APPENDIX 1

The Geochronology and Depositional Environments of Pisces No. 1 sediments over the interval from 1075.2 m. to 2564.5 m. (after Paltech Pty. Ltd.).

1.1. The Foraminiferal Sequence in Pisces No. 1.

1.2. The Palynological Sequence in Pisces No. 1.

1.1. THE FORAMINIFERAL SEQUENCE in PISCES # 1.

Fifty sidewall cores were examined from PISCES # 1. The sequence is divisible into an upper, *carbonate* marine unit and an underlying series of *non-carbonate*, marginal marine to non-marine units. The absence of planktonic foraminifera in the *non-carbonate* series prohibits any comment regarding biostratigraphy or age in this report (refer Palynology). However, the *carbonate* unit contains a number of planktonic foraminiferal assemblages, thus permitting precise biostratigraphic designation as summarised below:-

Sidewall Cores Depth (m)	Approx. E-Log Unit Boundary	Age	Zone*	Paleoenvironment¶
1075.2 to 1155.0		Mid Miocene	D-1	Mid Shelf (≈100m)
	?			
1198.5 to 1464.0		Mid Miocene	D-1 to D-2	Outer Shelf Canyon (≈150m)
	?			
1475.0 to 1604.0		Mid Miocene	D-2 to E-1	Shelf Edge Canyon (≈200m)
	?			
1620.0 to 1681.5		Early Miocene	E-2	Shelf Edge Canyon (≈200m)
	?			
1684.5 to 1794.5		Early Miocene	F to G	Prograding Wedge at Shelf/Slope Break (≈200m)
	1796			
1796.5 to 2320.5		? No planktonic foraminifera found	?	Marginal marine *non-carbonates*

* Planktonic foraminiferal zonation after Taylor (in prep). This report includes distribution chart for Pisces on Table 1 with reliability of zonal determinations.

¶ Interpretation based on distribution of selected benthonic foraminiferal species and other sediment grains (<.075mm) as shown on Table 2 of this report. Paleobathymetric ranges are in parentheses.

The sidewall core at 1794.5 representing the base of the carbonate sequence, contains an "upper" Zone G assemblage, indicating an Early Miocene age at approximately 18 million years ago. The sequence continued, apparently uninterrupted,to at least the mid Miocene Zone D-1 at 1075. (The sidewall core at 1075.2m was the highest recovered in Pisces # 1.)

Faunal and other sediment grains in the basal part of the carbonate sequence (1794.5 to 1684.5) indicate a progr ding wedge of the shelf edge. This wedge probably resulted from distal, carbonate sediment discharge from a submarine canyon which was apparent as canyon fill at and above 1681.5m.

The *non-carbonate* series between 1796.5 and 2320 contain at least three lithological units, with no planktonic foraminifera and only sporadic benthonic foraminifera and fish fragments. However, some sidewall cores were heavily contaminated with mid Miocene from the carbonate unit above (for example at 2097).

Directly below the carbonate unit were two "Greensand" units; each lithologically distinct from the other. The higher one, from 1796.5 to 1803.0 was a fine quartz, qlauconitic clayey sandstone containing some coarse wind blown quartz grains. This unit may represent the "Lakes Entrance Greensand", but this cannot be confirmed either micropaleontologically or palynologically. The lower "Greensand", from 1808.5 to 1825, was coarser grained with distinct pellet glauconite which was oxidised to limonite in the top half of the unit (1808.5 to 1816.5).

Palynological examinations (see Palynology Report) revealed that dinoflagellates and spore/pollen were present only below this oxidised horizon (i.e. at and below 1820.5). These microfloras were of Late Cretaceous age and were dominated by low specific diversity dinoflagellate assemblages. The sporadic benthonic foraminiferal assemblages, between 1820.5 and 2320 were composed completely of arenaceous forms (refer Table 2 - this Report). These forms were euryhaline, tolerating fluctuating salinities; conditions also indicated by the low diversity nature of the dinoflagellate assemblages. Therefore we interpret that sedimentation between 1820.5 to at least 2320 took place in marginal marine situations such as lagoons, estuaries and delta fronts.

TABLE 1 ? PLANKTONIC FORAMINIFERAL DISTRIBUTION - PISCES ≠ 1
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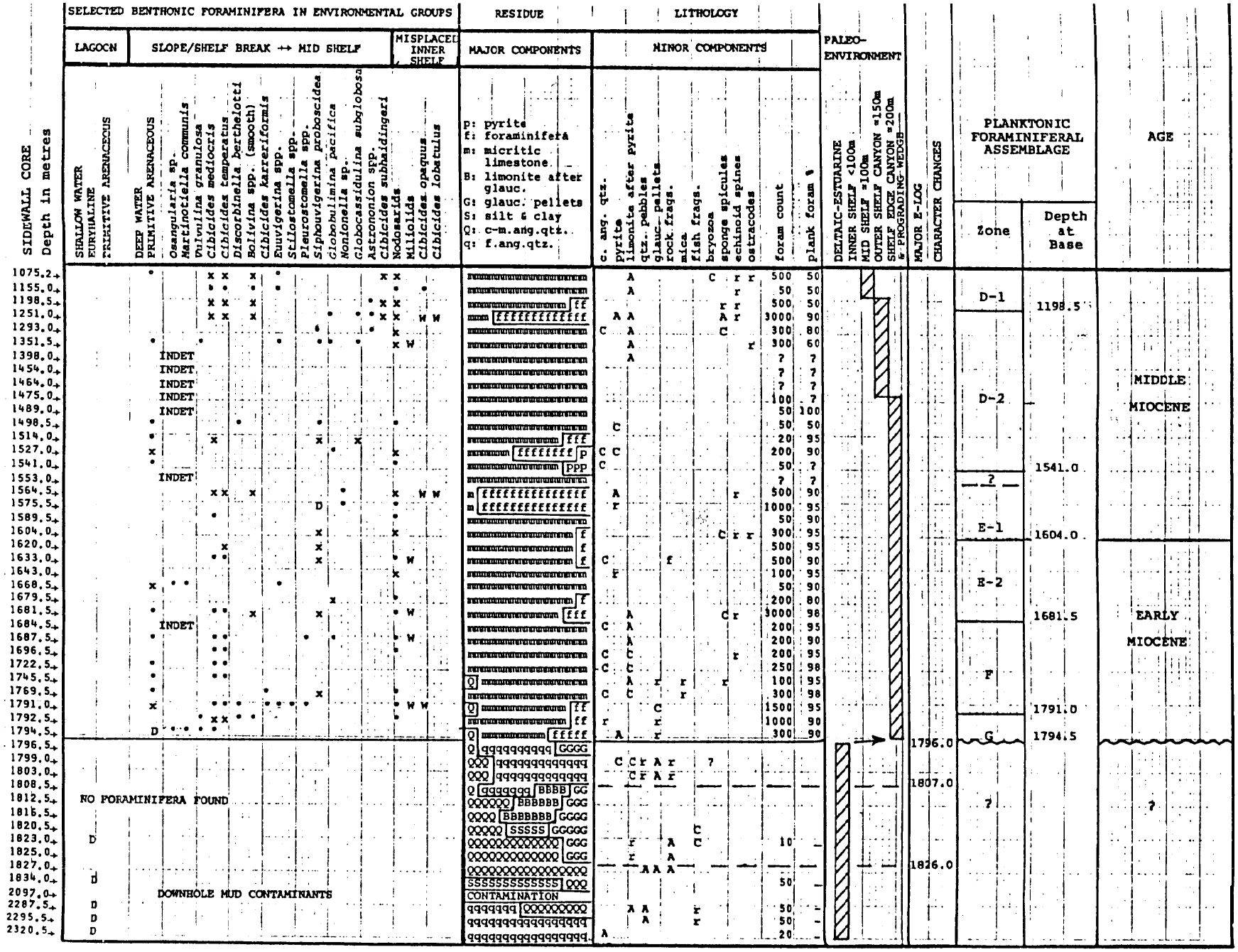
SIDEWALL CORE Depth in metres	PLANKTONIC FORAMINIFERA																					PLANKTONIC FORAMINIFERAL ASSEMBLAGE		AGE
	G'oides trilobus	*G'alia bella*	*G'alia continuosa*	*G'alia nana*	*G'alia zealandica* (S.S.)	*G'quad dehiscens* (S.L.)	*G'quad dehiscens* (S.S.)	*G'quad advena*	*G'quad venezuelana*	*G'ina bulloides*	*G'ina woodi connecta*	*G'ina woodi woodi*	*Cat. dissimilis*	*G'oides bispherícus*	*G'oides trilobus* (elongate)	*G'alia siakensis*	*G'alia miozea miozea*	*G'alia praescitula*	*Praeorb. glomerosa*	*G'alia peripheronda*	*G'quad altispira*	*G'alia conica*	*Orb. suturalis*	*Orb. universa*	*G'alia praemenardii*	*G'alia miozea conoidea*	*G'ina ciperoensis*	ZONE	Depth at Base	
1075.2	x									x	x												x	x					
1155.0	x									x	x												x				D-1	1198.5	
1198.5	x									x	x											°	x	°	x	°			
1251.0	x	x			x					x	x		x		x	x	x	°	°		x	°	x	x	x	x			
1293.0	x									x			x			x	x						x	x	x				
1351.5	x									x						x	°						x	x	x				
1398.0										x	?												°		°				
1454.0										x	?												°		x				
1464.0										x	?												°		°				MIDDLE
1475.0	°					°				x				°			°						x						
1487.0						°				x							°	°					°	°			D-2		MIOCENE
1498.5										x													x						
1514.0	x			x		x	°			x	x		x		x	x	x			°		°	x	°					
1527.0	x			°		x	°			x	x		x				°	°				°	°						
1541.0	°			°						°	°		°				°						°					1541.0	
1553.0	INDET																										?		
1564.5	x	x		x						x	x	x	x			x	x	x	x			x							
1575.5	x	x		x						x	x	x	x			x	x	x				x							
1589.5							°			x								x	°								E-1		
1604.0	x			x			°			x	x	x					x	x	x			x						1604.0	
1620.0	x	x		x		x	°			x	x	x	x			°	x	x	x	°	°	°							
1633.0	x	x		x		x				x	x	x	x			°	x	x	x	°		°							
1643.0	°						°			°			°								°						E-2		
1668.5	°			°		°	°			°	°	°					°												
1679.5		x				x	x	x	x		x		x				x	x	x										
1681.5	x	x	x		°		x	x	?	x		x	x	x	x	x	x	x	x	x	°							1681.5	EARLY
1684.5	°			x		x				x		x		°			x	x											
1687.5						°	°			x		x		°			°												MIOCENE
1696.5	x	?	?	?								x		°															
1722.5	x	°	x		x			°	?	x	°		x		x		x										F		
1745.5	°									x		x		°			°												
1769.5	x	°	x		°					x	x	x		°	x		°												
1791.0	x	x	x		x			x		x	x	x	x	x	x	x	x											1791.0	
1792.5	x	°	x	x	°	x	x			x	x	x	x																
1794.5	x	°	x	x	°	°	°	°	°	x	x	x															G	1794.5	
1796.5	NO PLANKTONICS SEEN																										?		?
1799.0																													
1803.0																													
1808.5																													
1812.5																													
1816.5																													
1820.5																													
1823.0																													
1825.0																													
1827.0																													
1834.0																													
2097.0	DOWNHOLE MUD CONTAMINANTS from Zone D-2																												
2287.5	NO PLANKTONICS SEEN																												
2295.5																													
2320.5																													

KEY:

° = <20 specimens
x = >20 specimens
D = Dominant >60% specimens

INDET = indeterminate because of recrystallisation
? = identification doubtful because of recyrstallisation.



KEY: * = <20 specimens
x = >20 specimens
D = Dominant >60% of assemblage
W = Worn specimens

TABLE 2: SIGNIFICANT BENTHONIC FORAMINIFERAL DISTRIBUTION, RESIDUE LITHOLOGY & PALEOENVIRONMENTAL ASSESSMENT- PISCES # 1

1.2. THE PALYNOLOGICAL SEQUENCE IN PISCES # 1.

Fifty sidewall cores from Pisces # 1 were examined for palynological content. On the basis of that examination, the following breakdown of the sequence was noted:-

Depth (m)	Age	Dinoflagellate Zone	Spore-Pollen Zone	Paleoenvironment
1796.5 to 1812.5	Indet -barren	?	?	?
1816.5	Indet			
1820.5 to 2161.0	Maastrichtian	*I. druggii* Zone	*T. longus* Zone	marginal
			— 2081 —	
			?	marine
2179 to 2490	Early Maastrichtian -Late Campanian	*I. korojonense* Zone	— 2320 — *T. lillei* Zone	
		— — 2379.5 —		
2509 to 2554.5	Campanian			Continental
2564.5	? Campanian		? *T. lillei* Zone	

The zonation scheme used is that established by Stover & Partridge (1973) and further updated in unpublished reports.

A list of the sidewall cores studied is shown on tables 1 and 2. The five shallowest sidewall cores, from 1796.5 to 1812.5, were barren and the sample at 1816.5 yielded insufficient information for dating purposes.

The section studied yielded an excellent well preserved Late Cretaceous marine dinoflagellate sequence. A detailed examination is beyond the scope of this report, but further examination is warranted as this sequence should provide valuable input into the clarification of a biostratigraphic Zonation

for the Late Cretaceous.

The preservation of the palynomorphs, particularly in the predominantly marine samples, is poor and the ranges of some of the species appear to be at variance with their known ranges. This may be the result of probable Oligocene/Miocene contamination, which was also mentioned in the foraminiferal report and is probably due to drilling mud contamination. Data provided by the spore-pollen assemblage allowed for zone determinations to be made, however the boundary between the *T. longus* and *T. lillei* Zones is rather indistinct, being somewhere between 2081m and 2320m.

The boundary at 2161m is based on the upper limit of the dinoflagellate *Isabelidinium korojonense* which is known to have a limited vertical range in the late Campanian/early Maastrichtian. The correlation of the dinoflagellate Zones with the European Stages is based on unpublished ranges for Western Australian sequences. However the *I. korojonense /I. druggii* boundary in W.A. is marked by a major disconformity. There is no evidence for a disconformity at that horizon in PISCES # 1, which leaves open the question of the age of the *I. korojonense/I. druggii* boundary in PISCES # 1.

The occurrence of Late Cretaceous dinoflagellate assemblages older than the *I. druggii* Zone, in the Gippsland Basin has not been previously reported and makes this an important sequence for further study.

REFERENCES.

HELBY, et al, in prep: Palynologic Zonation of the Mesozoic.

STOVER, L.E. & PARTRIDGE A.D., 1973: Tertiary and Late Cretaceous Spores & Pollen from the Gippsland Basin, South Eastern Australia. *Proc. R. Soc. Vict. Vol. 85,* Pt. 2.

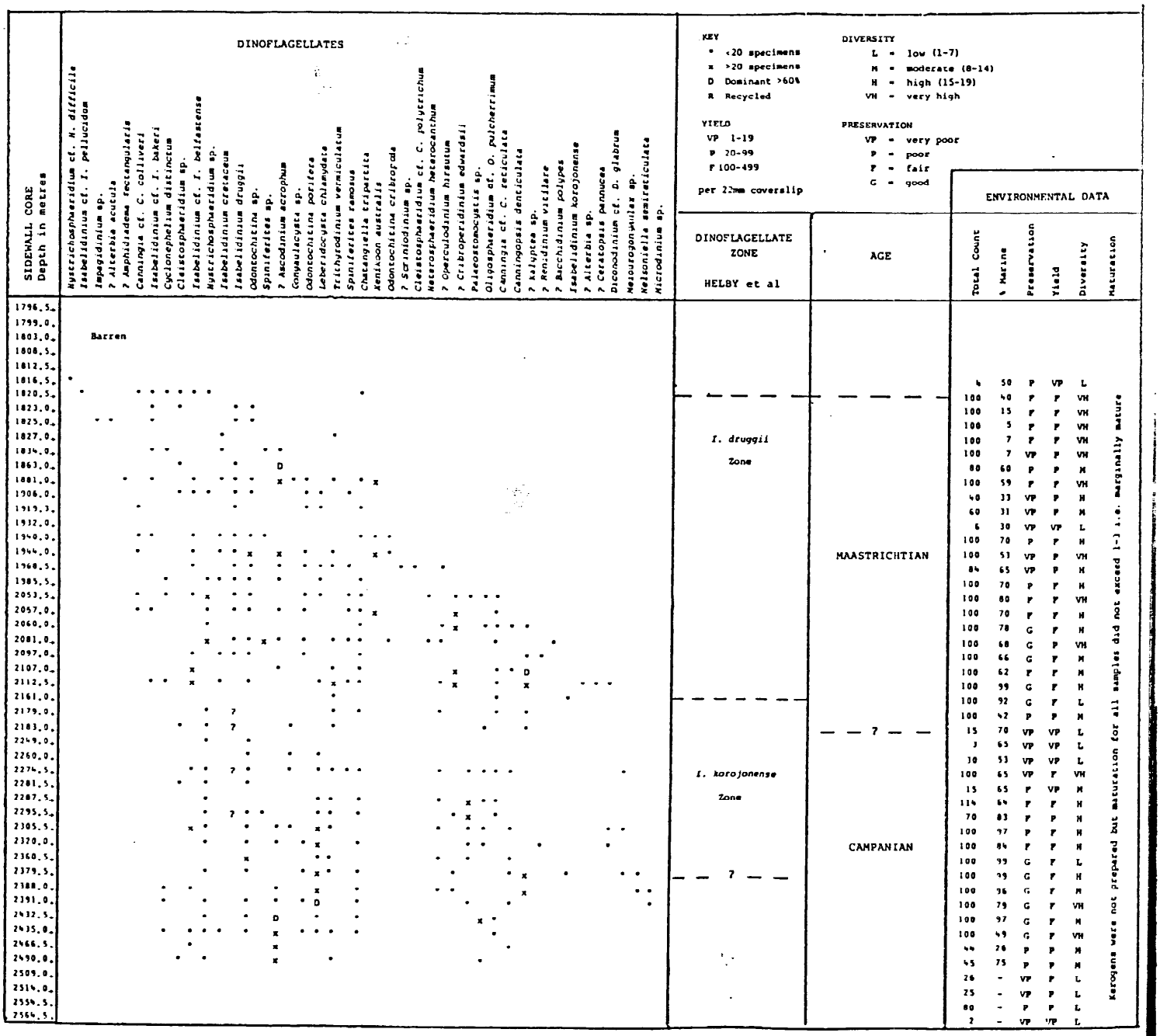


TABLE 2: DINOFLAGELLATE DISTRIBUTION CHART & ENVIRONMENTAL DATA - PISCES # 1.

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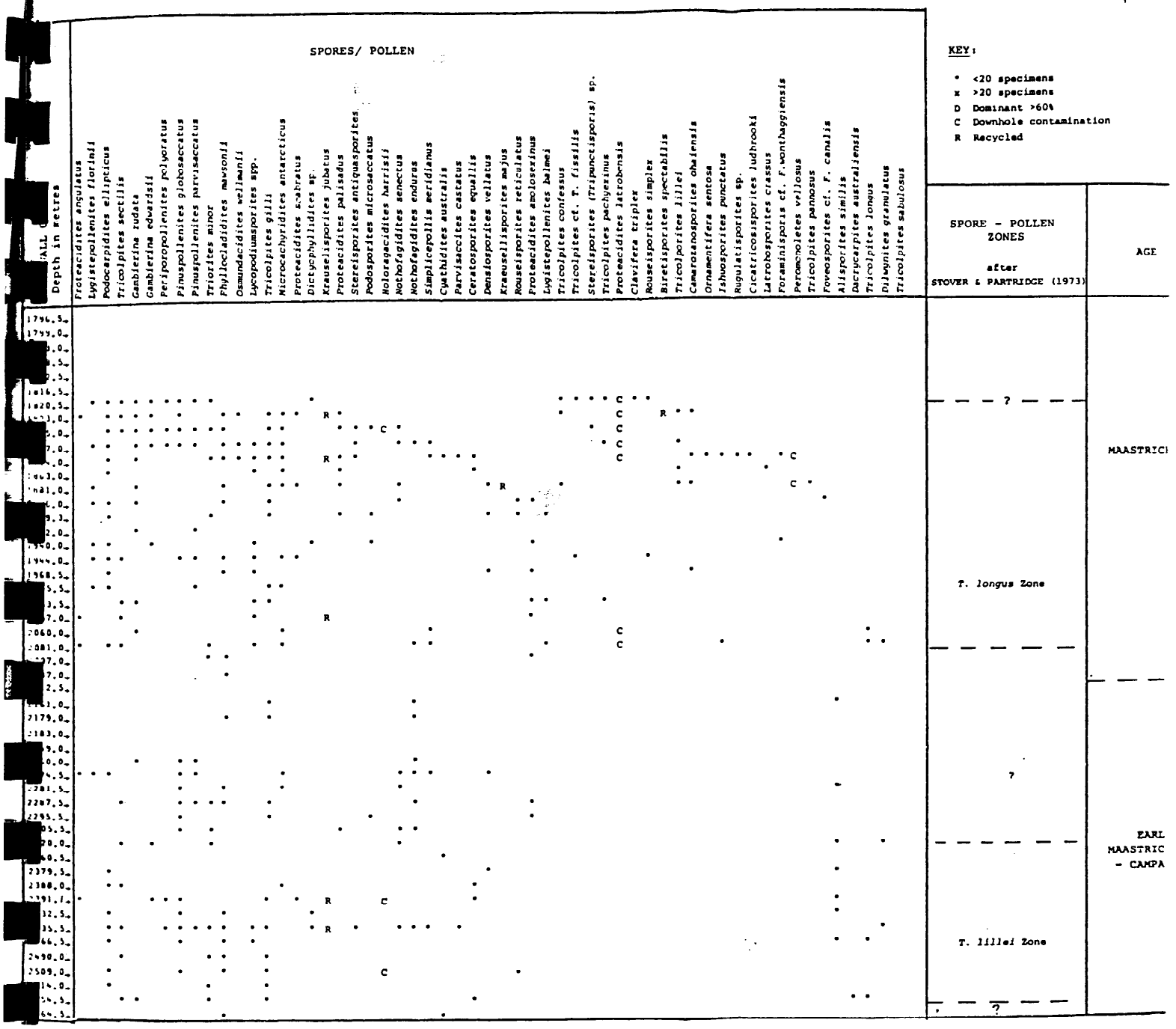

TABLE 1: SPORE/POLLEN DISTRIBUTION CHART - PISCES # 1.

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