

BIOSTRATIGRAPHY REVIEW

SOUTHERN PERTH BASIN

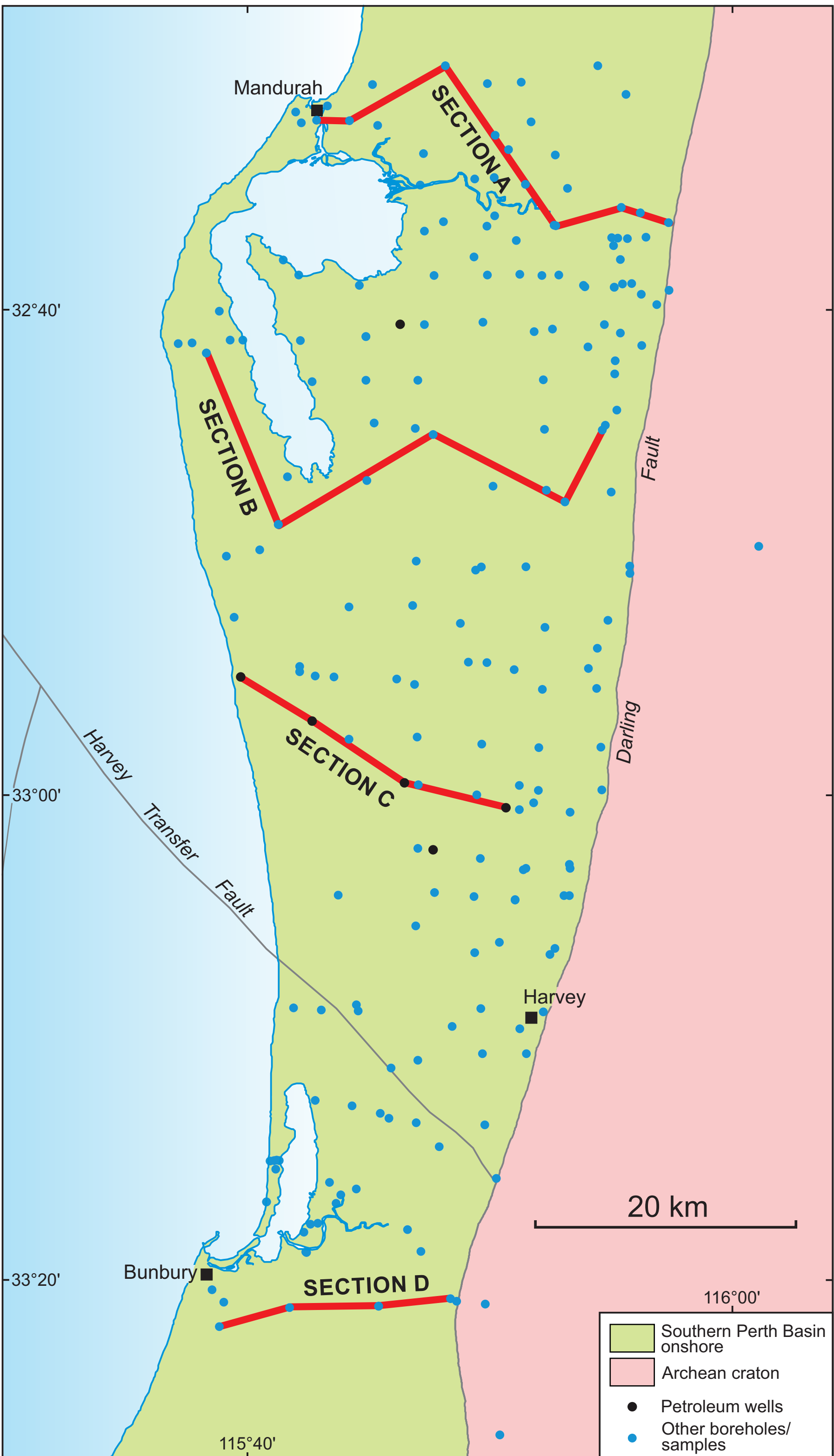


Figure 1. Well and bore sites used in this study, and locations of presented stratigraphic sections

A project is underway to modernize and collate all historical palynological data from the southern Perth Basin. The first half of this review, covering sites between Mandurah and Bunbury (Fig. 1) was published in early 2018 as **GSWA Report 174**. Work has now shifted south to the remainder of the basin. It is hoped that summarizing this data can help clarify the stratigraphy in the region, as well as provide better ties between well and seismic data.

Age control for the mostly terrestrial Permian to Cenozoic strata of the southern Perth Basin is reliant on palynology; however, much of this age data is old (prior to the establishment of the Helby et al. (1987) Australian Spore-Pollen and Dinocyst zonation schemes) and no regional summary has been previously attempted, other than for specific time intervals (e.g. Jurassic: Filatoff, 1975; Late Jurassic to Early Cretaceous: Backhouse, 1978, 1988).

Overall data extent

The biostratigraphic review of the Harvey area identified miospore assemblages extending from the Lower Triassic *Kraeuselisporites saeptatus* Zone through to the Lower Cretaceous *Balmeiopsis limbata* Zone (Fig. 2). Putative Permian palynofloras from the Lake Preston 1 petroleum well were too degraded to be confirmed as this age, and Cenozoic palynofloras, although present throughout the region, were unable to be formally zoned due to a relative lack of research on microfloras of this age in Western Australia. Marine microplankton-bearing assemblages were restricted to post breakup Cretaceous and Cenozoic strata, extending from the *Kaiwaradinium scrutillinum* to *Xenascus asperatus* Zones.

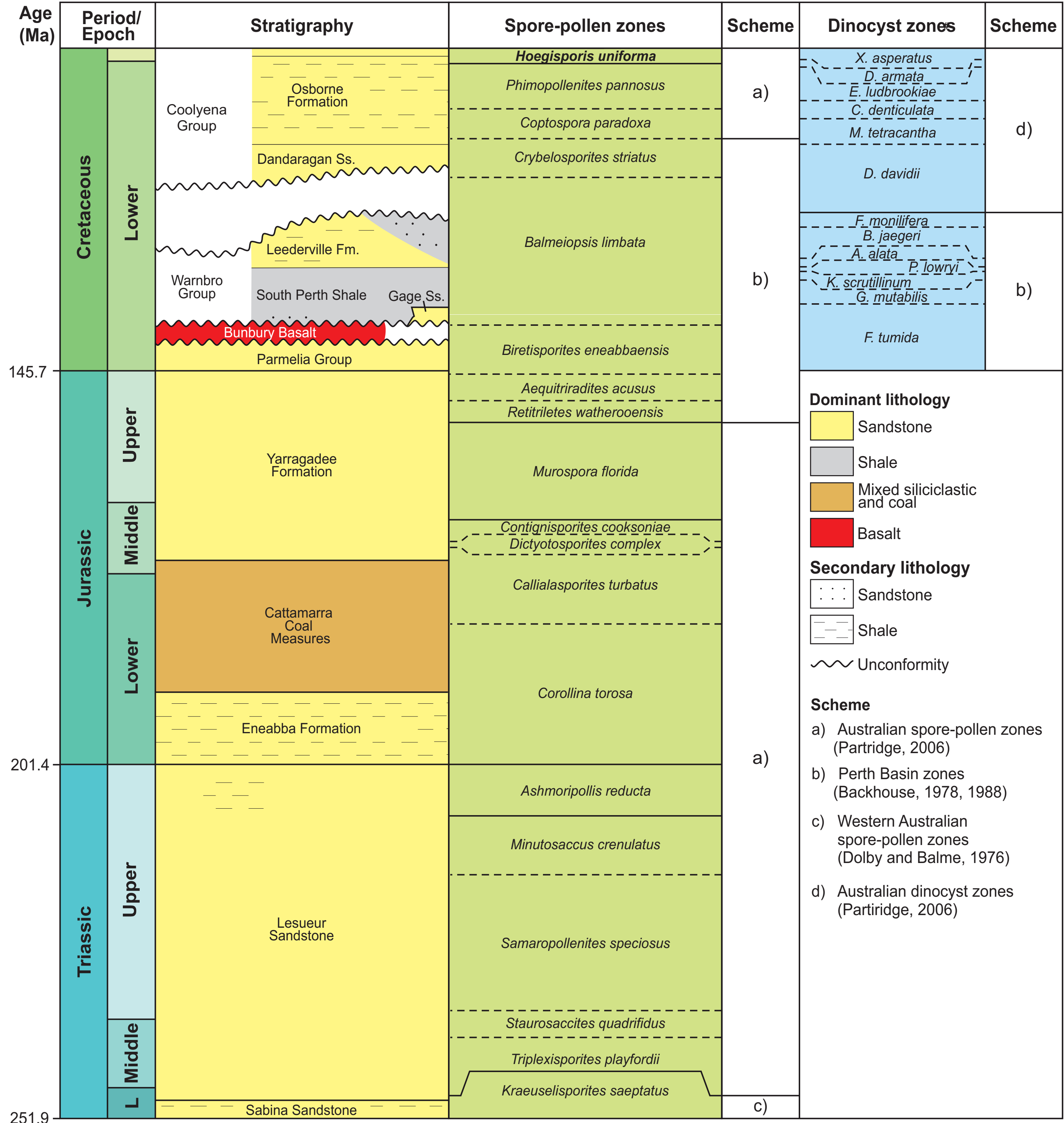
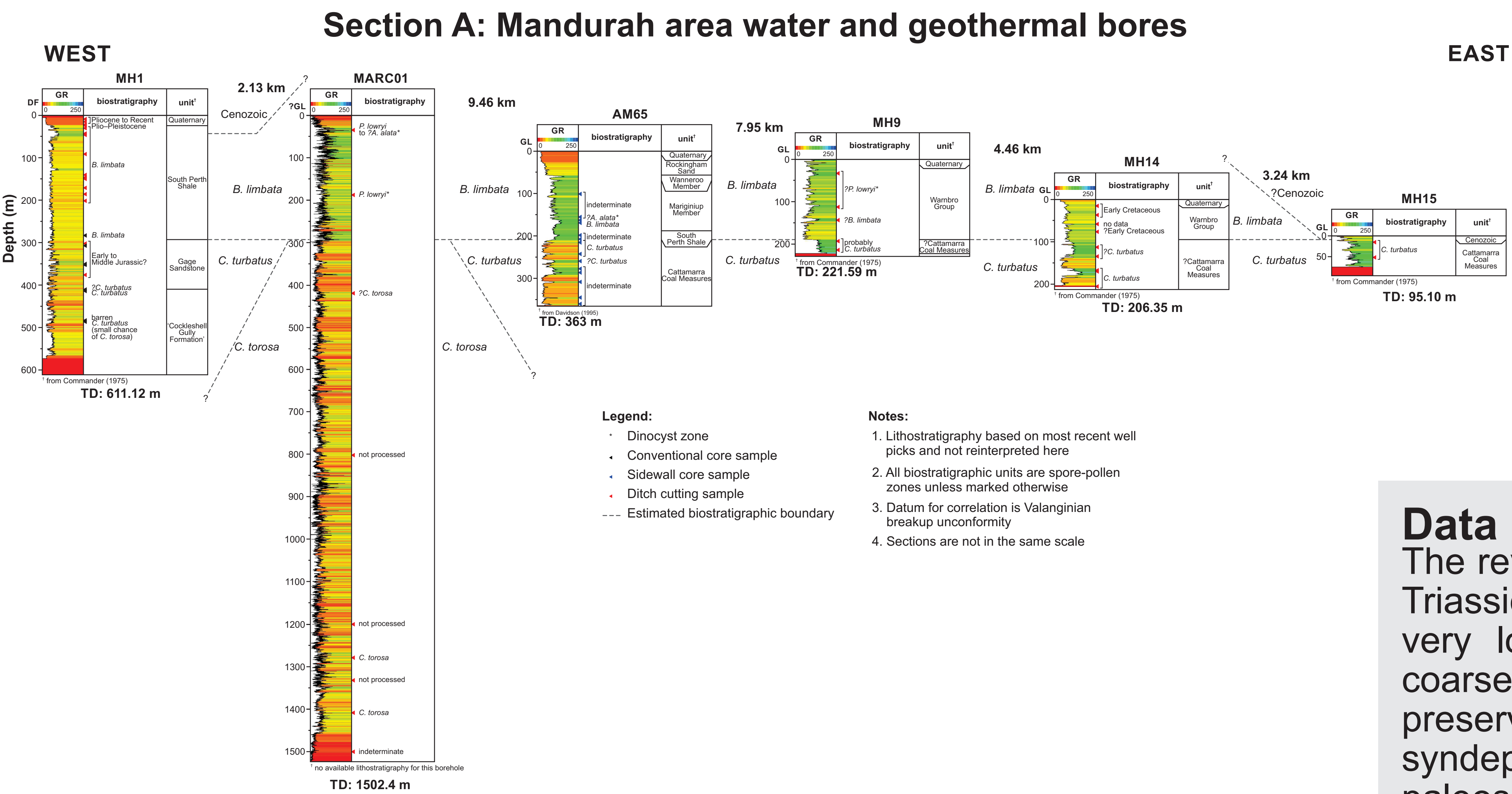
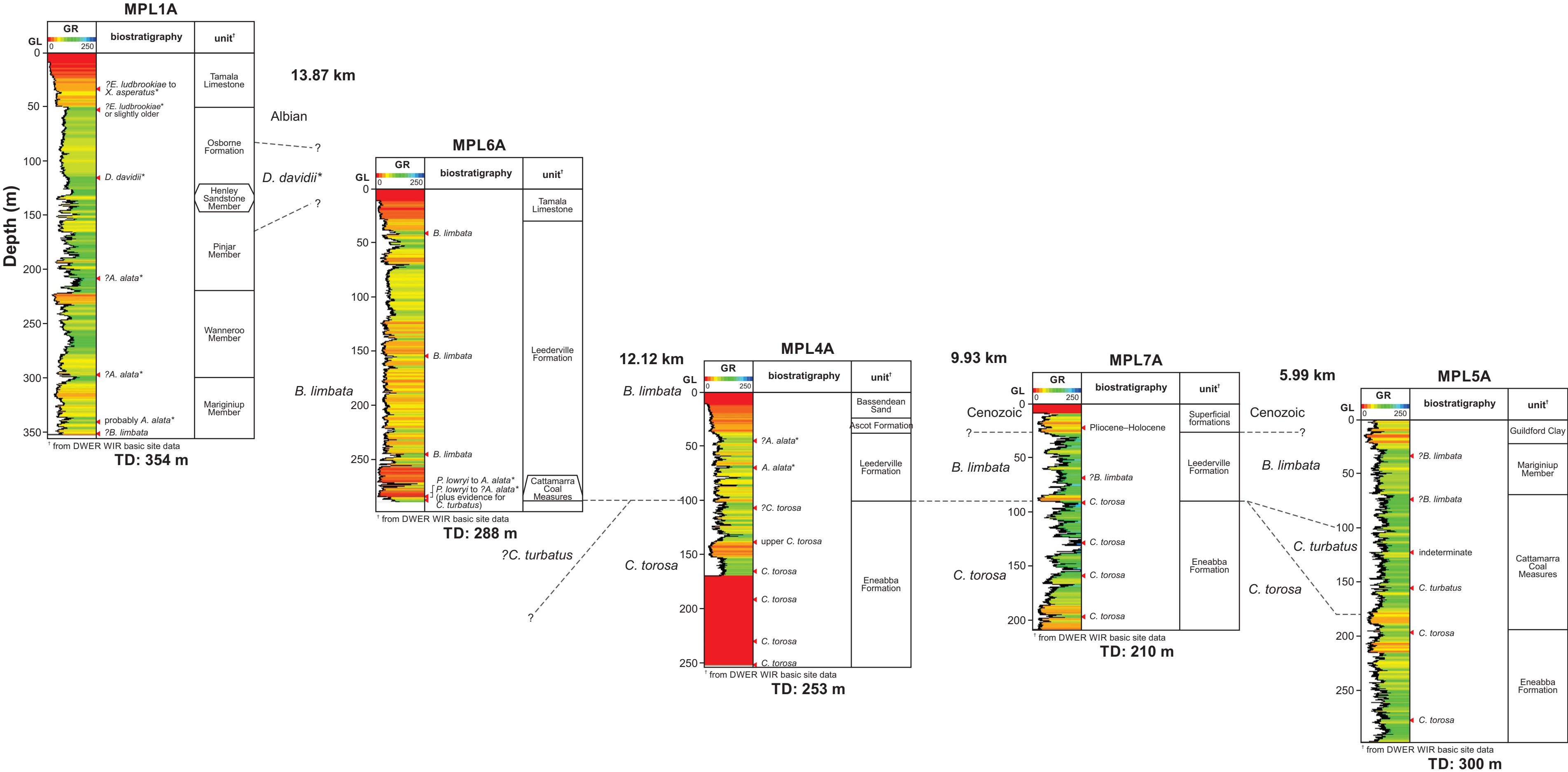


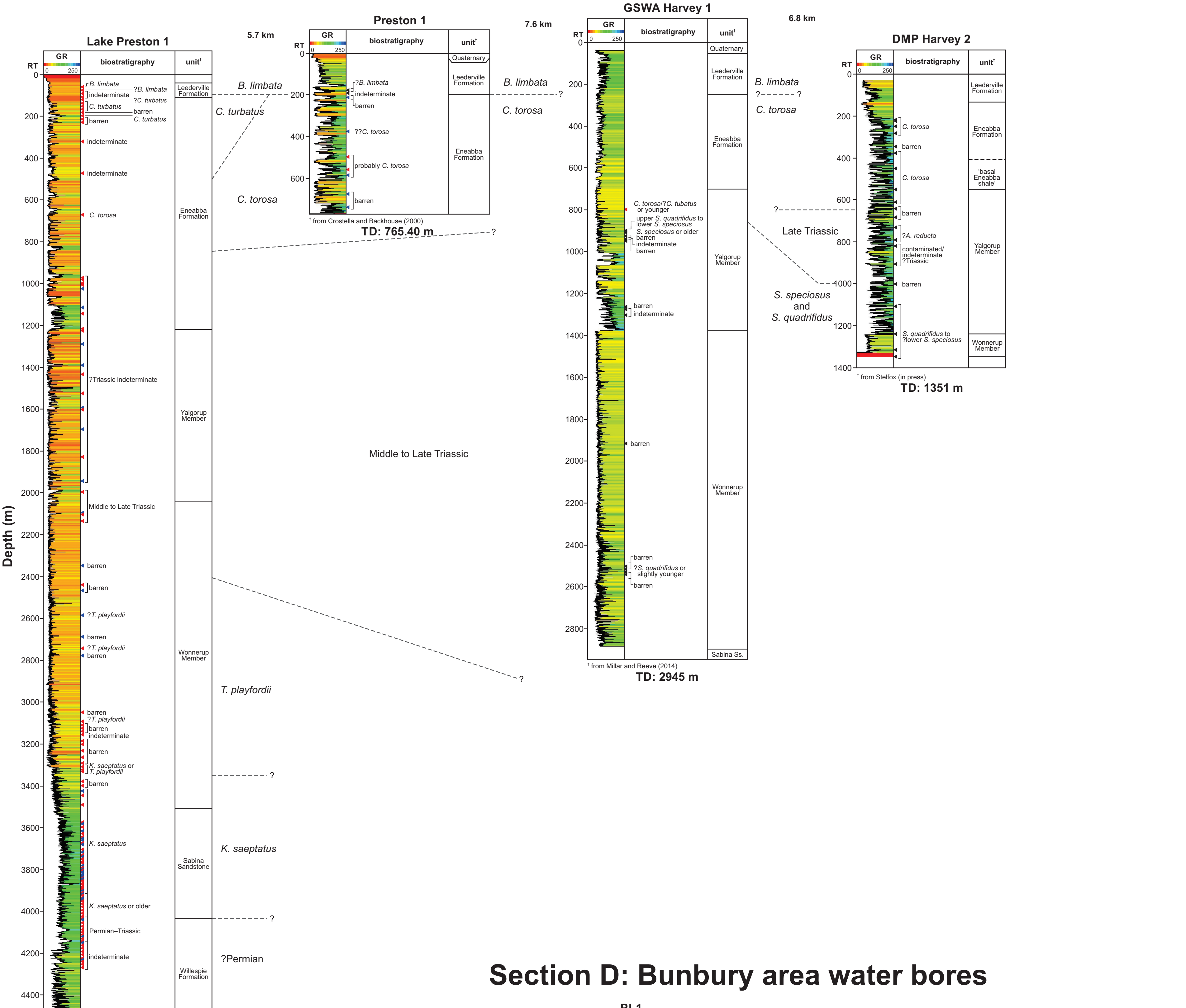
Figure 2. Biostratigraphic schemes used in the study, matched to the generalized stratigraphy of the southern Perth Basin



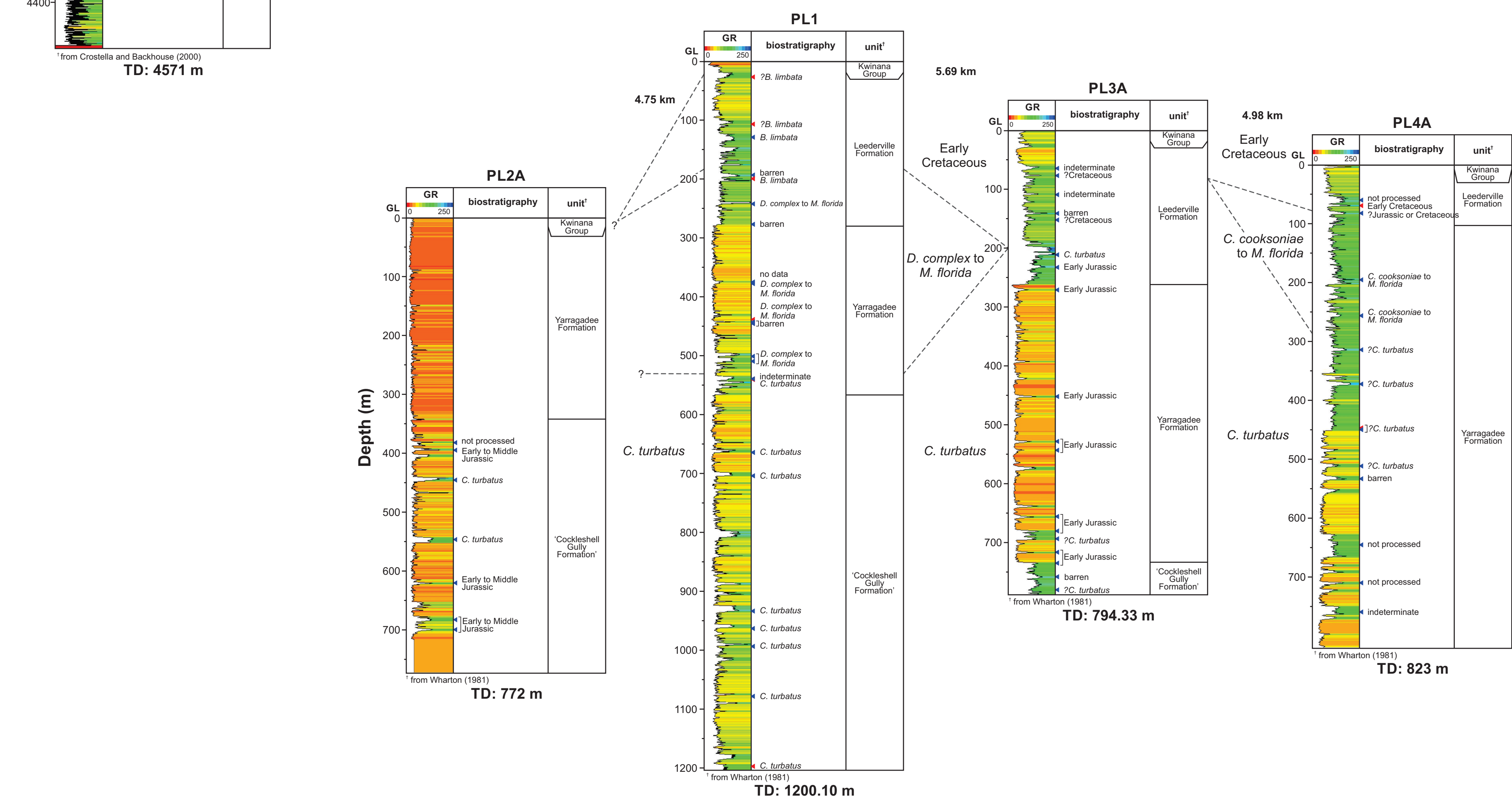
Section B: central water bores



Section C: Harvey Ridge petroleum wells



Section D: Bunbury area water bores



Data robustness

The review identifies biostratigraphic uncertainty within the Middle Triassic to Lower Jurassic succession, with numerous barren and very low yielding samples, mostly due to the dominance of coarse-grained and strongly oxidized lithologies unsuitable for the preservation of palynomorphs. Oxidation appears to be mostly syndepositional, with the extensive development of red beds and paleosols throughout this part of the stratigraphy. The poor biostratigraphy and laterally discontinuous nature of the lithologies make this section particularly difficult to correlate. Biostratigraphic fidelity improves greatly after breakup (Early Cretaceous and younger), and is also fair within the Lower Triassic succession.

Marine mid-Cretaceous assemblages

Later Cretaceous assemblages (*Dicodinium davidii* to *X. asperatus* Dinocyst Zones) are rare within the study area, and are highly localized west of the Harvey Estuary (MPL1A; Section B). Although Aptian-aged assemblages have been previously assigned to the Coolyena Group (Osborne Formation), apparent depositional breaks both above and below the *D. davidii* Zone in this area might suggest a new stratigraphic unit separate from both the Warnbro and Coolyena Groups.

Lacunae and absent zones

As noted by numerous authors, the northern part of the study area lacks Middle Jurassic (*Dictyosporites complex* Zone) to lowermost Cretaceous (*Biretisporites eneabbaensis* Zone) rocks, with this section apparently removed during uplift of the Harvey Ridge prior to the Valanginian continental breakup event. At the centre of the Harvey Ridge (Sections B and C), this uplift event also appears to have removed sediments containing the upper Lower Jurassic *Callialasporites turbatus* Zone, with assemblages of the lower Lower Jurassic *Corollina torosa* Zone encountered close to the surface.

Farther south, within the Bunbury Trough, later Jurassic (*D. complex* to *Murospora florida*) zones are recorded only rarely (Section D), and no uppermost Jurassic (*Retitrites watheroensis*) to lowermost Cretaceous (*B. eneabbaensis*) assemblages are noted anywhere in the study area.

Conclusions

The review identified a number of features that distinguish the southern Perth Basin from the better studied northern part of the basin. The most obvious of these differences is the lack of marine Middle Jurassic and Lower Triassic assemblages in the southern Perth Basin. This suggests that the shoreline was located around the present level of the Perth metropolitan area during both these high sea-level periods. An unusual biostratigraphic assemblage, transitional between the *B. eneabbaensis* and *B. limbata* Spore-pollen Zones, has also been identified around the Harvey township, although this biounit is presently speculative and may simply reflect a local variant of one zone or the other. Together, all of these biostratigraphic differences support the need to reassess the stratigraphy of the southern Perth Basin.

References:

- Backhouse, J 1978, Palynological zonation of the Late Jurassic and Early Cretaceous sediments of the Yarragadee Formation, central Perth Basin, Western Australia: Geological Survey of Western Australia, Report 7, 53p.
- Backhouse, J 1988, Late Jurassic and Early Cretaceous palynology of the Perth Basin, Western Australia: Geological Survey of Western Australia, Bulletin 135, 233 p.
- Filatoff, J 1975, Jurassic palynology of the Perth Basin, Western Australia: Palaeontographica Beiträge zur Naturgeschichte der Vorzeit. Abteilung B: Paläophytologie, v. 154, p. 1–113
- Helby, R, Morgan, R and Partridge, AP 1987, A palynological zonation of the Australian Mesozoic: Association of Australasian Palaeontologists, Memoir 4, p. 1–94.

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