The Nullarbor – definitely not boring!

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The Nullarbor Plain – the largest contiguous limestone outcrop in the world – is widely regarded as somewhere without interest to be driven across or by rail on the 'Trans' as quickly as possible by Australian travellers.

Au contraire, it is a fascinating place with so many geologic, geomorphic, and other scientific and cultural values.

Our discussion is restricted to the geology, but it would be remiss of us not to mention the First Nation's people art sites in caves and their manipulation of their environments with their engineering of water-filled rock-holes. There are also highly significant paleontological deposits with remains of megafauna and more recently extinct fauna such as the 'Tasmanian Tiger' and a significant cave-adapted invertebrate fauna. It is also the site for the majority of Australian meteorite discoveries.

The values outlined here demonstrate than the Nullarbor needs to be better known to Australians – not as an area to be crossed but as an asset.

World Heritage values and more

Image: Chowilla Landslip collapse doline, photo K. Dixon

In 1992 the Commonwealth Department of The Arts, Sport, The Environment and Territories commissioned a report from the University of Canberra to investigate the World Heritage values of the Nullarbor.

The report found that the Nullarbor met all four of the Natural Heritage criteria for World Heritage listing. Cultural heritage values may also meet World Heritage standards. Since the 1992 report there has been much ongoing research and documentation of the karst, sub-fossil and subterranean ecology values.

The Victorian Speleological Society (VSA) supported by other speleologists, has documented over 3,000 karst features across much of the 230,000 square kilometres of the Plain utilising ultralight aircraft. Over 7000 features are now documented. Such recent discoveries by speleologists have generated a complete rethink of cave development on the Nullarbor.

The Nullarbor Plain is one of the largest karst areas in the world. About 190,000 km² is underlain by limestone, making it Australia's largest karst region and one of the world's great karst areas. As such the Nullarbor should be better recognised in Australia for its significant landscape.

Platforms and cliffs

The Nullarbor is a west-side up/east-side down tilted carbonate platform of flat lying Eocene-Miocene cool-water carbonate calcarenites of the Eucla Group with three formations: Eocene Wilson Bluff Limestone, Late Oligocene- Early Miocene Abrakurrie Limestone and Middle Miocene Nullarbor Limestone. The tilting occurred in the Late-Miocene- Early Pliocene, resulting in the spectacular continuous cliff-lines of the Great Southern Scarp – the Baxter and Bunda cliffs and the Hampton Escarpment. A later uplift created the Roe and Israelite Coastal Plains that are covered with a thin Pliocene-Pleistocene carbonate sand.

Image: Wilson Bluff Limestone at the base of Bunda Cliffs, overlain by Nullarbor Limestone with modern calcrete on top, photo K. Dixon

The Nullarbor is not flat! It has a low rolling relief with an amplitude of between three to less than10 metres and a wavelength of several hundred metres. On at least one place on the Eyre Highway, we cross a prior stream valley relating to Australia's wetter past as we drifted north. Perhaps the most dramatic feature of the Nullarbor are the spectacular cliff lines displaying the elements of the Nullarbor's limestones. We have the Baxter Cliffs to the east and the Bunda Cliffs to the west – probably the longest unbroken cliff-line in the world with heights of up to 150 metres above the Southern Ocean. Between the sea cliffs we have the dramatic Hampton Escarpment overlooking the Quaternary Roe Plain – a result of sea level change.

Caves and blowholes

There are several deep caves often reaching to the water-table, and hundreds of shallow caves, blow holes and rock holes. The often water-filled deep caves are long and have collapse doline entrances are mainly within the Wilson Bluff Limestone and were probably imitated during the Oligocene. The two types of shallow caves; widespread vertical tubes or blowholes (<10m deep) with small passages, and fewer horizontal caves often containing dark coloured calcite speleothems.

The blowholes "breathe" spectacularly in response to changes in atmospheric pressure. A band of them is located along the Late Miocene shoreline across the Nullarbor and probably formed as flank margin caves in the zone of enhanced dissolution at the seaward margin of the freshwater lens along the limestone coastline. The entrances occurred from denudation due to the Late Miocene-Early Pliocene uplift.

Image: Nullarbor blowhole "breathing out", photo K. Dixon

Evidence of climate change

Evidence of uplift and sea level change is to be found in several places in the Eucla Basin and on the Nullarbor such as the Ooldea sand dunes and in the cutting of the Rae and Israelite Plains. There is also evidence of climate change as Australia drifted northwards after separation from Antarctica perhaps best demonstrated by the plethora of paleochannels to the north of the Nullarbor.

Additional evidence of climate change can be seen in the caves. Old black calcite speleothems, deposited in wetter times, are now being destroyed by halite wedging with an intervening period of gypsum deposition.

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