

INTERPRETATIVE DATA
Palynological analysis of core sample
at 270.5 metres in Banjo-1A,
onshore Gippsland Basin.

by

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Summary

A single sample was submitted for palynological analysis from Core-15 at 270.5m in the Banjo-1A well located in the easternmost onshore Gippsland Basin. Upon processing the sample gave a rich organic yield containing a moderate diversity spore-pollen assemblage assigned to the *Proteacidites tuberculatus* Zone indicating a broad Oligocene to Early Miocene age. The assemblage has the character of a restricted coal microflora, which although consistent with the coaly lithology, unfortunately does not allow a more definitive age assignment. Based on the age and geographic location of the well the sample is interpreted to be from the thin transgressive strandline sequence at the base of the Lakes Entrance Formation referred to as the Colquhoun Sandstone Member.

Introduction

The core sample of brown-black lignite to carbonaceous mudstone from 270.5m in Core 15, was received by the author on Friday 10th February 2006 and forwarded to Core Laboratories Australia Pty Ltd in Perth for processing on 13th February. The prepared palynological slides were returned on 1st March and the initial results of the microscope analysis were verbally communicated on the 2nd March. The 13.7 grams of sample processed gave a high residue yield, containing a high concentration of palynomorphs, whose preservation was fair to good. The moderate diversity assemblage of 19 spore-pollen species recorded from the sample is listed in Table 1.

Banjo-1A sample from core 15 at 270.8 metres

Zone: *Proteacidites tuberculatus* Zone

Age: Early Oligocene to Early Miocene

The recorded spore-pollen assemblage is overwhelming dominated by *Nothofagidites* pollen (>80%). In comparison, gymnosperm pollen (~11%) and other angiosperm pollen (<8%) are very much secondary, while spores and fungal microfossils in the assemblage count are negligible (<1%). Most of the species in the assemblage are also long-ranging so the zone and age assignment is by necessity based on the overall composition of the microflora in the context of the stratigraphic succession. The most important feature is the dominance of *Nothofagidites* pollen which restricts the assemblage to the broad age range of Middle Eocene to Middle Miocene, the time interval during which the Gippsland Basin palynological succession is characterised by rainforest taxa. The second most important criterion is the occurrence of the spore *Cyatheacidites annulatus* which is the designated index species for the base of the *P. tuberculatus* Zone (Stover & Partridge, 1973; Partridge & Dettmann, 2003), and thus confirms an age assignment no older than this zone. The total range of this species is however quite long. Although its oldest occurrence is within the Early Oligocene, it thereafter ranges throughout the Oligocene and Miocene and only goes extinct within the Pliocene. The third factor affecting the preferred age assignment is the location of the sample at the base of the sedimentary succession below both carbonates and a glauconitic sandstone section which are broadly Oligocene to Miocene in age. The recovery of an obvious non-marine lithology and palynological assemblage from below these marine units, means that the sample based on law of superposition cannot be any younger than the *P. tuberculatus* Zone. Finally, supporting the zone assignment is negative evidence: the absence of all spore-pollen species normally found in either Eocene or Middle Miocene coals. The best age assignment for the samples is therefore Early

Oligocene to Early Miocene. Unfortunately there is insufficient diversity in the recorded assemblage to be any more precise than that.

Geological Discussion

The Banjo-1A well, located near the township of Marlo and the mouth of the Snowy River, is currently the easternmost exploration well in the onshore Gippsland Basin. The well lies over 45 km due east of the onshore Lake Entrance oil field and only 24 km west of the coastal outcrop of granite at Cape Conran. The nearest wells containing palynological data for comparison are in the Lakes Entrance area to the west, and the offshore Gilbert-1A well located ~18 km to SSW, and the Baleen-1 and Flathead-1 wells located ~26 km due south.

The assemblage recovered in Banjo-1A is most similar to those recorded from the Colquhoun Sandstone Member at the base of the Lake Entrance Formation (Hocking, 1976a, b). The most recent palynological studies of samples from this unit are in the Petro Tech-1 and Hunters Lane-1 wells analysed by Partridge (1998a, b). The assemblages recorded from the Colquhoun Member in these two wells are notably of higher diverse and also contain marine dinocysts reflecting their more diverse lithologies. In contrast, the Banjo-1A sample yielded a low diversity and non-marine assemblage because it is from a coaly lithology.

The palynological succession in the closest offshore wells to the south are quite distinct from the suggested stratigraphy in Banjo-1A. Equivalent *P. tuberculatus* Zone spore-pollen assemblages are only recorded from the marine carbonates of the basal Seaspray Group. The underlying marine glauconitic sandstone are assigned to the Gurnard Formation and contain mixed spore-pollen and dinocyst assemblages of Middle to Late Eocene age, which are clearly older than the assemblage analysed in Banjo-1A. In Gilbert-1A, which is located on the southern edge of the Northern or Lakes Entrance Platform the Gurnard Formation rest directly on eroded Strzelecki Group. In the Baleen-1 and Flathead-1 wells, which are located on the Northern Strzelecki Terrace south of the Wellington Fault, there is a thin (<10 metres) non-marine sandstone section of Early Eocene age (*Proteacidites asperopolus* Zone), lying between the base of the Gurnard Formation and top of the eroded Strzelecki Group. This non-marine interval has been referred to as "Latrobe coarse clastic" or as a feather-edge of the Kingfish Formation (Partridge, 1999). Although representing a similar non-marine depositional environment the much greater age makes it inappropriate to correlate this stratigraphic interval with the non-marine succession in Banjo-1A.

The final comparison of the non-marine section in Banjo-1A is with the Burong Formation of Partridge (1999) and Bernecker & Partridge (2001). This formation has an age range of Middle Eocene to basal Oligocene (Lower, Middle and Upper *Nothofagidites asperus* Zones), and is a western non-marine facies equivalent of the Gurnard Formation. Palaeogeographic mapping of this unit to the west of the Lakes Entrance area shows that the Burong Formation is largely if not entirely restricted to south of the Wellington Fault (Partridge, 1999). Based on this distribution the author believes it would be inappropriate to apply the name Burong Formation to demonstrably younger non-marine sediments lying east of the Lakes Entrance area, and a considerable distance north of the Wellington Fault. In conclusion, the best and most appropriate name applicable to the basal section in Banjo-1A is therefore the Colquhoun Sandstone Member.

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Table 1: Species list for Core 1 sample at 270.8m in Banjo-1A.

Spores

<i>Cyatheacidites annulatus</i> Cookson 1947	X
<i>Cyathidites paleospora</i> (Martin) Alley & Broadbridge 1992	0.6%
<i>Foveotriletes palaequetrus</i> Partridge in Stover & Partridge 1973	X
<i>Laevigatosporites major</i> (Cookson) Krutzsch 1959	X
<i>Laevigatosporites ovatus</i> Wilson & Webster 1946	X
Total Spores:	0.6%

Gymnosperm Pollen

<i>Dacrycarpites australiensis</i> Cookson & Pike 1953	X
<i>Lygistepollenites florinii</i> (Cookson & Pike) Stover & Evans 1974	5.4%
<i>Phyllocladidites mawsonii</i> Cookson 1947	1.2%
<i>Podocarpidites</i> spp.	4.2%
<i>Trichotomosulcites subgranulatus</i> Couper 1953	X
Total Gymnosperm pollen:	10.8%

Angiosperm Pollen

<i>Haloragacidites harrisii</i> (Couper) Harris in Mildenhall & Harris 1971	0.6%
<i>Haloragacidites trioratus</i> Couper 1953	X
<i>Ilexpollenites anguloclavatus</i> McIntyre 1968	3.6%
<i>Micrantheum spinysporis</i> Martin 1973	X
<i>Nothofagidites deminutus</i> (Cookson) Stover & Evans 1974	2.4%
<i>Nothofagidites emarcidus/heterus</i> (Cookson)	54.8%
<i>Nothofagidites falcatus</i> (Cookson) Hekel 1972	22.3%
<i>Nothofagidites vansteenisii</i> (Cookson) Stover & Evans 1974	1.8%
Tricolporate pollen undiff.	2.4%
Total Angiosperm Pollen:	88.0%
Total Spore-Pollen Count:	166

Other Palynomorphs

Fungal spores & hyphae	0.6%
Indeterminate palynomorphs	1.2%
Total Other Palynomorphs:	3
Total Count:	169