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Further Palynological dating and correlation of Mesozoic and Tertiary sediments from Eyre Peninsula, S.A.

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Summary

Two groups of samples from Eyre Peninsula have been analysed. The Elliston samples are correlative with the Polda Formation, probably in the latest Middle Jurassic. The younger Middle Eocene sample indicates the presence of Pidinga Formation and is in keeping with previous observations of Alley (1996).

The presence of *Triorites magnificus* in the V09-1 palynofloras indicates a Late Eocene age and sediments correlative with the Pidinga Formation. A poor yield for the V07-1 sample has meant only a tentative Miocene age can be assigned based on palynofloras from older sediments dated by Alley (1996) .

Borehole Summary Table:

Borehole	Depth	Age
E04-1	38-40m	Middle Eocene
E16-1	72-74m	late Middle Jurassic
E30-1	54-56m	latest Middle Jurassic
E36-1	48-50m	latest Middle - early Late Jurassic
VB07-1	24-26m	?Early - Middle Miocene
VB09-1	32-34m	Late Eocene
	70-72m	Late Eocene

Location

General Location:

All samples are from onshore Polda Basin from localities around Elliston and Venus Bay.

Mapsheets: Elliston 1:250 000 & KIMBA 1:250 000

Introduction

A total of seven samples from the Elliston area (Group A) and Venus Bay (Group B), Eyre Peninsula, were submitted by Diamond Ventures NL, Camberwell, Victoria for palynological dating.

Sludge samples from Drillholes E04-1(38-40m), E16-1(72-74m), E30-1(54-56m), E36-1 (48-50m) and cuttings from VB07-1 (24-26m) and VB09-1 (32-34m, 70-72m).

Laboratory processing was undertaken in the Biostratigraphy Laboratory, Mines and Energy Resources South Australia by Ms Lyn Broadbridge with palynological analyses and dating carried out by Andrew Rowett, Senior Geologist, Mines and Energy Resources, South Australia.

Data were processed using StataBugs V1.3 , a biostratigraphic computing system.

Palynomorph images have been captured using the Videovue image-capture system in association with CorelDraw5 graphics software.

General composition of palynofloras and dating
Yields varied considerably between samples, overall the sludges tended to provide better yields than the cuttings.

Elliston Area (Group A)
E04-1, 38-40m Sludge sample.
Palynomorph preservation was good as was the yield. Common taxa include *Haloragacidites harrisii* and *Nothofagidites* spp., along with a diverse collection of *Proteacidites* spp.. Saccate grains were also well represented. Eight dinoflagellate species were recorded. Reworked Cretaceous palynomorphs included *Callialasporites turbatus*, *Murospora florida* and *Coptospora paradoxa*. The assemblage is assigned to the Lower *Nothofagidites asperus* Zone (Helby et al, 1987), i.e. Middle Eocene, based on the occurrence of a number of typical southeastern Australian zonal indicators including *Nothofagacidites falcatus*, *Proteacidites recavus*, *P.reflexus* and *Rhoipites angurium.* The overall composition is similar to Middle Eocene assemblages found in CRAE2 in the Eucla Basin (Alley & Beecroft 1993).

E16-1, 72-74m. Sludge sample.
Good palynomorph preservation and reasonable yield. The following are all well represented in the assemblage *Callialasporites dampierii, Retitriletes spp., Cyathidites spp.* and *Contignisporites spp.*. The presence of *Contignisporites cooksoniae* and *Retitriletes circolumenus* in association with an abundance of *Callialasporites dampierii* and the absence of *Murospora florida* would support assigning the assemblage to the late Middle Jurassic *Contignisporites cooksoniae* Zone (Helby *et al.*, 1987), i.e. Middle - lower Middle Callovian.

E30-1, 54-56m. Sludge sample.
Excellent palynomorph preservation and yield. Common palynomorphs include *Callialasporites dampierii*, *Alisporites similis* and *Retitriletes* spp. with *Araucariacites australis* also well represented. The presence of *Murospora florida* (Figure 1) would support assigning the assemblage to the *Murospora florida* Zone, i.e. Upper middle Callovian - Kimmeridgian (Helby *et al* 1987). The abundance of *C. dampierii* would suggest the assemblage is probably nearer the base of the Zone as this grain is less common towards the top, i.e Upper middle Callovian (late Middle Jurassic) age. The presence of the dinoflagellate *Ctenidodinium tenellum* in the Polda Basin is considered unusual although Helby *et al* (1987) note that the *Pareodinia ceratophora* Dinoflagellate Superzone, which includes the *Wanaea digitata* Dinoflagellate Zone and of which *C.tennellum* is part, has been encountered in the Basin. *C.tennellum* makes its final appearance at the top of the *Wanaea digitata* Zone (Helby *et al*. 1987), i.e Middle - late Callovian, would therefore support a latest Middle Jurassic age and indicate some fluviodeltaic to shallow marine influence.

E36-1, 48 -50m. Sludge sample.
Good palynomorph preservation and yield. A similar palynoflora to that of the E30-1 sample with *Callialasporites dampierii*, *Araucaria australis*, *Retitriletes* spp. and bisaccate grains common but with *Microcachryidites antarcticus* showing an increased frequency. The assemblage is assigned to the *Murospora florida* Zone, i.e Upper middle Callovian - Kimmeridgian (Helby *et al*. 1987). The top of the Zone is defined by a decline in prominence of *Callialisporites dampierii* and corresponding

increase in *Microcachrydites antarcticus* and although the former species shows no marked decline a slightly younger age could be interpreted, i.e. latest Middle - early Late Jurassic.

Venus Bay (Group B)

VB07-1, 24 -26m. Cutting
Palynomorph preservation is fair but yield poor. The palynoflora is dominated by *Haloragacidites harrisii* with *Nothofagidites* spp. and *Myrtacidites* spp. also common. Other palynomorphs present include *Cyathidites minor*, *Cupanieidites orthoteichus*, *Milfordia homeopunctata, Microcachryidites antarcticus* and *Phyllocladidites mawsonii*. Five species of dinoflagellate are present. A single reworked specimen of the Late Cretaceous - Paleocene *Gambierina rudata* is also present. The presence of *Nothofagidites falcatus* indicates the assemblage is no older than Middle Eocene. However, based on Alley's 1996 work on sample 40-42m from VB07-1 in which a Early - Middle Miocene age was recorded, a younger or equivalent age is therefore expected for this assemblage. It is interesting to note the decrease in dinoflagellates from that recorded by Alley (1996) from older sediments indicating minimal marine influence.

VB09-1, 70-72m. Cutting
Palynomorph preservation is good and yield excellent. A very diverse sample. The palynoflora is dominated by *Nothofagidites heterus* with *Haloragacidites harrisii* also abundant. *Nothofagidites* spp. of the b*rassii* group, *Proteaceae* spp., *Myrtacidites* spp., *Cyathidites* spp. and *Phyllocladidites mawsonii* are also common. *Spinizonocolpites* (pollen of the coastal palm *Nypa*) is also well represented. The Late Eocene indicator *Triorites magnificus* is also present. Thirteen species of dinoflagellate are present. The assemblage is assigned to the Middle *Nothofagidites asperus* Zone, i.e. Late Eocene.
A number of reworked specimens of the Cretaceous palynomorphs *Callialasporites dampierii*, and *C.turbatus* were recorded along with a single specimen of *Murospora florida.*

VB09-1, 32-34m. Cutting
The high degree of fragmentation of palynomorphs has made quantitative analysis difficult despite an overall good yield. *Nothofagidites heterus* and *Haloragacidites harrisii* dominate the palynoflora with *Cyathidites spp*., *Myrtacidites spp*., *Proteacidites* spp., *Araucariacites australis* and *Phyllocladidites mawsonii* also common. The Late Eocene indicator *Triorites magnificus* is also present. Dinoflagellates are common with 26 species present including *Batioladinium micropoda, Cyclonephalium compactum, Spiniferites* sp. and *Micrhystridium* sp.. The assemblage is assigned to the Middle *Nothofagidites asperus* Zone, i.e. Late Eocene. Reworked Cretaceous palynomorphs included *Coronatispora telata, Retitriletes austroclavatidites, Cingutriletes clavus* and *Neoraistrickia sp.*.

Stratigraphic Implications

The presence of late Middle Jurassic sediments in the western part of the Polda Basin Formation would be correlative with the late Middle - Late Jurassic Polda Formation (Figure 3). The Middle Eocene age of the E04-1 palynoflora would indicate that the sample is from the Pidinga Formation, which is extensive on Eyre Peninsula (Alley, 1992; 1993).

The paucity of the VB07-1 assemblage means only an oldest age can be suggested, i.e. Middle Eocene, but based on the previous work by Alley (1996) must be at least Miocene in age and therefore correlative with the Garford Formation (Figure 2).

The presence of *Triorites magnificus* in the VB09-1 samples confirms a Late Eocene age. Using the same analogy as that of Alley (1996), in reference to the sample from VB10-1, i.e. the dark sand-sandy clay lithologies present, depth of the samples in association with the abundance and diversity of dinoflagellates (particularly in sample 32-34m) and the age would indicate a correlation of the Late Eocene marine facies of the Pidinga Formation (Alley and Beecroft, 1993). The environment of deposition was most likely estuarine to paralic to coastal marine.

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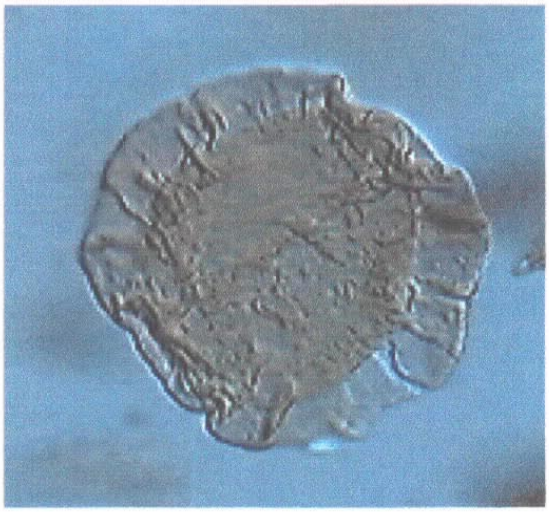
Helby, R., Morgan, R. & Partridge, A.D., 1987. A palynological zonation of the Australian Mesozoic. *Association of Australian Palaeontologists, Memoir*, 4:1 - 94.

Jurassic spores from E30-1 & E36-1

Murospora florida 320X

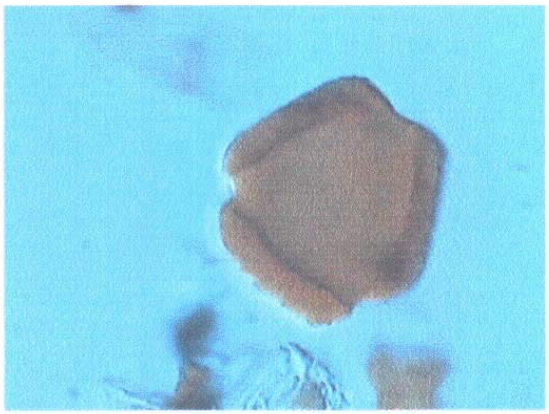
Contignisporites cooksoniae 320X



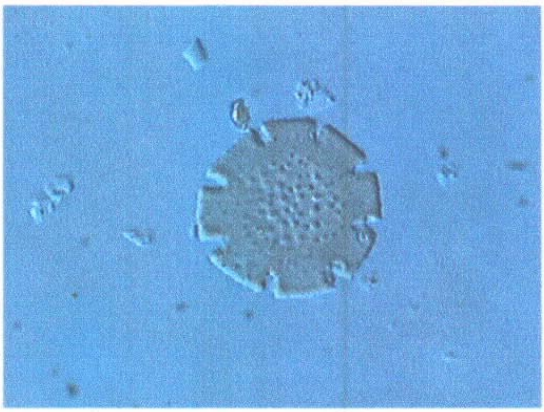
Callialasporites dampieri 320X

Retitriletes circulumenus 320X (E36-1)

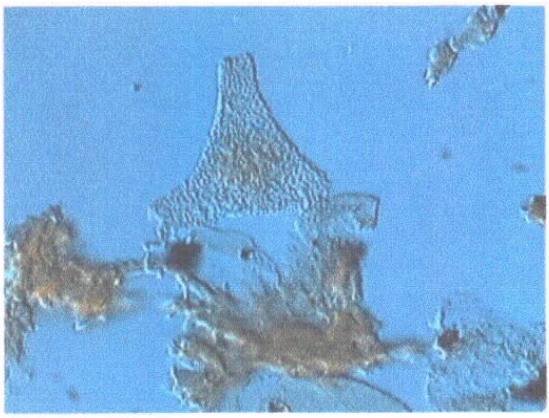
Tertiary pollen grains and dispersed cuticle from VB09-1



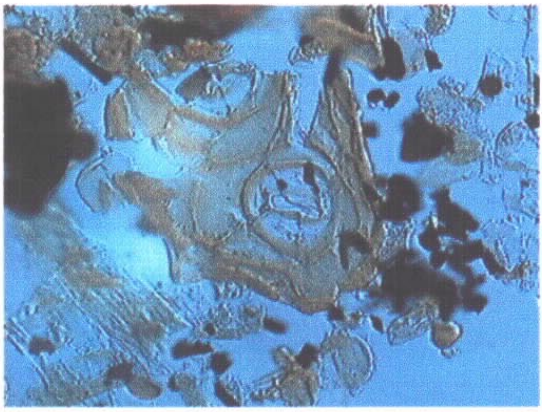
Triorites magnificus 320X



Nothofagidites heterus 320X



Proteacidites pachypolus 320X



Araucarian cuticle 320X

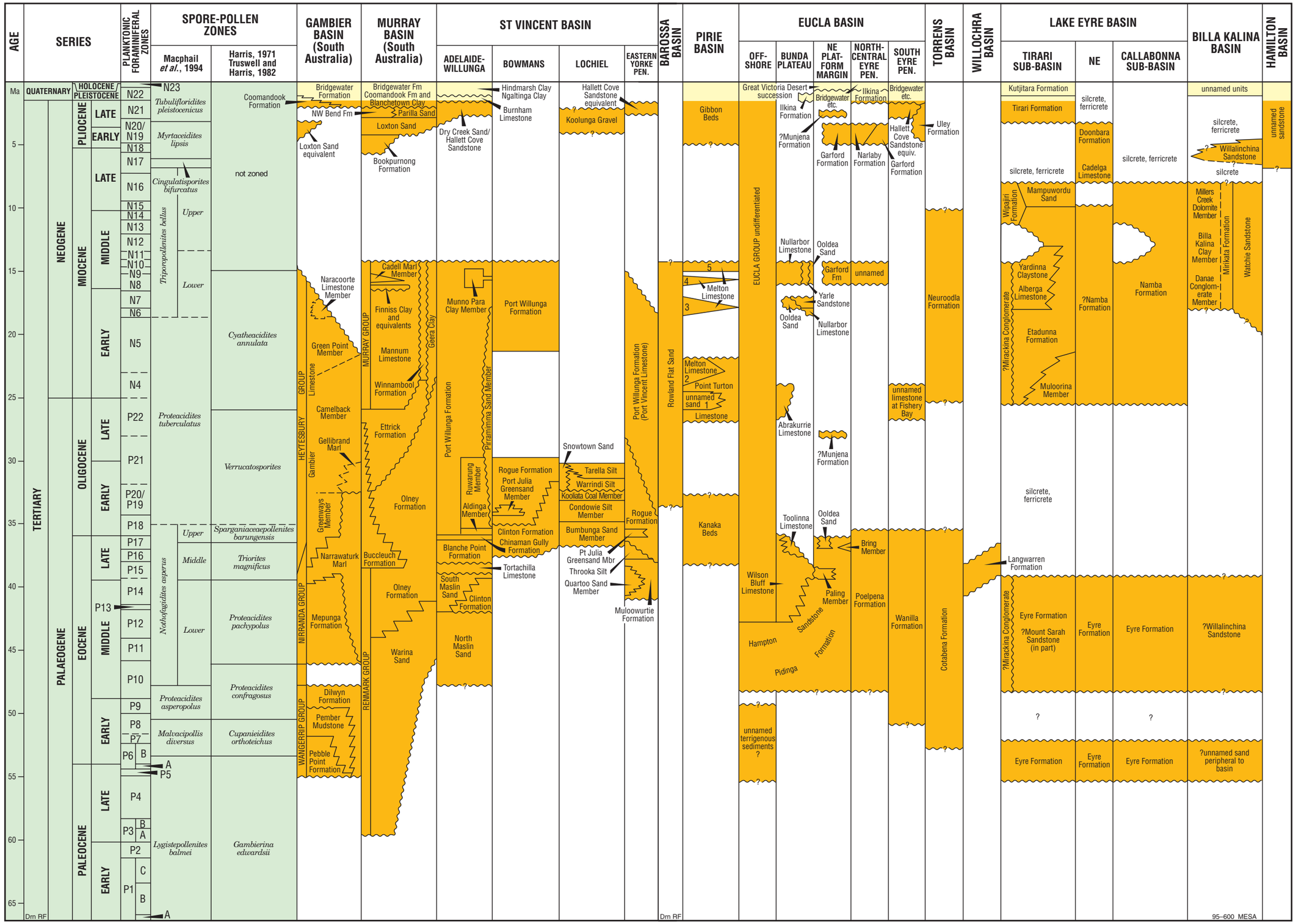


Figure 2. Correlation chart for South Australian Tertiary Basins

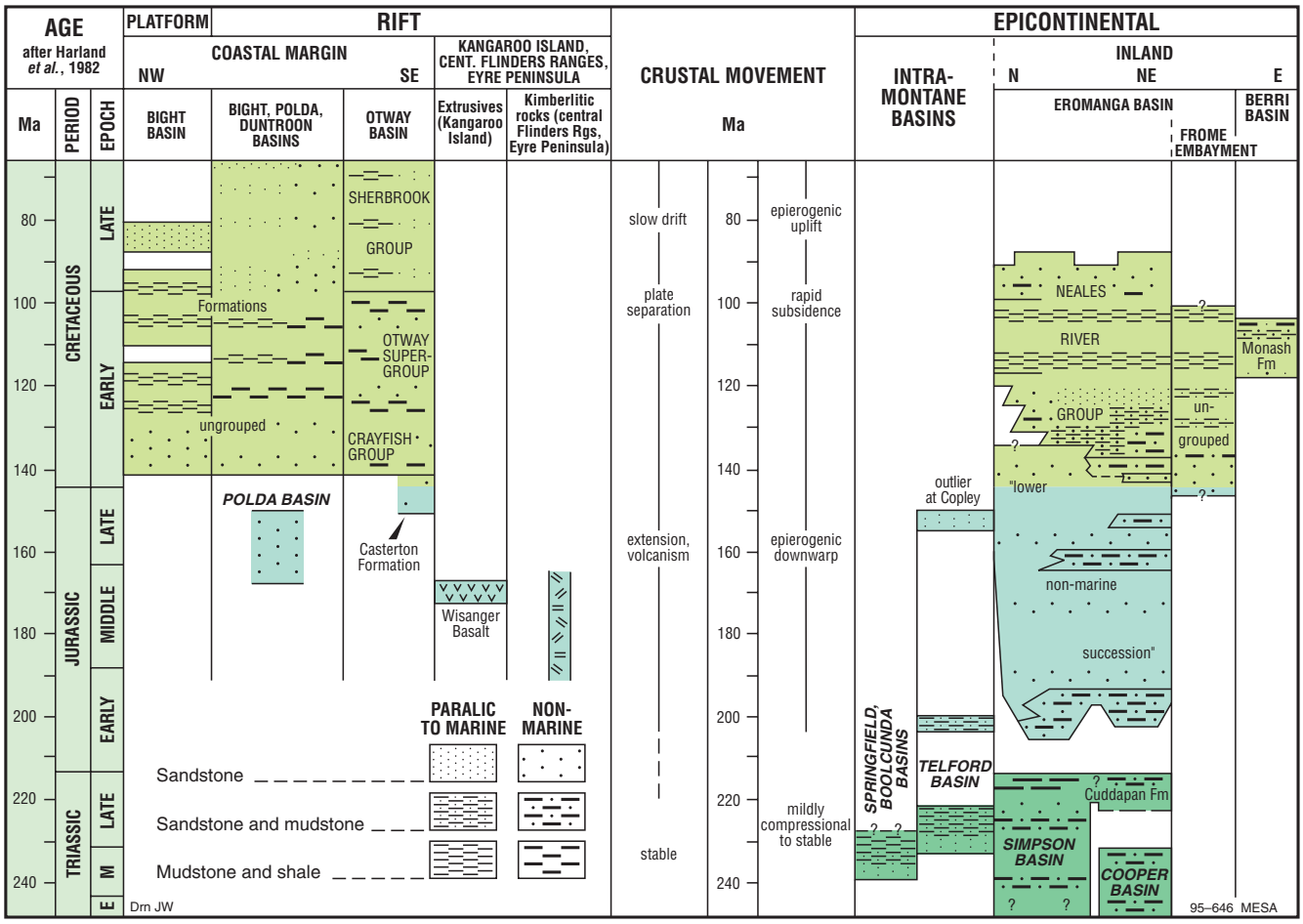


Figure 3. Nomenclature and correlation of the Mesozoic basins in SA.