FLORA

WHAT WOULD YOUR KOJONUP BUSHLAND GROW - 40 MILLION YEARS AGO?

Penny Hussey

Suppose a time machine deposited you back forty million years or so and left you on the edge of the Wheatbelt, say at Kojonup. What would your bushland grow?

Well, for a start, Australia had just gained approximately its modern shape, having separated from Antarctica, but was a lot further south. It was cooler, and much wetter. Most of the land was fairly flat, with broad valleys where rivers flowed south, into where Antarctica had been – or maybe the rivers were in the process of turning around to flow north (the Blackwood and the Swan hadn't been invented yet). The hills were granite outcrops, poking through the surrounding plain, which in gereral was very poor soil with few nutrients – all in all, just like today but cooler and wetter.

But what about the plants? Much of the land was covered in temperate rain forest but there were also areas of sandplain and poor soil where banksias, wattles and sheoaks thrived, just as they do today.

How do we know this? By studying fossils.

The south-west of WA is, in general, a poor place for fossils, as there aren't many opportunities for them to form. Dead animal or plant remains need to collect somewhere, be quickly covered so they don't decay, then, over millions of years, turned to rock. Because most of the south-west has been land since land began, that rules out sediment on the sea bed, and we are pretty short on lakes, too. But we did – at least in the Eocene, forty million years ago – have plenty of meandering streams.

*Fig 1: A fossil in the making – a kurrajong leaf (*Brachychiton gregorii*) at the edge of Lake Deborah, north of Bullfinch.*

Fig 2: Nothofagus plicata, *a deciduous leaf, Kojonup. Larger unidentified leaf also visible.*

Pic 3: A Banksieaeformis *leaf, very similar to modern* Banksia menziesii, *Walebing.*

As the stream wends its way down, it picks up debris from the plants around it; leaves, twigs, cones and even whole logs may be carried along and deposited as the current slows, on a bend, in a lake or a delta. If there is not much oxygen, and the debris pile quickly gets covered by a layer of sand or mud brought in by the next flood, so the shape of that plant debris can be preserved in the resulting rock as outlines in the sandstone or mudstone (fig 1). The resulting trace fossils can be found in many separate areas of WA but especially around the western edge of the Wheatbelt (including at Kojonup, Tambellup, West Dale, Calingiri and Walebing), in sediments alongside some palaeorivers and in the Kennedy Range in the Gascoyne.

In a swamp or a flat alluvial plain, of course, there are also plant remains and, given anaerobic conditions, plant debris may form coal. Collie coal contains a lot of plant fossils, as do the Coalseam coal measures around Mullewa, but they are Permian (290 million

continued on page 17

FLORA

continued from page 16

Fossils

years old) well before the time we are interested in at Kojonup.

What do the Wheatbelt fossils reveal about the plants in the vicinity of those ancient streams? Well, many of them had rainforest features – flat leaves with 'drip tips' to channel off the excess water. Some look so like the southern beeches (*Nothofagus*) still found in the eastern states, New Zealand and South America, that they have to be related (fig 2). Another common group were the araucarias (modern representatives are bunya, Norfolk Island and hoop pines), as well as sheoaks, kurrajongs, figs and livistona palm (similar, perhaps, to the palms still found at Millstream and in the Kimberley). There are also leaves that look myrtaceous and some that may be wattles or peas.

But there is another group of great interest to us in WA, the '*Banksieaeformis*'. These are leaves that look as if they could have fallen from a modern-day banksia or dryandra (fig 3). In the Kennedy Range, a superb cast of a banksia cone has been found, so like *Banksia attenuata* that it is almost uncanny. This evidence not only tells us that plants from the Banksia Family (Proteaceae) have been around for a long time, but also something about the conditions in which they lived.

Modern-day proteaceous plants grow mostly on poor soil, sandplain, gravel or laterite. Doubtless this is because they have specialized cluster roots that are able to cope with the harsh conditions (see WW 9/2) – in fact there is a school of thought which says they actually help to create them (see WW 5/4). So our banksia leaves are a pretty sure indication that sandplain and laterite also occurred widely across the landscape during the Eocene. Perhaps only the river valleys contained good enough soil to support the rainforest trees?

What about understorey? Some of the leaves that have been studied may well come from shrubs or understorey plants, but we know that temperate rainforest nowadays is often so dense that it is very little on the ground layer, except where rocks or other changes in soil type create an opening in the canopy. Some idea can be obtained from studying pollen grains, which are waxy and remarkably resistant to decomposition. Different plants have quite distinctive pollen grains, ornamented with lumps or wings for example, though you need an electron microscope to see them properly. A palynologist can study a pollen assemblage and tell which plant families it came from, sometimes even the genus. Unfortunately no one has been able to do this for our Eocene floras yet, though much younger deposits have been studied in some detail by this method.

Leaf fossils occur in many areas along the western edge of the Wheatbelt, where sandstone and conglomerate that was once the bed of ancient rivers are found fairly high in the landscape, being the remains of old abandoned drainage lines. On the South Coast, the Pallinup Siltstone is a marine deposit, and the washed-in leaves are not particularly well preserved but you may find some, eg in the spongolite cliffs at the Twertup Field Study Centre in the Fitzgerald River National Park. In the Goldfields, leaves are found in deposits at depth along the course of the old palaeorivers. A lot has been learnt from all of these sites, but there may be other locations of which palaeontologists are not aware.

If you have sedimentary rock outcrops on your property, have a look for leaf fossils. Fossil hunting is fun – real treasures of knowledge await you! However, to ensure that scientists can learn from the sites too, please let your *LFW* Officer know, and we will check with Museum palaeontologists whether they are aware of the location and would like good specimens to be lodged with them.

Happy fossiling!

Reference list available, contact Ed.

WATTLE GRASS - *ACACIA ANOMALA*

A *LFWer* sent in this great photo of the very rare *Acacia anomala*, Wattle Grass. It is an inconspicuous plant whose leafless, grass-like stems burst into cigar-shaped flowers in spring. It grows on gravelly soil along the Darling Scarp and is known only from a few sites in the Shires of Chittering, Swan and Kalamunda.

If you live in the right sort of place, have a look for this plant. It would be great to find a new population! (Don't confuse it with the much commoner *A. wildenowiana*, which has spherical flower heads.)

To maintain site security for DRF, we won't say who took this pic, but thank you for letting us use it!