10 pages

OIL and GAS DIVISION

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INTERPRETATIVE

A PALYNOLOGICAL ANALYSIS OF FLYING FISH-1, GIPPSLAND BASIN

by

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INTRODUCTION

Twenty-one cutting samples were collected from the Victorian Mines Department's core store and processed for palynology. Recovery was quite good and stratigraphic assignment could be made with confidence to all but one sample.

Zones and lithological/facies subdivison of the basal Lakes Entrance Formation and the Latrobe Groups are summarised below. All samples are summarised in Table 1 and each occurrence of the individual species is tabulated in the distribution charts.

SUMMARY

Unit/Facies	Zone	Depth (Feet)
Lakes Entrance Formation	*P. tuberculatus*	3560'-3570'
Latrobe Group	Lower *N. asperus*	3900'-4410'
	P. asperpolus	4650'-5210'
	UNCONFORMITY	
	Upper *L. balmei*	5330'-5620'
	Lower *L. balmei*	5750'-5910'
	T. longus	6000'-6520' T.D.

GEOLOGICAL COMMENTS

1. The post-Eocene section immediately above the Latrobe is composed of shales and siltstones that grade upward into the more typical marl and limey lithology above 2500'. This more clastic sedimentation at the base of the *P. tuberculatus* zone is considered due to the more shoreward position of this well.

2. Another indication of the shoreward position is the large number of coal beds and stringers interbedded with the coarse sands of the Latrobe section.

3. Latrobe lithology extends throughout the Eocene sediments. The younger section (N. asperus zone) is not separated into the lithologically distinct glauconitic sandstone (Gurnard Formation) that is found in many of the more "seaward" wells.

4. Only one major unconformity is apparent. This cuts out all of the zones between the P. asperpolus zone and the Upper L. balmei zone, most of the Early Eocene time. This break in sedimentation is located somewhere in the unsampled interval between 5210' and 5330'.

5. Upper and Middle N. asperus sediments were not recognised, however, these zones are known to be quite thin in the wells where they have been found and there is a large sample gap between the last sample with P. tuberculatus at 3570' and the next sample, which contains Lower N. asperus fossils, from 3900'. Therefore, it is not possible, under the present circumstances, to determine if the Upper and Middle N. asperus zones are missing, due either to non-deposition or deposited and subsequently removed; or if indeed these beds are present but are less than 330' in thickness. The presence of a specimen of Triorites magnificus, the index for the Middle N. asperus zone, as a mud contaminant in the sample from 5610'-5620', suggests that some younger part of the N. asperus zone is present in the well section.

DISCUSSION OF ZONES

The presence and distribution of individual species is presented in the distribution sheets. The basis for zonation of this well is discussed below.

Tricolpites longus zone : 6000'-6520' (T.D.)

In addition to the nominate species, which was present in almost all of the samples from this section, the regular and present occurrence of such forms as Triporopollenites sectilis, Proteacidites clinei and Proteacidites reticuloconcavus also suggest basal L. balmei or lower.

Lower Lygistepollenites balmei zone : 5750'-5910'

Frequent and consistent occurrences of L. balmei combined with the presence of Australopollis obscurus and Proteacidites angularus and the lack of index forms from higher in the section indicate that samples from this section come from the Lower L. balmei zone.

Upper <u>Lygistegepollenites</u> <u>balmei</u> zone : 5330'-5620'

The top of this zone is well marked by the first occurrence of the index species, <u>Lygistegepollenites</u> <u>balmei</u>. Both <u>P.</u> <u>annularis</u> and <u>P.</u> <u>grandis</u> extend downward to a depth of 5620'. These forms, which do not occur below the Upper <u>L.</u> <u>balmei</u> zone, are considered as indicative that the enclosing sediments are not stratigraphically lower than the upper part of the <u>L.</u> <u>balmei</u> zone. Additional evidence for this stratigraphic placement of these samples is that <u>Proteacidites</u> <u>angularus</u>, a Lower <u>L.</u> <u>balmei</u> marker, occurs regularly in all of the samples below this section, but is not found in this interval.

<u>Proteacidites</u> <u>asperpolus</u> zone : 4650'-5210'

The common occurrence of <u>P.</u> <u>asperpolus</u> throughout this section demonstrates that these sediments are no older than <u>P.</u> <u>asperpolus</u> zone. The scattered but consistent recurrence of such species as <u>P.</u> <u>grandis</u>, <u>S.</u> <u>prominatus</u> and <u>M.</u> <u>tenuis</u> restricts these beds below the <u>N.</u> <u>asperus</u> zone.

Lower <u>Nothofagus</u> <u>asperus</u> zone : 3900'-4410'

Forms such as <u>N.</u> <u>asperus</u>, <u>P.</u> <u>recavus</u> and <u>P.</u> <u>refleius</u> demonstrate that this part of the section is in the <u>N.</u> <u>asperus</u> zone. At the same time, the occurrence of <u>S.</u> <u>prominatus</u> and <u>P.</u> <u>clarus</u> shows that these sediments are not stratigraphically higher than the lower part of the zone.

<u>Proteacidites</u> <u>tuberculatus</u> zone : 3570'

The one sample taken above 3900' contained both <u>Cyathidites</u> <u>anularus</u> and <u>Pyxidinopsis</u> <u>pontus</u>, both of which are characteristic of the <u>P.</u> <u>tuberculatus</u> zone of the Oligo-Miocene.

Table 1: SUMMARY OF PALEONOLOGICAL ANALYSIS, FLYING FISH-1, GIPPSLAND BASIN

SAMPLE	DEPTH (m)	DEPTH (ft.)	ZONE	AGE	CONFIDENCE RATING	YIELD	DIVERSITY	COMMENTS
Ctngs	1085-88	3560-70	*P. tuberculatus*	Oligo-Miocene	3	Fair	Moderate	*C. annulatus*
"	1189-92	3900-10	Lower *N. asperus*	Middle Eocene	3	Good	Moderate	
"	1210-13	3970-80	~~Indeterminate~~	-	-	Very Low	Very Poor	Coal
"	1253-56	4110-20	Lower *N. asperus*	Middle Eocene	3	Good	High	Coal
"	1301-04	4270-80	Lower *N. asperus*	Middle Eocene	3	Good	High	Coal
"	1341-44	4400-10	Lower *N. asperus*	Middle Eocene	3	Good	High	Coal
"	1417-20	4650-60	*P. asperopolis*	Middle Eocene	3	Good	High	Coal
"	1472-75	4830-40	*P. asperopolis*	Middle Eocene	3	Good	High	
"	1512015	4960-70	*P. asperopolis*	Middle Eocene	3	Good	High	
"	1542-45	5060-70	*P. asperopolis*	Middle Eocene	3	Good	High	
"	1585-88	5200-10	*P. asperopolis*	Middle Eocene	3	Good	High	
"	1625-28	5330-40	Upper *L. balmei*	Upper Paleocene	3	Good	Moderate	
"	1661-64	5450-60	Upper *L. balmei*	Upper Paleocene	3	Good	Moderate	Coal
"	1710-13	5610-20	Upper *L. balmei*	Upper Paleocene	3	Good	High	Coal
"	1753-56	5750-60	Lower *L. balmei*	Upper Paleocene	3	Fair	Moderate	Coal
"	1798-1801	5900-10	Lower *L. balmei*	Upper Paleocene	3	Fair	Moderate	
"	1829-32	6000-10	*T. longus*	Lower Paleocene	3	Good	Moderate	
"	1853-56	6080-90	*T. longus*	Lower Paleocene	3	Fair	Moderate	
"	1899-1902	6230-40	*T. longus*	Lower Paleocene	3	Fair	Moderate	
"	1917-20	6290-6300	*T. longus*	Lower Paleocene	3	Good	Moderate	
"	1884-87	6510-20	*T. longus*	Lower Paleocene	3	Fair	Moderate	

PALYNOLOGY DATA SHEET

BASIN: GIPPSLAND ELEVATION: KB: 32 feet GL: 86 feet

WELL NAME: FLYING FISH-1 TOTAL DEPTH: 6520 feet

AGE	PALYNOLOGICAL ZONES	HIGHEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	LOWEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
NEOGENE	*T. pleistocenicus*										
	M. lipsis										
	C. bifurcatus										
	T. bellus										
PALEOGENE	*P. tuberculatus*	3560'	3				3570'	3			
	Upper *N. asperus*										
	Mid *N. asperus*										
	Lower *N. asperus*	3910'	3				4410'	3			
	P. asperopolus	4650'	3				5210'	3			
	Upper *M. diversus*										
	Mid *M. diversus*										
	Lower *M. diversus*										
	Upper *L. balmei*	5330'	3				5620'	3			
	Lower *L. balmei*	5750'	3				5910'	3			
LATE CRETACEOUS	*T. longus*	600'	3				6520'	3			
	T. lilliei										
	N. senectus										
	U. *T. pachyexinus*										
	L. *T. pachyexinus*										
	C. triplex										
	A. distocarinatus										
EARLY CRET.	*C. paradoxus*										
	C. striatus										
	F. asymmetricus										
	F. wonthaggiensis										
	C. australiensis										
	PRE-CRETACEOUS										

COMMENTS: Stratigraphy entirely from cuttings. All depths in feet

CONFIDENCE RATING:
- O: 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.

DATA RECORDED BY: H.E. STACY DATE: SEPTEMBER 14, 1979

DATA REVISED BY: DATE:

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Well Name FLYING FISH-1 Basin GIPPSLAND Sheet No. 1 of 4

SAMPLE TYPE *	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
DEPTHS / PALYNOMORPHS	3560-70	3900-10	3970-80	4110-20	4270-80	4400-10	4650-60	4830-40	4960-70	5060-70	5200-10	5330-40	5440-50	5610-20	5750-60	5900-10	6000-10	6080-90	6230-40	6290-300	6510-20
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												/	/	/	/	/	/	/	/	/	
L. florinii				/			/			/		/			/	/			/	/	
M. diversus						/	/	/	/		/		/			/		/			
M. duratus					cf.																
M. grandis																					
M. perimagnus				/																	

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

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

SAMPLE TYPE *	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
DEPTHS / PALYNOMORPHS	3560-70	3900-10	3970-80	4110-20	4270-80	4400-10	4650-60	4830-40	4960-70	5060-70	5200-10	5330-40	5440-50	5610-20	5750-60	5900-10	6000-10	6080-90	6230-40	6290-300	6510-20
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							cf.	cf.	/	/	/			/							
P. grevillaensis				cf.																	
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 FLYING FISH-1 **Basin** GIPPSLAND **Sheet No.** 3 **of** 4

PALYNOMORPHS \ DEPTHS	3560-70	3900-10	3970-80	4110-20	4270-80	4400-10	4650-60	4830-40	4960-70	5060-70	5200-10	5330-40	5440-50	5610-20	5750-60	5900-10	6000-10	6080-90	6230-40	6290-300	6510-20
SAMPLE TYPE *	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
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																cf	/	/		/	
T. phillipsii		/									/	/				/				/	/
T. renmarkensis																					
T. sabulosus																					
T. simatus		cf.																			
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																					
a Prot. prepolus														/							
b Integricorpus sp.																/					
c Prot. gematus																	/				

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

Well Name FLYING FISH-1 Basin GIPPSLAND Sheet No. 4 of 4

SAMPLE TYPE *	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
PALYNOMORPHS / DEPTHS	3560-70	3900-10	3970-80	4110-20	4270-80	4400-10	4650-60	4830-40	4960-70	5060-70	5200-10	5330-40	5440-50	5610-20	5750-60	5900-10	6000-10	6080-90	6230-40	6290-300	6510-20
H'kolpomairigaudae	/																				
Impag. maculatum	/										cf.										
Ling. machaerophorum	/																				
Nemat. rhizoma	/																				
Puxid. pontus	/																				
Spin. ramosus	/										/										
Spinidinium sp.		/																			
Defl. flounderensis				/																	
Defl. phosphoritica				/																	
Operc. centrocarpum								/	/	/	/										

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