HEMATITE SNAIL NO. 1 - TORQUAY EMBAYMENT
OTWAY BASIN, VICTORIA
PALYNOLOGICAL EXAMINATION OF CORES & SIDE WALL CORES

by

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CONTENTS PAGE

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ABSTRACT

Results of palynological examination of cores and sidewall cores from Hematite Snail No. 1 Well, Torquay Embayment, Victoria, indicate an Oligocene age at 1938 ft., a Middle Eocene age (Proteacidites pachypolus zone) between 2564 and 2783 ft., a Middle to Upper Paleocene (Gambierina edwardsii zone) for a sidewall core at 2865 ft. and an early Cretaceous age for sediments between 2907 and 4031 ft.

All Tertiary units carry marine dinoflagellate cysts indicating marine incursions, at times limited, within the sequence.

A remanié assemblage of late Permian forms is present in the highest Cretaceous sample. The source of these is unknown.

INTRODUCTION

Hematite Petroleum Pty. Ltd. drilled Snail No. 1 Well in the Torquay Embayment of the Otway Basin at Lat. 38°54'S and Long. 144°18'E to a total depth of 4 051 feet. This report details the palynology of two core and thirteen sidewall core samples. The distribution of species is plotted on plan No. 73-130 together with the S.P. and Resistivity logs. A sidewall core 21 at 2 707 ft. was not prepared. It is a sand and is extensively mud infiltrated.

A comparison of palynological biostratigraphic schemes for southern Australia is presented in Table 1.

CORRELATION AND AGE

Cretaceous

Assemblages from SWCs. 1 to 15 and from Core 3 were generally well preserved but very sparse. The best assemblage is from SWC 15 at 2 907 ft. and contains a typical lower Cretaceous microflora with C. australiensis and D. complex. There is nothing else in the assemblage to correlate with Dettmann and Playford's (1969) biostratigraphic scheme for the Cretaceous. The section of the well from 2 907 to 4 031 feet is therefore undifferentiated lower Cretaceous.

Tertiary

Assemblages of this age are diverse and generally well preserved. Those from SWC 17 (2 865 ft.) and SWC 29 (1 938 ft.) are better preserved than those from the middle of the section. Three distinct units are present and will be dealt with separately.

1. Middle-Upper Paleocene

SWC 17 at 2 865 ft. yielded a typical Paleocene assemblage with, in particular, Lygistepollenites balmei, Gambierina edwardsii and Australopollis obscurus. These species indicate a correlation with the Gambierina edwardsii zone of Middle to Upper Paleocene age (Harris, 1971). In terms of Stover and Evan's (1973) scheme, the assemblage would be correlated with their Lygistepollenites balmei zone (see Table 1).

On-shore sections of the Eastern View Coal Measures are to be correlated with this sample. The important difference lies in the presence of an assemblage of marine dinoflagellates in the off-shore sample. The on-shore sequence appears to be entirely non-marine and dominated by coaly facies.

2. Middle Eocene

SWC's 18-27 and Core 2 carry assemblages which are more or less similar and are assigned to the one biostratigraphic unit. The unit is characterised firstly by a diverse assemblage of Nothofagidites spp. including N. asperus in one sample. Present also are Proteacidites pachypolus and P. asperopolus , Tricolpites thomasii, and Triorites magnificus. Although N. asperus is rare and P. asperopolus is present but rare, this assemblage is a correlative of the Proteacidites pachypolus zone of Harris (1971). The absence of Proteacidites rectomarginis (= P. clintonensis Harris 1972) indicates that it is within the lower part of the zone. There are no indications of the older Proteacidites confragosus zone being present, such as the nominate species, low frequency of Nothofogidites spp., and high Haloragacidites harrisii count.

The age of this unit is Middle Eocene. In the Eucla Basin, it is present in the Pidinga Formation with a Middle Eocene foraminiferal fauna (Lindsay and Harris, 1973).

On-shore correlatives of this biostratigraphic unit in the

Otway Basin are not yet well documented. It does not appear to be present in the onshore Torquay Embayment where only the younger half of the P. pachypolus zone is present (see Harris 1971) and the outcrop section further to the west at Browns Creek is all certainly younger. Nevertheless it is more closely related to the Demons Bluff Formation than to the Eastern View Coal Measures. The Kongorong Sand in the Gambier Embayment is a probable correlative but this has not yet been studied in detail.

This assemblage is equivalent to the lower part of Stover and Evan's (1973) Nothofagidites asperus zone in the Gippsland Basin (see Table 1).

?Oligocene

The highest sidewall core, 29 at 1 938 ft. yielded an assemblage dominated by Nothofagidites spp. associated with Proteacidites rectomarginis, very rare Cyatheacidites annulatus and Tricolpites retequetrus. The microplankton component includes the freshwater green algal colony, Pediastrum sp. C. annulatus has not been found in outcrop sections older than the Janjukian. It is rare within the basal unit at the type section of the Jan Juc Formation but not present in the Browns Creek Clays further to the west. The latter unit possibly extends into the early Oligocene. On this limited evidence SWC 29 is probably of Oligocene age but no younger. The Cyatheacidites annulatus zone of Harris (1971) is a correlative and should now be extended down into the Oligocene with the finding of C. annulata in the type Janjukian. The Proteacidites tuberculatus zone of Stover and Partridge (1973) of Early Oligocene to Early Miocene age is a correlative.

ENVIRONMENTS

Cretaceous

No marine fossils were observed in sediments of this age. The large amount of detrital woody tissue, sands and few spores or pollen indicate rapid sedimentation in a non-marine environment.

Tertiary

All units described herein carry marine dinoflagellate cysts and acritarchs in varying amounts. In SWC 29 the microplankton dominate the assemblage and an offshore shelf environment is indicated.

Microplankton occur more sporadically in the Middle Eocene and the Paleocene units and do not reach more than 5% of the total sporomorph count.

A marginal marine facies with very limited marine influence is indicated.

A note on preservation

In contrast to the Oligocene and Paleocene assemblages, those from the Middle Eocene were generally less well preserved and were noticeably darker in colour - yellow to brown. This would indicate greater diagenetic changes in the unit compared with those above or below.

Colour changes such as these have been used elsewhere to indicate possible hydrocarbon generation. Colour changes to a darker yellow have been shown to be associated with liquid hydrocarbons and those of darker brown colours with gaseous hydrocarbons (Staplin, 1969).

PALEOCENE-EOCENE BOUNDARY

Table 1 shows the sequence of palynological zones for the early Tertiary in Southern Australia and despite which system (i.e. Harris, 1971; Stover and Evans, 1973; Stover and Partridge, 1973) is used two zones appear to be absent from this well. That is, the whole of the Lower Eocene and probably the early part of the Middle Eocene were either not deposited or were eroded prior to the deposition of the lower P. pachypolus zone. A similar feature has been noted by Harris (1971) from on-shore sections in the Torquay Embayment, but here more section is absent and deposition did not commence in the Eocene until late P. pachypolus zone. There is only about 80 ft. between SWC17 and SWC18 and it is very doubtful whether the "missing" interval is represented in this section. The geophysical logs do not show any major changes in this interval.

TABLE 1

Attempted comparison of early Tertiary palynological zonal schemes, southern Australia

Age		Harris, 1971	Stover & Partridge, 1973
	U	Triorites magnificus	
Eocene	M-U	Proteacidites pachypolus	Nothofagidites asperus
	M	Proteacidites confragosus	Proteacidites asperopolus
	L	Cupanieidites orthoteichus	Malvacipollis diversus
Paleocene	M-U	Gambierina edwardsii	Lygistepollenites balmei
	?L		Tricolpites longus

REWORKED FOSSILS

Throughout the Middle Eocene and Cretaceous sediments species such as Cicatricosisporites australiensis, C. hughesi and Contignisporites sp. appear occasionally with more rarely occurring Permian striate bisaccate pollen. The source of the Cretaceous species is easily explained by the presence of the underlying Cretaceous sediments.

However, at the top of the Cretaceous section in SWC15 at 2 907 ft. several Permian species are present (not included in the chart): Dulhuntyispora parvithola (Balme and Hennelly), Striatopodocarpidites phaleratus (Balme and Hennelly), Parasaccites gondwanensis (Balme and Hennelly) and Protohaploxypinus spp. In Western Australia D. parvithola occurs only in the Upper Permian Wagina Sandstone (Segroves, 1970). Within the Cooper Basin in South Australia the presence of this species indicates an Upper Stage 5 assemblage (Paten, 1969), which probably spans the boundary between the Lower and Upper Permian.

The source of this late Permian assemblages would not appear to be from onshore Victorian Permian units as these are all within Stage 2 (Early Permian) unless later units have been completely eroded. An alternative is an unknown source to the south or south west on the margin of the Embayment. The late Permian sediments in Tasmania are too distant to be considered as a probable source.

Permian remanié microfossils have been reported previously in both Cretaceous and Tertiary sediments of the Otway Basin (Cookson, 1955; Harris, 1965).

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APPENDIX

Data on Samples Studies

Sample No.	Depth in Feet (metres in parenthesis)	Core or Sidewall No.
S2635	1938 (590.70)	SWC29
S2631	2546 (776.02)	SWC27
S2632	2584 (787.60)	SWC25
S2633	2626 (800.40)	SWC24
S2634	2664 (811.99)	SWC23
S2651	2684 (818.08)	Core 2
S2636	2783 (848.26)	SWC18
S2637	2865 (873.25)	SWC17
S2638	2907 (886.05)	SWC15
S2644	3157 (962.25)	Core 3
S2639	3449 (1051.26)	SWC12
S2640	3600 (1097.28)	SWC9
S2641	3909 (1191.46)	SWC6
S2642	3931 (1198.17)	SWC5
S2643	4031 (1228.65)	SWC1