Palynological analysis of cuttings samples from Port Fairy–1, onshore Otway Basin.

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INTERPRETATIVE DATA

SUMMARY.
Ten cuttings samples have been analysed over a 689 metre interval from the Sherbrook and Otway Groups in the Port Fairy–1 exploration well in the Portland Trough. The spore-pollen and microplankton assemblages recovered are diagnostic of the latest Maastrichtian Timboon Sandstone or Massacre Shale between 856 and 874m at the top of the Sherbrook Group, and the Turonian Flaxman and Waarre Formations between 1351 and 1387m at the base of the group. The palynology further indicates that the stratigraphic interval age equivalent to the Waarre Unit C reservoir sands is absent in Port Fairy–1. The spore-pollen assemblages recovered from the bottom ~150 metres penetrated in the well are diagnostic of the Late Albian Eumeralla Formation. Recovery of a distinctive new angiosperm species from these cuttings suggests that part or whole this section has not previously been intersected in the subsurface and Port Fairy–1 may contain the youngest known Eumeralla Formation in the Otway Basin. The stratigraphic distribution of all sample analysed is summarised in the following table:

Table 1. Stratigraphic and palynological summary of Port Fairy–1, Otway Basin.

AGE	STRATIGRAPHY	PALYNOLOGY	DEPTHS (mKB)
Recent to Paleocene		NOT ANALYSED	
Late Maastrichtian	SHERBROOK GROUP Massacre Shale and/or Timboon Sandstone	Upper *F. longus* SP Zone and *M. druggii* MP Zone	856 to 874m
Campanian to Coniacian	Paaratte Formation Skull Creek Mudstone Nullawarre Greensand Belfast Mudstone	NOT ANALYSED (but present in cavings)	
Late Turonian	Flaxman Formation	*G. ancorus* SP Subzone and *K. polypes* MP Subzone	1351 to 1357m
Early Turonian	Waarre Formation Units A and B	*P. mawsonii* SP Zone and *C. edwardsii* MP Acme Subzone	1369 to 1387m
Albian	OTWAY GROUP Eumeralla Formation	*P. pannosus* SP Zone	1405 to 1545m

SP = Spore-Pollen; MP = Microplankton

INTRODUCTION

Only cutting samples were submitted for analysis from the Port Fairy–1 well drilled by Essential Petroleum Resources Limited as no core or sidewall cores were taken in the well. An initial batch of eight samples was received and forwarded to Laola Pty Ltd in Perth on 18th February 2002 for palynological processing, and the prepared palynological slides received back on 1st March. These were immediately examined with an initial Provisional report submitted the same day, and a subsequent updated report with initial quantitative data submitted on 10th March. Based on these results an additional two cuttings samples at 856-59m and 1368m were selected for analysis and these were forwarded to Laola Pty Ltd on 18th March. Prepared palynological slides were received back on 27th March, and the third Provisional report was submitted the same day.

The zones identified from and ages assigned to the samples (Table 1) conform to the standard Australian palynological zonation scheme of Helby *et al.* (1987), subsequently improved and modified by Partridge (1999). Zone identification criteria, confident ratings and microplankton abundances in the samples are summarised on Table 2. The amount of sample processed averaged 15.7 gram, with the exception of the shallowest samples from which 53 grams was processed, to give mostly moderated to high yields of kerogen which contained moderate to high concentrations of palynomorphs which were mostly well-preserved (Tables 3 & 4). Species recorded during the microscope examination are listed in Table 5 & 6. Author citations for most species recorded in can be sourced from the Dettmann (1963), Helby *et al.* (1987), or the indexes for dinocysts and other organic-walled microplankton prepared by Fensome *et al.* (1990) and Williams *et al.* (1998).

GEOLOGICAL DISCUSSION

The ten cuttings samples analysed all gave good assemblages which can be confidently assigned to diagnostic zones and are not significantly complicated by downhole cavings. The samples can be group into three associations representing the top of the Sherbrook Group, the basal ~50 metres of the Sherbrook Group and the top ~150 metres of the underlying Otway Group. A section of 477 metres representing the bulk of the Sherbrook Group was not sampled between 874 and 1351m, but the likely zones present in this interval can be inferred from caved index species recorded in deeper cuttings.

The two shallowest samples contain diverse assemblages of latest Maastrichtian age (Upper *F. longus* Zone), which are representative of either the uppermost part of the Timboon Sandstone or the basal part of the Massacre Shale according to the correlation between the zones and lithological nomenclature advocated by Partridge (2001). Noteworthy in these two assemblages was the lack of any obvious down-hole contamination from either the Pebble Point Formation or overlying Pember Mudstone.

Between these and the top of the next sample from the Flaxman Formation is a 477 metre sampling gap. However the presence of caved specimens of *Nelsoniella aceras, Amphidiadema denticulata, Isabelidinium cretaceum, Odontochitina porifera, Chatangiella tripartita* and *Isabelidinium balmei* in the deeper samples suggests that section age equivalent to the Belfast Mudstone and younger Skull Creek Mudstone is present in the Port Fairy–1 well.

The five samples between 1351 and 1387m from the basal 40 to 50 metres of the Sherbrook Group all contain diagnostic assemblages. The top two samples at 1351 and 1357m contain distinctive assemblages belonging to the *G. ancorus* and *K. polypes* Subzones which are diagnostic of the Flaxman Formation. The significant abundance or spike of *Cupressacites* pollen (average 24%) in these two samples further restricts them to the upper part of the formation equivalent to the Banoon Member of Partridge (2001). The bottom three samples at 1369m, 1381m and 1387m also contain distinctive assemblages. The microplankton are referred to the *C. edwardsii* Acme Subzone, and the spore-pollen probably all belong to the *H. trinalis* Subzone even though the eponymous species was only confidently recorded at 1369m. The microplankton subzone is characteristic of Units A and B or the Waarre Formation in the Port Campbell Embayment, while the spore-pollen subzone extends slightly higher into the lower part of Unit C (= Unit Ca of Partridge 2001; fig.2). As there is only a 12 metre sampling gap between the Flaxman and Waarre assemblages it appears likely that the main reservoir sandstones that occur in the upper part of Unit C of the Waarre Formation are absent in the Port Fairy–1 well. Further, as there is no obvious caved species in the cuttings representative of either the *Laevigatosporites musa* or *Isabelidinium evexus* Subzones, which are characteristic of the upper part of Unit C, the most likely scenario is that the Flaxman Formation rests unconformably on Unit B of the Waarre Formation.

Finally, the deepest three samples between 1405 and 1545m, although contaminated with significant caved material, can all be confidently assigned to the *P. pannosus* Zone which is characteristic of the youngest part of the Eumeralla Formation. The occurrence in these three samples of a distinctive new pollen species here called *Tricolpites melusina* sp. nov., that has not previously been reported from

either the Eumeralla, Waarre or younger formations, suggests that the Port Fairy–1 well ma have penetrated a younger part of the Eumeralla Formation that has not been intersected before.

BIOSTRATIGRAPHY

Upper *Forcipites longus* spore-pollen & *Manumiella druggii* microplankton Zones
Interval: 856 to 874 metres
Age: Latest Maastrichtian.

The spore-pollen assemblages from the shallowest two cuttings are dominated by angiosperm pollen, principally *Proteacidites* species (average 31% of spore-pollen count), and are no younger than the Upper *Forcipites* (al. *Tricolpites*) *longus* Zone based on the youngest occurrences of a number of species the most reliable of which are *Forcipites longus, Grapnelispora evansii, Nothofagidites senectus, Ornamentifera sentosa, Proteacidites* (al. *Cranwellipollis) palisadus, Proteacidites reticuloconcavus* ms and *Tricolporites lilliei*. The samples are also no older than the Upper *F. longus* Zone based on the oldest occurrence of *Tripunctisporis maastrichtiensis* and the moderate abundances of *Gambierina rudata* (~8%).

Marine microplankton are moderately abundant (average 15% of SP + MP count) in the samples, but species diversity is low with the assemblages overwhelmingly dominated by the index species *Manumiella conorata* (>70% of MP count) which is diagnostic of the *M. druggii* Zone.

Phyllocladidites mawsonii spore-pollen & *Palaeohystrichophora infusorioides* microplankton Zones
Interval: 1351 to 1387 metres.
Age: Turonian.

The assemblages from the five cuttings samples from the basal ~50 metres of the Sherbrook Group are consistent with the revised understanding of these two broad zones, and can be further subdivided into the new subzones recognised by Partridge (1999, 2001). The composite spore-pollen assemblage recorded from the interval has a diversity of >50 species with the eponymous species recorded in all samples, but lacks *Hoegisporis uniforma* and other index species diagnostic of the older Cenomanian *H. uniforma* Zone (formerly the *A. distocarinatus* Zone), and any significant species of the younger overlying *T. apoxyexinus* Zone. The composite microplankton assemblage has a recorded diversity of >35 species, and as such is of sufficient diversity for confident assignment to the *P. infusorioides* Zone, even though the eponymous species was only recorded in the shallowest two cuttings samples. The *P. infusorioides* Zone was originally defined on negative criteria. These are the absence of index species that, either become extinct at the top of the underlying *D. multispinum* Zone, or have their first appearance in the overlying *C. striatoconum* Zone (Helby *et al.*, 1987). Subsequently, other index species which have abundance acmes or extinctions within the *P. infusorioides* Zone have been documented and these form the basis of the new subzones (Partridge, 1999, 2001). As with other wells analysed from the Otway Basin none of the diagnostic species of the Cenomanian *D. multispinum* Zone have been found in the Port Fairy–1 well. Criteria for identification of the subzones is discussed in the following:

Gleicheniidites ancorus spore-pollen & *Kiokansium polypes* microplankton Subzones
Interval: 1351 to 1357 metres.
Age: late Turonian.

The two cuttings are assigned to the upper part of the *G. ancorus* Subzone on the presence of the eponymous species and the spike in the abundance of *Cupressacites* pollen. Supporting criteria for the subzone identification is the youngest occurrences of *Appendicisporites distocarinatus* and *Laevigatosporites musa* ms and presence of *Coptospora pileolus* ms. The spore-pollen assemblages are dominated by *Cupressacites* pollen (average 24%), *Podocarpidites* pollen (15%), and spores of *Gleicheniidites circinidites* (8.7%).

The samples are also interpreted to be no younger than the *K. polypes* Subzone based on the LADs of the index species *Kiokansium polypes* and *Valensiella griphus*. The microplankton assemblages are dominated by the colonial algae *Amosopollis cruciformis* (average 27%) and the dinocyst *Heterosphaeridium* spp. (13.5%). The index species *Palaeohystrichophora infusorioides, K. polypes* and *V. griphus* are all present in moderate abundances (range 3 to 5%). The moderate abundance of *Cribroperidinium edwardsii* (4%) in the deeper sample is considered to represent reworking rather than either an extension of the range of that species or possible top for the underlying subzones.

***Hoegisporis trinalis* spore-pollen & *Cribroperidinium edwardsii* microplankton Acme Subzones**
Interval: 1369 to 1387 metres.
Age: early Turonian.

The three cuttings all probably belong to the *H. trinalis* Subzone on the consistent presence of the spores *Appendicisporites distocarinatus* and *Verrucosisporites admirabilis* ms, even though the eponymous species *Hoegisporis trinalis* was only confidently recorded from the shallowest sample at 1369m. The spore-pollen assemblages are dominated by spores of *Cyathidites* (average 19%) and *Gleicheniidites circinidites* (17%), with a secondary dominance of *Podocarpidites* pollen (12%).

A samples can also be assigned to the *C. edwardsii* Acme on the dominance (>20%) of the eponymous species in the assemblages. The consistent presence of *Palaeoperidinium cretaceum* (4%) supports this assignment as does the sharp decline in abundance of *Amosopollis cruciformis* and *Heterosphaeridium* spp. Most of the 5% abundance of the latter two species is probably due to cavings.

***Phimopollenites pannosus* spore-pollen Zone**
Interval: 1405 to 1545 metres
Age: Late Albian.

The three deepest cuttings samples all contain Early Cretaceous spore-pollen assemblages typical of the Otway Group mixed with spore-pollen and microplankton caved from the overlying Sherbrook Group. The recorded assemblages are dominated by smooth trilete spores assigned to *Cyathidites* (average 26%) and bisaccate pollen assigned to *Podocarpidites* (16%), and show an increase in the abundance of *Corollina torosa* pollen (from <1% to 3%) and decline in *Gleicheniidites circinidites* spores (from 14% to 4%) relative to the overlying *P. mawsonii* Zone. The samples are assigned to the *P. pannosus* Zone on the presence of *Coptospora paradoxa* at 1405 and 1441m and the eponymous species *Phimopollenites pannosus* at 1441 and 1545m. A position high in the zone is suggested based on the frequent presence (>2%) of a new angiosperm species here informally named *Tricolpites melusina* sp. nov. This distinctive species has not been recorded from other sections of the *P. pannosus* Zone analysed from the Otway Basin, and may in future provide a useful criterion for subdivision of the zone. The moderate abundance (5 to 11%) of microplankton recorded in the counts (Table 5) consists mainly of caved species in the cuttings. Only *Sigmopollis carbonis, Horologinella* sp. cf *H. lineata* and perhaps *Micrhystridium* sp. are considered to be *in situ* and these non-marine microplankton represent <2% of the assemblage count.

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*Confidence Ratings used in STRATDAT database and applied to Table 2.

Alpha codes: Linked to sample		**Numeric codes:** Linked to fossil assemblage		
A	Core	**1**	**Excellent confidence:**	High diversity assemblage recorded with key zone species.
B	Sidewall core	**2**	**Good confidence:**	Moderately diverse assemblage recorded with key zone species.
C	Coal cuttings	**3**	**Fair confidence:**	Low diversity assemblage recorded with key zone species.
D	Ditch cuttings	**4**	**Poor confidence:**	Moderate to high diversity assemblage recorded without key zone species.
E	Junk basket	**5**	**Very low confidence:**	Low diversity assemblage recorded without key zone species.

Table 1: Interpretative data from of Port Fairy–1, Otway Basin.

Sample Type	Depth	Spore-Pollen Zones (Microplankton Zones) and AGES	CR*	Comments & Key Species Present
Cuttings	856-59m	Upper *Forcipites longus* Zone (*Manumiella druggii* Zone) **Latest MAASTRICHTIAN**	D1 D3	MP 20% of total SP + MP count and dominated by *Manumiella conorata.* SP count dominated by *Proteacidites* pollen with FAD of *Tripunctisporis maastrichtiensis* and common *Gambierina rudata* at 10% confirming Upper subzone.
Cuttings	874m	Upper *Forcipites longus* Zone (*Manumiella druggii* Zone) **Latest MAASTRICHTIAN**	D1 D3	MP 12% dominated by *Manumiella conorata.* SP count dominated by *Proteacidites* pollen. Zones confirmed by FADs of *Forcipites longus* and *Manumiella conorata.*
Cuttings	1351m	*Gleicheniidites ancorus* Subzone (*Kiokansium polypes* Subzone) **late TURONIAN**	D1 D2	MP 11% dominated by *Amosopollis cruciformis.* SP count dominated by *Cupressacites* pollen 25% LADs of *Kiokansium polypes* and *Valensiella griphus* confirms assignment to *K. polypes* Subzone of *P. infusorioides* Zone.
Cuttings	1357m	*Gleicheniidites ancorus* Subzone (*Kiokansium polypes* Subzone) **late TURONIAN**	D1 D2	MP 16% dominated by *Amosopollis cruciformis.* SP count dominated by *Cupressacites* pollen 23% which with FAD of *Gleicheniidites ancorus* confirms assignment to subzone of *Phyllocladidites mawsonii* Zone.
Cuttings	1369m	*Phyllocladidites mawsonii* Zone & *Hoegisporis trinalis* Subzone (*C. edwardsii* Acme Subzone) **early TURONIAN**	D1 D2	MP 6% of total count with *Cribroperidinium edwardsii* at 26% of MP count. SP dominated by spores of *Gleicheniidites* 20% and *Cyathidites* 19% and containing LAD of *Hoegisporis trinalis.*
Cuttings	1381m	*Phyllocladidites mawsonii* Zone (*C. edwardsii* Acme Subzone) **early TURONIAN**	D1 D2	MP 14% of total count with *Cribroperidinium edwardsii* at 26% of MP count. SP count dominated by spores of *Gleicheniidites* 13% and *Cyathidites* 17%.
Cuttings	1387m	*Phyllocladidites mawsonii* Zone (*C. edwardsii* Acme Subzone) **early TURONIAN**	D1 D2	MP 10% of total count with *Cribroperidinium edwardsii* at 16% of MP count. SP count dominated by spores of *Gleicheniidites* 19% and *Cyathidites* 21%.
Cuttings	1405m	*Phimopollenites pannosus* Zone **Late ALBIAN**	D1	*In situ* non-marine MP <1% of total count. SP count dominated by *Cyathidites* spores 32% and contains LADs of *Coptospora paradoxa, Tricolpites melusina* sp. nov. and frequent *Crybelosporites striatus* and *Corollina torosa*.
Cuttings	1441m	*Phimopollenites pannosus* Zone **Late ALBIAN**	D1	*In situ* non-marine MP <2% of total count. SP count dominated by *Cyathidites* spores 31% and includes LAD of *Phimopollenites pannosus.*
Cuttings	1545m	*Phimopollenites pannosus* Zone **Late ALBIAN**	D5	*In situ* non-marine MP <2% of total count. SP count dominated by *Podocarpidites* pollen 26% and *Cyathidites* spores 16%. Sample contains significant down-hole contamination.

FAD & LAD = Last & First Appearance Datums.
MP = Microplankton
SP = Spore-pollen

BASIC DATA

Table 3: Basic sample data for Port Fairy–1, Otway Basin.

Sample Type	Depth	Lithology & Texture of cuttings	Wt (grams)	VOM (cc)	Lab. Yield
Cuttings	856-59m	Black-dark grey argillaceous quartz sandstone, very fine texture.	52.9	2.8	0.052
Cuttings	874m	Dark grey mudstone, very fine texture.	15.1	0.3	0.019
Cuttings	1351m	Black mudstone, fine texture.	15.3	0.7	0.045
Cuttings	1357m	Dark grey mudstone, fine-medium texture.	15.4	0.5	0.032
Cuttings	1369m	Medium grey mudstone, coarse-grain texture.	18.6	1.4	0.075
Cuttings	1381m	Medium grey mudstone, fine-medium texture.	15.0	1.1	0.073
Cuttings	1387m	Medium-light grey mudstone, powder to lumpy texture.	15.1	0.9	0.059
Cuttings	1405m	Medium grey mudstone, very fine texture.	15.3	0.4	0.026
Cuttings	1441m	Dark grey mudstone, medium texture.	15.4	0.4	0.025
Cuttings	1545m	Dark grey mudstone, lumpy texture.	15.3	0.2	0.013

Wt = Weight of sample processed in grams.
VOM = Volume of wet organic residues in cubic centimetres recovered from sample.
Org. Yield = VOM divided by Wt.

Table 4: Basic assemblage data for Port Fairy–1, Otway Basin.

Sample Type	Depth	Visual Yield	Palynomorph Concentration	Preservation	No. SP Species	No. MP Species
Cuttings	856-59m	High	Moderate	Poor-good	43+	8+
Cuttings	874m	High	Moderate-high	Good	43+	6+
Cuttings	1351m	High	High	Good	37+	27+
Cuttings	1357m	High	High	Fair-good	32+	25+
Cuttings	1369m	High	Moderate	Poor-fair	41+	17+
Cuttings	1381m	High	High	Poor-fair	32+	26+
Cuttings	1387m	High	Moderate-high	Poor	37+	23+
Cuttings	1405m	Moderate	Moderate	Poor-fair	33+	13+
Cuttings	1441m	High	Moderate	Poor-fair	37+	6+
Cuttings	1545m	Moderate	Low	Poor	26+	3+
				Averages:	**36.1**	**15.4**

Table 5: Species abundances and occurrences in Port Fairy–1, Otway Basin.

Sample Type:	Cuttings	Cuttings
Depth:	856-59m	874m
Spore-Pollen Species		
Angiosperm pollen undiff.	0.6%	2.8%
Australopollis obscurus	1.2%	
Araucariacites australis	0.6%	2.1%
Baculatisporites spp.	2.4%	
Beaupreaidites orbiculatus		cf.
Camarozonosporites apiculata †	X	X
Camarozonosporites bullatus	X	X
Camarozonosporites heskermensis		X
Clavifera triplex	0.6%	X
Cyathidites spp. large >40µm	X	0.7%
Cyathidites spp. small <40µm	4.2%	2.8%
Densoisporites velatus		0.7%
Dilwynites granulatus	2.4%	
Dictyophyllidites spp.	1.2%	2.1%
Forcipites longus		X
Gambierina rudata	9.5%	6.4%
Gleicheniidites circinidites	3.0%	6.4%
Grapnelispora evansii	X	
Herkosporites elliottii	1.8%	1.4%
Ilexpollenites spp.		0.7%
Laevigatosporites major	X	X
Laevigatosporites ovatus	5.4%	2.8%
Latrobosporites amplus	X	1.4%
Liliacidites spp.	X	1.4%
Lygistepollenites balmei	0.6%	0.7%
Lygistepollenites florinii	1.8%	1.4%
Marattisporites scabratus	1.2%	
Microalatidites paleogenicus		0.7%
Microcachryidites antarcticus	1.2%	2.1%
Nothofagidites endurus		X
Nothofagidites senectus	X	1.4%
Ornamentifera sentosa	X	
Peninsulapollis gillii	0.6%	
Peromonolites baculatus †	X	
Perotrilites spp.		X
Phyllocladidites mawsonii	4.2%	9.9%
Phyllocladidites verrucosus	1.2%	
Podocarpidites spp.	6.0%	13.5%
Proteacidites spp.	31.0%	25.5%
Proteacidites clinei †	1.2%	0.7%

Table 5: Species abundances and occurrences in Port Fairy–1, Otway Basin (continued).

Sample Type:	**Cuttings**	**Cuttings**
Depth:	**856-59m**	**874m**
Proteacidites konfragosus †	X	X
Proteacidites palisadus		0.7%
Proteacidites prepolus †	X	
Proteacidites reticuloconcavus †	1.8%	0.7%
Pseudowinterapollis wahooensis	X	
Retitriletes spp.	X	2.8%
Stereisporites antiquisporites	10.7%	2.1%
Stereisporites regium	1.2%	0.7%
Tetracolporites verrucosus		0.7%
Trichotomosulcites subgranulatus	0.6%	1.4%
Tricolp(or)ates spp.	1.2%	2.1%
Tricolpites waiparaensis		X
Tricolporites lilliei		X
Trilete spores undiff.	3.0%	
Triporopollenites spp.		0.7%
Tripunctisporis maastrichtiensis	X	
Total Spores:	34.5%	24.1%
Total Gymnosperms:		31.9%
Total Angiosperms:	47.6%	44.0%
Total Spore-Pollen:	**168**	**141**
MP count:	**41**	**20**
Combined SP + MP count:	**209**	**161**
MP% of combined MP + SP count:	**19.6%**	**12.4%**
Microplankton & Algae Species		
Microplankton undiff.	5%	15%
Alterbidinium sp. cf *A. acutulum*	X	5%
Amosopollis cruciformis	2%	
Botryococcus braunii		X
Impletosphaeridium sp.	7%	5%
Manumiella conorata	71%	70%
Nummus sp.		X
Palaeostomocystis reticulata	2%	
Paralecaniella indentata	12%	5%
Spiniferites spp.	2%	
Total Microplankton:	41	20
Reworked Palynomorphs	1.0%	3.1%
TOTAL COUNT:	209	**161**

Abbreviations: X = Present
cf. = Compared with
† = Manuscript species.

Table 6: Species abundances and occurrences in Port Fairy–1, Otway Basin.

Sample Type:	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts
Depth:	1351m	1357m	1369m	1381m	1387m	1405m	1441m	1545m
Spore-Pollen Species								
Aequitriradites spinulosus					X		1.3%	
Appendicisporites distocarinatus	X		0.6%	X	X			
Araucariacites australis	1.3%	2.9%	2.4%	1.7%	1.6%	2.7%	1.3%	5.3%
Asteropollis asteroides		X						
Australopollis obscurus	0.6%	0.5%			0.8%	0.9%		
Baculatisporites spp.	0.6%	1.0%	1.8%	2.5%	3.2%	1.8%	1.9%	8.8%
Balmeisporites glenelgensis			X					
Balmeisporites holodictyus						X		
Ceratosporites equalis	X				X	X	0.6%	
Cicatricosisporites spp.	X	X		2.5%	1.6%	4.5%	7.6%	1.8%
Clavifera triplex	1.3%	X	X					
Coptospora paradoxa						X	0.6%	
Coptospora pileolus †	X							
Corollina torosa	0.6%	1.0%	1.2%		X	2.7%	4.5%	0.9%
Crybelosporites striatus					RW	2.7%	1.9%	2.6%
Cupressacites sp.	25%	23.%	3.7%	5.9%	X	3.6%	3.8%	1.8%
Cyathidites spp. large >40µm	0.6%	1.4%	3.7%	1.7%	7.3%	3.6%	4.5%	1.8%
Cyathidites spp. small <40µm	4.5%	6.2%	15.2%	15.3%	13.7%	28.2%	26.8%	14.0%
Cyclosporites hughesii						X	X	
Dacrycarpites australiensis	0.6%							
Densoisporites velatus			0.6%					
Dictyophyllidites spp.	0.6%	4.3%	5.5%	4.2%	3.2%	3.6%	1.3%	1.8%
Dictyotosporites speciosus						X		
Dilwynites spp.	11.6%	12%	9.8%	14.4%	7.3%	2.7%	1.9%	0.9%
Dilwynites echinatus †	X		X			X		
Dilwynites granulatus	X	X	X	X	X	X	X	X
Dilwynites pusillus †	X	X	X	X	X	X	X	
Foraminisporis asymmetricus						X	X	
Foraminisporis dailyi	X		0.6%					
Foveogleicheniidites confossus			1.2%	X				
Gleicheniidites ancorus †	0.6%	1.0%						
Gleicheniidites circinidites	8.4%	9.1%	19.5%	12.7%	18.5%	6.4%	2.5%	4.4%
Herkosporites elliottii	X	2.4%	0.6%		1.6%			
Herkosporites proxistriatus	X		X	2.5%				
Hoegisporis trinalis †			X		?			
Laevigatosporites musa †		0.5%				0.9%		
Laevigatosporites ovatus	2.6%	1.9%	3.0%	2.5%	1.6%	2.7%	1.9%	
Liliacidites spp.			X	0.8%	0.8%	0.9%		
Lygistepollenites florinii	CV			CV				CV
Marattisporites scabratus	0.6%	1.4%	1.2%	0.8%	0.8%			0.9%
Matonisporites cooksoniae							X	
Microcachryidites antarcticus	6.5%	6.2%	3.0%	5.1%	2.4%	6.4%	3.8%	3.5%
Neoraistrickia truncata		X	X					
Osmundacidites wellmanii	0.6%	0.5%	1.8%	0.8%	1.6%	2.7%	1.9%	6.1%
Peromonolites spp.	X		X		2.4%			
Perotrilites jubatus			0.6%		1.6%	X		1.8%

Table 6: Species abundances and occurrences in Port Fairy–1, Otway Basin (continued).

Sample Type:	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts
Depth:	1351m	1357m	1369m	1381m	1387m	1405m	1441m	1545m
Perotrilites majus			X	X				
Phimopollenites pannosus							3.2%	0.9%
Phyllocladidites eunuchus †		0.5%					X	
Phyllocladidites mawsonii	2.6%	1.0%	X	0.8%	0.8%		0.6%	2.6%
Podocarpidites spp.	20.6%	9.1%	12.8%	11.0%	11.3%	9.1%	12.1%	26.3%
Proteacidites spp.	X		0.6%	0.8%	2.4%	0.9%	0.6%	
Retitriletes spp.	0.6%	1.9%	X	2.5%	3.2%	2.7%	2.5%	1.8%
Retitriletes austroclavatidites						X	X	
Retitriletes nodosus	RW			X		X		
Stereisporites antiquisporites	0.6%	0.5%	0.6%	X	0.8%	1.8%	0.6%	0.9%
Stoverisporites microverrucatus						X		
Trichotomosulcites subgranulatus	5.8%	6.7%	1.8%	6.8%	6.5%	2.7%	5.1%	4.4%
Tricolp(or)ates spp.		1.0%	1.2%	0.8%	0.8%	1.8%	1.3%	
Tricolporites melusina †						2.7%	0.6%	3.5%
Trilete spores undiff.		3.3%	4.9%		4.0%	0.9%	1.9%	2.6%
Trilobosporites trioreticulosus			X					
Triporoletes laevigatus						X	1.9%	
Triporoletes reticulatus			X	X	X		0.6%	0.9%
Verrucosisporites admirabilis †		1.0%	1.8%	2.5%	X	CV		
Vitreisporites signatus	2.6%			0.8%	X		0.6%	
Total Spores:	**22%**	**36%**	**63%**	**51%**	**65%**	**63%**	**61%**	**50%**
Total Gymnosperms:	**77%**	**62%**	**35%**	**47%**	**30%**	**30%**	**34%**	**46%**
Total Angiosperms:	**0.6%**	**1.4%**	**1.8%**	**2.5%**	**4.8%**	**7.3%**	**5.7%**	**4.4%**
Total Spore-Pollen:	**155**	**209**	**164**	**118**	**124**	**110**	**157**	**114**
Total MP in MP + SP count:	**20**	**40**	**11**	**20**	**14**	**14**	**9**	**7**
Combined MP + SP Count:	**175**	**249**	**175**	**138**	**138**	**124**	**166**	**121**
MP% in SP + MP counts	**11.4%**	**16.1%**	**6.3%**	**14.5%**	**10.1%**	**11.3%**	**5.4%**	**5.8%**
Microplankton								
Microplankton undiff.	5%	16%	5%	10%	16%	21%	11%	
Amosopollis cruciformis	31%	23%	3%	5%	3%	7%	11%	
Amphidiadema denticulata			CV					
Callaiosphaeridium asymmetricum	X	X						
Chatangiella tripartita	CV							
Chatangiella victoriensis	CV							
Chlamydoporella nyei		4%	X	6%	10%	7%		
Cleistosphaeridium ancoriferum	2%	1%	4%	3%	3%			
Cribroperidinium apione	5%	3%		X	7%			
Cribroperidinium edwardsii		4%	26%	26%	16%	7%	22%	29%
Cyclonephelium compactum				4%	5%			
Cyclonephelium distinctum	X		X					
Cyclonephelium vannophorum				3%				
Cymatiosphaera sp.				X	X			
Exochosphaeridium spp.	X	X	5%	4%	X	7%	CV	
Flaxadinium sp. nov. †	8%	1%		1%		7%		
Florentinia deanei					X			
Heterosphaeridium spp.	11%	16%	22%	8%	3%	7%	CV	43%

Table 6: Species abundances and occurrences in Port Fairy–1, Otway Basin (continued).

Sample Type:	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts	Cutts
Depth:	1351m	1357m	1369m	1381m	1387m	1405m	1441m	1545m
Heterosphaeridium conjunctum	X	X						
Heterosphaeridium heteracanthum	X	X	X	X	X	CV		
Horologinella sp. cf *H. lineata*						7%		
Hystrichodinium pulchrum		X		1%				
Isabelidinium spp.	5%	4%	1%					
Isabelidinium balmei	CV	3%			CV			
Isabelidinium cretaceum		CV						
Kallosphaeridium sp.	X	7%		3%	2%			
Kiokansium polypes	5%	3%	5%	4%	5%			
Manumiella conorata			CV					CV
Micrhystridium spp.	3%		1%	X	2%	14%		
Microdinium ornatum				X				
Nelsoniella aceras								CV
Odontochitina costata	X		4%		2%	CV		
Odontochitina operculata	X	3%						
Odontochitina porifera	3%	1%						
Oligosphaeridium spp.			14%	14%	7%		11%	
Oligosphaeridium complex	X		X	X	X		CV	
Oligosphaeridium pulcherrimum		X		X				
Palaeohystrichophora infusorioides	5%	3%				7%		
Palaeoperidinium cretaceum			5%	4%	3%	CV		
Palambages spp.	2%			X				
Pterospermella australiensis				X		CV		
Sigmopollis carbonis/hispidus					X	X	33%	29%
Spiniferites spp.	6%	4%	3%	4%	9%	7%	11%	
Tanyosphaeridium salpinx	5%							
Trichodinium castanea		X		3%	2%	CV		
Trithyrodinium spp.	2%							
Valensiella griphus	3%	4%					CV	
Veryhachium sp.					5%	X		
Xenascus sp.	X	X						
Total Microplankton count:	**62**	**74**	**76**	**80**	**58**	**14**	**9**	**7**
Other Palynomorph								
Fungal microfossils	1.3%	0.9%	1.2%			0.9%	2.5%	
Botryococcus braunii		X						
Reworked/Caved spore-pollen						0.9%		2.6%
Aratrisporites spp.					RW			RW
Battenipollis sectilis	CV							
Forcipites sabulosus	CV							
Latrobosporites amplus/ ohaiensis	CV					CV		
Nothofagidites senectus							CV	
Ornamentifera sentosa						CV	CV	
Pilosisporites notensis					RW			
Total Others:	**2**	**2**	**2**			**2**	**4**	**3**
TOTAL SP + Others COUNT:	**157**	**211**	**166**	**118**	**124**	**112**	**161**	**117**

Abbreviations: X= Present; CV = Caved; RW = Reworked;
cf. = Compared with; † = Manuscript species