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 (FS2) within the Birdrong Sandstone on the platform
that divides the initial transgressive systems tract (TST1) containing highest occurrence
(HO) of Phoberocysta neocomica, and a glauconitic highstand systems tract (HST1)
containing HO of Canningia reticulata;
(3) FS3 at the base of the Muderong Shale on the platform marking the base of a TST2
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 HST2 sediments containing
LO of Canningia colliveri, Kiokansiumpolypes 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.