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PALYNOLOGICAL ANALYSIS

OPAH-1, GIPPSLAND BASIN

by

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SUMMARY

Twenty-one sidewall cores were processed for palynomorphs in Opah-1. Examination of the samples gave the subdivision of the Latrobe Group summarised on the following table :

Unit	Zone	Depth (in feet)	Age
Lakes Entrance Formation	P. tuberculatus	7870 to 7893	Early Oligocene
UNCONFORMITY at 7898			
Undated Unit ?Gurnard Formation	Barren Zone	7895 to 7925	?
Flounder Formation Equivalent	P. asperopolus	7930 to 7935	Early Eocene
UNCONFORMITY at 7939			
Latrobe Coarse Clastics	Upper L. balmei (W. homomorpha dinoflagellate Zone)	7940 to 8150	Late Paleocene
		TD : 8210	

DISCUSSION OF ZONES

All samples processed and examined are listed on Table 1. The species identified from the samples are given on the accompanying distribution charts. The basis for choosing the zone boundaries is discussed in the following :

Proteacidites tuberculatus Zone 7870 to 7893 feet.

The consistent presence of the spore *Cyatheacidites annulatus* in the five samples clearly refers this interval to the *P. tuberculatus* Zone. A number of undescribed dinoflagellates in the samples also support a *P. tuberculatus* Zone age which would correlate the section with the basal Lakes Entrance Formation in other wells. The grey calcareous siltstone lithology of the interval, and the E-log response would also indicate correlation with the Lakes Entrance Formation.

In contrast to this palynological data, the results from the study of foraminifera (Taylor 1977b) suggests that the interval between 7850 to 7893 feet contains both J2 and K zone faunas, which would make the section partially Late Eocene in age and also time equivalent to the youngest part of the Gurnard Formation in some other wells. This is best demonstrated by the data obtained from the recent well Swordfish-1 (Taylor 1977a, Partridge 1977). In this well, Early Oligocene (zone J2) and Late Eocene (zone K) faunas were identified over an interval of 45 feet at the top of the Gurnard Formation (in sidewall cores between 6560-6564 feet and 6571-6604 feet respectively). However, on palynology these same samples were referred respectively to the Upper *N. asperus* Zone and Middle *N. asperus* Zone.

The presence of Late Eocene in this section in Opah-1 can be disputed as it is based on a doubtful identification of Subbotina linaperta in the sidewall core at 7890 feet. The presence of the Early Oligocene J2 zone cannot be disputed nor the correlation with Swordfish-1 as the same planktonic foraminiferal assemblage occurs in both wells. The conflict with the palynological data can be resolved if we consider that the base of the P. tuberculatus Zones lies within the J2 planktonic foraminiferal zone and not at the base of J1 as has been previously stated (Partridge 1976, figure 2). The implication of this to the geology of the Gippsland Basin is that fine grained Lakes Entrance Formation sedimentation commences slightly earlier than previously recognised (Partridge 1976, figure 7) and approximates even closer the Eocene-Oligocene boundary.

Barren Zone (sidewall cores from 7895 to 7925 feet).

The five sidewall cores processed in this interval yielded mainly flaky brown amorphous organic material and some black angular woody material but no palynomorphs. Lithologically, this section of brown to rare green silty sandstone with accessory glauconite and limonite is similar to the Gurnard Formation. It is unusual in being oxidised, which is the most likely reason for the absence of spore-pollen and dinoflagellates.

The section is reminiscent of the 130 feet of red to brown ferruginous shales and siltstones in Moray-1, between 5370 and 5500 feet (-5338 to -5470 feet subsea). Like Opah-1, the Moray-1 section lacks firm age dating. In Moray-1, the foraminiferal zone I-1 is identified down to 5360 feet. No foraminifera were identified in sidewall cores below this and new fauna observed in cuttings gave only an Eocene to Early Oligocene age. The section was also barren of palynomorphs except for a single sidewall core at 5490 feet which gave a Lower N. asperus age. In the Moray-1 well completion report, most of this section was correlated with the early Oligocene. It could just as likely be Middle to Late Eocene in age and correlated with the Gurnard Formation which is also the obvious correlation for this section in Opah-1.

Proteacidites asperopolus Zone 7930 to 7935 feet.

The two sidewall cores are assigned to the P. asperopolus Zone on the presence of Myrtaceidites tenuis, Conbaculites apiculatus and Santalumidites cainozoicus. The dinoflagellates identified supoort this age, especially the occurrence of Homotryblium tasmaniensis. Unfortunately, only a very low yield of fossils was recovered from the samples. The low yield particularly hampered the identification of the dinoflagellates present and consequently, the samples cannot be referred to any of the Early Eocene Wetzeliella zones nor closely compared with dinoflagellate assemblages from the age equivalent Flounder Formation.

Upper Lygistepollenites balmei Zone 7940 to 8150 feet (and Wetzeliella homomorpha Dinoflagellate Zone).

Less than 200 feet of Upper L. balmei Zone was intersected. The nine samples examined from this interval are assigned to the zone on the common occurrence of Lygistepollenites balmei and the presence of other index species such as Australopollis obscurus, Amosopollis dilwynensis, Camarozonosporites bullatus, Gambierina rudata and Polycolpites langstonii. All these species become extinct near the top of the L. balmei Zone. Indicator species for Upper subdivision of the L. balmei Zone present in the samples include Banksieacidites elongatus, Cyathidites gigantis (fairly common), Malvacepollis diversus and Verrucosisporites kopukuensis. Two unusual occurrences are Bysmapollis emarciatus and Gephrapollenites cranwellae. Their presence in this interval extends the lower limits of their ranges from the Lower M. diversus Zone to the Upper L. balmei Zone.

The dinoflagellates present support the Upper L. balmei age. The presence of Wetzeliella homomorpha refers the section to the dinoflagellate zone bearing that name.

The 54 feet of siltstone between 7939 and 7993 feet from the upper part of this zone is anomalous and was unexpected compared with the sandy facies in the Upper L. balmei Zone in surrounding wells. The six sidewall cores examined from this unit all yielded good zone assemblages and are closely comparable with assemblages from the underlying section (7993-8210 feet), and from adjacent wells. The possibility that this upper unit could be stratigraphically younger and contain reworked L. balmei Zone assemblages is emphatically rejected based on the absence of the common marker species of the M. diversus or P. asperopolus Zones. The occurrences of Bysmapollis emarciatus and Gephrapollenites cranwellae in Opah-1 cannot be taken as evidence of reworking as both forms are very minor components of assemblages from younger zones. If they were reworked, the Opah-1 assemblages should contain the commoner M. diversus and P. asperopolus Zone indicator species as well.

Taylor (1977b) does however, record the planktonic foraminifera Subbotina frontosa from the sidewall core at 7970 feet within this upper section. The worldwide range of this species suggests that it does not extend below the Early Eocene. Further, the maximum possible age for the section based on this single planktonic species conflicts with the palynology which indicates a Late Paleocene age. This age for the palynological zones is derived by correlation with dinoflagellate assemblages in New Zealand, again dated by planktonic foraminifera. Considering that both the spore-pollen and dinoflagellate assemblages in this section in Opah-1 are represented by a number of species the age dating and correlation based on the palynology is considered more reliable than that of the single planktonic foraminifera species.

REFERENCES

Partridge, A.D., 1976, The Geological expression of Eustacy in the Early Tertiary of the Gippsland Basin: APEA J., v.16, pt.1, p.73-79.

Partridge, A.D., 1977, Palynological analysis Swordfish-1, Gippsland Basin : Esso Aust. Ltd. Palaeo. Rept., 1977/13.

Taylor, D., 1977a, Foraminiferal sequences Swordfish-1 : Esso Aust. Ltd. Palaeo. Rept., 1977/5.

Taylor, D., 1977b, Foraminiferal sequence Opah-1 : Esso Aust. Ltd. Palaeo. Rept., 1977/12.

TABLE - 1 : SUMMARY OF PALYNOLOGICAL ANALYSIS, OPAH-1, GIPPSLAND BASIN

SAMPLE AND DEPTH		ZONE	AGE	CONFIDENCE RATING	YIELD	DIVERSITY	REMARKS
SWC 61	7870'	*P. tuberculatus*	Early Oligocene	0	Moderate	Moderate	*Cyatheacidites annulatus* present
SWC 30	7880'	"	" "	0	Moderate	High	"
SWC 29	7885'	"	" "	0	Moderate	Moderate	"
SWC 28	7890'	"	" "	0	Moderate	Moderate	"
SWC 27	7893'	"	" "	0	Low	Moderate	"
SWC 26	7895'	Barren of Fossils					Only brown amorphous material of rounded shape recovered.
SWC 23	7902'	Barren					Nothing recovered
SWC 22	7905'	Barren of Fossils					Brown flaky material of indeterminar origin recovered.
SWC 18	7920'	Barren of Fossils					Angular woody material recovered
SWC 17	7925'	Barren of Fossils					Brown flaky and woody materials recovered.
SWC 16	7930'	*P. asperopolus*	Early Eocene	1	Low	Moderate	
SWC 15	7935'	*P. asperopolus*	Early Eocene	1	Very Low	Moderate	
SWC 14	7940'	Upper *L.balmei*	Late Paleocene	0	High	Moderate	*W. homomorpha* Dino. Zone
SWC 13	7945'	" "	" "	0	High	High	"
SWC 12	7950'	" "	" "	0	High	High	"
SWC 10	7970'	" "	" "	0	High	Moderate	"
SWC 9	7980'	" "	" "	0	High	High	"
SWC 8	7992'	" "	" "	0	High	High	"
SWC 5	8070'	" "	" "	0	Moderate	High	"
SWC 3	8106'	" "	" "	0	High	High	"
SWC 1	8150'	" "	" "	0	High	High	"

BASIN GIPPSLAND DATE JUNE 20, 1977

WELL NAME OPAH-1 ELEVATION K.B. +83 feet

AGE	PALYNOLOGIC ZONES	HIGHEST DATA Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time	LOWEST DATA Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time
OLIG-MIO.	*P. tuberculatus*	7870	0				7893	0			
EOCENE	U. *N. asperus*										
	M. *N. asperus*										
	L. *N. asperus*										
	P. asperopolus	7930	1				7935	1			
	U. *M. diversus*										
	M. *M. diversus*										
	L. *M. diversus*										
PALEOCENE	U. *L. balmei*	7940	0				8150	1			
	L. *L. balmei*										
	T. longus										
LATE CRETACEOUS	*T. lilliei*										
	N. senectus										
	C. trip./T.pach.										
	C. distocarin.										
	T. pannosus										
EARLY CRETACEOUS											
PRE-CRETACEOUS											

COMMENTS: Wetzeliella homomorpha Dino. Zone 7940-8150 feet (rating 1)

T.D. : 8210 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: A.D. Partridge DATE June, 1977

DATA REVISED BY: DATE

Well Name OPAH-1 Basin GIPPSLAND Sheet No. 1 of 4

SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
PALYNOMORPHS / DEPTHS	7870	7880	7885	7890	7893	7895	7902	7905	7920	7925	7930	7935	7940	7945	7950	7970	7980	7992	8070	8106	8150
A. qualumis																					
A. acutullus																					
A. luteoides																					
A. oculatus																					
A. sectus																					
A. triplaxis																					
A. obscurus																				/	/
B. disconformis												/			/						
B. arcuatus																					
B. elongatus														/						/	
B. mutabilis																					
B. otwayensis																					
B. elegansiformis																					
B. trigonalis																					
B. verrucosus																					
B. bombaxoides																					
B. emaciatus																		/		/	/
C. bullatus															/						
C. heskermensis																					
C. horrendus																					
C. meleosus																					
C. apiculatus											/										
C. leptos																					
C. striatus																					
C. vanraadshoovenii																					
C. orthoteichus/major											/						/				
C. annulatus	/	/	/	/	/																
C. gigantis													/	/	/		/	/		/	
C. splendens														/		/	/	/	/	/	
D. australiensis																					
D. granulatus		/			/							/	/	/	/	/		/	/	/	/
D. tuberculatus											/								/		
D. delicatus																					
D. semilunatus														/	/						
E. notensis																					
E. crassiexinus																					
F. balteus														/							
F. crater																					
F. lucunosus																					
F. palaequetrus				/																	
G. edwardsii																	/				
G. rudata														/			/		/		
G. divaricatus																					
G. gestus																					
G. catathus																					
G. cranwellae													/					/			
G. wahooensis																					
G. bassensis																					
G. nebulosus																					
H. harrisii	/	/	/	/	/						/	/	/	/	/	/	/		/	/	
H. astrus																					
H. elliottii		/	/												/						
I. anguloclavatus																			/		
I. antipodus															/						
I. notabilis																					
I. gremius											/										
I. irregularis	/	/		/							/										
J. peiratus																					
K. waterbolkii																					
L. amplus																					
L. crassus			/		/									/			/				
L. ohaiensis																					
L. bainii																					
L. lanceolatus																					
L. balmei													A	/	A	/	A	/	A	A	A
L. florinii	/	/	/	/	/						/		/	/	/		/	/	/	/	/
M. diversus												/			/	/	/	/			
M. duratus																					
M. grandis																					
M. perimagnus																					

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

Well Name OPAH-1 Basin GIPPSLAND Sheet No. 2 of 4

SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
PALYNOMORPHS / DEPTHS	7870	7880	7885	7890	7893	7895	7902	7905	7920	7925	7930	7935	7940	7945	7950	7970	7980	7992	8070	8106	8150
M. subtilis											/			/							
M. ornamentalis	/	/	/		/																
M. hypolaenoides	/																				
M. homeopunctatus																					
M. parvus/mesonesus		/									/										/
M. tenuis											/	/									
M. verrucosus																					
M. australis																					
N. asperus																					
N. asperoides																					
N. brachyspinulosus														/					/	/	
N. deminutus				/							/										
N. emarcidus/heterus	/	/	/	/	/						/			/	/	/	/		/	/	/
N. endurus													/					/			
N. falcatus	/			/	/																
N. flemingii											/		/	/	/		/	/			/
N. goniatus																					
N. senectus																					
N. vansteenisii		/		/																	
O. sentosa																					
P. ochesis																					
P. catastus											/								/		
P. demarcatus														/	/				/		
P. magnus																					
P. polyoratus											/			/			/	/	/	/	/
P. vesicus																					
P. densus																			/		
P. velosus																				/	
P. morganii/jubatus																					
P. mawsonii	/	/	/	/	/						/	/	/	/	/	/	/	/	/	/	/
P. reticulosaccatus													/								
P. verrucosus																					
P. crescentis																					
P. esobalteus											/										
P. langstonii																		/			
P. reticulatus																					
P. simplex																					
P. varus																					
P. adenanthoides (Prot.)																			/		/
P. alveolatus																					
P. amolosexinus																					
P. angulatus																					
P. annularis														/				/		/	/
P. asperopolus																					
P. biornatus																					
P. clarus																					
P. cleinei																					
P. confragosus																					
P. crassis																					
P. delicatus																					
P. formosus											/										
P. grandis																					
P. grevillaensis																					
P. incurvatus																					
P. intricatus																					
P. kopiensis																					
P. lapis																					
P. latrobensis																					
P. leightonii											/	/									
P. obesolabrus																					
P. obscurus																					
P. ornatus																					
P. otwayensis																					
P. pachypolus																					
P. palisadus																					
P. parvus																					
P. plemmelus																					
P. prodigus															/			/		/	
P. pseudomoides																					
P. recavus																					

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

Well Name OPAH-1 **Basin** GIPPSLAND **Sheet No.** 3 **of** 4

PALYNOMORPHS / DEPTHS	7870	7880	7885	7890	7893	7895	7902	7905	7920	7925	7930	7935	7940	7945	7950	7970	7980	7992	8070	8106	8150
SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
P. rectomarginis																					
P. reflexus																					
P. reticulatus																					
P. reticuloconcavus																					
P. reticuloscabratus																					
P. rugulatus																					
P. scitus																					
P. stipplatus																					
P. tenuiexinus													/		/	/			/		
P. truncatus																					
P. tuberculatus																					
P. tuberculiformis																					
P. tuberculotumulatus																					
P. xestoformis (Prot.)																					
Q. brossus																					
R. boxatus																					
R. stellatus																					
R. mallatus														/				/		/	/
R. trophus																					
S. cainozoicus											/	/									
S. rotundus																					
S. digitatoides																					
S. marlinensis																					
S. rarus																					
S. meridianus											/				/		/		/	/	
S. prominatus																					
S. uvatus																					
S. punctatus											/										
S. regium																					
T. multistrixus (CP4)													/			/			/		/
T. textus																					
T. verrucosus																					
T. securus																					
T. confessus (C3)																					
T. gillii																			/		
T. incisus																					
T. longus																					
T. phillipsii														/						/	/
T. renmarkensis																					
T. sabulosus																					
T. simatus																					
T. thomasii																					
T. waiparaensis																					
T. adelaidensis (CP3)																					
T. angurium																					
T. delicatus																					
T. geraniodes																					
T. leuros																					
T. lilliei																					
T. marginatus																					
T. moultonii																					
T. paenestriatus											/										
T. retequetrus																					
T. scabratus																					
T. sphaerica											/					/					
T. magnificus (P3)																					
T. spinosus																					
T. ambiguus					cf																
T. chnosus																					
T. helosus																					
T. scabratus																					
T. sectilis																					
V. attinatus																					
V. cristatus																					
V. kopukuensis													/	/			/				
C. subtilis				/																	
A. dilwynensis													/	/	/		/		/		

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

Well Name OPAH-1 Basin GIPPSLAND Sheet No. 4 of 4

SAMPLE TYPE *	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
PALYNOMORPHS / DEPTHS	7870	7880	7885	7890	7893	7895	7902	7905	7920	7925	7930	7935	7940	7945	7950	7970	7980	7992	8070	8106	8150
Nema. balcombiana	/	/																			
Cycl. vieta	/			/																	
Ling. machaerophorum	/	/			/																
Dino. simplex	/	/	/		/																
H/kolp. rigaudae	/	/		/	/																
Oper. centrocarpum	/	/	/	/	/						/										
Spiniferites spp.	/	/	/	/	/									/		/		/			/
Cras. concinnia		/																			
Dino. mamilatus		/	/																		
Dino. scabroellipticus		/		/																	
Syst. placacantha			/																		
Spin. cingulata			/																		
Emsl. australiensis				/																	
Heter. paxilla											/										
Seno. compta											/										
Duos. nudum											/										
Lept. maculatum											cf										
Wetz. articulata											cf										
Defl. flounderensis											cf										
Homo. tasmaniense											/	/									
Reticulodinium sp.											/	/									
Cord. inodes											/	/							/		
Dyph. colligerum											cf					/			/		
Defl. medcalfi													/	/			/	A	/	A	A
Wetz. homomorpha													/		/				/	/	/
Prae. indentata														/			/		/		/
Spinidinium sp.																	/	/	/		
Defl. dilwynensis																			/	A	
Areoligera sp.											A	A									

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