

## **Reconstructing ancient environments from detailed stratigraphic distributions of dinoflagellate cysts: providing a palaeobathymetric and related sequence framework for the Valanginian to Aptian of the northwestern Australian margin**

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The environmental effects upon the lateral distribution of Early Cretaceous microplankton assemblages and the differentiation of shallow and deeper-water assemblages have not been studied extensively in the Australian region (Helby *et al.*, 1987). For this study, Valanginian to Early Aptian assemblages from the Carnarvon Basin and adjacent oceanic areas were investigated to clarify the nature of environmental controls – particularly bathymetry – on species distribution.

On the Mesozoic Carnarvon Platform, which overlies the Paleozoic Southern Carnarvon Basin, a programme of continuous coring and closely spaced sampling of the Lower Cretaceous Birdrong Sandstone and Muderong Shale has provided material for study. A Valanginian to Early Aptian succession of dinocyst events is developed primarily from six well intervals on the platform and from DSDP Sites 259 and 263. In addition, pre-existing palynological material from four wells containing reference sections for the mid Hauterivian to Barremian *Muderongia testudinaria*, *Muderongia australis* and *Ovoidinium cinctum* Zones of Helby *et al.* (1987), and seven other wells located in the region were re-analyzed.

Based on palaeobathymetric reconstruction of well intervals across the Carnarvon Basin, several key sequence surfaces and dinocyst events have been identified. These are:

- (1) The Breakup Unconformity that marks the base of the Birdrong Sandstone and initial flooding of the Carnarvon Platform during the latest Hauterivian to early Barremian;
- (2) A subsequent flooding surface (FS<sub>2</sub>) within the Birdrong Sandstone on the platform that divides the initial transgressive systems tract (TST<sub>1</sub>) containing highest occurrence (HO) of *Phoberocysta neocomica*, and a glauconitic highstand systems tract (HST<sub>1</sub>) containing HO of *Canningia reticulata*;
- (3) FS<sub>3</sub> at the base of the Muderong Shale on the platform marking the base of a TST<sub>2</sub> containing an *O. cinctum* acme, HO of *Diconodinium micropunctatum*, *Muderongia* sp. aff. *M. testudinaria* and *Scrinodinium attadalense*, and lowest occurrence (LO) of *Druggidium rhabdoreticulatum* and *Meiourgonyaulax?* sp. B Backhouse;
- (4) A maximum marine flooding surface/interval characterized by common *M. australis* and the highest abundance and diversity of benthic foraminifera; and
- (5) The major KA Seismic Horizon dividing the Early Aptian HST<sub>2</sub> sediments containing LO of *Canningia colliveri*, *Kiokansium polypes* and *Angustidinium acribes*, and HO of *Batioladinoium longicornutum*, *Epitricysta vinckensis* and *M. australis*, and the overlying Windalia Radiolarite containing the LO of *Cribroperidinium edwardsii*, *Endoceratium turneri* and *Diconodinium davidii*.