwayensis</i>																									
<i>P. pachypolus</i>																									
<i>P. palisadus</i>																									
<i>P. parvus</i>																									
<i>P. plimmelus</i>																									
<i>P. prodigus</i>																									
<i>P. pseudomoides</i>																									
<i>P. recavus</i>																									

*C=core; S= sidewall core; T= cuttings.

SAMPLE TYPE *	T		T		S		S		T		S		S		S		S		T		S		S		S		S		
	4050-60'	4120-36'	4251'	4274'	4270-80'	4306'	4308'	4384'	4459'	4498'	4490-500'	4516'	4550'	4602'	4604'	4606'	4615'	4618'	4730-40'	4739'	4753'	4756'	4780'						
DEPTHS																													
PALYNOFORMS																													
<i>P. rectomarginis</i>																													
<i>P. reflexus</i>																													
<i>P. reticulatus</i>																													
<i>P. reticuloconcavus</i>																													
<i>P. reticulosabratus</i>																													
<i>P. rugulatus</i>																													
<i>P. scitus</i>																													
<i>P. stipplatus</i>																													
<i>P. tenuixinus</i>																													
<i>P. truncatus</i>																													
<i>P. tuberculatus</i>																													
<i>P. tuberculiformis</i>																													
<i>P. tuberculotumulatus</i>																													
<i>P. xestiformis</i> (Prot.)																													
<i>O. brossus</i>																													
<i>R. boxatus</i>																													
<i>R. stellatus</i>																													
<i>R. mallatus</i>																													
<i>R. trophus</i>																													
<i>S. canozoicus</i>																													
<i>S. rotundus</i>																													
<i>S. digitoides</i>																													
<i>S. marlinensis</i>																													
<i>S. rarus</i>																													
<i>S. meridianus</i>																													
<i>S. prominatus</i>																													
<i>S. uvatus</i>																													
<i>S. punctatus</i>																													
<i>S. regium</i>																													
<i>T. multistrius</i> (CP4)																													
<i>T. textus</i>																													
<i>T. verrucosus</i>																													
<i>T. securus</i>																													
<i>T. confessus</i> (C3)																													
<i>T. gillii</i>																													
<i>T. incisus</i>																													
<i>T. longus</i>																													
<i>T. phillipsii</i>																													
<i>T. renmarkensis</i>																													
<i>T. sabulosus</i>																													
<i>T. simatus</i>																													
<i>T. thomasi</i>																													
<i>T. waiparaensis</i>																													
<i>T. adelaiddensis</i> (CP3)																													
<i>T. angurium</i>																													
<i>T. delicatus</i>																													
<i>T. geraniodes</i>																													
<i>T. leuros</i>																													
<i>T. lilliei</i>																													
<i>T. marginatus</i>																													
<i>T. moultonii</i>																													
<i>T. paenestriatus</i>																													
<i>T. retequetrus</i>																													
<i>T. scabratus</i>																													
<i>T. sphaerica</i>																													
<i>T. magnificus</i> (P3)																													
<i>T. spinosus</i>																													
<i>T. ambiguus</i>																													
<i>T. chnosus</i>																													
<i>T. helosus</i>																													
<i>T. scabratus</i>																													
<i>T. sectilis</i>																													
<i>V. attinatus</i>																													
<i>V. cristatus</i>																													
<i>V. kopukuensis</i>																													
<i>Cycadopriles</i> sp.																													

*C=core; S=sidewall core; T=cuttings.

SAMPLE TYPE *	DEPTHS																			
	3323'	3377'	3412'	3430'	3438'	3443'	3447'	3450'	3454'	3456'	3460'	3468'	3482'	3642'	3704'	3734'	3797'	3841'	4006'	4498'
PALYNOMORPHS																				
<i>Holor. incurvata</i>																				
<i>Spinif. ramosa</i>																				
<i>Operc. centrocarpum</i>	A				A		A													
<i>Lingu. machaerophorum</i>																				
<i>Penta. lactinictum</i>																				
<i>Rottf. borussica</i>	cf																			
<i>Tecta. pellitum</i>																				
<i>Cyclo. vieta</i>																				
<i>Crass. concinna</i>																				
<i>Defla. phosphoritica</i>																				
<i>Syste. placacantha</i>		cf																		
<i>Corru. incompositum</i>																				
<i>Corde. capricornum</i>																				
<i>Defla. extensa</i>						A	A	A	A	A		cf								
<i>Phtha. coreoides</i>																				
<i>Spinif. laceolatus</i>																				
<i>Holor. spinosus</i>																				
<i>Eisen. ornata</i>																				
<i>Membr. adnata</i>																				
<i>Lepto. dispertitum</i>																				
<i>Corru. corrugatum</i>																				
<i>Praeo. indentata</i>									A											
<i>Phtha. eocenicum</i>																				
<i>Defla. leptodermata</i>																				
<i>Hemip. semilunifera</i>																				
<i>Lepto. elegans</i>																				
<i>Hustr. camera</i>																				
<i>Samla. reticulifera</i>																				
<i>Cassi. imperfecta</i>																				
<i>Tecta. marium</i>																				
<i>H/kolp. rigaudae</i>																				
<i>Dyphes ariensis</i>																				
<i>Hysti. variata</i>																				
<i>Batia. compta</i>																				
<i>Balti. nanum</i>																				
<i>Syste. speciosus</i>								cf												
<i>Emsla. australiensis</i>																				
<i>Heter. paxilla</i>																				
<i>Membr. clathrodermata</i>																				
<i>Batia. dentalia</i>																				
<i>Thala. pelagica</i>															A					
<i>Leptodinium sp.</i>																				
<i>Spinidinium spp.</i>																				
<i>Areos. diktyoplokus</i>																				
<i>Hemicystidinium sp.</i>																				
<i>Homof. tasmanensis</i>																				
<i>Wetze. hyperacantha</i>																				
<i>Defla. pachyceros</i>																				

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