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Re: Tertiary Palynology, Otway Basin

Resolution is restricted in many of these samples due to the availability of cuttings only. Downhole caving may therefore be masking older ages with older reworking difficult to interpret. Where this is suspected, I have highlighted it.

I CODRINGTON-1

A 417.4m(cutts) : *asperus* Zone : middle to Late Eocene : intermediate marine : dominant *Nothofagidites* spp and *Spiniferites* in a very lean assemblage and in the absence of older markers is definitive : Nurranda Sub Group is favoured and Mepunga Formation certainly possible.

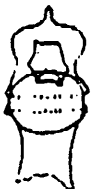
B 469.2m(cutts), 481.4m(cutts), 670m(cutts) : lean apparently middle *diversus* Zone with caved *asperus* Zone : Early Eocene : marginal to brackish marine although marine influence could be largely caved : youngest *H. tasmanlense*, *M. diversus*, *P. grandis*, *P. ornatus*, *P. tuberculiformis* and *S. prominatus* plus a downhole influx of *H. harrisii* indicate the *asperopolus* to *diversus* Zones. The presence of *T. ambiguus* and *P. tuberculiformis* without older markers indicates the middle Subzone, but they could be partly caved. The data imply a hiatus removing the *asperopolus* and upper *diversus* Zones but scarcity of key markers could produce the same interpretation. : Either all Pember equivalent or some Pember and some Dilwyn is likely as the Pember/Dilwyn boundary usually falls in the middle *diversus* Zone.

C 688.6m(cutts) : lower *diversus* Zone : Early Eocene : marginal marine : *M. diversus* and *P. demarcatus* without younger markers suggest the Subzone and youngest *D. pachyceros* is consistent, being usually restricted to the middle and lower *diversus* Subzones: This implies Pember equivalent rather than Dilwyn.

II EUMERALLA-1

A 767.8-770.8m(cutts) : apparently middle *diversus* Zone : Early Eocene : marginally marine : Oldest *P. kopiensis* and *P. ornatus* without other markers suggest the middle Subzone, but could be caved into the lower Subzone. Rare *D. pachyceros* indicates the middle or lower Subzones : lower Dilwyn or upper Pember equivalent is therefore suggested.

B 813.5-816.6m(cutts) : apparently *senectus* Zone/*australis* dinoflagellate Zone : Campanian : marginal marine : *X. australis* is rare but consistent and is the oldest element seen, suggesting the *australis* Dino Zone. Younger presumed caved elements include *G. edwardsii* and *I. pellucidum* (suggesting Maastrichtian *longus*-



lillei Zones) and *P. pachypolus* (suggesting the upper *diversus* Zone) : assuming the oldest elements are in place, the Paaratte Formation is favoured.

III GREENSLOPES-1 : I have the original palynology report but it covers only section below 1367m.

A 390-400m(cutts) : apparently *longus* Zone : Maastrichtian : nearshore marine : youngest *T. longus*, *T. lillei*, *Q. brosius* and *I. druggii* indicate the zone. Reworking is unlikely to be responsible for the zonal assignment although very minor older Late Cretaceous elements from the *lillei* Zone and older do occur : topmost Cretaceous Paaratte Formation equivalent.

B 450-60m(cutts) : apparently *paradoxa* Zone with younger caving : mid Albian : apparently nearshore but marine elements may be caved : youngest *C. paradoxa* and *C. striatus* suggest the *C. paradoxa* Zone with younger elements like *P. mawsonii*, *S. regium*, *G. rudata* and the dinoflagellates probably caved. A *mawsonii* Zone assignment with reworking is possible but considered less likely. : apparently topmost Eumeralla, but Paaratte/Flaxmans is possible.

IV KILLARA-1

A 444m(cutts) : apparently *longus* Zone with caved *balmei* (Paleocene) and trace reworked *senectus* Zone (Campanian) : apparently Maastrichtian : marginal marine : this assemblage is clearly mixed, but the dominant elements are from the *longus* Zone (*T. longus*, *T. verrucosus*, *T. sectilis*, *I. druggii*, *I. coronata*). A single *X. australis* suggests the Campanian *senectus* Zone and correlative *australis* dinoflagellate Zone, but is considered reworked. A Paleocene *balmei* Zone assemblage is minor (*G. rudata*, *L. balmei*, *D. speciosus*, *P. vyrophorum*) and is considered caved from a Pebble Point equivalent. Very minor younger caving includes *P. pachypolus* (Dilwyn) and *N. falcata* (Nirranda Sub Group) : overall, Paaratte assignment seems most likely.

NAJABA-1 : I have the work of Dettmann (1986) and Morgan (1987) but these cover only the section below 1311m. Sample size was on the small side, so yields are generally poor.

A 320m(cutts) : *asperopolus* (or upper *diversus*) Zone : Early Eocene : apparently marginal marine, but marine elements could be caved : dominant *H. harrisii* and youngest *M. tenuis*, *M. diversus*, *P. grandis*, *P. ornatus* and *S. prominatus* indicate the *asperopolus* or older zones. Frequent *F. pachypolus* plus rare *Kisselovia coleothrypta* (340m) and *K. thompsonae* (400m) suggest the lower *asperopolus* Zone, but could be caved : Dilwyn is therefore consistent.

B 400m(cutts) : upper *diversus* Zone : Early Eocene : apparently marginal marine : dominant *H. harrisii* and oldest consistent *P. pachypolus* indicate the zone, but the latter could be caved. Youngest *P. tuberculiformis* is consistent : Dilwyn Formation is likely.

- C 690m(cutts), 785m(cutts) : upper or middle *diversus* Zone : Early Eocene : apparently brackish : rich yields with common amorphous organic matter dilute the age diagnostic taxa. *P. pachypolus* at 785m suggests it is all upper *diversus* Zone, but it was not seen at 690m, and could be caved at 785m : The Dilwyn/Pember boundary usually falls in the middle *diversus* Zone.
- D 900m(cutts), 1100m(cutts) : middle *diversus* Zone : Early Eocene : brackish to marginal marine : oldest *P. tuberculiformis* and *T. ambiguus* indicate the middle *diversus* Zone, but could be caved. Youngest *D. pachyceros* and consistent *A. homomorphum* at 1100m are consistent : The Pember/Dilwyn boundary usually falls in this Subzone.
- E 1400m(cutts) : lower *diversus* Zone : Early Eocene : marginal marine : youngest *C. gigantis* and *H. septata* and the downhole influx of *M. diversus* and *M. fimbriatum* indicate the Subzone. Rare *P. pachypolus* is considered caved : Pember assignment is likely.

These results make the assignment of swcs at 1311m and 1400m to upper *diversus* by Morgan (1987) look wrong. Perhaps those swcs were largely mudcake?

- F 1460m(cutts) : lower *balmei* Zone : Paleocene : marginal marine : Although lean, the presence of *P. pyrophorum* indicates lower *balmei*, consistent with previous assignment of 1405-1460.5m(swcs) to lower *balmei* by Morgan (1987). : Pebble Point equivalent is indicated.

VI NORTH EUMERALLA-1 : I have the completion report palynology of Wilschut (undated)

- A 374.7-377.8m(cutts) : probably upper *diversus* with heavy *asperus* caving. : Early or Middle Eocene : marginally marine : This assemblage is unclear. Dominance of *Nothofagidites* spp (43%) favours an *asperus* Zone assignment. Youngest *P. tuberculiformis* and *P. grandis* favour the *asperopolus* or older zones as does the scarcity of dinoflagellates. Youngest *P. ornatus* and *I. notabilis* favour the *asperopolus* or older zones, but do range into the basal lower *asperus* Zone. Overall, either is possible on this data. However Wilschut studied a swc from 1244m (379.2m) which had dominant *H. harrisi* (23%) and youngest *S. prominatus*, *P. grandis* and *M. diversus*, suggesting the upper *diversus* (or possibly *asperopolus*) Zone. His data indicates the *asperus* Zone above at 1172ft (357.2m).

This sample at 377.8m therefore seems likely to be Dilwyn Formation close to the base of the Nirranda Subgroup. However, drillers depths have associated errors and a log top Dilwyn at 382m may still be possible.

B 767.8-770.8m(cutts) : indeterminate

This sample is almost barren and so is indeterminate. However, swc data from Wilschut at 2526ft is very close to these cuttings (2519-2529ft) and suggests a lower *diversus* Zone assignment, consistent with the Pember Formation.

VII PRETTY HILL-1

A 390.6-396.7m(core) : middle *diversus* Zone : Early Eocene : marginally marine : *B. elongatus*, *P. kopiensis*, *P. nasus*, *P. tuberculiformis* and *D. pachyceros* without younger markers indicate the Subzone in core : Dilwyn Formation is therefore indicated, not Nirranda.

B 588-91m(cutts) : *balmei* Zone : Paleocene : marginally marine : Despite lean yield, youngest *L. balmei* without older markers indicates the Zone : Pebble Point or basal Pember Formation are both possible. Better yields might have helped distinguish the two.

VIII SHAW-1

A 280m(cutts) : apparently *tuberculatus* Zone : Oligocene : nearshore marine : *Nothofagidites* dominance with *P. laticinctum* and *C. annulatus* are diagnostic of the *P. tuberculatus* Zone, but the Oligocene might be caved into older *asperus* Zone assemblages : Nirranda Subgroup seems likely, certainly not Dilwyn.

B 325m(cutts) : lower *asperus* Zone (*heterophlycta* Dino Zone) : Middle Eocene : nearshore marine : *Nothofagidites* dominance with *A. ornatum* and *D. heterophlycta* indicate the Subzone. Rare *C. annulatus* and *P. laticinctum* suggest the Oligocene as above, but are considered caved here, where older elements are seen. : Nirranda Subgroup is indicated. Top Dilwyn must be below this point.

Regards

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19.1.95

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