DEPARTMENT OF MINES AND ENERGY

GEOLOGICAL SURVEY

SOUTH AUSTRALIA

REPORT BOOK

No.93/43

PALYNOLOGICAL DATING AND CORRELATION OF SAMPLES FROM BUS SWAMP 1, OTWAY BASIN, VICTORIA

N F ALLEY

Biostratigraphy

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Palynological Dating and Correlation of Samples from Bus Swamp 1, Otway Basin, Victoria

NEVILLE F. ALLEY
BIOSTRATIGRAPHY BRANCH

Palynological examination of eight samples from Bus Swamp 1 Well, Otway Basin, western Victoria, was undertaken. The samples range in age from the upper part of the *Cicatricosisporites australiensis* Zone of Helby *et al.* (1987) to the upper part of the *Foraminisporis wonthaggiensis* Zone, ie. Berriasian to Barremian (Early Cretaceous).

Palynological data presented in unpublished reports by Morgan and Burger were examined and correlated with the Australian Mesozoic scheme of Helby *et al.* (1987). These additional data show the samples analysed from Bus Swamp 1 range in age from *Coptospora paradoxa* Zone (Middle Albian) through to *C. australiensis* Zone (Berriasian).

SAMPLE INFORMATION

BOREHOLE DATA SUMMARY :

Palynological No.	Depth (m)
7242	830
7243	830-835
7258	982
7246	1145
7247	1406
7260	1515.83
7248	1790
7249	1800-1805
7259	1803

Type of sample: core and sidewall core, cuttings

Submitter: A. Hill, Oil and Gas Division

LOCATION:

General location: Western Victoria

STRATIGRAPHIC INFORMATION:

Geological Province: Otway Basin

ANALYTICAL DATA:

Laboratory technique:
Standard palynological laboratory methods were employed including digestion in HF, heavy liquid separation (zinc bromide), controlled treatment with Schulze Solution, sieving with 129 um and 10 um filters and mounting the residues as strews in glycerine jelly.

Microscope used: Zeiss Photomicroscope 111

RESULTS:

The correlations made below follow the Mesozoic palynological zonal scheme of Helby, Morgan and Partridge (1987). This is the best synthesis available for palynological dating in the Australian Mesozoic and should be preferred above other more local schemes. My conclusions are primarily based on the first appearances of key species as determined by Helby *et al.* (1987), but in the absence of these, some evaluation of the general composition of the palynofloras is made.

A chart of the species distribution in Bus Swamp 1 from the samples analysed, and on which my conclusions are largely based, is attached.

To aid in understanding the time relationships between different palynological datings undertaken in the Otway Basin I have complied a correlation chart of the various schemes used and the key palynofloral events (first and last appearances).

Zonation:

Sample 830 m

Correlation - upper *F. wonthaggiensis* Zone of Helby *et al.*, (1987).

Contains common *Foraminisporis wonthaggiensis* but lacks *F. asymmetricus*. The presence of *Triporoletes reticulatus* and *Pilosisporites notensis* indicates a correlation with the upper part of the zone. The presence of *Pilsosporites parvispinosus* is intriguing because this species is thought to make its first appearance in the middle of the younger *Cyclosporites hughesii* Zone, but there is nothing else to suggest a younger age, particularly in the absence of the key zonal fossil *F. asymmetricus*.

A number of species are abundant including: *Ceratosporites equalis*, *Cyathidites australis*, *C. minor*, *Cycadopites nitidus*, *Microcachryidites antarcticus*, *Podocarpidites ellipticus* and *Stereisporites antiquasporites*.

The sample is nonmarine.

The assemblage is equivalent to the Lower (probably lowermost) *Cyclosporites hughesii* Zone as currently being employed by Morgan in the Otway Basin.

S 7243 830-835 m

Correlation - upper *F. wonthaggiensis* Zone on the basis of the presence of *F. wonthaggiensis* and *Pilosisporites notensis* in the absence of *F. asymmetricus*. In this sample *P. parvispinosus* is absent.

Abundant species include: *Cyathidites asper* (the most abundant), *C. australis*, *C. minor*, *Retitriletes austroclavatidites*, *Microcachryidites antarcticus* and *Podocarpidites ellipticus*.

The sample is nonmarine.

The assemblage is equivalent to the lower *C. hughesii* Zone of Morgan in the Otway Basin. I requested that Roger Morgan review the assemblage for me and he concluded that it correlates with the Lower *C. hughesii* Zone, as he uses it in the Otway Basin. We are in agreement with the age.

Burger (unpublished report) also examined a sample from this level (MFP9864) and concluded that on the basis of the presence of *Pilosisporites parvispinosus* the assemblage was not significantly older than the Middle *C. hughesii* Zone. While this is a reasonable conclusion to reach on the basis of the presence of *P. parvispinosus*, I feel that the absence of the zonal fossil *Foraminisporis asymmetricus* indicates that the assemblage is not correlative with the *C. hughesii* Zone (Helby *et al.*, 1987) nor the Middle *C. hughesii* Zone of Dettmann (1986). *F. asymmetricus* is a good indicator for the *C. hughesii* Zone.

S 7244 957 m

During laboratory processing this sample was accidently mixed in with a sample at 1105 m. There was sufficient sample to allow the sample at 1105 m to be reprocessed, but not enough for the sample at 957 m. Thus a reasonable assessment of the age of the sample at 957 m can still be made.

Yield and preservation of palynomorphs in the sample are very good.

Correlation - lowermost *F. wonthaggiensis* Zone on the basis of the presence of *F. wonthaggiensis* in the absence of *Triporoletes reticulatus* and *Pilosisporites notensis*. There are consistent occurrences of *Cyclosporites hughesii* and *Dictyotosporites speciosus*.

Rare recycled Permian pollen are present.

The sample is nonmarine.

S 7258 982 m

This sample contained no palynomorphs.

S 7245 1105 m

This sample gave quite good recovery of palynomorphs, but restricted species diversity. It contains consistent *Cyclosporites hughesii* and *Dictyotosporites speciosus*, but lacks *F. wonthaggiensis*, *Triporoletes reticulatus* and *Pilosisporites notensis*. On this evidence the assemblage should be correlated with the upper part of the *Cicatricosisporites australiensis* Zone. However, a sample at 1515.83 m contains rare *F. wonthaggiensis*, thus the sample at 1105 m cannot be older than that. On this basis the sample at 1105 m is correlated with the lowermost *F. wonthaggiensis* Zone.

Rare recycled Permian pollen are present.

The sample is nonmarine.

S 7246 1145 m

Correlation with a spore-pollen zone is not possible because the yield and preservation of palynomorphs are extremely poor and the sample lacks zonal fossils. At best all that can be concluded is that the assemblage contains *Ceratosporites equalis* and must be younger than middle *Retitriletes watherooensis* Zone.

The sample appears nonmarine.

S 7247 1406 m

Correlation not possible because the sample is virtually barren of palynomorphs and the preservation of those is extremely poor.

S 7260 1515.83 m

Correlation - lower *Foraminisporis wonthaggiensis* Zone on the basis of the presence of extremely rare *F. wonthaggiensis* and the absence of the younger *Triporoletes reticulatus* and *Pilosisporites notensis.*

The yield of the assemblage is fair and the preservation poor to fair.

One recycled Permian pollen, *Plicatipollenites densus*, was recorded.

The sample is nonmarine.

Burger examined a sample from within the interval (MFP9865) and made a correlation with the upper *Crybelosporites stylosus* Zone of Dettmann (1986) mainly on the basis of the absence of *F. wonthaggiensis*. However, the latter species is present in the interval and thus the assemblage should more correctly be correlated with that zone.

S 7248 1790 m

Correlation - upper part of the *Cicatricosisporites australiensis* Zone on the basis of the presence of *Cyclosporites hughesii* in the absence of *F. wonthaggiensis, Triporoletes reticulatus, Pilsosporites notensis* and *F. asymmetricus*. Interestingly, *C. australiensis* could not be found.

One specimen resembling *F. wonthaggiensis* was found but the preservation is poor (as is the whole assemblage) and confident identification is not possible. If *F. wonthaggiensis* is present then the lower part of the *F. wonthaggiensis* Zone may be present, since the nominate species is often very rare in this part of the zone.

However, in general the assemblage is more typical of *C. australiensis* Zone, especially the presence of consistent *Classopolis* spp., *Converrucosisporites rewanensis, Ischyosporites crateris, Kraueselisporites linearis, Retitriletes facetus, R. watherooensis, Matonisporites cooksonae, Murospora florida, Neoraistrickia densata, Staplinisporites caminus* and *Callialasporites* spp.

The sample is nonmarine.

The assemblage is equivalent to the upper *C. australiensis* Zone as used by Morgan in the Otway Basin and to the *Crybelosporites stylosus* Zone per Burger. The latter author examined a sample within the interval (MFP9880) and my designation agrees with his.

S 7249 1800-1805 m

Correlation - upper part of the *C. australiensis* Zone on the basis of the presence of *C. australiensis*, *C. ludbrookii* and *Cyclosporites hughesii* in the absence of *F. wonthaggiensis*, *Triporoletes reticulatus* and *Pilosisporites notensis*.

A specimen of *Foraminisporis asymmetricus* was found but its colour and general state of preservation suggests that it is a downhole contaminant.

The sample is nonmarine.

The assemblage is equivalent to the upper *C. australiensis* Zone of Morgan and the upper part of the *C. stylosus* Zone as used by Burger.

S 7259 1803 m

The yield and preservation of palynomorphs in this sample is very poor; it contains abundant plant matter and vitrinite exhibiting significant thermal alteration.

Correlation - none possible. All that can be concluded is that *Ceratosporites equalis* and *Retitriletes watherooensis* are present and thus the sample is younger than the upper part of the *Retitriletes watherooensis* Zone.

CORRELATION BETWEEN SAMPLES FROM OTHER ANALYSES UNDERTAKEN ON BUS SWAMP 1

This section correlates between other analyses undertaken by Morgan and Burger and the palynological zonal system of Helby *et al.* (1987) for the Australian Mesozoic. The correlations are based on the evidence presented by the authors in the unpublished reports on Bus Swamp 1.

An asterisk indicates that the age determination has been corrected.

BURGER	HELBY *ET AL.* (1987)	
657	-	
830-835	Upper	*F. wonthaggiensis**
862	Upper	*F. wonthaggiensis**
913	Upper	*C. australiensis*
1510-16	Upper	*C. australiensis*
1756	Upper	*C. australiensis*
1785-90	Upper	*C. australiensis*
1815	-	
MORGAN		
300	*Coptospora paradoxa*	
465	*Cyclosporites hughesii**	
756	Upper *F. wonthaggiensis*	
886	Upper *F. wonthaggiensis*	
1190	Upper *C. australiensis*	
1325	Upper *C. australiensis*	
1560	Upper *C. australiensis*	
1640	Upper *C. australiensis*	
1730	Upper *C. australiensis*	
1840	-	

CONCLUSIONS

The samples range in age from *Coptospora paradoxa* Zone (mainly Middle Albian) through to the upper part of the *Cicatricosisporites australiensis* Zone (mainly Berriasian).

There is no evidence for removal of the Upper *C. australiensis* Zone, either in the Morgan scheme or that of Helby *et al.* (1987). In any event, the sampling intervals are too broad and the palynomorph recovery too poor in many samples to be able to determine the presence of hiatuses with any confidence.

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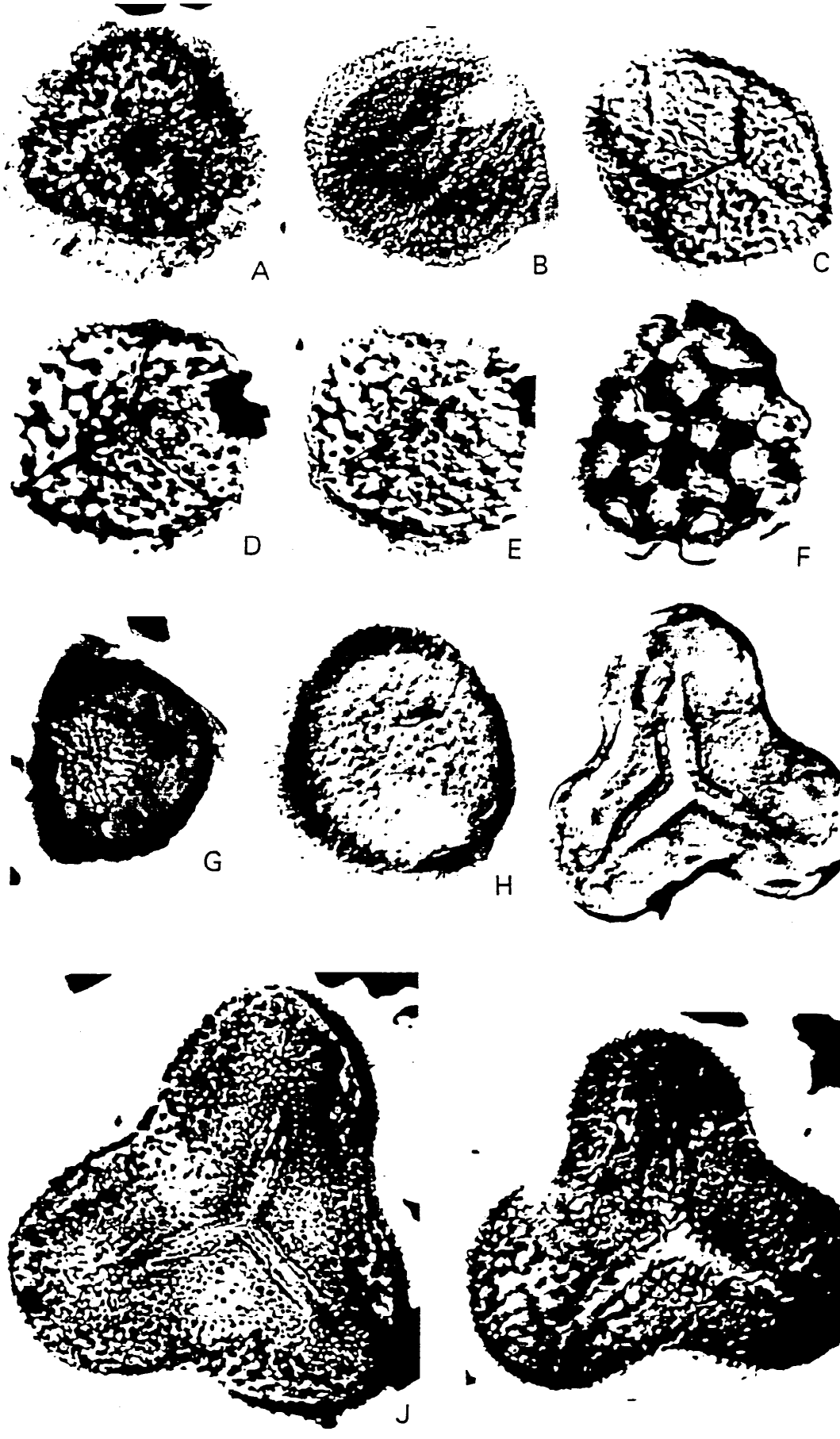
Plate 1. Selected palynomorphs from Bus Swamp 1. Sample depth from which the palynomorphs were recovered shown in parentheses.

A. *Dictyotosporites speciosus* (830-835). B. *Dictyotosporites complex* (1790). C, D, E. *Foraminisporis wonthaggiensis* (830); photographs showing the variable ornamentation typical of the species; Plates D & E are the same specimen but at different focus levels, D. the proximal surface showing the trilete mark and E. a more distal focus showing details of spinose ornamentation. F. *Klukisporites scaberis* (830-835). G. *Cooksonites variabilis* (1790). H. Unnamed ?alga (830) which has a restricted range (*Foraminisporis wonthaggiensis* Zone) within the Cadna-owie Formation of the Eromanga Basin. I. *Pilosisporites parvispinosus* (830). J, K. *Pilosisporites notensis* (830-835), photos of different specimens showing variable size and ornamentation.


A
B
C
D
E
F
G
H
I
J
K

SCALE
1 inch = 175

Sample	Depth
S7242/1	830.00
Sa	831.00
S7243/1	832.50
Sb	833.50
S7244	957.00
Sg	958.00
S7245/1	1105.00
Sf	1106.00
S7246	1145.00
Sc	1146.00
S7260/1	1515.83
Sd	1516.83
S7248/1	1790.00
Se	1791.00
S7249/1	1802.50
S7259/1	1803.00

55 Aequitriradites spinulosus
66 Aequitriradites verrucosus
17 Alisporites grandis
1 Alisporites similis
2 Araucariacites australis
3 Baculatisporites comaumensis
56 Biretisporites spectabilis
18 Callialasporites dampierii
40 Callialasporites segmentatus
19 Callialasporites trilobatus
61 Callialasporites turbatus
57 Camarozonosporites clivosus
54 Camarozonosporites ramosus
4 Ceratosporites equalis
_0 Cicatricosisporites australiensis
21 Cicatricosisporites ludbrookiae
41 Classopollis chateaunovi
42 Classopollis simplex
51 Contignisporites cooksoniae
43 Converrucosisporites rewanensis
74 Cooksonites variabilis
62 Couperisporites tabulatus
58 Crybelosporites stylosus
67 Cyathidites asper
5 Cyathidites australis
68 Cyathidites concavus
6 Cyathidites minor
22 Cycadopites nitidus
23 Cyclosporites hughesii
24 Dictyophyllidites crenatus
7 Dictyophyllidites harrisii
59 Dictyotosporites complex
69 Dictyotosporites filosus
60 Dictyotosporites speciosus
25 Foraminisporis asymmetricus
70 Foraminisporis dailyi
44 Foraminisporis wonthaggiensis
63 Foveosporites canalis
45 Foveotriletes parviretus
26 Gleicheniidites circinidites
80 INDET algae
27 Ischyosporites crateris
28 Klukisporites scaberis
46 Kraeuselisporites linearis
71 Kuylisporites lunaris
64 Laevigatosporites belfordii
29 Laevigatosporites ovatus
30 Leptolepidites major
31 Leptolepidites verrucatus
47 Lycopodiacidites asperatus
32 Matonisporites cooksonae
8 Microcachryidites antarcticus
48 Murospora florida
49 Neoraistrickia densata
9 Neoraistrickia truncatus
33 Osmundacidites wellmanii
82 Permian indet.
72 Pilosisporites notensis
75 Pilosisporites parvispinosus
81 Plicatipollenites densus
10 Podocarpidites ellipticus
34 Podocarpidites multesimus
52 Polycingulatisporites clavus
76 Polycingulatisporites densatus
53 Reticulatisporites pudens
11 Retitriletes australoclavatidite
35 Retitriletes circolumensus
77 Retitriletes eminulus
36 Retitriletes facetus
65 Retitriletes huttonensis
12 Retitriletes nodosus
37 Retitriletes reticulumsporites
38 Retitriletes rosewoodensis
13 Retitriletes watherooensis
14 Staplinisporites caminus
15 Stereisporites antiquasporites
39 Tricotomosulcites subgranulatis
73 Trilobosporites purverulentus
78 Triporoletes reticulatus
79 Triporoletes simplex
50 Velosporites triquetrus
16 Vitreisporites pallidus