Permian conodont biostratigraphy of Australia and New Zealand

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Earlier reports on the Permian conodont biostratigraphy of Western Australia have documented faunas from the Canning Basin (Noonkanbah Formation) and Carnarvon Basin (Callytharra, Coyrie, Wandagee and Coolkylia formations) that ranged in age from the Late Sakmarian to the Roadian. New studies have now documented additional Permian conodont faunas from the Perth Basin (Beekeeper Formation, and a single specimen of *Clarkina jolfensis* from the basal Kockatea Shale) and from the Canning Basin (Nura Nura Member of the Poole Formation, from throughout the Noonkanbah Formation, in the Lightjack Formation and from the Kirkby Range and Cherrabun Members of the Hardman Formation). These faunas range in age from the Late Sakmarian to the Wuchiapingian and possibly Changhsingian. This study has been able to recognize a total of 9 species of the Genus *Vjalovognathus* based on prominent morphologic trends. Unfortunately several of the key taxa have yet to be recognised in localities outside Australia.

New Zealand Permian conodont biostratigraphy is limited to the single recovery of *Mesogondolella idahoensis* fauna from a locality Nokomai in the Caples Terrane, southern South Island. This fauna is suggested to be of Kungurian age. A fauna thought to contain *M. bisselli* from the Meyers Pass locality in the Torlesse Terrane has been re-identified and is now thought to be of Carboniferous age. The New Zealand material is part of the accreted terrane complex of New Zealand and was not at its present location at the time of deposition.

In the high latitude faunas of the Western Australian basins the conodont fauna has been dominated by the genus *Vjalovognathus* with only occasional occurrences of the genera *Hindeodus* and *Mesogondolella* and only a single occurrence of the genus *Sweetognathodus* in the Nura Nura Member of the Poole Formation. In the lower latitude conodont faunas from Timor, Pakistan, Tajikistan and Nepal/Tibet, the generic and species diversity of the conodont faunas is greater and this has been attributed to warmer water temperatures.

New U-Pb CA-IDTIMS isotopic age tie points for the Lightjack Formation, Canning Basin, Western Australia

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Ash-fall tuffs are extremely rare in the Permian of Western Australia, but recent coal exploration boreholes in the Fitzroy Trough of the Canning Basin have intersected several in the ~30–300 m thick Lightjack Formation. We here report four high-precision U–Pb zircon CA-IDTIMS ages of these tuffs. The formation contains marine to non-marine facies, and extends along the major depocentre of the Canning Basin (Fitzroy Trough – Gregory Sub-basin) and its margins, where it is sporadically exposed at localities including Lightjack Hill (type section), the Noonkanbah area, Liveringa Ridge and in Shore Range. The formation is dominated by siltstone and calcareous to ferruginous sandstone, with minor coal and fossiliferous beds near its base. It has previously been assigned a Roadian–Wordian age based on ammonoids (*Daubichites goochi* and *Bamyaniceras australe*) and brachiopods (*Neochonites* (*Sommeriella*) *afanasyevae* Zone), whereas palynomorphs (*Dulhuntyispora granulata* to *D. parvithola* Zones) indicate a slightly younger age for the upper part of the formation. Rare *Vjalovognathus* sp. nov. is the only conodont recovered from calcareous facies. Two closely spaced tuffs at ~58 m depth in exploration corehole Rey-D16C1 southeast of Duchess Ridge have isotopic ages of 268.86 Ma and 269.10 Ma with per mil and sub-per mil uncertainties. These ages indicate an early Wordian age (currently dated internationally at ~266–270 Ma). A third tuff sample from ~70 m in a nearby corehole (Rey-LR12C) also yielded an early Wordian age of 268.63 Ma. The fourth tuff sample from 210 m in Blackfin Liveringa P01 (drilled next to Petaluma 1, and 64 m above the base of the formation) is dated at c. 270.14 Ma, essentially at the Roadian–Wordian boundary.