NEW PALYNOLOGY OF NORTH EUMERALLA-1, ONSHORE OTWAY BASIN, VICTORIA

BY

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for MINORA RESOURCES

OCTOBER, 1988.

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I SUMMARY

3402 ft. (swc) : P. pannosus Zone : late Albian : non-marine : usually topmost Eumeralla Formation

3534 (swc)-4810 ft. (cutts) : upper C. paradoxa Zone : mid Albian : non-marine : usually flat response Eumeralla

5210-5410 ft. (cutts) : lower C. paradoxa Zone : mid Albian : non-marine : usually spiky response Eumeralla

5467 (swc)-5884 ft. (swc) : C. striatus Zone : early Albian : non-marine ; usually very spiky response Eumeralla, sometimes with coals

6100 (swc)-6294 ft. (swc) : upper C. hughesi Zone : late Aptian : non-marine : usually less spiky response Eumeralla

6440-6900 ft. (cutts) : lower C. hughesi Zone : early Aptian : non-marine : usually very spiky response Eumeralla, sometimes with coals

7200 (cutts)-8777 ft. (swc) : F. wonthaggiensis Zone : late Neocomian : non-marine : usually Pretty Hill Formation

II INTRODUCTION

Ed Kopson of Minora Resources submitted 15 cuttings samples from the North Eumeralla-1 for palynostratigraphy. This was on behalf of the PEP III operating group, as part of regional appraisal of the area. Raw data was available in Wilschut (1974). This report details the final interpretation of results of the samples herein, with some consideration of the Wilschut report.

Palynomorph occurrence data are shown as Appendix I and form the basis for the assignment of the samples to eight spore-pollen units of late Neocomian to late Albian age. The Cretaceous spore-pollen zonation is essentially that of Dettmann and Playford (1969), but has been significantly modified and improved by various authors since, and most recently discussed in Helby et al. (1987), as shown on figure 1. As discussed in Morgan (1986) (Appendix to the Connard report), I have found the Dettmann and Douglas (1976) subdivision unworkable in some respects. The zonation used herein is that of Helby et al (1987) as discussed by Morgan (1986). The C. hughesi Zone of Dettmann and Douglas (1976) is therefore not the same as that herein.

	AGE		SPORE - POLLEN ZONES	DINOFLAGELLATE ZONES
Early Tertiary	Early Oligocene		P. tuberculatus	
	Late Eocene		upper N. asperus	P. comatum
			middle N. asperus	V. extensa
	Middle Eocene		lower N. asperus	D. heterophlycta
				W. echinosuturata
			P. asperopolus	W. edwardsii
				W. thompsonae
	Early Eocene		upper M. diversus	W. ornata
				W. waipawaensis
			middle M. diversus	
			lower M. diversus	W. hyperacantha
	Paleocene		upper L. balmei	A. homomorpha
			lower L. balmei	
				E. crassitabulata
				T. evittii
Late Cretaceous	Maastrichtian		T. longus	M. druggii
	Campanian		T. lillei	I. korojonense
			N. senectus	X. australis
	Santonian		T. pachyexinus	N. aceras
				I. cretaceum
				O. porifera
	Coniacian		C. triplex	
	Turonian			C. striatoconus
				P. infusorioides
	Cenomanian		A. distocarinatus	
Early Cretaceous	Albian	Late	P. pannosus	
		Middle	upper C. paradoxa	
		Early	lower C. paradoxa	
			C. striatus	
	Aptian		upper C. hughesi	
			lower C. hughesi	
	Barremian		F. wonthaggiensis	
	Hauterivian			
	Valanginian		upper C. australiensis	
	Berriasian		lower C. australiensis	
Juras.	Tithonian		R. watherooensis	

FIGURE 1 ZONATION FRAMEWORK

III PALYNOSTRATIGRAPHY

A. 3402 ft. (swc) P. pannosus Zone

Assignment to the Phimopollenites pannosus Zone is indicated at the top by the absence of younger indicators, and at the base by oldest P. pannosus (Wilschut 1974 data).

Wilschut also assigned this sample to the P. pannosus Zone.

Non-marine environments are indicated by the common and diverse spores and pollen, and lack of microplankton.

These features are normally seen in the top most Eumeralla Formation.

B. 3534 ft. (swc)-4810 ft. (cutts) : upper C. paradoxa Zone

Assignment to the upper Coptospora paradoxa Zone is indicated at the top by youngest Coptospora paradoxa without younger indicators (Wilschut data at 3534 ft., swc, data herein at 4330 ft., cuttings), and at the base by oldest Pilosisporites grandis without older indicators (data herein). The Wilschut data contains nothing diagnostic in the interval 4802-5269 ft. (both swcs) and so does not aid the breakdown. Significant reworking in the cuttings at 4330 ft. includes Coptospora striata, Dictyotosporites speciosus and Pilosisporites parvispinosus which are otherwise all indicators of the lower C. paradoxa Zone. Their inconsistent occurence beneath supports the contention that they are reworked. Reworking at 4810 ft. (cutts) includes *Cyclosporites hughesi*. Minor caving inclues *P. pannosus*.

Wilschut (1974) assigned this interval to the *C. paradoxa* Zone, although he could not recognise the subzones on his data.

Non-marine environments are indicated by the common and diverse spores and pollen and absence of brackish indicators. At 4330 ft. (cutts), minor lacustrine influence is indicated by the freshwater algal taxa *Botryococcus* and *Schizosporis* spp.

These features are normally seen in the upper Eumeralla Formation associated with a flat sonic response.

C. 5210 ft. (cutts)-5410 ft. (cutts) : lower *C. paradoxa* Zone

Assignment is indicated at the top by youngest *C. striata* (considered to be in place) and supported by youngest consistent *P. notensis* and *D. speciosus* at 5410 ft. (cutts). Oldest *P. grandis* at 5210 ft. (cutts) may be caved a short distance. At the base, the swc at 5467 ft. contains a good assemblage, but lacks *C. paradoxa* (Wilschut data). Its true base range in place is therefore probably the cuttings at 5410 ft. *Falcisporites* spp. and *Stereisporites antiquasporites* are frequent.

Wilschut (1974) assigned this interval to the *C. paraadoxa* Zone without subzones.

Non-marine environments are indicated by the common and abundant spores and pollen, and lack of spiny acritarchs. Minor lacustrine influence is indicated by rare algal taxa (*Schizosporis* spp.).

These features are usually seen in the Eumeralla Formation, associated with a slightly spiky sonic response intermediate between the flat response above and the very spiky response below.

D. 5467 ft. (swc)-5884 ft. (swc) : *C. striatus* Zone

Assignment is indicated at the top by the absence of younger indicators in a good assemblage, and at the base by oldest *Crybelosporites striatus* (Wilschut data) Frequent *Cicatricosisporites australiensis* and *S. antiquasporites* are also not seen below this point (Wilschut data) and suggest a base to the Albian. The cuttings studied herein are not diagnostic and contain caved taxa such as *C. paradoxa*, *Perotriletes majus*, *Trilobosporites tribotrys* and *T. trioreticulosus*. Minor Triassic reworking was seen.

Wilschut (1974) assigned this interval to the *C. striatus* Zone and topmost *C. hughesi* Zone. This is not at gross variance with that herein.

Non-marine environments with some lacustrine influence are indicated by the common and diverse spores and pollen, rare algal taxa (*Schizosporis* spp.) and absence of spiny acritarchs.

These features are normally seen in the mid Eumeralla Formation, often associated with a very spiky sonic response, sometimes with coals.

E. 6100 ft. (swc)-6294 ft. (swc) : upper C. hughesi Zone

Assignment is indicated at the top and base by the absence of younger and older indicators. Youngest C. hughesi at 5884 ft. (Wilschut data) is consistent, as a short range overlap with C. striatus is not unusual. The interval contains frequent Cyathidites and Osmundacidites wellmannii. The cuttings sample at 6010 ft. (data herein) contains obvious caving and cannot be reliably assigned.

Wilschut (1974) assigned this interval to Dettmann's F. asymmetricus and R. reticulatus subzones of her C. hughesi Zone without subdivision. This presents no major conflict with the assignment herein.

Non-marine environments with minor lacustrine influece are indicated by the common and diverse spores and pollen, common cuticle, rare algal taxa and absence of spiny acritarchs.

These features are normally seen in the lower Eumeralla Formation, associated with a relatively flat log response between spiky intervals above and below.

F. 6440 (cutts)-6900 ft. (cutts) : lower C. hughesi zone

Assignment is indicated at the top by youngest Cooksonites variabilis, here coincident with an influx of Pilosisporites notensis (data herein). The Wilschut data does not show P. notensis below 6294 ft. (swc). At the base, assignment is indicated by oldest P. notensis considered to be in place (cuttings at 6900 ft. herein), and the absence of older indicators seen below. *F. asymmetricus* appears to be in place down to 6440 ft. in cuttings (herein). *Cyathidites* spp. are common thoughout. This zone base is picked from cuttings and so cannot be considered as reliable as when picked from good core or swc samples. The posibility of this boundary being picked too high is discussed below.

Wilschut (1974) assigned this interval to the *F. asymmetricus* and *R. reticulatus* Subzones of the *C. hughesi* Zone, on negative evidence. His data therefore does not conflict with the present assignment.

Non-marine environments are indicated by the common and diverse spores and pollen, very common cuticle, and absence of saline microplankton. Rare algal *Schizosporis* suggest minor lacustrine influence.

These features are normally seen at the base of the Eumeralla Formation, associated with spiky sonic response and often including coals. In some wells, topmost Pretty Hill Formation sands occur with the zone.

G. 7200 (cutts)-8777 ft. (swc) : *F. wonthaggiensis* Zone

Assignment is indicated at the top on youngest *Microfasta evansii* (data herein). This occurs consistently beneath, and so is not considered reworked. Youngest *Murospora florida* also occurs at this point but due to its scarcity, only weakly supports the assignment. Further, an influx of much darker palynomorphs suggests penetration of a significant unconformity. Amongst the darker fossils are rare *P. notensis* specimens, suggesting that the lower *C. hughesi*

Zone may extend a short distance below the unconformity. Overlap of M. evansii and P. notensis is not normally seen in clean samples in the Otway Basin, and so their . co-occurrence in cuttings is considered due to caving of P. notensis, as reworking of M. evansii is considered less likely. At the base, oldest Foraminisporis wonthaggiensis indicates the assignment (Wilschut data), and is supported by oldest D. speciosus at 8647 ft. (swc, Wilschut data). Cyathidites spp. dominate the assemblages, and an unusual influx of Contignisporites cooksoniae occurs at 7200 ft. (cutts, herein) and is probably caved into deeper samples. No significant change was noted at 7800 ft.

Wilschut (1974) assigned this interval to the C. hughesi Zone of Dettmann on very patchy data. It does not contradict the assignment herein.

Mostly non-marine environments are indicated by the common and diverse spores and pollen, common cuticle and presence of minor lacustrine algal Schizosporis spp.

Single specimens of the brackish indicator Micrhystridium were seen at 8900 ft. (caved in cuttings, data herein) and 8289 ft. (swc, Wilschut data). A single specimen of the dinoflagellate Fusiformacysta salasii at 8270 ft. (cutts) also suggests minor brackish influence.

These features are normally seen in the upper half of the Pretty Hill Formation.

H. 8900 ft. (cutts) : indeterminate

Yield from this sample was very poor, comprising mostly vitrinite and inertinite. A few spores and pollen show light spore colours suggesting that they are mostly or all caved. Cyathidites are dominant, but are not considered "in place". Wilschut (1974) showed top metamorphic basement at 8850 ft.

IV CONCLUSIONS

A. The section appears to be internally fairly complete, with no whole zones or subzones missing. At the base, however, deposition did not commence until mid Neocomian time, significantly after that elsewhere in the basin.

B. The best palynological boundaries are top upper paradoxa, top hughesi and base wonthaggiensis. Weaker boundaries are top lower paradoxa (due to the probable reworking at 4330 ft.), top striatus (in the absence of crisp swc data), top lower hughesi (as C. variabilis is always scarce), and top wonthaggiensis (in the absence of the swcs for re-examination).

C. Palynologically, the most likely location for the hughesi/wonthaggiensis boundary and so also the "the Pretty Hill unconformity" is in the gap 6900-7200 ft. This is on the basis of youngest M. evansii, the increase in spore colour (noted also by Wilschut 1974) and the weak support of youngest M. florida. The location of 7100 ft. suggested by Shell is therefore a likely candidate. No good palynological evidence exists for a deeper location, although the new data is weak as it is cuttings based. Restudy of the Shell swc preparations would have been vital if they could have been located.

D. I have not seen logs from this well, and so cannot comment of the correlation between the biostratigraphy and the usual log pattern.

V REFERENCES

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APPENDIX I

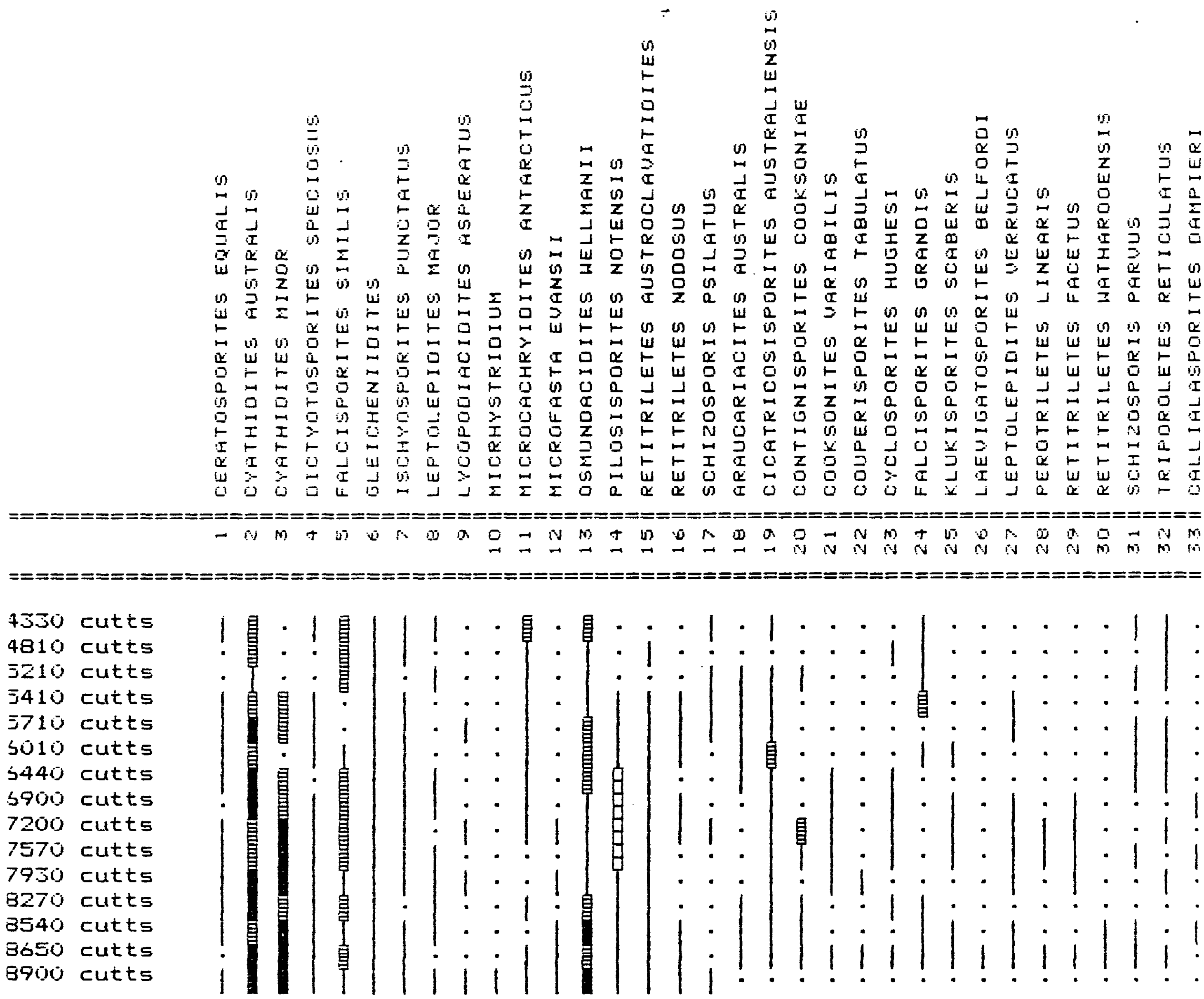
COMPOSITE PALYNOMORPH RANGE DATA

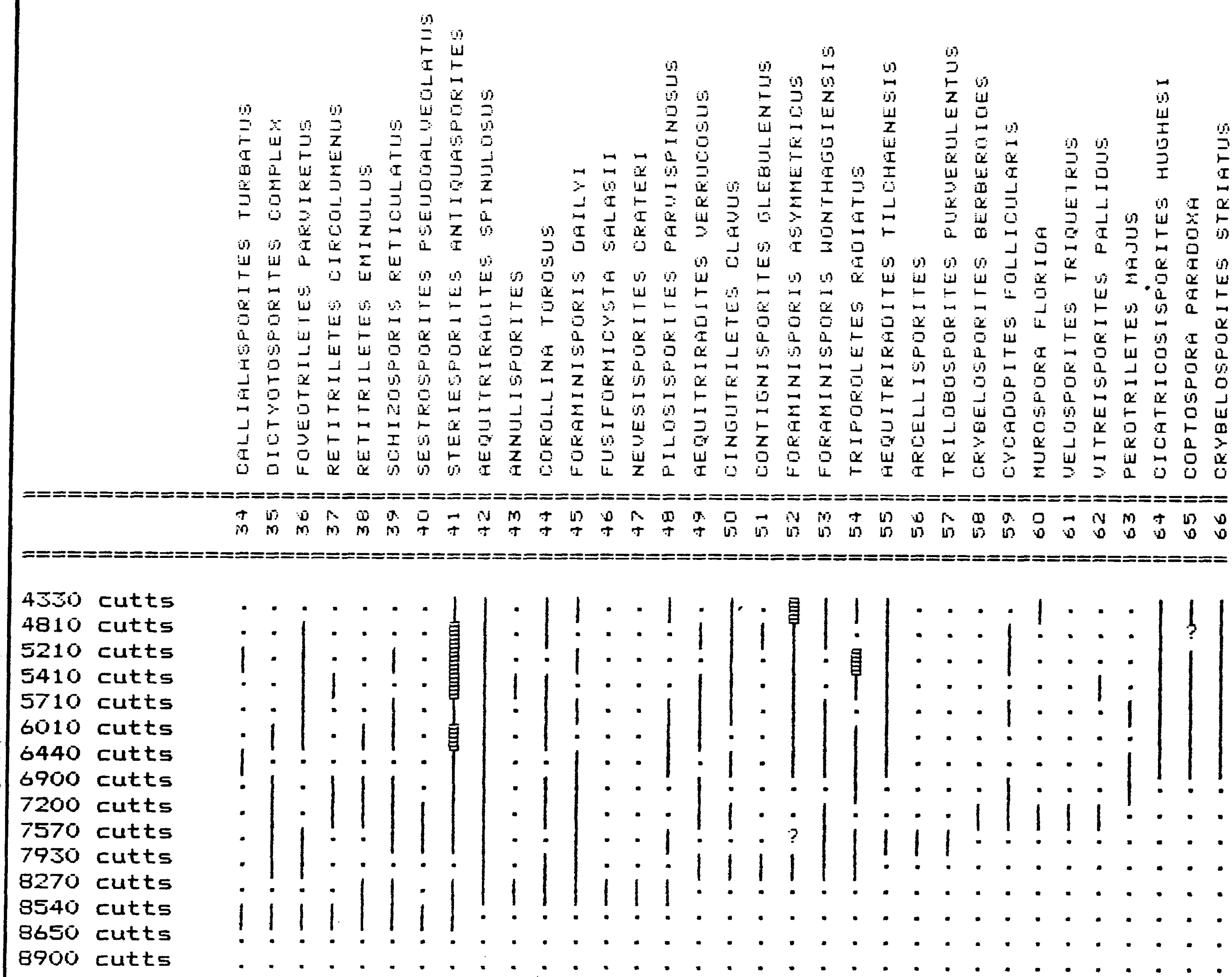
NORTH EUMERALLA - 1 COMPOSITE PALYNOLOGICAL DATA

RANGE CHART OF GRAPHIC ABUNDANCES BY LOWEST APPEARANCE

Key to Symbols

- = Very Rare
- = Rare
- = Few
- = Common
- = Abundant
- ? = Questionably Present
- . = Not Present





34 CALLIALASPORITES TURBATUS
35 DICTYOTOSPORITES COMPLEX
36 FOVEOTRILETES PARVIRETUS
37 RETITRILETES CIRCOLUMENUS
38 RETITRILETES EMINULUS
39 SCHIZOSPORIS RETICULATUS
40 SESTROSPORITES PSEUDOALVEOLATUS
41 STERIESPORITES ANTIQUASPORITES
42 AEQUITRIRADITES SPINULOSUS
43 ANNULISPORITES
44 COROLLINA TOROSUS
45 FORAMINISPORIS DAILYI
46 FUSIFORMICYSTA SALASII
47 NEVESISPORITES CRATERI
48 PILOSISPORITES PARVISPINOSUS
49 AEQUITRIRADITES VERRUCOSUS
50 CINGUTRILETES CLAVUS
51 CONTIGNISPORITES GLEBULENTUS
52 FORAMINISPORIS ASYMMETRICUS
53 FORAMINISPORIS WONTHAGGIENSIS
54 TRIPOROLETES RADIATUS
55 AEQUITRIRADITES TILCHAENESIS
56 ARCELLISPORITES
57 TRILOBOSPORITES PURVERULENTUS
58 CRYBELOSPORITES BERBEROIDES
59 CYCADOPITES FOLLICULARIS
60 MUROSPORA FLORIDA
61 VELOSPORITES TRIQUETRUS
62 VITREISPORITES PALLIDUS
63 PEROTRILETES MAJUS
64 CICATRICOSISPORITES HUGHESI
65 COPTOSPORA PARADOXA
66 CRYBELOSPORITES STRIATUS
4330 cutts
4810 cutts
5210 cutts
5410 cutts
5710 cutts
6010 cutts
6440 cutts
6900 cutts
7200 cutts
7570 cutts
7930 cutts
8270 cutts
8540 cutts
8650 cutts
8900 cutts

4330 cutts
4810 cutts
5210 cutts
5410 cutts
5710 cutts
6010 cutts
6440 cutts
6900 cutts
7200 cutts
7570 cutts
7930 cutts
8270 cutts
8540 cutts
8650 cutts
8900 cutts

67 DICTYOTOSPORITES
68 FOVEOTRILETES MORETONENSIS
69 MATONISPORITES COOKSONIAE
70 BALMEISPORITES HOLODICTYUS
71 CONCAVISSIMISPORITES PENOLAENSIS
72 COPTOSPORA STRIATA
73 DICTYOTOSPORITES FILOSUS
74 NEORAISTRICKIA
75 TRILOBOSPORITES TRIORETICULOSUS
76 TRIPOROLETES SIMPLEX
77 COPTOSPORA WRINKLY
78 JANUASPORITES SPINULOSUS
79 TRILOBOSPORITES TRIBOTRYS
80 BALMEISPORITES TRIDICTYUS
81 CICATRICOSISPORITES LUDBROOKIAE
82 FOVEOSPORITES CANALIS
83 PILOSISPORITES GRANDIS
84 COPTOSPORA SP A (PORTHOLE)
85 DICTYOPHYLLIDITES
86 PHIMOPOLLENITES PANNOSUS
87 BOTRYOCOCCUS

4330 cutts
4810 cutts
5210 cutts
5410 cutts
5710 cutts
6010 cutts
6440 cutts
6900 cutts
7200 cutts
7570 cutts
7930 cutts
8270 cutts
8540 cutts
8650 cutts
8900 cutts

SPECIES LOCATION INDEX

Index numbers are the columns in which species appear.

INDEX NUMBER	SPECIES
42	AEQUITRIRADITES SPINULOSUS
55	AEQUITRIRADITES TILCHAENESIS
49	AEQUITRIRADITES VERRUCOSUS
43	ANNULISPORITES
18	ARAUCARIACITES AUSTRALIS
56	ARCELLISPORITES
70	BALMEISPORITES HOLODICTYUS
80	BALMEISPORITES TRIDICTYUS
87	BOTRYOCOCCUS
33	CALLIALASPORITES DAMPIERI
34	CALLIALASPORITES TURBATUS
1	CERATOSPORITES EQUALIS
19	CICATRICOSISPORITES AUSTRALIENSIS
64	CICATRICOSISPORITES HUGHESI
81	CICATRICOSISPORITES LUDBROOKIAE
50	CINGUTRILETES CLAVUS
71	CONCAVISSIMISPORITES PENOLAENSIS
20	CONTIGNISPORITES COOKSONIAE
51	CONTIGNISPORITES GLEBULENTUS
21	COOKSONITES VARIABILIS
65	COPTOSPORA PARADOXA
84	COPTOSPORA SP A (PORTHOLE)
72	COPTOSPORA STRIATA
77	COPTOSPORA WRINKLY
44	COROLLINA TOROSUS
22	COUPERISPORITES TABULATUS
58	CRYBELOSPORITES BERBEROIDES
66	CRYBELOSPORITES STRIATUS
2	CYATHIDITES AUSTRALIS
3	CYATHIDITES MINOR
59	CYCADOPITES FOLLICULARIS
23	CYCLOSPORITES HUGHESI
85	DICTYOPHYLLIDITES
67	DICTYOTOSPORITES
35	DICTYOTOSPORITES COMPLEX
73	DICTYOTOSPORITES FILOSUS
4	DICTYOTOSPORITES SPECIOSUS
24	FALCISPORITES GRANDIS
5	FALCISPORITES SIMILIS
52	FORAMINISPORIS ASYMMETRICUS
45	FORAMINISPORIS DAILYI
53	FORAMINISPORIS WONTHAGGIENSIS
82	FOVEOSPORITES CANALIS
68	FOVEOTRILETES MORETONENSIS
36	FOVEOTRILETES PARVIRETUS
46	FUSIFORMICYSTA SALASII
6	GLEICHENIIDITES
7	ISCHYOSPORITES PUNCTATUS
78	JANUASPORITES SPINULOSUS
25	KLUKISPORITES SCABERIS
26	LAEVIGATOSPORITES BELFORDI
8	LEPTOLEPIDITES MAJOR
27	LEPTOLEPIDITES VERRUCATUS
9	LYCOPODIACIDITES ASPERATUS
69	MATONISPORITES COOKSONIAE
10	MICRHYSTRIDIUM
11	MICROCACHRYIDITES ANTARCTICUS
12	MICROFASTA EVANSII
60	MUROSPORA FLORIDA
74	NEORAISTRICKIA

11	MICROCACHRYIDITES ANTARCTICUS
12	MICROFASTA EVANSII
60	MUROSPORA FLORIDA
74	NEORAISTRICKIA
47	NEVESISPORITES CRATERI
13	OSMUNDACIDITES WELLMANII
28	PEROTRILETES LINEARIS
63	PEROTRILETES MAJUS
86	PHIMOPOLLENITES PANNOSUS
83	PILOSISPORITES GRANDIS
14	PILOSISPORITES NOTENSIS
48	PILOSISPORITES PARVISPINOSUS
15	RETITRILETES AUSTROCLAVATIDITES
37	RETITRILETES CIRCOLUMENUS
38	RETITRILETES EMINULUS
29	RETITRILETES FACETUS
16	RETITRILETES NODOSUS
30	RETITRILETES WATHAROOENSIS
31	SCHIZOSPORIS PARVUS
17	SCHIZOSPORIS PSILATUS
39	SCHIZOSPORIS RETICULATUS
40	SESTROSPORITES PSEUDOALVEOLATUS
41	STERIESPORITES ANTIQUASPORITES
57	TRILOBOSPORITES PURVERULENTUS
79	TRILOBOSPORITES TRIBOTRYS
75	TRILOBOSPORITES TRIORETICULOSUS
54	TRIPOROLETES RADIATUS
32	TRIPOROLETES RETICULATUS
76	TRIPOROLETES SIMPLEX
61	VELOSPORITES TRIQUETRUS
62	VITREISPORITES PALLIDUS