

APPENDIX NO. 8

PALYNOLOGICAL REPORT

THE STRATIGRAPHIC PALYNOLOGY
of
SELENE # 1,
GIPPSLAND BASIN.

for: PHILLIPS AUSTRALIAN OIL COMPANY,
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SELENE # 1
STRATIGRAPHIC PALYNOLOGY SUMMARY.

Depth (m)	Zone	Age	Paleoenvironment
1822	—	Late Eocene or younger	Marine
2826 to ¶2875A	—	Early to Mid Eocene*	Marine
¶2875B	? <i>T. longus</i> / <i>L. balmei</i> <u>Transition</u>		Non marine
2879.5 to 3181	<i>T. longus</i>	Maastrichtian	Non marine
3195.5 to 3523	<i>T. lilliei</i>	Campanian	Non marine

* Refer Reconciliation at back of report.

¶ Two sidewall cores were shot in separate "runs" at depths similarly labelled as 2875. The sample 2875A (first "run") contains an assemblage distinctly different from that of 2875B (third "run" of sidewall cores).

The samples have been divided into three groups:

- 1) 3523m to 2875Bm - sidewall core of grey silts and clay with a considerable carbonaceous content.
- 2) 2875Am to 1822m - sidewall core of sands with very little carbonaceous material.
- 3) 2875Cm to 2835m - cuttings of grey silty clay chips. Some sand grains are present, but they probably result from down working of the sands listed above.

1. 3523-2875Bm - LATE CRETACEOUS.

The spores and pollen identified are listed in Table 1 and the ranges of diagnostic species are shown on Figure 1.

The species in Table 1 are grouped into three categories:-

- 1) Spores, mostly from ferns and their allies.
- 2) Gymnosperm pollen: pines e.g. hoop pine, Huon pine etc. These would have been mostly forest trees. Their relatives are found today in forests of Tasmania, New Zealand, New Caledonia and New Guinea. Only a few grow on the Australian Mainland and they are restricted to rainforests and the wetter climates.
- 3) Angiosperm pollen: flowering plants. These may have been trees or shrubs.

The ranges of diagnostic species and zonation follows Stover & Partridge (1973) as ammended by Partridge (1976). Experience has shown that subsequent publications on the same period extend the ranges of some diagnostic species. This is seen especially for the Early and Middle Cretaceous where three groups of authors have published on this time range. For this reason, if the ranges of some species fall slightly outside of those given in the references, then it is not considered serious. Sometimes there is conflicting evidence, and the method adopted then is to add up all the pros and cons before making a decision.

THANK YOU

T. lilliei Zone - Campanian : 3523 to 3195.5m.

Species which first appear at the base of the *T. lilliei* Zone are present in the deepest sample. These diagnostic species are *Gephyrapollenites wahooensis*, *Nothofagidites endurus*, *Tricolporites lilliei* and *Triporopollenites sectilis* (see Table 1 and Figure 1). There is variation in presence and abundance of some species but no trends, i.e. the overall aspects of the assemblages remain much the same up to 3195.5m.

Wood, cuticles and other plant tissue fragments occur throughout in variable quantities. Abundant plant tissue fragments is thought to indicate a swamp environment. Where wood is conspicuous, the gymnosperm pollen is usually more abundant, particularly *Phyllocladidites mawsonii* (living relative, Huon Pine) and this could indicate a swamp-forest environment.

T. longus Zone - Maastrichtian, 3181 to 2875Bm.

The overall characteristics of the assemblages here are much the same as those for the *T. lilliei* Zone. The top of the older zone is marked by the introduction of some five diagnostic species which mark the base of the younger zone. Three of these five species have been seen, and two of these only once, leaving only one, viz *Tetracolporites verrucosus* which has been recorded regularly, although not in every assemblage. Stover & Partridge show *Australopollis obscurus* appearing about half way through the zone, but it has been found together with *T. verrucosus* at the base of this zone. Thus the top of the *T. lilliei* Zone is defined on negative evidence and only slight evidence for the delimitation of the base of the *T. longus* Zone has been found here.

Wood, cuticles and other plant tissue fragments occur throughout, just the same as the *T. lilliei* Zone.

The sample from 2875B stands apart from all the others. It is by far the best preserved, with the most abundant pollen and the richest assemblage. Some Tertiary forms are present (see Figure 1), but the *T. longus* species are by far the most abundant. However, this assemblage could be transitional towards the *L. balmei* Zone.

Palaeoecology.

No dinoflagellates have been found anywhere here, indicating non-marine conditions. There is an overall similarity of the assemblages which probably result from relative stability of the environment. The exceptional preservation and abundance in the assemblage at 2875Bm may indicate the start of some change.

2. 2875A - 1822m - EOCENE.

The dinoflagellates, spores and pollen found in these samples are listed in Table 2. The ranges of relevant diagnostic species are shown on Figure 2.

Spores and pollen are sparse and the species found are mostly thick walled or tough and likely to survive transport and degradation. Frequently, only one or two specimens of each species have been found and they are usually corroded or crumpled. There is virtually no plant tissue debris in any of the samples, indicating that this area of deposition was not receiving plant debris from the land. Thus the spore-pollen assemblages are exceedingly poor and of hardly any value for an age determination. *Spinozonocolpites prominatus* is the exception; and it is usually well preserved. The parent plant of this pollen species is *Nypa*, the mangrove palm, hence transportation to the site of deposition was via a different route to that of pollen from land-based plants. Its range is included on Figure 2.

The dinoflagellates in these sandy samples are few and mostly crumpled or broken. They are also quite small. This probably results from the high energy nature of the area of deposition. *Spiniferites ramosus* is by far the most common. Several subspecies have been seen but they are of no stratigraphic value so they are not identified here.

There are very few diagnostic species present; *Glaphrocysta retiintexta* is not recorded as having ranged above the Early Eocene. However, an early Eocene age for samples between 2838m and 2826m conflicts with the Mid Eocene aspect of the planktonic foraminiferal fauna (refer "Reconciliation" at back of this report).

The sample at 1822m was no older than Late Eocene age, as it contained *Systematophora placacantha*, which ranged from the Late Eocene to at least the Miocene. The planktonic foraminiferal assemblage was definitely Late Eocene as it included *Globorotalia cerroazulensis cocoaensis* with *G. gemma* and *Globigerinatheka index*.

Palaeoecology.

A marine environment not conducive to the accumulation of dinoflagellates or plant debris, spores and pollen from the land.

3. 2875C - 2835m.

These samples were ditch cuttings, hence presence of contamination by down working is likely. However, there are no spore-pollen assemblages above 2835m, and only the dinoflagellates in the sand, so the source of possible contamination is very limited.

The assemblages consist of dinoflagellates, spores and pollen and are generally much the same as those in the sandy samples. However, preservation is better and there is more diversity and abundance and most of the dinoflagellates are larger (i.e. normal sized) when compared to those in the sandy samples. All of this is consistent with the silty clay nature of the samples.

The spore-pollen assemblages are very restricted and there is virtually no plant debris present. As with the sandy samples, they are of practically no value for age determinations, except for *Spinozonocolpites prominatus*.

Five of the diagnostic species of dinoflagellates and *S. prominatus* are present in these samples (see Table 2 and Figure 2), indicating an Early to Mid Eocene age. The spores and pollen found here are consistent with this age.

Palaeoecology.

These ditch cutting samples provide evidence of a marine environment apparently more conducive to the accumulation of dinoflagellates, spores and pollen than the same interval represented by sidewall core. This difference was due to the sidewall cores being mainly of sand grade, thus atypical of the aggregate lithology of the interval which contained a high percentage of silt and finer grade material. The palymorph accumulation was thus a function of energy; settling being greater in low energy, fine sedimentation episodes than during high energy, sand deposition. However, the depositional site was not receiving much debris spores or pollen from land based plants.

CONCLUSIONS and RECONCILIATION with FORAMINIFERAL DISTRIBUTION.†

Absence of dinoflagellates in the Late Cretaceous sediment below 2875m indicate this interval was deposited in non-marine conditions. But indication of slight marine influence was noted by the presence of an arenaceous foraminiferal fauna at 3020m.† The highest Cretaceous flora in the sidewall core at 2875Bm was a transitional one between the Late Cretaceous *T. longus* Zone and the Paleocene *L. balmei* Zone. Thus a latest Maastrichtian age is deduced for the surface upon which rest the marine to marginal marine sediments of early to mid Eocene age (e.g. sidewall core 2875Am).

The dinoflagellate zones tabulated on Figure 2 have been named but not documented in Partridge (1976). From the general discussion it would appear that these zones contain reasonable spore-pollen assemblages as well as dinoflagellates. Examination of two samples from Helios # 1 which contain the *I. druggii* and *E. crassitabulata* Zones confirms this impression. These zonal nominate species are the most common dinoflagellates in their respective samples. On this interpretation of the character of a Gippsland Basin dinoflagellate zone, these *Selene* assemblages do not fit any of the designated zones. *Apectodinium homomorphum* has been found in two samples, but only one or two specimens occur in each. As the range of this species extends well above the confines of the *A. homomorphum* Zone, it is unlikely that those assemblages represent this Zone; especially in view of the fact that the dinoflagellates at 2826m were associated with mid Eocene planktonic foraminifera.†

Conflict exists between the age assigned to a dinoflagellate assemblage and that of a planktonic foraminifera associated in the same sidewall core. For instance, from Stover et al (1979) the Dinoflagellate assemblages in sidewall cores from 2842 to 2826m would fall within the lower Eocene, yet the planktonic foraminifera are considered as Mid Eocene.† The ages of the Dinoflagellate Zones are based on examination of New Zealand Standard sections (refer Stover et al). However, the top of the range of *Rhombodinium ornatum*, together with the complete ranges of *Kisselovia thompsonae* and *K. edwardsii* would now be considered as Mid Eocene, being

†refer to *Stratigraphy of the Foraminiferal Sequence in Selene # 1, Gippsland Basin*, by David Taylor dated March 3, 1983.

associated with the planktonic foraminifera *Globigerina frontosa* (= *G. boweri* of Jenkins).† For these reasons, a "grey" area (marked by ? ?) appears on Table 2 between the Lower and Mid Eocene. Similar "grey" areas are apparent between the Paleocene and Eocene as well as between the Mid and Late Eocene. Resolution of these "grey" areas of conflict between dinoflagellate and foraminiferal workers can only be resolved upon availability of thorough documentation of both dinoflagellate and planktonic foraminiferal species distribution in the Gippsland Basin.

†refer to *Stratigraphy of the Foraminiferal Sequence in Selene # 1, Gippsland Basin*, by David Taylor dated March 3, 1983.

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