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NEW PALYNOLOGY OF FERGUSONS HILL-1

ONSHORE OTWAY BASIN, AUSTRALIA

BY

ROGER MORGAN

for BHP Australia

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REF:OTW.FERGHILL

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CONTENTS

I SUMMARY

Thirty five new samples (9 core, 26 cuttings) have been studied mostly to refine Late Cretaceous control in the well. Previous raw data from an extensive core suite in the Early Cretaceous is not available, and the existing preparations are believed lost in the Brisbane flood. The text of the orginal report by Dettmann (1964) and a table by Wilschut (undated) have been considered to produce the following breakdown.

depth unknown : longus Zone (druggii dino Zone) : Maastrichtian : marine (seen in cavings beneath this point)

323m(cutts) - 335m(cutts) : indeterminate

354m(cutts) - 463m(cutts) : ?senectus Zone or indeterminate : ?Campanian : marine

475m(core) - 497m(cutts) : upper apoxyexinus Zone (cretacea dino Zone) : Santonian : nearshore to intermediate marine (marine maxima at 497m and 480m)

503m(cutts) - 543m(cutts) : middle apoxyexinus Zone (cretacea dino Zone) : Santonian : intermediate marine shallowing to nearshore marine (marine maximum at 543m)

579m(cutts) - ?661m(cutts) : lower apoxyexinus Zone (porifera dino Zone 579-610m) : Santonian : nearshore to intermediate marine (marine maxima at 619m and 543m)

741m(core) - 745m(core) : mawsonii Zone (infusorioides dino Zone 743-745m) : Coniacian-Turonian : marginal marine

792m(cutts) - 948m(core) : ?pannosus Zone : late Albian : non-marine

1042m(core) - 1554m(core) : upper *paradoxa* Zone : mid to late Albian : non-marine

1693m(core) - 2002m(core) : lower *paradoxa* Zone : mid Albian : non-marine

2145m(core) - 2239m(core) : *striatus* Zone : early Albian : non-marine

2262m(cutts) - 2674m(core) : upper *hughesi* Zone : Aptian : non-marine

2808m(core) - ?3530m(cutts) : lower *hughesi* Zone at the top and possibly to the base : Aptian : non-marine

II INTRODUCTION

Paul Carroll and David Pickavance of BHP Petroleum initiated palynological review of several wells pertinent to their acreage. In Fergusons Hill-1, they sought improved resolution throughout the late Cretaceous to facilitate sequence stratigraphic analaysis. A small number of Early Cretaceous cuttings have also been studied. Raw data from the original report (Dettmann 1964) cannot be located, and the original slide preparations are similarly lost, perhaps in the Brisbane flood. New study from cores in the Early Cretaceous would improve resolution, although maturity near TD is very high and yields would be poor. Wilschut (undated) provided a breakdown for Fergusons Hill-1 in the Ross Creek-1 report and that information has been incorporated here.

Extensive cuttings study has two main advantages but also two main disadvantages. The first advantage is that the data becomes semicontinuous and key horizons can be seen in the cavings and not missed because they occur between the point sampling of swcs or due to unfavourable facies at the swc depth. The second advantage is that a downhole or extinction based zonation can be developed which works in cuttings and therefore provides a powerful tool to monitor drilling and enable cost efficient drilling and engineering decisions especially early TD. Quite accurate predictions ahead of swcs, logs and the bit are possible.

The first major disadvantage is that potential caving renders all oldest occurrences (or inceptions in time) of doubtful value. Thus the established zonations which particularly in Australia are based on oldest occurrences from extensive swc suites, do not work well. Youngest occurrence or extinction events in close proximity to the established zone boundaries need to be established to continue to use the established zonation. Alternatively, the existing zonation can be abandoned and a new one erected based on extinction events.

I have tried to do both herein, working within the established zonaton of Helby, Morgan and Partridge (1987), but initiating a set of 38 numbered horizons. The most obvious (and therefore most reliable) bear the whole numbers 1 to 15 from youngest to oldest and are all extinction or major acme events reliably identifiable from cuttings. The other twenty three horizons bear a number and a lower case letter to show their lower level of confidence and their usual stratigraphic location. For example, horizons 7a, 7b, 7c and 7d occur from youngest to oldest, between major horizons 7 and 8, but are less reliable and therefore may crosscut the major horizons. They comprise mostly oldest occurrences in cuttings or youngest occurrences of rare species. The relationship of the two schemes are shown in figure 1 and the discussions herein is within the existing zonal framework.

The second major disadvantage to extensive cuttings study is that heavy caving can obscure subtle events due to dilution. Inspection of a caliper log can indicate the extent of caving, but even small quantities of a richly fossiliferous rock can obscure subtle horizons in a sparsely fossiliferous rock beneath. In such cases, identification of marine maxima and maximum flooding surfaces must be tempered with caution.

The best of both alternatives can be achieved by a mix of swcs and cuttings. Downhole monitoring can be readily achieved by 50 to 100m cuttings, followed up by extensive swc suites to close sampling gaps to around 30m.

Detailed correlation is possible using the data herein and is the subject of a separate report. Raw data are presented in Appendix I.

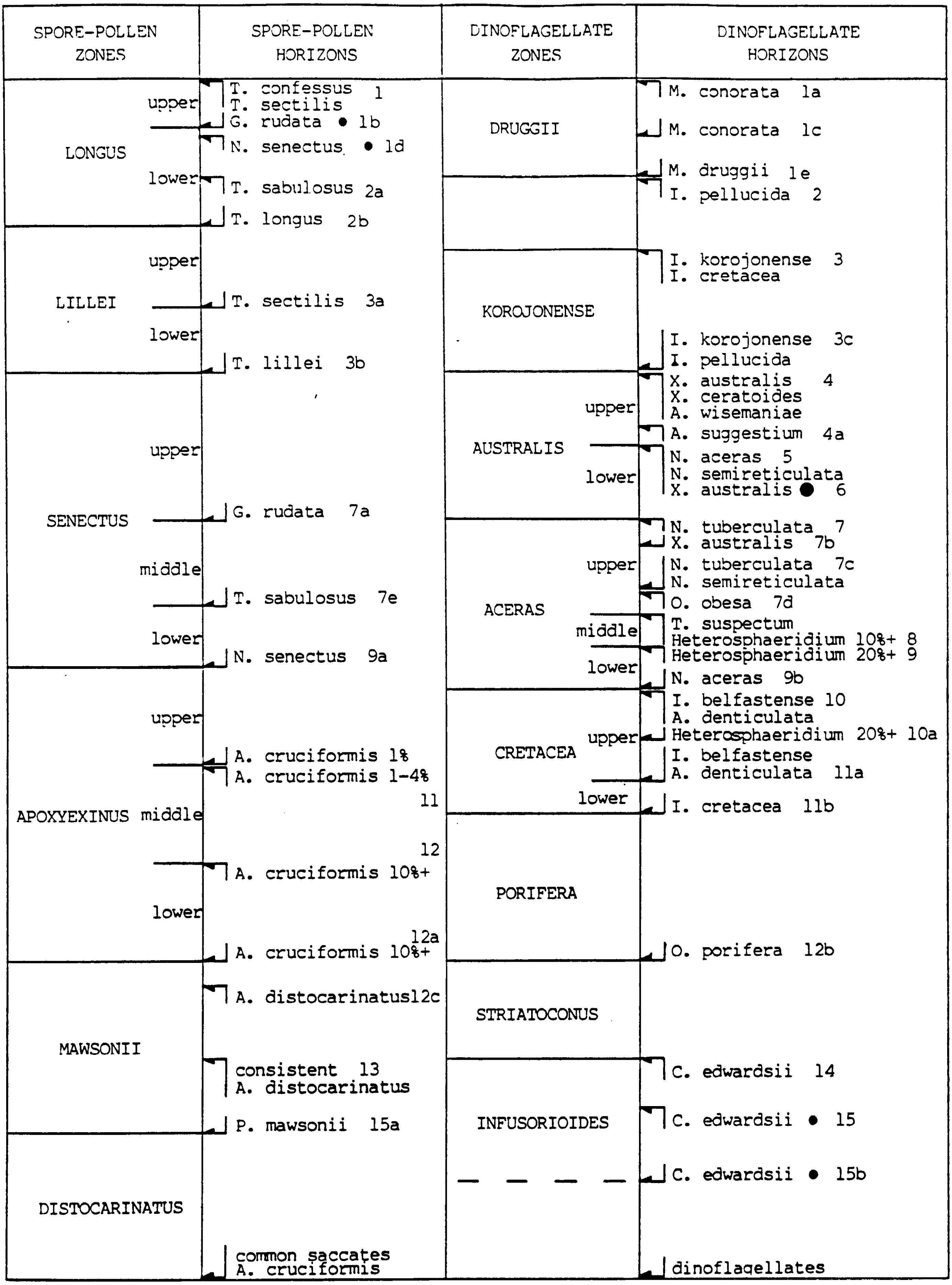

FIGURE 1 ZONATION USED HEREIN SHOWING THE NUMBERED HORIZONS AGAINST THE EXISTING FORMAL ZONATION.

● =frequent (4-10%) ⬤=common (11-30%)

III PALYNOSTRATIGRAPHY

A longus Zone (druggii dino Zone) represented as caving at 436m. As discussed below rare Manumiella conorata exists at 436m in cuttings indicating the longus spore-pollen Zone and the druggii dino Zone (horizon 1a), but must be caved at that point. It must exist near here as a thin marine horizon.

B 323m(cutts) - 335m(cutts) : indeterminate

These two new cuttings samples are from sands considered to be Late Cretaceous Timboon Sand, but they are extremely lean and contain nothing definitively Late Cretaceous. The assemblages are probably mostly caved from the Tertiary above.

At 323m, Proteacidites and Cyathidites are the most numerous, but rare elements include Gambierina rudata (balmei-senectus Zones) and Malvacipollis subtilis (upper balmei-tuberculatus Zones). Clearly a Paleocene balmei Zone assignment or older is indicated. No dinoflagellates were seen, suggesting non-marine environments, but too few specimens were seen to be definitive.

At 335m(cutts), Proteacidites, Araucariacites and Microcachryidites are the most numerous, but no spore-pollen species are particularly age diagnostic. Apectodinium hyperacanthum is a rare dinoflagellate element however, and indicates a late Paleocene upper balmei spore-pollen zone assignment. The rare dinoflagellates suggest a marginal marine environment, but too few specimens were seen to be definitive, and all may be caved.

C 354m(cutts) - 463m(cutts) : ?senectus Zone or indeterminate

These six samples are similarly extremely lean from sandy section, but they contain some rare late Cretaceous restricted elements. At 354m(cutts), Proteacidites and Gleicheniidites are frequent and rare elements include Amosopollis cruciformis (Late Cretaceous restricted) and the dinoflagellate Heterosphaeridium solida (australis to infusorioides dino Zones). A senectus zone or older zone is therefore indicated. At 366m(cutts), the assemblage is similar, but no age diagnostic taxa were seen. At 381m(cutts), the extremely lean assemblage includes Nothofagidites senectus (senectus Zone and younger), Chatangiella spp, and a probable Xenikoon australis (australis dino Zone = upper senectus Zone).

At 408m, the assemblage is extremely lean but again includes H. solida. At 436m, a slightly better yield includes Manumiella conorata which is restricted to the druggii dinoflagellate zone, correlative of the Maastrichtian longus spore-pollen zone. This is almost certainly caved from a point at topmost Cretaceous. The spore-pollen are not age diagnostic. At 463m(cutts) a richer assemblage includes prominent Falcisporites and Microcachryidites with prominent Heterosphaeridium heteracanthum amongst the dinoflagellates.

In summary, although assemblages are extremely poor, most contain elements suggesting the senectus spore-pollen zone of Campanian age. Marine environments are suggested throughout by the presence of dinoflagellates, but they are always subordinate to the spore-pollen, suggesting the nearshore to marginal marine range.

D 475m(core) - 497m(cutts) : upper apoxyexinus Zone (cretacea dino Zone 475-543m)

Assignment to the upper Tricolporites apoxyexinus Zone (= Tricolpites pachyexinus Zone of previous usage) of Santonian age is indicated at the top by the absence of younger indicators such as N. senectus and by the dinoflagellate horizon youngest Isabelidinium belfastense and Amphidiadema denticulata (horizon 10). Other features coincident include youngest Odontochitina obesa (horizon 7d) youngest Trithyrodinium suspectum (horizon 8) and youngest Heterosphaeridium 20%+ (horizon 9). These events are bunched together here either due to unfavourable sandy facies above, or due to unconformity. The base of the interval is taken at the sample above the downhole influx of Amosopollis cruciformis (horizon 11).

Other correlative horizons include youngest Chatangiella victoriensis (usually at or slightly above horizon 10), oldest Heterosphaeridium 20%+ (horizon 10a) oldest Tricolpites confessus (intra apoxyexinus) all at 475m. Within the interval, spores and pollen dominate with Falcisporites common and Dilwynites, Phyllocladidites mawsonii, Microcachyidites and Cyathidites frequent and Australopollis obscurus consistent. A. cruciformis is rare (1-2%) throughout. Amongst the dinoflagellates, Heterosphaeridium dominate at the top, with Odontochitina and Trithyrodinium frequent towards the base. The presence of Isabelidinium cretaceum, I. belfastense and A. denticulata into core beneath, indicates the cretacea dino Zone to the base and beyond, and that horizon 11a lies below this interval. Gillinia hymenophora has its youngest occurrence at 497m.

Nearshore to intermediate marine environments are indicated with dinoflagellate contents of 10% with moderate diversity at 480m to 38% with moderate diversity at 497m(cutts) and 31% with moderate diversity at 475m. These two marine maxima may represent maximum flooding surfaces, although the assemblage at 497m may be partly caved. The marine maximum at 475m correlates tightly to an identical one in several other wells nearby.

E 503m(cutts) - 543m(core) : middle apoxyexinus Zone (cretacea dino Zone)

Assignment to the middle Tricolporites apoxyexinus Zone of Santonian age is indicated by the intermediate A. cruciformis content (mostly 2-10%). At the top (503m), A. cruciformis is anomolously high (22%) but this is taken as horizon 11, as contents below are all in the range 2-11%. The base is taken on the sample above the massive increase of A. cruciformis to 32% at 579m (horizon 12). Within the interval, oldest A. denticulata and I. belfastense occurs at 539m core (horizon 11a) and oldest I. cretacea at 543m core (horizon 11b) and 579m (cuttings) where it is probably caved. Oldest Tricolpites gillii (usually intra apoxyexinus) occurs at 539m (core) and oldest frequent thick walled Trithyrodinium occurs at 521m (cutts). Youngest consistent Circulodinium deflandrei occurs at 503m (cutts).

Amongst the spore-pollen, Falcisporites are common with Microcachryidites, P. mawsonii, Dilwynites, Cyathidites and A. cruciformis frequent. Of the dinoflagellates, Heterosphaeridium spp, Isabelidinium spp and Circulodinium deflandrei are the most numerous, although none are common.

Intermediate marine environments are indicated at the base (32% dinos at 543m core) shallowing to nearshore marine at the top (12% dinos at 503m). The interval therefore appears to represent a shallowing trend above the marine maximum at the base (543m).

F 579m(cutts) - ?661m(cutts) : lower apoxyexinus Zone (porifera dino Zone 579-610m)

Assignment to the lower Tricolporites apoxyexinus Zone of Santonian age is indicated at the top on the massive downhole influx of A. cruciformis 10%+ (32% at 579m horizon 12). At the base, oldest A. cruciformis 10%+ (horizon 12a) actually occurs at 610m(cutts), but A. cruciformis is close to 10% (actually 7%) down to 661m, and horizon 12a is picked at the lower depth as this is more consistent with the dinoflagellate datums seen here and in Triton-1. It is possible that base lower apoxyexinus is picked too low in both wells (as it is picked as a base common range in cuttings and could easily be caved). They are, however, picked consistently.

Within the interval, oldest Odontochitina porifera is at 610m cutts (horizon 11b, but could be caved), youngest Aptea sp is at 579m (ties to 2850m in Triton-1) youngest Cleistospphaeridium huguonioti is at 619m (2975m in Triton-1) and youngest consistent Trithyrodinium granulata at 619m (3075m in Triton). Oldest consistent Chatangiella occur at 579m cutts with oldest consistent Isabelidinium at 610m cutts.

Amongst the spore-pollen, A. cruciformis is common at the top (579-610m) and frequent below (616-661m). Intermittently common are Falcisporites, and Microcachryidites while frequent forms include Cyathidites, Dilwynites and P. mawsonii. Oldest Ornamentifera sentosa occurs at 579m(cutts) and is considered to fall at base apoxyexinus Zone, but the species is always extremely rare. Australopollis obscurus occurs consistently to 661m(cutts) but not beneath. Amongst the dinoflagellates, no species are frequent, but Heterosphaeridium heteracanthum, Odontochitina spp and thin walled Trithyrodinium spp are consistent.

Environments are in the nearshore to intermediate marine range with marine maxima at 619m (24% dinoflagellates) and just above the interval top at 543m (32% dinoflagellates). Marine minima occur just below the interval base (0% dinoflagellates at 741m) and within the interval at 616m (7% dinoflagellates).

G 741m(core) - 745m(core) : mawsonii Zone (infusorioides Zone 743-745).

Assignment to the Phyllocladidites mawsonii Zone (equivalent to the former Clavifera triplex Zone) of Coniacian to Turonian age is indicated at the top by youngest consistent Appendicisporites distocarinatus (horizon 13) and at the base by oldest P. mawsonii in core (horizon 15a). Within the interval, youngest Cribroperidinium edwardsii occurs at 743m(core) indicating the Palaeohystrichophora infusorioides dinoflagellate Zone and penetration of horizon 14. Within the interval, Cyatheacidites tectifera and Coptospora pileosa became consistent at 743m and below, oldest Clavifera triplex occurs at 743m (core). Lileacidites kaitangataensis occurs at 741m only (core) and was seen in the mawsonii Zone in Mussel-1 at 2238m.

Amongst the totally dominant spore-pollen, Falcisporites, Cyathidites and Microcachryidites are all common, with intermittently frequent Araucariacites, A. distocarinatus, Gleicheniidites and Osmundacidites. Trilete spores are much more common here than in the section above.

Environments are marginally marine to non-marine, with dinoflagellate content less than 1% in all cases and diversity very low. At 741m, dinoflagellates are totally absent and only rare algal acritarchs (Schizosporis) are present. There, the environment is considered totally non-marine. Cribroperidinium edwardsii is a rare component of the deeper two samples (743 and 745m). Tracheid and cuticle are major components of these samples and further indicate their proximal environments.

H 792m(cutts) - 948m(core) : ?pannosus Zone

No raw data from core is available. Assignment to the Phimopollenites pannosus Zone of latest Albian age is based solely on the table from Wilschut (undated) in the Ross Creek-1 palynology report, plus the raw data from a single cuttings sample herein. Wilschut assigned the interval 946-948m with "determination uncertain" presumably on the raw data of Dettmann (1964). Without raw data I cannot assess this determination. New cuttings herein at 792m contain Coptospora paradoxa, Perotriletes jubatus and Crybelosporites striatus but lack Phimopollenites pannosus and so appear to belong to the upper paradoxa Zone. P. pannosus can be rare, however, and Dettmann may have logged it. In these new cuttings, Falcisporites, Podosporites microsaccatus and Microcachryidites are common, and the downhole influx of ornate spores including Aequitriradites tilchaensis, Cicatricosisporites australiensis, C. paradoxa, C. striatus, Foraminisporis asymmetricus indicates certain penetration of the Eumeralla Formation in either the pannosus or paradoxa Zones.

Environments are non-marine. The new cuttings yielded rare algal acritarchs indicating only minor lacustrine influence.

I 1042m(core) - 1554m(core) : upper *paradoxa* Zone

No raw data is available. Wilschut assigned this interval with a "determination certain." Presumably he used Dettmann's definition of *C. paradoxa* without *P. pannosus* above or *Dictyotosporites filosus* and *D. speciosus* below. As discussed below, this may not necessarily be so.

Non-marine environments are usual in this Zone.

J 1693(core) - 2002m(core) : lower *paradoxa* Zone

Dettmann raw data from core is not available, but Wilschut assigns this interval with "determination uncertain." This is despite the fact that Dettmann in running text states that *D. speciosus*, *D. filosa* and *C. paradoxa* co-occur at 2002m (core 18). It seems that the interval base is well controlled, but that the top is not. Two new cuttings were studied herein, and the upper (1762m) contains youngest *Pilosisporites notensis*, confirming the lower *paradoxa* Zone at that point. The lower (1920m) also contains *P. notensis* but also contains the upper *paradoxa* Zone markers *Trilobosporites tribotrys*, *T. trioreticulosus* and *Pilosisporites grandis* which are therefore presumed caved.

In the new cuttings, *Cyathidites* spp are abundant (around 40%) with frequent *Cicatricosisporites australiensis*, *Microcachryidiates*, *Falcisporites* and *Osmundiacidites*.

Non-marine environments are indicated by the total absence of dinoflagellates or acritarchs. Swamps seem likely, as spores totally dominate the terrestrial palynomorphs.

Light to mid brown spore colours indicate early maturity for oil.

K 2145m(core) - 2239m(core) : striatus Zone

Dettmann raw data is not available, but her running text mentions oldest occurrences for C. paradoxa and Crybelosporites striatus enabling firms assignment of this interval. Wilschut assigns the same interval, "determination certain" presumably on the same data.

Non-marine environments are usual in this zone.

L 2262m(cutts) - 2674(core) : upper hughesi Zone

No raw data from core is available, but two new cuttings herein supplement the running text of Dettmann and the Wilschut assignments. Dettmann mentions youngest Cyclosporites hughesi at 2383m(core) in the absence of C. striatus, thus defining the top. The base is taken in the sample above youngest Cooksonites variabilis which is mentioned at 2808m by Dettmann. Wilschut assigns this interval differently at its base, but does not state his criteria, which therefore cannot be assessed.

New cuttings at 2262m contain consistent P. notensis but lack C. striatus and so are assigned to the hughesi Zone. C. paradoxa is present but obviously caved given its light spore colour. At 2417m (new cutts), rare C. striatus is obviously caved. In these assemblages, Falcisporites and Cyathidites are both abundant with Microcachryidites common and Araucariacites and C. australiensis intermittently frequent.

Non-marine environments are indicated by the absence of dinoflagellates and very rare algal taxa (Schizosporis spp) suggest minor lacustrine influence. High spore diversity and the balance between saccatus and spores suggests swamp margin environments.

Light to mid brown spore colour at 2262m suggests early maturity for oil. Mid brown spore colour at 2417m suggests full maturity for oil.

M 2808m(core) - ?3530m(cutts) : lower hughesi Zone at the top and possibly to the base.

The lack of good raw data from core is particularly frustrating at this level where Pretty Hill equivalents might be present. At the top, youngest C. variabilis indicates the assignment from the Dettmann running text. The base is much more difficult to define. Dettmann notes D. speciosus down to 3486m in core (I see it to 3529m in cuttings), but it extends down to the base wonthaggiensis Zone in intra Pretty Hill equivalents. Dettmann notes C. australiensis down to 3504m in core (I see it to 3496m in cuttings) and my experience is that it is very rare below the lower hughesi Zone (= base Eumeralla equivalent). Dettmann does not mention P. notensis but I record it down to 3529m in cuttings with spore colour that suggests that it is in place and not caved, and I therefore consider the section very likely to be lower hughesi Zone (and therefore Eumeralla equivalent) to the base. In addition, I have not seen the Pretty Hill equivalent restricted taxon Microfasta evansii. I would very much like to know an oldest P. notensis from core.

In the new cuttings, Cyathidites are abundant with common Osmundacidites and Falcisporites. The age diagnostic elements C. australiensis, S speciosus and P. notensis are rare but consistent.

Non-marine environments are indicated by the absence of dinoflagellates. Fairly low spore diversity and strong dominance of two spore types, along with rare algal acritarchs, suggests swamp environments.

Spore colours are dark brown above 3077m suggest full maturity for oil, while dark brown to black colours below 3124m suggest full maturity to post maturity for oil, and full maturity for gas/condensate. The compatibility of individual specimens with these general assemblage colours has been important to determining the caved or "in situ" nature of key specimens in cuttings.

IV CONCLUSIONS

A The new preparations of cores and cuttings have greatly increased confidence and correlation of the Late Cretaceous section, especially to the expanded section in Triton-1. The section contains thick palynologically barren sands which will always be undated, and may contain significant hiati. Grain counts have helped locate significant marine maxima which may be maximum flooding surfaces. Possible sequence boundaries might be 85my close above 475m, 87.5my in the gap 661m to 741m, and 90my near 743m.

B The Early Cretaceous is thick but the sparse new cuttings have not greatly upgraded the existing breakdown since no existing raw data or existing microscope slides can be located. New study of the extensive available core suite might upgrade the breakdown. In particular, nothing older than the Aptian lower *hughesi* Zone can be seen in the new cuttings, inferring that the "top Pretty Hill unconformity" and Pretty Hill equivalent section have not been penetrated. New study of cores is recommended if this tentative conclusion defies other stratigraphic data.

C Once again, the top *apoxyexinus* Zone seems to be a significant geological time, with virtually barren sands above, and more fossiliferous shales below. This may be related to Tasman Sea rifting as discussed by Lowry and Longley (1991). Top Early Cretaceous is also a significant time, with thick non-marine Eumeralla Formation beneath, and condensed marine Sherbrook Group above.

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W E L L: FERGUSONS HILL #1

F I E L D / A R E A: ONSHORE OTWAY BASIN, VICTORIA, AUSTRALIA

A N A L Y S T: R. MORGAN D A T E : FEBRUARY 1992

N O T E S: ALL DEPTHS IN METRES
ALL FIGURES ARE PERCENTAGES

RANGE CHART OF OCCURRENCES BY HIGHEST APPEARANCE IN GROUP

1 APECTODINIUM HYPERACANTHUM
2 ALTERBIA SP
3 HETEROSPHAERIDIUM SOLIDA
4 SPINIFERITES FURCATUS/RAMOSUS
5 CHATANGIELLA VICTORIENSIS
6 XENIKOON AUSTRALIS
7 MANUMIELLA CORONATA
8 APTEODINIUM SP
9 EXOCHOSPHAERIDIUM PHRAGMITES
0 HETEROSPHAERIDIUM HETEROCANTHUM
1 OLIGOSPHAERIDIUM PULCHERRIMUM
2 AMPHIDIADEMA DENTICULATA
3 CONOSPHAERIDIUM STRIATOCONUS
4 HETEROSPHAERIDIUM LATEROBRACHIUS
5 ISABELIDINIUM BELFASTENSE
6 ISABELIDINIUM ROTUNDA
7 ODONTOCHITINA OBEROPORIFERA
8 ODONTOCHITINA PORIFERA
9 PALAEOHYSTRICHOSPHORA INFUSORIOIDES
0 TRITHYRODINIUM SUSPECTUM
1 TRITHYRODINIUM THIN PSILATE
2 AUSTRALISPHAERA VERRUCOSE

323 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
335 CUTTS	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0336 CUTTS	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
354 CUTTS	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
381 CUTTS	.	.	.	.	X	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0408 CUTTS	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0436 CUTTS	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
463 CUTTS	.	.	1	.	.	.	.	1	1	3	1	.	.	.	.	.	.	.	.	.	.	.
475 CORE 1	.	.	19	X	1	.	.	.	.	8	.	X	?	X	X	X	X	X	X	3	X	.
0480 CORE 1	.	.	3	.	.	.	.	.	.	2	.	.	.	X	1	X	1	2	.	1	.	X
497 CUTTS	.	.	.	.	9	.	.	.	.	5	.	.	.	.	.	X	.	1	.	.	2	.
503 CUTTS	.	.	.	2	X	.	.	.	.	7	.	.	.	.	.	.	.	.	.	.	.	.
0521 CUTTS	.	.	2	2	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	3	.
530 CORE 2	.	.	6	1	X	.	.	.	.	7	.	1	.	.	X	.	.	.	.	.	1	.
543 CORE 2	.	.	1	1	.	.	.	.	.	3	.	.	.	.	?	.	.	.	.	.	.	.
579 CUTTS	.	.	1	1	X	.	.	.	X	6	X	.	.	.	.	.	.	X	.	.	.	.
0610 CUTTS	.	.	.	1	.	.	.	.	.	4	.	.	.	.	.	.	.	X	.	.	1	.
616 CORE 3	.	.	.	1	.	.	.	1	X	2	.	.	.	.	.	.	.	.	X	.	1	.
619 CORE 3	.	.	.	1	.	.	.	1	2	1	X	.	.	.	.	.	.	.	1	.	1	.
0661 CUTTS	.	.	X	1	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.
741 CORE 5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
743 CORE 6	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0745 CORE 6	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0792 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
762 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
920 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2262 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
417 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
077 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3124 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
225 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
417 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3450 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3496 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
529 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

0436 CUTTS	408 CUTTS	381 CUTTS	0354 CUTTS	336 CUTTS	335 CUTTS	323 CUTTS		
•	•	•	•	•	•	•	23	ODONTOCHITINA COSTATA
•	•	•	•	•	•	•	24	ODONTOCHITINA OBESOPERCULATA
•	•	•	•	•	•	•	25	BATIACASPHAERA SUSPECTUM
•	•	•	•	•	•	•	26	GILLINIA HYMENOPHORA
•	•	•	•	•	•	•	27	HYSTRICHODINIUM PULCHRUM
•	•	•	•	•	•	•	28	ISABELIDINIUM CRETACEUM
•	•	•	•	•	•	•	29	ISABELIDINIUM GLABRUM
•	•	•	•	•	•	•	30	ISABELIDINIUM RECTANGULARE CONTRACTUM
•	•	•	•	•	•	•	31	ODONTOCHITINA CRIBROPODA
•	•	•	•	•	•	•	32	ODONTOCHITINA OPERCULATA
•	•	•	•	•	•	•	33	ODONTOCHITINA STUBBY
•	•	•	•	•	•	•	34	TRITHYRODINIUM PUNCTATE
•	•	•	•	•	•	•	35	TRITHYRODINIUM THICK PSILATA
•	•	•	•	•	•	•	36	APTEA SP
•	•	•	•	•	•	•	37	CIRCULODINIUM DEFLANDREI
•	•	•	•	•	•	•	38	ALTERBIA ACUMINATUM
•	•	•	•	•	•	•	39	CHATANGIELLA TRIPARTITA
•	•	•	•	•	•	•	40	CHLAMYDOPHORELLA NYEI
•	•	•	•	•	•	•	41	FROMEA FRAGILIS
•	•	•	•	•	•	•	42	ISABELIDINIUM ELONGATUM
•	•	•	•	•	•	•	43	MILLIOUDODINIUM SP
•	•	•	•	•	•	•	44	NUMMUS

0485 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0475 CORE 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0480 CORE 1	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0497 CUTTS	3	.	1	X	1	X	X	X	2	6	1	X	3	.	.	.	.	.	.	.	.	.
0503 CUTTS	.	.	.	.	.	.	X	6	.	.	.	.	.	1	2	.	.	.	.	.	.	.
0521 CUTTS	2	.	.	X	.	2	.	.	2	2	.	.	1	.	1	.	.	.	.	.	.	.
0530 CORE 2	.	.	.	.	.	X	?	X	2	.	.	.	.	.	3	1	X	1	X	X	X	2
0543 CORE 2	.	.	.	.	.	2	.	X	.	.	.	.	.	.	3	X	1	.	.	X	.	.
0579 CUTTS	.	.	.	1	X	X	.	2	.	.	.	.	.	1	X	.	X	.	.	.	.	.
0610 CUTTS	.	.	.	.	1	.	.	2	?	1	X	.	.	.	2	.	.	.	.	.	.	1
0616 CORE 3	.	.	.	.	.	.	.	.	.	.	.	.	X	1	1	.	.	.	.	.	.	.
0619 CORE 3	.	.	.	.	2	.	.	.	.	.	.	.	.	2	5	.	.	X	.	.	.	1
0661 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.
741 CORE 5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
743 CORE 6	1	.	.	.	.	.	.	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.
0745 CORE 6	X	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.
792 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
762 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1920 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
262 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
417 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3077 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3124 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
225 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
417 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3450 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
496 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
529 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

	45 TANYOSPHAERIDIUM SALPINX	46 CALLAOISPHAERIDIUM ASYMMETRICUM	47 CHATANGIELLA SVERDRUPIANA	48 HETEROSPHAERIDIUM CONJUNCTUM	49 ISABELIDINIUM SP	50 SPINIDINIUM SP	51 TRITHYRODINIUM	52 TRITHYRODINIUM GRANULATA	53 CYCLONEPHELIUM COMPACTUM	54 ISABELIDINIUM RECTANGULARE RECTANGULARE	55 OLIGOSPHAERIDIUM COMPLEX	56 PARALECANIELLA	57 CLEISTOSPHAERIDIUM HUGUONIOTI	58 EXOCHOSPHAERIDIUM ARNACE	59 KIOKANSIUM POLYPES	60 XIPHOPHORIDIUM ALATUM	61 CLEISTOSPHAERIDIUM SP	62 SCHIZOSPORIS PARVUS	63 CRIBROPERIDINIUM EDWARDSII	64 CYMATIOSPHAERA	65 STIPHROSPHAERIDIUM DICTYOPHORUM	66 SCHIZOSPORIS PSILATUS
323 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
335 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0336 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0354 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
381 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0408 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0436 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
463 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0475 CORE 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0480 CORE 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
497 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
503 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0521 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0530 CORE 2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
543 CORE 2	.	1	X	1	5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0579 CUTTS	.	X	.	.	.	X	2	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0610 CUTTS									1	X	1											

0616 CORE 3	.	.	.	.	.	.	.	X	.	.	.	X	.	.	.	.	.	.	.	.	.	.
0619 CORE 3	.	.	.	.	.	.	.	R	.	.	X	.	2	1	4	X	.	.	.	.	.	.
661 CUTTS	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	3	.	.	.	.	.
741 CORE 5	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.
0743 CORE 6	.	.	.	.	.	.	.	.	X	.	X	.	.	.	.	.	.	.	X	X	X	.
745 CORE 6	.	.	.	.	.	.	.	.	X	.	1	.	.	.	.	.	.	.	X	.	.	.
792 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X
1762 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1920 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
262 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X
417 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3077 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	.
124 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
225 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3417 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
3450 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
496 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
529 CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

	67 SCHIZOSPORIS RETICULATUS	68 AUSTRALOPOLLIS OBSCURUS	69 CAMEROZONOSPORITES OHAIENSIS	70 CYATHIDITES AUSTRALIS	71 CYATHIDITES MINOR	72 FALCISPORITES SIMILIS	73 GAMBIERINA RUDATA	74 GLEICHENIIDITES	75 MALVACIPOLLIS SUBTILIS	76 NOTHOFAGIDITES ENDURUS	77 OSMUDACIDITES WELLMANII	78 PHYLLOCLADIDITES MAWSONII	79 PODOSPORITES MICROSACCATUS	80 PROTEACIDITES SP	81 ARAUCARIACITES AUSTRALIS	82 DILWYNITES GRANULATUS	83 MICROCACHRYIDITES ANTARCTICUS	84 NOTHOFAGIDITES EMARCIDUS	85 CAMEROZONOSPORITES BULLATUS	86 RETITRILETES AUSTROCLAVATIDITES	87 AMOSOPOLLIS CRUCIFORMIS	88 CERATOSPORITES EQUALIS
323 CUTTS	.	1	1	1	5	3	1	2	1	X	2	2	2	4	.	.	.	.	.	.	.	.
0335 CUTTS	.	1	.	.	1	2	.	2	.	1	.	2	.	3	4	3	4	1	.	.	.	.
0336 CUTTS	.	.	.	.	.	1	.	1	.	.	.	1	.	.	1	.	.	.	1	1	.	.
354 CUTTS	.	.	.	.	.	.	.	2	.	.	.	.	.	2	1	2	1	1	.	.	1	1
0381 CUTTS	.	.	.	.	.	2	.	.	.	1	1	1	.	1	.	.	1	.	.	.	.	.
0408 CUTTS	.	.	.	1	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
436 CUTTS	.	1	.	.	.	1	.	.	.	.	2	.	1	2	3	2	1	.	.	1	.	.
463 CUTTS	.	1	1	1	.	6	.	1	.	.	1	1	.	.	1	.	5	.	.	1	.	1
0475 CORE 1	.	3	1	4	2	23	.	1	.	.	.	9	.	1	.	5	9	.	.	1	1	2
0480 CORE 1	.	8	.	3	8	23	.	4	.	.	.	5	3	1	1	9	11	.	.	2	1	1
497 CUTTS	.	1	X	1	4	8	.	2	.	.	5	4	3	2	3	9	9	.	.	.	2	.
0503 CUTTS	.	.	.	2	5	15	.	4	.	.	4	4	1	.	5	.	9	.	.	2	22	1
0521 CUTTS	.	2	.	1	7	11	.	.	.	.	.	.	1	1	1	5	4	.	.	3	5	.
530 CORE 2	.	1	.	5	4	15	.	4	.	.	.	6	.	2	9	11	10	.	.	1	2	.
543 CORE 2	.	1	.	2	3	19	.	2	.	.	3	.	6	.	2	4	11	.	.	.	11	.
0579 CUTTS	.	X	.	1	7	14	.	1	.	.	X	.	4	.	4	10	5	.	1	.	32	2
610 CUTTS	.	2	.	1	7	12	.	4	.	.	1	4	2	.	2	9	6	.	.	2	20	3
616 CORE 3	.	X	.	3	6	31	.	1	.	.	2	1	5	.	4	10	19	.	.	1	7	.
0619 CORE 3	.	X	.	3	3	15	.	3	.	.	5	3	1	.	10	10	13	.	.	.	2	1
0661 CUTTS	.	1	.	8	10	23	.	3	.	.	6	8	5	.	2	5	8	.	.	3	7	2
741 CORE 5	.	.	.	5	17	22	.	2	.	.	4	.	1	.	10	5	15	.	.	.	.	3
743 CORE 6	.	.	.	12	20	20	.	.	.	.	.	X	3	.	5	9	15	.	.	3	3	.
0745 CORE 6	.	.	.	7	14	17	.	11	.	.	10	X	2	.	5	13	11	.	.	X	3	1
792 CUTTS	.	.	.	4	12	22	.	X	.	.	8	.	12	.	11	2	11	.	.	3	.	.
762 CUTTS	.	.	.	26	19	16	.	.	.	.	12	.	.	.	8	.	6	.	.	1	.	.
1920 CUTTS	.	.	.	14	22	4	.	3	.	.	8	.	.	.	5	.	9	.	.	4	.	1

[illegible]	[illegible]	[illegible]	.	.	[illegible]	[illegible]	[illegible]	.	.	.	.	[illegible]	.	.	.	[illegible]	.	[illegible]	.	.	[illegible]	.	[illegible]
2417	CUTTS	X	.	.	30	5	15	.	1	.	.	8	.	.	.	8	.	10	.	.	1	.	.
3077	CUTTS	X	.	.	27	19	15	.	1	.	.	13	.	.	.	1	.	7	.	.	6	.	.
3124	CUTTS	.	.	.	23	4	10	.	.	.	.	22	.	.	.	2	.	3	.	.	8	.	1
3225	CUTTS	.	.	.	31	7	16	.	.	.	.	11	.	.	.	2	.	10	.	.	7	.	1
3417	CUTTS	.	.	.	23	13	19	.	1	.	.	13	.	.	.	1	.	.	.	.	6	.	5
3450	CUTTS	.	.	.	22	12	13	.	X	.	.	22	.	.	.	7	.	1	.	.	6	.	.
3496	CUTTS	.	.	.	20	15	18	.	1	.	.	13	.	.	.	3	.	6	.	.	6	.	1
3529	CUTTS	X	.	.	22	15	16	.	1	.	.	17	.	.	.	4	.	1	.	.	4	.	.

Sample	Type	89 ERICIPITES SCABRATUS	90 LYGISTEPOLLENITES FLORINII	91 PEROTRILETES JUBATUS/MORGANII	92 STEREISPORITES ANTIQUISPORITES	93 TRIPOROLETES RADIATUS	94 NOTHOFAGIDITES SENECTUS	95 PERIPOROPOLLENITES POLYORATUS	96 CALLIALASPORITES DAMPIERI	97 CLAVIFERA TRIPLEX	98 COPTOSPORA PILEOSA	99 CYCADOPITES FOLLICULARIS	100 FALCISPORITES GRANDIS	101 TRICOLPITES CONFESSUS	102 TRICOLPITES GILLII	103 TRILOBOSPORITES TRIORETICULOSUS	104 AEQUITRIRADITES SPINULOSUS	105 COROLLINA TOROSUS	106 DENSOISPORITES VELATUS	107 DICTYOTOSPORITES SPECIOSUS	108 TRICOLPORITES	109 CALLIALASPORITES TURBATUS	110 CINGUTRILETES CLAVUS
323	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0335	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
336	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
354	CUTTS	1	2	1	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0381	CUTTS	.	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0408	CUTTS	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
436	CUTTS	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
463	CUTTS	.	.	.	1	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.
0475	CORE 1	.	.	.	.	.	.	.	.	1	X	2	3	X	X	X	.	.	.	.	.	.	.
480	CORE 1	.	.	.	.	.	.	.	.	.	.	2	3	.	1	.	1	1	1	X	1	.	.
497	CUTTS	.	.	.	.	.	.	.	2	2	.	1	.	.	.	.	X	.	1	.	.	1	1
0503	CUTTS	.	X	X	.	.	.	.	.	4	.	.	.	.	.	.	.	1	.	.	.	.	.
521	CUTTS	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	2	.	.	.	.	.
530	CORE 2	.	.	.	.	.	.	.	.	2	.	.	2	.	X	.	X	.	.	.	.	.	.
0543	CORE 2	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	1	.	1	.	.	.	1
0579	CUTTS	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
610	CUTTS	.	.	.	.	.	.	1	.	4	.	.	.	.	.	.	X	X	.	.	.	.	.
616	CORE 3	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	X	X	1	.	.	.
0619	CORE 3	.	.	.	.	.	.	.	.	.	.	2	2	.	.	.	.	2	.	X	.	1	.
661	CUTTS	.	.	1	.	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.
741	CORE 5	.	.	.	.	.	.	.	2	.	.	3	.	.	.	.	.	.	X	.	.	.	.
0743	CORE 6	.	.	1	2	.	.	.	.	X	X	1	.	.	.	.	X	2	.	.	.	.	X
745	CORE 6	.	.	.	.	X	.	.	1	.	1	.	.	.	.	X	X	1	.	.	.	.	.
792	CUTTS	.	1	X	.	.	.	.	1	.	.	1	7	.	.	.	.	1	.	.	.	.	.
762	CUTTS	.	.	.	.	.	.	.	1	.	X	1	5	.	.	.	.	1	.	.	.	1	.
1920	CUTTS	.	.	.	.	.	.	.	1	.	.	.	.	.	.	1	X	2	.	.	.	6	.
262	CUTTS	.	.	.	.	.	.	.	.	.	.	.	4	.	.	X	X	2	.	.	.	.	.
417	CUTTS	.	.	.	.	.	.	.	.	.	.	.	18	.	.	.	X	1	.	.	.	.	.
3077	CUTTS	.	.	.	.	.	.	.	2	.	.	.	4	.	.	.	X	.	.	X	.	.	.
124	CUTTS	.	.	.	1	.	.	.	5	.	.	.	8	.	.	.	.	3	.	2	.	1	.
225	CUTTS	.	.	.	.	.	.	.	2	.	.	.	2	.	.	.	.	1	.	X	.	.	.
3417	CUTTS	.	.	.	1	.	.	.	2	.	.	2	.	.	.	.	.	2	.	X	.	1	.
3450	CUTTS	.	.	.	X	.	.	.	6	.	.	2	5	.	.	.	.	1	.	X	.	.	.
496	CUTTS	.	.	.	4	.	.	.	2	.	.	.	2	.	.	.	.	3	.	X	.	1	.
529	CUTTS	.	.	.	.	.	.	.	2	.	.	2	3	.	.	.	.	2	.	1	.	3	.

		111 CYATHEACIDITES TECTIFERA	112 ORNAMENTIFERA SENTOSA	113 PEROTRILETES MAJUS	114 PHIMOPOLLENITES PANNOSUS	115 LYCOPODIACIDITES ASPERATUS	116 TRIPOROLETES RETICULATUS	117 CRYBELOSPORITES STRIATUS	118 CICATRICOSISPORITES AUSTRALIENSIS	119 COPTOSPORA PARADOXA	120 FOVEOTRILETES PARVIRETUS	121 NEORAISTRICKIA	122 TRICOLPORITES APOXYEXINUS	123 CICATRICOSISPORITES LUDBROOKIAE	124 CRYBELOSPORITES BRENNERI	125 FOVEOGLEICHENIIDITES	126 LEPTOLEPIDITES VERRUCATUS	127 PHYLLOCLADIDITES EUNUCHUS	128 BALMEISPORITES HOLODICTYUS	129 ANNULISPORITES	130 APPENDICISPORITES DISTOCARINATUS	131 APPENDICISPORITES TRICORNITATUS	132 BALMEIOPSIS LIMBATA
0323	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0335	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
336	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
354	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0381	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
408	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
436	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0463	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
475	CORE 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
480	CORE 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
497	CUTTS	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0503	CUTTS	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
521	CUTTS	.	.	.	.	1	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
530	CORE 2	.	.	.	.	.	.	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0543	CORE 2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
579	CUTTS	.	X	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
610	CUTTS	.	.	.	X	3	.	.	1	X	1	1	1	.	.	.	.	.	.	.	.	.	.
0616	CORE 3	.	.	.	.	.	.	.	X	.	.	.	.	X	X	X	X	1	.	.	.	.	.
619	CORE 3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	.	.	.	.
661	CUTTS	.	.	.	.	1	.	.	3	.	.	.	.	.	.	.	.	2	.	.	.	.	.
741	CORE 5	.	.	.	.	.	.	.	1	.	X	.	.	1	.	.	.	.	.	1	5	1	1
0743	CORE 6	X	.	.	.	1	.	.	X	.	.	.	1	X	.	X	.	X	.	.	X	.	.
745	CORE 6	.	.	.	.	1	X	1	.	.	1	.	.	.	.	.	1	.	.	.	2	X	.
792	CUTTS	.	.	.	.	.	X	2	1	X	.	.	.	.	.	.	.	.	X	.	.	.	.
1762	CUTTS	.	.	.	.	.	.	1	4	X	.	.	.	.	.	.	.	.	.	.	.	.	.
920	CUTTS	.	.	.	.	.	1	5	13	X	X	.	.	.	.	.	.	.	.	.	.	.	.
262	CUTTS	.	.	.	.	.	X	.	14	X	.	.	.	.	.	.	.	.	.	.	.	.	.
2417	CUTTS	.	.	.	.	.	X	X	2	.	X	.	.	.	.	.	.	.	.	.	.	.	.
3077	CUTTS	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	.	.	.	.	.	.	.
124	CUTTS	.	.	.	.	.	.	.	3	.	.	1	.	.	.	.	.	.	.	.	.	.	.
225	CUTTS	.	.	.	.	.	.	.	3	.	.	.	.	.	.	.	1	.	.	.	.	.	.
3417	CUTTS	.	.	.	.	.	.	.	6	.	.	.	.	.	.	.	.	.	.	.	.	.	.
450	CUTTS	.	.	.	.	.	.	.	1	.	.	.	.	.	.	.	.	.	.	.	.	.	.
496	CUTTS	.	.	.	.	.	.	.	2	.	.	.	.	.	.	.	1	.	.	.	.	.	.
3529	CUTTS	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	2	.	.	.	.	.	.

OOKSONIAE

OMPLEX

AVERRUCATUS

ERIS

ERI

NGATAENSIS

LATUS

GANTIS

LUMENUS

LCHAENSIS

MMETRICUS

LYI

CTATUS

RRUCOSUS

SUS

S HUGHESI

THAGGIENSIS

NULATA

ENSIS

VISPINOSUS

NDIS

		CONTIGNISPORITES C	DICTYOTOSPORITES C	INTERULOBITES INTR	KLUKISPORITES SCAB	KUYLISPORITES ZIPF	LILIACIDITES KAITA	NEVESISPORITES VAL	CRYBELOSPORITES GI	RETITRILETES CIRCO	AEQUITRIRADITES TI	DICTYOPHYLLIDITES	FORAMINISPORIS ASY	FORAMINISPORIS DAI	ISCHYOSPORITES PUN	AEQUITRIRADITES VE	ARAUCARIACITES FIS	CICATRICOSISPORITE	FORAMINISPORIS WON	PILOSISPORITES GRA	PILOSISPORITES NOT	PILOSISPORITES PAR	PILOSISPORITES GR
		133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154
0323	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0335	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0336	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0354	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0381	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0408	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0436	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0463	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0475	CORE 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0480	CORE 1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0497	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0503	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0521	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0530	CORE 2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0543	CORE 2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0579	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0610	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0616	CORE 3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0619	CORE 3	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0661	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0741	CORE 5	2	X	X	X	X	X	?	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0743	CORE 6	X	.	X	.	.	.	.	X	1	.	.	.	.	.	.	.	.	.	.	.	.	.
0745	CORE 6	X	.	X	X	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0792	CUTTS	.	X	.	X	.	.	.	.	.	X	1	1	X	X	.	.	.	.	.	.	.	.
1762	CUTTS	.	.	.	.	.	.	.	.	.	.	.	X	X	.	X	2	X	X	X	X	X	.
920	CUTTS	.	.	.	.	.	.	.	.	.	.	.	1	.	.	X	.	.	.	X	X	.	X
262	CUTTS	.	.	.	.	.	.	.	.	.	X	1	.	.	.	X	.	.	1	.	1	X	.
2417	CUTTS	.	.	.	X	.	.	.	.	.	X	.	.	.	.	.	.	.	X	.	1	.	.
077	CUTTS	.	.	.	.	.	.	.	.	.	X	.	.	.	.	.	.	.	X	.	X	.	.
124	CUTTS	.	.	.	1	.	.	.	.	X	.	.	.	.	1	.	.	.	1	.	3	.	.
3225	CUTTS	.	.	.	2	.	.	.	.	X	.	.	X	1	.	.	.	.	.	.	X	.	.
3417	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	1	.	.	.	1	.	2	.	.
3450	CUTTS	.	.	.	.	.	.	.	.	.	.	.	.	.	2	X	.	.	.	.	X	.	.
3496	CUTTS	.	.	.	2	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	X	X	.
3529	CUTTS	.	.	.	1	.	.	.	.	1	.	.	.	.	1	.	.	.	.	.	2	.	.

ILOBOSPORITES TRIBOTRYS

UPERISPORITES TABULATUS

TITRILETES NODOSUS

RAMINISPORIS RETICULOWONTHAGGIENSIS

TITRILETES FACETUS

OKSONITES VARIABILIS

TREISPORITES PALLIDUS

	T	C	R	F	R	C	U	
	155	156	157	158	159	160	161	
0323 CUTTS	.	.	.	.	.	.	.	0323 CUTTS
0335 CUTTS	.	.	.	.	.	.	.	0335 CUTTS
0336 CUTTS	.	.	.	.	.	.	.	0336 CUTTS
0354 CUTTS	.	.	.	.	.	.	.	0354 CUTTS
0381 CUTTS	.	.	.	.	.	.	.	0381 CUTTS
0408 CUTTS	.	.	.	.	.	.	.	0408 CUTTS
0436 CUTTS	.	.	.	.	.	.	.	0436 CUTTS
0463 CUTTS	.	.	.	.	.	.	.	0463 CUTTS
0475 CORE 1	.	.	.	.	.	.	.	0475 CORE 1
0480 CORE 1	.	.	.	.	.	.	.	0480 CORE 1
0497 CUTTS	.	.	.	.	.	.	.	0497 CUTTS
0503 CUTTS	.	.	.	.	.	.	.	0503 CUTTS
0521 CUTTS	.	.	.	.	.	.	.	0521 CUTTS
0530 CORE 2	.	.	.	.	.	.	.	0530 CORE 2
0543 CORE 2	.	.	.	.	.	.	.	0543 CORE 2
0579 CUTTS	.	.	.	.	.	.	.	0579 CUTTS
0610 CUTTS	.	.	.	.	.	.	.	0610 CUTTS
0616 CORE 3	.	.	.	.	.	.	.	0616 CORE 3
0619 CORE 3	.	.	.	.	.	.	.	0619 CORE 3
0661 CUTTS	.	.	.	.	.	.	.	0661 CUTTS
0741 CORE 5	.	.	.	.	.	.	.	0741 CORE 5
0743 CORE 6	.	.	.	.	.	.	.	0743 CORE 6
0745 CORE 6	.	.	.	.	.	.	.	0745 CORE 6
0792 CUTTS	.	.	.	.	.	.	.	0792 CUTTS
1762 CUTTS	.	.	.	.	.	.	.	1762 CUTTS
1920 CUTTS	X	.	.	.	.	.	.	1920 CUTTS
2262 CUTTS	.	1	X	.	.	.	.	2262 CUTTS
2417 CUTTS	.	.	.	.	.	.	.	2417 CUTTS
3077 CUTTS	.	.	X	1	.	.	.	3077 CUTTS
3124 CUTTS	.	1	1	.	X	.	.	3124 CUTTS
3225 CUTTS	.	.	.	.	1	X	.	3225 CUTTS
3417 CUTTS	.	.	.	.	.	1	.	3417 CUTTS
3450 CUTTS	.	.	.	.	.	.	X	3450 CUTTS
3496 CUTTS	.	.	.	.	.	.	.	3496 CUTTS
3529 CUTTS	.	.	.	.	.	.	.	3529 CUTTS

SPECIES LOCATION INDEX

Index numbers are the columns in which species appear.

INDEX NUMBER	SPECIES
104	AEQUITRIRADITES SPINULOSUS
142	AEQUITRIRADITES TILCHAENSIS
147	AEQUITRIRADITES VERRUCOSUS
38	ALTERBIA ACUMINATUM
2	ALTERBIA SP
87	AMOSOPOLLIS CRUCIFORMIS
12	AMPHIDIADEMA DENTICULATA
129	ANNULISPORITES
1	APECTODINIUM HYPERACANTHUM
130	APPENDICISPORITES DISTOCARINATUS
131	APPENDICISPORITES TRICORNITATUS
36	APTEA SP
8	APTEODINIUM SP
81	ARAUCARIACITES AUSTRALIS
148	ARAUCARIACITES FISSUS
22	AUSTRALISPHAERA VERRUCOSE
68	AUSTRALOPOLLIS OBSCURUS
132	BALMEIOPSIS LIMBATA
128	BALMEISPORITES HOLODICTYUS
25	BATIACASPHAERA SUSPECTUM
46	CALLAOISPHAERIDIUM ASYMMETRICUM
96	CALLIALASPORITES DAMPIERI
109	CALLIALASPORITES TURBATUS
85	CAMEROZONOSPORITES BULLATUS
69	CAMEROZONOSPORITES OHAIENSIS
88	CERATOSPORITES EQUALIS
47	CHATANGIELLA SVERDRUPIANA
39	CHATANGIELLA TRIPARTITA
5	CHATANGIELLA VICTORIENSIS
40	CHLAMYDOPHORELLA NYEI
118	CICATRICOSISPORITES AUSTRALIENSIS
149	CICATRICOSISPORITES HUGHESI
123	CICATRICOSISPORITES LUDBROOKIAE
110	CINGUTRILETES CLAVUS
37	CIRCULODINIUM DEFLANDREI
97	CLAVIFERA TRIPLEX
57	CLEISTOSPHAERIDIUM HUGUONIOTI
61	CLEISTOSPHAERIDIUM SP
13	CONOSPHAERIDIUM STRIATOCONUS
133	CONTIGNISPORITES COOKSONIAE
160	COOKSONITES VARIABILIS
119	COPTOSPORA PARADOXA
98	COPTOSPORA PILEOSA
105	COROLLINA TOROSUS
156	COUPERISPORITES TABULATUS
63	CRIBROPERIDINIUM EDWARDSII
124	CRYBELOSPORITES BRENNERI
140	CRYBELOSPORITES GIGANTIS
117	CRYBELOSPORITES STRIATUS
111	CYATHEACIDITES TECTIFERA
70	CYATHIDITES AUSTRALIS
71	CYATHIDITES MINOR
99	CYCADOPITES FOLLICULARIS
53	CYCLONEPHELIUM COMPACTUM
64	CYMATIOSPHAERA
106	DENSOISPORITES VELATUS
143	DICTYOPHYLLIDITES

134	DICTYOTOSPORITES COMPLEX
107	DICTYOTOSPORITES SPECIOSUS
82	DILWYNITES GRANULATUS
89	ERICIPITES SCABRATUS
58	EXOCHOSPHAERIDIUM ARNACE
9	EXOCHOSPHAERIDIUM PHRAGMITES
100	FALCISPORITES GRANDIS
72	FALCISPORITES SIMILIS
144	FORAMINISPORIS ASYMMETRICUS
145	FORAMINISPORIS DAILYI
158	FORAMINISPORIS RETICULOWONTHAGGIENSIS
150	FORAMINISPORIS WONTHAGGIENSIS
125	FOVEOGLEICHENIIDITES
120	FOVEOTRILETES PARVIRETUS
41	FROMEA FRAGILIS
73	GAMBIERINA RUDATA
26	GILLINIA HYMENOPHORA
74	GLEICHENIIDITES
48	HETEROSPHAERIDIUM CONJUNCTUM
10	HETEROSPHAERIDIUM HETEROCANTHUM
14	HETEROSPHAERIDIUM LATEROBRACHIUS
3	HETEROSPHAERIDIUM SOLIDA
27	HYSTRICHODINIUM PULCHRUM
135	INTERULOBITES INTRAVERRUCATUS
15	ISABELIDINIUM BELFASTENSE
28	ISABELIDINIUM CRETACEUM
42	ISABELIDINIUM ELONGATUM
29	ISABELIDINIUM GLABRUM
30	ISABELIDINIUM RECTANGULARE CONTRACTUM
54	ISABELIDINIUM RECTANGULARE RECTANGULARE
16	ISABELIDINIUM ROTUNDA
49	ISABELIDINIUM SP
146	ISCHYOSPORITES PUNCTATUS
59	KIOKANSIUM POLYPES
136	KLUKISPORITES SCABERIS
137	KUYLISPORITES ZIPPERI
126	LEPTOLEPIDITES VERRUCATUS
138	LILIACIDITES KAITANGATAENSIS
115	LYCOPODIACIDITES ASPERATUS
90	LYGISTEPOLLENITES FLORINII
75	MALVACIPOLLIS SUBTILIS
7	MANUMIELLA CORONATA
83	MICROCACHRYIDITES ANTARCTICUS
43	MILLIOUDODINIUM SP
121	NEORAISTRICKIA
139	NEVESISPORITES VALLATUS
84	NOTHOFAGIDITES EMARCIDUS
76	NOTHOFAGIDITES ENDURUS
94	NOTHOFAGIDITES SENECTUS
44	NUMMUS
23	ODONTOCHITINA COSTATA
31	ODONTOCHITINA CRIBROPODA
17	ODONTOCHITINA OBEROPORIFERA
24	ODONTOCHITINA OBESOPERCULATA
32	ODONTOCHITINA OPERCULATA
18	ODONTOCHITINA PORIFERA
33	ODONTOCHITINA STUBBY
55	OLIGOSPHAERIDIUM COMPLEX
11	OLIGOSPHAERIDIUM PULCHERRIMUM
112	ORNAMENTIFERA SENTOSA
77	OSMUDACIDITES WELLMANII
19	PALAEOHYSTRICHOSPHORA INFUSORIOIDES
56	PARALECANIELLA
95	PERIPOROPOLLENITES POLYORATUS
91	PEROTRILETES JUBATUS/MORGANII
113	PEROTRILETES MAJUS
114	PHIMOPOLLENITES PANNOSUS
127	PHYLLOCLADIDITES EUNUCHUS
78	PHYLLOCLADIDITES MAWSONII
154	PILOSISPORITES GRANDIS

151	PILOSISPORITES GRANULATA
152	PILOSISPORITES NOTENSIS
153	PILOSISPORITES PARVISPINOSUS
79	PODOSPORITES MICROSACCATUS
80	PROTEACIDITES SP
86	RETITRILETES AUSTROCLAVATIDITES
141	RETITRILETES CIRCOLUMENUS
159	RETITRILETES FACETUS
157	RETITRILETES NODOSUS
62	SCHIZOSPORIS PARVUS
66	SCHIZOSPORIS PSILATUS
67	SCHIZOSPORIS RETICULATUS
50	SPINIDINIUM SP
4	SPINIFERITES FURCATUS/RAMOSUS
92	STEREISPORITES ANTIQUISPORITES
65	STIPHROSPHAERIDIUM DICTYOPHORUM
45	TANYOSPHAERIDIUM SALPINX
101	TRICOLPITES CONFESSUS
102	TRICOLPITES GILLII
108	TRICOLPORITES
122	TRICOLPORITES APOXYEXINUS
155	TRILOBOSPORITES TRIBOTRYS
103	TRILOBOSPORITES TRIORETICULOSUS
93	TRIPOROLETES RADIATUS
116	TRIPOROLETES RETICULATUS
51	TRITHYRODINIUM
52	TRITHYRODINIUM GRANULATA
34	TRITHYRODINIUM PUNCTATE
20	TRITHYRODINIUM SUSPECTUM
35	TRITHYRODINIUM THICK PSILATA
21	TRITHYRODINIUM THIN PSILATE
161	VITREISPORITES PALLIDUS
6	XENIKOON AUSTRALIS
60	XIPHOPHORIDIUM ALATUM

PALYNOLOGICAL DATA SHEET

BASIN: OTWAY SPORE-POLLEN ZONES　　ELEVATION: KB: ________ GL: ________

WELL NAME: FERGUSONS HILL-1　　TOTAL DEPTH: ________

AGE		PALYNOLOGICAL ZONES	HIGHEST DATA Preferred Depth	Rtg	HIGHEST DATA Alternate Depth	Rtg	LOWEST DATA Preferred Depth	Rtg	LOWEST DATA Alternate Depth	Rtg
NEOGENE	Plei	T. pleistocenicus								
NEOGENE	Plio	M. lipsus								
NEOGENE	Mio.	C. bifurcatus								
NEOGENE	Mio.	T. bellus								
NEOGENE		P. tuberculatus								
NEOGENE	Olig	upper N. asperus								
PALEOGENE	L.Eo	mid N. asperus								
PALEOGENE	Mid Eo	lower N. asperus								
PALEOGENE		P. asperopolus								
PALEOGENE	Earl Eo	upper M. diversus								
PALEOGENE		mid M. diversus								
PALEOGENE		lower M. diversus								
PALEOGENE	Pale	upper L. balmei								
PALEOGENE	Pale	lower L. balmei								
LATE CRETACEOUS	Maas	upper T. longus	?				?			
LATE CRETACEOUS	Maas	lower T. longus								
LATE CRETACEOUS		T. lillei								
LATE CRETACEOUS	Camp	N. senectus ♀	354	?			463	?		
LATE CRETACEOUS	Sant	up T. apoxyexinus ♀	475	1			497	4		
LATE CRETACEOUS	Sant	mid T. apoxyexinus ♀	503	3			543	4		
LATE CRETACEOUS	Con	low T. apoxyexinus ♀	579	3			661	?		
LATE CRETACEOUS	Tur	P. mawsonii ♀/✡	741	1			745	0		
LATE CRETACEOUS	Ceno	A. distocarinatus								
EARLY CRETACEOUS	Alb	P. pannosus Ø	792	3			948	?		
EARLY CRETACEOUS	Alb	upper C. paradoxa Ø	1042	2			1554	0		
EARLY CRETACEOUS	Alb	lower C. paradoxa Ø	1693	1			2002	0		
EARLY CRETACEOUS	Alb	C. striatus Ø	2145	2			2239	0		
EARLY CRETACEOUS	Apt	upper C. hughesi Ø	2262	3			2674	2		
EARLY CRETACEOUS	Apt	lower C. hughesi Ø	2808	1			3530	?		
EARLY CRETACEOUS	l.Ne	F. wonthaggiensis								
EARLY CRETACEOUS	e.Ne	up C. australiensis								

Environments :

- o lacustrine (algal acritarchs).
- Ø non-marine (no or very few 5% algal acritarchs).
- ✡ brackish (spiny acritarch, no or very few dinoflagellates 1%).
- ✡/♀ marginal marine (1-5% very low diversity dinoflagellates).
- ♀ nearshore marine (6-30% low to medium diversity dinoflagellates).
- ♀/♀♀ intermediate marine (31-60% medium diversity dinoflagellates).
- ♀♀ offshore marine (61%-80% medium to high diversity dinoflagellates).
- θ far offshore marine/oceanic (81%-100% high diversity dinoflagellates and/or planktonic forams).

Confidence Ratings :

- 0 : good to excellent with numerous zone fossils in core/swc.
- 1 : fair with rare zone fossils in core/swc.
- 2 : poor with non-diagnostic assemblage in core/swc. Often occurs next to a distinctive 0 to 1 rating, lacking the zone fossil seen adjacent.
- 3 : good with extinction event (top range) in cuttings.
- 4 : poor to fair with inception event (base range) in cuttings and therefore may be picked too low if caved or too high if swamped by cavings.
- 5 : poor with non-diagnostic assemblage in cuttings. Usually seen adjacent to a higher rating and picked on the absence of key zone fossil.
- ? : no confidence. Picked as a best guess in very poor data.

Data recorded by : Roger Morgan Feb 1992

Data revised by : Roger Morgan Feb 1992

PALYNOLOGICAL DATA SHEET

BASIN: OTWAY DINOFLAGELLATE ZONES   ELEVATION: KB: ________ GL: ________

WELL NAME: FERGUSONS HILL-1   TOTAL DEPTH: ________

AGE		PALYNOLOGICAL ZONES	HIGHEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg	LOWEST DATA Preferred Depth	Rtg	Alternate Depth	Rtg
LATE CRETACEOUS	Maas	M. druggii	?				?			
	Camp	I. korojonense								
		upper X. australis								
		lower X. australis								
	Sant	N. aceras								
		I. cretaceum ♀	475	0			543	4		
	Con	O. porifera ♀	579	3			610	4		
	Turo	C. striatoconus								
	Ceno	P. infusorioides ♀/✡	743	1			745	2		

Environments :

- o lacustrine (algal acritarchs).
- ⌀ non-marine (no or very few 5% algal acritarchs).
- ✡ brackish (spiny acritarch, no or very few dinoflagellates 1%).
- ✡/♀ marginal marine (1-5% very low diversity dinoflagellates).
- ♀ nearshore marine (6-30% low to medium diversity dinoflagellates).
- ♀/♀♀ intermediate marine (31-60% medium diversity dinoflagellates).
- ♀♀ offshore marine (61%-80% medium to high diversity dinoflagellates).
- ⊖ far offshore marine/oceanic (81%-100% high diversity dinoflagellates and/or planktonic forams).

Confidence Ratings :

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1 : fair with rare zone fossils in core/swc.
2 : poor with non-diagnostic assemblage in core/swc. Often occurs next to a distinctive 0 to 1 rating, lacking the zone fossil seen adjacent.
3 : good with extinction event (top range) in cuttings.
4 : poor to fair with inception event (base range) in cuttings and therefore may be picked too low if caved or too high if swamped by cavings.
5 : poor with non-diagnostic assemblage in cuttings. Usually seen adjacent to a higher rating and picked on the absence of key zone fossil.
? : no confidence. Picked as a best guess in very poor data.

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