



Fossils and Fruitcake in the Simpson

Kallakoopah Creek, Southern Lakes Expedition

Australian Desert Expeditions 13-26th of June 2014

Work carried out under DEWNR Permit No. M26309-2 to Camens

Trip participants:

Trip leader: Andrew Harper

Cameleers: Harry Wright, Ilse Pickerd and Andrea Hennings

Cobs: Peter and Lydia Storey, Bruce Robertson, Dinah Priestley, Karen Payten, Steve Clarke, Sandra King, Graham Durant, Jenny Barry

Scientists: Gresley Wakelin-King (geomorphologist), James Moore (palaeontologist), Aaron Camens (palaeontologist), Tony Magor (District Ranger, Desert Parks, DEWNR)



James Moore



Aaron Camens





Day 1: 15-6-14

Mungerannie to rendezvous (S 27°00.542' E 138°22.311', distance walked 13km)

Day 2: 16-6-14

Through the dunes (Camp 2 S 27°07.215' E 138 °23.707', distance walked 12.5km)

Day 3: 17-6-14

Through the dunes (Camp 3 S 27°13.090' E 138 °24.463', distance walked 15.2km)

Day 4: 18-6-14

Into the salt lakes (Camp 4 S 27°15'15.2" E 138 °19'56.2", distance walked 17.5km)

Day 5: 19-6-14

Back to the dunes (Camp 5 S 27°17'03.0" E 138 °15'16.2", distance walked 16km)

Day 6: 20-6-14

Across the dunes to Lake Thoopooconallie (Camp 6 S 27°18'08.8" E 138 °10'46.8", distance walked 13.4km)

Day 7: 21-6-14

West shore of Lake Thoopooconallie (Camp 7 S 27°24'15.7" E 138 °11'35.4", distance walked 15.6km)

Day 8: 22-6-14

South across the salt lakes to Kallakoopah Creek (Camp 8 S 27°27'46.6" E 138 °14'11.4", distance walked 18.76km)

Day 9: 23-6-14

East along the Kallakoopah floodplain (Camp 9 S 27°26'37.1" E 138 °19'46.7", distance walked 18.3km)

Day 10: 24-6-14

East to the out station (Camp 10 S 27°25'10.7" E 138 °26'14.8", distance walked 18.1km)

Day 11: 25-6-14

Outstation to Mungerannie (distance walked 3.1km)





Trip Aims

This trip represented the first opportunity for any palaeontologist to prospect this part of the Simpson Desert. Archaeologist Steve Webb had previously made collections of fossils from several sites along the Kallakoopah Creek but little is known of their geological provenance. As such our two aims for this trip were:

1. To examine the geology of the areas traversed and put it into a regional framework.
2. To prospect the area for fossil remains.

Understanding the geology of the area is critical to the interpretation of the areas in which the fossils were found. Just to the south on the Warburton River two main fossil-bearing geological formations are known. The younger of these is the Katipiri Formation, consisting of white to yellow and orange fine-grained, fluvial (river) sands and is Late Pleistocene in age (approximately 100ka). The river channels of the Katipiri Sands represent ancient channels draining into the modern Lake Eyre. The elder formation is the Tirari Formation, broken up into two members: the Pompapillinna Channels and the Main Body Tirari. The Pompapillinna channels appear to span a significant period, potentially ranging from around 300 thousand to >2 million years old. These river channels represent drainage channels to a depocentre significantly further north of Lake Eyre, a lake often referred to as Lake Dieri that was significantly larger than the former. The channels incise down into the Main Body Tirari Fm., which is composed of green lacustrine clays around 4 million years old (deposited during the Pliocene period). During this period much of the southern Simpson Desert would have been part of Lake Dieri and the climate was significantly wetter than it is today. Fossils have been found in all these units on the Warburton River but, prior to this trip, it was unknown which, if any, of these units cropped out along the Kallakoopah.

Fossils

Fossils previously found on the Warburton River include a range of extant and extinct organisms. These range from fish, crocodiles and turtles, to giant extinct animals such as *Megalia* (the 5m goanna), to *Thylacoleo* (the marsupial 'lion'), to sthenurines (short-faced, browsing kangaroos) to *Diprotodon* (a two tonne herbivore, the biggest marsupial that ever lived).

The Kallakoopah Creek reveals the northernmost extent of known quaternary fossil mammal sites (those found by Steve Webb) and it was hoped that prospecting the sediments exposed in the banks of this river would reveal additional fossil deposits from the Katipiri Sand equivalent and maybe even the older sediments of the Pliocene Tirari formation. The main focus for this trip was thus to walk as much of the modern Kallakoopah channel as possible, in order to determine the northern extent of fossil bearing strata in the region





Fossil finds:

Despite initial assumptions that fossil exposures would only be found in the creek, we quickly learned that the deflation pans between dunes were often prospective. The first site we found consisted of a deflation surface, where the sand from the older dune core had been eroded away, leaving behind heavier elements such as rocks, stone tools and fossils (see left). We found a range of shells, fish bones, turtle shell, emu eggshell and some fragments of crocodile and mammal bones.



This is fairly typical of these kinds of deposits in the region and clearly represents a time period when there was significantly more water around than there is today.

Once we had realised that there was also good potential for fossil preservation in these deflation pans, fossils started turning up all

over the place as we walked through the dunes. Aboriginal grinding stones, tools, stone flakes and spear points were also common, the positioning of flakes right next to fossils from extinct megafauna being a good lesson in knowing how to interpret the deposit- at first glance it might look like the fossils and flakes were the same age.



Left: stone flakes in a deposit next to bone fragments.



Right: a grinding stone.





Another feature of the deposits seen in the swales was the preponderance of rhizomorphs (fossil root casts). These often had an appearance similar to the fossilised bone and were often a good marker for where bone might be present (see right). Limonite (a dark red, iron-rich rock) nodules were also a good indicator of where bone might be present and in this respect the deposits were similar to those of the Katipiri Formation deposits seen further south on the Warburton River.



It was near these fossil roots and limonite nodules that the first megafaunal fossil was found for the trip- a tiny scrap of a *Diprotodon* tooth found by Karen. This told us that the fossils we were looking at were probably at least 50,000 years old, and probably much older.

As we continued to walk through the dunes the fossils started piling up- Graham was next with a fossilised yabby button (used to store calcium when the yabby is moulting) and soon everyone was finding fossils.

An afternoon tradition of ‘fossils and fruitcake’ soon developed, where we’d share our finds for the day over tea and fruitcake around the campfire. The abundance of fossils as we walked through the area was extremely encouraging and probably represents the northernmost occurrences of megafaunal deposits ever found in South Australia.





On day 4 we walked across the first of several small salt lakes. On the eastern edge a reasonably large sediment profile was visible, demonstrating that the fossils were eroding out from the white sands just below the hardened dune core. We started to find larger pieces of *Diprotodon* limb bones and teeth (rather than the tiny fragments found previously) and also began to expand the fauna with some kangaroo bones and a Brush-Tailed Possum jaw being found.



A fragmented *Diprotodon* molar (left) and fossilised *Diprotodon* turds (coprolites) (right).

James also found the corner of the molar from an extinct sthenurine kangaroo. Sthenurines were short-faced browsing kangaroos (as opposed to the larger grazing kangaroos still around today) found across much of Australia up until about 40,000 years ago.

This trip also allowed me to collect extra measurements of the trackways of various animals for comparison with my fossil footprint work. There is currently very little in the published literature describing the tracks of modern Australian animals, let alone describing recent fossil trackways. As such any additional measurements that we can take from modern trackways are going to be useful in determining the identities of fossil track makers, as well as telling us more about how extant animals move.

I collected measurements relating to a bunch of different emu trackways during the trek, as well as tracks from kangaroos, bustards, dragons, goannas and unidentified small mammals.





As we moved across into some larger salt lakes the exposed section became larger and we started seeing river sands and lacustrine clays, rather than just the sand dune cores (see right). At first the appearance of the green clay seemed similar to that seen in the Pliocene-aged Tirari Formation on the Warburton River, which raised the possibility of finding some older fossils. Unfortunately, it turned out that the sediments were significantly younger, with the usual megafaunal assemblage being represented. What was interesting though was that the sediments in this area represented a lake edge, with periods where clays were being



deposited in a lake bed and other periods where the lake bed was obviously further away and only cross-bedded river sands were being deposited.

We then walked out onto the largest salt lake visited during the trip, Lake Thoopocoonallie, and quickly established the presence of fossil deposits along the western shore. Some quick trench warfare courtesy of James (below) revealed that the river sands were absent here, the sediments showing a cyclical deepening and shallowing lake facies with layers of grey clay interspersed with iron-rich yellow to dark red fine sands (see left).



In addition to layers with thousands of snail shells preserved (probably representing a mass death due to anoxic conditions at some point) many additional fossils were revealed. Among the now familiar crocodile, fish and turtle bones, we also found more fragments of *Diprotodon*, some spectacular pieces of fossilised wood encrusted in gypsum crystals. Like the deposits seen in the swales, these fossils were often associated with carbonate cobbles, rhizomorphs and limonite nodules. They also seemed to appear periodically along the N-S trending part of the shoreline.





One of the highlights from the deposits along Lake Thoopooconallie was the distal end of a large kangaroo femur. It turned out to belong to a large extinct, sthenurine kangaroo like *Procoptodon goliai*, the biggest species of roo ever to have lived (see right). *Diprotodon* coprolites were also common in these deposits.

Fossil deposits were also seen on the western shore of another salt lake further south, near the Kallakoopah. These deposits seemed to be more similar to those seen near the start of the trip, eroding out of the base of the sand dunes rather than out of fluvial sediments. This was the richest site seen on the trip, with abundant *Diprotodon*, emu eggshell, kangaroo bones, the jaw of a bettong, pieces of a large bird- possibly *Genyornis* (a 250kg flightless relative of geese, ducks and mound-building birds), fish, turtle and even rodents. As a



reminder to always be careful about the context in which we find fossils, we also found a strange tooth in the deposit that didn't look like any element of the Australian fauna we were familiar with. It was mineralised in the same way that a lot of other teeth in the deposit were but turned out to be a cow tooth. This demonstrates that we were looking at a time-averaged deposit that accumulated over a period of probably at least 50,000 years. It also shows us that we don't know which of the fossils in the deposit were contemporaneous, and that we need to be careful about chasing the fossils back to the layer(s) that they are eroding out from.

Emerging out of the dunes and onto the Kallakoopah floodplain we were in for a surprise. Contrary to our expectations, the majority of the sediments exposed along that stretch of the modern river channel seemed quite young, the majority of bones in the sediment belonging to camels, dingoes, cows and rabbits.

In the bed of the modern creek mass fish deaths like that on the right also provide reminders of how drought affects this area of the world. Recent bones found included the Water Rat and the Crescent Nail-Tail Wallaby (recently extinct) as well as yabbies and mussel shells.



Despite the lack of fossils found on the Kallakoopah Creek itself, it was an extremely successful trip. We found abundant fossil material as we traversed the dunes and salt lakes, including probably the northernmost occurrences of several extinct taxa in South Australia. We also gained valuable new insight into the geology of the region and this will go a long way towards helping us place the sites in a regional framework.



THANKS!

I'd like to say a big thanks first of all to Andrew Harper for getting this trip funded and happening- without the tireless efforts of people like Andrew, vast areas of inland Australia would be completely closed to scientific investigation. I wholeheartedly support the work the Australian Desert Expeditions are carrying out in this part of the world and feel very privileged to have been able to come out on this trek. I cannot overstate how important the contributions of all the 'cobs' are to the success of these ventures too, without your support this research couldn't be undertaken and the role you're playing in facilitating research in the beautiful, remote part of the country is pivotal. Thanks also to the cameleers Harry, Ilse and Andrea; you're incredibly hard work day in day out had me feeling like I was sitting around scratching my arse most of the time! I also thank Gresley for her useful discussions about landscape forming processes during the trip and Tony for his insights into managing this fragile part of the world. Last but not least I have to thank James for coming along on this trip, digging holes and rolling my swag



for me while I carried my arm around in a sling. It was a fantastic experience and I look forward to the chance to get out to this part of the world again.

James enjoying the nightly swag ritual (left) and Aaron burning that bloody sling! (right).

