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OTWAY BASIN

NEW PALYNOLOGY OF CASTERTON-1,

ONSHORE OTWAY BASIN, VICTORIA

PALYNOLOGY OF CASTERTON-1

BY

ROGER MORGAN

for MINORA RESOURCES NOVEMBER, 1988.

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NEW PALYNOLOGY OF CASTERTON-1

ONSHORE OTWAY BASIN, VICTORIA

BY

ROGER MORGAN

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I SUMMARY

1400-1800 ft. (cutts) : lower C. paradoxa Zone : mid Albian : non-marine

2016 (core)-2300 ft. (cutts) (2027 ft. core) : C. striatus Zone : early Albian : non-marine

2430 (core)-4400 ft. (cutts) (3596 ft. core) : lower C. hughesi Zone : early Aptian

?4908 (core) (5280 ft. core)-5968 ft. (core) : F. wonthaggiensis Zone : late Neocomian : non-marine to slightly brackish

6406 (core)-6769 ft. (core) : upper C. australiensis Zone : early Neocomian : non-marine

7253 (core)-7957 ft. (core) : lower C. australiensis to R. watherooensis Zones : non-marine

There remains some problems with this well in the lower C. hughesi interval, for a variety of reasons.

II INTRODUCTION

Ed Kopson of Minora Resources submitted 5 new cuttings samples from the Early Cretaceous for palynostratigraphy. This was on behalf of the operating group, as part of regional appraisal of the area. Earlier work available herein included a study of the cores reported in Morgan (1986) and a summary table of core assignment by Evans (1966). The raw data of Morgan (1986) and the samples studied herein is combined in this report.

Palynomorph occurrence data are shown as Appendix I and form the basis for the assignment of the samples to six spore-pollen units of ?Late Jurassic to mid 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	
	Albian – Middle	upper C. paradoxa	
	Albian – 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. 1400 ft. (cutts)-1800 ft. (cutts) : lower C. paradoxa Zone

Assignment to the lower Coptospora paradoxa Zone is indicated at the top by youngest Pilosisporites notensis and Dictyotosporites speciosus. P. notensis is relatively frequent. At the base, oldest C. paradoxa indicates the assignment, although it could be caved a short distance. The absence of Pilosisporites grandis or Perotriletes majus suggest the absence of the upper C. paradoxa Zone from the well. The presence of Trilobosporites trioreticulosus and T. tribotrys indicates that the topmost lower C. paradoxa Zone is present. Cyathidites, Falcisporites, Cicatricosisporites australiensis and Stereisporites antiquasporites are frequent in the assemblage.

Earlier work did not include samples from this level.

Non-marine environments are indicated by the common and diverse spores and pollen, frequent cuticle, and absence of spiny acritarchs. The presence of algal Botryococcus and Schizosporis spp. suggests freshwater lacustrine influence.

These features are normally seen in the middle Eumeralla Formation.

B. 2016 ft. (core)-2300 ft. (cutts) : C. striatus Zone

The core at 2016-27 ft. is assigned as discussed by Morgan (1986). Cuttings at 2300 ft. studied herein contains C. striatus (apparently in place on spore colour) without older indicators. The sample is therefore assigned to the *C. striatus* Zone although it is possible that *C. striatus* is caved a short distance, in which case a *C. hughesi* Zone assignment would be indicated. The dominance of *Cyathidites* spp. is consistent with the assignment.

These data are consistent with the assignment by Evans (1966) of core 1 (2017 ft.) to his K1d (= *C. striatus* Zone).

Non-marine environments are indicated by the common and diverse spores and pollen and absence of spiny acritarchs. Minor lacustrine influence is suggested by rare *Schizosporis* spp.

These features are normally seen in the middle Eumeralla Formation.

C. 2430 ft. (core)-4400 ft. (cutts) : lower *C. hughesi* Zone

Data utilised consist of four core samples from Morgan (1986) and two cuttings samples herein (4000 ft. and 4400 ft.). Assignment is apparently clear cut with youngest consistent *Cooksonites variabilis* and *Cyclosporites hughesi* at the top (core at 2430 ft. Morgan 1986 data), and oldest *Pilosisporites notensis* in core at 3596 (1986 data), and apparently in place (on spore colour) at 4400 ft. in cuttings (herein). *Cyathidites* spp. and *Osmundacidites wellmannii* are frequent throughout.

These data are most confusing. Firstly, the core depths listed by Evans (1966) (core 2 = 2425 ft. core 3 = 3142-52 ft., core 4 = 3601 ft.) correspond to only two of Morgan's four cores (2430 ft. and 3596 ft.).

The other samples labelled as core by Morgan (2507-12 ft. containing a Cyathidites dominated non-diagnostic possibly pre Aptian assemblage and 2609-18 ft. containing an apparently C. hughesi assemblage) therefore may be mislabelled by depth or even well, and may be best ignored. Re-examination of the core boxes would establish whether core is curated from the unexpected depths.

Secondly, this data conflicts with Evans (1966) who assigned cores down to core 3 (3142-52 ft.) to his Kld unit (= C. striatus Zone). I cannot duplicate his results and so cannot support them. The possibility exists that the cores have become confused and mixed up during repeated examination over a long period of time and that the marked depths are not reliable. Resampling of cores may or may not clarify the issue.

Non-marine environments are indicated by the common and diverse spores and pollen and absence of spiny acritarchs. The lacustrine algal forms Schizosporis and Microfasta are present.

D. ?4908 ft. (core) 5280 ft. (core)-5968 ft. (core) : F. wonthaggiensis Zone

Assignment is on the basis of Morgan's (1986) data. At the top, absence of younger indicators is diagnostic. However, samples at 4908-17 ft. and 5084 ft. are quite lean, and absences may not be definitive. A much better yield was obtained at 5280 ft., and is considered definitive. Other discussion is unaltered from Morgan (1986).

E. 6406 ft. (core)-6769 ft. (core) : upper *C. australiensis* Zone
7253 ft. (core)-7957 ft. (core) : lower *C. australiensis* to *R. watherooensis* Zones

These intervals have not been re-examined and the discussion from Morgan (1986) still stands.

IV CONCLUSIONS

A. The new cuttings sampling provides infill information between the previous conventional core data. The *C. paradoxa* Zone is recognised for the first time, and the extent of the *C. striatus* and lower *C. hughesi* Zones is extended.

B. The core data of Morgan (1986) at 2507-12 ft. and 2609-18 ft. are now considered suspect, as they do not correspond to the core depths, as recorded by Evans (1966). Re-examination of the core at 2430 ft. however, confirms its lower *C. hughesi* Zone assignment which is in conflict with Evans (1966). Resampling of the cores in this interval might help.

C. The studied section appears to be largely complete, although the upper *C. hughesi* Zone has not yet been recognised and may be thin. At the top, the section is probably truncated.

V REFERENCES

Dettmann, M.E. and Douglas, J.G. (1976) Palaeontology. In Geology of Victoria Ed. Douglas, J.G. and Ferguson, J.A. Eds. Geol. Soc. Austr. Sp. publ. 5 164-176

Dettmann, M.E. and Playford, G., (1969) Palynology of the Australia Cretaceous : a review. In Stratigraphy and Palaeontology, Essays in honour of Dorothy Hill, KSW Campbell Ed. ANU Press, Canberra, 174-210

Evans, P.R. (1966) Mesozoic Stratigraphic Palynology in the Otway Basin Bur. Min. Rescour. Rec. 1966/69

Helby, R.J., Morgan, R.P. and Partridge, A.D. (1987) A palynological zonation of the Australian Mesozoic Australas. Assoc. Palaeont., Mem. 4

Morgan, R.P. (1986) Otway Basin oil drilling : a selective palynology review unpubl. rept. for P. Connard

APPENDIX I

COMPOSITE PALYNOMORPH RANGE DATA

CASTERTON #1.. ..COMPOSITE PALYNOLOGICAL DATA.. ..

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C L I E N T: Minora Resources

W E L L: Casterton #1

F I E L D / A R E A: Otway Basin

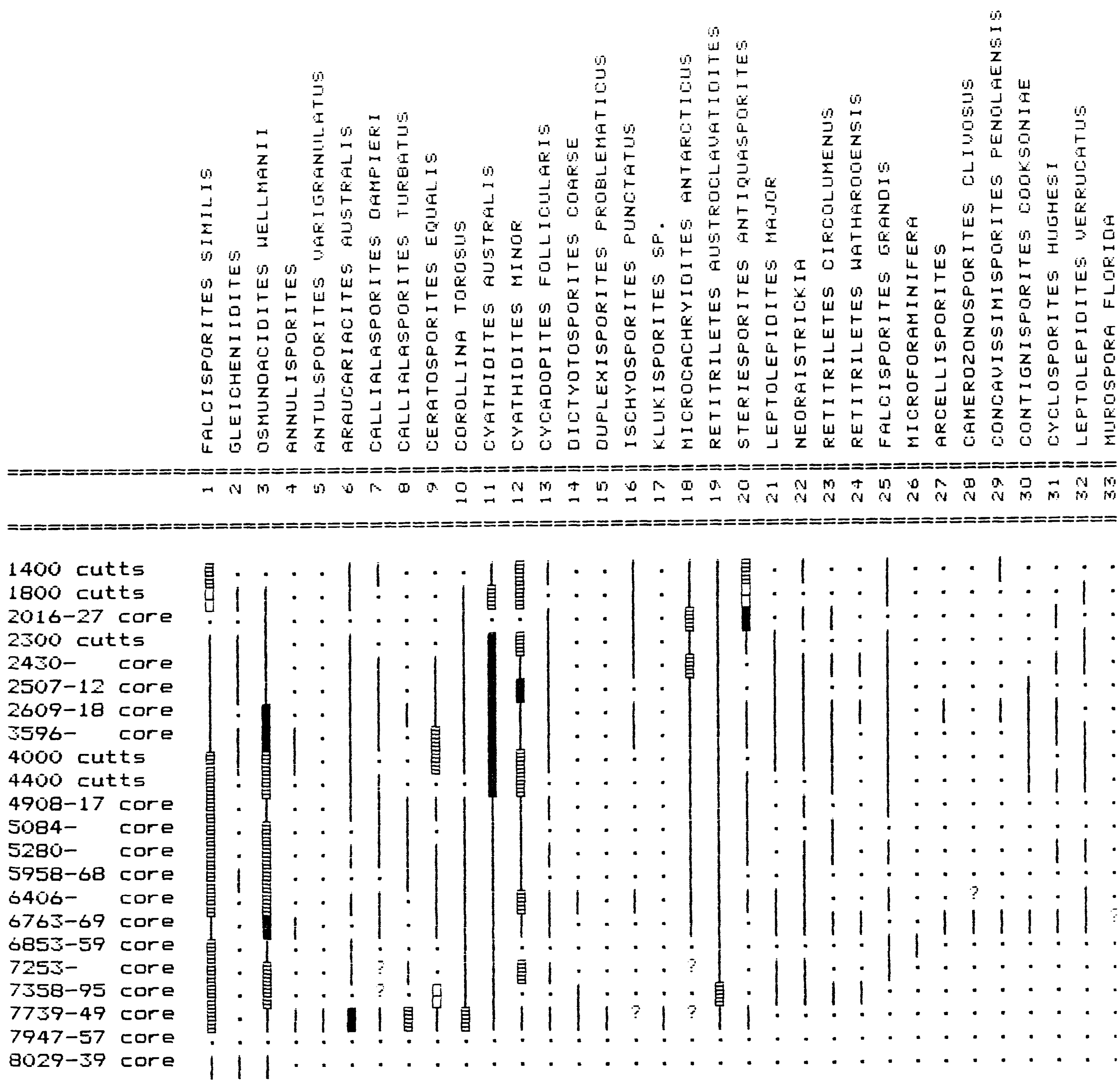
A N A L Y S T: Roger Morgan　　D A T E : November '88

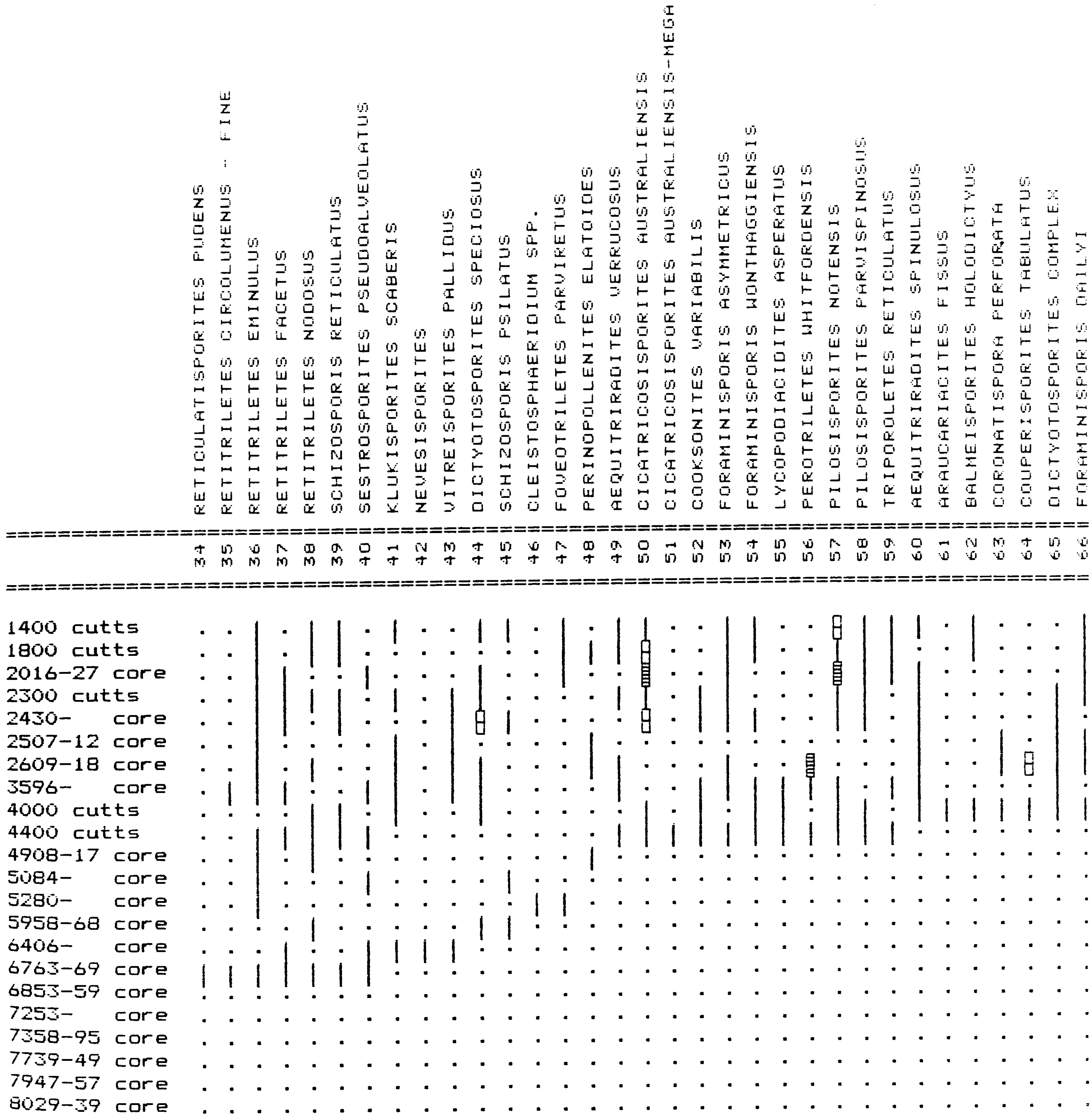
N O T E S: all sample depths are in feet

RANGE CHART OF GRAPHIC ABUNDANCES BY LOWEST APPEARANCE

Key to Symbols

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




34 RETICULATISPORITES PUDENS
35 RETITRILETES CIRCOLUMENUS - FINE
36 RETITRILETES EMINULUS
37 RETITRILETES FACETUS
38 RETITRILETES NODOSUS
39 SCHIZOSPORIS RETICULATUS
40 SESTROSPORITES PSEUDOALVEOLATUS
41 KLUKISPORITES SCABERIS
42 NEVESISPORITES
43 VITREISPORITES PALLIDUS
44 DICTYOTOSPORITES SPECIOSUS
45 SCHIZOSPORIS PSILATUS
46 CLEISTOSPHAERIDIUM SPP.
47 FOVEOTRILETES PARVIRETUS
48 PERINOPOLLENITES ELATOIDES
49 AEQUITRIRADITES VERRUCOSUS
50 CICATRICOSISPORITES AUSTRALIENSIS
51 CICATRICOSISPORITES AUSTRALIENSIS-MEGA
52 COOKSONITES VARIABILIS
53 FORAMINISPORIS ASYMMETRICUS
54 FORAMINISPORIS WONTHAGGIENSIS
55 LYCOPODIACIDITES ASPERATUS
56 PEROTRILETES WHITFORDENSIS
57 PILOSISPORITES NOTENSIS
58 PILOSISPORITES PARVISPINOSUS
59 TRIPOROLETES RETICULATUS
60 AEQUITRIRADITES SPINULOSUS
61 ARAUCARIACITES FISSUS
62 BALMEISPORITES HOLODICTYUS
63 CORONATISPORA PERFORATA
64 COUPERISPORITES TABULATUS
65 DICTYOTOSPORITES COMPLEX
66 FORAMINISPORIS DAILYI
1400 cutts
1800 cutts
2016-27 core
2300 cutts
2430- core
2507-12 core
2609-18 core
3596- core
4000 cutts
4400 cutts
4908-17 core
5084- core
5280- core
5958-68 core
6406- core
6763-69 core
6853-59 core
7253- core
7358-95 core
7739-49 core
7947-57 core
8029-39 core

	67 SCHIZOSPORIS PARVUS	68 CONTIGNISPORITES GLEBULENTUS	69 FOVEOSPORITES MORETONENSIS	70 JANUASPORITES SPINULOSUS	71 MICROFASTA EVANSII	72 PEROTRILETES LINEARIS	73 TRIPOROLETES RADIATUS	74 TRIPOROLETES SIMPLEX	75 VELOSPORITES TRIQUETRUS	76 CICATRICOSISPORITES LUDBROOKIAE	77 HOROLOGINELLA SP.	78 PEROTRILETES PSILATE	79 PEROTRILETES SP.A.	80 SCHIZOSPORIS SP.	81 COPTOSPORA PARADOXA	82 LAEVIGATOSPORITES BELFORDI	83 AEQUITRIRADITES TILCHAENESIS	84 BIRETRISPORITES	85 CINGUTRILETES CLAVUS	86 CRYBELOSPORITES STRIATUS	87 TRILOBOSPORITES TRIBOTRYS	88 TRILOBOSPORITES TRIORETICULOSUS	89 COPTOSPORA STRIATA	90 TRILOBOSPORITES PURVERULENTUS	91 BOTRYOCOCCUS	92 DICTYOPHYLLIDITES	93 PILOSISPORITES GRANDIS
1400 cutts	.	.	.	.	.	.	│	.	.	.	.	.	.	.	│	.	.	.	.	│	│	│	.	.	│	│	│
1800 cutts	.	.	.	.	.	.	│	│	.	.	.	.	.	.	│	.	.	.	.	│	.	│	.	.	.	.	.
2016-27 core	.	.	.	.	.	.	.	.	│	│	.	.	.	.	.	.	│	.	.	│	.	.	?	│	.	.	.
2300 cutts	│	.	.	.	.	.	.	.	.	.	.	.	.	.	│	.	.	.	│	│	│	│	.	.	.	.	.
2430- core	.	.	│	.	.	.	□	.	│	.	.	.	.	.	.	.	│	│	.	.	.	.	.	.	.	.	.
2507-12 core	.	│	.	.	│	.	│	.	│	.	.	.	.	.	?	│	.	.	.	.	.	.	.	.	.	.	.
2609-18 core	.	.	.	.	│	.	.	│	│	│	│	▤	▤	│	.	.	.	.	.	.	.	.	.	.	.	.	.
3596- core	.	│	│	│	▤	│	│	│	│	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4000 cutts	│	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4400 cutts	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
4908-17 core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5084- core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5280- core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
5958-68 core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6406- core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6763-69 core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
6853-59 core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7253- core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7358-95 core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7739-49 core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
7947-57 core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
8029-39 core	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

SPECIES LOCATION INDEX

Index numbers are the columns in which species appear.

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49	AEQUITRIRADITES VERRUCOSUS
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84	BIRETRISPORITES
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85	CINGUTRILETES CLAVUS
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14	DICTYOTOSPORITES COARSE
65	DICTYOTOSPORITES COMPLEX
44	DICTYOTOSPORITES SPECIOSUS
15	DUPLEXISPORITES PROBLEMATICUS
25	FALCISPORITES GRANDIS
1	FALCISPORITES SIMILIS
53	FORAMINISPORIS ASYMMETRICUS
66	FORAMINISPORIS DAILYI
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17	KLUKISPORITES SP.
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88	TRILOBOSPORITES TRIORETICULOSUS
73	TRIPOROLETES RADIATUS
59	TRIPOROLETES RETICULATUS
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75	VELOSPORITES TRIQUETRUS
43	VITREISPORITES PALLIDUS