

Geology of the northern Perth Basin post-conference excursion 6–10 September 2019



AEGC2019
Data to Discovery

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Incorporating the AIG, ASEG, PESA, and WABS

Guides: Arthur Mory (GSWA) and possibly David Haig (UWA)

Overview: Examine Permian – Lower Triassic core, including from the Waitsia field and wells drilled to evaluate shale gas, and equivalent outcrops at Irwin River. The excursion also takes in Cretaceous exposures on Murchison House Station that are well known from the offshore Northern Carnarvon Basin, and the ?Siluro-Ordovician in spectacular coastal cliffs and the Murchison River gorge.

Please register your interest as early as possible **with a payment of \$1800 by 31st May** — repaid if there are insufficient numbers— to secure accommodation (**twin share; single supplement \$165**) as the excursion falls in the peak of the wildflower season. Later registrations are feasible only if there are at least 8 persons registered and paid for by that date — up to 31 participants can be accommodated.

Itinerary:

Friday 6th: in morning examine Lower Permian to Lower Triassic successions at the core library, afternoon drive to Mingenew.

Saturday 7th: examine the best Permian exposures along the Irwin River, then drive to Geraldton.

Sunday 8th: visit Lower Triassic localities near Geraldton and west of Northampton, plus ?Siluro-Ordovician coastal exposures south of Kalbarri.

Monday 9th: in morning visit Cretaceous outcrops near Thiradine Point on the north side of the Murchison River, in afternoon ?Siluro-Ordovician at Z-bend and The Loop in the Murchison River gorge.

Tuesday 10th: drive to Perth (580 km).

Logistics: This 5-day (4 nights) excursion starts at 08:30 at the Carlisle Core Library (37 Harris St Carlisle) and ends in central Perth (covers almost 1400 km). Included is transport from Carlisle and back to Perth by minibus or coach (depending on numbers), budget accommodation, entry fees at Kalbarri, and all meals and some snacks apart from at roadhouses.

Attire and safety: Wear ankle-covering hiking boots, long sleeve shirt and wide-brimmed hat while examining outcrops, and bring a water bottle, G-pick and hand lens. If unsure of your stability, wear ankle and/or knee supports/braces, and use a hiking stick, especially on steeper outcrops near Kalbarri.

Geology overview:

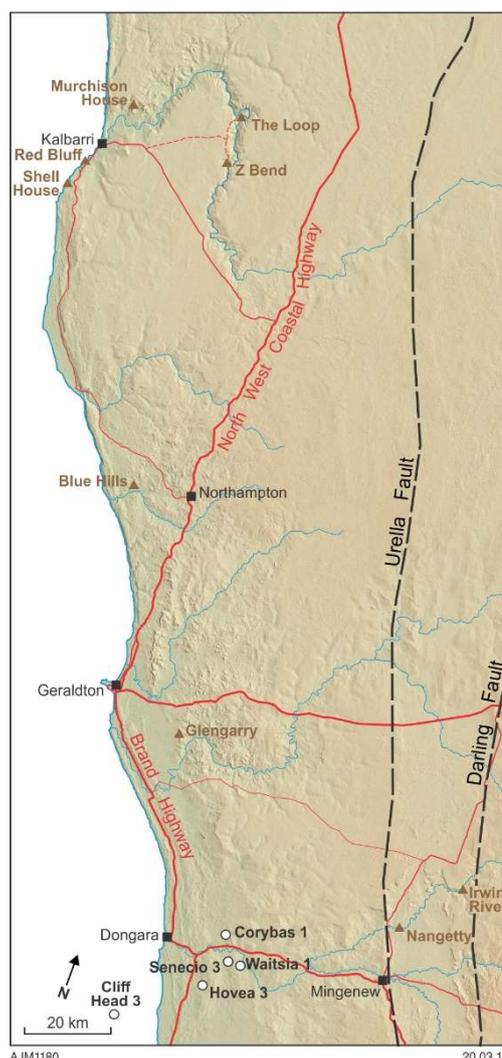
Ordovician – earliest Silurian redbed deposition (Tumblagooda Sandstone) in braided fluvial, tidal sandflat, and coastal redbed settings extending at least 700 km

from the northern Perth Basin to Onslow. The Ordovician basin was a north–south-oriented, north opening, interior-



Coastal exposure of Tumblagooda Sandstone

fracture, which developed in equatorial to low tropical latitudes. The outcrop includes thin-bedded bioturbated and rippled facies interbedded with crossbedded sandstone. Bedforms are laterally continuous, attributed to the lack of higher plant taxa during deposition, and suggest sheet braiding. The eurypterid tracks are considered to be evidence of some of the earliest excursions of animals into non-marine environments, but there is some controversy about this interpretation.



Route of excursion

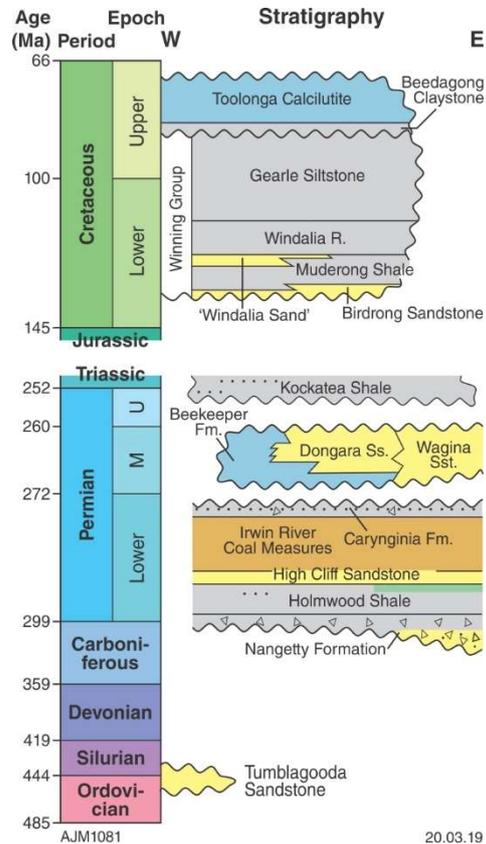
The **Lower Permian** interior rift succession shows a progression from glacial facies (Nangetty Formation), marine mudstone (Holmwood Shale) to carbonate (Fossil Cliff Member), shoreface sandstone (High Cliff Sandstone), lower delta plain facies (Irwin River Coal Measures) followed by restricted glacio-marine terrigenous facies (Carynginia Formation). Of these the High Cliff Sandstone and Irwin River Coal Measures form reservoirs for gas- and oilfields near Dongara (e.g., Cliff Head and Xanadu). Coal in the Irwin River Coal Measures and mudstone in the Carynginia Formation likely had some contribution to sourcing these fields although the major contribution was from the Lower Triassic Hovea Member of the Kockatea Shale. The core and outcrops contain abundant well-preserved sedimentary structures; participants will be encouraged to deduce environments of deposition.



Large ripples in the Irwin River Coal Measures

Although the **Cretaceous** succession on Murchison House Station is condensed relative to further north, it also shows the same overall transition from siliciclastic deposition in an interior sea to carbonate indicative of open-marine circulation. At the base of the succession are Barremian – early Aptian shallow marine shoreface sand facies (Birdrong Sandstone), which form a regional reservoir in the Northern Carnarvon Basin. At Kalbarri the overlying regional seal (Muderong Shale) consists of innermost neritic glauconitic sand facies. The succeeding Aptian–Albian contains inner to mid-neritic radiolarian-rich mudstone (Windalia Radiolarite) overlain by mid-neritic glauconitic siltstone and greensand (Alinga Formation) and Cenomanian mudstone (upper Gearle Siltstone). The

Aptian–Albian is part of a maximum flooding as the Indian Ocean opened following breakup at 136 Ma. The global eustatic sea-level high during the Cretaceous lies within the Turonian Haycock Marl and is overlain by Santonian–Campanian chalk and marly calcilutite (Toolonga Calcilutite) — these are part of the extensive carbonate shelf that formed when open-marine circulation was established at about 100 Ma.



Stratigraphy seen in core and outcrop

Recommended reading: GSWA Record 2005/9 (the pdf can be downloaded free of charge from <http://dmpbookshop.eruditetechnologies.com.au/product/geology-of-the-northern-perth-basin-western-australia-a-field-guide.do>)



Panorama of Cretaceous strata near Thiradine Point, Murchison House Station