"THE KNEE BONE'S CONNECTED TO THE ... (BLOODY SIDE OF THE CAVE!)"

FOSSILS FROM MT ETNA AND BROKEN RIVER CAVES.

By Scott A. Hocknull

Abstract

Rich deposits of fossil bone have been recovered from a series of caves in the Mt Etna/ Limestone Ridge Caves and a cave in the Broken River. Presented here is a preliminary list of the animals that once inhabited both areas and what this tells us about past ecosystems in Queensland. The role of palaeontology and speleology will be discussed in the hope to provide adequate incentive and enthusiasm to all cavers so that any deposits they find don't go unnoticed.

Fossils collected from, the now extinct, Elephant Hole and Speaking Tube Caves, Mt Etna and Mini, Larynx and Ballroom Caves, Limestone Ridge have produced many wonderfully preserved fossils. Elephant Hole Cave is special for it has the most diverse fauna including; a new species of sugar glider, bilbies, Tassie devils, bandicoots, possums, lizards, frogs, snakes, dunnarts, antechinus, kangaroos (rock wallabies), ghost bats, bent-wing bats, snails and rodents. Speaking Tube Cave is breccia filled cave with animal smells, however, work has just begun on this site. Mini, Larynx and Ballroom Caves have produced some of the oldest material, including the same new species of sugar glider, and small rnarsupicarnivores. It does, however, contain a large cuscus, ring-tailed possums, lizards, rodents, a possible small marsupial lion, and large kangaroos. Dodgey's Cave, in the Broken River, has produced similar faunas to Mini Cave, including ring-tailed possums, rodents and sugar gliders. It has also preserved bilbies, ghost bats, bent-wing bats, bandicoots, phascogales, and large, possibly tassie devil teeth. There is a good record of Australia's recent past, preserved in the silt and breccia along the east-coast of Australia. The caves have acted like huge pit traps, in effect, producing fauna surveys that span many thousands of years.

INTRODUCTION

Fossils in Australia are characterised by being uncommon, fragmentary and badly preserved. Few sites comprise of complete skeletons and even fewer have entire ecosystems preserved within their sediments. The early history of palaeontology in Australia tended to focus on the biggest and best fossil specimens for scientific study and public display. Large animals, like the well known *Diprotodon* are found throughout Australia's recent fossil record and tell of times when the continent was much wetter and more diverse in numbers of species. Questions are then raised as to *what* were these marvelous beasts, *when* did they disappear and *why?*

The answers lie, not within the study of the largest animals themselves, but in the smaller, more "insignificant" members of the ecosystem.

The reasons for this are many-fold:

1. Smaller animals are effected by climatic change and are therefore good correlates for previous climatic regimes:
2. Small animals make up the largest proportion of faunas and can provide insights into the type of ecosystem operating at the time the larger "mega" fauna were around;
3. Where small animals are preserved, they are associated with larger animals and found in relatively high abundances and; finally,
4. Many of the small species have not gone extinct and therefore, provide substantial evidence for previous distributions (conservation in mind).

Where then do you find fossils of small animals? CAVES! Caves are the richest resources for small animal fossil faunas in the world. They act as natural pit-fall traps that collect animals brought into or those that fall into their cavernous interiors. Fine silt, either from bat and owl pellets or blown in or washed in from the exterior provide the anoxic conditions for fossil bone and shell preservation. Thus, within a single cave, fossils from a range of animals and plants can be found. For all the back-boned animals there are two ways of accumulation within caves:

1. Brought in as prey by bats, owls, snakes, frogs and some mammals; or
2. Pit-falls that collect any number of large and small vertebrate.

Snails, millipedes and beetles also preserve via guano from bats or the members of an internal ecosystem. Plant material is also preserved in cave deposits, as seed, pollen and rootlets. Each of the caves under the present study accumulated their deposits via a combination of these processes. The following paragraphs will describe two caves systems, one from the Broken River near Townsville and the other from Limestone Ridge and Mt Etna proper.

Elephant Hole Cave - Speaking Tube Cave - Mini Cave Larynx Cave - Ballroom Cave Limestone Ridge & Mt Etna - Rockhampton CEQ

Little fossil material has been collected from the fossil breccias of the Mt Etna region. The Queensland Museum holds collections from fissure deposits in the Marmor Quarry, near Marmor, cave breccias in Speaking Tube Cave (Mt Etna) and silt deposits from Elephant Hole Cave (Mt Etna). Most recently, Paul Tierney, Noel Sands and the author excavated small pieces from Mini, Larynx and Ballroom Caves (Limestone Ridge) with remarkable results.

The Fauna So Far....

Elephant Hole Cave (extinct)

The Specials:

Macrotis lagotis (Bilby); Two molars are unmistakably from *M lagotis.* The presence of the Bilby within the EHC deposit illustrates a close proximity to add areas sometime in Mt Etna's past. A mathematical prediction, using climate modelling, of former Bilby distribution by BIOCLIM produced a maximum distribution line very close to Rockhampton, and hence both records corroborate each other.

Petaurus sp. nov. (new species of sugar glider); many jaws and skeletal elements are attributable to this extinct and distinctive species. Fossils of this species have been found in EHC and MC and hence provide a faunistic link between the two sites – the significance of this will be discussed later.

Sarcophilus harrisi (Tasmanian Devil). Devil's are known from mainland Australia throughout it's recent past, however, few records are as high up the continent as Rockhampton.

SNAIL SHELL

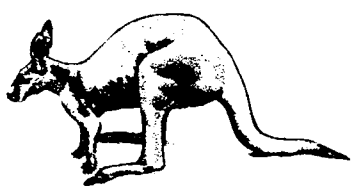
Although many people think the best thing for snails is to lightly marinate them, another application - being developed by Dr. John Stanisic at the Queensland Museum, for their shells is to study the affects of shell growth in relation to precipitation levels and climate fluctuations. Shell growth can be retarded when times are bad and accelerated in better times, therefore, by using the fossil shells and comparing them to modern shells that have experienced known environmental stress the past climates and precipitation fluctuates can be predicted.

Not so special, but significant:

Seeds
Molluscs (snails)
Frogs (3 species so far)
Lizards (dragons, skinks, geckos, snake-lizards, goannas)
Snakes (elapids (venomous), pythonids)
Rodents *(Rattus, Pseudomys, others)*
Bats (Macroderma gigas, Miniopsteris others)
Marsupial Mice *(Antechinus, Sminthopsis)*
Marsupial Cats *(Phascogale, Dasyurus)*
Bandicoots *(Perameles nasuta, Isoodon obesulus)* Rock Wallabies *(Petrogale)*
Kangaroos & Wallabies *(Macropus spp.)* Mountain Brushtail *(Trichosurus caninus)*

Mini Cave - Larynx Cave - Ballroom Cave

Molluscs (snails)
Ringtailed possum *(Pseudocheirus sp.) Cuscus (Strigocuscus sp.)*
Marsupial Mouse *Antechinus sp.*
Petaurus sp. nov.
?Marsupial lion tooth
Large kangaroo
Rodents
Skink



DODGEY'S CAVE, BROKEN RIVER

In 1995 a small party from the Queensland Museum discovered fossil bone breccia outside and within several caves in the Broken River region, west of Townsville, NEQ. One of the caves, Dodgey's Cave had the breccia and large samples of cave silt collected from it. From these collections several species have been identified, however, nothing has jumped out as being terribly spectacular - until recently.

The Specials:

Macrotis lagotis (Bilby): - From bone breccia. The presence of the bilby from this locality reiterates the interesting conclusions brought forward by the BIOCLIM data and the specimens found in EHC. The presence of bilbies so far from their present distribution also provides further evidence of a rapid reduction in range in recent times.

Macroderm gigas (Ghost Bat): - From silt floor. In mid 1998, the author discovered a skull of a Ghost bat, lying on the top of a silt slope within the first chamber of Dodgey's Cave. It is not fossilised and seems to be very recent in origin! Determining the age of the skull is near impossible, however, there are three factors that can be used to estimate the latest date.

1. The skull was found very near an excavation that commenced in 1995. If the skull has originated from reworking of the silt layers then the maximum age of the skull will be known when these bones are dated.
2. In spite of thorough surface searching within this chamber for skulls and teeth in 1995, large complete skulls like this one were not recovered.
3. Deposition within BR caves is rapid (wet cave system), therefore, if skull had been stationary for - even up to 10 years - calcium incrustation should be present. The fossil does not possess any of these characteristics.

There are therefore, two possibilities:

1. The animal has been deposited there in the last 5- 10 years or it has been reworked from previous deposits when calcium incrustation was not so active.
2. Another, confounding factor is that throughout the excavation the most common jaw element of a bat is the Ghost Bat.

The possible presence of a new locality for Ghost Bats within the Broken River region needs urgent attention.

Large marsupicarnivores -

There are many teeth and fragments of teeth that indicate the presence of large marsupial carnivores, unfortunately the bones and teeth are badly preserved and are identifiable. The closest possibility is the Tassie Devil.

Other beasties...

Silt accumulations (different ages)

Rufous Bettong
Marsupial Cat *Phascogale topoatafa Glider Petaurus sp.*
Brush-tailed possum *Trichosurus vulpecula Quoll Dasyurus sp.*
Antechinus, Sminthopsis.
Bats *(Miniopterus, Rhinolophus)*
Rattus, Pseudomys (rodents)
Dog/ Dingo *Canisfamiliaris*
Cane Toad *Bufo marinus*
Rock Wallaby *Petrogale*
Pythons
Venomous snakes
Frogs
Dragons, skinks, geckos, goannas.
Snails, millipedes, seeds, pollen.

Bone Breecia
(oldest material)
Rodents
Skinks, dragons, snakes
Antechinus
Bats
Ring-tailed possum
Brush-tailed possum
Rock Wallaby

PALAEOCLIMATES AND SIGNIFICANCE OF BOTH SITES.

The significance of each cave site has not been fully recognised so far. It won't be until dating of the caves is accomplished that the entire significance of the fossil faunas is known. What can be concluded so far is easiest represented in point form.

- Both cave systems preserve faunas of different ages (breccia vs silt) within each cave, therefore, it is possible to provide rough chronologies of the caves geological past. This will aid in understanding the formation of the fossil deposits and determine how they formed in the first place.
- Each cave system preserves large and diverse faunas, which will inevitably lead to better understandings of past ecosystems.
- The fossil faunas from Larynx, Ballroom and Mini cave are typically rainforest adapted species (e.g. ring-tails, cuscuses). The presence of the new species of sugar glider may suggest that it had it's origins in rainforest areas,
- The fossil fauna from Elephant Hole Cave suggests a different ecosystem of dry scherophyll (similar to today) (e.g. arid-adapted species). The presence of the sugar glider here is confusing, however, it may provide the vital 'link between the two faunas. Either the two faunas are different due to time (e.g. rainforest fauna being older = hard old breccia, than the arid-adapted fauna = soft young silt), or they are of similar ages with the ecosystem holding mostly arid-adapted species with pockets of rainforest. This will only be determined through close dating.

- The Broken River deposits seem to be dominated by arid-adapted species and therefore are indicative of very recent times. It may be that Dodgey's Cave preserving its arid-adapted faunas, are of similar age to that of Elephant Hole Cave.

THE FUTURE

There is still a significant portion of work ahead. More excavations are needed, with more finite excavation techniques. But most of all the need for firm dates is the one retarding factor in understanding the full extent of these cave systems. The lack of funding for dating and excavation has plagued palaeontology throughout it's entire history, however, this needs to change if the information used by biologists is going to be of any worth.

The Queensland Museum now has small samples from Chillagoe, Michell-Palmer, Hervey's Range, Broken River, Mt Etna, Limestone Ridge, Gore Cement Mills, Texas Caves, Ashford Caves and Riversleigh. Each of these sites provides a record of climatic fluctuations that pushed and pulled Australia's rainforests and woodlands apart. What we need to do now is to sythesise these pieces of information by good dating techniques and more thorough excavation. What is needed ... Time and Finance (typical).

Cavers are an integral part of the study of ancient faunas, stumbling across them where ever they go, however, little is reported to the relevant researchers in each field. The field guides that are kept by Caving Clubs and Societies are important to people (like myself in knowing the whereabouts of fossil deposits. This is not to encourage the collection of fossils from caves for personal or museum collections, it is to understand the full potential of cave systems and to mount proper, well organised, neat and very discrete digs with the combined help of all interested parties. Cavers and Palaeos must work together to develop a rapport that can benefit the public, science and our quest for knowledge as human beings. The present applications of the knowledge of our recent past is the ability to predict events in the future! Whether they be for *Homo sapiens* or for animals and plants we wish to conserve.

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