WELL COMPLETION REPORT

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FLOUNDER-6

APPENDIX 4 PALYNOLOGICAL ANALYSIS OF FLOUNDER-6, GIPPSLAND BASIN

by

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A.D. Partridge

PALYNOLOGICAL ANALYSIS

OF

FLOUNDER-6 AND FLOUNDER-6 (SIDETRACK)

GIPPSLAND BASIN

by

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INTRODUCTION

Forty-one sidewall core and seven core samples were examined in Flounder-6 and Flounder-6A. The zones recognised in the well are summarised below. Details of all samples examined are given on Table-1 while the confidence ratings for the zone intervals are given on the accompanying Data Sheet.

SUMMARY

UNIT

SPORE-POLLEN ZONES

Lakes Entrance Formation

P. tuberculatus 6340 feet

UNCONFORMITY AT 6341 FEET -

Flounder Formation

6341 - 7424 feet

P. asperopolus 6354 to 7091 feet <u>W. edwardsii</u> 6475 to 6546 feet

W. ornata

7288 feet

DINOFLAGELLATE

ZONES

W. thompsonae 6876 to 7091 feet

Upper <u>M</u>. <u>diversus</u> 7142 to 7413 feet

UNCONFORMITY AT 7424 FEET -

Latrobe Coarse Clastics

7424 - 7878 feet

Upper L. balmei 7426 feet

Lower L. balmei 7600 to 7845 feet

Upper Flounder Field Seal

Lower L. <u>balmei</u> 7907 to 8065 feet T. evittii 8033 to 8065 feet

7878 - 8082 feet

Lower Flounder Field Seal

T. longus 8095 to 8145 feet D. druggii 8095 feet

8082 - 8145 feet

Latrobe Coarse Clastics

T. longus 8145 to 8584 feet D. druggii 8175 to 8444 feet

8145 - 8601 feet

Flounder-6, T.D. = 8214 feet

Flounder-6A, T.D.= 8601 feet

1. Flounder Formation

The top of the Flounder Formation can be picked from the electric logs at 6341 feet. This is directly below the sidewall core at 6340 feet containing a good <u>P. tuberculatus</u> Zone assemblage with both spore-pollen and dinoflagellate zone species.

The base of the Flounder Formation lies between sidewall cores at 7413 and 7426 feet, which is not reflected by any marked log break.

The Flounder Formation itself is 1083 feet thick and can be subdivided into two spore-pollen zones and three dinoflagellate zones. Subtle lithological and electric log character changes can be related to the threefold dinoflagellate subdivision of the section.

The most apparent subdivision is the calcareous mudstone and siltstone unit between 6340 and 6800 feet which may be referred entirely to the <u>W</u>. <u>edwardsii</u> Zone even though the nominated species only occurs in the two samples at the top of this interval. The underlying unit would correspond to the interval of the <u>W</u>. <u>thompsonae</u> Zone between 6800 and 7100 feet. This corresponds to the highest occurrence of sands, interbedded with mudstone and siltstone in the Flounder Formation. The break at 6800 feet between the above two units may have some regional importance. It corresponds for example to the time of deep water sand emplacement in the Gurnard Formation in Kingfish-7 (see Partridge 1977).

The lowest unit between 7100 and 7426 feet corresponds to the Upper M. diversus. It contains dinoflagellates throughout but only the sample at 7288 feet can be referred to a specific dinoflagellate zone. This is the <u>W. ornata</u> Zone. There is not much apparent lithological distinction between the middle and lower units except for an increase in the percentage of sand in the lower unit.

2. L. balmei Zone Coal Measures

The division of the L. <u>balmei</u> Zone into Upper and Lower subzones is not clearly defined in Flounder-6. Considering the most recent revision of Stonefish-1 (Partridge 1976) it is probable that in the Flounder Field area the Flounder-Tuna Channel has cut down into the Lower L. <u>balmei</u> Zone. The records of the Upper L. <u>balmei</u> Zone given on data sheets for the other Flounder wells are undoubtedly wrong. Unfortunately revision of these wells is beyond the scope of this report. The source of error is that the base of the Upper L. <u>balmei</u> Zone is recognised on two different parameters. One is the first appearances of spore-pollen such as <u>Cyathidites gigantis</u> and <u>Banksieaeidites</u> elongatus. The alternative is the first appearance of the dinoflagellate <u>Wetzeliella homomorpha</u>. The difficulty lies in that the first occurrences of these forms is not always concurrent, and secondly in the Flounder wells there is difficulty in distinguishing <u>W</u>. <u>homomorpha</u> from various undescribed species of <u>Spinidinium</u>. These two dinoflagellate types seem to represent an evolving plexus in which speciation is difficult.

3. Flounder Field Seal

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The shale-siltstone seal to the Flounder T.1 reservoir sands can be divided into two units based on palynology, as follows:

Unit A: 7878 to 8082 feet Lower L. <u>balmei</u> Zone Unit B: 8082 to 8145 feet T. <u>longus</u> Zone

Although there is as yet no clearly defined lithological distinction between these units this subdivision is important as it corresponds to the Cretaceous-Tertiary boundary (as well as a major palynological zone boundary) and is elsewhere in the basin recognised as a major seismic sequence boundary. Dinoflagellates occur throughout both units attesting to their deposition in an open marine environment. The good sidewall core sampling in Flounder-6A compared to the earlier Flounder wells has for the first time allowed the documentation of the occurrence of the <u>Trithyrodinium evittii</u> Dinoflagellate Zone within the Flounder Field Seal. That this zone should occur in the shale seal has been suspected for some time. The occurrence of the <u>Deflandrea druggii</u> Dinoflagellate Zone within the basal part of the shale seal has been documented previously from other Flounder wells.

DISCUSSION OF ZONES

Species identified from the samples examined are given on the eight attached distribution sheets. The basis for choosing the zone intervals is discussed in the following:

Tricolpites longus Zone 8095 to 8584 feet

Flounder-6 and -6A reached total depths while still within the <u>T</u>. <u>longus</u> Zone. This is based on the presence of the spore <u>Stereisporites</u> (<u>Tripunctisporis</u>) <u>punctatus</u> at 8584 feet in the deepest sidewall core and the dinoflagellate <u>Deflandrea</u> <u>druggii</u> at 8444 feet. Other species identified characteristic of the <u>T</u>. <u>longus</u> Zone included <u>Quadraplanus</u> <u>brossus</u>, <u>Proteacidites gemmatus</u>, <u>P</u>. <u>otwayensis</u>, <u>P</u>. <u>palisadus</u>, <u>P</u>. <u>reticuloconcavus</u> and the dinoflagellate <u>Deflandrea</u> <u>corunata</u>.

The diversity within the zone is quite high. This is not apparent from the distribution charts however, as the samples were not studied in detail.

The top of the \underline{T} . longus Zone is identified as lying within the lower part of the Flounder Field seal.

Lygistepollenites balmei Zone 7426 to 8065 feet

The base of the <u>L</u>. <u>balmei</u> Zone is recognised by the extinction of the characteristic spore and pollen species of the underlying <u>T</u>. <u>longus</u> Zone, and the incoming of the characteristic species of the <u>Trithyrodinium evittii</u> Dinoflagellate Zone.

The top of the L. <u>balmei</u> Zone is identified on the highest mutual occurrence of <u>Lygistepollenites balmei</u>, <u>Australopollis obscurus</u>, <u>Latrobosporites amplus</u> and <u>L. ohaiensis</u>, all in the sample at 7426 feet. This sample is the only one that can possibly be referred to the Upper <u>L. balmei</u> subzone based on the abundant occurrence of a species of <u>Spinidinium</u> transitional to Wetzeliella homomorpha.

Three samples at the base of the <u>L. balmei</u> Zone (from 8033, 8050 and 8065 feet) can be referred to the <u>Trithyrodinium</u> evittii Dinoflagellate Zone based on common occurrence of the nominated species. Important accessory species are <u>Deflandrea</u> <u>speciosus</u>, <u>Areoligera</u> <u>senonensis</u> and common Hystrichosphaeridium tubiferum.

Other dinoflagellates occur in samples throughout the <u>L</u>. <u>balmei</u> Zone (see distribution charts) but are not diagnostic on any particular zone.

Upper Malvacepollis diversus Zone 7142 to 7413 feet

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As is usual, the finer grained lithologies sampled in the Flounder Formation gave rich yields of diverse assemblages. The sandstone lithologies gave generally poor assemblages and sometimes could only be defined as indeterminate. In the sidewall core at 7413 feet, no species that would restrict the sample to the Upper M. <u>diversus</u> Zone were identified. However, there is a marked change in preservation of the fossils compared to the underlying <u>L</u>. <u>balmei</u> Zone, and the dominance of the pollen <u>H</u>. <u>harrisii</u> precludes an age older than Lower <u>M</u>. <u>diversus</u> Zone. An Upper <u>M</u>. <u>diversus</u> age for the basal sediment in the channel is preferred from comparison with Flounder-1 and -2, the closest adjacent wells. The other samples clearly belong to the Upper <u>M</u>. <u>diversus</u> Zone because of common occurrence of <u>Proteacidites pachypolus</u> and <u>Myrtaceidites tenuis</u>. This is further supported by the dinoflagellates, especially the occurrence of <u>Wetzeliella</u> ornata at 7288 feet.

Proteacidites asperopolus Zone 6354 to 7091 feet

The base of the P. asperopolus Zone is normally taken at the first appearaces of such species as Santalumidites cainozoicus, Conbaculites apiculatus and Proteacidites asperopolus. In this well there is a little scatter in the first appearance of these species which is reflecting the detail in which the individual samples have been worked. For convenience therefore the base of the zone is placed at the sample containing the first appearance of the dinoflagellate Wetzeliella thompsonae. Other features characteristic of the P. asperopolus Zone are common occurrence of Proteacidites pachypolus and Myrtaceidites tenuis and consistent presence of Triporopollenites helosus. The top of this zone and top of Flounder Formation is readily recognised by marked change in style of preservation and diversity of samples across the unconformity with the overlying Lakes Entrance Formation. That the top of the Flounder Formation is still within the P. asperopolus Zone is confirmed by occurrence in the highest sample, at 6354 feet, of the species Myrtaceidites tenuis, Conbaculites apiculatus and the common occurrence of the dinoflagellate Deflandrea flounderensis.

Proteacidites tuberculatus Zone 6340 feet

This zone is recognised by the occurrence of three key spores species <u>Cyatheidites annulatus</u>, <u>Foveotriletes crater</u> and <u>F. lucunosus</u> in the sample at 6340 feet.

The sidewall core at 6356 feet also obviously belongs to the <u>P. tuberculatus</u> Zone even though it was not documented in detail. It must either be misshot or mislabelled as it is obviously below the E-log pick for the top of the Flounder Formation.

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SAMPLE a	nd DEPTH (in feet)	ZONE	AGE	CONFIDENCE RATING	YIELD	DIVERSITY	COMMENTS
SWC 34	6340	P. tuberculatus	Miocene	. 0	Moderate	Moderate	Reworked Early Eocene present
SWC 32	6354	P. asperopolus	Early Eocene	0	High	High	Top of Flounder Formation
SWC 31	6356	P. tuberculatus	Miocene	1	Moderate	Moderate	SWC miss-shot or miss-labelled
SWC 72	6475	P. asperopolus	Early Eocene	ō	High	High	Top occurrence W. edwardsii
SWC 71	6546			0	High	Moderate	W. edwardsii present
SWC 70	6625		17	ō .	High	High	
SWC 69	6690	11		· o	High	Moderate	
SWC 68	6750	71	n	õ	High	High	
SWC 67	6805	Barren of palynomo	rphs	-	-	-	Coarse sandstone lithology
SWC 66	6876	P. asperopolus	Early Eocene	0	High	High	Top occurrence W. thompsonae
SWC 65	6937	<u> </u>	Barry Boccile	ů .	High	High	W. thompsonae present
SWC 64	6949	91		õ	Moderate	Moderate	W. thompsonae present
SWC 63	7029	**		0	High	High	W. thompsonae present
SWC 62	7091	n		ŏ	High	High	Lowest occurrence W. thompsona
SWC 102	7142	Coper M. diversus	Early Eocene	2	Moderate	Moderate	Lowest Occurrence
SWC 60	7186	Upper M. diversus	Durry Docene	2	Low	Low	Fine sandstone lithology
SWC 59	7261	Indeterminant		2	Very low	Very low	Sandstone lithology
SWC 101	7288	Upper M. diversus	Farly Forme	0	High	High	
SWC 56	7402	opper M. diversus	Early Eocene	0		High	Occurrence of W. ornata
SWC 55	7402			2	High		Base of Flounder Formation
SWC 54	7413	Numer T. helmei	Paleocene		Very low	Very low Moderate	base of ribunder rormation
		Upper L. <u>balmei</u>	Paleocene	. 1	High		
SWC 53	7457	L. balmei		· 1	Moderate	Moderate	Descente Delesseridinum
SWC 51	7600	Lower L. balmei		1	High	Moderate	Presence Palaeoperidinum
ana 50	2000	• · · · · • • • • • • • • • • • • • • •			Moderate	Low	pyrophorum
SWC 50	7666	Lower L. <u>balmei</u>		1	Moderate	LOW Moderate	
SWC 49	7707	"		1	Low		
SWC 46	7845			1 1	Low Moderate	Moderate Low	
SWC 45	7907						
SWC 100	7930 7945			1	Moderate Moderate	Moderate Moderate	
SWC 99				1		Moderate	
SWC 98	7960			1	Moderate		
SWC 97	7975			1	Moderate	Moderate	
SWC 96	7990	-	-	1	Moderate	Low	
SWC 94	8020			1	Moderate	Moderate	
SWC 93	8033	**		0	High	Moderate	Top occurrence <u>T. evittij</u>
SWC 92	8050			0	Moderate	Moderate	<u>T. evittii</u> present
SWC 91	8065			0	Moderate	Moderate	Lowest occurrence <u>T. evittii</u>
SWC 90	8080	Indeterminant	-	-	Moderate	Low	· · · · ·
SWC 89	8095	T. longus	Maestrichtian	1	Moderate	LOW	Top occurrence D. <u>druggii</u>
Core - 2	8164	17		1	Moderate	Moderate	
Core - 3	8175	11	**	1	Low	Low	<u>D. druggii</u> present
Core - 3	8199	и	n	1	Moderate	Moderate	
Core - 4	8141	H	11	2	Very Low	Very Low	
Core - 4		"	n	1	Moderate	Low	
Core - 4	8152	n	H	1	Low	Low	
Core - 4	8157	n	17	1	Moderate	Moderate	
SWC 77	8444	n		0	Moderate	Moderate	D. druggii present
		-			T	Moderate	
SWC 75	8546	"	•	1	Low	Moderate	

N.B. Samples underlined are from Flounder 6A (sidetrack)

 TABLE - 1:
 SUMMARY OF PALYNOLOGICAL ANALYSES,

 FLOUNDER - 6 AND FLOUNDER - 6A, GIPPSLAND EASIN

BASIN	•	GIPPS	LAND			DAT	E	March 17, 1	978.			
WELL	NAME	FLOUN	DER-6 AND	-6A		ELE	VATION	K.B. +83	fee	t		
·		<u> </u>	HI	JHE ST	DATA			LOW	EST I	ATA	· · · · · · · · · · · · · · · · · · ·	
AGE	F	ZONES	Preferred Depth	Rtg.	Alternate Depth	Rtg.	2 way time	Preferred Depth	Rtg	Alternate Depth	Rtg.	2 way time
OLIG- MIO.	<u>P.</u>	uberculatus	6340	0				6340	Ö			
<u>5 ×</u>	U. <u>N</u>	l. <u>asperus</u>										
	M. <u>N</u>	l. asperus										
	L. <u>N</u>	. <u>asperus</u>								-		
Э	<u>P</u> . <u>a</u>	asperopolus	6354	0			-	7091	0			
EOCENE	U. <u>N</u>	1. diversus	7142	2	7288	0		7413	2	7402	1	
	M. <u>N</u>	<u>M. diversus</u>										
	L. <u>1</u>	M. <u>diversus</u>			· · · · · · · · · · · · · · · · · · ·							· .
INE	<u>v.</u>	L. <u>balmei</u>	7426	1				7426	1			
PA LE OCENE	L.]	L. <u>balmei</u>	7600	-1				8065*	0			
PA	<u>T</u> .	longus	8095*	1	· · · · · · · · · · · · · · · · · · ·			8584*	2	8546*	1	
	<u>T</u> .	<u>lilliei</u>			· · · · · · · · · · · · · · · · · · ·) 				
E	<u>N</u> .	senectus										
LATE CRETACEOUS	<u> </u>	trip./ <u>T.pach</u>							 			
C		distocarin.	· · · · · · · · · · · · · · · · · · ·								· ·	
		pannosus				. 						.
E/	ARLY	CRETACEOUS										
PI	RE-CR	ETACEOUS)	<u> </u>	<u> </u>							
L]		<u> </u>			<u>]</u>				
COM	MENTS	<u>*These</u> <u>W.edw</u> <u>W.orn</u> <u>T.ev</u>	ardsii Zon Data Zone Z Lttii Zone	n <u>e 647</u> 7288 f 8033	t. to 8065 ft	<u>Et; W</u> ; D.	druggi	sonae Zone (i Zone 8095	to 8	444 fr.		
•	INGS: E: I	poller 1; SWC or poller 2; SWC or and/or 3; CUTTIN poller 4; CUTTIN microp	and microp CORE, <u>GOC</u> CORE, <u>FOC</u> CORE, <u>POC</u> microplar GS, <u>FAIR (C</u> or microp IGS, <u>NO CON</u> plankton.	oplank DD CON Dlankt DR CON Nkton. CONFID Dlankt NFIDEN	ton. FIDENCE, a on. FIDENCE, a ENCE, assem on, or bot CE, assemb ed to one	ssemb ssemb nblag h. lage parti	lage wi lage wi e with with no cular z	ge with zone th zone spec th non-diago zone species n-diagnostic one, then no	cies nosti s of c spo o ent	of spores c spores, either spo pres, pollo cry should	and poll ore a en an be m	en nd d/or ade.
	A b	lso, if an e better confid	entry is gi lence ratir	lven a ng sho	3 or 4 co uld be ent	nfide	nce rat if pos	ing, an alto sible.	ernat	e depth w	ith a	
DAT	A REC	CORDED BY:		-		· ,		March 17,	1978	٩		
		VISED BY:					DATE_					

Well NameF													۱ <u> </u>		IPPS							No						r
SAMPLE TYPE *		S	S	S	S	S	S	S	S	S	N.	S	S	S	S	S	S	S	s	-0	S	S	S	s	-s	2	S	\vdash
DEPTHS	6340	6354	6356	6475	6546	525	969	6750	305	6876	337	6949	7029	1602	7142	7186	7261	7288	402	7413	7426	7457	7600	7666	707	7845	2067	
PALYNOMORPHS	6	<u>و</u>	63	64	<u>6</u>	8	ĕ	6	ق	õ	<u>ö</u>	<u>ة</u>	7	7			7	7	~		7	~	7	-				ļ'
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D. granulatus	Δ			<u></u>	\square	\square	\geq	\geq		$\left \right>$	\geq		-	\geq	\triangleright	\geq			\vdash		\vdash	\vdash	\vdash					+-
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L. bainii		1					1			<u> </u>	_		<u> </u>	ļ						. <u> </u>	 		┨		<u> </u>	+		-}
L. lanceolatus			1_				·	 			.		 		0.1	<u> </u>		₋		ļ	1à.	-	\leftarrow	A	-		k	+
L. balmei	-k-	1	4	K	1	\leftarrow	\leftarrow	6		K	\leftarrow	k	1	1	RW			$\overline{\mathbf{x}}$	K		<u> </u>	R	$ \models $	107	沱	$\overline{\mathbf{x}}$	K	弋
L. florinii M. diversus	- -	누	4	\rightarrow	K	ト	1-	\mathbf{k}	1	+	\succ	┢	ト	た	K]	1	Ŕ	K	\mathbf{T}	t-	†`		1	1	<u> </u>		T
M. duratus					+	ᡟ᠆᠆	1	†`	ا	+	<u> </u>	1	<u> </u>								1						1	I
M. grandis		1	1-	1	1	1		1					[1					\bot		\downarrow				1	<u> </u>	4
M. perimagnus		7	1	T	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	_

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A = Common or Abundent C = Caved RW = Reworked species

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Well Name	LOUNT	DER-	<u>6 </u>	<u>6A</u>												SLAN					heel	N N	فت .(0	<u>مــــــــــــــــــــــــــــــــــــ</u>			
SAMPLE TYPE *	_ v	<i>v</i>	S	S	V.	S	S	S	S	S	U	U	σ	U	U	U U	C	S	ŝ	S			_			_		F
DEPTHS	7945	7960	975	7990	020	8035	050	065 .	8080	8095	8141	8144	152	8157	164	175	8199	8444	3546	8584								
PALYNOMORPHS	\downarrow	-	7						~				~~~~	~~	~~~~	8			~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~								┝
A. qualumis A. acutullus																												-
A. luteoides																												
A. oculatus																												
A. sectus																												┝╌
A. triplaxis A. obscurus										-																		
B. disconformis										$ \forall$	_																	
B. arcuatus																												
B. elongatus	·																											┢
B. mutabilis																												+-
B. otwayensis B. elegansiformis																1												T
B. trigonalis	-																											L
B. verrucosus		· · ·																Δ										╞
B. boinbaxoides																												+
B. emaciatus C. bullatus			t—	├ ──┤																								T
C. heskermensis	-1	1																										_
C. horrendus	1	<u> </u>														<u> </u>							<u> </u>					+-
C. meleosus																												+-
C. apiculatus	-																											+-
C. leptos C. stríatus	-1	1															<u> </u>							<u> </u>				T
C. vanraadshoovenii																												Į_
C. orthoteichus/major																												
C. annulatus			 														<u> </u>	<u> </u>									<u> </u>	+
C. gigantis C. splendens		├		K													 											1-
D. australiensis	\rightarrow																1		_									
D. granulatus		\square	\sum		\sum	\sum		\leq	\square																			
D. tuberculatus																<u> </u>												┢━
D. delicatus		<u> </u>											<u> </u>														<u>†</u>	+
D. semilunatus E. notensis		1					-		 								<u> </u>											T
E. crassiexinus																			ļ		L			<u> </u>	<u> </u>		<u> </u>	
F. balteus		ļ		ļ		ļ								ļ														+-
F. crater	_	<u> </u>					—														┣		┝				+	+
F. lucunosus F. palaequetrus		╂──	+												-		+			 	<u> </u>							T
G. edwardsii			 	<u> </u>	1	<u> </u>																						T
G. rudata			\sum					\geq		\geq					A	J	N	\triangleright	Ļ				<u> </u>				┣	
G. divaricatus			ļ	L	ļ							ļ	L															+
G. gestus G. catathus				<u> </u>																								+
G. cranwellac																	1											T
G. wahooensis								\leq															ļ	L				-
G. bassensis		[[L													<u> </u>							
G. nebulosus									<u> </u>							+										<u> </u>	+	┼╴
H. harrisii			<u>+</u>						<u> </u>	}					ţ		†						1	1				1
<u>H. astrus</u> H. elliottii	A	${ \upharpoonright}$	<u>†</u>		K		$ \leq $	\leq									1_			—	[ļ			ļ	1
I. anguloclavatus												L		ļ	ļ				 	ļ	ļ			 	 	ļ		
I. antipodus				ļ		\geq				┠		<u> </u>								 								+
I. notabilis		+							┼──						{			f									f	t-
I. gremius I. irregularis						+					\mathbf{k}			† . -		+	\uparrow	<u> </u>	1	†	<u>†</u>	1	1	1				1-
J. peiratus			1]			<u> </u>		\square	[1	1	1	<u> </u>		+	+-
K. waterbolkii				1		ļ	ļ	<u></u>			ļ	<u> </u>	Ę-	ļ					1	 	 		_					
L, amplus		<u> </u>	K	1	Ł	k-	_	\rightarrow	┥		┣	\leftarrow	\rightarrow	1	╂	+	+		+	┼──			+	+	+		+	+-
L. crassus	-+>	+	\vdash	\vdash	\vdash	\downarrow	1				┼──	R	<u> </u>	ĸ	k	+	+	+		A.	<u> </u>	†	1		†		1	+
L. ohaiensis L. bainii		+	+	+	 	†	1	<u> </u>	1	\vdash	1	<u> </u>			1_`	1		1	<u> </u>	[<u> </u>	<u> </u>	1		1	_	-		T
L. lanceolatus		1		1											Ļ	L			<u> </u>		ļ	<u> </u>	_		 	ļ		
L. balmei		1	$ \geq $	X	P	A	A		\overline{P}	F		$ \ge $	6	\geq	\vdash	\downarrow		\geq	╄	f						┼		+-
L. florinii M. diversus	\rightarrow	+	\downarrow	\rightarrow		╂—			\rightarrow	\rightarrow	+	+	\vdash	\rightarrow	1	+	1	\vdash	1	1		1	1	+	1	1	+	-†-
M. diversus M. duratus		╂					<u>+</u>				<u> </u>				†		1	1	1		1		1		1		1-	1
M. grandís			1	1		ŀ	1		1		1		1				1		F	1	$\lfloor -$	ļ	L	\bot	\downarrow		ļ	Ļ.
M. perimagnus		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	i	1	1	ł.	1	1		1

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A = Common or Abundar C = Caved RW = Reworked species

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	Well NameFD	OUND	<u>ER-6</u>	Ę (5A							•	Basi	n	GI	PPS	LAND				S	hee	t N	o. <u>3</u>	0	of <u>.8</u>		
ļ	SAMPLE TYPE *	_ v	s,	S	S	S	S	S	S	S	م	0	S	0	<u></u>	<u> </u>	0	- 07	03	57	-01	5	-07	<u> </u>		- v	<u>لم</u>	Ţ
ĺ	DEPTHS												_						~	~	5						6	
		6340	6354	6356	6475	6546	6625	6690	6750	6805	6876	6937	6949	7029	1607	7142	7186	7261	7288	7402	7413	7426	74S7	7600	7666	70.1	7345	
ļ	PALYNOMORPHS	2	0	0	2	9	9	~ °	6	16			Ļ		<u></u>		<u> </u>		-	<u> </u>						<u> </u>	ļ	4
	<u>M. subtilis</u>	Ł	\simeq			\geq		\geq			\geq	\triangleright	\vdash	\geq		\geq	$ \geq $		\geq	\geq						ļ	<u></u>	┥
	M. ornamentalis M. hypolaenoides																		·									ł
ł	M. homeopunctatus	1															-										<u> </u>	1
ļ	M. parvus/mesonesus		<u></u>		_		\geq	_				\geq				L				_							ļ	-
ł	M. tenvis		\vdash	 	ert		\geq							$ \rightarrow $		A				\frown			<u> </u>		∤ ∣		┣	┥
ł	M. verrucosus M. australis	+													-		1										<u> </u>	1
Į	N. asperus	\square																										J
ļ	N. asperoides		₋												ļ									\leftarrow	<u> </u> '	 	–	4
ł	<u>N. brachγspinulosus</u> N. deminutus							<u> </u>									\leftarrow						├──	\vdash	┥──			-
ł	N. emarcidus/heterus	K	K									K			K		$\overline{}$				\leq							
ĺ	N. endurus																							Ľ.,				
ļ	N. falcatus N. flemingii	-[-				k-	6	F			\leftarrow			┣	k-	<u> </u>	 								┣			4
ł	N. goniatus		 			\rightarrow	+>						<u> </u>		$\downarrow \rightarrow$									<u> </u>	<u> </u>	 	1-	+
ŀ	N. senectus											1															\Box	1
ſ	N. vansteenisii O. seritosa	1-	ļ						\geq							<u> </u>									<u> </u>			_
ŀ	P. ochesis	+	 								┝													<u> </u>	<u> </u>	 	<u>†</u>	-
ŀ	P. catastus	+	†																								<u> </u>	ĺ
	P. demarcatus										\geq																	1
	P. magnus P. polyoratus																										┨───	-
	P. vesicus	卞																										-
	P. densus																						\leq					
	P. velosus																·								ļ			-
	P. morganii/jubatus P. mawsonii	\leftarrow	K														$ \leftarrow $		\sim	$\overline{}$			K	K	5	1	k	-
	P. reticulosaccatus	1->																							la_		\square	2
	P. verrucosus	1-														<u> </u>										<u> </u>	L	_
ŀ	P. crescentis							\leftarrow				<u> </u>		<u> </u>		K						·						-
ł	P. esobalteus P. langstonii	-{																							<u>+</u>			
ł	P. reticulatus																											_
	P. simplex				L										k	k-								–				-
	P. varus P. adenanthuides (Prot.)	, 					K					\leftarrow			\vdash												+	1
	P, alveolatus		\leq				\leq																		Ē]
	P. amelosexinus	1		ĺ	L									L								-		L	ļ	<u> </u>		
ŀ	P. angulatus	٩	k						-		-	K				k								\vdash	–	\vdash	┨	+
ŀ	P. annularis P. asperopolus	RW									R	->															<u>† </u>	
ŀ	P. biornatus	1													<u> </u>													_
	P. clarus P. cleinei	-	<u> </u>																								┼──	-
	P. confragosos	J																										-
	P. crassis	1	\leq																							ļ		1
f	P. delicatus	4											\leftarrow		┣	_									<u> </u>	 		-
ŀ	P. formosus P. grandis	╉──											<u> -></u>													<u>├</u>	<u>+</u>	1
ŀ			<u> </u>					\square								1				`								1
ſ	P. incurvatus	1	<u> </u>					<u> </u>				<u> </u>			ļ	<u> </u>											 	-
ŀ	P. Lanionsis	•					1		k			K	 														 	-
ł	P lanis	1					\rightarrow					†>			†	$\overline{\mathbf{n}}$								Ľ			1	
t	P. latrobensis											[ļ		Ę,			\sum					<u> </u>	ļ			1
ſ	P. leightonii	•				ļ								┣		\vdash			\geq					 	<u> </u>			-
ŀ	D observer						\leftarrow	K							\mathbf{k}	†								†—	1	†	<u> </u>	+
ŀ	P. ornatus	•	<u> </u>		<u> </u>						\leq				Ľ	L_			\sum							1		1
ţ		•			F		k	5			<u> </u>	<u> </u>	<u></u>	<u> </u>	k	\mathbf{k}^{-}	<u> </u>		-]				┣		 	<u> </u>	-
ŀ	P. otwayensis P. pachypolus P. palisarlus				A_	ert		\land	\wedge			A	A_						A >						<u>├</u>		 	_
ł	P. parvus	•														Ľ											1	1
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ŀ	P. prodigus P. pseudomoides	• [k		6			\geq	\geq							5.	┨	-
ŀ	P. pseudomoioes P. recavus	•[<u>├</u>				\vdash														Tu>	?	ł
1	*C=core; S=sidewall core; T		•	•				•		لمستعدما				n 01	• 11	a un d	int								الميبينين ا			-

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SAMPLE TYPE *	S	S	S	U.	S	S	(1)	S	S	v	C	U	υ	0	0	υ		S	5	N N	<u> </u>	T	T	T				Т
DEPTHS						、																		—				Ť
PALYNOMORPHS	7945	7960	7975	0662	8020	8035	8050	8065	8080	2005	8141	8144	8152	8157	8164	8175	8199	8444	8546	8584								
M. subtilis										-												1	+	†				ϯ
M. ornamentalis																												T
M. hypolaenoides		1			-					-																		1
M. homeopunctatus						·						<u> </u>										 	<u> </u>	-l	ļ		<u> </u>	-
M. parvus/mesonesus M. tenuis																								E				\pm
M. verrucosus																							<u> </u>	_				+
M. australis N. asperus																						┨	+		<u> </u>			+-
N. asperoides														<u> </u>									+					t
N. brachyspinulosus												<u>├</u> ──		\uparrow						1		-	1		t	-		t
N. deminutus																												t
N. emarcidus/heterus																												ļ
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O, seritosa			_															·			1							Í
P. ochesis		1																										l
P. calastus																				ļ	ļ		 	∔			ļ	4
P. demarcatus						\geq															ļ		<u> </u>	1	ļ	ļ!		-
P. magnus P. polyoratus																									├ -			+
P. vesicus																												+
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P. velosus																					1		1	<u> </u>				t
P. morganii/jubatus]
P. mawsonii			N	\geq				\geq	\square	\geq		\geq	\geq	D			\sum		\geq			L	<u> </u>	<u> </u>		L!	L	1
P. reticulosaccatus			\geq																		ļ	ļ	L	<u> </u>			L	1
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P. adenanthoides (Prot.)	\searrow																						<u> </u>					+
P. alveolatus										-		-												┼	<u> </u>			ł
P. amolosexinus												A)											<u> </u>	<u> </u>				$^{+}$
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P. obesolabrus													—-i														i	t
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P. pachypolus															·													4
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P. parvus P. plemmelus P. prodigus P. pseudomoides P. recavus										\leq													┝━┥	<u>├</u>				†
P. pseudomoides						$\overline{\cdot}$				_ ¥							_											t
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Well Name	FD	OUN	DER-	6ξ	6٨								Basi	n	C	1PP	SLAN	D			s	hee	t No	o	<u> </u>	1	<u> </u>	
SAMPLE TYPE *		S	S	\$	<u>_</u> 0	S	ം	_0		_v	<u>ب</u>	<u>_</u> 0	S	<u>_</u> 2	<u>.</u> 0	_v.	~	<u></u> 0	S	<u>_</u> 0	<u>_</u> 9	S	S	<u>-</u> v	S	_ <u>v</u>	<u></u> 0	
DEPTHS		0	_									~	œ,			~	5	_	~	2	3	9	2		0	2	5	
PALYNOMORPHS		6340	6354	6356	6475	6546	6625	6690	é750	6805	6876	6937	6649	7029	1607	7142	7186	7261	7288	7402	7413	7426	7457	7600	7666	7707	7845	
P, rectomarginis								_																				
P. reflexus P. reticulatus																												
P. reticuloconcavus P. reticuloscabratus										_																		
P. rugulatus																												
P. scitus P. stipplatus															\geq													-
P. tenuiexinus												И	\sum										\leq					<u> </u>
P. truncatus P. tuberculatus																												-
P. tuberculiformis									\geq	_		_			И													_
P. tuberculotumulatus P. xestoformis (P	rot.)																											
O. brossus R. boxatus																						ļ	_	-				-
R. stellatus																						\geq		<u> </u>				
R. mallatus R. trophus											\square	\geq		\geq	\geq		Λ		\geq			\vdash			\square			
S. cainozoicus			\leq				\leq	\leq	Ζ		И	\leq		\leq	Ζ				И					—				
<u>S. rotundus</u> S. digitatoides																									<u> </u>			-
S. marlinensis										_														L				
S. rarus S. meridianus															Z				\leq									
S. prominatus S. uvatus																									<u> </u>	<u> </u>		
S. punctatus									\leq					\leq	\leq									<u> </u>				
S. regium T. multistrixus (CP4)																										┣		
T, textus																									—	—		
T. verrucosus T. securus																								-			\geq	È
T. confessus (C3)																						K		k	<u> </u>		<u> </u>	
<u>T. gillii</u> T. incisus													\leq											\square	<u> </u>	ļ		<u> </u>
T. longus T. phillipsii					į-—																							-
T. renmarkensis																								<u> </u>	<u> </u>		<u> </u>	-
T. sabulosus T. simatus							┢									 .						<u> </u>				+		+-
T. thomasii																								<u> </u>				
T. waiparaensis T. adelaidensis (CP3)																	\leq		1									<u> </u>
T. angurium T. delicatus																								┼			<u> </u>	┣.
T. geraniodes																									1			
T. leuros T. lilliei																								+			<u> </u>	-
T. marginətus			-									-							ļ					F	-			F
<u> </u>			R		K				<u> </u>		\vdash	R	A			<u> </u>								1	<u> </u>	<u> </u>	<u> </u>	E.
T. retequetrus											ļ													┢	<u> </u>	<u> </u>	┼	┝
T. scabratus T. sphaerica		<u> </u>			<u> </u>					<u> </u>	<u> </u>			${\boldsymbol{\boxtimes}}$	<u> </u>			<u> </u>	$ \leq$		1			<u> </u>	<u> </u>	<u>†</u>	†	F
T. magnificus (P3) T. spinosus							 																	+	┝─		⊢	-
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T. chnosus T. helosus					k		K	K	K											<u> </u>	<u> </u>		<u> </u>	<u>† </u>	<u> </u>	<u> </u>	E	E
T. scabratus							[]		—		\leq	—	—	\square								ļ		+	+-	<u> </u>	_	+
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V. cristatus V. kopukuensis			K			k	K	K	K		\leftarrow	F		\leftarrow					\vdash		k			+			<u> </u>	-
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DEPTHS	6340	6354	56	6475	46	6525	06	6750	05	6876	137	5949	129	1602	7142	7186	7261	7288	7402	7413	7426	457	7600	7666	7707	845	7907	
PALYNOMORPHS	63	63	63	64	65	65	66	67	68	<u> </u>	_6	-55	-1	-2:	<u>_F]</u>	7	17	17	7	-11	<u> </u>	<u>5</u>	-7	-7		-7	-	╞
Dinosph. simplex	\geq																-											┢
Dinosph. clavatus Nemat. balcombiana	\geq		-	•••••																					-			t
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Defl. macmurdoensis						\mathbb{N}																						ł
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Areoligera sp.		<u> </u>	ļ	L	 	\vdash	\geq	<u> </u>											<u></u>								<u> </u>	╀
Homo, tasmanense		ļ		 	ļ		12			<u> </u>									\rightarrow							┝		╀
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Prae. indentata		K	${ } $			A	\leq																					
Hyst. tubiferum Trithy. evittii		<u> </u>			ł	A	A	A																ļ	ļ			1 †
Arcol. senonensis			1			$\langle \rangle$	~	×			<u> </u>											<u> </u>		+	1-			†
Defl. druggii		_	ļ							Δ						\square		\leq							<u> </u>			
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