

## Mid-latitude Western Australia and Shark Bay: modern climatic and enviro-depositional analogs for the Triassic Montney and Charlie Lake formations of the WCSB

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### Summary

The Triassic Montney (Lower) and Charlie Lake (Upper) formations in western Canada preserve textural and compositional indicators of deposition under semi-arid conditions characterized by inland deserts, evaporitic lakes and brine pans, ephemeral river systems, strong aeolian silt-sand influence/sourcing, offshore storm wind/wave settings (possibly with episodic abnormal cyclonic events), and carbonate accumulation in condensed/low siliciclastic-input environments. These conditions are consistent with mid-latitude margins of the west coasts of continents (as for the WCSB in Triassic time) from the present to the geological past. Modern analogs include coasts of Namibia, Morocco, Chile, Baja California, and Western Australia (WA).

With his Western Australian roots and Ph.D. research in Shark Bay (SB), the author for many years has favored mid-latitude WA (Figs.1, 2, 3) as a modern analog for the Triassic of western Canada, applied in many client and other presentation. The main focus areas have been on three ephemeral river and delta systems:

1. The Gascoyne River (Figs. 2, 3), entering northern SB at the town of Carnarvon into an open marine, wave-dominant environment of normal salinity (35-36 ppt salinity) and moderate astronomical tidal range, with strong northerly long-shore currents driven by prevailing southerlies.
2. The Wooramel River (Fig. 2), entering east-central SB into a relatively quiescent metahaline (40-55 ppm salinity) to hypersaline (55-70+ ppm) embayment with reduced, meteorologically-influenced tidal range - but subject to episodic storm and cyclonic events.
3. The Minilya-Lyndon river system (Fig. 2), an internal drainage system entering the northeastern margin of the ephemeral hypersaline Lake McLeod north of SB, essentially 'non-tidal'.

Of particular significance for a Charlie Lake analog, the Wooramel delta forms a broad reddish-colored prograding 'mudflat' with ephemeral halite salt pans and surficial coatings, with gypsum crystals precipitating below the delta surface - compositional characteristics not normally associated with deltas! All of the river channels may be sand-filled and dry for part of a year or for multi-year spans. Montney coquinas also find an excellent analog in bivalve coquinas concentrated along the southern hypersaline shorelines of SB, with strong evidence for redeposition under cyclonic storm conditions. The presentation will use satellite, aerial and ground imagery to document aspects of the ephemeral river-delta systems and associated sediments.

The Shark Bay area northward lies within the Carnarvon sedimentary basin of WA (Fig. 1). The offshore sector of the basin produces high volumes of oil, condensate and gas from Permian, Triassic and other intervals, mainly siliciclastics, with the Gorgon LNG plant now on line, and several other LNG sites in development or planning. A reflection of the interest in origin of some of the clastic reservoirs in this basin is recent commencement of an industry research consortium through the University of Western Australia focused on three of the ephemeral river-delta systems along the Carnarvon basin shoreline, including the Gascoyne.

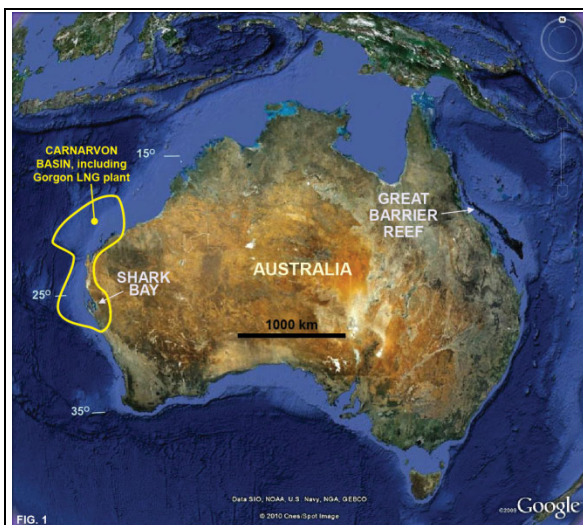


Figure 1

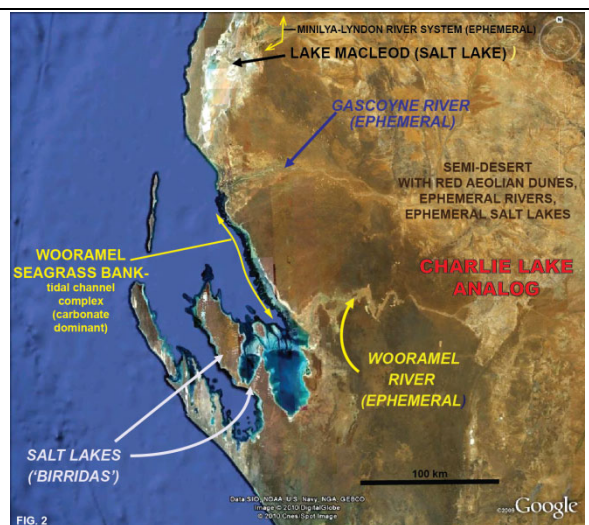


Figure 2

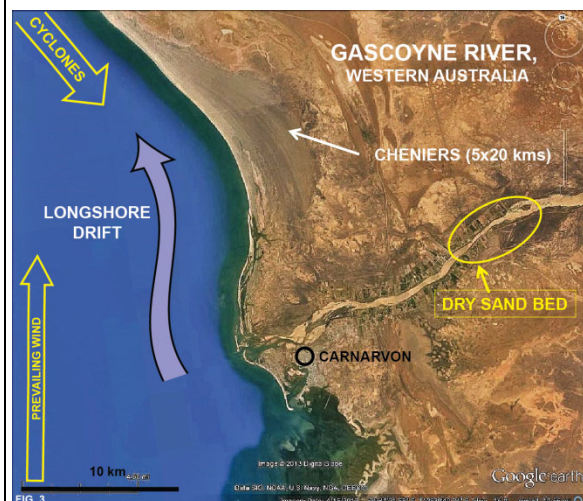


Figure 3