



PE990800

APPENDIX 2

PALYNOLOGICAL ANALYSIS

APPENDIX-2
PALYNOLOGICAL ANALYSIS OF SEAHORSE-2,
GIPPSLAND BASIN

by

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PART 1

INTERPRETATIVE DATA

Introduction

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INTRODUCTION:

Twenty-four (24) sidewall cores from Seahorse-2 were processed and examined for palynomorphs. Fossil recovery from most samples ranged from fair to poor and almost half were so poor that an age assignment could not be made on the basis of the enclosed flora.

Palynological zones and lithologic/facies subdivisions from the base of the Lakes Entrance Formation to the bottom of the well are summarized below. The detailed results of sample analysis are given in Table-1 and the occurrence of individual species is tabulated in the accompanying distribution chart.

SUMMARY

UNIT/FACIES	ZONE	DEPTH (METRES)
LAKES ENTRANCE FORMATION	<u>P. tuberculatus</u>	1369.9-1386.8
-----1393.5-----		
GURNARD FORMATION	Upper <u>N. asperus</u>	1402.0
	Middle <u>N. asperus</u>	1405.0-1422.0
-----1417.5-----		
	Lower <u>N. asperus</u>	1454.0-1571.0
LATROBE GROUP	<u>P. asperopolus</u>	?
(COARSE CLASTICS)	Upper <u>M. diversus</u>	1603.0
	Middle <u>M. diversus</u>	1643.0-1745.0
	Lower <u>M. diversus</u>	?
	Upper <u>L. balmei</u>	1791.5-1803.0
	Lower <u>L. balmei</u>	2004.0
		T.D. - 2021.0

GEOLOGICAL COMMENTS:

An apparently complete stratigraphic section, from Late Cretaceous (T. longus Zone) to Early Oligocene (P. tuberculatus Zone) was identified in Seahorse-1. A similarly complete section may be present in Seahorse-2, however not all zones could be recognised. This, in part, may be due to the very sandy nature of much of this section, which results in poor recovery of fossils. However, there also appears to be a significant change in thickness of some of the zones between Seahorse-1 and Seahorse-2. The Middle N. asperus Zone appears to be similar in thickness, but the lower N. asperus Zone section is significantly thicker in Seahorse-2. The sample from 1571 metres in Seahorse-2 appears to be Lower N. asperus Zone in age both in composition of the species types and on the ratios of Nothofagidites spp. to H. harrisii. The equivalent sample from Seahorse-1, based on electric log correlation appears to be P. asperopolus Zone in age. Similarly the sample from 1603 metres in Seahorse-2 contains a good Upper M. diversus Zone assemblage while the equivalent sample in Seahorse-1 appears to still be P. asperopolus Zone. Also this only leaves 32 metres, at the most for the P. asperopolus Zone in Seahorse-2. Fifty-one metres of P. asperopolus Zone were recognised in Seahorse-1. Additional samples from both Seahorse-1 and Seahorse-2 need to be studied in order to resolve this problem.

A similar problem is encountered at the boundary of the Eocene/Paleocene. In Seahorse-2, good Middle M. diversus Zone assemblages are found as low as 1745 metres and the highest Upper I. balmei Zone is encountered at 1791 metres, leaving only 46 metres for possible Lower M. diversus Zone sediments. In Seahorse-1 over 51 metres of Lower M. diversus Zone was identified.

DISCUSSION OF ZONES:

Lower Lygistepollenites balmei Zone: 2004 metres.

The bottom sample, from 2004 metres, is the only one that can be identified as Lower L. balmei Zone. In addition to the general L. balmei or older markers, such as Australopollis obscurus, Gambierina edwardsii, Tetracolporites verrucosus and Lygistepollenites balmei, the assemblage also includes Proteacidites gemmatus which normally does not range above the T. longus Zone.

Upper Lygistepollenites balmei Zone: 1791.5 to 1803 metres

These samples contained L. balmei zone markers, such as L. balmei, Australopollis obscurus and Polycolpites langstonii. In addition, the occurrence of Banksieacidites elongatus and Cupanieidites orthoteichus demonstrate that the samples are no older than Upper L. balmei Zone.

Middle Malvacipollis diversus Zone: 1643 to 1745 metres.

The three samples from this section contained a diverse assemblage that included Proteacidites kopiensis P. leightonii, P. nerinensis, P. biornatus and Deflandrea obliquipes. The lack of any specimens of either Myrtacidites tenuis or Proteacidites pachypolus suggests that these samples are below Upper M. diversus Zone sediments.

Upper Malvacipollis diversus Zone: 1603 metres.

Common Myrtacidites tenuis, occasional occurrence of Proteacidites pachypolus and P. tuberculiformis, combined with no specimens of P. asperopolus indicates that this sample is from the Upper M. diversus Zone.

Lower Nothofagidites asperus Zone: 1454 to 1571 metres.

Occurrence of Proteacidites reflexus, P. recavus, P. stipplatus, rare P. pachyplus and P. asperopolus combined with the sharp increase in the ratio of Nothofagidites spp. to H. harisii indicate that these samples are from the Lower N. asperus Zone.

Middle Nothofagidites asperus Zone: 1405 to 1422 metres.

Triorites magnificus in the core from 1422 metres and a Middle N. asperus Zone dinoflagellate flora from 1405 metres, which includes Deflandrea heterophlycta, D. leptodermata, Phthanoperidinium eocenicum and Holoroginella spinata identify these samples as Middle N. asperus Zone.

Upper Nothofagidites asperus Zone: 1402 metres.

Common occurrence of Phthanoperidinium coreoides marks this sample as coming from the Upper N. asperus Zone sediments.

Proteacidites tuberculatus Zone: 1269.9 to 1386.8 metres.

These samples from the P. tuberculatus Zone contain Cyatheacidites annulatus, and the name species, P. tuberculatus, as well as the dinoflagellate Protoellipsodinium simplex.

TABLE-1
 INTERPRETATIVE DATA
 SUMMARY OF PALYNOLOGICAL ANALYSIS OF SEAHORSE-2, GIPPSLAND BASIN

SAMPLE	DEPTH (METRES)	DEPTH (FEET)	ZONE	AGE	CONFIDENCE RATING	YIELD	SPORE-POLLEN DIVERSITY	DINOS DIVERSITY	COMMENTS
SWC 92	1269.9	4166.0	<u>P. tuberculatus</u>	Oligo-Miocene	0	Poor	Moderate	Low	
SWC 69	1384.0	4540.5	<u>P. tuberculatus</u>	Oligo-Miocene	0	Fair	Moderate	Moderate	
SWC 68	1386.8	4550.0	<u>P. tuberculatus</u>	Oligo-Miocene	0	Fair	Moderate	Moderate	
SWC 67	1390.0	4560.0	Indeterminate	?	-	Poor	Low	None	
SWC 65	1396.0	4580.0	Indeterminate	?	-	Poor	Low	None	
SWC 63	1402.0	4600.0	Upper <u>N. asperus</u>	Late Eocene	1	Fair	Low	Moderate	
SWC 62	1405.0	4609.5	Middle <u>N. asperus</u>	Late Eocene	1	Fair	Moderate	High	
SWC 61	1406.9	4616.0	Non diagnostic	?	-	Poor	Low	None	
SWC 43	1511.4	4958.5	Non diagnostic	?	-	Barren	-	-	
SWC 59	1413.0	4636.0	Non diagnostic	?	-	Poor	Low	Low	
SWC 57	1422.0	4665.0	Middle <u>N. asperus</u>	Late Eocene	0	Fair	High	Low	
SWC 52	1441.0	4727.5	Indeterminate	?	-	Poor	Low	None	
SWC 50	1444.6	4739.5	Indeterminate	?	-	Poor	Low	None	
SWC 47	1454.0	4770.0	Lower <u>N. asperus</u>	Middle Eocene	1	Fair	High	Low	
SWC 44	1480.9	4858.5	Non diagnostic	?	-	Poor	None	Low	
SWC 42	1523.0	4996.5	Non diagnostic	?	-	Poor	Low	None	
SWC 36	1571.0	5154.0	Lower <u>N. asperus</u>	Middle Eocene	2	Fair	High	None	
SWC 34	1603.0	5259.0	Upper <u>M. diversus</u>	Early Eocene	1	Fair	High	None	
SWC 33	1609.0	5279.0	Indeterminate	?	-	Poor	Low	None	
SWC 29	1643.0	5390.5	Middle <u>M. diversus</u>	Early Eocene	1	Good	High	Moderate	
SWC 24	1695.0	5561.0	Middle <u>M. diversus</u>	Early Eocene	1	Good	High	None	
SWC 17	1745.0	5725.0	Middle <u>M. diversus</u>	Early Eocene	2	Good	High	Low	
SWC 14	1791.5	5877.5	Upper <u>L. balmei</u>	Paleocene	1	Fair	Moderate	None	
SWC 13	1803.0	5915.0	Upper <u>L. balmei</u>	Paleocene	1	Fair	Moderate	None	
SWC 6	1915.0	6283.0	Indeterminate	?	-	Barren	-	-	
SWC 2	2004.0	6575.0	Lower <u>L. balmei</u>	Paleocene	1	Fair	Moderate	None	

P A L Y N O L O G Y D A T A S H E E T

B A S I N : GIPPSLAND

ELEVATION: KB: 21m GL: - 42.1m

WELL NAME: SEAHORSE-2

TOTAL DEPTH: 2021m

A G E	PALYNOLOGICAL ZONES	H I G H E S T D A T A					L O W E S T D A T A				
		Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time	Preferred Depth	Rtg	Alternate Depth	Rtg	Two Way Time
NEOGENE	<i>T. pleistocenicus</i>										
	<i>M. lipsis</i>										
	<i>C. bifurcatus</i>										
	<i>T. bellus</i>										
PALEOGENE	<i>P. tuberculatus</i>	1269.9	0				1386.8	0			
	Upper <i>N. asperus</i>	1402	1				1402	1			
	Mid <i>N. asperus</i>	1405	1				1422	0			
	Lower <i>N. asperus</i>	1454	1				1571	2			
	<i>P. asperopolus</i>										
	Upper <i>M. diversus</i>	1603	1				1603	1			
	Mid <i>M. diversus</i>	1643	1				1745	2			
	Lower <i>M. diversus</i>										
	Upper <i>L. balmei</i>	1791.5	1				1803	1			
	Lower <i>L. balmei</i>	2004	1				2004	1			
LATE CRETACEOUS	<i>T. longus</i>										
	<i>T. lilliei</i>										
	<i>N. senectus</i>										
	U. <i>T. pachyexinus</i>										
	L. <i>T. pachyexinus</i>										
	<i>C. triplex</i>										
EARLY CRET.	<i>A. distocarinatus</i>										
	<i>C. paradoxus</i>										
	<i>C. striatus</i>										
	<i>F. asymmetricus</i>										
	<i>F. wonthaggiensis</i>										
	<i>C. australiensis</i>										
	PRE-CRETACEOUS										

COMMENTS: _____

- CONFIDENCE RATING:
- 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 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: Howard E Stacy DATE: September 17, 1982

DATA REVISED BY: _____ DATE: _____

PART II

BASIC DATA

TABLE 2: BASIC DATA
PALYNOMORPH DISTRIBUTION CHARTS

TABLE 2
BASIC DATA

SEAHORSE-2, GIPPSLAND BASIN

SAMPLE SAMPLE	DEPTH (METRES)	DEPTH (FEET)	YIELD	SPORE-POLLEN DIVERSITY	DINOS DIVERSITY
SWC 92	1269.9	4166.0	Poor	Moderate	Low
SWC 69	1384.0	4540.5	Fair	Moderate	Moderate
SWC 68	1386.8	4550.0	Fair	Moderate	Moderate
SWC 67	1390.0	4560.0	Poor	Low	None
SWC 65	1396.0	4580.0	Poor	Low	None
SWC 63	1402.0	4600.0	Fair	Low	Moderate
SWC 62	1405.0	4609.5	Fair	Moderate	High
SWC 61	1406.9	4616.0	Poor	Low	None
SWC 43	1511.4	4958.5	Barren	-	-
SWC 59	1413.0	4636.0	Poor	Low	Low
SWC 57	1422.0	4665.0	Fair	High	Low
SWC 52	1441.0	4727.5	Poor	Low	None
SWC 50	1444.6	4739.5	Poor	Low	None
SWC 47	1454.0	4770.0	Fair	High	Low
SWC 44	1480.9	4858.5	Poor	None	Low
SWC 42	1523.0	4996.5	Poor	Low	None
SWC 36	1571.0	5154.0	Fair	High	None
SWC 34	1603.0	5259.0	Fair	High	None
SWC 33	1609.0	5279.0	Poor	Low	None
SWC 29	1643.0	5390.5	Good	High	Moderate
SWC 24	1695.0	5561.0	Good	High	None
SWC 17	1745.0	5725.0	Good	High	Low
SWC 14	1791.5	5877.5	Fair	Moderate	None
SWC 13	1803.0	5915.0	Fair	Moderate	None
SWC 6	1915.0	6283.0	Barren	-	-
SWC 2	2004.0	6575.0	Fair	Moderate	None

SAMPLE TYPE *	DEPTHS																				
	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S
<i>A. qualumis</i>																					
<i>A. acutullus</i>																					
<i>A. luteoides</i>																					
<i>A. oculus</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. nutabilis</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. zuz'aliensis</i>			/	/	/				/	/						/	/	/	/	/	/
<i>D. granulatus</i>	/	/	/	/	/				/	/					/	/	/	/	/	/	/
<i>D. tuberculatus</i>																					
<i>D. delicatus</i>																					
<i>D. semilunatus</i>																					
<i>E. notensis</i>																					
<i>E. crassiexinus</i>								/		/				/	/						
<i>F. balteus</i>																					
<i>F. crater</i>																					
<i>F. lucinosus</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. wahooensis</i>																					
<i>G. bassensis</i>																					
<i>G. nebulosus</i>												/	/					/	/	/	/
<i>H. harrisi</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 *	DEPTHS																								
	1269.9	1384	1386.8	1390	1396	1402	1405	1406.9	1413	1422	1441	1444.6	1454	1480.9	1511.4	1523	1571	1609	1643	1695	1745	1803	1915	2004	
<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 (Prot.)</i>																									
<i>Q. 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 (CP4)</i>																									
<i>T. textus</i>																									
<i>T. verrucosus</i>																									
<i>T. securus</i>																									
<i>T. confessus (C3)</i>																									
<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. adelaidensis (CP3)</i>																									
<i>T. angurium</i>																									
<i>T. delicatus</i>																									
<i>T. geraniodes</i>																									
<i>T. leuros</i>																									
<i>T. lillei</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 (P3)</i>																									
<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 *	1289.9 S	1384 S	1386.8 S	1390 S	1402 S	1405 S	1406.9 S	1413 S	1422 S	1441 S	1444.6 S	1454 S	1480.9 S	1511.4 S	1523 S	1571 S	1609 S	1643 S	1695 S	1745 S	1803 S	1915 S	2004 S	
DEPTHS																								
PALYNOFORMS																								
<i>P. mammilatus</i>																								
<i>P. vietus ms.</i>																								
<i>I. maculatum</i>																								
<i>I. victorianum</i>																								
<i>L. machaerophorum</i>																								
<i>O. centrocarpum</i>																								
<i>K. cuneatus ms.</i>																								
<i>P. simplex</i>																								
<i>A. capricornum</i>																								
<i>D. heterophlycta</i>																								
<i>D. phosphoritica</i>																								
<i>P. coreoides</i>																								
<i>P. eocenicum</i>																								
<i>Phthanoperidinium sp.</i>																								
<i>A. alvicornu</i>																								
<i>S. ramosus</i>																								
<i>A. senonensis</i>																								
<i>B. compta</i>																								
<i>C. imperfecta ms.</i>																								
<i>H. tubiferum</i>																								
<i>R. vitilare</i>																								
<i>S. variable</i>																								
<i>V. clathroderma</i>																								
<i>D. leptodermata</i>																								
<i>N. balcombiana</i>																								
<i>S. lanceolatus</i>																								
<i>H. floripes</i>																								
<i>Homotryblium sp.</i>																								
<i>H. spinata</i>																								
<i>S. reticulifera</i>																								
<i>Lejenunia sp.</i>																								
<i>V. extensa</i>																								
<i>Spinidinium sp.</i>																								
<i>D. flounderensis</i>																								
<i>D. obliquipes (l.h.)</i>																								

* C=core: S=sidewall core: T=cutting