



Palynology of Tertiary sediments from Windermere Drill Holes 1 and 3.

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Abstract

Approximately 50 m of core was sampled from two drill holes at Windermere. The palynology of the samples was investigated, and approximate ages were assigned based on the palynological schemes for the Gippsland and Bass Basins.

WINDERMERE DH1

Approximately 50 m of core was sampled for palynological investigation from the top of Windermere DH1, and approximate ages were then assigned to the samples based on the palynological schemes of Stover and Partridge (1973) and Partridge (1973) for the Gippsland and Bass Basins respectively.

49.43 m (sample 919)

Tricolpites gillii Cookson, 1957 is common in the microflora. This species last appears in the Lower *Malvacipollis diversus* Zone in the Gippsland Basin, and is uncommon after the Middle *M. diversus* Zone in the Bass Basin, suggesting therefore that the palynoflora is no younger than the Middle *M. diversus* Zone.

Other significant pollen types occurring within this sample include:

Nothofagidites goniatus (Cookson) Stover and Evans, 1973

Proteacidites adenanthoides Cookson, 1950

P. latrobensis Harris, 1966

P. incurvatus Cookson, 1950

Beaupreaidites verrucosus Cookson, 1950

Gambierina rudata Stover, 1973

Malvacipollis diversus Harris, 1965

P. adenanthoides, *P. incurvatus* and *M. diversus* first appear in the *Lygistepollenites balmei* Zone in either the Bass or Gippsland Basins (or both), while *N. goniatus*, *P. latrobensis* and *B. verrucosus* appear earliest at the base of the *M. diversus* Zone. This suggests that the age of the sample lies between the Lower and Middle *M. diversus* Zones. However in both the Bass and Gippsland Basins *G. rudata* last appears in the Upper *L. balmei* Zone, and does not overlap the ranges of *N. goniatus*, *P. latrobensis* or *B. verrucosus*.

It is possible that *G. rudata* represents pollen from reworked sediments, but it is also possible that the stratigraphic ranges of some pollen types in Tasmanian sediments are different from those of the same pollen types in the Gippsland and Bass Basins. Hence, in Tasmania, *G. rudata* may range slightly further than the Upper *L. balmei* Zone, thus extending into the Lower *M. diversus* Zone. If this is the case then the most probable age of the microflora at 49 metres is very early Eocene, corresponding with the Lower *M. diversus* stratigraphic zone.

43.20 m (sample 918)

Tricolpites gillii becomes scarce and *Gambierina rudata* is not present, although the remaining flora is similar to that at 49.43 m, thus suggesting a slightly younger age than sample 919.

Proteacidites crassus Cookson, 1950 and *Ericipites crassixinus* Harris, 1972 first appear in WDH 1 at 40.0 m (sample 117), which gives the sediment at this depth a maximum age corresponding with the Upper *M. diversus* Zone. However, the presence of palynomorphs similar to *Nothofagidites falcatus* (Cookson) Stover and Evans, 1973; *N. asperus* (Cookson) Stover and Evans, 1973; and *Periporopollenites vesicus* Partridge, 1973 suggests the sediment may be somewhat younger, as their ranges within the Bass and Gippsland Basins do not begin until the Lower *Nothofagidites asperus* Zone (middle Eocene). The presence of *M. diversus* gives a minimum age corresponding with the Lower *N. asperus* Zone, as this species last appears in this zone.

Samples 916 (37.5 m), 915 (27.0 m), 913 (22.60 m) and 914 (15.0 m)

These samples yielded pollen and spores with similar stratigraphic ranges (see fig. 1). Therefore, it seems likely that the sediments between 40.2 m and 15.0 m also fall within the Lower *N. asperus* Zone, giving them a probable age of middle Eocene.

Sample 912 (90.1 m)

This sample was taken from just beneath the basalt capping, and also has a likely minimum age corresponding with the Lower *N. asperus* Zone because of the persistence of *M. diversus* to this depth. However, the palynoflora has a somewhat different composition from the similarly-aged microfloras beneath it, due to the presence of *Proteacidites pachypolus* Cookson and Pike, 1954 and *P. reticulatus* Cookson, 1950, and it is possible that some reworking has occurred. The presence of *P. crassus* gives the sediment a maximum age corresponding with the Upper *M. diversus* Zone (early Eocene), but the stratigraphic position of the sample suggests that it is younger than this, as it overlies sediments of probable middle Eocene age.

Thus the deepest samples from WDH 1 (49.43 m) indicate an early Eocene age for this level, while sediments sampled near the top of the drill hole are probably no younger than middle Eocene.

WINDERMERE DH3

One hundred metres of core from hole WDH 3 were sampled for palynological investigation. The top 29 m of core, consisting of weathered orange-brown plastic clay, was

barren of microflora. Between 30 m and 99 m, however, rich palynofloras were examined from six separate samples.

Sample 903

At the base of the hole, 99.45 m below ground level, significant pollen and spore types include:

Tricolpites gillii Cookson, 1957
Gambierina rudata Stover, 1973
Nothofagidites flemingii (Cooper) Potonie, 1960
N. brachyspinulosus (Cookson) Harris, 1965
Stereisporites (*Tripunctisporites*) sp.
Proteacidites tenuixinus Stover, 1973
P. angulatus Stover, 1973
Haloragacidites harrisii (Cooper) Harris, 1971

In the Gippsland and Bass Basins *H. harrisii* does not appear in sedimentary sequences until the Lower *L. balmei* Zone, thereby setting a maximum age of early Palaeocene for the base of the drill hole. Within the Bass and Gippsland Basins *G. rudata* does not extend beyond the Upper *L. balmei* Zone (although data for WDH 1 suggests that *G. rudata* may extend partially into the Lower *M. diversus* Zone), thus the presence of this species within the sample indicates the palynoflora is no younger than the late Palaeocene (or very early Eocene).

T. gillii, *N. flemingii*, *N. brachyspinulosus*, *Stereisporites* (*Tripunctisporites*) sp. and *P. tenuixinus* are all common in the *L. balmei* Zone, while *P. angulatus* does not extend past the Lower *L. balmei* Zone in the Bass Basin. This, combined with the absence of typical species which first appear in the Upper *L. balmei* Zone (e.g. *Proteacidites incurvatus* Cookson, 1950; *P. annularis* Cookson, 1950; *P. grandis* Cookson, 1950; *Malvacipollis subtilis* Stover, 1973) gives the most likely age of the sediment as lying within the Lower *L. balmei* Zone, i.e. early Palaeocene.

95.0 metres (sample 905)

The microflora is very similar (fig. 1) and is therefore also likely to be early Palaeocene in age.

69.93 m (sample 902) and 50.39 m (sample 904)

Both samples have microfloras which fall within the middle *M. diversus* Zone. *T. gillii*, which becomes rare after the Middle *M. diversus* Zone, and *Periporopollenites demarcatus* Stover, 1973 and *Proteacidites kopiensis* Harris, 1972 (sample 904 only), which first appear within or just before the Middle *M. diversus* Zone, are indicators of this. These samples are probably of early Eocene age.

33.43 m (sample 901) and 30.10 m (sample 911)

These samples have pollen and spore types associated with the Lower *N. asperus* Zone. *N. falcatus*, *N. asperus* and *P. vesicus*, which occur in both samples, do not make their first appearances in the Bass and Gippsland stratigraphic zonations until the Lower *N. asperus* Zone, indicating that this is the maximum age possible for these samples based on these zonal schemes. The samples are also unlikely to be any younger than the Middle *N. asperus* Zone, due to the presence of *Triporopollenites ambiguus* Stover, 1973 (in sample 911), which does not range past this zone.

Hole WDH 3 therefore ranges in age from early Palaeocene at its base (99.45 m below ground level), through early Eocene between at least 50 and 70 m, and up to the middle Eocene at approximately 30 metres.

REFERENCES

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- STOVER, L. E.; PARTRIDGE, A. D. 1973. Tertiary and Late Cretaceous spores and pollen from the Gippsland Basin, southeastern Australia. *Proc. R. Soc. Vict.* 85:237-286.

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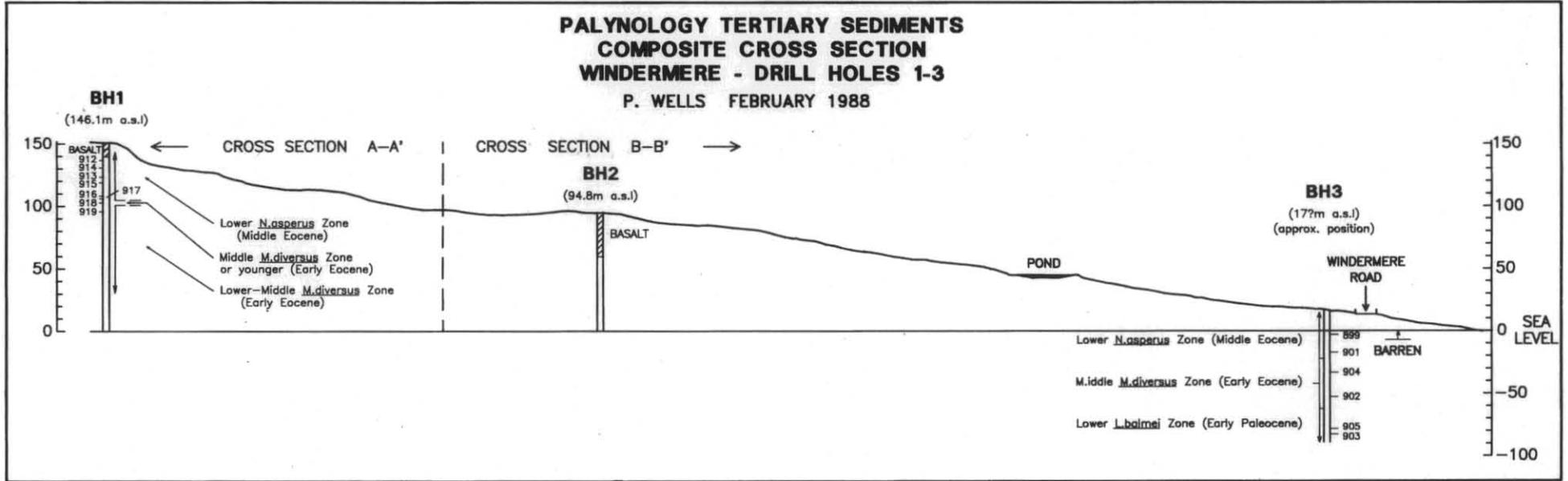


Figure 1.